The Impact of Oil Palm Processing Industry: A Case Study of Assin Fosu in the Central Region of Ghana

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Abstract: The study found that majority of oil palm processors were men. In terms of age distribution of oil palm processors, majority fall within 31-60 years age category and few were within 18-30 years age category. In addition, the study found that inadequate finance, low palm oil prices, erratic or absence of electricity, unavailability of palm fruits, high taxes and low technology are the major challenges confronting oil palm processors in Assin Fosu. Furthermore, oil palm processors also face employment and health risks such as insect bites, itching eyes, body pains, among others. Finally, it was found that the major determinants of oil palm processors’ livelihood were annual income from processing oil palm and the annual liters of oil palm produced. It is recommended among other things that the processors form associations and save money with financial institutions in order to access loans.

1.0 Background
The oil palm tree is the world’s most efficient oil bearing crop (Putheti & Obire, 2010). The palm tree belongs to the family Palmae (Thomas, 2014), and is historically believed to root from West Africa hence the name Elaeis guineensis (Yusoff, 2006). The three common varieties grown in Africa for commercial purposes are Dura, Pisifera and Tenera (Ohimain et al., 2013). The palm tree produces two kinds of oil (palm oil and palm kernel oil) all of which have domestic and industrial importance (Frank et al., 2011). Countries well noted for large scale cultivation of oil palm on the African continent include Nigeria, Ghana, Cameroon, Côte d’Ivoire, Angola, Liberia, Sierra Leone, Togo, the Congo, Tanzania and Madagascar (Hartley, 1988).

The demand for oil for food and non-food engagements resulting from population explosion and the desire to satisfy mans’ need will continue to trigger the production of more palm oil. Locally, smallholders in Ghana produces between 60% - 80% of domestic and industrial palm oil need (MPOC 2009). An estimated 28 million tons of vegetable oil will be needed by 2020 if per capita consumption increases by 5% worldwide (Teoh, 2010).

Since the mid-19th Century Oil palm has evolved from wild to industrial plantation crop, harvested and processed into palm oil for export. According to Amanor (1994), Ghana (then Gold Coast) exported palm oil to the European market in the nineteenth century. The palm oil industry of the then Gold Coast collapsed due to the fall in palm oil prices worldwide in the 1960s and 1970s, and the establishment of the European oil palm Plantation in Indonesia and Malaysia (Adjei-Nsiah et al., 2012). However, successive governments have made efforts at supporting the oil palm industry for both local consumption and for export. In view of this, the government of Ghana in 2003/2004 introduced the President Special Initiative where the palm oil industry was considered as a national priority to be promoted because of its competency to alleviate unemployment and/or poverty, as a livelihood support program (PSI, 2004). Employment opportunities, revenue generation, foreign exchange, oil for household consumption and for industrial feed among others are the numerous benefits the palm oil industry brings onboard (Teoh, 2010). Others include fuel generation, palm wine, mushroom, fibers and shell for construction purposes. The WBG/IFC (2011), estimated that the oil palm industry offers employment to 6 million people worldwide per hectare than any other form of farming.

Despite the numerous benefits, various NGO reports have highlighted significant undesirable impacts on rural communities, episodes of human rights abuses and ‘land grabbing’ in areas of oil
palm expansion (WRM 2001; Butler 2009; Colchester and Jiwan 2006; Colchester et al. 2007). According to Foe (2008), “the oil palm industry has been accused of negatively affecting human health, destroying cultural heritage and leading to the loss of autonomy and self-sufficiency, in addition to impoverishment as a result of debts and low wages”. Butler et al., (2009) also suggested that whereas the cultivation and processing of oil palm afford new income opportunities and economic advantage to farmers in the short term, the future economic consequences remain uncertain. It is against this background that the study aims at assessing the effect of oil palm processing on the livelihood of smallholders at Assin Fosu in the Central Region of Ghana.

Problem Statement
Traditionally, palm and coconut oil play vital role in domestic food preparation due to their unique flavour and taste (Maley & Chepstow-Lusty, 2001). The vegetable oil industry’s contribution to employment and revenue generation among key processing societies cannot be overemphasized (Teoh, 2010). In Ghana, 60% -80% of palm oil are produced by smallholder facilities whose activities are not regulated (Opoku, 2008). However, like other agricultural and industrial activities palm oil processing raises environmental, socio-economic and human health concerns (Poku, 2002).

Oil palm processing has been ongoing for years in the Central Region, specifically Assin Fosu. The oil palm processing to some extent has served as revenue generation and employment to women and their families (Olagunju, 2008). It has also to some extent affected the health and socio-economic well-being of the local folks and the children of school going age (Ohimain, 2012). The inhumane conditions of work, local environment degradation, and the social burdens linked with transforming raw materials into finished products leaves much to be desired at the processing mills (Ma, 1999).

