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Economic Analysis of Processing Palm Kernel in Kwaebibirem District, Ghana

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ABSTRACT

Increasing demand for fats and oil for industrial production has resulted in net import of palm oil. In order to resolve this problem, various interventions have been implemented to boost palm oil production. Despite the application of numerous initiatives in the oil palm sector in Ghana, palm kernel oil production continued to decline. This study examined the profitability of processing palm kernel oil in order to identify gaps and possible ways palm kernel oil production can be enhanced to supplement demand for palm oil. Quantitative and qualitative methods were used to elicit information for the study. Respondents indicated that they were no longer producing palm kernel oil but rather, they were only engaged in it treatment. Palm kernels were sold to other groups of processors who own modified equipment purposely designed to generate palm kernel oil. Findings on the profitability of this activity revealed that though women no longer generate oil from their activity, they earned average income of GH¢ 126.59 on a tonne of palm kernel. The viability of this activity was tested with a benefit-cost ratio, at a rate of 1.67. The test proved that treatment of palm kernels without the production of palm kernel oil is a profitable business. It was discovered that this menial activity generates employment for 10-14 number of people in a mill. Processors called for state and private sector investment in the industry.

Keywords: Palm Nuts, Palm Kernel, Palm Oil, Kwaebibirem District, Palm Kernel Oil

Introduction

The oil palm (*Elaeis Guineensis*) is a crop that has several economic use. Income is derived when fruit of the oil palm is processed (Verheye, 2002). Palm oil is derived from the mesocarp of palm fruits; and a main by-product is palm kernel (Poku, 2002). Palm kernel is embedded in a hard case called shells which

constitute about 45%-48% of the total weight of palm fruit. Palm kernel contains about 47%-50% weight of oil in a palm fruit (Gbasouzor *et al.,* 2012). A white to yellowish vegetable oil is obtained from the kernel of the oil palm. Therefore, two types of oil are generated from the oil palm fruit. They are however different in terms of fatty acid composition as well as physical properties (Hertrampf and Piedad-Pascual, 2012). Palm kernel oil contains lauric as the major fatty acid and it is this lauric acid which accounts for about 48% of the composition of fatty acid in palm kernel oil. Palm kernel oil also contains muriatic acid (16%) and oleic acid (15%) (Zulkafli *et al*, 2013). Palm kernel oil is more saturated than palm oil and so it is hydrogenated to produce variety of food and non-food products in the industrial sector (International Trade Center, 2012). Palm kernel oil has many edible and non-edible use in homes and industries in Ghana (Danyo, 2013). In comparison to other traditional cooking oil such as coconut oil, groundnut and palm oil, palm kernel oil is a cheap source of vegetable oil (Ankrah, 1998). Ghana produces about 232, 700 million tonnes of crude palm and kernel oil annually (MASDAR, 2010). However, demand for fats and oil are established at about 252, 432 million tonnes in the industrial sector (Ayodele, 2010). In addition, demand for palm kernel oil for industrial production is higher than it supply (Ofusu-Budu and Sarpong, 2013). This need could be supplemented with palm kernel oil; however, it is largely produced by small scale processors and its extraction is in low capacity per production (Ofusu-Budu and Sarpong, 2013). In this regard, some questions need to be answered on palm kernel oil production in Ghana. They include: How feasible and profitable is palm kernel processing business? Are the production practices efficient enough to ensure sustainability of the industry? What are the challenges faced by palm kernel processors? In order to provide answers to these questions, this study examines the economics of processing palm kernel in Kwaebibirem District of Ghana. The study is expedient because it would provide the information needed for the development of successful palm kernel oil processing enterprises. It will also inform investors and policy makers by showcasing the potentials of palm kernel processing industry to boost economic development.

Study Area

This study was carried out in Kwaebibirem District in the Eastern region of Ghana. Kwaebibirem District has a land area of 1230 km^2 with Kade as its capital. It is bordered by Birim North District to the north-west, Atiwa District to the north-east, on the south-east by Denkyembour District, and on the South-west by Akyemansa District. It is located between latitude $6^0$22'N-latitude $5^0$75'S and longitude $1^0$0'W–longitude $0^0$35'E^0 (Kwaebibirem District,

