

ADOPTION OF IMPROVED OIL PALM PROCESSING TECHNOLOGIES AMONG WOMEN PROCESSORS IN ETHIOPE WEST LOCAL GOVERNMENT AREA OF DELTA STATE.

Onyemaechi Ugboh, Ph.D and Obinyan Noel Uadiale
Department of Agriculture, University of Delta, Agbor, Delta State, Nigeria

Email: onyemaechi.Ugboh@Unidel.Edu.Ng

ABSTRACT

The study examined the adoption of improved oil palm processing technologies among women processors in Ethiope West Local Government Area of Delta State. Specifically, the study determined: the socio-economic characteristics of oil palm processors, the level of awareness of improved processing technologies among palm oil processors, the level of adoption of improved processing technologies by palm oil processors and the constraints to adoption of improved oil palm processing technologies. A total of 120 respondents were randomly selected from eight extension cells. Data were obtained by use of structure interview schedule and were analyzed and presented by the use of mean, standard deviation and percentage. The major findings of this study were that the mean age of respondents was 45years, the mean processing experience of respondents was found to be 13years, the mean farm size was found to be 2ha, majority of the respondents were educated, there Was a general low awareness of technologies among the oil palm processors and there was a general low level of adoption of technologies among the oil palm processors. It is recommended that Delta State Agricultural Development Programme (DTADP) should create more awareness in these technologies that processors indicated low awareness and credit facilities with low interest should be extended to processors to enable them meet financial requirement in adopting improved oil palm processing technologies.

INTRODUCTION

Background Information

Oil palm processing plays a traditional role in employment of labour in the agricultural sector in Nigeria. With a population growth rate of 2.5%, domestic and industrial consumption of oil palm will continue to be on the increase in Nigeria (Omoti, 2003).

In Nigeria, 80% of palm oil comes from dispersed small holders who harvest semi-wild plants and use manual processing techniques. The processors in the study area process oil palm to get palm oil, kernel and fibre. The method of getting these products is very tedious and laborious. This requires substantial proportion of labour force. The success or failure of processing depends largely on how labour and other associated resources are efficiently used. An efficient processing technologies increase the quality and quantity of oil palm available for consumption and trade (Ukpabi, 2004).

Agboola (1993) stated that improved technologies that meet both growth and sustainability goals can be efficiently used by oil palm processors. Jalani, Ariffion. and Chann (2000) stressed that oil palm processors in rural areas should embrace well integrated capital intensive, high volume and high extraction rate in their processing method in order to encourage high transformation of oil palm industry in the rural areas.

Ulluwishewa (1993) noted that the goal of sustainable development is lasting improvement in quality of life and not just short-term improvement that disappear rapidly at the end of the projects cycle. Similarly, a sustainable technology is one that staywith the recipients (in this case the processors) and remain relevant long after the change agent has left the scence.

Johnson and Kellog (1989) as sighted by Agbamu (2007) stated that one way of accelerating national development in nation with large agricultural sector is the development and adoption of new agricultural technologies that can be adopted by small-scale farmers. On this note, progress in agricultural development depends to a great extent on the willingness and ability of farmers to

adopt new technologies being developed in research stations. Presently, the use of traditional methods by palm oil processors is pre-dominant in most part of Nigeria. The traditional method mainly involves pounding cooked fruits in large wooden or concrete mortars with a wooden pestle, foot trampling the cooked but cold fruits in canoes or specially constructed wooden troughs. This kind of processing methods is usually associated with low quality oil and small quantity of oil per production effort which usually results in decreased market value and less income.

Statement of the problem

Abolu and Yayock (1982) stated that oil palm processors are Known to be reluctant in adopting improved oil palm processing technologies. They prefer to use their traditional methods instead of the modern methods.

Literature show that past studies on adoption of oil palm processing technologies focused on the influence of socio-economic characteristics of farmers on adoption. The level of adoption of palm oil processing technologies has been scarcely studied. It is in view of this situation that this study was designed to answer the following research questions:-

- (1) Are palm oil processors aware of improved processing technologies?
- (2) What is the level of adoption of improved processing technologies by palm oil processors?
- (3) What are the constraints to adoption of improved palm oil processing technologies?

