

GHANA INSTITUTE OF JOURNALISM

**QUALITY OF OIL PALM PRODUCTION SMALL-SCALE FARMERS
(A CASE STUDY OF ASUOM COMMUNITY IN THE EASTERN REGION)**

BY

ISAAC DEBRAH OSEI

OCTOBER 2020

**QUALITY OF OIL PALM PRODUCTION SMALL-SCALE FARMERS
(A CASE STUDY OF ASUOM COMMUNITY IN THE EASTERN REGION)**

BY

ISAAC DEBRAH OSEI

(MADC 19086)

**A PROJECT WORK SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES
AND RESEARCH, GHANA INSTITUTE OF JOURNALISM, IN PARTIAL
FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF
ARTS (M.A) DEGREE IN DEVELOPMENT COMMUNICATION**

OCTOBER 2020

DECLARATION

Student's Declaration

I, the undersigned solemnly declare that the title “Quality of Oil Palm Production among Small-Scale Farmers: A case study of Asuom community in the Eastern region”, is based on my own work carried out during the course of study under the supervision of Dr. Richard Boateng.

I further certify that wherever I have used materials from other source, we have given due credit to them in the text of the report and given their details in the references.

STUDENT’S NAME: ISAAC DEBRAH OSEI (MADC 19086)

.....
SIGNATURE

.....
DATE

Supervisor's Declaration

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision as laid down by the Ghana Institute of Journalism

SUPERVISOR’S NAME: DR. RICHARD BOATENG

.....
SIGNATURE

.....
DATE

DEDICATION

For the immense support, motivation and trust ushered me throughout the academic year, I would like to appreciate my siblings who stood by me through all the difficult moments also, my parents Mr Osei Ameyaw Frederick and Miss Konadu Beatrice for the hope and persistence.

ACKNOWLEDGEMENT

My profound appreciation goes to the Almighty God for seeing me through this work amidst the Global Pandemic. His strength and gift of life propelled me to complete this course in this challenging age.

Special credit to my supervisor, Dr. Richard Boateng for his patience, guidance and consistent support and in-depth contribution towards the study.

To the School of Graduate Studies- Ghana Institute of Journalism, my colleagues and friends, most especially the MA-Development Communication Class of 2020, who stood by me through the inflexible times and gave me the confidence that I needed to complete this course.

ABSTRACT

A number of improved oil palm production practices have been introduced to assist small-scale oil palm farmers increase yield and improve on their product. This study was conducted to examine the quality of oil palm production among small-scale farmers in Asuom community in Kwaebibirem District of the Eastern Region of Ghana. In all, 5 oil palm farmers were selected using purposive sampling and interviewed using unstructured questionnaires. Respondents dutifully availed themselves to be interviewed. The survey was to; ascertain farmers' knowledge on modern oil palm production methods; examine the communication channel between oil palm farmers and extension support services and; to investigate the oil palm production process and their effect on perceived quality. Results revealed farmers' who do not apply fertilizer recorded 100%, due to their organic farming practice. Also, 100% of farmers admitted palm fruits are processed/steamed with the locally manufactured Kramer. Furthermore to that, farmers who ensure best management practices on the farm recorded 100%. However, 80% of respondents actively engage the services of extension officers. It is recommended that for palm fruits to be processed without storing them for a number of days which results in fatty acid, a contributing factor to less quality of products, farmers should be educated on the improved cooked stove which has enough capacity to process palm fruits within the shortest possible hour and adapt the use. Since, farmers do not apply fertilizer, the constant use of empty shells known as "bonkete" will help improve yields. Additionally, it is recommended that extension services should cover more farmers who should be encouraged to adopt improved oil palm production farming practices and therefore improve on their livelihood assets. Keywords: Oil palm, Adoption, Livelihood Assets.

TABLE OF CONTENT

TITLES	PAGES
Cover	i
Declaration.....	ii
Dedication.....	iii
Acknowledgement.....	iv
Abstract.....	v
Table of Content.....	vi
List of Tables	viii
List of Figures	ix
Abbreviations.....	x

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study.....	1
1.2 Statement of the problem/ Significance of the Study	3
1.3 Hypothesis.....	5
1.4 Objectives of the study.....	6
1.5 Definition of terms.....	6
1.6 Methodology.....	6
1.7 Sampling	7

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction	8
2.2 Theoretical Review	8

2.2.1 Functionalism theory.....	8
2.2.2 Participatory theory.....	9
2.2.3 Diffusion of innovation.....	12
2.3 Empirical research.....	15

CHAPTER THREE: RESEARCH METHODOLOGY AND ANALYSIS

3.0 Introduction	35
3.1 Research design.....	35
3.2 Sampling.....	47
3.3 Data collection instrument.....	47
3.4 Administrative process.....	47
3.5 Questionnaire interview.....	47

CHAPTER FOUR: DATA ANALYSIS AND DISCUSSION

4.0 Introduction	39
4.1 Data analysis.....	39
4.2 Discussion.....	44

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.1 Conclusion and recommendation.....	47
References.....	48

LIST OF TABLES

TITLES	PAGES
Table 1: Qualitative Interviews	38
Table 2: Presentation of Results.....	43

LIST OF FIGURES

TITLES	PAGES
Figure 1: Palm Oil Processing Chart Flow	32
Figure 2: Improved Cook Stove.....	34
Figure 3: Population according to 2010 censusu Kwaebibirem District and Asuom Community as of 2010.....	36
Figure 4: This picture depicts a section of women in Asuom Community using the Kramer in steaming palm fruits while a chunk of fruits is stored outside for days, to be processed	45

ABBREVIATIONS

PKO	Palm Kernel Oil
CPO	Crude Palm Oil
CAGR	Cumulative Annual Growth Rate
BOPL	Benso Oil Palm Limited
NORPALM	Norwegian Oil Palm Ghana Limited
GOPDC	Ghana Oil Palm Development Company
HL	High Lipase
FFA	Fresh Fatty Acid
FFB	Fresh Fruits Bunches
OEL	Oil Extraction Low

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Oil palm is grown in the forest belt in Ghana, where the rainfall amount is greater than 1200 mm/annum and distributed in a bimodal fashion. The most suitable areas for oil palm cultivation in Ghana are in the Western, Central and Eastern Regions.

In West African region – especially Côte d’Ivoire, Ghana, Nigeria and Sierra Leone – is a major producer of both palm oil and palm kernel oil (PKO). The consumption of oil palm in Ghana and other parts of West Africa is expected to increase due population growth and increase in demand. In many countries, the palm oil sector has a significant economic impact. In Nigeria, the palm oil industry employs millions of workers, while in Guinea, Liberia and Sierra Leone it is a major source of income and trade along the common border districts. Oil palm serves as a raw material for industry and a source of foreign exchange. Production of palm oil now accounts for 37 percent of the total global output of oilseeds, it’s estimated as the leading vegetable oil.

Malaysia and Indonesia dominate world production and trade with 90 percent of global output, while West Africa accounts for a negligible 3.5 percent. Given a per capita edible oil consumption of 10-11 kg, and if all edible oil were supplied by crude palm oil (CPO), the population of West Africa would require about 2 million metric tonnes (MT) of CPO to be self-sufficient. However, total supply is currently 1.4 million MT, leaving a demand gap of 600 000 MT, which is currently filled by imports. The global palm oil industry has recently witnessed unprecedented growth, with a cumulative annual growth rate (CAGR) of 8 percent, although West Africa’s CAGR is at 1.5 percent.

The competitive landscape is dominated by Southeast Asian producers who have better production efficiency (higher productivity at comparable costs of production, hence able to capture larger shares of the world market) and ideal climatic conditions, resulting in loss of revenue opportunity for producers in West Africa. Many West African countries (and countries in other parts of Africa) have plans to expand and develop oil palm plantations. Buoyed by rising producer prices, strong international demand for vegetable oil and the large

demand potential within Africa, as well as demand from biofuel markets, several West Africa countries have formulated national programs to encourage both national and foreign investments in new oil palm plantations.

There appears to be a continuous diversion of crops away from citrus, formerly a major tree crop in the region. Citrus trees are being cut down by producers in order to replant the land with oil palm because there is a lack of ready market for citrus and very little profit margin at the end of the year, compared with oil palm. The oil palm industry is characterized by various types of agro-systems, ranging from large agro-industry plantations to small-scale farmers, who may or may not be organized into cooperatives. Several supply models also co-exist, from fully integrated agro-industry companies with oil mills which procure from their own plantations, to out grower schemes, to small-scale producers – primarily women who either sell fruit to processors, or produce oil for their own consumption or for sale to local markets.

The local industry contends with a number of constraints, including little demand-driven research, limited access to land and finance, high production costs, low levels of technology, low extraction rates and poor-quality CPO, and lack of adequate government support. Some African governments are targeting oil palm as a key sector for agricultural growth and to address rural poverty.

However, the sector's current expansion is driven largely by large-scale agro-industry and 350 Rebuilding West Africa's food potential favors large plantations for economies of scale, which raises the question of whether and to what extent small-scale farmers, including women, can successfully compete, capture a share of the value addition of the growing sector and improve their incomes.

Oil palm is grown in the forest belt in Ghana, where the rainfall amount is greater than 1200 mm/annum and distributed in a bimodal fashion. The most suitable areas for oil palm cultivation in Ghana are in the Western, Central and Eastern Regions. Large oil palm plantations (nucleus estates and out growers) and processing mills are located in these regions. Some of the large-scale plantations are Benso Oil Palm Limited (BOPP) and Norwegian Oil Palm Ghana Limited (NORPALM) in the Western Region, Twifo Oil Palm Plantation Limited (TOPP) in the Central Region, and the Ghana Oil Palm Development Company (GOPDC) at Kwae near Kade in the Eastern Region, (Kwabena and Daniel)

Asuom, is a farming community in the Eastern region, in the Kwaebibirem district. Inhabitants mostly grow food crop and produces cash crops for production through various means of processing.

Oil palm, is the most dominated cash crop in the catchment area. The problem emanating from the under researched community (Asuom) suggests that oil palm production among these small-scale farmers are of low quality. The determinants to the problem are influenced by some factors leading to the substandard oil palm production. These contributing factors may be as a result of inadequate/quality/absence of modern machinery, costly inputs of labour, imported fertilizers, insecticides, quality of seeds planted/nursed, size of land, soil fertility, absence/insufficient agro chemicals used, non-conformance to best farm management practices, among others.

The in-depth research is expected to challenge the current state of the oil palm production among small-scale farmers by; employing elements that contribute to the quality of production (produce), ascertain the knowledge of farmers on modern oil palm production method, examine the communication channel between oil palm farmers and extension support services, similarly, investigate the oil palm production processes and their effect on perceived quality. The key question in this chapter is “are producers the same as processors, and suppliers”? what are the contractual arrangements between processors and producers/suppliers.?

1.2 STATEMENT OF THE PROBLEM/SIGNIFICANCE OF THE STUDY

The focus of the study is to examine factors that contribute to the low quality of oil palm production among small-scale farmers in Asuom Community producers, processors, suppliers are overwhelmed by the texture of oil palm processed for sale, which has over the years caused chaos in selling as a result of its low quality. This has had an adverse effect on capital derived from sale juxtapose the cost of production.