2006). The district has a tropical climate characterized by two distinct conditions of wet and dry seasons. The wet seasons ranges from April-July and September-November with total annual rainfall of about 1500m. While the dry season ranges from December to March. Minimum and maximum temperature ranges between 25°C – 30°C respectively (Ghana Statistical Service, 2014). The main economic activity carried out in the district is agriculture; that is, crop and livestock production. The following crops are produced: cocoa, citrus, plantain, banana, and cassava, oil palm, rubber, rice, leafy and fruit vegetables, maize, among others. However, oil palm cocoa, rubber and citrus are the main cash crops produced in the district. It is estimated that about 13,095 households are engaged in the cultivation of oil palm (Adjei-Nsiah *et al.*, 2012b). About 50% of oil palm farmers produce palm fruits on contractual agreement with Ghana Oil Palm Development Company (GOPDC), the largest palm oil production company in Ghana (Ofusu-Budu and Sarpong, 2013). GOPDC also produces about 30% of oil palm whilst 70% production of oil palm is carried out by smallholder farmers. Hence, a total area of 50, 700 ha of oil palm are under cultivation in the district (Adjei-Nsiah *et al.,* 2012b).

Research Methods

Data was obtained from a quantitative method through a questionnaire interview. Qualitative method drew from in-depth interview, focus group discussions (FGD) and observation of processing practices carried out by palm kernel processors. Kernel processing mills were strategically located in few communities in the district. Thus, the study was purposively carried out in five communities, namely, Nkwatanang, Kwae, Subi, Kade and Asuom. These towns were selected because of the presence of palm kernel processing activities in these communities. Snow ball sampling procedure was used to make a list of all the processing sites in the selected communities. In all, 60 palm kernel processors were sampled for the study. This number was selected because of the low number of women who were processing palm kernel in the study area. There is an awareness that drawing on a small sample size makes it difficult to generalize. So the description of processors activities is not intended to be interpreted as representative of the profitability of all palm kernel processors in Ghana. But rather, the study illustrates a range of strategies adopted by processors in applying technology to increase income. In each of the five selected communities, simple random sampling method was used to sample 3 processing mills. This was made from of a list of kernel processing mills in the selected communities. In addition, 12 respondents were proportionally sampled from each community. Subsequently, 4 respondents were also sampled from 3

processing mills in each community. Thus, with the total number of mills in the communities, ratios of 1 mill to 4 respondents were used and this resulted in 12 respondents being sampled from each community (Table 1). This process was made with systematic random method to draw 4 respondents. In every mill, processors owned a shed and so with the systematic sampling method, the total number of sheds in a mill was calculated and every nth shed was selected. Questionnaires were then administered to a processor in the shed.

Table 1: Distribution of Total Number of Respondents Sampled in the Selected Communities

Communities	Number of kernel mills in each community	Number of respondents sampled in each mill	Number of respondents sampled in each community
Nkwatanang	3	4	12
Kade	3	4	12
Kwae	3	4	12
Asuom	3	4	12
Subi	3	4	12
Total	15		60

Source: Author's Field Survey, 2014

Analytical Methods

Statistical Package for Social Scientist (SPSS) version 2.1 was used to generate descriptive statistics such as frequency tables, percentages and mean scores in analyzing the data. The profitability of processing palm kernel was estimated using economic tool such as the net profit approach, return on investment (ROI) and benefit cost ratio. The net profit of processing palm kernel was calculated as:

The Net profit = Total Gross Return (TGR) – Total Cost (TC)

Where

Total Cost (TC) = Total Variable Cost (TVC) + Total Fixed Cost (TFC) …… (1)

Gross Profit = Total Gross Return (TGR) – Total Variable Cost (TVC) …….. (2)

The Profit Margin (PM) was used to evaluate the efficiency of kernel processing activity. The ratio states as net returns divided by sales.

Return on investment (ROI) was also calculated to determine the efficiency of kernel processing as an economic activity. ROI is expressed as:

$$ROI = \frac{(\text{Gain from Investment} - \text{Cost of Investment})}{\text{Cost of Investment}}$$

The viability of this activity was tested with the benefit-cost ratio. Where the calculated ratio above 1 is regarded as positive and below 1, it is regarded as a negative.

$$\text{Benefit-Cost Ratio} = \frac{\text{Present Value of Total Profit (Total Revenue)}}{\text{Present Value of Total Cost (Total Cost)}}$$