Answers to the above questions will constitute the focus of this study.

Objectives of the study.

The general objective of this study is to determine the level of adoption of improved oil palm processing technologies in Ethiope West Local Government Area of Delta State, Nigeria. The specific objectives are to;

- (i) identify the social and economic characteristics of oil palm processors.
- (ii) determine the level of awareness of improved processing technologies among palm oil processors.
- (ii) determine the level of adoption of improved processing technologies by palm oil processors.
- (iv) determine the constraints to adoption of oil palm processing technologies.

Significance of the study.

The study will be of great benefit to the policy makers, researchers, extension officers and farmers. To the policy makers, the study will provide the much needed insight into the level of adoption of improved oil palm processing technologies by processors.

To the researchers, the study will provide information on the influence of personal characteristics on adoption of technologies. To the extension officers, the study will help to identify the socio-economic characteristics affecting the adoption of improved oil palm processing technologies in Ethiope West Local Government Area.

The result of the study will also be helpful to anyone who is interested in oil palm processing to know what techniques to use in order to increase yield of oil palm products. Finally, it is hoped that the study will serve as useful resource material to subsequent researchers on related topic.

LITERATURE REVIEW

Botany Of Oil Palm

The oil palm belongs to the palmate family. It is a monocot that sometimes grows to a height of about 15 meters. It has an unbranched habit and produces a single trunk which bears a crown of fronds. The crown consists of between 25 and 40 large pinnate fronds. It is a monoecious plant with male and female inflorescences (flowers) being borne at the axils of the fronds. These are produced in alternating cycles. The female inflorescence or spadix gives rise to the palm bunch bearing the palm fruits. The female inflorescences are produced in the axils of lowers leaves while the male inflorescence are produced in the axils of the younger upper leaves (Okomah, 2009). The individual

fruit of oil palm is oval-shape drupe. They are red-yellow or black depending on the variety. An oil palm produces up to twelve bunches of fruits per year. The fruit has a thin exocarp surrounding the mesocarp. The endocarp (Shell) surrounds the seed (Kernel).

There are three types of fruits based on their colours.

1. **Nigrescens**:- These are ordinary fruits which are black when unripe. The fruits are red when ripe, with part of the top half black in colour.
2. **Virescens**:- These fruits are green when unripe due to a marked absence of anthocyanic pigment. They are light reddish-orange when ripe with greenish tip.
3. **Albescens**:- These fruits are white when unripe due to a marked absence of carotenoids. They are pale yellow when ripe.

Origin and Variety of oil Palm. The oil palm is a perennial crop that originated in the tropical rain forest of West Africa. It spread to South America in 16th century and to Asia in the 19th century. During the 1970s, Asia overtook Africa as the principal oil palm producing region in the world. In recent decades, the domestic consumption of oil palm in West Africa has increased more rapidly than its production. Oil palm production in Nigeria has virtually been stagnated but today, world oil palm production amounts to 14.4 million tons, with Nigeria which is one of the largest producers in West Africa, accounting for only 7% (Ogunjobi, 2008).

Kei, My wish and Duncan (1997) compare the characteristics of the oil palm sectors in Malaysia and Nigeria and found out the Malaysia's success is built on plantation management together with processing in large modern mills. Varieties of Oil Palm

There are three varieties of oil palm. These varieties are based on shell thickness. They are;

- i. **Dura**:- These are fruits which have thick shell. They are the most common form in the groves.
- ii. **Pisifera**:- There are fruits which have little or no shell at all and the kernel is surrounded by a fibre ring.
- iii. **Tenera**:- These are fruits which have thin shell surrounded by a fibre ring. This is a hybrid obtained by crossing Dura with pisifera,

Agronomic Requirements of Oil Palm

For oil palm production to be successful, the following agronomic requirements are needed. They are;

Land preparation:- The land is cleared and hoe is used to make heaps or ridges. Flat land can be used for growing oil palm. Land can also be prepared mechanically by ploughing, harrowing and ridging.