It is noteworthy that little research work has been done on the socio-economic and livelihood impacts of palm oil extraction on the livelihood of the processors in study areas. The concern prompted the need to assess the employment opportunities, health risk and challenges confronting smallholder palm oil processing. The main objective is to determine the socio-economic impacts and challenges confronting oil palm processors at Assin Fosu in the Assin North District. Specific objectives are to determine the sex and age distribution in the palm oil processing industry at Assin Fosu, to ascertain the major processing and safety challenges faced by processors of palm oils at Assin Fosu, to assess the employment opportunities and health risk associated with smallholder palm oil processing and to determine the factors that influence the household livelihood status of palm oil processors at Assin Fosu.

The rest the study is organized into four. Relevant literature is highlight and next section deals with materials and methods. The results and discussions is contained the next section. The final is summary, conclusion and recommendations of the research work.

2.0 Literature review

History and Morphology of the Palm Tree
The oil palm tree (Elaeis guineensis), is the world’s most efficient oil bearing crop (Putheti & Obire, 2010). It is believed to originate from the humid zone of West Africa hence the name “gineensis” (Yusoff, 2006). It belongs to the family Palmae, lacking arboreal characteristic of wood, bark, and cambium (Thomas, 2014). The three common varieties grown in Africa (for that matter Ghana) for commercial purposes are Dura, Pisifera and Tenera (Ohimain et al., 2013). The oil palm tree flourishes well on well drained, deep fertile soils. The oil palm tree requires plenty sunshine, evenly distributed rainfall range of 1,600 mm/yr – 2,000 mm/yr, and temperature range of 25-28°C. Flowers are dense and formed at the bases’ of the fronds. An average of eighteen individual fronds (a frond at a time) develops from the apex of the palm tree annually.

The palm fruits attain maturity and are harvested between five to six months from flowering (Putheti and Obire, 2010). The fresh fruit bunch weighs between 10kg and 40kg whilst the fruitlets weigh between 6g to 20g. (Poku, 2002). The oil palm tree has a shelf-life of sixty-five years and over and may grow to a height of 20 meters (Hartley, 1988).

Palm oil producing countries well noted for large scale cultivation are Indonesia, Malaysia, Nigeria, Ghana, Cameroon, Côte d’Ivoire, Angola, Liberia, Sierra Leone, Togo, the Congo, Tanzania and Zanzibar.

Palm Oil Extraction Process
The palm oil extraction industry may be grouped into traditional, small and medium semi mechanised scale, and large industrial mills (Poku, 2002). Palm oil extraction occurs in mills where the oil is extracted from the fibre of the palm fruits. During the extraction process, volumes of water are used and about 50% of the water used results in effluent called Palm Oil Mill Effluent (POME). The major stages in palm oil extraction are bunch reception, bunch striping/quatering, sterilization/boiling, digestion/pounding, pulp pressing, oil clarification and storage.
Regardless of a mill’s activities, the oil extraction processes are almost similar and chemical-free. Women and children are mostly involved at all the stages of palm oil extraction (Osei-Amponsah et al., 2012).

**The concept of smallholder palm processors, poverty and rural development**

Smallholder palm oil processors are those mills that process up to 2000 Kg of fresh fruit bunches (FFB) in an hour (Poku, 2002; Putheti and Obire, 2010). Contrary, the small-scale processing industry uses between 6-28 days after fruit harvest to process palm oil (Zu et al., 2012). Zu et al., (2012) maintained that the oil produced by the small-scale processors are inferior because of the high free fatty acids contain therein. Characteristically, smallholder unit produce lesser or inadequate and poor quality palm oil per palm fruit bunch than the large scale mills due to low level of technology applied in the extraction process (Osei-Amponsah et al., 2012).

According to Putheti and Obire (2010), smallholder palm oil processors does not denote significant reduction in efficiency but rather decreased working capital due to lack of access to loans. She emphasized that the efficiency of smallholders will magnify if processing mills become sophisticated and are well situated within the centre of the community. This will minimize fruit spoilage as dependence on vehicles (a scarce social amenity in the rural settings) for transporting palm fruits to mills will be limited.

Small-scale palm oil processing seems to hold the key to rural poverty reduction in palm oil producing countries. The oil palm tree is the best oil bearing crop and for that matter offers the greatest raw material for starting rural industries (Putheti and Obire, 2010). It is the only industry that has “no-true-waste”. The supposedly “waste products” provide enormous opportunity to supplement agrarians’ revenue. The fronds, fibres, nuts, chaff, spikelets, shell, POME etc. are all economically important since they provide a stage for some industry. The poverty alleviation scenario in Malaysia which was hinged on promoting the palm oil industry showed significant elimination of poverty among rural oil palm processors after its implementation in 1984. The poverty rate of 30.3 per cent in 1970 was reduced to nil (1984) among palm oil processors. The poverty alleviation program addressed the chronic issues of inadequate access to capital, land, and low returns from the sale of processed palm oil.

In the same vein, the Government of Ghana supported the palm oil industry in an attempt to alleviate poverty among the citizenry (PSI, 2004).