Results and Discussions

Personal Characteristics of Respondents

Sex distribution of processors in table 2 shows that 100% women were processing palm kernel. Tanle *at al.*'s (2011) study on palm kernel processing in Komenda Edina Eguafo Abirem (KEEA) and Cape Coast Metropolis also indicated that palm kernel oil processing is dominated by women with no male involved. Interview with leaders at various mills also revealed that palm kernel processing is solely carried out by women in the district. They explained that there were tedious processing practices involved in the production of palm kernel oil. Hence, most people prefer to engage in palm oil production in Kwaebibirem District. Though, men were operating in palm kernel oil mills as attendants, mill owners, drivers and caretakers. The age distribution of kernel processors also shows that majority (45%) were between 30-40 years of age and 6 were 60 years old and above. The majority of kernel processors who were between the ages of 30-40 years indicate that they were in their youthful stage. This age range was necessary because processors indicated that production of palm kernel require a lot of manual energy. The result shows that 55% of processors have 5-10 household sizes. Table 2 also shows that 17% of kernel processors have not had formal education. Respondents disclosed that kernel processing is mostly undertaken by migrants who do not have access to palm fruits or land to cultivate crops.

In addition, kernel processing is also perceived as a menial job for migrants originating from the northern sector of the country. Bouadu (2013)'s study on palm kernel processing at Atasomanso in the Ashanti region indicates that 98% of women processors had no basic education. Processing of palm kernels does not require formal education because skills were acquired from older and experienced processors. However, an encouraging finding in this study is that, majority of processors had formal education. Therefore, it is likely that formal education may help processors to understand issues better and anticipate

market demands. The number of years processors have been engaged in this activity can affect their income level, efficiency of production and adoption of marketing strategies. Majority (32%) of kernel processors have been in the business between 5-10 years (Table 2). This indicates that most processors have been in this business for a long time. Tanle et al.'s (2011) study on kernel processing also indicated that four out of ten kernel oil processors had been in business for less than ten years whilst a third had been in the business for 20 years and above in the KEEA District and Cape Coast Metropolis in Ghana. Through interviews, it was discovered that processors have not received any formal training on the production of palm kernel. Hence, the average years of experience (5-10 years) in processing palm kernel shows that processors might have spent some time as apprentices with their mentors.

Table 2: Socio-Demographic Characteristics of Processors (n = 60)

Variable	Frequency	Percentage
Sex		
Male	-	-
Female	60	100
Age		
15-30 years	17	28
30-40 years	27	45
40-50 years	7	12
50-60 years	5	8
60+ years	4	6
Household size		
1-5	33	55
5-10	22	37
10+	5	8
Level of education		
Primary School	20	33
Junior High School	25	42
Senior High School	5	8
Non formal	10	17
Years of experience		
< 5 years	14	23
5-10 years	19	32
11-15 years	12	20
20+	6	10