Climatic and soil requirements:- Oil palm requires a temperature of 18°C - 27°C, rainfall of 150cm - 200cm per annum, a deep loamy soil rich in organic matter, and a slightly acidic soil pH 4.5-6.

Method of propagation:- By seeds.

Planting Dates:-

- i. **Pre-nursery**:- August - October.
- ii. **Nursery**:- 9 months later
- iii. **Field establishment**:- March – May (a year after).

Seed rate:- Seed rate is the number of seeds per hole. The number of seeds required per hole is one seedling and per hectare is 120-150 seeds/ha.

Germination of seed:- seeds are soaked in water for seven days, the water being changed daily. After seven days, the seeds are placed in the shade for 24 hours to dry before being bagged (500 per bag) in polythene bags. The seeds are sent to the germinator which has a temperature of 39°C (102 °F) for 80 days. Soaking of the seeds begins again and continues for seven days, the water

being changed daily. The seeds are then dried under shade for two hours before being sent to the cooling house. After about two weeks, germination begins. (Iwena, 2007). Pre-nursery Operations:- The seeds boxes or tray are filled with top soil. rich in humus. Thereafter the seeds are sown at a spacing of 7.0cm by 7.0cm. Shades are then provided for seeds. The seeds are watered in the morning and evening. Mulching is also done. Pre-nursery last for four to five months before they are transferred to the nursery. (wena, 2007).

Nursery Operations:- It requires a level, well drained loamy soil. The soil is ploughed and harrowed or polythene bag are used. Planting in the nursery is done early April during which the seedlings are removed with a ball-of-earth. The spacing in the nursery is 60cm by 60cm. watering weeding and mulching are done in the nursery.

Transplanting:- Transplanting is done after one year of seedling in the nursery (April-May). It is done with a ball-of-earth on the roots. It requires a spacing of 9m by 9m in triangular form in a hole of 4.5cm deep on the field. The roots are trimmed to encourage the development of new ones.

Cultural Practices:- It include:

- (i) Weeding: This should be done regularly, using cutlass or herbicides, e.g gramoxene.
 - (ii) Fertilizer application:- N.P.K. 15:15 fertilizer is applied at the rate of 800kg/ha
 - (iii) Cover crops:- Cover crops should be planted to prevent erosion, evaporation and to add nutrients to the soil.
 - (iv) Pruning:- Pruning should be done regularly.
- Maturity Period:- This is between three to seven years after transplanting into the field.
- Harvesting:- Mature bunches are harvested when the fruits are red or dark-red in colour. The bunch is harvested with a cutlass or harvesting knife.

Palm Oil Processing

Processing fresh fruits bunches (FFB) into palm oil remains of the most difficult activities in palm oil processing in Nigeria.

Among small-scale producers, palm oil is principally processed by traditional or semi or fully mechanized method. Omoti (2003) asserted that outside the traditional methods, the total oil making capacity in the country as at 1997 was 290tons FFB per hour.

Research efforts to improve on the milling processes through introduction of simple and affordable scale mills have resulted in the design and fabrication at NIFOR, in collaboration with FAO/UNDP, of the semi-mechanized integrated NIFOR small scale processing equipment (Hadcock, 1983, 1984). Further work in the 1990s has led to the improvements of the equipment and production of its various models leading to higher extraction efficiency and less labour input as Well as recovery of palm kernel (Airedo, 1996).

Omoti (2003), stated that the processing equipment is made up Of the sterilizer. cooker. rotary stripper, horizontal digester-screw press and clarifier. Research and development work in many disciplines - biochemistry, chemical and mechanical engineering provided the opportunity for large scale fully mechanized processing, resulting in the evolution of a sequence of processing steps designed to extract from a harvested oil palm bunch to produce a high yield or quantity of palm oil. The oil processing in summary involves the reception of fresh fruits bunches from the plantations, sterilizing and threshing of the bunches to free the palm fruits, mashing the fruits and pressing out the crude palm oil. The crude oil is further treated to purify it for storage. In Nigeria most of the palm oil is produced by traditional methods, In the traditional method, the spikes are dropped off the bunch after harvest and piled together. The heat generated loosens the fruits which are separated manually from the spike. Another method of fruit separation from the bunch involves pilling the whole bunches and covering them for seven days. Within this period, the fruit detaches. Thereafter extracted fruits are washed and are boiled

