

**ANALYSIS OF TECHNOLOGY TRANSFER
PROCESS AND ITS IMPLICATION ON ADOPTION
OF IMPROVED PALM OIL PROCESSING
TECHNOLOGY BY WOMEN IN HO DISTRICT**

BY

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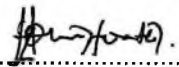
DECLARATION

I do hereby declare that this work is, with the exception of specified ideas attributed to specified search, entirely the product of my own research and that it is the true record of the goal I set myself.



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ABSTRACT

Oil palm processing is one of the occupations of women in the Dodome and Tsyome communities in the Ho district of the Volta Region of Ghana. To assist women to increase production, Agricultural Sector Improvement Project (ASIP) and Helping Hand Association for Women's Development (HHAWD) have introduced improved palm oil processing technologies into these communities. However these technologies are not being used.

The study was conducted to determine the technology transfer process used and also identify problems that are militating against the trial and the subsequent adoption of the improved technology. A descriptive research was employed to collect data. A sample of 132 small-scale palm oil processors was randomly selected for the study. In addition, 8 officials from ASIP and HHAWD were purposively sampled to provide information about the improved technology. Interviews and self-administered questionnaires were used to collect data. Data was coded and analyzed using the Statistical Package for Social Sciences (SPSS).

The study revealed that the beneficiaries of the improved technology saw the need for the technology. However, factors such as Technical fault on the equipment, problems combining processing using the improved technology with farming, lack of credit, management problems among others have negatively influenced the trial and adoption of the technology.

The failure of the people to try and adopt the improved technology has been attributed to the following:

- ◆ Some vital principles of technology transfer, such as the determination of the resource base of the beneficiaries, the involvement of the beneficiaries in the selection and introduction of the equipment and thorough training of the beneficiaries in the use of the equipment, were not followed during the transfer of the technology.
- ◆ Economic activities such as farming, petty-trading among others are more lucrative to the people than palm oil processing.
- ◆ There are some technical problems with the equipment.

It is recommended that:

- Decisions to transfer improved technologies in the form of equipment to clients in rural areas must be demand-driven if they are to be accepted.
- Thorough investigations of the needs and priorities and the resource base of beneficiaries should be carried out so as to make sure the innovations meet the felt needs of the people.
- Beneficiaries of improved technologies are involved in the selection and introduction of the technologies so as to avoid their rejection.
- There should be an organisation of adequate training for beneficiaries in the use of improved technologies especially machinery.
- Institution of credit facilities for beneficiaries to enable them acquire the necessary inputs.

- Monitoring of rural projects by implementers needs to be intensified so as to ensure that problems with such projects are readily identified and solved.

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LIST OF ABBREVIATIONS/ACRONYMS

NGO	-	Non-Governmental Organisation
ASIP	-	Agricultural Sector Investment Project
HHAWD	-	Helping Hand For Women's Development
UNIFEM	-	United Nations Development Fund for Women
NAEP	-	National Agricultural Extension Programme
URADEP	-	Upper Region Agricultural Development Project
VORADEP	-	Volta Region Agricultural Development Project
ISSER		Institute of Statistical, Social and Economic Research
WCED		World Commission on Environment and Development
GOPDC		Ghana Oil Palm Development Corporation
TOPP		Twifo Oil Palm Plantation
BOPP	-	Benso Oil Palm Plantation
NOPL		National Oil Palm Limited
TCC		Technology Consultancy Centre
GDP	-	Gross Domestic Product
ITTU	-	Intermediate Technology Transfer Unit
ILO	-	International Labour Organization
UN		United Nations
ARRD	-	Agricultural and Rural Development Department
NCWD		National Commission on Women and Development
HRD		Human Resource Development
FAO	-	Food and Agricultural Organization

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

Palm oil has been produced in Ghana for as long as rural Ghanaian women have been preparing food for their households (ILO/NCWD 1985)

The importance of palm oil production as input for soap and margarine as well as for household consumption need not be overemphasised. In the 1970s, the demand for palm oil in soap manufacture increased (UNIFEM, 1993). This increased demand has resulted in efforts by Government of Ghana, State and foreign partnerships and individual peasant farmers to increase the cultivation of oil palm, which could be processed so as to achieve self-sufficiency in the production of palm oil in Southern Ghana. Current production figures in Southern Ghana showed that there has been an increase in the oil palm production from 508780 metric tonnes in 1992 to 572989 metric tonnes in 1994 (Ministry of Food and Agriculture, 1995). However, industries with improved technologies to process the palm fruits into palm oil are woefully inadequate (Gyesi, 1990). There are only four large-scale mechanically operated mills in the country owned by the Ghana Oil Palm Development Corporation (GOPDC), Twifo Oil Palm Plantation (TOPP), Benso Oil Palm Plantation (BOPP), and National Oil Palm Limited (NOPL), located in Kwae, Twifo Ntaf ewaso, Benso

and Pretsea respectively. There are also a few medium and small-scale mills with limited capacities.

In the light of this the government and some NGOs are making efforts to establish more small-scale palm oil processing industries that could utilise improved technologies to process the abundantly produced raw materials in some rural areas. Basically this is to enable the rural women to produce palm oil at a lower cost and also add value to the produce so as to ensure ready market for it. The Technology Consultancy Centre (TCC) for example, investigated ways in which greater quantities of palm oil could be produced at a relatively lower cost. This is to enable households with low incomes to take advantage of the low production cost to produce the oil for home consumption and for soap, which could be sold to generate some income. They found out that if traditional methods of producing palm oil were improved, then more palm oil could be produced and used extensively for both consumption and soap making (UNIFEM, 1993).

It is believed that with the development of improved technologies and the subsequent establishment of the small-scale palm oil processing industries employment avenues would be opened for women who traditionally engage in this venture. An indication of the importance of agro-industry within the manufacturing sector is its employment generating capacity (Atwood and Bavister, 1987). It is also anticipated that the industries would serve as a quick

and steady source of income and therefore a catalyst for the improvement of the standard of living of the rural women.

Women in some communities in the Ho district have over the years been processing oil palm into palm oil using cumbersome traditional methods despite available technologically enhanced methods such as diesel and petrol engine powered pounders and oil presses. The women using the traditional methods, on the average spend more than twelve hours processing only 30 kg of palm fruits a day so have been unable to readily satisfy the quest for the oil by consumers and middlemen who come from different parts of the region to purchase it. Most of the women still live in abject poverty due to very low returns from the cumbersome and less productive traditional methods employed.

Realising the fact that given the necessary assistance the women could produce more and a better quality oil for the ready market available, an NGO, Helping Hand Association for Women's Development and the Government of Ghana, through the Agricultural Sector Investment Project (ASIP) introduced some technologies into these communities. These technologies in the form of fruit pounders and oil presses were introduced by the two organisations in 1995 and 1996 respectively. Basically this is aimed at helping the women boost the production of the oil, cut down the labour demand and lessen the drudgery associated with the traditional methods (Appendix 1).

Other expectations from the use of the improved technology include, shortening of processing time, generation of more income for the women and generally to

serve as a strategy for the development of the area. Agyemang (1994) suggested that there should be prevalent rural industrialisation to provide the necessary stimuli for growth. Once these industries are established they could form the nuclei of growth poles and development will diffuse from growth poles to other places.

Modification of traditional technology will have more diverse impact on the various groups living in poverty for; one reason for improving traditional technology is to improve productivity and raise the incomes of those who possess productive assets (Griffin and James 1981).

Improved technology on its own does not however improve productivity but its technological capability, which involves the ability to search for available alternatives, selection and development of appropriate ones. It also entails the use of suitable transfer mechanisms and the compatibility of the technology to the socio-econo-cultural needs of the recipients, which enable the technology to be accepted and used (Fransman and King, 1984). Any technology has a series of definable characteristics that influence its transfer from one context to another (Anderson, 1985).

1.2 Research Problem

The improved technology introduced into the small-scale palm oil processing industry in Ho district is characteristically contended to be labour saving, capable of removing or lessening the drudgery associated with the traditional technology.

It is believed to shorten the long period of time taken using the traditional methods and increase the output of oil.

