Agrosearch,23(1), 27-38, (2025) https://dx.doi.org/10.4314/agrosh.v23i1.3

Determinants of the Adoption of Improved Shea Butter Processing Technologies in Oyo State, Nigeria

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Abstract

This research was conducted to find out factors that may be associated with low adoption of improved shea butter technologies in Oyo State. A combination of sampling procedures was employed to select the respondents. Data was collected both qualitatively through interview schedule and qualitatively through key informant interviews from 400 respondents. Multiple regression was utilized for the analysis of the determinants of adoption of improved shea butter processing technologies. The outcome of the research revealed that 91.5% of the respondents were female, 60.2% were literates, with at least primary school education, average of 55.2 years of age, average experience of 21 years in processing shea butter, average of 7 household members, average annual income of ₦1,006,782.38. Multiple regression results revealed that socio-economic factors in the model were able to explain up to 61.8% of the variation in the adoption of improved shea butter processing technologies of respondents. The coefficient estimate indicated that scale of income diversification (β = 0.086), annual income (β = 6.196), access to extension contact (β = 0.041) and access to resources for shea butter processing (β = 0.244) showed a positive significant relationship. With 62% impact of socioeconomic factors, this study concluded that adoption or otherwise of improved shea butter processing technologies is massively influenced by socioeconomic factors in Oyo State. A unified approach for training processors is required to enhance understanding and adoption of shea butter processing technologies in Oyo State.

Keywords: processing technology; adoption; income diversification; annual income; extension contact

Introduction

Shea butter is a fat which is taken out from the nut of the African shea tree (*Vitellaria paradoxa*). Shea is used in the food, pharmaceutical, and cosmetic industries as an edible oil, antimicrobial, and moisturizer. Shea butter is an essential fat of high nutritional value that is utilized in a variety of industries, such as the food industry, cosmetics and pharmaceuticals, as antimicrobials, edible oils and moisturizers (Adesope, 2019). It is solid at ambient temperature (25-30˚C) and liquid when

temperature exceeds that of ambient (Ayanfunke & Kabiru, 2020). The shea tree, which is native to Africa, is a widely valued crop among indigenous peoples in all regions where it is cultivated. It is used as a replacement for cocoa butter and is considered to be the second most significant oil crop in the continent, second only to oil palm trees (Abagale *et al.*, 2016). It also has enormous importance as a source of livelihood, especially for rural women, and also serves as a means of earning foreign exchange (Aremu *et al.*, 2022; Daku *et al.,* 2012). Virtually all the parts of the tree have one or more uses. However, shea butter is the most prominent of all the by-products of the shea tree.

Technologies are generated in agricultural research institutes to improve efficiency of farmers/processors for increased outputs and income of agricultural value chain actors (Adesiji *et al.*, 2 015; Ayinde *et al.*, 2022). With focus on shea butter processing technology, studies by Sanusi et al., (2016) on the level of utilization reveals low utilization of modern technologies in Nigeria. Kolosche et al. (2016) reported that shea processors in Niger state were not well versed in the most up to date processing technique, which led to lack of adoption of these technologies and poor quality of shea butter produced.

Agricultural technologies have several significant characteristics that affect the decision of farmers to adopt. For example, Akudugu (2012) identified factors determining the adoption of agricultural technology to include social and economic status as well as access to physical assets. Socioeconomic factors, especially the high cost of agricultural technologies, are considered to be barriers to agricultural technology adoption (Ayinde *et al.*, 2022; Sennuga *et al.*, 2020). However, Ogunyemi *et al.*, (2022) stated that improvement of rural-urban income, rely on effective cooperative platform formation and warding off of intermediary influence on input-output investment on agribusiness, understanding of socioeconomic factors must come first. Without this being taken care of, consequences will result in lower productivity, increased production costs, environmental degradation, limited adaptability, missed market opportunities, reduced competitiveness, and lack of innovation (Aremu *et al.*, 2022). It is crucial that farmers should stay abreast of technological advancements and embrace those that can contribute to their long-term success and sustainability in the agricultural sector.