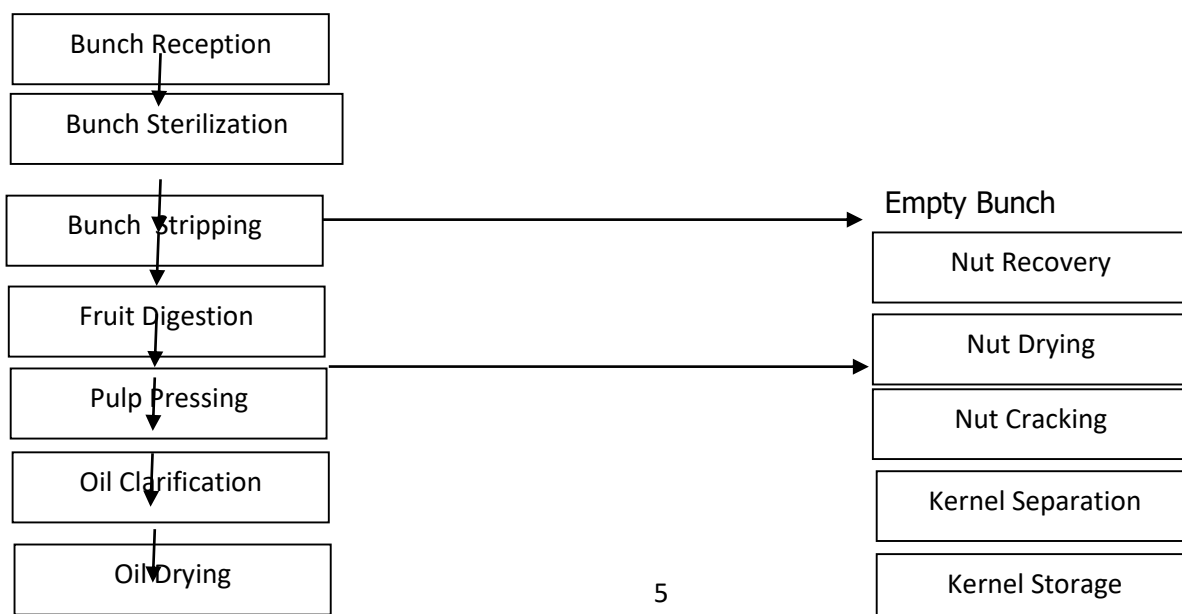
in large pots for about two hours. The cooked fruits are then left in the not for sometime before maceration. Maceration is done by pounding in a wooden mortar with a wooden pestle until a mixture of nuts and crushed pulp of even consistent is obtained. The nuts are separated from the fibre by picking the nuts (dry process) or separating the oil. The nuts are subsequently picked out after washing (wet process). In the wet process, the mashed fruits are washed in water to float the oil. The floating oil is collected and boiled. In the dry process, the mashed pulp is heated to melt the oil which is extracted by pressing between the palms of the hand. The residual oil in the mash for the wet process is extracted in a similar way. Oil obtained from either method is treated and allowed to settle out from the sludge. The modern industrial method involves the use of palm oil mills

for extraction of oil. The essential components of oil mills are steam generator, sterilizing chamber, stripper, digester, hydraulic or centrifugal press, oil clarifier, fibre/nut separator, nut cracker and bel/kernel separator. Palm oil processors of all sizes go through operational palm oil is stages. The flowchart diagram for processing shown in figure 2.1. The major processes (bunch sterilization, threshing, milling, pressing, and clarification) are briefly discussed below.