It is also known to be relatively simple to use, compatible with the aspirations and felt needs of the people and easy to maintain in terms of minor repair works. The community can also conveniently handle and manage the residue. The architecture of the improved unit makes it more hygienic and more efficient in the disposal of waste and reduction of environmental pollution as against the traditional method. In other words, it has a more relative advantage over the traditional technology.

Available estimated production figures show that, total annual production using the traditional technology is 2080 litres, with a production cost per litre being ₦466.00 whilst that of the improved technology is 16000 litres with a total production cost per litre being ₦433.00. This shows a 7.1% reduction in production cost per litre (Ankora, 1996). However, Ankora (1996) in his appraisal neglected cost of labour which involves the time and energy used to gather fuelwood as well as pounding and pressing of fruits. The improved unit uses less fuelwood as compared to the traditional method. Incorporating labour cost into the analysis, assuming labour cost per man per week is ₦10,000.00, the result indicated a decrease of 64% in cost per litre, using the Improved Technology (Refer to appendix 2).

Even though the improved technology has been characteristically proven by the Project Implementers to be more beneficial, environmentally friendly and

relatively advantageous through demonstrations and training sessions, there is still a widespread use of the traditional technology.

Preliminary field investigations indicated that many women have still not tried the improved technology whilst a good number of men have however entered the business which has traditionally been the preserve of women and are vigorously trying the improved technology.

With this trend of affairs it is evident that though the improved technology might seem significantly beneficial from the point of view of the Implementing agencies, there might be some hindrances militating against its trial by the women and for that matter its widespread adoption.

This study therefore to analyses the Technology Transfer Process employed in the introduction of the improved palm oil processing technology and the implications of the process on the trial and eventual adoption of the technology. The results obtained would enable the researcher to derive improved technology transfer models to enhance the ultimate adoption of the technology and similar technologies in the Ho district.

1.3 Research questions

Based on the research problem above the study therefore seeks to address the following questions:

1. How has the improved palm oil processing technology been selected and introduced?

2. How is the Improved Technology introduced to Dodome and Tsyome communities considered with respect to gender attributes?
3. What are the implications of the transfer process on adoption?

1.4 The study area

Ho district lies between latitudes 6° 45' and 6° 55'N and longitudes 0° 30' and 0° 35' E. It is boarded to the west by Kpando district and the Asuogyaman district of the Eastern region of Ghana, to the north by Hohoe district and to the east by the Republic of Togo. It covers an area of 2,757 square kilometres.

The district experiences a wet semi-equatorial climate. Mean monthly temperatures are about 23° C due to the influence of altitude. Mean annual rainfall ranges from 100 to 175 cm. The highland areas receive about 150cm of rainfall while the lower elevations receive about 120 cm. The annual pattern of rainfall is bi-modal with major rains between March/April and July/August and the minor rains between September and November.

As at 1984, 98% of the economically active population were employed. Out of the employed population, 63% were engaged in agriculture, fishing and related activities. The population of males and females were 59 and 67 percent respectively. About 15% of the females were engaged in trading which was also their second important economic activity.

Food crops such as cassava, yam, maize and cowpeas are grown in the district as a whole. There are also small to medium size patches of oil palm plantations around Tsito, Sokode and Atikpui-Nyive areas.

There are also activities such as pito brewing, sculpturing, pottery, dyeing of cloth, kente weaving and currently a good number of oil palm processing industries.

The district is chosen for the study because it is a district in which a number of improved technologies such as fruit pounders, oil presses, cassava mills and graters among others have been introduced into small-scale agro-based industries.

1.5 Objectives

The objectives are designed to verify the technology transfer process and its implication on the adoption of the improved technology.

1.5.1 Main objective

To determine the Technology Transfer Process employed by the Implementers of the improved oil palm processing technology so as to find out its possible implication on the ultimate adoption of the technology.

1.5.2 Specific objectives

1. To find out how the improved technology was selected, developed, and introduced.
2. To find out whether the parties involved in the transfer of the Improved Technology have kept the principles of technology transfer.
3. To determine the knowledge generated by both the beneficiaries and Implementers relevant to the technology selection, development and introduction.
4. To examine the socio-economic environment of the Palm oil Processors and how it affects the trial of the improved technology.
5. To identify the factors hindering the trial of the improved technology.
6. To find out whether the improved technology is 'gender neutral' or 'gender specific'.
7. To find out the implications of the transfer process on the adoption of the improved technology.

1.6 Hypotheses

1. The Technology transfer process employed is not responsible for the non-acceptance of the Improved technology by the Palm oil processors.

2. Farming which is the major occupation of the people is not a factor hindering the use of the Improved technology.

1.7 Justification

Agriculture is known to be the dominant sector of the Ghanaian economy contributing over half the GDP and about three-quarters of export earning. Most of the population lives in the rural areas and derives their incomes from agriculture and related activities.

The nascent industrial sector depends on agriculture as a source of raw materials. Agriculture is an important source of revenues and has direct and indirect influences on public and private savings (NAEP, 1992).

In view of these positive contributions of agriculture to the economy of Ghana, there has been the desire of the government and some NGOs such as Helping Hand Association for Women's Development, to improve agricultural productivity. This is evidenced in the collectivised agricultural organisations that have been established since independence. Examples include the Ghana State Farms Corporation, Ghana Workers Brigade, Ghana Farmers League into which trained agricultural Extension Officers were drafted, to attain the required success. There was also the establishment of prominent projects with extension components such as URADEP and VORADEP. These were supported by the World Bank in an attempt to improve extension delivery and for that matter the agricultural sector (Korang-Amoako, Donkor and Amoah 1994).

There has also been the introduction of some improved technologies into industries especially in the rural areas to facilitate easy processing of agricultural products to reduce post harvest losses and most importantly as a means of developing the rural areas and reducing rural poverty. For example there has been the introduction of improved technologies such as fruit pounders and oil presses into small-scale palm oil processing industries and cassava mills and graters into gari processing industries in some rural areas in the country. This is being done as a means of opening up those areas and raising the incomes of the rural folk especially women.

Prevailing conditions in the country so far however show that agricultural productivity has not improved significantly. Korang-Amoako et al (1994) observed that whereas the population growth rate ranges from 2.6-3.2% per annum, agricultural productivity has averaged 2.1% annually since 1985. The lots of farmers have therefore not significantly improved.

In some communities where the improved technologies have been introduced the enthusiasm with which they were expected to be tried and consequently adopted and used leaves much to be desired.

It should be noted that for a sustained economic growth to be achieved in Ghana, and for the people to enjoy improved standards of living, the agricultural sector must become more productive. This is because it is believed that over

70% of the population lives in rural areas and depends on agriculture and its related activities directly and indirectly.

Diverse reasons and views have been expressed for failures in rural development and the inability of the agricultural sector to achieve the expected level of productivity.

A school of thought attributes the failure to the inability of research and extension to select, develop and transfer improved and appropriate technologies to farmers. One of the reasons given for the prevailing deficiency in food production is the poor agricultural technologies that have been developed and transferred to farmers (ISSER, 1997).

Another school of thought attributes the failure to inappropriate design and implementation of agricultural and related projects and ineffective support services. For example there is improper analysis of the existing situations in the areas where certain projects are sited. There is the inability of project implementing agencies to identify the needs, aspirations and the priorities of the people the projects are meant to serve.

Other reseachers feel projects fail because of inadequate funding. It is also argued that poor or improper and ad hoc approaches to the selection, designing and construction of equipment for the projects contribute to the failure of some projects.

Poor institutional framework for delivery of agricultural credit, which is exacerbated by severe shortages of funds in the banking system, poor marketing infrastructure for commodities which are primarily meant for the internal market. The result is that, despite the availability of demand for these commodities, they could not reach the market in time nor be stored properly, leading to high post harvest losses and high marketing costs (NAEP, 1992).

Still other researchers also argue that there is little or no involvement of the local people in the planning and development of strategies in the implementation and management of projects. This results in the implementation of projects, which are not compatible with the socio-econo-cultural values of the beneficiaries, so they refuse to accept them. Governments, NGOs and International Development Agencies often used "top-down" approaches to design programmes without consulting the intended beneficiaries. Local, National and International decision makers often use funds to import technologies rather than to utilise and enhance locally conceived sustainable approaches. The failure rates of such projects are high and thus result in widespread disinterest in the project by the rural people (WCED, 1987).