Socio-economic factors are significant lifestyle components that measure the financial stability and social standing of the people in a society, a key driving force that influences the extent to which farmers perceive and utilize improved technologies (Dagnogo *et al.,* 2021). An understanding and right appropriation of these factors can change and sustain the level of adoption of improved technologies in shea butter processing (Adesiji et al., 2015). Rogers (2010) described adoption as a mental process that an individual undergoes through initial acknowledgement and awareness of the innovation till the stage of application. Therefore, understanding and being cognizant of the social as well as the economic reasons which have impact on Improved Shea Butter Technologies (ISBTs) adoption is undoubtedly required to boost

strategic plans needed to stimulate adoption of improved shea butter technologies in the study area. Hence, this scientific enquiry was embarked upon to ascertain the socio-economic factors that affect the usage of improved shea butter processing technologies in Oyo State, Nigeria.

Methodology

This research was conducted in Oyo State, Nigeria using a mixed research design where data was collected both qualitatively and quantitatively. The state land mass coverage is 28,454 square kilometers and it lies between latitude 9˚8.74¹N and 7˚1.68¹N and longitude 2˚38.66¹E and 4˚38.25¹E of the Greenwich Meridian. The state comprises 33 local government areas and has a population density of 297 people per square kilometers (Eme & Idike, 2015). Majority of people engaged in growing different types of food crops (Maize, Yam, Cassava and so on) and cash crops (Cocoa, palm tree, kolanut to mention but a few). Parkia biglobosa tree, Shea butter trees are mostly found in the wild.

The population of this study is shea butter processors in Oyo State, comprising only the people that process shea nut into butter. The estimated population of shea butter processors in Oyo State is 882,738, according to the Agricultural Development Programme (ADP), Ministry of Agriculture, Oyo State (2019). However, this study selected only 400 respondents to represent the entire population using sample size determination. The Taro Yamane (1967) sample size determination formula for finite population was used in settling for the respondents that make up the sample size for this enquiry. Given the population size of the study location, it is unrealistic to extract information from the entire population, inferences were therefore drawn from data obtained from a segment of the whole population. Subsequently, different sampling techniques were used at different stages to arrive at the final respondents for the study. The shea butter producing areas in Oyo State were clustered into three ADP zones, namely Saki, Ogbomoso and Oyo. The study area was narrowed to manageable size for effective sampling.

Five (5) local government areas (LGAs) namely; Itesiwaju, Orire, Atisbo, Saki West and Saki East were selected from the clustered zones using purposive sampling techniques. This was based on the preponderance of shea butter processing in these areas. Simple random sampling through balloting was then employed to select four (4) council wards from each of the Local Government Areas (LGAs) sampled for the study. This is to ensure that every council has equal chance of being selected. Purposive sampling technique was used in selecting twenty (20) households from each of the council wards. This was done based on the shea butter processing activity in the households. In every of the households selected, a respondent was randomly selected, giving every element of the population an equal chance of being selected. Hence, 20 respondents were selected in each of the 20 sampled council wards bringing a total of 400 respondents used for the study. Furthermore, purposive

sampling was employed to select fourteen (14) informants for key study interviews. The informants are executives (chairman, secretary) of shea butter processing association in each local government area and extension agents covering the areas. The selection was done based on the perspective that they were informed of the phenomena of the study considering their position as executive members and agricultural extension agents that have worked with the shea butter processing associations in their respective local government areas for 5years and above.

Structured questionnaires and key informant interviews were used as instruments of data collection for mixed method research design that is quantitative and qualitative data of the study. Test for reliability of the research instrument (test-retest) was conducted on 20 shea butter processors randomly selected within two weeks in Ilorin, Kwara State with similar characteristics to those in the study area (Pearson product moment correlation analysis). The result of the test-retest was a Coefficient of Reliability (r) of 0.7, indicating that the research instrument was reliable. In constructing the questions for the interview, the researchers ensured that the questionnaires were not open ended but structured. This was administered by the researchers reading out the questions to the respondents and writing down their responses. This was done with the help of three (3) research assistants based on the objectives of the study. There was face to face interaction with the researchers and the respondents. This instrument of data collection used reduced the bias of the interviewer and also enabled the researcher to cover a relatively large number of respondents. Key Informant Interview (KII) guide was used to collect qualitative data to complement the structured questionnaire used. Informants with a minimum of 5 years of experience in shea processing were interviewed using key informant interviews with only seven (7) questions. This is because the school of thought believes experience is the best teacher and these categories of informants have garnered consistent wealth of experience in working with the shea processors over the years. The interview was conducted in the respective homes of the respondents within the space of 45 mins-1 hour, each. This instrument enables the study to cross-check the responses gathered through the structured interview schedule.