Bunch sterilization:- sterilization of the fruits or bunches before milling for the purpose of oil extraction, is achieved by boiling. As indicated by Opeke (1992), sterilization softened the fruits for stripping from the bunches and for milling. Sterilization can be carried out in pots, drums or in sterilization chamber. Stripping:- This is the removal of fruits from sterilized or quartered bunches. The stripped fruits are re-sterilized for about 30-40 minutes before milling (fruit digestion). Fruits pound more easily when they

are hot and well sterilized, i.e softened. Milling (fruit digestion):- This is pounding of sterilized fruits for the purpose of separating the mesocarp from the kernel (de -pulping). After the separating, the mesocarp is pounded until no streak of coloured outer skin is distinguishable any more.

Pressing:- The pounded fruit is then loaded into the press for extraction of the oil. At times, it may be necessary to add water to the mass for softening purposes to facilitate oil extraction. Clarification: In traditional method of oil palm processing, the extracted crude oil is clarified by boiling and skimming. After extraction, the palm oil is referred to as crude, because it contains a certain amount of water and impurities such as sludge. In order to purify it, the crude oil is brought to boil in an aluminum pot. After boiling for sometime, a drop of water is introduced into the boiling oil. If a loud cracking noise is heard, the oil is then allowed to cool and then decanted, leaving the sludge and other impurities in the bottom of the pot.



Oil Packing

Fig. 2.3: Palm Oil Processing unit operations

Concepts of Adoption and Diffusion of Technologies

Adoption of innovation is the yardstick for the measurement of progress in Agricultural extension delivery. Ekong (2003) and Williams, Fenley, (1984) define adoption as a decision to continue full use of an innovation. Adoption involves decision making after communication between extension workers and farmers or after farmer-to-farmers communication (Agbamu 2006). According to Agbamu (2006), a good starting point of any discussion on adoption process is to understand the content in which farmers operate their farms and make daily decision. Decision making for the farm family is the settlement of questions which arise from the day-to-day and season-to season operation of the farm. Adoption process is the mental process through which an individual passed from first hearing about an innovation to the final decision to use it. (Ekong., 2003). The U.S.A North Central Rural Sociology Committee of Iowa in 1995 recognized five stages explaining the process of innovation adoption; awareness, interest, evaluation, trial and adoption stage. Agbamu (1998) found that the farmers generally passed through only three stages of adoption process: awareness, trial and adoption stages. Agbamu (2006) concluded that everybody might not necessarily pass through the entire five stages prior to acceptance of an innovation. The five stages of adoption are; Awareness stage: At this stage, the farmers merely know about the existence of an innovation but lacks details about it. He may therefore need more information about it by making inquiry. Interest stage:- The farmer develops interest by asking questions and collecting information about the new innovation/technology to assess its potentialities.

Evaluation stage:- The farmer at this stage mentally evaluates the applicability of the innovation in light of the solution of his Own problem situation, If mental evaluation gives favourable disposition, he will then be set to try the innovation practically.

Trial stage:- The farmer actually applied the innovation on small scale under his own circumstances and agents and sales promoter. If the farmer is satisfied with the trial, he may decide to continue the use of that innovation.

Adoption stage:- This is the stage where a farmer has approves the innovation and decided to continue using it. Adoption involves acceptance and repeated use of an innovation. Diffusion is a process by which an innovation spreads from its Source of development to its ultimate adopters. Diffusion of technologies is the spread of information about innovation through a population and is simply the result of a host of individual adoption decision (Fliegel, 1984). The diffusion process involves four essential elements- the innovation, its communication from one individual or group to another, a social system within which the innovation spread and a time period over which the diffusion process occurs. Diffusion mainly involves spread of innovation information which create awareness for more people over time, and lead to increase innovation adoption rate over time.

Improved Technology of Pressing Oil Palm

Akintelure T. I (1976) looked into the screw press oil mill under small holder management unit in Ikale Local Government Area. He came up with finding that the mill performed below expectation due to the unfavourable pricing policy of the fruits producers and increase in the price of palm oil which eventually led to the farmers out rightly Cutting off the supply of fresh fruit bunches to the mill. NIFOR (1987) in it's study of limitations of the visual symptoms Of ripeness found out that in 1974. the estimated oil losses due to inefficient processing. It emphasized that at the present time, the Nigerian oil palm industry is on the decline because of the traditional processing techniques, which it says are labour intensive and very inefficient. It noted that the suitable and efficient technology does not exist in the rural area with the result that about 60% of fresh fruit hunches available are not being harvested and processed.