The authors of “improving palm oil quality through identification and mapping of the lipase gene causing oil deterioration, (F. Morcillo, D. Cros et, al., article 2160,2013) argue that, the mesocarp lipase activity causes consequential oil losses and requires costly measures to limit free fatty acids quantities. Here, it was demonstrated that elite low-lipase lines yield oil with substantially less free fatty acids than standard genotypes, allowing more flexibility

for post-harvest fruit processing and extended ripening for increased yields. They identify the lipase and its gene cosegregates with the low-/high-lipase trait, providing breeders a marker to rapidly identify potent elite genitors and introgress the trait into major cultivars.

One major constraint that weighs heavily on yield and harvest management is the rapid oil acidification due to the high lipase (HL) activity that releases free fatty acids (FFA) in the mesocarp of bruised ripe fruits^{7,8,9,10}. Acidity has a strong impact on the quality of commodity oil because an FFA content of >5% is considered to be unfit for human consumption.

(Tagoe, Ametorgbor et al) further argue that, the quality of palm oil is mostly determined by the fatty acid, moisture and impurity content, and bleach ability. This study examined the quality of palm oil produced at cottage industry level in Ghana with a view to improve its quality to meet industrial standards and increase its marketability. Palm oil produced from fruits stored at various periods with various levels of contamination were examined over a twelve-month storage period for their microbial, fatty acid, moisture and impurity contents. PCR amplifications, sequencing and fragment analysis methods were used to identify microbes, while fatty acid (FFA), moisture and impurity indices were determined by titration and oven-dry methods.

The major factors determining the fatty acid content was age of fruits used to process the oil and the length of storage of the oil after processing. The results show that good grade oils with low fatty acid (FFA) contain microbes, some of which have the potential of producing toxin. There was a direct relationship between storage period of oil and fatty acid content, and microbial loads in oils. As storage period increased, fatty acid and microbial load increased ($r = 0.972$ and 0.967). Lipolytic organisms identified are *Aspergillus* (0.27), *Bacillus* (0.08), *Candida* (1.34), *Geotrichum* (1.00) and *Pseudomonas* (2.11) species.

While contamination and deterioration of the fruits increased with age. The longer the fruits were stored, the higher the contamination and deterioration and the higher the free fatty acid content of the oil the longer the storage period the higher the fungal population.

The above school of thoughts are pointing to the fact that, the free fatty acid (FFA), contamination and deterioration of fresh fruits, storage period are a contributing factors of oil extraction low (OEL).

However, the understudying community although experiencing the above challenges, in their capacity to improve their produce can modify their method of production/processing. A visit to the community identified that, processor use the conventional way of processing the palm fruits amidst its storage period and acidity.

The practice of long storage and the derivation of fatty acid is a borne out of their conformist method of processing using what we call” Kramer”. The Kramer as a means of steaming palm fruits has small quantity limit, hence, fruits storage rendering fruits acidic, contaminated, deteriorated and fatty which causes OER.

Additionally, I realized that, the traditional method of processing causes more harm to the farmer’s health due to emissions from the Kramer.

Also, I realized most community folks either do not have access to internet connectivity or do not have basic or feature phones. This made it impossible for extension officers to communicate to them directly via mobile to solve issues relating to farm management. Inconsistent visit of extension officers generates lack of skills on the part of these farmers contribute to low productivity.

1.3 HYPOTHESIS

According to Cooper and Schindler (1998:43) the research literature disagrees about the meaning of the term proposition and hypothesis.

A research proposition is a statement about the concepts that may be judged as true or false if it refers to observable phenomenon. The major proposition to this empirical research is to change the conservative methods of oil palm processing among the small-scale farmers.

This novel adaptation will improve the oil quality through a sequence of hygienic procedures. Nonetheless, it is based on a true fact that the community produces less quality of oil palm product based on the empirical research.

1.4 OBJECTIVES OF THE STUDY

1.4.1 General Objectives:

- To examine the determinants of quality of oil palm production (products) among small scale farmers

1.4.2 Specific objectives

- To ascertain the knowledge of the farmers on modern oil palm production methods
- To examine the communication channel between oil palm farmers and extension support services
- To investigate the oil palm production processes and their effect on perceived quality

1.5 DEFINITION OF TERMS

Abbreviations, technical terms, unfamiliar words used in embarking on this research will be duly explained in full in order to provide accurate meaning and vivid understanding to the reader. These terms will be referenced as well.

1.6 METHODOLOGY

The researcher embarked on a primary data collection in Asuom. Pre-tested the tool to be assured it is devoid of errors, after which the actual data collection followed. The adaptation of qualitative method of data collection was employed in the empirical research.

The researcher was expected to engage about five (5) respondents in Asuom community for the interview. The theories underpinning this research is Participatory, Functionalism and Diffusion of Innovation. The purpose is to bring social change and development through sustained improvement in the palm oil processing sector involving the community in the project in order to sustain and own the process.

1.7 SAMPLING

The sample method being implemented is non-probability sampling- the use of purposive sampling will be relevant in this case since the research is targeted at small-scale oil palm producers. The essential requirement of key personalities relevant in the study will be requested. The use of unstructured and non-numerical instrument will be used in the interview process through inter-personal communication with farmers. The result obtained from respondents will be transcribed to analyze data.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter is focused on both theoretical literature and empirical research. The theoretical aspects are focused on Functionalism, Participatory and Diffusion of Innovation theories of community development. These theories become a supporting element for community members to see the need to adapt to the changing society. However, the empirical literature is fixated on already researched work by scholars in the field of oil palm. This research was done in accordance with the project objectives.

2.2 THEORETICAL REVIEW

2.2.1 Functionalism Theory

The functionalist perspective is based largely on the works of Herbert Spencer, Emile Durkheim, Talcott Parsons, and Robert Merton.

According to functionalism, society is a system of interconnected parts that work together in harmony to maintain a state of balance and social equilibrium for the whole.

Societies change from simple to complex, from undifferentiated to highly differentiated division of labor.

Technology is the primary cause of social change. Functionalism posits that society is more than the sum of its parts; rather, each aspect of it works for the stability of the whole. Durkheim envisioned society as an organism since each component plays a necessary role but can't function alone. When one-part experiences a crisis, others must adapt to fill the void in some way.

In functionalist theory, the different parts of society are primarily composed of social institutions, each designed to fill different needs. Family, government, economy, media, education, and religion are important to understanding this theory and the core institutions that define sociology. According to functionalism, an institution only exists because it serves

a vital role in the functioning of society. If it no longer serves a role, an institution will die away. When new needs evolve or emerge, new institutions will be created to meet them.

Functionalism emphasizes the consensus and order that exist in society, focusing on social stability and shared public values. From this perspective, disorganization in the system, such as deviant behaviour, leads to change because societal components must adjust to achieve stability. When one part of the system is dysfunctional, it affects all other parts and creates social problems, prompting social change

2.2.1.1 Criticisms

Many sociologists have critiqued functionalism because of its neglect of the often-negative implications of social order. Some critics, like Italian theorist Antonio Gramsci, claim that the perspective justifies the status quo and the process of cultural hegemony that maintains it.

Functionalism does not encourage people to take an active role in changing their social environment, even when doing so may benefit them. Instead, functionalism sees agitating for social change as undesirable because the various parts of society will compensate in a seemingly organic way for any problems that may arise.

2.2.2 Participatory Theory

Participatory development communication is the use of mass media and traditional, interpersonal means of communication that empowers communities to visualize aspirations and discover solutions to their development problems and issues.

Participatory communication is "the theory and practices of communication used to involve people in the decision-making of the development process. It intends to return to the roots of its meaning, which, similarly to the term community, originate from the Latin word 'communis', i.e. common (Mody, 1991).

Therefore, the purpose of communication should be to make something common, or to share...meanings, perceptions, worldviews or knowledge. In this context, sharing implies an

equitable division of what is being shared, which is why communication should almost be naturally associated with a balanced, two-way flow of information.

“Participatory development seeks to give the poor a part in initiatives and projects that are designed by outside organizations in the hopes that these projects will be more sustainable and successful by involving local.

2.2.2.1 Stages of Participatory Project

Each project issue in participatory development can be divided into stages, and this division facilitates assessment of when and to what degree a participatory approach is relevant. From an institutional perspective, there are four key stages of a development project:

1. Research Stage is where the development problem is accurately defined. All relevant stakeholders can be involved in this process. The research around the development problem can include studying previous experiences, individual and community knowledge and attitudes, existing policies and other relevant contextual information related to socio-economic conditions, culture, spirituality, gender, etc.
2. Design Stage defines the actual activities. A participatory approach helps to secure the ownership and commitment of the communities involved. Active participation by local citizens and other stakeholders aims to enhance both the quality and relevance of the suggested interventions.
3. Implementation Stage is when the planned intervention is implemented. Participation at this stage increases commitment, relevance and sustainability.
4. Evaluation Stage participation ensures that the most significant changes are voiced, brought to common attention and assessed. For a meaningful evaluation, indicators and measurements should be defined in a participatory process at the very beginning of the initiative involving all relevant stakeholders

2.2.2.2 Forms of Participatory Development

1. Passive participation is the least participatory of the four approaches. Primary stakeholders of a project participate by being informed about what is going to happen or has already happened. People's feedback is minimal or non-existent, and their participation is assessed through methods like head counting and contribution to the discussion (sometimes referred to as participation by information).
2. Participation by consultation is an extractive process, whereby stakeholders provide answers to questions posed by outside researchers or experts. Input is not limited to meetings but can be provided at different points in time. In the final analysis, however, this consultative process keeps all the decision-making power in the hands of external professionals who are under no obligation to incorporate stakeholders' input.
3. Participation by collaboration forms groups of primary stakeholders to participate in the discussion and analysis of predetermined objectives set by the project. This level of participation does not usually result in dramatic changes in what should be accomplished, which is often already determined. It does, however, require an active involvement in the decision-making process about how to achieve it. This incorporates a component of horizontal communication and capacity building among all stakeholders—a joint collaborative effort. Even if initially dependent on outside facilitators and experts, with time collaborative participation has the potential to evolve into an independent form of participation.
4. Empowerment participation is where primary stakeholders are capable and willing to initiate the process and take part in the analysis. This leads to joint decision making about what should be achieved and how. While outsiders are equal partners in the development effort, the primary stakeholders are *primus inter pares*, i.e., they are equal partners with a significant say in decisions concerning their lives. Dialogue identifies and analyses critical issues, and an exchange of knowledge and experiences leads to solutions. Ownership and control of the process rest in the hands of the primary stakeholders

2.2.2.3 Criticisms

When compared with traditional forms of development, PD is sometimes criticized for being costly and slow. A project may take longer if one has to engage, work and come to a consensus with local communities, then if one did not have to do these things. PD may also have higher startup costs than traditional development. In addition, PD is criticized for reaching a smaller population than traditional development. Community dialogue and augmentation may initially involve only a few individuals, whereas dropped food aid reaches hundreds of people

More radical development thinkers have put several criticisms forward. PD projects have been accused of treating communities as if everyone in them is the same. This issue has been raised most specifically with regard to gender. Critics suggest that while many organizations acknowledge the importance of including women in PD projects, the history of success has been limited.

