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Assessing the Impact of Indigenous Shea Butter Processing Activities in Northern Ghana

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Abstract

Shea butter production generates income for most people in the Northern Ghana and most rural women depend on it for a living. Notwithstanding this, the waste from Shea butter processing has become major contributors to environmental impairment. This study thus assessed the ramifications the indigenous Shea butter processing has on the environs of Northern Ghana. The study was a descriptive survey that used one hundred and ten (110) respondents and questionnaire was the main instrument for data collection. Analysis of the results revealed that the indigenous methods of Shea nut processing did not help protect the environment compared to the other methods (semi-mechanized and fully-mechanized method); the wastes are left unmanaged and disposed of indiscriminately because of the unavailability of engineered dumping sites thereby causing nuisance to the immediate environs. It was, in fact, conspicuous from the responses that, the processors expressed sentiments about the dangers of the indiscriminate waste disposal yet nothing has been done about it. It was also revealed that Shea wastes continues to form heaps in the Metropolis and impart foul odors and also choke gutters causing flooding with the slightest downpour. The processors are suffering from ailments resulting from enormous heat and smoke and obnoxious odor. Over dependence of fuel wood as a source of energy is also contributing to deforestation of the savannah forest. It is therefore recommended that, the indigenous method of Shea butter processing should give way to a modern one to mitigate the environmental impact in the Metropolis. Meanwhile, the Metropolitan Assembly should adopt proper management of the waste generated to lessen the impact on the environment.

Keywords: Shea butter, Shea Waste, Indigenous processing method, Environmental degradation, Environmental Sanitation.

Introduction

The Northern sector of Ghana is under–developed with low income economy as compared to the southern sector[1]. With majority of the rural people depending on agriculture and petty trading for their livelihood. Shea butter production is one of the major occupations for the rural people in the sector and in almost all communities in the region, women folk engage in its production[2]. Shea collection, processing and subsequent sale of Shea-based products generate income and offer employment to the rural women and children[3,4] and about 600,000 women in the northern region depend on the income generated from Shea butter production[5]. The Shea tree is an important commodity in the Northern part of Ghana; the fruit is a source of food and the seed an important source of glycerol and fatty acids[6,7].

In spite of the economic and nutritional benefits of Shea, its processing causes a major environmental degradation which has become a major public health and environmental concern[8]. Wastes generated during Shea butter processing, mainly waste brown water, waste black sludge, seed husks and seed shells[9], are indiscriminately disposed thereby becoming menace to the environment and health threats to dwellers.

The mostly dominated method of Shea extraction is the traditional manual method[10] of which most processors depend on[11] and because of its inefficiency in extraction, gives lower yields per unit input of raw materials resulting in most of the raw materials being discarded as waste. These discarded wastes are not properly managed and accumulate causing serious environmental pollution[12]. Shea cake, a by-product in the Shea industry[13-15], is disposed indiscriminately in the environment until they form heaps of waste. These wastes are rich in phenol compounds[16] which can combine with enzymes and other proteins to form polymers[17] of high molecular weight compounds which are not biodegradable[18] and have toxic effects on aquatic organisms and microorganisms[19]. These organic wastes have some dramatic effect on soil physical properties as well[8].

Furthermore, hot water which is used for the extraction of the butter[12] generates heat and oily wastewater which according to[9], flows freely into the immediate bare land. The liquid waste disposed stagnates making the place muddy and non-supportive of crop and animal survival. The decaying organic waste and stagnated wastewater emit obnoxious odor, while also serving as procreation ground for flies, mosquitoes and maggots which are minatory to the health of the immediate dwellers[12]. The

disposed seed husks and the seed shells choke gutters and other water ways making the place more prone to flooding with the slightest downpour. Leachates from these wastes might reach nearby water source and then also introduce contaminants that can negatively change the chemical composition of the water. Moreso, the indigenous method requires large quantities of fuel wood[7,20] and majority of processors rely on it as their main source of energy[9]. Aside its deforestation and subsequent environmental effect, enormous heat and smoke generation can result in respiratory ailments, undue irritation of the eyes as well as nose and throat among processors[12]. The current research therefore assesses the impact of the traditional method of Shea production on the environment of the Northern Ghana.