Global Palm Oil Supply and the Challenges Confronting the Small Scale Industry

In recent times, oil palm (*Elaeis guineensis*) has been one of the world’s most expanding tree crop covering nearly one-tenth of the world’s permanent cropland (Rist, Feintrenie, & Levang, 2010). The palm oil is currently the most traded vegetable oil around the globe. Countries noted for large scale production includes Indonesia, Malaysia, Thailand, Columbia, Nigeria etc. with Indonesia and Malaysia accounting for about 80% of world palm oil supply (Madaki and Seng, 2013). Over the past twenty years the oil palm industry has grown into a huge and imperative industry with economic benefits such that it comes next to the *Theobroma cacao*. Forecast for palm oil use in Ghana by 2011 showed that 255,700 MT will be needed for household and industrial.

Consumption out of which 161, 200 MT will be produced (MPOC, 2009). An increasing shortfall ranging between 94,500 MT - 101,800 MT was therefore expected in the year 2011-2012. For the country to bridge the palm oil deficit gap small scale processors had to produce about 80% of the total crude palm oil output (MASDAR, 2010).

Smallholder palm oil processors has significant role to play in terms of sustainability and credibility of the industry (Diemer et al., 2004). In Malaysia and Indonesia smallholder of palm plantation proportion about 35 to 40 percent while contributing to about 33% of total palm oil output (Vermeulen and Goad, 2006). Despite their contribution to economic growth, small scale palm oil processors are faced with numerous challenges spanning from cultural, socio-political, technology, infrastructural, financial among others. According to Oghenerobor and Joseph (2012) small scale oil palm are faced with problems such as unstable political environment, harsh economic climate, lack of funding, infrastructural decay and labour shortage. Other are unfulfilled promises, high cost of labour, taxes on agricultural products (FOE,
processors may have resulted from the long hours current trends in processing than the old aged. 

involved in oil palm processing are adaptive to associated with palm oil processing. The itchy eyes, fatigue and fever experienced by oil palm workers in its plantations and processing units while the small scale and traditional processors employs and provides products and incomes to millions of people especially females; involved in the various stages as harvesting, quartering, boiling, milling, storage and the commerce of palm oil. Carrere further indicated the following: half of Liberia’s palm oil is produced by 220,000 women and few men; women are involved in processing about 80% of Nigeria’s red palm oil demand. In a related study, Carrere (2010) revealed how attractive the palm oil processing has become to women and quoted a respondent, “I now earn more than my husband, ’I hope it will last, so that we can finally have a roof of our own over our heads.”

On the contrary, Oghenerobor and Joseph (2012) in a study revealed male dominance in the oil processing business. He establish that males dominated the palm oil processing industry by 76% to 12% females, 72.7 and 27.3% men and women respectively (Ohimain, Emeti, and Izah, 2014). Most (64%) processors were relatively young between the age bracket of 41-50 years, as 30 -41 years were recorded by (Ohimain et al., 2014).

Oghenerobor and Joseph (2012) also postulated that palm oil processors within the age bracket of 20 and 50 years were the workforce that can be productive while those below 20 and above 50 years are mostly dependents. His study highlighted that 74% of the respondents were married with average household size of 8 persons; thus the undoubted role the family will play in terms of labour. Ohimain, et al., (2014) also found that the palm oil processing was an ideal venture for the married who are actively working. However, Akangbe et al., (2011), showed that (46.9%) of the palm oil extractors were 60years and above, while 16.9% were within the active youthful age bracket of 20-40 years. The young, agile and educated involved in oil palm processing are adaptive to current trends in processing than the old aged.

Fatigue, body pains, eye irritation, cough and fever are some of the occupational health concerns associated with palm oil processing. The itchy eyes, fatigue and fever experienced by oil palm processors may have resulted from the long hours of exposure to fire and biofuel smoke. The health consequences of women and children in acquiring conjunctivitis, pneumonia, emphysema and other acute infections of the lower respiratory tract intensify as they spend long hours per day at fireplaces breathing biofuel smoke (WHO, 2006; Rehfuss, 2006). According to (UNICEF, 2002), children who inhale biofuel smoke suffer mental retardation since quality air is a prerequisite for early childhood development. Humans and animals alike have directly or indirectly been exposed to different concentrations of biofuel smoke. Because wood smoke originates from natural sources, some people usually appreciate its smell and flavor without knowledge of the possible health implications. Exposure to the various constituents in biofuel smoke may adversely provoke heart and respiratory disorders in human.

According to Ekpenyong et al., (2012) outdoor air pollution is a central menace to human health and can decrease the life expectancy of people frequently exposed to it . The United Nations Environment Programme, estimates that about 1.1 billion people breathe unhealthy air (UNICEF, 2002). On the global front, air pollution is believed to claim 8000 and 2.4 million deaths daily and yearly respectively (Müller et al., 2011). Whereas, men are mostly engrossed with harvesting the oil palm and coconut fruits women and children are mostly involved in conveying and processing the fruits into edible vegetable oil making them more exposed to biofuel smoke. The exposure to biofuel air pollutants affects both adults and children, but children living in ecologically vulnerable sites are more exposed to environmental hazards due to their daring and lively nature.