This may be because PD projects seek to address women's immediate needs "without addressing underlying aspects of gender subordination such as the unequal division of reproductive labour, restrictions on female mobility, domestic violence, women's lack of autonomy and so on". Critics have also said that PD projects fail to adequately address other inequalities such as class and caste. In trying to give voice to communities, development agencies may connect only with elite members of a group, thereby re-enforcing local inequalities. PD projects have also been accused of enabling tokenism, where a few "handpicked" local voices are allowed to speak as a "rubber stamp to prove ... participatory credentials". This view suggests that organizations only include local voices to improve their image, without really seeking to engage the population with which they are working.

2.2.3 Diffusion of Innovation Theory

Diffusion of Innovation (DOI) Theory, developed by E.M. Rogers in 1962, is one of the oldest social science theories. It originated in communication to explain how, over time, an idea or product gains momentum and diffuses (or spreads) through a specific population or social system. The end result of this diffusion is that people, as part of a social system, adopt a new idea, behaviour, or product.

Adoption means that a person does something differently than what they had previously (i.e., purchase or use a new product, acquire and perform a new behaviour, etc.). The key to adoption is that the person must perceive the idea, behaviour, or product as new or innovative. It is through this that diffusion is possible.

Adoption of a new idea, behaviour, or product (i.e., "innovation") does not happen simultaneously in a social system; rather it is a process whereby some people are more apt to adopt the innovation than others. Researchers have found that people who adopt an innovation early have different characteristics than people who adopt an innovation later. When promoting an innovation to a target population, it is important to understand the characteristics of the target population that will help or hinder adoption of the innovation.

There are five established adopter categories, and while the majority of the general population tends to fall in the middle categories, it is still necessary to understand the characteristics of the target population. When promoting an innovation, there are different strategies used to appeal to the different adopter categories.

1. **Innovators:** These are people who want to be the first to try the innovation. They are venturesome and interested in new ideas. These people are very willing to take risks, and are often the first to develop new ideas. Very little, if anything, needs to be done to appeal to this population.
2. **Early Adopters:** These are people who represent opinion leaders. They enjoy leadership roles, and embrace change opportunities. They are already aware of the need to change and so are very comfortable adopting new ideas. Strategies to appeal to this population include how-to manuals and information sheets on implementation. They do not need information to convince them to change.
3. **Early Majority:** These people are rarely leaders, but they do adopt new ideas before the average person. That said, they typically need to see evidence that the innovation works before they are willing to adopt it. Strategies to appeal to this population include success stories and evidence of the innovation's effectiveness.
4. **Late Majority:** These people are skeptical of change, and will only adopt an innovation after it has been tried by the majority. Strategies to appeal to this

population include information on how many other people have tried the innovation and have adopted it successfully.

5. **Laggards:** These people are bound by tradition and very conservative. They are very skeptical of change and are the hardest group to bring on board. Strategies to appeal to this population include statistics, fear appeals, and pressure from people in the other adopter groups.

The stages by which a person adopts an innovation, and whereby diffusion is accomplished, include awareness of the need for an innovation, decision to adopt (or reject) the innovation, initial use of the innovation to test it, and continued use of the innovation. There are five main factors that influence adoption of an innovation, and each of these factors is at play to a different extent in the five adopter categories.

1. **Relative Advantage:** The degree to which an innovation is seen as better than the idea, program, or product it replaces.
2. **Compatibility:** How consistent the innovation is with the values, experiences, and needs of the potential adopters.
3. **Complexity:** How difficult the innovation is to understand and/or use.
4. **Triability:** The extent to which the innovation can be tested or experimented with before a commitment to adopt is made.
5. **Observability:** The extent to which the innovation provides tangible results.

2.2.3.1 Limitation of Diffusion of Innovation Theory

There are several limitations of Diffusion of Innovation Theory, which include the following:

- Much of the evidence for this theory, including the adopter categories, did not originate in public health and it was not developed to explicitly apply to adoption of new behaviours or health innovations.

- It does not foster a participatory approach to adoption of a public health program.
- It works better with adoption of behaviours rather than cessation or prevention of behaviours. It doesn't take into account an individual's resources or social support to adopt the new behaviour (or innovation).

This theory has been used successfully in many fields including communication, agriculture, public health, criminal justice, social work, and marketing. In public health, Diffusion of Innovation Theory is used to accelerate the adoption of important programs that typically aim to change the behaviour of a social system.

The theories of development Participatory, Functionalism and Diffusion of Innovation are community development approaches that seeks to change society's perception on improving the quality of oil palm production among small-scale farmers

2. 3 EMPIRICAL RESEARCH

Although oil palm (*Elaeis Guineensis*) is native to West Africa, most producer nations (except Ivory Coast) are net importers of palm oil. The whole of Africa's total production of crude palm oil (CPO) is estimated to be 4–6 percent of world production (GoG/MoFA, 2010). While Ghana's share of total Africa's production, is only about 6 percent (approximately 0.4 percent of the world's production).

In 2014, Ghana produced 495,000 metric tonnes MT, consumed 760,000 MT, imported 300,000 MT, and exported 35,000 MT, which represents an annual growth rate of 27.08 percent (Index Mundi, 2014). The projections for industrial quality palm oil production (2010 – 2025) suggest there will be only a modest increase in production if the current trend continues without any sustainable intervention in the industry.

In addition to this, domestic consumption will increase drastically within the same period (MASDAR, 2010). There is, thus, an opportunity to explore this demand by developing the oil palm industry. An increase in the production of high-quality palm oil (particularly from the small-scale mills) could be a solution to reduce the huge importation and also provide opportunity for economic growth in rural areas, through job creation. There are three main scales for the production of palm oil.

These are the small- (traditional and artisanal), medium and large scale. Women constitute 80 percent of small-scale oil palm processors. These women usually access the services of semi-automated artisanal (Kramer) mills largely operated by men. These processors buy fresh fruit oil palm bunches from small-scale farmers who cultivate 87 percent of land and produce 80 percent of the bunches in the industry (MOFA, 2011).

Small-scale processing capacity is from 3 to 8 tonnes fresh fruit bunches/day with an extraction rate of 9–11 percent (MoFA, 2011). The small-scale operations produce 80 percent of Ghana's crude palm oil (CPO), but this is of poor quality mainly due to presence of high free fatty acids (FFA) (Angelucci, 2013). Few processors produce slightly better quality palm (locally called Zoomi) for home consumption, while the majority make ordinary crude palm oil, which is sold to the 'local' soap processors, Togolese and Nigerian informal markets (Osei-Amponsah & Visser, 2016).

This article focuses on the production of ordinary crude palm oil at the small-scale level. The medium and large-scale producers together with their smallholder and out grower schemes cultivate 13 percent of the total area under oil palm production. The large-scale plantations are mostly owned by private foreign investors and the government of Ghana (World Bank, 2011). The large and medium-scale plantations are linked to 15–60 tonnes/hour capacity processing and refinery facilities with palm oil extraction rates of 18–21.5 percent (MoFA, 2011).

Processing of fresh fruit bunches is highly mechanised, and the crude palm oil is of high industrial quality (low free fatty acid levels). It is refined into other products, exported and/or sold to domestic manufacturing companies. Oil palm processing started in Ghana around the 16th century (Henderson & Osborne, 2000), largely by households (Lynn, 1991). By the 19th and early 20 centuries, plantations were established by the Dutch (Dickson, 1969), then British and other Europeans.

Through an oil palm ordinance in 1913, rights were given to mill operators by the government to extract palm oil within the vicinity of the plantations. However, this plantation system failed, due to lack of a sustainable supply of oil palm fruits (La-Anyane, 1961; 1963). Then after independence there was another policy putting more emphasis on plantation systems (Ministry of Agriculture, 1990), which led to the creation of state farms.

Again, this failed, because engaging in state-owned farms did not prove economically viable at the time (Miracle & Seidman, 1968). During the second half of the 20th century there was an attempt to modernize processing activities but with little success (Kaniki, 1980). Then from 1977, government sought to promote medium to large plantations and processing plants through private corporations, foreign assisted government ventures, and joint public-private projects. Largely, the policy incentives of the 20th century centred on government for the acquisition of land for large and medium-scale oil palm plantation and processing mills.

The policy interventions did not explicitly promote the production of palm oil by small-scale processors, and there was no specific gender-based strategies to address the needs of the large number of women involved in the industry at the village level. At the start of the new millennium, the oil palm industry was identified by the government as having great potential to create jobs and reduce poverty. To offset the gap in demand and supply of palm oil, the President's Special Initiative (PSI) on oil palm managed by an interministerial facilitation team was announced in 2002. This was an initiative to make the oil palm industry a key sector for sustained economic growth and development, particularly in rural areas (GoG, 2003; GoG, 2004).

It was expected that the development of the new oil palm farms and efficient processing facilities would lead to employment creation (about 1.2 million farm operatives alone), foreign exchange generation (net inflow of about US\$1.6 billion from CPO alone) and foreign direct investment flows (over US\$4.0 billion). Again, this initiative did not have policy interventions for the already existing small-scale oil palm processing enterprise. The PSI did not survive and came to a halt by 2008 (Asante, 2012). The current development policy is from the master plan study of the oil palm industry, launched by the Ministry of Food and Agriculture in 2012. It is expected to enhance Ghana's competitiveness in the palm oil export market and also to meet its domestic demand for manufacturing and household consumption (MASDAR, 2010).

It recommends the establishment of a large plantation and processing mill with attached smallholder farmer schemes. It is clear that past policies and interventions tried to enhance growth of the industry through large scale production (Asante, 2012; Miracle & Seidman, 1968), and 'fixing of development' (Li, 2007) for the small-scale enterprises (Kaniki, 1980), but with little success.

The previous policy interventions, thus, created constraints of poor processing practices, low quality of product and lack of remunerative markets for the small-scale oil palm producers. The situation leads to a clear distinction between the large and small-scale producers, in terms of the quality and price of product, as well as types of market they access. At the macroeconomic level of policy formulation, it may seem logical to kick out the 'inefficient' small-scale enterprises and channel all fruit bunches to the large-scale mills with high quality palm oil and extraction rates. But, there is a high degree of embeddedness of palm oil production activities in rural areas that provide livelihoods for several actors in the value chain (Basiron, 2007; Ibitoye, Akinsorotan et al., Role of small-scale enterprises in agricultural 133 2011; Ofosu-Budu & Sarpong, 2013; OseiAmponsah & Visser, 2016; Rist et al., 2010; Sargeant, 2001).

Therefore, there is urgent need to address the 'inefficiencies' of the small-scale enterprises to make them viable to support livelihoods of many poor households. However, just coming up with technological fixes from only a top-down approach to address their challenges may not be effective. This is because the actors in this enterprise have their own 'science' and practices, which need to be understood alongside the introduction of new knowledge and technology (Barrow, 1992).

Most importantly, as actors they are capable of applying their experiences and respond to change (Long, 2001; Osei-Amponsah & Visser, 2016). Processing practices of small-scale palm oil enterprise Small-scale oil palm fruit processing involves bunch quartering (cutting), fruit loosening and storing fruits before digestion. Generally, all the processing stages are done manually except the digestion or pounding of cooked fruits which is done by a diesel engine or electricity powered digester equipment. In few cases oil extraction is also mechanized using a screw press.

In contrast, large-scale processing is highly mechanized, involving steam sterilisation of fruit bunches within 48 h of arrival at the plant, followed by stripping of fruits, digestion and extraction, then clarification and drying of the palm oil. The time and way the fruits are processed after bunch harvest impacts on the quality of the palm oil produced (Hyman, 1990; Owolarafe et al., 2008; Tan et al., 2009).