Methodology

The research was conducted at six processing centers in the Tamale Metropolitan Assembly namely; Kasalgu, Kanfiayili, Kumboyili, Sagnarigu, Tunteiya and Tiehsuma processing centers. The target population was Shea butter producers within the Tamale metropolis. With the support of the management of Tiehsuma Processing Center of Tamale, five hundred and fifteen (515) registered Shea butter processors were identified and this formed the sample frame for the study. The five hundred and fifteen (515) processors belong to six processing centers. The six processing centers and their respective number of processors are as follows: Kasalgu (228), Kanfiayili (100), Kumboyili (30), Sagnarigu (45), Tunteiya (32) and Tiehsuma (80). It is the sum total of the individual processing centers which automatically formed the target population of the study.

Multi-stage sampling technique was employed in the study. The first stage of the sampling involved stratifying the processing centers into six homogeneous strata. To ensure a fair representation of respondents from each stratum, the stratified random sampling was used to select respondents from each stratum at the second stage using the formula:

$$n_s = \frac{N_p}{N} \times n$$

Where: n_s is the sample size for each stratum, N_p is the population size for each stratum, N is total population size, and n is total sample size require for the study.

From the above formula the total number of respondents from each processing center was: Kasalgu (49), Kanfiayili (21), Kumboyili (6), Sagnarigu (9), Tunteiya (8) and Tiehsuma (17) giving a total of 110 respondents. At the third stage, the simple random sampling method was to select the sample size from the sample population in each stratum. Here, pieces of papers were inscribed "Yes and No" according to the number of respondents need in each stratum and those who picked "Yes" were chosen for the study.

The study drew predominantly on a descriptive survey using structured questionnaires and backed by extensive observation and interviews. The test items in the questionnaire were well structured, closed ended statements which required respondents to express their opinions as to whether they strongly disagreed, disagreed, indifferent, strongly agreed or agreed to the statements. Specifically, the study parameters assessed included the methods of processing Shea butter; ascertaining the nature of waste generated from Shea butter and effect; determining the sources of heat and water availability for the processes; assessing the availability of waste dumping site for their waste product; assessing the environmental sustainability knowledge level of the processors; determining the extent of environmental sanitation awareness level of the processors. The results from the study (quantitative data) were analyzed using excel and results discussed using descriptive statistics.

Results and Discussion

Demographic Information of Respondents: The study (Figure-1) provides confirmatory evidence that the most proactive people in Shea butter production are women. Along similar lines is the finding from Ademola *et al.*[21] and Garba *et al.*[22] who reported that women are mostly into Shea butter processing than men. From the study, 87% of the respondents were female with the rest being male. The majority of women participating in this industry are, therefore, a boost to the economic life of the various families involved. However, majority of the workforce were young and virile people below the ages of 50 years. The involvement of workers above age 50 years is an indication that the aged are not just dependent on the young working but contribute to the upkeep of the family as well.

The research findings also validate the findings from Abujaja *et al.*[23] and Matanmi *et al.*[20] who reported that majority of Shea butter processors generally lack formal education. From the study, majority of the respondents (62%) had not attained any form of formal education with basic education (33%) being the highest educational qualification of respondents. Education of respondents is paramount since it could affect, to a greater extent, their knowledge on environmental sustainability as well as the skills applied in the Shea butter production.

Indigenous practices of processing Shea butter: From Figure-2, 43.63% of the respondents dissented with the statement that indigenous methods of Shea butter processing do not help to protect the environment. On this statement, 50% of the respondents were indifferent with only few (6.37%) agreeing to the statement. Also 58.18% of the respondents agreed to the statement that the indigenous Shea butter processing does not facilitate production with 31.82% disagreeing to the fact. In another development, more than half (55.46%) of the respondents admitted to the fact that activities of the processors affect the environmental management practices within the metropolis although 5.45% were indifferent to the statement.