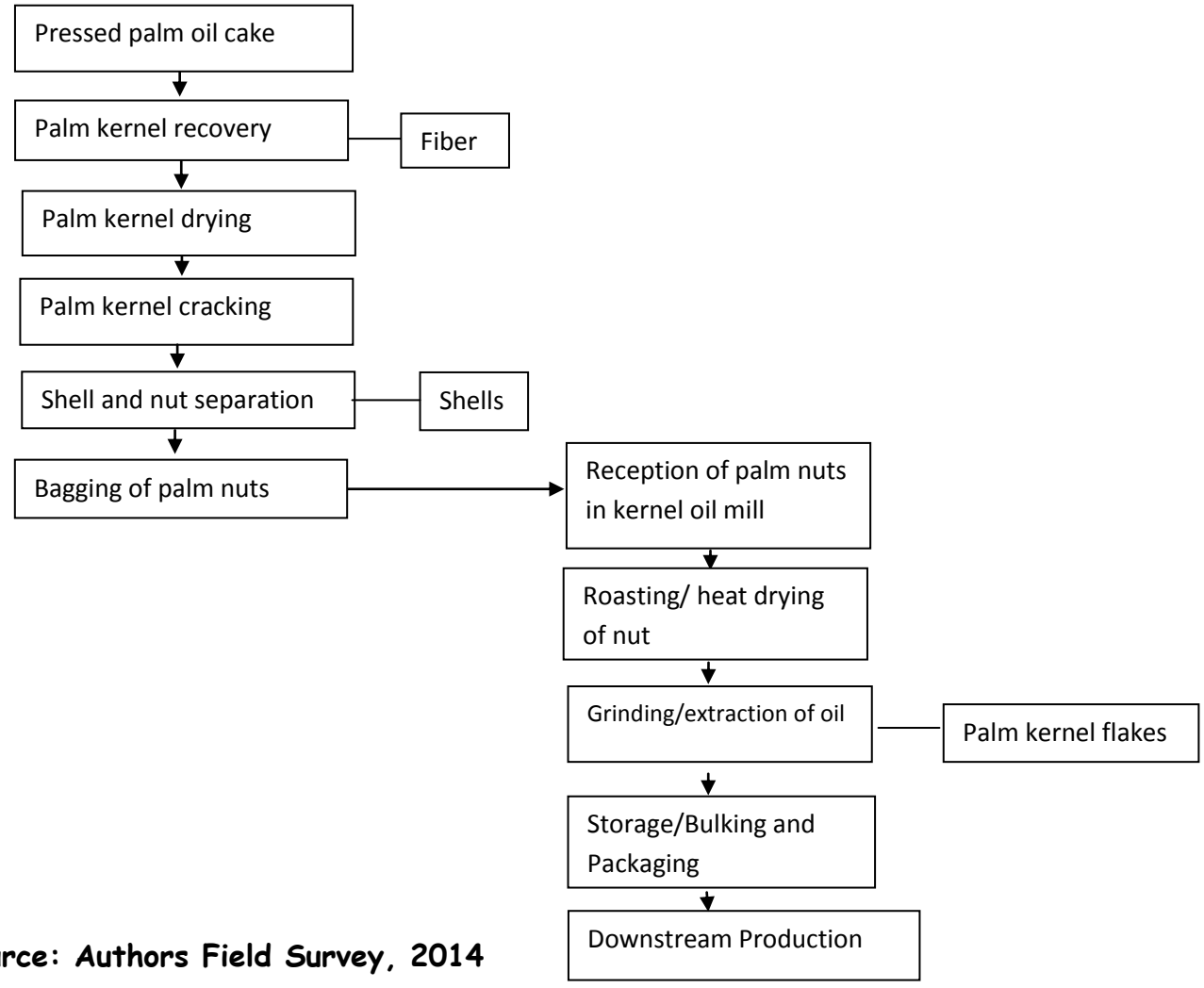
Source: Author's Field Survey, 2014

Palm Kernel Oil Extraction Practices in Kwaebibirem District

In the olden days, extraction of palm kernel oil was a major occupation of women. Palm nuts were spread in the sun for about a week or more until shrinkage of the kernel occurs within the shells. This enables easy cracking of palm nut without causing damage to the kernels. Palm nuts were cracked between stones to obtain palm kernels. Further, black palm kernel oil was extracted by roasting kernels in an earthen pot by stirring until the whole is covered with exuded oil. A small quantity of cold water is sprinkled into the pot after removing it from the fire, and then, the contents were pounded in a mortar until an oily meal is produced. The paste is boiled until large quantity of oil is formed. When the mixture is cool, oil is taken from it surface with a ladle. Palm kernel oil produced through this technique is actually used locally. These production practices has been superseded by the use of nut cracking equipment located at some mills in Kwaebibirem District. Currently, there are three methods of extracting oil from palm kernel in Kwaebibirem District.

They are: traditional method for home oil extraction; direct solvent extraction method used in large and medium scale processing mills of palm kernel; and mechanical extraction, composed of high pressure and combine digester screw press are also used for small and large scale extraction of palm kernel oil. Two processing practices were adopted by kernel processors in Kwaebibirem District. The first involved the use of mechanical nut cracker to produce a mixture of palm nuts and shells (Fig. 1). The mixture is separated by winnowing with the aid of air current to separate kernels from shells. Kernel and shell separation is further carried out in a clay bath which is a concentrated viscous mixture of clay and water. The density of the clay causes shells to sink while lighter kernels float. Floating kernels are scooped in a basket, washed with clean water and dried. The shells were scooped out from the clay bath and discarded for other uses. Some small scale palm kernel oil processors extract oil by frying kernels in a cooking pot. Fried nuts are subsequently digested into paste in a motorized grinder. Furthermore, palm kernel paste is mixed with some quantity of water and boiled with a lot of heat. As this takes place, oil begins to form after almost all the water has evaporated from the palm kernel paste. The oil is periodically scooped with a ladle leaving palm kernel cake in the pot. The second production practice which is mainly adopted by processors in Kwaebibirem District is a new phenomenon. With this method, palm kernel processors were engaged in cracking of palm nuts; shell and kernel separation; and drying of palm kernels. Hence, kernel processors end their production by selling processed kernels to small scale sole kernel oil processors who own digester screw press or

high pressure screw press to generate oil in a different mill. This mechanized equipment is used for extracting palm kernel oil with ease and the result is yellowish oil and dry palm kernel flakes as the residue. Processed palm kernels were sold to small scale kernel oil processors located at Kusi, Kade, Bodua, Subi and to WAML Industries Limited, a free zone company at Nkwantanan. Some buyers or agents also travel from Kasoa, Bawjiase, Obuasi and Kumasi to buy processed palm kernels and process it further into oil. In this study, all the small scale kernel processors interviewed in Kwaebibirem District undertook the following activities: palm kernel recovery, palm kernel drying, palm kernel cracking, separation of nut from shells through clay bath washing and bagging of the palm nuts in jute bags to enable easy transportation of palm kernels to small and medium scale kernel oil mills within and outside the district. Figure 1 summaries processes involve in the production of palm kernel oil by small scale processors in Kwaebibirem District: A (Palm nut pre-treatment procedure), B (Palm kernel oil extraction activities carried out by different group of producers) and C (by-products in the industry).