From the above, it is evident that no single reason could be assigned to the disinterest of people to try innovations, non-acceptance of projects, collapse of projects or the inability of projects to achieve the aims for which they have been established.

It is for these reasons that the study would like to analyse the Technology Transfer Process adopted. It would also identify other factors that might be hindering the women from trying the improved technology in the form of fruit pounders and oil presses introduced into the small-scale palm oil processing industries in Dodome and Tsyome communities in the Ho District. Suggestions and recommendations would then be made to enhance their widespread adoption.

The findings of the study would put the Implementers of projects in the right perspective to consult adequately and understand the needs, aspirations and priorities of the people the projects and technologies are meant for.

They will also be better equipped with factors to consider when such programmes and projects are to be reviewed and others to be executed. For example careful and exhaustive analysis of existing situations in the areas in question, proper and pragmatic methods of determining the priorities of the people and the determination of educational and communication methods. Also the selection of the appropriate channels for the dissemination of new ideas should be done to enhance the acceptance and use of such technologies and projects. Blackburn (1989) indicated that a technology is transferred if the information is conveyed such that it fulfils a particular need of the client and also when it can be effectively applied by the client to his own situation.

The findings will also afford the rural communities, where technologies are being introduced into agro-based industries, the opportunity to appreciate the

importance of these technologies and so try them in view of the positive contributions of agro-based industries to rural development. Palm oil processing industries particularly have had considerable impact on the development of some rural areas in Ghana in terms of employment opportunities, provision of infrastructure such as health facilities, roads, educational institutions, electricity supply, pipe-borne water, decent houses and recreational facilities (Gyesi, 1988).

It is also believed that the study will contribute immensely to the reduction of poverty in these communities by the year 2020, in line with the global aspirations of poverty reduction in rural areas by that time. This could be achieved by outlining some of the drawbacks to successful transfer of Improved Technologies so that appropriate measures are taken to resolve the issue.

CHAPTER TWO

2.0 METHODOLOGY

2.1 Introduction

This chapter describes the methodology used in this study. It entails the description of the research design, the target population of the study, sampling technique and the development of data collection instrument. It also deals with the administration of the pre-test, final questionnaire development, data collection and the itinerary of data collection.

This chapter also contains a brief discussion of how the data was analysed.

2.2 Research design

To achieve the objectives of the study a descriptive research design was used.

A descriptive research also known as correlation research deals with the determination of relationships between variables, the testing of hypotheses and the development of generalisations, principles and theories that have universal validity (Best and Kahn, 1995). It is concerned with functional relationships. The expectation is that if variable A is systematically associated with variable B, prediction of future phenomena may be possible and the results may suggest additional or competing hypothesis to test. Thus this research design was

adopted since the study sought to determine the effect of the Technology Transfer Process on the Adoption of the Improved Technology.

Descriptive research is also known to be particularly appropriate in the behavioural sciences because many of the types of behaviour that interest the researcher cannot be arranged in a realistic setting. Descriptive data may be expressed qualitatively in verbal terms and quantitatively in mathematical symbols. Qualitative studies give social scientist much useful information. Correlational techniques generally intend to answer questions about relationships between variables (Cohen and Holiday, 1982). Technological innovations, especially those introduced into rural areas are meant to effect certain changes in the lives of the recipients if they are adopted and used. The acceptance of these technologies depends greatly on the effective design of communication and transfer strategies during their implementation.

This study therefore seeks to determine the technology transfer process used and how it affected the adoption of the technology. The phenomenon of the study is therefore adoption and the main factor is the Technology Transfer Process.

2.3 Population

The target population for the study comprised:

- (a) Small-scale palm oil processors in the Dodome and Tsyome communities in the Ho District.

- (b) The implementing organisations namely: Helping Hand Association for Women's Development (HHAWD) and Agricultural Sector Improvement Project (ASIP).

The staff of the implementing organisations were interviewed to determine how the improved technology was selected, developed and introduced and their perception about the willingness of the beneficiaries to try the improved technology.

2.4 Sampling

A list of all the Palm Oil Processors was compiled. Numbers were assigned to all the 200 names on the list since the population is quite small. The pieces of paper on which the numbers were written were placed in a container and thoroughly shuffled. One hundred and thirty two (132) out of the two hundred (200) were randomly selected by picking. One hundred and thirty two (132) Processors were selected from the population so that the sample population will be within $\pm 5\%$ of the population proportion with a 95% level of confidence (Krejcie and Morgan 1970).

Purposive sampling technique was employed to select eight (8) officials from the Implementing agencies. In purposive sampling the researcher handpicks the cases to be included in his sample on the basis of his judgement of their topicality. In this way the researcher builds up a sample that is satisfactory to the specific needs (Cohen, 1986).

2.5 Development of the Instrument

Study Concepts, Objectives, Information Source and Method of Data Collection

Study Concepts	Objectives	Information Required	Source of information	Data collection instrument
Characteristics of Improved Technology	To find out whether the Improved tech. has got the attributes of a technology, which could make the beneficiaries, accept it.	<ul style="list-style-type: none"> • Relative advantage of improved technology. • Complexity of improved Technology. • Observability of improved technology. • Compatibility of improved technology. • Affordability of improved technology. 	Palm oil Processors Staff of Implementing Organisation	Interview schedule Questionnaire
Technology Transfer Process	<p>To determine how the improved technology was selected, developed and introduced to the beneficiaries.</p> <p>To find out whether the Technology Transfer Process used corroborates with the Principles of Technology Transfer.</p>	<ul style="list-style-type: none"> • Choice/selection of the improved technology. • Introduction of improved Technology. • Implication of the transfer process on the trial of the technology. • Usefulness of the improved technology. • Training of beneficiaries. Provision of incentives. • Involvement of beneficiaries 	Palm oil Processors Staff of Implementing Organisation	Interview schedule Questionnaire

		<p>in making decisions.</p> <ul style="list-style-type: none"> Monitoring. 		
Communication and Knowledge generation	To find out whether the beneficiaries came out with some ideas and suggestions before and after the introduction of the improved technology.	<ul style="list-style-type: none"> Suggestions made by beneficiaries before and after the introduction of the improved technology. 	<p>Palm oil Processors</p> <p>Staff of Implementing Organisation</p>	<p>Interview schedule</p> <p>Questionnaire</p>
Gender Issues	To determine whether gender was considered in the selection, development and the introduction of the improved technology.	<ul style="list-style-type: none"> Whether the Improved technology is 'gender specific' or 'gender neutral'. Roles played by opposite sexes in the use of the improved technology. Whether participation of men in the business has any effect on the trial of the technology. By women. How improved technology affected the work roles of women using the technology. 	<p>Palm oil Processors</p> <p>Staff of Implementing Organisation</p>	<p>Interview schedule</p> <p>Questionnaire</p>

<p>Socio-economic activities</p>	<p>To find out major income generating activity of the beneficiaries.</p> <p>To find out whether the other income generating activities other than palm oil processing have any influence on the trial of the improved technology.</p> <p>To find out whether the beneficiaries were involved in the implementation of the project.</p>	<ul style="list-style-type: none"> • Major economic activity of the beneficiaries. • Economic activity which provides major income • Influence of other businesses on Palm oil processing <p>using the Improved technology.</p> <ul style="list-style-type: none"> • Contributions Made by Beneficiaries Towards the implementation of the project. 	<p>Palm oil Processors</p> <p>Staff of Implementing Organisation</p>	<p>Interview schedule</p> <p>Questionnaire</p>
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2.6 Pre-testing

The Interview schedule and Questionnaire were pre-tested at Akyem Tafo and Accra respectively between the 25th of February and 15th of March 1999 involving fifteen (15) Palm oil Processors and two (2) officials of the

Implementing agency. The pre-testing was done to improve upon the accuracy, validity and reliability of the interview schedule and the questionnaire.

2.7 Development of final questionnaire and Interview Schedule

After the administration of the Pre-test, the Interview schedule and Questionnaire were modified to eliminate any ambiguities so as to make them vivid, more understanding and very easy to translate to the respondents. The Interview Schedule and Questionnaire were basically in two parts. The first part sought to gather information on the Transfer process, communication and knowledge generated by both the Implementers and recipients of the Improved Technology. It also looked at socio-economic and cultural factors taken into consideration during the transfer process, gender issues and the perceived characteristics of the Improved Technology. The second part solicited information on the demographic characteristics of the recipients of the Improved Technology. The information included town/village, sex, age, highest level of education, marital status, family size and length of time beneficiaries have been processing palm oil. The information on the demographic characteristics was gathered to see whether any of them has effect on the trial of the technology.