Ajibola L.A (1985) tried to determine whether the installation of the oil mills is justified in terms of earning instead of the opportunity cost of capital investment, using some established plantations in the western Nigeria as case study, he found that oil palm production is still profitable. The yield may reach 8tons per hectare after some years of growth. He also found out that large scale mills are not very profitable but believes that the traditional method of processing must be scraped and replaced with small scale mills whose efficiency and hygienic output will offset the higher cost of production. He concluded by saying that investment in oil palm project is a profitable venture more so if it is capable of processing its own palm fruits.

Constraints Associated with the use of Improved Oil Palm

Processing Technologies:

Constraints associated with the use of improved technologies of processing oil palm include a wide range of technical and socio- economic factors. These factors include, lack of capital, access to market, inadequate land, inconsistent government policy, inadequate extension officers, inadequate processing equipments etc.

Lack of Capital:- Most of the oil palm processors are poor and do not have the finance to make purchase of new processing equipments. Also, most of them do not have the required collateral security to enable them to secure loans from banks. Even some of the processors who could get loan, at times divert such loan to other purposes such as chieftaincy, marriage ceremonies etc.

Access to Market:- Marketing can be a problems for poor Processors, as most of them do not have available finance to transport their produce to the market. Lack of market for oil palm products leads to low productivity. Typically, processors transport their produce on hand as head loads, on bicycles or in Lorries. Poor handling of the product can lead to a high substantial loss.

Inadequate Land:- High population reduces the size of farm land and increase in population has led to increase in the various alternatives like industries to which land can be used, This also put more pressure on the available land. Also, since oil palm is a permanent crop, most land owners don't want to rent their land to oil palm farmers for cultivation. And if there are no land to cultivate the oil palm, there will be no oil palm fruits to process.

Inconsistent Government Policy: - inconsistent government policies on oil palm reduces its productivity. These policies fail to recognize that there are peasant processors that produce palm oil for the country. Most of the agricultural programmes are centered on fake City processors who only collect money and use it for other purposes.

Bad implementation of these policies reduces the productivity of palm oil.

Inadequate Extension Officers:- Majority of the processors are illiterate, that is, they cannot read and write. They do not know how to use modern processing technologies like digester screw press. They find it different to accept new innovations in processing oil palm which will boost their efficiency and productivity. And there are no adequate extension officers to teach the processors about the modern technologies. As a result of this, there will be no increasement in palm oil products.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

The overall purpose of the study was to examine the adoption of improved oil palm processing technologies in Ethiope West Government Area of Delta State. Interview schedule was used to obtain information relating to the stated objectives. Specific objectives of the study include socio-economic characteristics of processors, awareness of improved oil palm processing technologies, adoption of improved oil palm processing technologies and constraints to adoption of oil palm processing technologies. One hundred and twenty(120) respondents were used for the study. Data were analyzed using descriptive statistics such as mean, percentage and standard deviation. Results of the study show that: (1) the mean age of respondents was 45years, (2) the mean processing experience of respondents was found to be 13years, (3) the mean farm size was. And to be 2ha, (4) majority of the respondents were educated, (5)

here was a general low awareness of technologies among oil palm and (6) there a general low level of adoption of processors and technologies among the oil palm processors.

Conclusion

Based on the findings of the study, the following conclusions were made:

1. Since a mean age of 45years was found for the respondents of the study, it was concluded that majority of the oil palm processors are still in their productive age.
2. Since an overall awareness percentage of 48.4% was found by the study. it was concluded that the respondents had low awareness of improved oil palm processing technologies.

Recommendations

Base on the conclusion of the study, the study, the following recommendations were made:

1. The Delta State Agricultural Development Programme (DTADP) should create more awareness in those technologies that processors indicate the low awareness.
- 2 Credit facilities with low interest should be extended to processors to enable them meet financial requirement in adopting improved oil palm processing technologies.

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