Source: Authors Field Survey, 2014

Reasons Why Women Were Engaged in the Pretreatment of Palm Kernel

In Kwaebibirem District, most processing mills were owned by individuals other than cooperatives. Thus, women did not have the right to determine the type of processing equipment that needs to be located in a mill. They also indicated that the cost of these equipment were very high; hence, women processors could not procure them individually. More so, private investors were more interested in investing in the palm oil industry; thus, the existence of few palm kernels processing mills in the district. The mills and equipment were owned by men who have employed caretakers to manage the mills. Women pay some prices for using equipment in the mill. Aside the tedious nature of processing palm kernels, processors were also paid low prices as compared to buying prices of palm oil in the district. Women were also constrained by unavailability of market for their produce. All these reasons discouraged them from producing palm kernel oil. As a result, they resort to engage in pre-treatment of palm kernels.

Income Generated through Processing of only Palm Kernels

The study proceeded to find out the average income generated from processing only palm kernels without the production of oil. Result indicates that the total average cost of processing a tonne of palm kernel was GH¢ 186.29. Table 3 shows that processing of palm nuts to obtain palm kernels, packed in jute sacks in Kwaebibirem District is a profitable business venture. This is evident by a gross profit of GH¢ 139.3 and a net profit of GH¢ 126.59 per a tonne of processed palm kernels. Using benefit-cost ratio to test for the profitability of this activity, results in table 3 shows a ratio of 1.67. This confirms that the pre-treatment of palm kernel is a viable business activity because the benefit-cost ratio exceeded 1.

Table 3: Average Income Generated from Processing 1 Tonne of Palm Kernel

Item	Amount (Ghana cedis)
Returns	
Palm nuts (Average palm nuts processed × Average price of a sack of palm nut)	247.08
Kernel shells	64.25
Fiber	1.55
Total Gross Return	312.88
Variable Cost	
Palm kernels	116.00
Transport	22.78
Funning off fiber	8.47
Cracking of kernels	9.42
Clay washing	11.83
Other (Fetching water, clay and sacks)	5.08
Total variable cost	173.58
Fixed Cost	
Rent	8.06
Others (Interest on borrowed Capital, maintenance & repair)	4.65
Total fixed cost	12.71
Total Cost (TVC+TFC)	186.29
Gross Profit (Total Gross Return-Total Variable Cost)	139.03
Net profit (Total Gross Return- Total Cost)	126.59

Exchange rate US $1 = GH ₵ 3.19 (2014)

Source: Computed from Author's Field Survey Data, 2014

With an average price of GH ₵ 312.41 of 1 tonne of palm kernel, the net return was GH ₵131.64 (table 4).

Table 4: Summary of Cost and Benefit per a Tonne of Pretreated Palm Kernels

Total revenue GH ₵	Total cost GH ₵	Net returns GH ₵	Profit margin	Return on investment	Benefit/cost ratio
312.88	186.29	126.59	0.40	0.67	1.67

Exchange rate US $1 = GH ₵ 3.19 (2014)

Source: Computed from Author's Field Survey Data, 2014

However, in the lean season of production (August-December), when palm nuts are scare in palm oil mills, processors produce less palm kernel because of increased competition for palm nuts. More so, in Kwaebibirem District, the absence of weighing scale for purchasing palm kernels does not enable processors to generate the estimated amount of income. Thus, buyers pay fewer

prices or they either acquire more palm kernels than what is supposed to amount to 1 tonne. On average, 1 tonne of palm nuts weighs 1000 kg; however, processors estimate 1 tonne of palm kernel to be equivalent to 7 jute sacks of palm kernels; hence, they either underestimate or overestimate the actual weight of palm kernels because the sizes of sacks vary. In most cases, processors buy 1 pick-up truck which is also assumed to be equivalent to 1 tonne of palm nuts from palm oil processors. Thus, a processor may get more than 1000kg of palm nuts whenever she buys a pick-up truck of palm nuts. The small scale processor who does not produce palm kernel oil have thus survived in the midst of competition with large and medium scale processors partly because they underestimate the amount and quantity of palm nuts purchased from palm oil processors.