The final document contained both close-ended and open-ended questions.

Open-ended items allow respondent to write how he feels about a topic. It is useful for obtaining information which cannot be classified into specific

categories until after the data received. In spite of the above advantages, open-ended items are difficult to tabulate and analysis is more cumbersome because of categories presented (Boateng, 1994.)

Van Dalen (1973) stated that closed-ended items are easy to administer and fill. They help keep the respondent's mind on the subject and facilitate the process of tabulation and analysis. These items, it is noted, fail to reveal the respondent's motive, they do not always yield information of sufficient scope and may not discriminate between fine shades of meanings. The two methods of designing questionnaires were used for the study in order to capture the benefits of both.

2.8 Data collection

The Interview schedule and Questionnaires, which were developed, based on the research question and objectives were administered by the researcher alone for uniformity of translation, effectiveness and to avoid discrepancies in data collected. It is also to make sure that the respondents had uniform understanding of the questions before answering. The questions were read out and translated into the local language for the respondents who do not understand English. Respondents were also given the freedom to express variables in locally known units. This exercise was undertaken between the 22nd of March 1999 and 20th of April 99.

2.9 Itinerary of data collection

PERIOD	ACTIVITY	LOCATION	ACTION BY
22-3-99 - 25-3-99	Field data Collection	Dodome Awlime	Researcher
27-3-99 - 2-4-99	Field data Collection	Dodome Aveha	Researcher
12-4-99 - 18-4-99	Field data Collection	Tsyome Afedo	Researcher
20-4-99	Field data Collection	Ho (ITTU)	Researcher
26-4-99 -17-5-99	Field data Collection	Accra (ASIP/ HHAWD)	Researcher

2.10 Data Analysis

Data collected was edited and all open-ended questions coded to ensure uniformity and ease of analysis. The Software Package for the Social Sciences (SPSS) was used for the storage of the data.

Descriptive analysis for example frequencies, means and percentages were used to describe the data. The motive is to make the result of the study less technical. The results were presented using frequency tables.

2.11 Limitations of the Study and Precautions

Interview method was employed in administering the bulk of this questionnaire. This is because a large number of the respondents cannot read and write and do not understand English. The questions were therefore read out and translated to the people in Ewe or Twi, whichever was more applicable. It is therefore likely that data collected will be subject to limitations associated with data obtained from interviews.

In the conduction of interviews, the sex, religion, vocabulary, accent, ethnic background or social class of the interviewer may alter the responses of the respondents. In view of this before interviewing any respondent the ground was well prepared by engaging in chats which could remove any misconceptions and inferiority complexes in relation to the background of the interviewer and the respondent.

Other extraneous factors associated with interviews such as boredom, decrease in recording skills which account for variations in a set of findings, were also guarded against. In order to avert such problems precautions were taken not to interview more than ten respondents continuously in a day.

However, where there was the need to interview more than ten respondents there were intermittent breaks to allow for rest.

Often collecting data from all respondents in a uniform manner introduces a rigidity into the investigation procedures thus preventing the investigation from

probing in sufficient depth. To reduce this problem to the barest minimum a lot of probing questions were asked and respondents were encouraged to express their views freely without any fear.

The conduction of interviews is also influenced by the emotional 'set' of the interviewee, by his self concern or self pity, by his desire to appear at good advantage, his hesitancy to report facts uncomplimentary to himself and his urge to please or antagonise the interviewer. Also often to some extent a respondent will colour and distort the facts he discloses. Anticipating these problems and the effects they could have on the data certain vital issues were probed further by asking more than one question at different parts of the same questionnaire. Respondents were also encouraged to offer reliable responses and also express their opinions freely without bias.

Since all the implementers of the technology work in small organisations where all the project co-ordinators share the same office, work under the same conditions and with the same project document, there was the possibility that a respondent would have another person responding for him in case of questionnaire. The same response could probably be given by all of them. To alleviate this problem a time was scheduled with them and the questionnaire administered to them at the same time whilst the researcher sat with them and

collected the questionnaire at the end of the period. The questionnaire also had a good number of open-ended questions which enabled the respondents to answer freely and fully in their own words. It also gave them the opportunity to reveal their motives and views fully about the project.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

This chapter reviews literature generally on Technology transfer and the adoption of technologies. Information available from a wide range of literature consulted indicates that adoption of innovations depends on several factors. Details of these information are necessary to provide full understanding of relevant aspects of the study. The first section of this review looks at the conceptual framework of the study, while the second aspect broadly considers Technology transfer process and its implication on the trial and subsequent adoption of technologies.

3.2 Conceptual Framework

This section outlines how various writers view different types of technology and what technology transfer entails. The Conceptual Model in Fig. 3.1 also tries to outline alternative ways by which Technologies could be transferred leading to the adoption or rejection of the Technology.

3.2.1 Technology

Technology, according to Singer (undated) consists of a society's pool of knowledge concerning the industrial, mechanical and practical arts. That it is made up of knowledge concerning physical and social phenomena, knowledge

regarding an application of basic principles to practical work and knowledge of the rules of thumb of practitioners and craftsmen.

Singer (undated) stressed that theoretical as well as practical pieces of knowledge together make up the set or pool of knowledge which we define as technology. These pieces of knowledge in the set, according to him may also be viewed as including know-how, methods, procedure experience of successes and failures and also physical devices and equipment.

Sofranko (1984) acknowledged technology as the translation of scientific laws into machines, tools mechanical devices, instruments innovations, procedures and techniques to accomplish tangible ends, attain specific needs or manipulate the environment for practical purposes.

Allen and Thomas (1992) on their part defined technology broadly as machinery. According to them it encompasses organization of production knowledge whether embodied in hardware, software, people or institutionalized practices. The hardware aspect of technologies consists of the tool that embodies the technology as a material or physical object and the software aspect consisting of the teaching methods interactions and communication processes involved in the generation of the technology and the skills and information base of the tool (Jaquier, 1979, Rogers, 1995, Roling, 1988). These two components of the technology the hardware and software aspects, can be generated either through evaluation, or interaction or can be borrowed.

From the above conceptions and views advanced about technologies, the use of knowledge, techniques and tools, to accomplish a task, stand out clearly as the key elements of technologies.

Technologies used in rural areas otherwise known as village technologies can be regarded as Traditional or Improved.

3.2.2 Traditional Technology

A traditional technology refers to the technology that utilizes locally acquired materials, skills and tools which have evolved through generations in a traditional society with the bearest minimum of external influence or without any external influences.

A traditional technology as applied to palm oil processing however connotes the boiling of palm fruits, followed by pounding of the fruits in a deep wooden mortar with a wooden pestle or the trampling on the fruits either in a stone-lined concrete or clay-lined pit dug into the ground to loosen the softened pericarp and fibres from the hard nut. The pounded mass is then stirred in water or squeezed by hand to remove the pulp containing the oil (Kordylas, 1991).



3.2.3 Improved Technology

An improved technology, on the other hand, refers to simple tools, techniques and skills which are regarded as more efficient than the traditional ones in terms of scale of operation, energy use, time use, labour use, quality output, ease of use or

safety in use. Moreover its development has been subjected to much external influence (International Labour Organisation 1984). An improved technology could therefore emerge as an upgrading of a traditional technology or the development of a new one through external influence or manipulation.

For the purpose of this study, improved technology shall refer to fruit pounders and oil presses which are assumed to be time saving, labour saving and easier to use as compared to the traditional method and which has an external influence. It also entails the associated communication and transfer process used in the introduction of the equipment into the small-scale industry in Dodome and Tsyome communities.

A small-scale industry has been defined by policy makers in Ghana as an establishment engaged in the extractive, processing or manufacturing business or any approved business including transportation in Ghana and employing less than 30 people including a working proprietor. An industry requiring simple unsophisticated production techniques and with capital investment of less than ₵1,000,000.00 (Govt. of Ghana, 1968).

For the purpose of this study however, small-scale industry shall refer to palm oil processing industries in Dodome and Tsyome communities with a total turn over of about ₵4,000,000.00 per annum.