Andersen et al. (2002) attributed increasing bodily pains among workers performing repetitive work to poor health-related lifestyle but not work demand and that the injuries sustained during processing result from the inappropriate personal protective apparel worn.

**Interventions for poverty reduction among small scale palm oil processors**

Any strategy to improve poverty among smallholder comes down to increasing productivity. Within the context of productivity, the factors that drive smallholder productivity, income, and livelihoods are; agronomy, supply chain, and enabling environment. The broad strategies to improve smallholder productivity and reduce poverty among them would be to support smallholders in the areas of agronomic practice, providing supply and input linkages including appropriate technology, as well as setting up an enabling legal, social, and market environment that
enhance production (Simeh and Tengku-Ahmad, 2001). World Bank/IFC (2011) however notes that to achieve holistic development among small scale processors both government and non-governmental agencies must come on board.

### Summary of major findings of the literature review

The literature review prompted small scale oil palm processing industry are those that takes between 6-28 days to process a batch of palm oil (Zu et al., 2012) and that women (Osei Amponsah et al., 2012) are mostly involved in the palm oil extraction process than men (Oghenerobor and Joseph 2012). On occupational health, the WHO (2006) suggested that long hours of exposure to biofuel smoke is associated with health hazards such as conjunctivitis, pneumonia, emphysema and other acute infections of the lower respiratory tract. The challenges include lack of funding and high cost of fresh fruit bunches, poor supply chain, unfriendly socio-economic environment

### 3.0 Methodology

#### Introduction

This chapter presents the detailed methodology adopted in this study. It covers Map of Study Area, research design, population, sample and sampling procedure, instrument for data collection, source of data, and data analysis.

#### Study Area

Assin North lies within Longitudes 1° 05′ East and 1° 25′ West and Latitudes 6° 05′ North and 6° 04′ South to the South, Twifo Ati-Morkwah to the West and Birim South in the Eastern Region to the East. The municipality covers a total land area of about 1,150 sq.km and comprises about 500 settlements including Assin Foso (the Municipal Capital), Assin Nyankumasi, Assin Akonfudi, Assin Bereku, Assin Praso and Assin Kushea.

The municipality has an average height of about 200m above sea level. The municipality is drained by numerous small rivers and streams. The main rivers include the Pra, Offin, Betinsin and Fum. Swamps also abound in the municipality which serves as potentials for fish farming and dry season vegetable and rice farming. Assin North Municipal falls within the moist tropical forest, mainly deciduous forest. The area has an annual rainfall between 1500mm and 2000mm. Annual temperatures are high and range between 30°C from March to April and about 26°C in August. Average relative humidity is high ranging from 60 to 70 percent.

The municipality comes under relative cool and moist South-West Monsoon Winds that blow from the Atlantic Ocean for some parts of the year, thus between December and February. The dry harmattan or North-East Trade Winds blow from the North to the area. Its dissipating effects, however is greatly reduced by long passage over the forest zone. The rainfall pattern is bi-modal. The major rainy season starts from April to July corresponding with the major farming season and the minor season starts from November to January (Source: Ghana Statistical Service, 2010 Population and Housing Census).

#### Map of Study Area

![District Map of Assin North](Source: Ghana Statistical Service GIS, 2010)
Table 3.1 summarizes the population and sex structure of the Assin North Municipal in the Central Region. The population of Assin North Municipality is 161,341 and accounts for 7.3 percent of the total population of Central Region. Majority of the population reside in rural (64.2%) communities (Source: Ghana Statistical Service, 2010 Population and Housing Census. 

Religion and culture: 84.5 percent of the populations are Christians; Muslims constitute 7.6 percent of the population, with traditionalists making up less than one percent. 6.5 percent of the people are not affiliated to any religious grouping. Languages spoken include Asante Twi, English and French (Source: Ghana Statistical Service, 2010 Population and Housing Census.

<table>
<thead>
<tr>
<th>Table 3.1: Age structure by sex in Assin North District</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Group</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>All Ages</td>
</tr>
<tr>
<td>0 – 4</td>
</tr>
<tr>
<td>5 – 9</td>
</tr>
<tr>
<td>10 – 14</td>
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<tr>
<td>15 – 19</td>
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<tr>
<td>20 – 24</td>
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<td>25 – 29</td>
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<td>30 – 34</td>
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<td>35 – 39</td>
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<td>40 – 44</td>
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<td>45 – 49</td>
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<td>50 – 54</td>
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<td>55 – 59</td>
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<td>60 – 64</td>
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<td>65 – 69</td>
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<td>70 – 74</td>
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<tr>
<td>75 – 79</td>
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<tr>
<td>80 – 84</td>
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<tr>
<td>85 +</td>
</tr>
</tbody>
</table>

Source: Ghana Statistical Service, 2010 Population and Housing Census

Research Design
This study adopted a cross sectional survey design and was also quantitative in nature. The use of cross-sectional survey design assisted the researchers to collect data from the participants at one particular point in time. Also, the use of quantitative technique enabled the researchers to use questionnaire to collect numeric data for analysis.