Seasonal Income and Quantity of Palm Nuts

In table 5, the average income derived from processing palm nuts to obtain kernels in the lean season (August-December) were GH¢ 1,736.07 and in the peak season (February-May), processors generate GH¢ 2,976.12. There were no seasonal changes in the prices of palm kernels because prices were determined by buyers. The fact that prices remain the same during peak and lean seasons may account for the low number of people participating in this business venture in the district. This is because processors indicated that palm oil processors were able to revise selling prices of palm oil according to production seasons.

Table 5: Seasonal Productions and Income Generated

Seasons	Average Quantity Produce (7 Sacks = 1 Tonne)	Average Income for each Season
Monthly production in the lean season	49 sacks (7 tonne)	¢35.40 ×49 sacks = ¢1,736.07
Monthly production in the peak season	84 sacks 12 tonnes	¢35.40×89 sacks =¢2,976.12

Exchange rate US $1 = GH ¢ 3. 19 (2014)

Source: Computed from Author's Field Survey Data, 2014

The cost and benefit of other profitable activities carried in the processing of kernel is summarized in table 6. Apart from the sale of palm kernels, women derived palm kernel shells which were profitable for other industrial productions. A tonne of palm kernel shells were sold at GH ¢ 70 at Ghana Oil Palm Development Company (GOPDC) buying price in 2014. After deducting the cost (GH ¢ 29.72), it was discovered that processors gained GH ¢ 43.53.

Table 6: Average Cost of Operation and Average Sales Output from Processing Activities

Activity	Cost	Output	Selling Pricing	Return on Activity
Sales of kernel shells	¢ 29.72	Shells	¢64.25	¢ 34.53

Exchange rate US $1 = GH ¢ 3.19 (2014)

Source: Computed from Author's Field Survey Data, 2014

Palm kernel oil processors who buy palm kernels from women were likely to make more money due to the fact they generate oil and palm kernel cakes which were in high demand in the livestock and poultry industry. Whiles kernel processors only derive kernel shells as by-products from their activities. Therefore, it can be inferred that processors who take charge of the entire production chain by producing palm kernel oil are likely to generate more income than those who process only palm kernels. So the fact that women earn GH¢126.59 as net-income (see table 4) shows that they earn an appreciable amount which is above the poverty line. Secondly, as business initiative takers, processors always produce more than 1 tonne of palm kernels in a day or in week. However, the fact that some customers buy palm kernels on credit; and processors experience scarcity of palm nuts during lean seasons constrained production.

Economic Benefit Derived from Pre-Treatment of Palm Kernels

The economic importance of processing palm kernel is underscored by the report of 82% of processors who indicated that 50% or more of their income was derived from processing palm kernels. Only 18% reported that they derive 50% or more of their income from other sources such as remittances and other business activities apart from processing palm kernels (Table 7). Processors were of the view that the generation of income and employment were the most significant advantages derived from processing palm kernel.

Table 7: Perception of Economic Importance of Value Addition

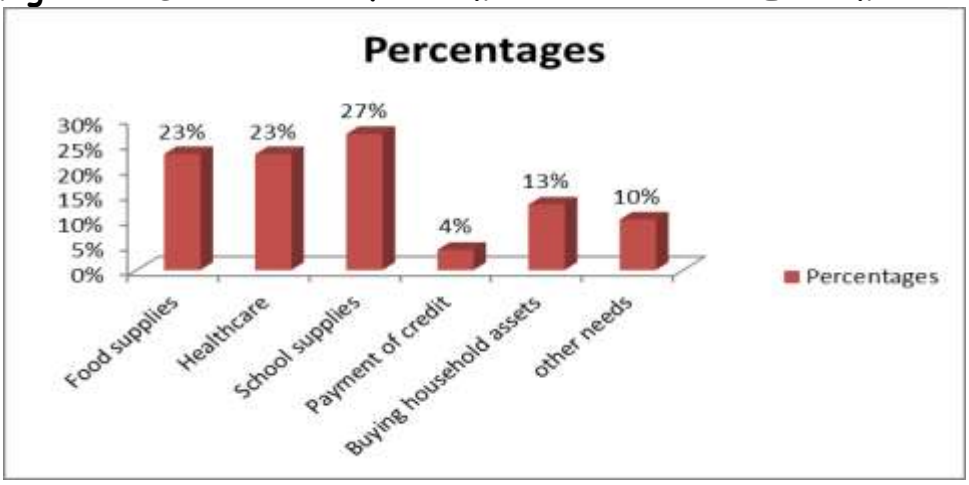
Perception of Economic Gains	Percentage
More than 50% of income generated from pre-treatment of palm kernels	82
Less than 50% of income generated from pre-treatment of palm kernels	18
Total	100