A major problem faced by change agents in the introduction of innovation is the receiver's resistance to change. This resistance stems from the fact that people

always envisage a certain degree of risk to be involved in the use of the new devices and ideas. Michiavelli (1961) said that men are generally incredulous, never trying new things unless they have tested them by experience.

Spicer (1952) however holds the view that it is more normal for men to accept changes than resist them. He therefore argued that in the event of resistance one is to see the situation as a symptom of something wrong with the technology transfer process or with the technology itself. Arguing in a Spiceran manner therefore, one would want to assert that the Palm Oil Processors in Dodome and Tsyome communities are likely to accept innovations than reject them. Any case of rejection, when all other factors such as Perceived characteristics of the Technology, Internal factors to the Potential Adopter and external factors are favourable, therefore, according to Tetteh (1987) could be seen as a sign of something wrong with the communication and transfer process.

The model designed for this study is therefore based on the assumption that, the trial and subsequent adoption of an Improved Technology (Alt) is a function of the:

1. Technology Transfer Process (TTP)
2. External factors that influence the adoption of the technology (Ef)
3. Perceived characteristics of the Technology (Pct)
4. Internal factors to the Potential adopter (If).

$$Alt: f(TTP+Ef+PCT+If).$$

3.2.4 Technology Transfer

Technology transfer is helping to convey information in such a way that it fulfills a particular need of the client and it can be effectively applied by the client to his or her own situation. Blackburn (1989) With this assertion, it implies that for any technology especially in the form of machinery to be accepted and used, its selection must be done with caution, taking into consideration its suitability and appropriateness to the needs and aspirations of the users.

Selection, according to Singer (1982) plays a very important role in the transfer and adoption of technologies. He noted that in selecting technologies cognisance must be given to factors such as ownership of resources, training, education, entrepreneurship, management resources and the availability of resources used in the production process. Selection and development in concrete cases would depend on the scale of production required, the specific features of interest and the available capital (ILO, 1984).

UNIFEM (1993) asserted that in view of the considerable range of technologies for improved extraction of oil, selection of the most appropriate technology for a given environment requires a careful examination of socio-economic relations such as social organization, ownership and control of resources and the need to provide support services such as training and credit.

Woodworth and Dashiell (1995) on their part mentioned that the development of adoptable technologies for small-scale farmers requires an understanding of farmers' conditions and priorities. These observations bring to focus the need for

analyzing the existing situation of the potential users of the technology, identification of their needs and determination of their priorities and identifying the resources available to them, when selecting and developing technologies for would-be users (B.2).

Projects which make use of such improved technologies could be established in rural areas by governments and NGOs on political grounds, to take advantage of certain available resources, as a means of opening up the rural areas or as a bid to improve the economic well being of the people. Depending on the issue involved the introduction of the projects or technologies by the implementers might or might not involve the participation of the beneficiaries. The model in Fig.3.1 stipulates that the selection, development and introduction of improved technologies could be carried out by the implementers of such technologies without involving or without the participation of the beneficiaries (T1). On the other hand the selection, development and the introduction of a particular technology could be done by the implementers in consultation with and full participation of the beneficiaries. Either way the technology is introduced the beneficiaries taking into consideration, the perceived characteristics of the technology, often assess it (B.4). This assessment is also done in relation to other factors such as external factors (availability of credit, incentives), internal factors and socio-econo-cultural factors. An ideal interplay between these factors prepares the ground for the acceptance of a particular technology as a good idea (B.5).

It must however be mentioned that studies have revealed that crucial in the acceptance of improved technologies is the involvement of the beneficiaries in their selection, development and introduction.

Choguill (1996) observed that the participation and involvement of beneficiaries in the development of projects and technologies is considered socially desirable because it develops peoples consciousness. Others endorse it because it encourages "problem solving" in communities (Breslin, 1987). Participation of beneficiaries in the development and implementation of projects is viewed as having the potential to help individuals overcome narrow and self-interested concerns when debating issues that impact the entire community. Such collective decision-making processes they observed, often solidify the civic virtues of reciprocity and co-operation and thus help build community social capital. Cottrell (1983) argued that participation is essential part of community change. The more the people participate in issues affecting them, the more they perceive they can control outcomes affecting their circumstances.

For technologies to impact positively on local women and for these technologies to be accepted and sustained, women should be invited to participate in planning, designing and eventually disseminating them so that their interests are properly reflected in the choices made and the changes introduced. Willingness or the urge to take risk in trying the technology follows its acceptance on trial basis (B.6). External and Internal factors to the adopter play prominent roles in the trial and adoption of of improved technologies.

3.3 External Factors

It is imperative that for improved technologies to be accepted and tried by beneficiaries, change agents should ideally be linked to the transfer process. Technical skills in using information, understanding scientific recommendations, interpreting and simplifying knowledge, human relations and effective communication are pre-requisites for enhancing the acceptance and trial of technologies.

According to Cusak (1983) if beneficiaries are going to accept new technologies for trial, it means that recommendations must be translated into terms they can understand and that recommendations must be specific to their operational requirements. He however, observed that it is unfortunate that lack of training among change agents in such skills is a serious barrier to a successful transfer of technology. Van den Ben and Hawkins (1996) believed that messages on the transfer of technologies have to be presented such that the client understands it and he is assisted to balance the advantages and disadvantages of the new practice. Indications are that change agents have a key role to play in the acceptance or rejection of technologies by clients.

The trial and adoption of improved technologies have also been observed widely to be positively related to institutional factors. Njoku (1981) observed that institutional factors such as membership of co-operative organization, intensity of extension services, and access to credit influence the acceptance and trial of improved technologies, much more than technical or biological factors. Low

interest rates, credit, improved transportation, marketing and extension activity according to Swanson (1984) are indispensable in promoting technological change.

Effective education and training of the beneficiaries in the use of improved technologies by implementers precipitate the trial of technologies. Lack of skills to operate improved technologies especially in the form of machines is likely to produce bitter experiences during the trial of the technology leading to its rejection. According to Anderson (1991) training and advice should be oriented to winning acceptance not only of the technological package itself, but the managerial and institutional changes necessary to ensure continuous and productive use of the technologies. It is also believed that training in the use of technologies being transferred will complete the transfer process as beneficiaries learn to use and maintain the technology.

Incentive packages and policies are also known to encourage trial of a new idea. Rogers (1995) observed that incentives facilitate the trial use of innovations leading to its full-scale adoption. Incentive systems operate at the level of farmers to achieve clientele participation.

Information on the effective use of newly introduced technologies requires regular visits and monitoring to ensure that networks of contacts are built with clientele on predictable but not rigidly scheduled basis. Monitoring according to Casley and Kumar (1987) is essentially an internal function that provides management with continuous input so that operations can be adjusted for increased efficiency.

3.4 Internal Factors

Internal factors, which largely influence the adoption of improved technologies, include demographic characteristics of the potential adopter and the socio-cultural environment of the adopter.

Demographic characteristics such as age, literacy, attitudes and interests are noted to have tremendous influence on the trial and adoption of technologies. Njoku (1981) indicated that the level of technology trial and adoption is influenced by the farmers' age, literacy rate and access to material inputs of a technology.

Socio-cultural and economic obstacles to change are discussed on the basis of whether they lie within the farmer or with the farm environment. Swanson (1984) identifies tradition, values and beliefs, illiteracy, lack of motivation for achievement, insufficient resources to take advantage of opportunities, low level skills and limited aspirations as socio-cultural and economic factors related to the adoption of technologies. According to him because of certain traditional beliefs values or cultural practices clients felt unconcerned with improvement, unwilling to take risk or unable to take advantage of existing opportunities. Ahmed (1980) and Carr (1980) noted that most technological innovations are rejected by rural women because they do not meet the priority needs of the people and that socio-economic and cultural factors are not considered in their design.

3.5 Perceived Characteristics of Technology

Many studies on adoption of improved technologies identified one or other perceived characteristic of the technology as a major contributing factor in determining the acceptance or rejection of a technology. This study has also incorporated these perceived characteristics into the model to find out whether they contributed in any way to the rate of trial of the improved palm oil processing technology.