Population
The population of interest for this study is defined as all oil palm processors at Assin Fosu in the Central Region. Assin Fosu was chosen because oil palm processing is one of the dominant occupations of the people and also because of the researcher’s ability to access data quickly. It was therefore expected that the elements of this target population would provide valid responses for the study.

Sampling and Sampling Procedure
The researcher used a sample size of 101 oil palm processors at Assin Fosu. The convenience sampling technique was used to select the participants for inclusion in the study. The use of this sampling procedure assisted the researchers to obtain participants that were readily available and willing to participate in the study.

Instrument for Data Collection
The study used a well-structured pre-tested questionnaire to collect data from the respondents (processors).
Data Collection Procedure
The researchers distributed the research instrument personally to 101 respondents. The respondents were selected at random to avoid bias. The questionnaire had four sections with both open and close ended questions. The first part of the instrument collected bio data (including age and sex distribution) on oil palm processors. Section B of the questionnaire collected data on employment and health risks associated with oil palm processing. Section C of the questionnaire collected data on factors that influence the household livelihood status. Section D collected data on processing and safety challenges confronting oil palm processors. Before administering the questionnaire, the purpose and importance of the study were explained to the respondents in Asante Twi. Also, interview administered method was adopted to administer the questionnaire to oil palm processors who were illiterate. The data was collected within two weeks (from 2nd – 16th March 2015). The researcher encouraged voluntary participation of the respondents, and also ensures that the respondents’ rights to be informed, right to privacy and right to choose are respected by maintaining confidentiality of all the information they gave to aid this study.

Source of Data
The data used was collected from mainly the primary source. The researcher used questionnaire to collect firsthand information from the processors of oil palm at Assin Fosu.

Data Analysis
The study used Statistical Package for Social Science (SPSS) Version 20 to generate descriptive statistics and binary logistic regression to analyse the data that was collected. The descriptive statistics were used to analyse research objective one, two, and three. The fourth research objective was analysed using logistic regression. The choice of this type of regression model is based on its suitability for working with a dependent variable of a dichotomous nature or limited dependent variable. That is, variable that is categorical in nature.

\[ \ln Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \mu \]

Where
- \( Y_i \) = Household livelihood status (Poor = 0, Non-poor = 1).
- \( X_1 \) = Household size (Number of people feeding from the same pot).
- \( X_2 \) = Annual income from oil palm processing (Measured in monetary terms: Ghana Cedis).
- \( X_3 \) = Source of household other incomes (Dummy: Income from other farming related activities = 1, otherwise = 0).
- \( X_4 \) = Ownership status of mill (Dummy: Yes = 1, No = 0).
- \( X_5 \) = Annual litres of oil palm processed (Measured in litres).
- \( X_6 \) = Number of times household process oil palm per year (Measured in numbers).
- \( X_7 \) = Type of financial institution accessed (Non-banking institutions = 1, Banking institutions = 0).

The dependent variable, livelihood status was measured or determined using the income approach. Participants’ income was measured as the amount of money realized from palm oil processing and related activities. Poverty line was placed at two-third mean income of respondents as adopted by Ighoro and Ejembi (2013), and the World Bank (1998). Based on this, the respondents were classified into two groups:

(a) Non-Poor: Those with income above Two-third mean income of respondents (i.e.\( NP > 2/3 \) Mean income),
(b) Poor: Those with income between One-third and Two-third mean income of respondents (i.e. between 1/3 and 2/3 Mean income).
4.0 Results and Discussions

Introduction
This chapter of the study presents the research results and discusses the findings of the study.

Demographic Profile of the Research Respondents: Sex and Age Distribution

The Table 4.1 showed the demographic profile of the research participants. To start with the age distribution of the respondents, majority (43.56%) were within 46-60 years age category, (32.67%) were within 31-45 years age category, and few (23.76%) were within 18-30 years age category. In terms of marital status, more than half (53.47%) were married, some (29.70%) indicated other categories (thus, single, widowed, widow), and few (16.83%) were either divorced or separated.

With regards to the gender distribution of the participants, more than half (52.48%) were male and some (47.52%) were female. Also, more than half of the respondents (57.42%) had some level of education while (42.57%) did not have any form of education.

Table 4.1: Demographic Profile of the Respondents

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-30yrs</td>
<td>24</td>
<td>23.76</td>
</tr>
<tr>
<td>31-45yrs</td>
<td>33</td>
<td>32.67</td>
</tr>
<tr>
<td>46-60yrs</td>
<td>44</td>
<td>43.56</td>
</tr>
<tr>
<td><strong>Marital Status:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>54</td>
<td>53.47</td>
</tr>
<tr>
<td>Divorced/Separated</td>
<td>17</td>
<td>16.83</td>
</tr>
<tr>
<td>Others</td>
<td>30</td>
<td>29.70</td>
</tr>
<tr>
<td><strong>Sex:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>53</td>
<td>52.48</td>
</tr>
<tr>
<td>Female</td>
<td>48</td>
<td>47.52</td>
</tr>
<tr>
<td><strong>Educational Status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educated</td>
<td>58</td>
<td>57.42</td>
</tr>
<tr>
<td>Uneducated</td>
<td>43</td>
<td>42.57</td>
</tr>
</tbody>
</table>