Source: Author's Field Survey, 2014

Varieties of Ways to which Income is Put to use by Kernel Processors

Respondents indicated that income generated from processing kernels were used for: purchasing food for their households (23%); healthcare needs (23%); school supplies (27%); paying back credits (4%); buying household assets (13%); and (10%) for others (Fig. 2). Respondents, who choose the option captioned others, specified that they use their income to pay rent and utilities. The fact that 23% of respondents use most of their income to cater for healthcare and educational needs shows how important income generated through processing of palm kernel is put to use.

Figure 2: Distribution of Income to Meet Socio-Economic Needs



Source: Author's Field Survey

Employment

One of the economic benefits of processing palm kernel is the creation of employment for processors and other people who assist women in their operation. Women depend mainly on hired labour to assist them in the mill to process palm kernels in large quantities. Although some household members were engaged in the mill, result on table 8 indicates that palm kernel processors employ average number of 8 people to help to process 1 tonne of palm kernel. Interviews revealed that the quantity of kernels to be process determines the number of people that are employed. Subsequently, information from interviews and FGD were used to find out about the number of people employed at each stage of the production chain (table 9). It was revealed that processing of palm kernels has the ability to create employment for about 10-14 peoples in the study area depending on the quantity. This includes employment generated for mill owners, caretakers, agents and traders in the small scale mill.

Table 8: Number and Gender of People Employed to Process Palm Kernel

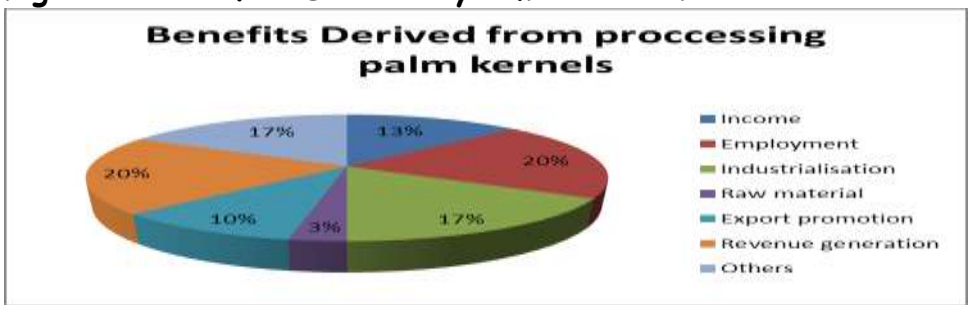
Activities	Number of People Involve	Gender of People Involved
Offloading kernels from the truck	3	Women and men
Funning	3	Women
Cracking	4	Women and men
Fetching water	2	Women
Clay washing	4	Women
Packaging	2	Women
Total number	18	

Source: Processors Interview and FGDs, 2014

Multiplier Effects of Processing Palm Kernel

Processors indicated that processing of palm kernels has multiplier effect in local and national economy. The percentage presentation of the benefits derived include: income (13%), employment (20%), industrialization (17%), raw material (3%), export promotion (10%), revenue generation (20%) and others (17%) (Fig3). Respondents who choose other options indicated diversification of livelihoods and income sources; use of local knowledge and waste reduction in the natural environment through reuse and recycling as some of the benefit their activities contributes to the local economy.