The quality of crude palm oil (CPO) is indicated by various attributes, and different end markets have different quality requirements. For household consumption, colour, smell and

taste (mainly rancidity in scientific terms) are important, and affect price. Generally, household consumers buy Zoomi type of palm oil, which is less rancid. Rancidity is not a major determinant of price in the West African regional markets such as the Ghanaian, Nigerian and Togolese informal CPO market and that for 'local' soap manufacturing. On the other hand, price on the industrial and international markets is dictated by several quality parameters, but importantly, the free fatty acid (FFA) level. The lower the FFA, the better the quality and, thus, the higher the price. These unwanted free fatty acids are the same components that cause rancidity (Badmus, 1991).

The FFA level is, therefore, an important quality parameter (Kardash & Tur'yan, 2005) in the selling of palm oil, with a maximum acceptable value of 5 percent (industrial and international) and low rancidity (household consumption) markets. The FFA presence in CPO is primarily attributed to lipase activity in the oil palm fruit mesocarp. The lipase is activated through bruising in the course of harvesting, transporting and processing, and this leads to hydrolysis of triacylglycerol producing free fatty acids (Henderson & Osborne, 1991). The longer a bruised fruit stays unsterilized the longer the hydrolysis activity continues and, thus, the higher the FFA level (Ngando et al., 2011; Tagoe et al., 2012). Fresh fruit bunches (FFB) must, therefore, be processed rapidly after harvesting to avoid oil degradation through FFA formation.

The initial sterilisation process at medium-and large-scale mills inactivates the lipase activity in the fruit. But, at the small-scale mills, FFB and spikelets are not sterilized until several days after harvesting when boiling is done. They are kept 134 C. Osei-Amponsah et al., (2018) *Ghana Jnl agric. Sci.* 52, 131-144 on the floor prior to loosening of fruits to enable fruits to detach more easily. Thereafter, the loosened fruits are still kept again for some time up to 21 days before they are cooked (OseiAmponsah et al., 2012). Zu et al., (2012) identified that the processing practice, which mostly affects CPO quality is duration of oil palm fruit storage.

It is necessary for small-scale processors to innovate their processing practices in a way that allows them to meet higher quality criteria of alternative markets. This article applies a bottom-up innovation approach as a way of jointly experimenting with key actors in the small-scale enterprise to generate knowledge they can identify with and use to improve on their practices. The importance of oil palm is manifested in oil yield per hectare and is dependent on the type of planting materials used coupled with sound agronomic practices.

In Ghana, about 583,313 households are involved in oil palm cultivation nation-wide, and generate about 1.62 million Ghana Cedis annually (Ghana Statistical Service, 2008). The total area under oil palm cultivation has increased from 296,800ha in 2001 to 360,000ha in 2010 (MOFA, 2011). The bulk of the area under oil palm production comes from a large number of private small-scale holdings with estimated total holding of 266,100 ha representing 80% of the total area under cultivation. Oil palm is one of the driving forces of rural agri-business and agro-industries. Among the vegetable oil crops, oil palm has the highest oil yield per hectare.

The oil palm industry has the potential to become one of the leading non-traditional foreign exchange earners for the country. For example, a total of about 2,004,300 Mt of Fresh Fruit Bunches were produced in Ghana in 2010 yielding a crude palm oil of about 397,502 Mt (MOFA, 2011). The export values for palm oil ranged from US\$ 7.9m in 2001 to US\$ 46m in 2010 (FAOSTAT, 2011). To boost the yields of small-scale oil palm farmers, a number of technologies such as improved production practices which comprise improved oil palm planting materials, lining & pegging, rodent control measures, use of cover crops, weed management strategies, fertilizer management strategies, pruning and harvesting, have been introduced. These technologies, when adopted could lead to improved livelihood assets such as physical, financial, natural, social and human capital. Farmers can use these acquired livelihood assets to undertake other livelihood strategies such as on-farm activities like cocoa production, citrus production, livestock rearing and non-farm activities such palm oil processing, soap making and trading etc.

Proceeds from these other diversified livelihood strategies can further be used by the farmers to acquire more livelihood assets. However, not all technologies adopted have impacted positively on adopters. Literature indicates that negative influences and environmental impacts are associated with modern technologies such as high yielding varieties and chemical fertilizers use (IFPRI, 2002). There is evidence that adoption of improved production practices can increase yields which in turn can improve upon the acquisition of livelihood assets (IFPRI, 2002; Rahman, 2002). This should have motivated farmers to adopt the improved production practices yet oil palm farmers in the Kwaebibirem district are not adopting the practices as expected. There is the perception that certain constraints faced by the farmers do not allow them to fully adopt such improved technologies. Among the constraints are high cost of inputs and sometimes their unavailability.

Also, the low extension coverage of farmers in Ghana has been a main source of worry and might be the main constraint to adoption (Asuming-Brempong, Sarpong and Asante, 2005). This study therefore attempts to assess the influence of the improved oil palm production practices on the livelihood's assets of oil palm farmers in the Kwaebibirem District.

In agricultural-dependent economies, extension programmes have been the main conduit for disseminating information on farm technologies, support rural adult learning and assist farmers in developing their farm technical and managerial skills. It is expected that extension programmes will help increase farm productivity, farm revenue, reduce poverty and minimize food insecurity. The millennium development goals (MDGs) of reducing hunger and to promote food security are rooted in increasing agricultural productivity, especially from the crop sector. This is because agriculture is considered as the engine of growth in many developing economies, particularly in sub-Saharan Africa (SSA).

The policy direction of growth and poverty reduction strategy (GPRS II) formulated by Ghana was to achieve accelerated and sustainable growth and poverty reduction through agricultural productivity. Although poverty had declined by 7.7% over the years (2005–2013), about 25% of Ghana's population is still poor while under a tenth of the population are living in extreme poverty. This suggests that the role of agriculture has not been sufficient to elevate many people above the poverty line, especially the rural folks who contribute immensely to agricultural production in Ghana.

Ghana's agricultural sector, which employs about 42% of the workforce, is dominated by smallholder farmers (about 90% farming on less than 2 hectares of land) who are using traditional production methods and farm inputs. Asfaw et al. 2006 argue that achieving productivity growth in the agricultural sector can only be successful through the development and dissemination of improved agricultural technologies to these smallholder farmers in the rural areas. Rural farmers farming on small hectares of land can be attributed to conditions such as lack of adequate credit, lack of access to product market, lack of adequate extension contacts, among others.

Among these constraints, inadequate extension services have been identified as one of the main limiting factors to the growth of the agricultural sector and rural community development at large. With recent threats of climate change and the rapid advancement in technology, more farmers require capital investment in agriculture and human capacity

development to at least continue to make their living out of farming. Thus, the role of agricultural extension today goes beyond the transfer of technology and improvement in productivity, but also, it includes improvement in farmers' managerial and technical skills through training, facilitation and coaching, among others. Incognizant of these problems, the government of Ghana through the Ministry of Food and Agriculture (MoFA) over the years has invested so much in building the capacities of smallholder farmers through agricultural extension programmes. Other stakeholders in the agricultural sector such as international and local funding agencies, non-governmental organizations and financial institutions have and continue to make investments in the delivery of extension services to farmer

Agricultural extension programmes have been one of the main conduits of addressing rural poverty and food insecurity. This is because, it has the means to transfer technology, support rural adult learning, assist farmers in problem-solving and getting farmers actively involved in the agricultural knowledge and information system. Extension is defined by FAO as; "systems that should facilitate the access of farmers, their organizations and other market actors to knowledge, information and technologies; facilitate their interaction with partners in research, education, agribusiness, and other relevant institutions; and assist them to develop their own technical, organizational and management skills and practices". By this definition, an extension is deemed as a primary tool for making agriculture, its related activities as well as other economic activities more effective and efficient to meet the needs of the people.

It is, therefore, regarded as a policy tool for promoting the safety and quality of agricultural products. Agricultural extension is aimed primarily at improving the knowledge of farmers for rural development; as such, it has been recognized as a critical component for technology transfer. Thus, agricultural extension is a major component to facilitate development since it plays a starring role in agricultural and rural development efforts.

Bonye et al. argued that extension provides a source of information on new technologies for farming communities which when adopted can improve production, incomes and standards of living. Extension service providers make an innovation known to farm households, act as a catalyst to speed up adoption rate and also control change and attempt to prevent some individuals in the system from discontinuing the diffusion process.

In reaching farmers, extension officers demonstrate a technology to farmers but with much concentration on early adopters since the laggards would learn later from the early adopting farmers.

Through extension services, farmers' problems are identified for further investigation and policy direction. Swanson argued that extension service goes beyond technology transfer to general community development through human and social capital development, improving skills and knowledge for production and processing, facilitating access to markets and trade, organizing farmers and producer groups, and working with farmers towards sustainable natural resource management. Where market failures such as limited access to credit and non-competitive market structures that provide a disincentive to farmers to produce exist, extension services tend to provide solutions.

2.3.1 Extension services are classified into 3 types

Technology transfer – the traditional model of the transfer of advice, knowledge and information in a linear manner;

Advisory – the use by farmers of a cadre of experts as a source of advice in relation to specific problems faced by them;

Facilitation – the aim of this model is to help farmers to define their own problems and develop their own solutions.

Traditional extension systems focus on increasing agricultural productivity, use a top-down approach and often emphasize the transfer of technology. This model for extension, however, is becoming outdated in the more competitive, market-oriented climate of today's agriculture. Alternative models have emerged that recognize other actors than traditional public extension services – including agribusiness companies, NGOs, agro-dealers, producer organizations and farmer to farmer exchanges.

Many countries, especially in Latin America, have privatized and contracted out advisory services. Uganda's National Agricultural Advisory Services (NAADS) have also contracted out extension services to the private sector and NGOs. FARM-Africa's farmer-to-farmer extension model involves extension professionals training farmers in demand-driven

technologies and encouraging them to serve their communities voluntarily as community extension workers.

After years of neglect and disinvestment, there has been renewed emphasis and new approaches to demand-led extension. Within the donor community, a revitalized and expanded role for advisory and information services is seen as central to pro-poor agricultural growth. Apart from their conventional role of providing and transferring knowledge in order to increase productivity, new functions include linking smallholder farmers to high value and export markets, promoting environmental outcomes and coping with public health challenges

Traditional extension does not always provide the most useful information to farmers

Governments or NGOs frequently provide agricultural advice designed to maximize yields, but farmers internalize the need to maximize profits. Evidence from field trials in Kenya, for example, finds that following the official seed and fertilizer recommendations from Ministry of Agriculture would maximize yields, but simply may not be profitable for many of the country's maize farmers (Duflo et al. 2008). Information poorly targeted toward farmer priorities may be one explanation for low take-up of traditional extension.

At the same time, training and information services can be critical in contexts where novel technologies are being promoted

A randomized evaluation of the roll-out of the improved seed variety New Rice for Africa (NERICA) in Sierra Leone observed that only those farmers that received extension services, alongside seed kits, experienced yield increases. Yields actually fell for farmers who received NERICA seeds alone (Glennster and Suri 2017). Similarly, Indian farmers attending field day demonstrations, where participants are encouraged to discuss their experiences and directly observe crop performance, adopted the Swarna Sub-1 flood-tolerant rice variety in significantly greater numbers than communities where access to the improved seeds was left to the status quo (Emerick and Dar 2017).