Sample size = 101
Source: Field survey (2015)

Major Processing Challenges Faced by Processors of Palm Oils at Assin Fosu

The study sought to determine the major challenges confronting oil palm processors in Assin Fosu. The results are illustrated in Table 4.2. as shown in the table, thirty (30) respondents representing 29.7% identified inadequate finance, twenty-one (21) representing 20.79% indicated low palm oil prices, twenty (20) of the respondents said erratic power supply and or absence of electricity, fifteen (15) representing 14.85% stated unavailability of fruits, nine (9) representing 8.91% cited high taxes, and six (6) of the respondents representing 5.94% mentioned low technology current employed in projection.

Table 4.2: Challenges Confronting Oil Palm Processors

<table>
<thead>
<tr>
<th>Challenges</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate finance</td>
<td>30</td>
<td>29.70</td>
</tr>
<tr>
<td>High Taxes</td>
<td>9</td>
<td>8.91</td>
</tr>
<tr>
<td>Low Technology</td>
<td>6</td>
<td>5.94</td>
</tr>
<tr>
<td>No Electricity</td>
<td>20</td>
<td>19.80</td>
</tr>
<tr>
<td>Unavailability of Fruit</td>
<td>15</td>
<td>14.85</td>
</tr>
<tr>
<td>Low Palm Oil Prices</td>
<td>21</td>
<td>20.79</td>
</tr>
<tr>
<td>Total</td>
<td>101</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Field survey (2015)

Employment and Health Risk Associated with Smallholder Palm Oil Processing

Frequent Sign of Illness

The research participants were asked if they often experience any illness. The result is shown in Figure 4.1. As shown in the figure, more than half (61.4%) said they often experienced illness, while (38.6%) do not experienced any form of illness. Based on this result it implies that majority of oil palm processors often experience illness.
Type of illness
The respondents were asked to indicate the type of illness they often experienced. Figure 4.2, (40.6%) identified itching eyes, (28.7%) indicated waist and back pains, a few (22.8%) indicated tiredness or fatigue, and 6.9% also identified other forms of illness. 1% of the respondents did not indicate any form or type of illness.

Experience of Insect Bites
In addition, the study sought to ascertain the research participants’ views on whether they often experienced insect bites when undertaking oil palm processing activities. Figure 4.4 shows (89.1%) of the respondents said “Yes” while (8.9%) said “No”. Few (2%) did not provide any answer to the statement.

Frequency of Visiting Health Facilities
More so, as illustrated in Figure 4.5, majority (42.6%) of the oil palm processors said they visit hospital or clinic every 6 months, (28.7%) indicated others, few (25.7%) said every 1-3 months, and a small number also said they visit hospital every 1-4 weeks. These results seem to suggest that it is the illnesses perceived to be associated with oil palm processing that make the farmers to visit hospital.
Factors that Influences the Household Livelihood Status of Palm Oil Processors at Assin Fosu

A direct logistic regression analysis was performed through SPSS Binary Logistic to assess the prediction of household livelihood status of oil palm processors in Assin Fosu in the Central region of Ghana. From Table 4.3, sixty-six (66) who were non-poor and thirty-five (35) who were poor (a total of 101 farmers) provided the data suitable for analysis.

Table 4.3: Classification Table of Household Livelihood Status (a, b)

<table>
<thead>
<tr>
<th>Observed</th>
<th>Predicted</th>
<th>Percentage Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Poor</td>
<td>Non-poor</td>
</tr>
<tr>
<td>Step 0</td>
<td>0</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>66</td>
</tr>
<tr>
<td>Overall Percentage</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Constant is included in the model.
b. The cut value is .500

Table 4.4 shows the results of the direct logistic regression analysis predicting household livelihood status from family size, annual income from processing oil palm, annual cost of hiring processing mill, annual litres of palm oil processed, number of times a farmer processed oil palm in a year, ownership of processing mill, and type of financial institutions accessed.

According to the Wald test, annual income from processing oil palm (Chi-square = 8.18, df = 1, B = 0.03, p < 0.05) and annual litres of palm oil processed (Chi-square = 3.06, df = 1, B = 0.00, p < 0.10) are reliable determinants household livelihood status of oil palm processors in Assin Fosu. This suggests that family size (Chi-square = 0.17, df = 1, B = -0.03, p = 0.89), annual cost of hiring processing mill (Chi-square = 1.95, df = 1, B 0.00, p = 0.16), number of times farmers processed palm oil per annum (Chi-square = 0.01, df = 1, B - 0.00, p = 0.91), ownership status of processing mill (Chi-square = 0.78, df = 1, B = -1.77, p = 0.38) and type of financial institutions accessed (Chi-square = 0.00, df = 1, B = -0.06, p = 0.97) are not significant predictors or determinants of household living status.