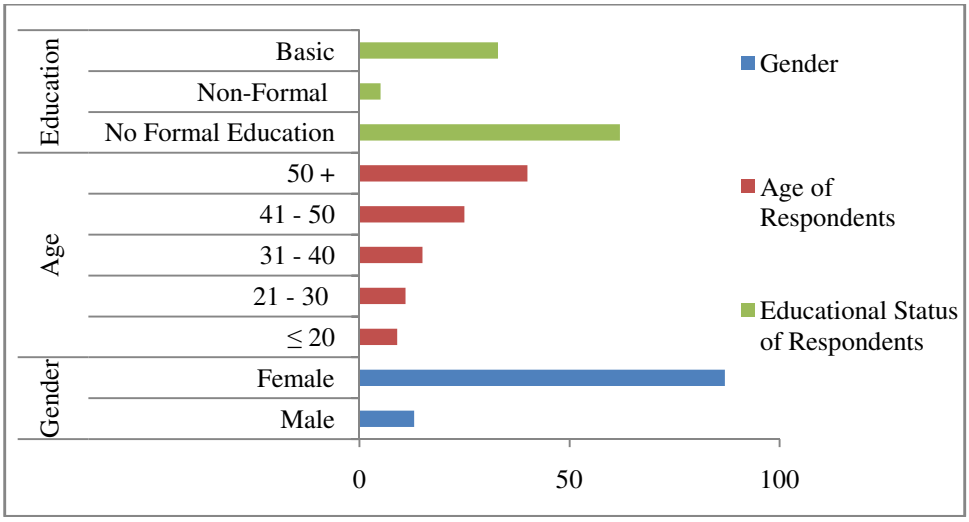

Figure-1
Demographic data of respondents

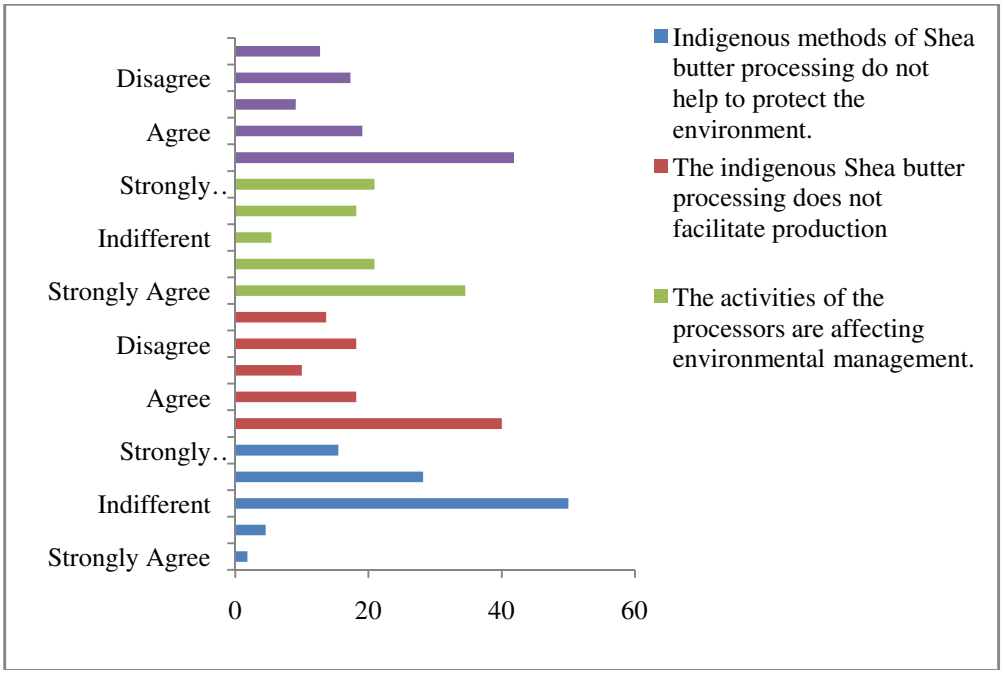

Figure-2
Indigenous practices of processing Shea butter

Furthermore, 60.91% of the respondents agreed to the statement that Shea butter processing results in sanitation problems within the metropolis while 30% disagreed to it. This low level of appreciation for environmental degradation may be attributed to the low level of education of respondents. On facilitating production, few of the respondents were satisfied with the indigenous processing methods while majority believed that there could have been more efficient and effective processing methods to help them speed up processing of the butter.