Information that is more accessible and customized to individual farmer circumstances can be important for behaviour change

Traditional extension models often rely on in-person visits with standard messages meant to be applicable across multiple contexts. However, these types of interventions often happen

on an infrequent basis and occur on schedules that may not align to when farmers have the highest demand for information. Information and communication technologies can be particularly useful in addressing these challenges by offering platforms to customize advisory services to farmer needs at different times of the agricultural cycle. In Gujarat, an interactive voice response (IVR) system, at the time known as Avaaj Otalo, provided timely information on weather and inputs, and offered a hotline for individual farmers to access agronomic advice. This platform improved extension service usage, enhanced input decisions, and increased yields (Cole and Fernando 2016). Text message reminders about input use and a complaint hotline to report service delays have similarly shown (on a preliminary basis) to increase fertilizer usage and lower input delivery problems for contract farmers in Western Kenya (Casaburi forthcoming)

Information can also be made more accessible through tools that simplify recommendations and messaging

Studies in Bangladesh on leaf colour charts and Kenya on measuring spoons for fertilizer application indicate that these simple tools help farmers calibrate their input decisions and lead to higher and more accurate rates of usage (Islam 2014, Duflo et al. in progress).

Understanding and using social networks can improve the spread of information

Many agricultural extension agents rely on the networks of ‘contact’ or ‘lead’ farmers to disseminate information to communities whom agents themselves are unable to reach. However, this diffusion of information through networks is not automatic, and the selection of different contact farmers can result in different learning patterns.

Research in Kenya and Malawi indicates that farmers are more likely to accept the recommendations of producers they consider similar to themselves and may need to see a new practice or technology demonstrated by several people in their network before they are willing to adopt (Tjernström 2017, BenYishay and Mobarak 2014, BenYishay et al. 2015). In Malawi, for example, 70% of people needed to see at least two connections to be persuaded to adopt a novel planting technique that required substantial labour investments but no other additional inputs (Beaman et al. 2015).

Learning from others, however, can be less effective in delivering messages or promoting technologies if social networks are segregated or small (Beaman and Dillon 2016, Emerick

et al. 2017). Nonetheless, more systematic and careful approaches to selecting ‘messengers could increase the effectiveness and inclusion of extension services.

2.3.2 Providing performance-based incentives can improve extension systems

Giving farmers a digital forum to rate the performance of extension services increased the effort of individual providers in Pakistan and led to significant improvement in outcomes – in this case, artificial insemination success rates (Hasanain et al. 2017). Similarly, incentivizing based on adoption of a new technology can improve learning (Jones and Kondylis 2016, BenYishay et al. 2016, Kondylis et al. 2016). In Malawi, incentives based on increases in knowledge and adoption among community members improved the performance of trainers (BenYishay and Mobarak 2015).

Price information alone might not be enough

Farmers in the developing world often operate in isolated markets, where they depend on traders to make decisions about how, where, and when to sell their harvest. A common strategy to address this dynamic involves providing farmers with external price information as a way to increase their bargaining power in these negotiations. Research in India indicates, however, that access to price information alone is unlikely to have significant effects in environments where traders collude or farmers lack sale options due to high transport costs (Fafchamps and Minten 2008, Mitra et al. 2018). However, providing price information to intermediaries and farmers with market access, or supplying price information alongside efforts to better connect farmers to different sale options, can cause prices to converge, with potential benefits to producers (Jensen 2007, Goyal 2010)

- The basic objectives of extension education is to raise the standard of the people living of the rural area by helping them in using their natural resources (Like land; water, livestock) in the right way.
- Rural people are helped in planning and implementation of their family and village plans for increasing agricultural production, improving existing village craft and industries.

- It should also help in providing minimum health, recreational, educational and housing facilities for improving family living condition in village.
- The fundamental objective of extension education is to develop the rural people economically, socially and culturally by means of education
- The specific objective is the development of the people.

2. 3. 3 Objectives

1. To provide the farmers the knowledge and help that will enable him to farm more efficiently and to increase his income.
2. To help in planning and implementing the family and village plans for increasing production in various occupations.
3. To provide facilities for better family living.
4. To encourage the farmer to grow his own food. Eat well and living well.
5. To promote better social, natural, recreational, intellectual and spiritual life among the people.
6. To open up new opportunities for rural people so that they may develop all their talent and leadership.
7. To help the member of the farm family to a larger appreciation of the opportunities the beauty and the privilege of the rural life and to know more about the world in which they live.
8. To build rural citizens who are proud of their occupation, independent in their thinking, constructive in their outlook, capable efficient and self-reliant in character and have a love of home and country in their heart.
9. To develop feeling of patriotism and love for society by developing civil civic sense among rural people
10. To train rural people youth for development works.

Extension officers in agricultural earning communities offer advice and information to help them solve their problems. Extension also aims to increase the efficiency of the family farm, increase production and generally increase the standard of living of the farm family. The

objective of extension is to change farmers' outlook toward their difficulties. However, most farmers in Asuom community express their sentiments on how external service officers do not engage them to assist their farming activities. In regards to that, they are denied of some basic farming information which could support their numerous activities on the farm, intend translate into a great and quality yields of palm fruits.

Most service providers from NGO sectors have initiated the Interactive Voice Response (IVR) bespoke to farmers which provides them with accurate information, education and training needed in farm management, (Solidaridad as an example). Using (IVR) platform, Solidaridad, an international civil society organization, is increasing access to agronomic and other production support information by farmers and communities that produce, oil palm and other food staples.

The platform is compatible with basic feature- and android phones. It allows the target audiences to receive pre-recorded messages in real time. It is an important part of a remote support approach that helps Solidaridad to quickly assess ground situations to generate response plans and interventions. However, the device could be challenging due to the fact that most farmers are located in rural communities with no power or insufficient power supply. Also, the purchase of android phone could pose a greater challenge due to lack of finances. This suggests that other alternatives to reach farmers could be employed.

The end result desired by an oil palm plantation is the production of fresh fruit bunches and a lot of good quality. Required to obtain the proper management ranging from the selection of land for gardens, nurseries, planting, maintenance, and harvesting.

A very important factor affecting the outcome of oil palm plantations is a land selection (climate, soil, topography) planting materials (tissue culture, new varieties), technical management (financial, organizational, labour, transport, pest, disease), harvesting (efficiency in harvesting, mechanization) and environmental (waste disposal, recycling, GHJ sustainable emission production. potential and production of palm oil is largely determined by the degree of land suitability and behaviour of farmers in managing plantations, 75% yield production of oil palm fruits have high levels of compliance with land. There have been many research results which prove that nutrition is crucial production of oil palm fruits, the nutrients needed different numbers from different parts of the plant (roots, stems, leaves, fruit bunches). Such as nitrogen generally has no effect on oil palm

yield components, but giving P lowered fruit production, fertilizer Potassium deficiency tends to reduce the mesocarp: fruit ratio, while Mg considerable increase palm oil.

Land Selection: Beginning oil palm plantations is good begins with the selection of appropriate land or soil, to determine the potential of land that can be developed to obtain the proper management of oil palm fruit productivity and quality good will. Type of soil on land that is planted affect the production of fresh fruit bunches. Approximately 60% of the area of oil palm plantations in Indonesia located on dry land is the limiting sour lowest pH and low availability of weather.

Therefore, the behaviour of fertilization is needed to reach 60% of the cost of maintenance of oil palm plantations. Most of the good land used for oil palm plantations is dominated by soil types and terric typic helosaprists halosaprists have a high nutrient to low pH. Palm trees can grow, develop and produce as expected when the available soil water evenly over time in sufficient quantities. In areas with rainfall 2000-2500 mm / year and no real dry periods or dry months less than one month per year and. It decreased production of fresh fruit bunches (FFB) can reach up to 20-30% if 1-2 years before going drought or long dry period of 5-6 months in a row.

To address the need for water in oil palm plantations, the conservation of soil and water to leach pit mulched. The results show that an increase in the number of leaf midrib, number of bunches, the average weight of bunches, and production of oil palm fresh fruit bunches. The climate of a region being essential to establish a land to be used as palm oil plantations. Average temperature increase of 1°C, and increasing water deficit of 50 mm / year simultaneously cause a decrease in palm oil production by an average of 2.15 tonnes / ha / year. 1°C increase in temperature and a reduction in water deficit of 100 mm / year will increase the oil production of 3.23 tonnes / ha / year.

Planting Materials: Selection of seed planted in oil palm plantations are very influential in the production of oil palm fruit desired besides labour, urea fertilizer, and herbicides do not directly affect fruit production. However, according to the level of workforce education correlated with achievement occurred in oil palm plantations. But research conducted for provide results kongret on the chosen type of plant seeds and plantation workers in education affects the productivity of oil palm fruit.

In addition to a good selection of seeds and proper spacing, the management of oil palm affecting the productivity of oil palm fruit, because the closer spacing of the possibility of becoming infected BSR (basal stem root) will be larger and harder to do eradication. Technical Management: Good fertilization management is the key to obtain high productivity and efficiency in oil palm plantations. Implementation of control measure, the data included: the type of pest and disease identification of the 284 Salmiyati et al. / APCBEE Procedia 8 (2014) 282 – 286 sample plot, the pest and disease distribution within the sample plot from affected areas of the plantation or disease. Indicated plant damaged by the pest and effected part, treatment applied, net fertilizer inputs, soil organic matter content, quantity and quality of irrigation water.

Provides information that an integrated approach to weed control and mice can maximize the benefits of weeding while reducing production losses due to rats. If the ground cover and weeds are not controlled and weeded the various pests will make the habitat under the cover of the weed pests, especially rodents. To eradicate pests should not be done after infection, and prevention of pests better to do than get rid of it, namely by applying imidacloprid on the oil palm trees are still young, this pest prevention method to avoid the attack of pests and species of Coleoptera Curculionidae. Weeding regularly have a certain relationship with fertilization with weed control activities that exist in the disc and chemically assisted on palm trees can improve work efficiency, organizing easier as well as save energy supervision. While, giving the herbicide glyphosate on oil palm plantations are actively kill weeds without a negative effect on the oil palm.

In areas that are difficult to eradicate weeds growing, performing weed classification method using SIFT (scale invariant feature transform) of observations detected the types of weeds that are disturbing. Of the detection results can be known and be prepared to use herbicides with SIFT method accuracy reached 95.7% up on the stage classification. using a less harmful herbicides to control weeds in immature plantations (aged <3 years) are the type of paraquat. The result showed that there was no effect on the plant and does not have adverse effects on vegetative and generative growth of oil palm. This suggests the use of appropriate herbicides a positive effect to improve its growth and productivity of plants. Management: Research showed that the distribution of the amount of fresh fruit bunches yields depends on farm size, age and tree maintenance. The larger the size of plantation the higher quality

of the harvest. The effect of size on the quantity of crop plantation. TBS observed to be significant at 99.0%. In general, well-managed plantation produce more fruits. Statistical analysis of the data showed that the significant effect of fertilizer application (99.0%) on the outcome of the fresh fruit bunches. To manage the harvesting of oil palm fruit bunches that are already ready to be harvested various methods are used, there is a set of colour of the fruit surface photogrammetric methods and, with a digital camera, analyzed by staining methods and laboratory testing, and the method of video image processing.