The study used a mixed research design. This means that the data collected was not only qualitative but also quantitative. Quantitative data was analyzed using Statistical Package for Social Science version 23, while qualitative data was looked at using thematic stories and direct quotes from people's responses. Primary data collected were analyzed using descriptive statistics like frequency counts, percentages, mean, and standard deviations. Livelihood capitals influencing adoption of Improved Shea Butter Processing Technologies (ISBPT) was determined with Multiple Regression analysis (Ordinary Least Square Model). The predictive model was specified implicitly thus (Equation 1):

$$Y = f(X_1, X_2, X_3, X_4, X_{5,} \ldots\ldots\ldots\ldots X_n)U \ldots\ldots\ldots \quad (1)$$

Where:

Y=Adoption of improved technologies

X_1 = Education attainment (Dummy, 1 If attended sch, 0 if not)

X_2=Occupational status (Dummy, 1 If SBP is primary occupation, 0 if otherwise)

X_3 = Estimated annual income (Dummy, 1annual income, 0 if otherwise)

X_4=Group membership (Dummy, 1 If registered member, 0 if otherwise)

X_5=Health Status (Dummy,1 If stressed, 0 if otherwise)

X_6 = Labour type (Dummy, 1 If family alone, 0 ifotherwise)

X_7=Extension visits (Dummy, 1 If there is ext.visit, 0 if otherwise)

X_8 = Access to resources (Dummy, 1 if having access, 0 if otherwise) and U= Error term.

Results and Discussion

Table 1: Socio- Demographic Characteristics of the (Quantitative) Respondents (n=386)

Variables	Frequency	Percentages	Mean (SD) Range
Sex			
Male	33	9	
Female	353	92	
Age (years)			55.2 (11.34) 29-72
≤ 30	13	3	
31 - 60	242	63	
61 and above	131	34	
Marital Status			
Single	14	4	
Married	330	86	
Divorced	4	1	
Widowed	38	9	
Educational level			
No formal education	154	40	
Primary education	140	36	
Secondary education	67	17	
Tertiary education	25	7	
Religion			
Traditional	30	8	
Islam	185	48	
Christianity	171	44	
Household size (persons)			6.6 (1.52) 4 - 11
≤ 5	89	23	
6 - 10	287	74	
Above 10	10	3	
Years of experience in shea butter processing			21.2 (14.02) 3 - 66
≤ 20	108	28	
21 - 40	163	42	
41 and above	115	30	

Source: Field Survey, (2021)

Table 1 presents socio-demographic characteristics of respondents in relation to sex, age, marital status, educational level, religious affiliation, household size and years of respondents' experience. The table shows that 92% (353) of the respondents were female while 9% (33) respondents were male. Obviously, females are more involved in shea butter processing in Oyo State. This finding aligns with the outcomes of similar studies which stated that shea butter processing is women green gold, because majority of women are more patient to go through the rudimentary process than men (Pouliot, 2012; Obisesan, 2014).

With regards to age, it is revealed from the table that most of the respondents were within the age range of 31-60 with 3% (13). While those in the age range of 60 and above were 34% (131). The age ranges from 29-72 years with an average of

55.2±11.34 (55years). An indication that the average age range of the respondents is 55 years. This finding is consistent with the assertions by the government that the youth does not find agriculture attractive, hence, their less involvement (Akinwunmi *et al*, 2020; Adewale, 2005).