Figure 3: Benefits Derived by Small Scale Kernel Processors

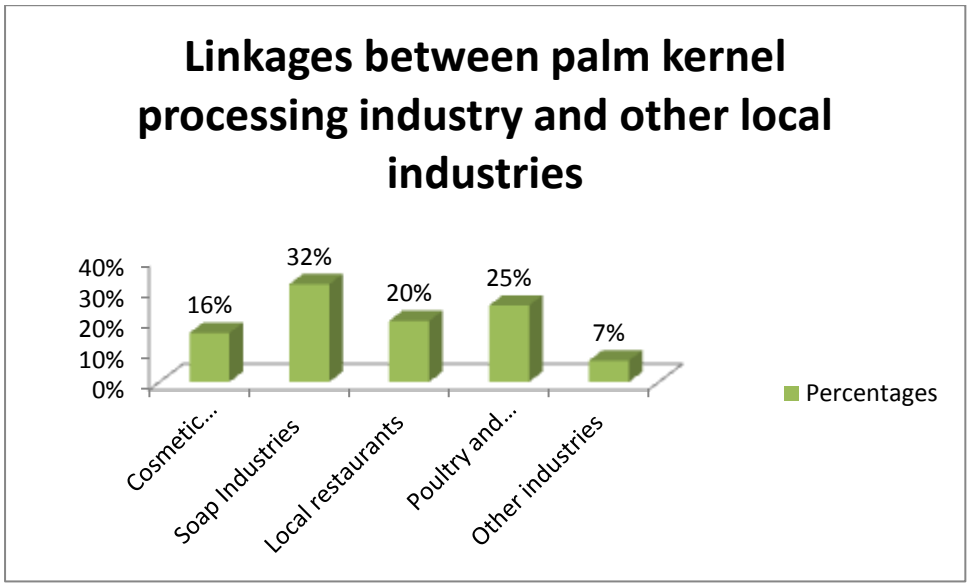


Source: Authors field survey, 2014

Linkages of Palm Kernel Processing with other Industries

Kernel processors also indicated that their activities have linkages with other industries. The percentage distribution of these linkages is as follows: cosmetic industries (16%), soap industries (32%), local restaurants (20%). Other respondents indicated that they had connections with the poultry and livestock industry (25%), whilst 7% mentioned that other food and non-food industries derive raw materials either directly or indirectly from their productions.

Figure 4: Connections of Value Addition Activities of Processors to other Industries



Source: Authors survey, 2014

Constraints Facing Kernel Processors

Table 10 shows constraints faced by palm kernel processors. Lack of market was identified by most (40%) of palm kernel processors. This may prove a point that low market for palm kernel oil is the reason why processors engage only in pre-

treatment palm kernels. The tedious and manual procedure involved in processing kernels (30%), lack of funds (12%), and low supply of palm kernels (8%), dictation of prices by agents and buyers (5%) and inexistence of cooperatives (5%) to initiate changes in the industry.

Table 10: Challenges Facing Palm Kernel Processors

Constraints	Frequency	Percent
Lack of market	24	40
Dictation of prices by agents	3	5
Lack of funds to access processing equipment	7	12
Tedious nature of traditional technologies	18	30
Low supply of palm kernel	5	8
Inexistence of cooperatives	3	5
Total	60	100

Source: Authors Field Survey, 2014

Conclusion and Recommendations

The study realized that palm kernel processors were no longer producing palm kernel oil but rather, they sell processed kernels to other processors downstream in the production chain. Though palm kernel processors were no longer producing oil, processors generate 131.64 as average net profit from pre-treating palm kernels. The viability of this activity was tested with a benefit-cost ratio exceeding 1.73; it proved that pre-treatment alone of palm kernels is a profitable business. Income and employment were key benefits generated from this activity. Processors use income generated to cater for household needs especially health and educational needs. There were multiplier effects of their activities in the local and national economy because processors have linkages with other industries in the country. The processors recommended that government should boost the production of oil palm in the district so that they could have access to raw materials (palm kernels) to increase their productive activities. Processors also suggested that specific sector ministries should come to their aid by providing training, financial sponsorships and trading of their products so that they could export oil. They also called for the intervention of the state in formulating policies that will enable small scale processors access credits without paying interest. They stated that training programs will ensure a trickling effect to farmers because they would be able to produce good quality oil to target the industrial and export markets. This call will require the need to create an entry into existing value chains through bye-laws or establishment of a body that will regulate the activities of processors to conform to international standard.

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Biography

Rebecca Sarku is an Agricultural Geographer and she serves as a teaching assistant at University of Ghana. She is particularly interested in the interconnections existing between rural and urban areas with a focus on agriculture, food security and land use. From 2009 until date she studied Geography, Resource, and Rural Development at University of Ghana and Kwame Nkrumah University of Science and Technology. She has been engaged in numerous research projects related to rural development, agriculture and food security. Her master of philosophy thesis was on the "*contribution of value addition in agriculture to development: case of the oil palm industry in Kwaebibirem District, Ghana"* and her undergraduate dissertation was based on "*the use of groundwater for irrigation: the case of Anloga in the Volta region of Ghana*". She and her research team have won a research grant from the Institute for Money, Technology, and Financial Inclusion-University of California, Irvine to conduct a study on the adoption and utilization of digital payment systems by small scale merchants in southern Ghana (July 2015-May 2016).