Environment: The APOIA-Oil Palm indicator and composite indices are constructed as multiattribute-utility scaling checklist, integrated as to systemically encompass the rural establishment, the local environmental compartments, the productive processes and the farm's interface with a local market setting. The results obtained in the sustainability assessment according to particular environment indicators offer a diagnostic tool to farmers /managers, pointing out how agricultural practice may comply with defined environmental standards and socioeconomic benchmark.

Quality of crude palm oil can be assessed both by looking at physical properties (smoking point, colour, viscosity) and chemical characteristics like iodine, free fatty acids, peroxide, dirt, moisture contents and bleachability index (PORAM, 2011). Palm oil is composed of fatty acids esterified with glycerol, and its quality is affected by reactions which cause the breakdown of the esterified fatty acids and formation of free fatty acids. The relevant standards for quality crude palm oil are: free fatty acid ($\leq 5\%$); dirt ($\leq 0.01\%$); moisture ($\leq 0.1\%$); and (>3) for bleachability (PORAM, 2011).

The free fatty acid (FFA) level of palm oil is the most essential indicator of quality for selling palm oil in especially export and domestic industrial markets (Kardash and Tur'yan, 2005). A high level of FFA implies the palm oil is very rancid and of poor quality. On the other hand, palm oil of low FFA value ($\leq 5\%$) is classified as high quality and also attracts a higher price. Quality assessment of palm oil for household consumption is basically organoleptic, in that buyer's taste, smell and assess colour of palm oil to determine its quality.

Palm oil of good taste, smell and deep red colour is generally perceived as the best for household consumption. For the purposes of this research, I use FFA levels as an indicator for palm oil quality. The quality of palm oil is then categorized based on its FFA level as high quality (1-5%), good quality (5-10%) and poor quality (above 10%). The vast majority

of artisanal processors produce poor quality oil and this type of palm oil is not acceptable to local industrial and exports markets because it affects the efficiency and cost of refining processes (Gibson et al., 2007). Such palm oil also gives a rancid taste which does not meet the preference of households for cooking purposes.

The only market option for this type of quality is the local soap manufacturers and informal markets in Nigeria and Togo, which buys any quality of the palm oil but at a lower price. If palm oil is to enhance rural development, then exploring alternative markets by artisanal processors for higher prices is important. Potential access to remunerative markets thus necessitates the assessment of palm oil quality level and the need for improvement in the artisanal processing enterprise.

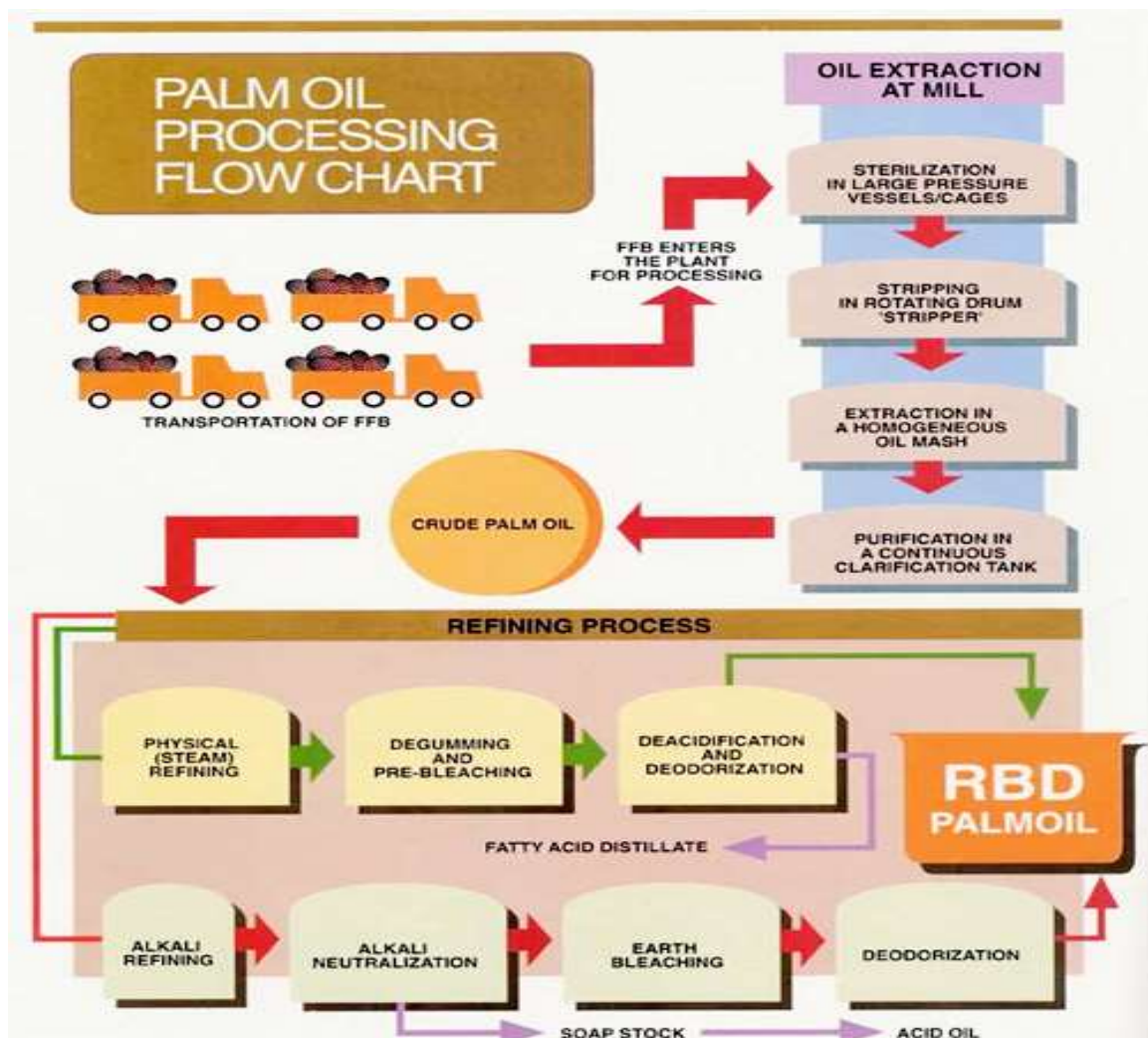


Figure 1: Palm Oil Processing Chart Flow

Palm oil fruit can be harvested all the year round. After cutting from palm trees, fresh palm fruit bunch must be processed within 2 days. Or the acid value will be high and affect the final palm oil quality. Modern palm oil processing...m. palmoilextractionmachine.com

- **Bunch Sterilization:** FFB (fresh fruit bunch) have to be sent to sterilize to avoid AV (acid value) rise by sterilize the fatty enzyme with high temperature. At the meantime, sterilizing section can also soften the fruits, which benefits the threshing section and reduces the damage to kernel.
- **Bunch Threshing:** The purpose of threshing is to separate the palm fruit from the FFB by rotary drum thresher.
- **Fruit Digestion:** The purpose of digestion is to separate the pulp and kernel, soften the pulp with heat and to destroy the pulp cell structure.
- **Pulp Pressing:** After sterilizing, threshing and crashing, palm pulp become soft and the cell structure is broken. In another word, we can easily get the oil with spiral oil press, which is also called CPO (crude palm oil).

However, the understudying community although experiencing the above challenges, in their capacity to improve their produce can modify their method of production/processing. A visit to the community identified that, processor use the conventional way of processing the palm fruits amidst its storage period and acidity. The practice of long storage and the derivation of fatty acid is borne out of their conformist method of processing using what we call” Kramer”. The Kramer as a means of steaming palm fruits has small quantity limit, hence, fruits storage rendering fruits acidic, contaminated, deteriorated and fatty which causes OER.

In spite of all these I engaged an agriculture engineer on how we can lessen the burden of these small-scale farmers. An agricultural engineer lecturer at the university of Ghana. PhD. Emmanuel Essien, together with I broached over the topic and came up with an idea of an IMPROVED COOKED STOVE. Being an agricultural engineer, he explicitly outlined the impacts of the cooked stove. He said” farmers/processor, will be able to work in a clean environment devoid of sickness caused by pollutants- he expressed that, the combust chamber with bricks, will lose less heat to the environment since it uses less firewood.

This will translate to a slower rate of deforestation, also profit, for using less firewood, their CO₂ (Carbon dioxide) emissions are reduced, he said”. When asked of its sustainability, this is what he has to say,” after the pilot of the cooked stove, artisans will train farmers and empower them to build it on their own as well maintain the facility- the capacity of the improved stove will hold 3tonnes of loose fruits, which translate into cooking large fruits at the same time without forcing the fruits down to rot which increases the FFA content that drives down the price they could have gotten from the local market. The stove will cook between 2 1/2 to 3hrs depending on the type of fuel. In contrast the Kramer cooks 3hrs-4hrs, of 2tonees of fruits.

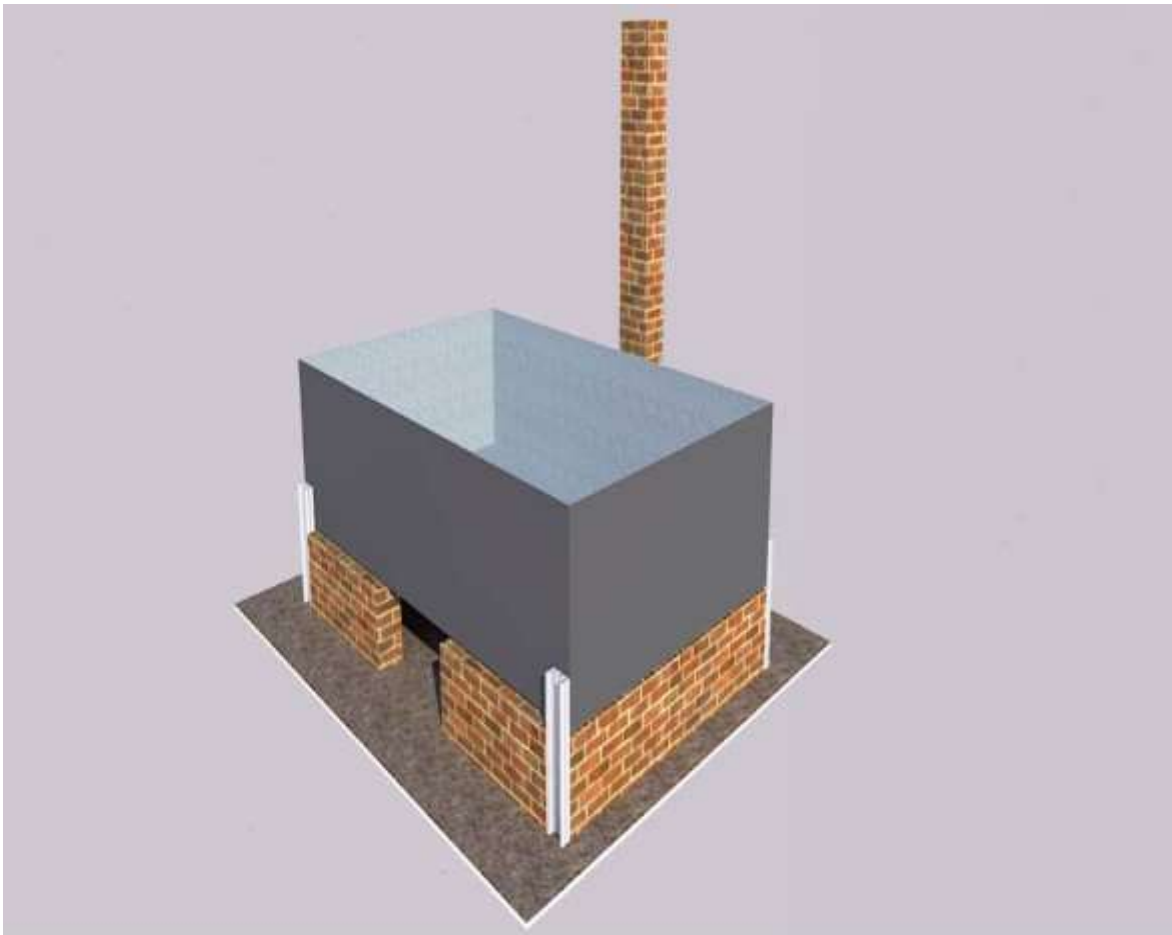


Figure 2: Improved Cook Stove

CHAPTER THREE

RESEARCH METODOLOGY

3.0 INTRODUCTION

This chapter lays emphasis on how the research will be conducted, the population size and sample size of our respondents, the data collection instrument (questionnaire) and the research administration processes. All these listed elements will facilitate our achieving the goal of the study.