Wastes generated by Indigenous processing method and how wastes are disposed: Results (Figure-3) indicates that, a whooping majority (71.82%) of the respondents are aware of the ineffectiveness of the indigenous method of Shea butter production giving out low extraction yields per unit input of raw materials, consequently generating more waste. These wastes include sand, stones, bad nuts, shell residues and Shea cake. 72.72% of respondents said they disposed their wastes on unauthorized lands. In fact, respondents were explicit in stating that, the waste generated especially, Shea cake, bad nuts and shells were poured into open places and gutters and it's evident from the responses that these wastes generated greatly affects

the environmental health and sanitation of residents. Developing countries like Ghana continue to battle with Environmental sanitation. It has been a worrisome issue over the past decades, yet, not much management practices have been put in place to emasculate these sanitation crises. Results (Figure-4) showed that, 71.82% of the respondents subscribed to the idea that the environment will be clean if appropriate management of Shea waste was applied. Because there is general lack of these management practices, it appears the heaps of the waste seen at the processing centers in the metropolis will not disappear anytime soon and will continue to heap as processing increases. This will lead to the covering of some crop lands by the heaps and their eventual degradation in respect of loss of soil fertility.

The farm lands are lost to the wastes from daily production rendering land tillage and agricultural productivity difficult. The heaps of Shea cake and other shea wastes have become nuisance to the environment and the respondents expressed their sentiments on that. Almost all the respondents agreed to the assertion that environmental sanitation is affected by the shea waste and strongly wished there could be regular collection of waste from the processing centers to reduce environmental pollution.

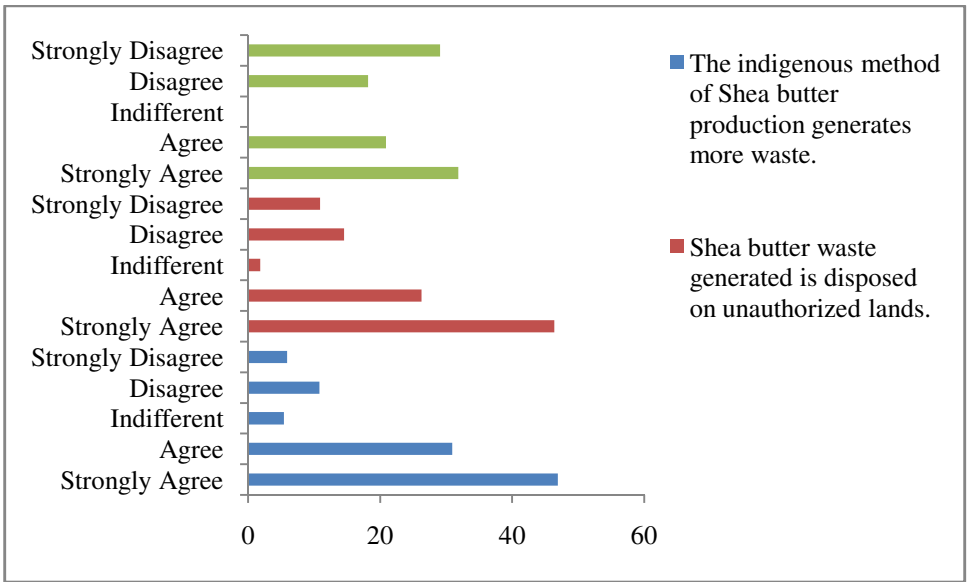

Figure-3
Wastes generated by Indigenous processing method and how wastes are disposed