On marital Status, married respondents constituted the bulk of the study with 85.5% (330) while respondents who were single were the least with 3.6% (14). Furthermore, respondents who were widowed came second with 9.8 % (38) respondents, while the divorced respondents were third with 4.7 % (18). The highest percentage recorded by the married respondents indicate that the married people are those who can settle down and engage in income activities to cope with the needs of the family. The singles were not so stable, moving from one place to another looking for greener pastures and less likely to be committed to shea processing operations. This finding is in agreement with the study of Agbamu (2006) which found that married farmers adopt and utilize improved agricultural technologies more than single farmers who are solely with less dependent responsibilities.

Data on educational status on the table revealed that 39.9% (154) respondents were without formal education and recorded the highest percentage, while the least respondents were the ones with tertiary qualification of 6.5% (25). Furthermore, respondents who had primary qualifications were the second highest percentage of 36.3% (140) while respondents with secondary qualifications were the third highest percentage of 17.4% (67). The predominance of respondents with no formal education, primary education and secondary school education showed that most of the respondents in the study location have a low level of formal education. This finding concurred with the result of the research conducted by Dauda (2013) which stated that farming in developing nations like Nigeria is undertaken by people of low educational background.

Data on religion affiliation showed that the majority of the respondents were of Islamic faith 47.9% (185), followed by respondents of Christianity faith with 44.3% (171) and the last were respondents of traditional faith with 44.3% (171) also the finding showed that respondents were of different religions with the majority from Islam. However, they form a cooperative in order to help one another.

This is in agreement with some studies that stated that the cooperative helps the respondents to meet each other dire need at one time or the other (Owolabi, 2017). Data regarding the household size of respondents, about 23.0% (89) respondents had 5 or less number of persons per household, 74.4% (287) respondents had 6-10 number of persons per household and 2.6% (10) respondents were having above 10 persons per household. The overall household members of the respondents range from 4-11 persons with an average of 7±1.5 persons. This finding agrees with that of Ademola *et al*, (2012) who stated that a good number of shea processors in Oyo State had the luxury of between 7 to 10 persons per household. Accordingly, since traditional processing of shea butter is labour intensive and processors have large household size to handle various processing tasks, this could discourage the adoption of

mechanized technologies for shea butter processing considering the availability of family labour which is often considered comparatively cheaper.

The years of experience in shea butter processing presented in Table 1 shows that 28.0% (108) respondents had 20 years experience or less, 42.2% (163) respondents had between 21-40 years, and 29.8 % (115) respondents had above 40 years of experience. The overall years of experience ranges from 3-66 years with an average of 21.2±14.0 years. This result indicates that processors have in depth experience in the processing of shea butter. This means that the processors had enough experience to be informed in their decision on whether or not to adopt modern processing technologies.

Table 2: Distribution of Respondents based on Stage of Adoption of ISBPTs Level of Adoption of Improved Shea Butter Processing Technologies in Oyo State

ISBPT	Awareness	Interest	Evaluation	Trial	Adoption	Mean(SD)
	Freq.(%)	Freq.(%)	Freq.(%)	Freq.(%)	Freq.(%)	
Roaster	-	-	-	-	386(100.0)	5.00(0.0)
Crusher	-	-	-	-	386(100.0)	5.00(0.0)
Attrition mill	-	-	-	-	386(100.0)	5.00(0.0)
Cold Press	74(19.2)	24(6.2)	28(7.3)	17(4.4)	243(63.0)	3.86(1.63)
Centrifuge	50(13.0)	11(2.8)	30(7.8)	7(1.8)	288(74.6)	4.22(1.43)
Solvent Extraction	78(20.2)	19(4.9)	34(8.8)	65(16.8)	190(49.2)	3.82(1.64)
Adoption rate						81.1%

Source: Field Survey, 2021

Findings in Table 2 indicate that all the respondents 100% (386) reached the adoption stage of usage of roaster, crusher and attrition mill ISBPTs after the adoption. However, on centrifudge technology type, 74.6% (288) respondents reached the adoption stage with only 2.8% of the respondents showing interest and 1.8% respondents that have tried the innovation; this was followed by 63.0% (243) respondents that reached adoption stage of cold press technology with 6.2% that showed interest and 4.4% that have tried the innovation. While 49.2% (190) respondents for solvent extraction technology reached adoption with 4.9 % showed interest and 16.8% trials.