Fliegel and Kivlin (1966) observed that innovations perceived as most rewarding and involving least risk and uncertainty are accepted and tried most rapidly. According to Rogers (1962) technology stands the chance of being accepted if there is evidence of it having a comparative advantage over an old practice in place. The relative advantage of an innovation as perceived by members of a social system is positively related to its rate of adoption (Rogers, 1995).

Tetteh (1987) believed that the compatibility of new ideas and practices with the values and experiences of people constitute a significant determinant of the rate of trial and adoption of improved technologies. Adams (1982) noted that a technology that is at variance with the potential adopters' value system and management objectives is unlikely to be acceptable.

Rogers (1995) asserted that the complexity of an innovation as perceived by the members of a social system is negatively related to its rate of adoption. The quicker the perception of the results and advantages of a technology by a farmer, the more likely he is to accept it.

The perceived observability of an innovation is positively related to its rate of adoption (Rogers, 1995).

A typical rural dweller may be reluctant to jeopardise his family's livelihood by adopting innovations that to him are untested (UN, 1989). Thus before accepting a technology, he prefers to try it on a small-scale. Rogers (1995) observed that new ideas that can be tried on the installment plan are generally adopted more rapidly than innovations that are not divisible.

It stands to reason therefore that any technology which has the requisite perceived characteristics, acceptable to the beneficiaries, and introduced taking cognisance of motivational factors such as incentives, adequate training and proper monitoring is likely to be accepted and used. Superb interplay of motivational factors and socio-economic and cultural factors without corresponding desirable perceived characteristics of the technology and vice versa, might lead after all to the rejection of the technology. Through efficient monitoring and feedback mechanisms, overhauling of the transfer process and the modifications of the technology could be geared towards the acceptability and continuous use of the technology.

3.1 Conceptual Framework

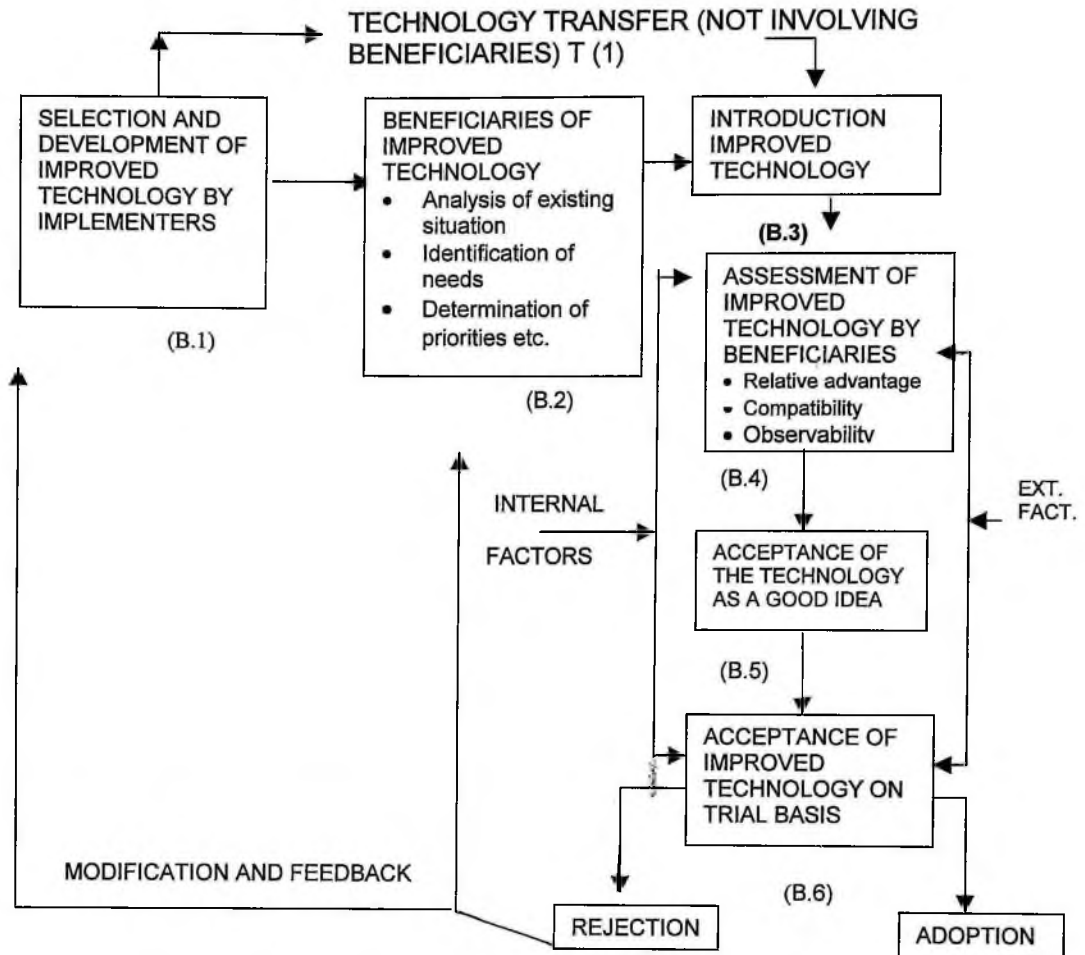


FIG. 3.1 A Conceptual Model of A Technology Transfer Process and Adoption

3.6 Technology Transfer Process and Adoption

Technology Transfer process, signifies a regular sequence of political, economic and technological events involving the selection, development and submission of a new technology by an agency or organization and their client with the aim of helping the clients to apply the new technology (Enos, 1985).

Technology transfer process according to this study connotes all activities and methods involved in the selection, development and introduction of the fruit pounders and oil presses into the palm oil processing industries in Dodome and Tsyome communities.

Singer (1982) emphasized that the appropriateness of a major source of technology, its value for development and its adoption depend on proper selection, proper condition of transfer and proper dissemination. He further stated that in selecting and transferring technologies, the role of factors such as ownership of land and other resources, training and education, entrepreneurship and scarce management resources as well as the resources currently used in the production process must be considered.

Enos (1985) found out that for a technology transfer process to be complete, and for the technology to be adopted, the following stages of the transfer process must be observed:

- i) determining the needs and objectives of the people;
- ii) surveying the alternative technologies and suppliers available;

- iii) choosing a particular combination of technology supplier, location and method of finance;
- iv) disseminating the technology throughout the economy and
- iv) improving upon the imported technology.

Johnson and Kellog (1984) on their part outlined what they termed a general approach in the transfer of technologies. According to them if technologies are to be accepted by beneficiaries, there must be careful diagnosis of farmers circumstances and actions in the area, planning and designing technological adaptation, on-farm testing and verification, multi-locational trials and dissemination.

UNIFEM (1993) asserted that in view of the considerable range of technologies available for improved extraction of oil, for example, selection of the most appropriate technology for a given environment requires a careful examination of socio-economic relations. These socio-economic relations include social organization, ownership and control of resources and the need to provide support services such as training and credit.

Flores, Bueno, Lapastora (1983) stressed that in all attempts to induce change in behaviour "from outside" the process of induction must be concerned with the establishment of cognitive, motivational and behavioural structures.

Boone (1985) outlined the following steps to follow when transferring an innovation.

- i) study, analysis and mapping of the organizations publics;
- ii) identifying and interfacing with target publics;
- iii) identifying and interfacing with leaders of target publics;
- iv) collaborative identification of needs;
- v) assessment and analysis of needs specific to target publics;
- vi) translating the needs into objectives
- vii) specifying general educational strategies and learning activities;
- viii) developing plans of action;
- ix) monitoring and evaluating programmes.

He elaborated that within each of these stages of the transfer process, there are specific processual tasks (activities) which must be performed to encourage beneficiaries to accept and use technologies introduced.

Processual tasks as stipulated by Boone (1985) include:

- 1. Assessing existing situation of the Potential Target, otherwise known as situation analysis**

Blackburn (1989) stressed the need for diagnosing the situation the potential population must work within and that important problems need attention.

Swanson (1984) also stressed the need for extension agents to understand the socio-cultural systems of the target group if they as change agents are to be successful in establishing the kind of rapport necessary for transferring any information, skills or attitudes to them. The socio-cultural systems according to

him include values and belief systems, the nature of family relationships and other social interactions of any community.

UNIFEM (1993) working on planning a project/enterprise, stated that socio-economic issues are of fundamental importance in baseline data or feasibility studies at the initial stages of project planning and advocated the use of simple one or two-sentence questionnaire or YES/NO answer-questionnaire to assess the existing situation of the target.