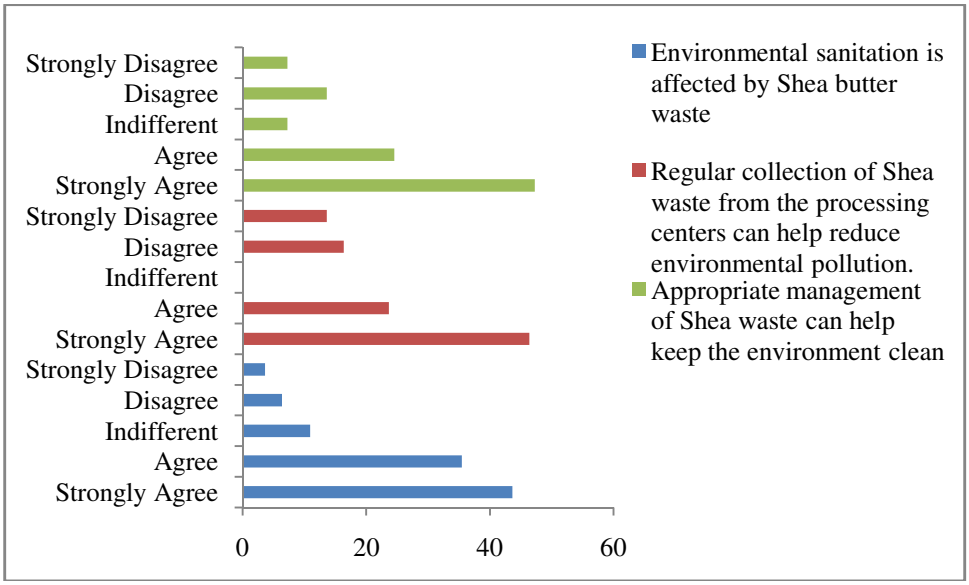

Figure-4
Sanitation concerns from respondents

Source of water and Energy for the extraction process: According to Moore[7], traditional/indigenous method of Shea butter production requires larger amount of water and fuel wood. From Figure-5, 71.81% of the respondents agreed to tap water being the main source of water for the processing. 60.08% agreed that there were alternative sources of water for processing while 39.09% disagreed that they had other sources of water apart from tap water. When respondents were interrogated on whether excessive use of water for processing can cause water shortage in the area, most of them concurred. Water for domestic uses in the area is already a challenge; therefore, excessive demand of water for processing Shea butter will be an additional challenge due to the perennial acute shortage of water in some areas in the municipality. A limited alternative source of water for processing was realized to be a serious challenge for processing activities.

Furthermore, all the respondents stated it clearly that their source of energy for processing was fuel wood which agrees with the report from Jibreel *et al.*[9] and Matanmi *et al.*[20]. None of them resorted to alternative energy source. Mohammed *et al.*[24] reported that, significant amount of energy that is wasted in the process of processing Shea butter was mainly due to technological choice, design and construction inadequacies of the stoves being used.

Their highly dependence on fuel wood for processing has a serious implication on the environment because the increase in subsequent productions would lead to frequent and fast depletion of the savannah forest. Surprisingly, when the respondents were asked whether or not excessive use of fire wood for Shea butter processing could deplete the environment, majority of them, representing 71.82% agreed to the statement. It is apparent from the response that the processors are sentient of the dangers of excessive cutting down of trees for fuel wood; nonetheless, it appears to be the only cheap and affordable source of energy they can rely on. This indicates that, Shea butter processing has an impact on the sustainability of the savannah forest which has a greater percentage of wood land.

Another worrisome concern arising from the overreliance on fuel wood as the primary energy source is the negative toll on the health of processors. Smoke from the fuel wood is known to generate quantum of carcinogenic and other health-damaging contaminants[25] which cause various respiratory diseases. A majority, 60.91% of the respondents, agreed that smoke and odor emanating from the processing can give rise to health problem which was evident from personal observations and also agrees with the report from Ajayi[12]. Ailments arising from smoke emission and obnoxious odor do not only affect processors, but residents nearby also as personal interview revealed that some residence closer to the processing centers complained of health problems as a result of emission of smoke and odor.

Regulation of Shea waste generated by the Metropolitan Assembly: From Figure-6, it is conspicuous that the metropolitan assembly seems to have no concern for the waste generated. The metropolis has not even bothered to create damping sites for the waste generated of which 85.45% of the respondents attested to. Also, 94.54% of the processors agreed that, the metropolis had not been able to collect waste generated which has resulted mainly in the indiscriminate disposal of the waste. This is evident from the look of the processing environs.