Table 4.4: Logistic Regression Analysis of Living Status Determinants of Oil Palm Processing Farmers in Assin Fosu

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>p-value</th>
<th>Odds Ratio exp(b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.63</td>
<td>0.21</td>
<td>9.20</td>
<td>0.00</td>
<td>1.89</td>
</tr>
<tr>
<td>Family Size</td>
<td>-0.03</td>
<td>0.17</td>
<td>0.018</td>
<td>0.89</td>
<td>0.98</td>
</tr>
<tr>
<td>Annual Oil Palm Proc. Income</td>
<td>0.03**</td>
<td>0.01</td>
<td>8.18</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Annual Cost of hiring Mill</td>
<td>0.00</td>
<td>0.01</td>
<td>1.95</td>
<td>0.16</td>
<td>1.00</td>
</tr>
<tr>
<td>Annual Litres of palm oil processed</td>
<td>0.00</td>
<td>0.01</td>
<td>3.06</td>
<td>0.08</td>
<td>0.99</td>
</tr>
<tr>
<td>Number of Oil processed time</td>
<td>-0.00</td>
<td>0.01</td>
<td>0.91</td>
<td>0.99</td>
<td></td>
</tr>
<tr>
<td>Ownership of Processing Mill</td>
<td>-1.77</td>
<td>0.78</td>
<td>0.38</td>
<td>0.17</td>
<td></td>
</tr>
<tr>
<td>Type of financial Inst. accessed</td>
<td>-0.06</td>
<td>0.00</td>
<td>0.97</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>Nagelkerke R Square</td>
<td>0.942</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cox &amp; Snell R Square</td>
<td>0.683</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall Statistics (Chi-Square)</td>
<td>73.38**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Significant at 0.05 level of significance  * Significant at 0.10 level of significance
Discussion of Results

Age and sex distribution of palm oil processors

This study sought to determine the sex and age distribution of processors in the palm oil processing industry at Assin Fosu. The study found that majority (43.56%) of the household farmers in the oil palm processing industry at Assin Fosu were within 46-60 years age category, some (32.67%) were within 31-45 years age category, and few (23.76%) were within 18-30 years age category. This implies matured people are engaged in oil palm processing at Assin Fosu. Also, more than half (52.48%) of the household farmers in the industry were male and some (47.52%) were female.

These results are inconsistent with the findings of previous researchers such as Oghenerobor and Joseph (2012); Ohimain, Emeti, & Izah, 2014 among others. For instance, Oghenerobor and Joseph (2012) in their study established that males dominated the palm oil processing industry. Most processors were between the age bracket of 41-50 years (Ohimain, Emeti, & Izah, 2014). This current finding with regards to the age grouping of the processors might support the assertion made by Oghenerobor and Joseph (2012) that palm oil processors within the age bracket of 20 and 50 years were the workforce that can be productive.

These results however are inconsistent with the findings of previous researchers as Osei-Amponsah et al. (2012), Akangbe et al. (2011) and Carrere, (2010). For example, Osei-Amponsah et al. (2012) found that women and children are mostly involved at all the stages of palm oil extraction. Akangbe et al. (2011)’s findings also showed that majority of the palm oil extractors were 60 years and above. Similarly, Carrere, (2010) found that half of Liberia’s palm oil is produced by 220,000 women and few men; women are involved in processing about 80% of Nigeria’s red palm oil demand.

Processing and safety challenges confronting palm oil processors

In addition, the study sought to ascertain the major processing challenges faced by processors of palm oils at Assin Fosu. The results of the study showed that inadequate finance, low palm oil prices, erratic or absence of electricity, unavailability of palm fruits, high taxes and low technology are the major challenges confronting oil palm processors in Assin Fosu. Also, the topmost challenges are inadequate finance, low palm oil prices and absence of electrical power supply.

These findings supported the findings of Puttheti and Obire (2010) that smallholder palm oil processors do not denote significant reduction in efficiency but rather decreased working capital due to lack of access to loans. It is also consistent with the findings of Oghenerobor and Joseph (2012) who found that small scale oil palm are faced with problems such as lack of funding, high taxes on agricultural products (FOE, 2008), and high cost of fresh fruit bunches power outages (Osei-Amponsah et al., 2012).

Employment and Health Risk

More so, the study sought to investigate the employment and health risk associated with smallholder palm oil processing. The results of the study found that majority of oil palm processors often experience illness. It was also found that itching eyes (44.60%), waist and back pains (28.70%), and tiredness or fatigue (20.8%) are the major illness often experienced by farmers that are engaged in processing oil palm at Assin Fosu.

The study further found that most oil palm processors often experience insects bite, and frequently visits health facilities, an indication of employment and health risks. These results seem to suggest that it is the illnesses perceived to be associated with oil palm processing that make the processors visit health facilities. This indicates further that there are employment and health risks associated with oil palm processing.