The data above revealed the progress and acceptance of improved shea butter technologies among the shea butter processors. The adoption rate of improved

technologies is stated as 81.1%. This means that the target population of the shea butter processors adopted the improved technologies. This high adoption rate suggests a relatively significant acceptance and possible uptake of the improved technologies within the target population. Novel ideas could be increasingly use, when having significant effect on the market or society (Al-hassan, 2019). Majority of the intended users or beneficiaries having recognized the benefits and value of the technologies adopt with time. They try to incorporate the new ideas into practices of daily lives. This finding corroborates the studies of Bolaji-Olatunji *et al.* (2018) and Yokamo (2020) that reported massive improvement in the standard of living of the Asians because of the green revolution adoption that transformed the state of their agriculture.

One of the Key informants noted:

"…. The shea butter improved technologies awareness was created among us. We registered our interest. We were encouraged and given the opportunity to try our hands on some of the improved technologies so as to make informed decision before adoption. Some of the experiences gained will materialize better in future. …" (Female Key Informant from Ago Amoda council ward in Saki east LGA, 2021.)

Another Key informant noted:

"…. The respondents were taken through the five stages of Roger's adoption process and they were given free hand on training to make their decision to implement and confirm what has been taught to them…." (Female Key Informant from Otu council ward in Itesiwaju LGA, 2021.)

Also, a key informant said:

"…. There are different stages of adoption of ISBPTs. I think about five or six stages. We were given several trainings on this before we decide on the way forward on the improved shea butter technologies adoption…" (Female Key Informant from Abule soro council ward in Orire LGA, 2021).

Factors Determining Adoption of Shea Butter Processing Technology

Table 3: Multiple Regression Analysis Showing Demographic Characteristics Influencing the Adoption of ISBPTs

	Unstandardized Coefficients		Standardized Coefficients		
Adoption of ISBPTs	B	Std. Error	Beta	t-stat.	Sig.
(Constant)	3.423	.433		7.911	.000
Educational status	-.053	.038	-.085	-1.408	.160
Labour type	.136	.130	.082	1.046	.296
Additional occupation	.086	.029	.199	2.968	.003**
Annual income	6.196E-7	.000	.274	3.087	.002**
Extension contacts	.041	.010	.223	4.184	.000**
Access to resources	.244	.107	.157	2.277	.023*
Membership of group	.138	.212	.051	.652	.515

Model Summary: R Square= 0.618; Adjusted R Square=0.100;
Std. Error of the Estimate=0.5404, F-stat. = 6.327, Sig. =0.000
*, ** implies significant at 0.05 and 0.01 level respectively

There are some socioeconomic factors that play an important effect in how much shea butter processors are likely to adopt the technology. The regression analysis in table 3 showed that certain socioeconomic factors had a significant impact on how likely they were to adopt the technology (R^2=0.618; F=6.327; p=0.01). For the most part, the socioeconomic factors that played a significant role were occupation, yearly income, contact with extension, and availability of resources. The input for Shea butter processing predicted that 61.8 percent of processors were likely to use the technology.

Conclusion and Recommendations

This study concludes that the socio-economic factors that influenced the adoption of improved shea butter processing technologies among processors in Oyo State were income, occupation, extension contact and resources access. All these have to be favorably revisited for change to occur, thereby promoting increase in adoption of ISBPTs in Oyo State. Adoption level of roaster, crusher, attrition mill and centrifuge improved shea butter processing technologies were high among processors in Oyo State. This study therefore recommends that consensus be reached in dealing with different groups of different educational backgrounds within the audience. A convergent point must be arrived at where everyone will be trained with the understanding of the significance of the training, irrespective of the educational background. This will help the respondents to make informed decisions that will increase adoption. These individuals must be provided with necessary knowledge and skills, training initiative empowerment to understand, utilize, and maximize the benefits of the improved technologies. Method of teachings employed should be re-considered for different groups for effective training programs. This should be tailored to the specific needs, context, and the target audience. It should be interactive, practical, and relevant, providing hands-on experiences and real-world examples. Provision of case studies, success stories, and testimonials can be played (audio-visual) to affirm the positive impact of the technologies.

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