Swanson (1984) also supported the analysis of existing situation of the target in the transfer of technologies and advocated the use of assessment surveys which deal with the examination of the target and their undertakings.

Foley (1991) in a discussion paper on women and energy expressed the view that events of the key assumptions underpinning the energy assistance policies of the past two decades, though plausible at the time, were wrong. She further stated that there were also flaws in the design and implementation of many energy assistance projects at a detailed level, because they were launched without adequate analysis of the existing situation of the women.

2. Identifying Needs of Potential Clients

Tyler (1971) defined needs as the difference between the present condition of the learner and an accepted norm. Boone (1985) defined it as a deficiency, imbalance, lack of adjustment or gap between the present situation and a set of societal norms believed to be more desirable. According to him the needs of

people can be determined by collecting and studying pertinent information about the existing situation of the people. He advised that such information must be carefully collected, analysed and interpreted by the change agent and leaders of the target public. He further advised that the change agent in collaboration with the leaders of the target group must properly use the interpreted information to analyze the needs of clients. This must be done in such a way as to stimulate interest among the target group and also to arrive at a possible course of action to fulfil the needs.

Conyers and Hills (1984) and Boone (1985) observed that the key to need identification and selection lies in the analysis of data and collaborative decision-making about needs. Boone (1985) further observed that the appropriate ways by which a change agent can obtain information about a target public's needs are continuing interfacing with leaders of target publics, listening, surveys, community studies, checklists, questionnaires and the use of census reports or other compilation of data. He reiterated that information to be gathered must relate to the current trends and projections, physical factors, what the people perceive their needs to be, and public issues and policy. He further stated that such information could be gathered from social norms, research findings and value judgments.

Woodworth and Dashiell (1995) emphasised that the development of adoptable technologies for small-scale farmers especially in developing countries requires an understanding of the farmers conditions and priorities. This is evident in Gockah's (1994) assertion that, the timely determination of the priority of the

women in the North for the adoption and use of less tedious and more efficient mechanized sheabutter processor has made it very possible for them to produce more and good quality sheabutter for sale in Ghana and abroad.

Essandoh (1994) observed that it takes time for innovations to be accepted but the ready acceptance of mechanised sheabutter processing methods introduced to women in the Upper East region by Wa ITTU is a proof of technology efficiency, proper determination of the priorities of the people and the massive campaign used to educate the small-scale industrialists on the benefits of adopting improved technologies. Flores, Bueno, and Lapastora (1983) found out that it is very expedient that felt needs, priorities, desires and interests of the learner must be recognized in planning effective programmes, that the learner must see the value, the purpose and ends of the programme and that the learning experiences must bring satisfaction and sense of achievement to the learner.

3. Selecting Target Clients And Identifying Resources

Available To Them

For effective diffusion of new ideas change agents must work with homogeneous categories of clients. Clients according to Swanson (1984) can be differentiated into groups based on their gender and age by using some broad based socio-economic factors such as size of enterprise, labour hired, communal or customary inputs availability, capital resources and influence ability. Boone (1985) suggested the diagnosis of organization's publics and their perceived relevance to the mission statement in identifying those clients to be served.

Swanson, Rollings and Jiggins (1984) stated that it is necessary to carry out further analysis of different user categories after identifying the different categories of intended users of an innovation. They advocated the use of case study method to assess the problems, needs, ideas and opinions of representative clients in each target category. Through collaborative efforts of the change agents and selected clients and their leaders all available resources could be identified (Compton, 1984).

4. Designing Plans Of Action

Plans of action may be defined as specific teaching strategies and learning experiences to guide a change agent in fulfilling macro needs through attaining macro objectives contained in the planned programme (Boone, 1985). Conyers and Hills (1984) observed that plans of action direct change agents to specify possible courses of action to solve problems and achieve desired planning goals and objectives. Actions must be carried out according to strategy. Actions that are likely to meet objectives according to Beaudoux; Crombruggle; Douxchamps; Gueneau and Nieukerk (1992), have to be accurately described and sequence for each action has to be proposed along with schedules and task descriptions for the various partners.

In arranging learning experiences or activities, agents should make sure the learning experiences are ordered and sequenced so that they re-inforce one another to create awareness, stimulate interest, provide information and ultimately encourage behavioural change or adoption of a new idea by the client.

Compton (1984) cautioned that since people have different learning styles it is important to match them with the appropriate teaching strategies. He further stated that regardless of the teaching strategies decided upon, it becomes necessary to specify the resources needed to help carry out the activities in the action plan.

5. Implementation of Technology Transfer Programme

Conyers and Hills (1984) refer to implementation as the whole process of translating objectives into visible results in form of specific projects or programmes of action.

ARRD (1990) identified the use of positive incentive systems, regular field visits, linkage between information inputs and support services and training as the means at hand for implementing extension programmes.

Beaudoux et al (1992) working on a mill project outlined the following phases of action to follow in implementing such projects.

- i) Meetings/discussions (decisions on priorities);
- ii) Information exchange;
- iii) Decision on village initiatives to be taken and the installation of a committee;
- iv) Discussions on technical, economic and organizational aspects of the project;

- v) meeting/debate/discussion on every aspect of the operation and of the equipment and of its modality particulars;
- vi) A 4-day information session for the members of the committee and 2 weeks for the miller;
- vii) One day demonstration on the equipment;
- viii) Meeting debate to discuss information provided by indicators during the monitoring phase as a means of evaluating the first year phase of the project.

Beaudoux et al further stated that strategic thought on the projects long-term development is also required. That the first year might involve installing some units of the equipment to set in motion a dynamic process of organization, testing, training methods and proposing selection criteria. Then from the second year the strategy could be to consolidate the organization of the first equipment and to install new ones based on recommendations made in the first phase.

In implementing programmes, a variety of educational and communication methods are utilized. Swanson (1984) identified field demonstration as the centre of much extension work. He stated that it is necessary to provide group leadership training for leaders chosen by their peers. He suggested the provision of supportive communication services which provide useful and timely information for the dialogue groups.

6. Monitoring and Evaluating the Programme

Throughout the duration of a programme it is important to know at all times which stage has been reached and what progress has been made to manage the implementation smoothly and effectively. Beaudoux et al (1992) defined monitoring as a continuous process of collecting and processing data. According to them it is essentially done by the partners involved in the action - the community partners and the support NGOs. They further explained that monitoring makes it possible to detect implementation anomalies, to correct action, management and effect technical reorientation. Boone (1985) on his part stated that in monitoring, important and crucial adjustments or modifications in an on-going activity are made as quickly as possible to ensure maximum behavioural change.

He outlined activities that should be undertaken when monitoring an on-going plan of action:

- i) Creating a two-way communication network with those assisting or taking part in the programme by adopting a participant observer role.
- ii) Process and evaluate the feedback obtained.

Evaluation, according to Beaudoux et al (1992) is a more complete analysis process of action. That evaluation is carried out at selected times and its purpose is to make periodic judgement on the action and if necessary it is re-orientated.

Seepersad and Henderson (1984) stated that when extension programmes are implemented, agents undertake an evaluation of the on-going project

systematically assessing the value of the implemented programme. Evaluation process according to them includes:

- i) the collection of data relating to the criteria;
- ii) providing information that adequately addresses the concerns.

UNIFEM (1987) proposed the following guidelines in introducing improved technologies:

1. Feasibility study, which includes sociological, technological and economic areas of study.
2. Survey of existing technologies.

Methods for dissemination, introduction and follow-up.

Considerations for users such as:

- (i) identification of user need,
- (ii) cost-effectiveness of equipment,
- (iii) ownership and management of equipment,
- (iv) maintenance of equipment, and
- (v) user income.

3.7 Communication, Knowledge Generation and Acceptance of Innovations

Communication is a process in which participants create and share information with one another to reach mutual understanding (Rogers, 1995). One way to increase the probability of widespread acceptance and use of new ideas is the systematic use of communication (Hedebro, 1986). Adams (1982) stated that

large numbers of clients can be made aware of innovations by mass media but trial and adoption will depend on the initial message being reinforced through personal contact with opinion leaders within the social system.