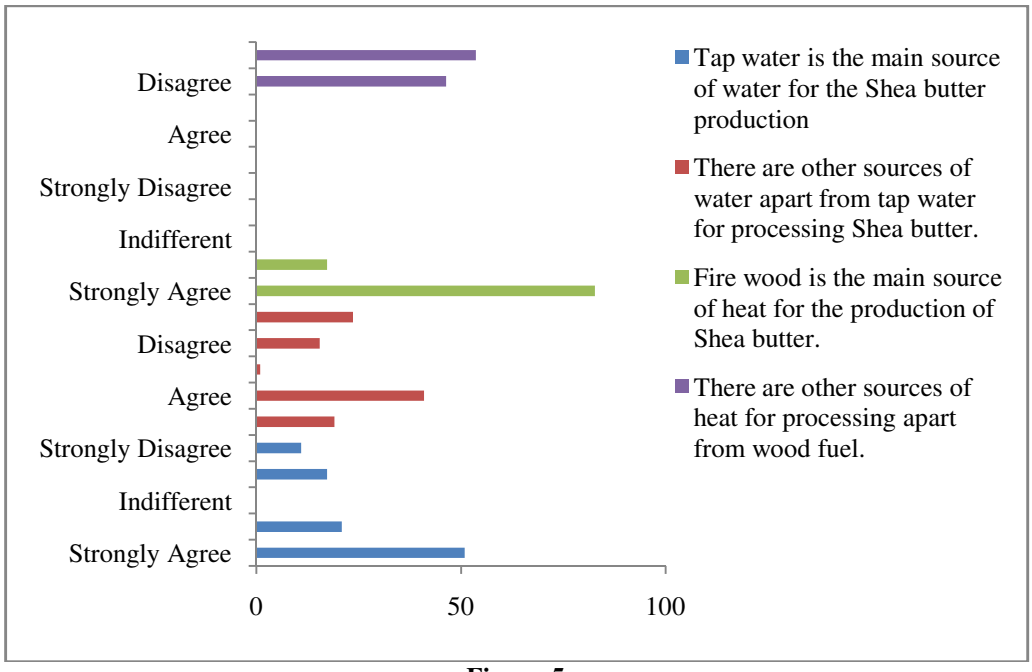

Figure-5
Source of water/heat for the extraction process

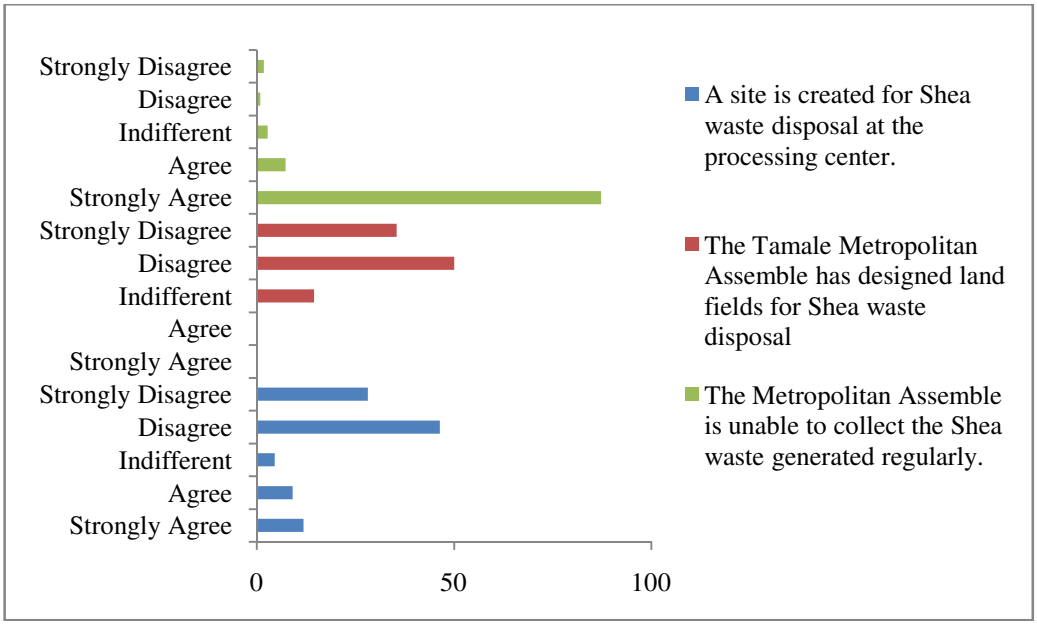

Figure-6
Action taken by the Metropolitan Assembly to remedy the situation

It is again a clue that all processing activities are not monitored and regulated and therefore waste generated are not monitored too, of which is the responsibility of the state and local government environmental agencies to handle, employ and dispose of waste generated[26].

Environmental sustainability knowledge level of processors: On logical grounds there seems to be no compelling reason to argue that the indigenous method is not minatory to environmental sustainability. However, some processors disagreed to the fact that their practice (indigenous processing) destroys the environment which may be partly due to the fact that, these dissenters thought admitting the fact might mean that they would have to stop the processing which may lead to loss of income and personal economic depression. They, however, agreed that disposal of waste destroys plants and animal species because it was evident at the disposal sites and they wished it could be done differently. About 72.73% agreed to this fact, nonetheless, few respondents (19.02%) disagreed with that. From the analysis (Figure-7), majority of the respondents reckoned the corollary of excessive cutting of trees for fuel wood on the environment but as earlier pointed, there seem to be no alternatives as fuel wood is the only cheap and readily source of energy for processing. Seventy-six (76%) of the respondents supported the idea of preventing global warming by cutting down the emission of smoke although few (14.55%) thought otherwise. In fact, some farmers argued that using compost from Shea waste can help improve soil fertility and hence sustain agricultural practices and the environment as a whole.