3.1 RESEARCH DESIGN

The researcher will embark on a primary data collection in Asuom. Pre-testing the tool to be assured it is devoid of errors, after which the actual data collection will follow. The adaptation of qualitative method of data collection will be employed in this empirical research. The researcher is expected to engage about five (5) respondents in Asuom community through interviews. The theories underpinning this research is Participatory, Functionalism and Diffusion of Innovation. The purpose is to bring social change and development through sustained improvement in the palm oil processing sector among the small-scale farmers.

The understudy problem will be descriptively interpreted to produce a result. Qualitative research requires the that researcher spends numerous hours indirect personal contact with those being studied. After which transcripts of conversation or study videotapes of behaviour in extraordinary detail, analyzing non-verbal as well as verbal communications among those understudies.

This is to understand concepts, opinions and experiences. The research will take a form of interview will aim at gaining a deep understanding of “quality of oil palm production among small-scale farmers in the Asuom community”, rather than the surface description of the sample of the population

Kwaebibirem district in the Eastern region recorded a total of, 113, 721 populaces in the district with a segregation of 70,539 Males and 72, 979 Females. The figure was the last recorded so far. Asuom community has a total population 100, 000 last recorded in 2010.

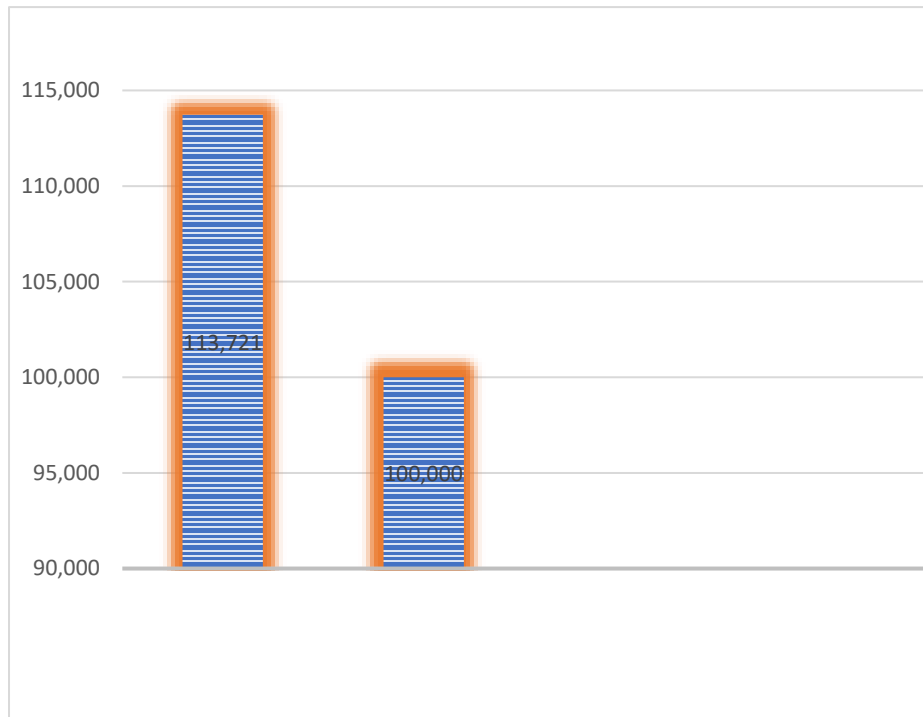


Figure 3: Population according to 2010 censusu Kwaebibirem District and Asuom Community as of 2010

Graphical representation of population of Kwaebibirem district which stands at 113,721, and Asuom which stands at 100,000 as at 2010

Among the population of 100, 000 in the Asuom community, only five (5) respondents will be purposively sampled qualitatively to represent the entire population. This exercise will be carried out on ONLY individual small-scale oil palm farmers. The outcome of the interview will bespeak the fact that majority of the farmers one way or the other have played victims with these methods of farming and oil processing which has contribute to it low effect in quality.

3.2 SAMPLING

The sample method being implemented is non-probability sampling- the use of purposive sampling will be relevant in this case since the research is targeted at small-scale oil palm producers. The essential requirement of key personalities relevant in the study will be requested. The use of unstructured and non-numerical instrument will be used in the interview process alongside inter-personal communication with farmers. The results obtained from respondents will be transcribed to analyze data.

3.3 DATA COLLECTION INSTRUMENT

The research will be conducted based on the objectives of the study. The data collection tool to be used for this exercise is questionnaire interview which will be loaded on a telephone device. The research will have a one-on-one interview between the interviewer and interviewee, which response will be recorded and transcribed for the research analysis.

3.4 ADMINISTRATION PROCESS

The questionnaire will be administered by the interviewer to the interviewee, for the respondent to provide their answer response. The administrator of the questionnaire will prep the respondents what the research is about and what it seeks to achieve. The interviewer will carry out the interview, analyse it afterwards, and provide recommendation to the outcome.

Table 1: Qualitative Interviews

RESEARCH QUESTIONNAIRE	
	Date of interview Time of Interview
No	DEMOGRAPHY OF RESPONDENT
1	What is your name
2	How old are you?
3	Marital status
4	Do you reside in this community?
5	How long have you stayed here?
KNOWLEDGE ON MODERN OIL PALM PRODUCTION METHODS	
6	Are you a farmer/ do you cultivate oil palm/ are you a processor?
7	Is oil palm cultivation/ processing your main source of income?
8	How many oil palm plantations do you have?
9	Do you process the fresh fruit bunches (FFB) oil from your palm farm?
10	What quantity of FFB do you cultivate in the last season?
11	What quantity of processed oil did you process in the last season (quantity in Kufuor gallons)
OILPALM PRODUCTION PROCESSES AND PERCEIVED QUALITY	
12	What is your method/procedure of processing oil palm?
13	What varieties of oil palm do you have on the plot?
14	How many days do you store palm fruits before processing
15	What process do you adapt in processing oil palm? Using the Kramer or going to the milling station
14	Who is your main buyer/
15	Do you ensure farm management practice?
16	What activities do you employ in ensuring farm maintenance?
COMMUNICATION CHANEL AND EXTENSIO OFFICERS	
17	How often do Agric extension officers visit your farm?
18	What training do Agric extension officers offer you?
19	What does your farm need to improve its yields and quality oil processing?
20	How do you advertise your product? Do you consider this/these effective? What can be done to improve communication within the oil palm value chain?

CHAPTER FOUR

FINDINGS AND DISCUSSION

4.0 INTRODUCTION

This topic talks about analysis of data collected on the field, presentation of results received on the field and discussion of outcome from respondents. The researcher successfully interviewed five (5) respondents in Asuom community. Among these were one (1) female and four (4) males representing oil palm farmers in the said community. These farmers are either farmer-processor or farmer. Interviewees were between the ages of 38-52 respectively

4.1 DATA ANALYSIS

Respondent 1: A 52-year-old Kwadwo Ohemeng, a farmer who cultivate oil palm in Asuom community is married with three kids, two females and a male. His main source of income is oil palm farming; his secondary income comes from petty trading. He cultivates on a 53-acre land. Tenera (Agric) is the variety of palm planted in his farm. During the last season (major) of his cultivation, Mr. Ohemeng's palm fruits weighed 50-51 tons and 30 tons during the minor season respectively. According to the farmer he is a member of a farmer group called Serendipalm, this group educate and train them on Best Management Practices (BMP) required to sustain their farm and increase their yield.

Even though, farmers are taken through farm training, they are not obliged to fertilize or use any agro chemical on the farm with the intention of cultivating

organic fruits. He admitted that, should Serendipalm permit him to fertilize and use other agro chemicals he could cultivate not less than 56 tons of palm fruits.

Outside of this, farmers aligned with Serendipalm only weed and prune their farm, palm branches and maintain palm circles occasionally.

Following this, when asked "how many days does palm fruits stay before processing"? he expressed that, "palm fruits could stay up to three days at the factory before processing". This bespeak that palm fruits sometimes become acidic and/or fatty before processing.

Also, another major thing he admitted was the use of Kramer in boiling the palm fruits before processing.

When the question of extension officers sets in, he emphasized that, “extension officers routinely come to train and educate them on farm practices, however, he had been under their training once this year”. Additionally, the extension officers assist farmers with labourers to help manage the farm by weeding and pruning.

“Undoubtedly, fertilizer and agro chemical application could help improve yield as well as oil quality should it be considered in the oil palm space by Serendipalm”. He stressed.

Respondent 2: Conversely, a 64-year oil palm farmer, Christiana Opoku, whose common name is Yesu Maame, is married with two kids, both females. She is a native of Asuom. She cultivates tenera (Agric) palm, on a 17-acre farm, she said” farming is the only source of income to her and family”. Likewise, Mr Ohemeng, Christiana also sells her palm bunches to Serendipalm, a farmer group in Asuom. During the major season, she harvested 4tons, which added up to her 5,000gh and 16 bunches in the minor season which is equivalent to 1ton. Christiana, admitted not applying fertilizer or any agro inputs on the basis of cultivating organic palm fruits, a directive by Serendipalm; this instruction is to enable farmers harvest chemical free fruits for oil processing. On-the-other hand, she maintains her farm by only weeding and pruning periodically. She confirms the use of Kramer by oil palm processors.

Furtherance to that, Christiana, expressed, she has had an engagement with extension officers 7 times this year. During their encounter, they were educated and trained on the need to refined their practices on the farm, to protect the ecosystem, plant economical trees to provides shades on the farm, abolish burning of weeds and rubbers which causes climate change and soil deterioration, more so, eliminate bad practices which causes heavy risk to the environment, planting of palm trees 28ft across to enhance spacing.

She continued by stating that, “continuous weeding and pruning will help improve yield.” She pleaded that, roads leading to farms if could be in good shape to transport their fruits to the milling site on time, deterioration of palm fruits on the farm could decline. Since it causes loss to most farmers.