These results are consistent with previous researchers’ findings. According to Foe (2008), “the oil palm industry has been accused of negatively affecting human health. Like other agricultural and industrial activities palm oil processing raises environmental, socio-economic and human health concerns (Poku, 2002). It has also to some extent affected the health and socio-economic well-being of the local folks (Ohimain et al., 2013).

Similarly, WHO (2006) maintained that the itchy eyes, and fatigue experienced by the processors may have resulted from the long hours of exposure to fire and biofuel smoke. Andersen et al., (2002) attributed increasing bodily pains among workers performing repetitive work to poor health-related lifestyle but not work demand and that the injuries and insect bites sustained during processing result from the poor sanitation and the inappropriate personal protective apparel worn.

Factors that influence the household livelihood

Furthermore, the study sought to determine the factors that influence the household livelihood status of palm oil processors at Assin Fosu. The results from the binary regression analysis showed that only annual income from processing oil palm (Chi-square = 8.18, df = 1, B= 0.03, p < 0.05) and annual litres of palm oil processed (Chi-square =
This result confirms the fact that small-scale palm oil processing holds the key to rural poverty reduction in palm oil producing countries (Putheti and Obire, 2010). In addition, these results seem to also support the assertion of Carrere (2010) that small-scale and traditional processors provide products and incomes to millions of people; involved in the various stages as harvesting, quartering, boiling, milling, storage, and the commerce of palm oil.

This could explain why the Government of Ghana through the President’s Special Initiative Program supported the palm oil industry in an attempt to alleviate poverty among the citizenry (PSI, 2004).

The second research question sought to ascertain the major processing challenges faced by processors of palm oil at Assin Fosu. The results of the study showed that inadequate finance, low palm oil prices, erratic or absence of electricity, unavailability of palm fruits, high taxes, and low technology were the major challenges confronting oil palm processors in Assin Fosu. Also, the topmost challenges are inadequate finance, low palm oil prices, and absence of electrical power supply.

The third research question sought to investigate the employment and health risk associated with smallholder palm oil processing. The results of the study found that majority of oil palm processors often experience illness. It was also found that itching eyes, waist and back pains, and tiredness or
Fatigue are the major illness often experienced by farmers that are engaged in processing oil palm at Assin Fosu. Since the illness perceived to be associated with oil palm processing similar to the illness often experienced by the oil palm processors, it was concluded that oil palm processing is the major cause of tiredness and fatigue, back and waist pains, itching eyes and other forms of illness among oil palm processors in Assin Fosu.

The study further found that most oil palm processors often experience insects bite, and frequently visits health facilities, an indication of employment and health risks. These results seem to suggest that it is the illnesses perceived to be associated with oil palm processing that make the farmers to visit hospital. This indicates further that there are employment and health risks associated with oil palm processing.

Finally, the study sought to determine the factors that influence the household livelihood status of palm oil processors at Assin Fosu. The results from the binary regression analysis showed that only annual income from processing oil palm and annual litres of palm oil processed are reliable determinants household livelihood status of oil palm processors in Assin Fosu. It was however found that family size, annual cost of hiring processing mill, number of times farmers processed palm oil per annum, ownership status of processing mill, and type of financial institutions accessed, were not significant predictors or determinants of household living status.

Conclusion
The study investigated the determinants of oil palm processors’ livelihood status at Assin Fosu in the Central Region of Ghana. The study found that majority of oil palm processors were men. This contradicted other researcher’s findings as well as the expectation that the industry is a female dominated. It was however supported some previous studies. In terms of the age distribution of the oil palm processors, majority fall within 31-60 years age category and few were within 18-30 years age category.

In addition, the study found that inadequate finance, low palm oil prices, erratic or absence of electricity, unavailability of palm fruits, high taxes and low technology are the major challenges confronting oil palm processors in Assin Fosu. Furthermore, oil palm processors also face employment and health risks such as insect bites, body pains, itching eyes, among others. Finally, it was found that the major determinants of oil palm processors’ livelihood were annual income from processing oil palm and the annual litres of oil palm produced.

In conclusion, knowledge contributed by providing new empirical evidence on age and sex distribution of oil palm processors, oil palm processing challenges, employment and health risks associated with oil palm processing, as well as the determinants of the livelihood status of oil palm processors.

Recommendations
The following were recommended based on the findings of the study:

i. The oil palm processors should form an association to improve their chances of getting loans.

ii. They should save daily with the financial institutions to enhance their chances of getting loans.

iii. Key stakeholders such as Ministry of Trade, Ministry of Agriculture among others need to support the oil palm processors to overcome some of the major processing challenges currently facing the farmers. For example, by helping them with ready market for the products.

iv. The farmers’ capacity need to be built on best practices and new technologies to enhance their annual production, and hence improved annual income, which was found to be a significant determinant of the livelihood status of the palm oil processors.

v. The oil palm processors should be educated on how best to minimize the employment and health risks associated with oil palm processing.

Suggestion for Future Research
Future studies should expand the sample size and include more oil palm processors in other cities. Also, the future studies may examine the determinants of the livelihood status of other categories of other small scale farmers such as processors of cassava, tomato farmers, and processors of cashew nut farmers, among others.

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