Although the processors had an idea of their role in sustaining the environment; they needed a form of empowerment and training into modern/better ways of sustaining the environment. It is against this background that several organizations, both governmental and non-governmental, are conceptualizing on ways of mitigating the negative effects Shea butter production has on the environment[27].

Effects of Indiscriminate Dumping of Shea Waste: Majority of the respondents responded positively and in fact were aware of the fact that, waste from Shea butter processing could choke the drains in the Metropolis. The fact that most of the respondents agreed meant that most of them were aware of environmental health and sanitation challenges posed by the indigenous Shea butter processing waste. Expressing opinion on the statement, the waste from Shea butter processing could choke the drains in the Metropolis; a mass of the respondents confirmed that. Observations showed that the seed husks and shells have indeed choked gutters and drains which could contribute to drainage problems and serious inundation with the slightest downpour. 62.73% indicated that their processing environment get muddy when it rains, perhaps, it is partly because the heaps of Shea cake, bad nuts and shells inhibit the flow of the run off. This muddy environs as well as the oil-lateen liquid which flows freely into the environ act as a medium for maggots, flies and mosquitoes procreation[12]. On top of this, the decaying waste matter emanates offensive odor all of which can pose health problems to the rural dwellers. This decaying organic waste also generates bioaerosols which contain several agents capable of inducing inflammation in the airways which is precarious to people in the vicinity[28]. The situation is likely to get worse as the extreme temperatures in the region will catalyze the biodegradation of the organic waste by microorganisms[29] which will increase the emission of bioaerosols and loathsome odor.