In the situation of communication within the oil palm value chain, Christiana suggested continuous calls and meeting with the extension officers particularly on their farms will immensely help farmers to know where they fall short in farm management and operation.

Respondent 3: Whereas, a 42-year Daniel Nyanor, popularly referred as Oluman, married with two boys and a native of Asuom shares that, he cultivates Tenera (Agric) palm on a 3-acre farm. Farming is his major source of income. According to him, he harvests his bunches and sells them to Serendipalm who are their main buyers. In the major season he harvested 52 bunches and 24 bunches in the minor season, he couldn't get the price sold to him.

When asked about the Best Management Practices (BMP) on the farm, he stated emphatically that, their main purchaser, Serendipalm had trained them and advised them on the effect of applying chemical fertilizer. Due to this organic farming they (farmers) do not apply any agro input. However, they weed, prune and maintain palm circles periodically. He also admitted the use of Kramer in steaming palm fruits. He religiously stated that, sometimes, palm fruits are stored for some days before steaming and processing into oil palm due to bumper harvest

Our conversation took us through some training's extension officers render to oil palm farmers in Asuom community and its surrounding communities. Apparently, two extension officers are stationed in the community who often visits farmers both home and, on the farm, to solve farm related issues. Furthermore to that, some extension officers communicate to these farmers via phone calls. These officers according to the interviewee train them on approaches to maintain and protect their farms. Farmers are cautioned not to burn weeds in the farm, avoid using any chemical spray on the farm, avoid cutting down trees, avoid littering and lighting fire on the farm among others.

Since, they are organic farmers and are prohibited from using any chemicals, he suggested the continuous use of empty fruit bunches (Bonkete) which is organic based as fertilizer for the farm. More so, he touched on the issue of bad roads leading to the farms; and expressed that, drivers evade them during the rainy season and thus affect their income, because fruits stay on the farm to rot.

Nyanor, stated that, for communication to be effective within the oil palm value chain, he recommends the use of information Centre where extension officers will have enough time to reach the masses and further educate them on farm management. He concluded.

Respondent 4: Similarly, James Dapaah, who is commonly referred to as Ayumvi is a 47-year farmer married with six children, three females and three males. He is a native of Asuom. He cultivates both Local Dura and Tenera (Agric) on a 3-acre farm. His major source of income is farming, though, on daily basis he sells medicine in and around the community. During the major season he harvested 56 bunches and 35 bunches in the minor season respectively.

He is a registered farmer with Serendipalm, therefore, practices organic farming. He neither fertilizes nor uses any agro chemical. Although, he weeds and prune intermittently. He acknowledged the use of Kramer in steaming oil palm before processing and added that, palm fruits could stay over four nights before processing.

According to James, he has encountered extension officers 3 times this year and has learnt a lot. He further stated that, officers trained them on farm management skills and advised them to avoid spraying of any kind on the farm, avoid engaging children below 18 years

He also recommended the continuous use of empty fruit bunches (Bonkete) as a source of organic fertilizer. The issue of bad roads in the community has been the talk of farmers, since it's contributing factor livelihood.

To improve communication within the oil palm space, he endorsed the need for more extension visits in the community to facilitate their day-to-day farming activities. He ended by saying, this will encourage farmers to be more circumspect with the BMP which will have a positive effect in yields.

Respondent 5: The interviews concluded with Samuel Takyi Kofi a 38-year farmer married with three children, 2 females and a male. He is a native of Asuom, and cultivates both Local Dura and Tenera (Agric) on a 6-acre farm. He sources palm nursery from Oil Palm Station (OPRI), his source of income is mainly farming. During the last major season, he harvested 600 bunches and 320 bunches in the minor season on his 14-acre farm.

He clearly stated that, Serendipalm is his main buyer, and due to that he has adapted to their farm practices, which is organic farming, he neither apply any fertilizer nor agro inputs. Although, he weeds, prunes and maintains farm circles infrequently. When asked why Serendipalm does not allow the application of agro chemicals, he stated, thus,” these chemicals kill worms and other insects that contribute to the oil nutrients and strength, also, using these chemicals will cause harm to the human system should we patronize the final product.” He vividly stated that, during major seasons their buyer, Serendipalm could stock palm fruit for four days before final steaming and processing. He further admitted the use of local steamer (Kramer).

The visit of extension officers has had a great impact on their business. He applauded the officers for meeting them 6 times this year. Advice given them by officers include; avoid burning of weeds and rubber in the farm, not engaging children below the age of 18, not engaging pregnant women in farm activities, no application of chemicals in the farm, planting of economic trees should be encouraged to provide shade on the farm, financial literacy, book keeping records, and other farm management practices. Also, he proposed consistent use of empty fruit bunches (Bonkete) as organic for the farm, in addition, for communication to be effective within the oil palm value chain, he is of the view that, information will reach a wider audience with the use of community information Centre, and constant phone calls from extension officers to guide them in the oil palm business.

Table 2: Presentation of Results

ACTIVITIES	NO. OF RESPONDENTS	PERCENTAGE (%)
Respondents who do not apply chemical fertilizer	5	100
Respondents who admitted palm fruits are processed/steamed with Kramer	5	100
Respondents who ensures Best Management Practices	5	100
Respondents who frequently engage the services of extension officers	4	80

4.2 DISCUSSION

The discussion is segmented in relation to the objectives under study

ASCERTAINING THE KNOWLEDGE OF THE FARMERS ON MODERN OIL PALM PRODUCTION METHODS

The illustration above depict figures in percentage form to their corresponding activities on the farm. It is unequivocally stated that among the respondents interviewed, 5 of them which constitute a 100% do not apply any agro chemical on their farm. This act is borne out of their organic practices on the farm. All 5 farmers interviewed revealed that farm management practices keep their farm fertile and strong. Periodically, they weed, prune and maintain farm circles among other farm management activities such as; picking all rubbers on the farm, not burning weeds, being climate friendly among others. This exercise if done routinely gives enough sunlight and ventilation in the farm, it impacts on the yields become enormous and strengthen the palm trees.

INVESTIGATING THE OIL PALM PRODUCTION PROCESS AND THEIR EFFECT ON PERCEIVED QUALITY

The second activity evidently depicts that all 5 respondents, farmer-processor or farmers admitted steaming their FFB in the “Kramer”. The practice of long storage and the derivation of fatty acid is borne out of their conformist method of processing using what we call” Kramer”. The Kramer as a means of steaming palm fruits has small quantity limit, hence, fruits storage rendering fruits acidic, contaminated, deteriorated and fatty which causes OER. The major factors determining the fatty acid content was age of fruits used to process the oil and the length of storage of the oil after processing. The results show that good grade oils with low fatty acid (FFA) contain microbes, some of which have the potential of producing toxin. There was a direct relationship between storage period of oil and fatty acid content, and microbial loads in oils. As storage period increased, fatty acid and microbial load increased ($r = 0.972$ and 0.967). Lipolytic organisms identified are *Aspergillus* (0.27), *Bacillus* (0.08), *Candida* (1.34), *Geotrichum* (1.00) and *Pseudomonas* (2.11) species. while contamination and deterioration of the fruits increased with age. The longer the fruits were stored, the higher the contamination and deterioration and the higher the free fatty acid content of the oil (Table 2) the longer the storage period the higher the fungal population.

The above school of thoughts are pointing to the fact that, the free fatty acid (FFA), contamination and deterioration of fresh fruits, storage period are a contributing factors of oil extraction low (OEL).



Figure 4: This picture depicts a section of women in Asuom Community using the Kramer in steaming palm fruits while a chunk of fruits is stored outside for days, to be processed

EXAMINING THE COMMUNICATION CHANNEL BETWEEN OIL PALM FARMERS AND EXTENSION OFFICERS

Among the 5 respondents only 4 of them frequently engage the services of extension officers. Kwadwo Ohemeng, the first respondent stated that, he rarely engages the services of extension officers. However, farmers who are trained by these officers wish they could have more of them, since their existence in the community has yielded a greater importance in their farming activities.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION AND RECOMMENDATION

I acknowledge all respondents for availing themselves for the interview even in their busy schedule. All interviewees were interrogated based on the qualitative questionnaire, which derived the appropriate information based on the objectives of the study.

Resulting from the interviews some respondents are of the view that, should their buyer, Serendipalm propose the use of agro inputs for the farm, their yields will increase compared to the organic method of farming. Contrary to that, others also confirmed that, the organic process has had a great impact on their yields. Although, they do not apply any chemical, the use of empty fruit bunches (Bonkete) will be of good help on the farm. They recommended the consistent use of this organic product to fertilize their farm lands.

More so, the use of community information centres was suggested for extension officers to educate and train oil palm farmers. This according to farmers will reach a wider range of the community folks who may need adequate farm training.

However, to avoid storage of palm fruits for days before processing which affect the quality of oil palm produced due to fatty acid and rotten fruits, which arises from the sue of Kramer as a result of its smaller capacity, I suggest the processors find a more convenient method of at least steaming a larger quantity of palm fruits to prevent over storage. It is essential to improve production content by using an improved cooked stove. The capacity of the improved stove will hold 3tonnes of loose fruits, which translate into cooking large fruits at the same time without forcing the fruits down to rot which increases the FFA content that drives down the price they could have gotten from the local market. The stove will cook between 2 1/2 to 3hrs depending on the type of fuel. In contrast the Kramer cooks 3hrs-4hrs, of 2tonees of fruits.

REFERENCES

- Agricultural for impact -Agric for extension growing opportunities for Africa's development, year 2020
- Crossman Ashley, University Functionalist theory, January 24, 2020
en.Wikipedia.org>Wiki> Participatory development
- F. Morcillo, D. Cros, N. Billote, G.F. Ngando- Ebongue, H. Domonhede, M. Pizot, T. Cuellar, S. Especout, R. Dhouib, F. Bourgis, S, Clavenol , T.J Tranbarger, B. Nouy& V.Aronde, Article number 2160 (2013), Improving palm oil quality through identification and mapping of the lipase gene causing oil deterioration
- Gideon Danso Abeam, Dennis Sedem Ehiakpor & Robert Aidoo, Article number 74 (2018), Agriculture and Food Security 7.
- Jeremy Magruder. Associate professor of Agricultural and Resource Economics, UC Berkeley, Craig McIntosh professor Economics, School of Global Policy and Strategy, University of California San Diego, Tavneet Suri, Associate professor, MIT Sloan School of Management 11. 01. 19
- Osei Amponsah Charity, PhD thesis Wageningen University, Wageningen NL (2013) ISBN: 978-94-6173-758-8
- Richard Caldwell senior programme officer Bill & Melinda Gates foundation, Rachel Lambert senior Livelihoods Adviser, Agricultural Research, DFID
- Salmiyati, Arien heryansya, Idayu, Eku Supriyanto, Publication: APCBEE procedia, Publisher: Elsevier, 2014
- Tagoe, S. M. A, Dickinson, M.J. and Apetorgbor, M.M., Division of plant sciences, school of Biosciences, university of Nottingham, Sutton-Bonington Campus, Loughborough, Leicestershire, LE 125RD, Forestry Research Institute Ghana, P.O.Box 63 KNUST, Kumasi, Ghana, West Africa, Factors influencing quality of oil palm produced at the cottage industry level in Ghana Sphweb.bumc.bu.edu>otlt> Behavioral Change Theories 4