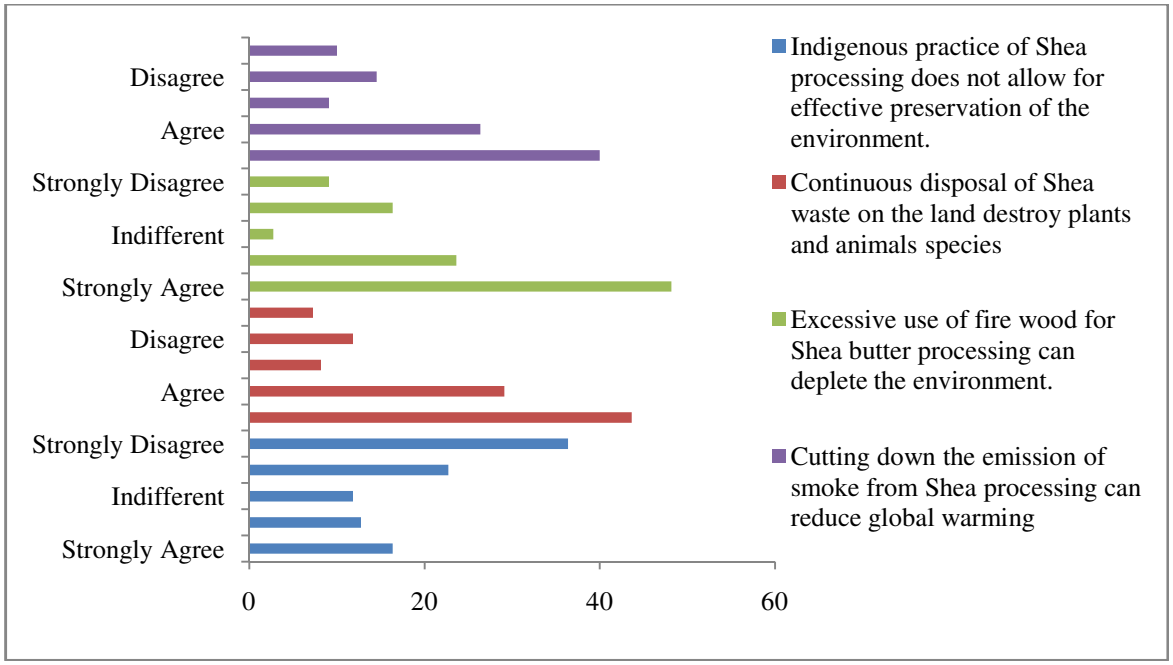

Figure-7
Environmental sustainability knowledge level of processors

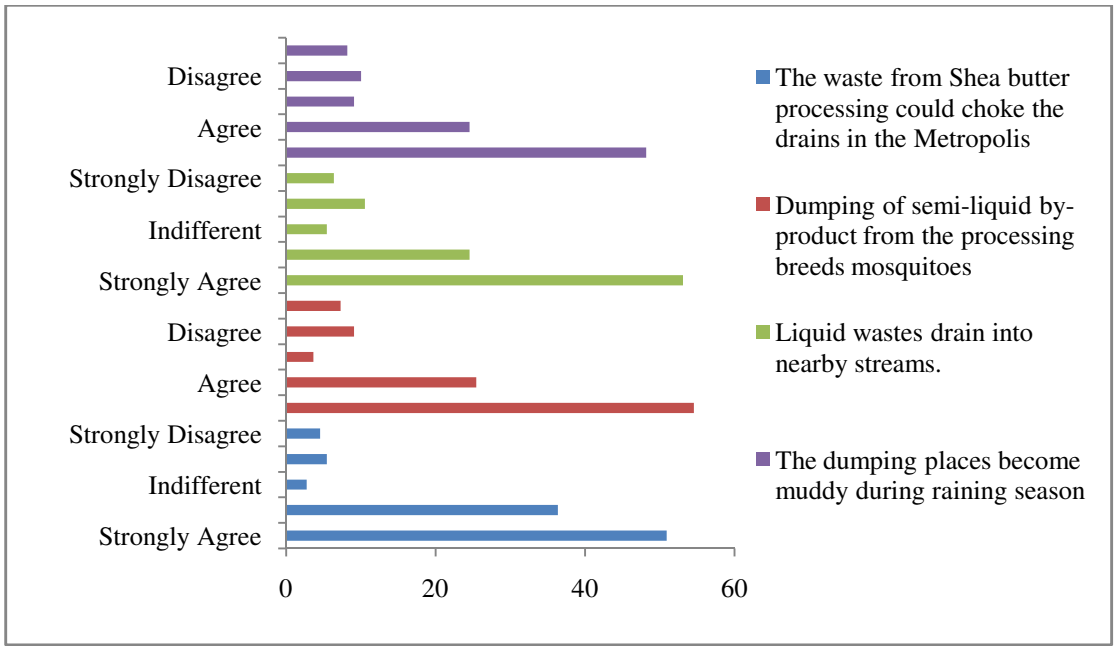

Figure-8
Effects of Shea waste on the Environment

Majority of the respondents (73.64%) attested to the fact that, the influxes of leachates from the dumping sites find their way into rivers and streams deteriorating the quality of the water. It is reported that Shea wastes are rich in phenolic compounds[30] which according to[31] is toxic to aquatic organisms. Cumulative effect of the foregoing discussions implies that there could be serious environmental challenges resulting from Shea butter processing in the near future if nothing was done about.

Conclusion

The indigenous Shea butter processing generates a lot waste which has negatively impacted on the environment. The low level of educational background of respondents has contributed to the environmental degradation in the Metropolis while indiscriminate cutting of tree for fuel wood contributes to the depletion of almost all the tree resources in the savanna forest. Furthermore, the

excessive use of water for processing has contributed to regular acute shortage of water in some parts of the processing area. Dumping sites are not created for Shea waste disposal at the processing centers was found to be a major cause of indiscriminate waste disposal within the metropolis which was found to have effect on plant and animal species. To add, dumping of semi-liquid by-product from the processing was noted to produce foul odor and also support the breeding of mosquitoes which can give rise to health problems. The Shea butter waste disposal has contributed to the drainage problems and flooding during the raining season in the metropolis.

The implication of the responses suggested that indigenous Shea butter processing has an effect on the environment and there should be an alternative method of processing to reduce impact the wastes have on the environment. Based on these, it is recommended that government and non-governmental organizations should help these local processors to move from using indigenous processing method to a more technologically advanced one which is noted to have efficient extraction yield and generate less waste. Meanwhile, the metropolitan to should adopt proper management of the waste generated in order to reduce its impact on the environment.

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