According to Hedebro (1986) the transfer of a new tool to a society does not only mean that the society has acquired a more efficient way of solving a practical problem, it may also imply other changes. He explained that the introduction of the new object may bring about changes in the established social organization. Also traditional authorities and ways of thinking may be threatened and there would be the need to establish a social order better adapted to the new products and ideas through effective communication.

Dissanayaka (1978) observed that knowledge when disseminated through culturally esteemed opinion leaders in a community is more likely to be accepted than when disseminated by people who do not enjoy a high degree of cultural esteem even though they may be quite knowledgeable in the specific field. He further made the observation that in our diffusion studies we tend to regard culture as an unproblematic concept but this is a highly contested concept. He advised that it is imperative that we pay greater attention to this terrain of contestation.

According to Rogers (1995) apart from the five perceived attributes of innovation, namely, relative advantage, compatibility, complexity, trialability and observability, other variables also affect an innovation's rate of trial and adoption. These include the type of innovation decision, the nature of communication channels, diffusing the innovation at various stages in the innovation decision - process, the nature of

the social system in which the innovation is diffusing and the extent of change agents promotional efforts in diffusing the innovation.

Hedebro (1986) indicated that the individual collects information from various sources but the different sources vary in importance depending on where in the decision process the individual is. He explained that the mass media are of greater significance in the first step than they are later. The mass media, according to him has a unique property in their ability to make things known to the public but when the person makes up his mind about what to think about a new product, he will more likely turn to other people, family friends or neighbours. These people form his net of interpersonal channels and he can discuss the new things he has experienced with them.

Clients prefer interpersonal contacts with authoritative people when seeking detailed information they require to make a decision about whether or not to try or adopt an innovation (Blackburn, 1989).

If any major positive outcome is to be expected when technologies are being transferred, change agents have to engage in a dialogue with the people involved (Hedebro, 1986). They have to listen to their problems and to adapt their efforts to how well equipped the people are to make use of the equipment in question. He pointed out further that the risk of failure of an innovation is greater without communication.

Even though extension communication is powerfully reinforced by the informal communication which takes place among beneficiaries of innovations on a day to day basis, for the diffusion rate to increase and for the innovations to be accepted, however, informal communication about performance would have to be consistent with persuasive messages from extension.

On knowledge generation by beneficiaries of an innovation, studies by Waters-Bayer (1988) illustrates that formal institutions of agricultural research and extension are not the sole agents of innovation and dissemination of new technologies. Evidence from parts of the world shows that the central source of innovation model does not conform with reality (Roling 1988 and Biggs 1989). Most agricultural technologies in use in the world today were developed by farmers, not by formally educated scientists. Apart from adaptations of innovations introduced from elsewhere, farmers may routinely make careful observations and trial of new ideas and trials of new procedures or work methods (Reijntjes; Haverkort and Waters-Bayer 1995).

Beneficiaries of Technologies are most innovative in devising and experimenting with various component technologies where change agents did not attempt to be directive in promoting a technology "package" (Connell, 1990). Box (1987) revealed the existence of local networks of farmers who regularly discuss among themselves and form concepts, adapt ideas, integrate knowledge and determine acceptable action. As a result of knowledge developed from technology trials, it is



possible to define the conditions for which the technologies are suitable and to formulate recommendations for their transfer (Swanson, 1984).

3.8 Socio-Economic Factors

The introduction of any new processing system to rural areas requires a thorough understanding of the socio-economic and cultural relations of the users. UNIFEM (1993) pointed out that socio-economic research needs to be conducted along side technical research if technologies which seem to be applicable, relevant and acceptable are to be introduced. In making changes, it is advisable for the change agents not to move from the status quo to the new conditions until they have obtained agreement on the method of transition if resistance is to be reduced to the minimum. This agreement could be achieved through the use of rewards, through bargaining, through participation or through some combination of these approaches. According to him, it is important to note that, the acceptance of change depends on the degree to which the innovation is superior to the idea it supersedes, either economically or technically or in sociological or psychological terms. It also depends on the degree to which the innovation is consistent with the existing values and past experiences of those who may adopt it.

The nature and extent of a technological change differ depending on levels of development and other socio-economic and cultural factors. The effect of change of a technology on women, for example, will usually depend to a large extent on their traditional role in particular, socio-economic settings and to the ways in which

they as producers and end-users of a technology are able to participate in decisions relating to it.

A world survey by United Nations (1989) indicated that technological innovations such as food processing tools, improved cooking stoves intended to benefit women have not necessarily been very successful because they were introduced without sufficient research on women's traditional tasks, socio-cultural norms and habitats. Such technologies produced no obvious improvement in women's lives and in most cases negatively affected them. It was found out that in some cases the technologies were rejected from the beginning. On the other hand according to the report, women were most receptive to those innovations that were linked to traditional institutions or groups. It was observed that it is very important that women are given the opportunity to participate in planning, designing and eventually in disseminating such technologies. The study also found out that an important way of minimising any negative impact of introducing new technologies in either agriculture and industry is to promote the concept of blending new and traditional technologies.

The idea according to them is to establish linkages between existing traditional technologies and know-how and the new technologies. Also the involvement of women in this process could ensure the relevance of application of new technologies to the specific societal needs in upgrading traditional methods.

Youdeiwei et al (1990) stated that in transferring technologies, it is important to determine where the people are and begin from there rather than planning and

implementing programmes beyond their capabilities. That there must be the encouragement of local participation in designing and implementation of programmes, voluntary involvement in programmes with absence of force or coercion, use of local community and the development of programmes based on mutual trust and respect and the use of effective communication.

Axinn (1991) stated that the learning and adoption of improved practices are facilitated by the existence of and participation of the rural people in organized groups, that clear understanding of goals of such practices are necessary for the achievement of the programmes goals. Boserup (1970) argues that women's status varies with the nature of productive activity and their involvement in it and that women's status is high where their involvement in productive activity is high. Axinn (1991) observed also that approaches to technology transfer that utilize both technical information from indigenous knowledge systems and from international scientific systems are likely to be more effective than technical information only from one of these sources. He noted also that the extent to which the goals of any agricultural related programmes will be achieved tends to be directly related to the extent to which various cultural factors are taken into consideration in planning the programme. He reiterated that the success of projects depends on the extent of personal contact between the people of the locality and the change agent and that technologies or innovations are easily accepted and sustained if the benefits to the clientele tend to be greater than the costs of the clientele.

3.9 Technology Transfer and Credit

Economic factors are often a constraint in the acceptance of improved technologies. Women are frequently denied access to formal lines of credit because they cannot provide any collateral and they usually do not have access to advice on how to obtain loans on an individual, group or co-operative basis (UNIFEM, 1993). The report further stated that in formulating any project, planning should include defining motivation, management, administration, organization of the participants training and credit.

Goka (1989) observed that the scale of operation of most rural on-farm activities is generally small. Consequently the levels of output and income are also low. He observed that to expand operations and to increase output and income, there is the need for investment in capital assets, since generally capital has not been available to these people from their own savings and resources. He stressed the need for capital in the form of credit to be made available to the producer for production with the anticipation of future repayment with interest. Women will be reluctant to accept new technologies particularly when they require capital investment which do not reduce the more arduous aspects of the work and which do not prove to be viable and appropriate to their needs (UNIFEM, 1993).

Ministry of Agriculture (1990) noted that the options for strengthening the small-scale group-processing sub-sector should include promoting stronger women's groups to achieve economies of scale, securing group credit and expanding their market outlets.

Njoku (1981) observed that increasing extension supervision and improving access to credit enhance technology adoption much more than merely developing technologies and making them available. Farmers inability to adopt innovation according to Swanson (1984) can stem from lack of resources, inability to qualify for credit and in general, poverty. An alternative view of development strategy places central emphasis on lack of resources as an inhibitor of farmer adoption decision (Morrison et al, 1984). Russo (1989) reported that lack of access to formal credit services is often an insurmountable barrier to women.

3.10 Technology Transfer, Incentives and Adoption of Improved Technology

Swanson (1984) observed that appropriate incentives are necessary if active interests of the people are to be sustained in agricultural projects. According to him without appropriate incentives there cannot be that dedication and sense of duty and honesty required in order to successfully mobilize resources and efforts to achieve results.

Many change agencies award incentives to clients to speed up the rate of adoption of innovations (Rogers, 1995). According to him the main function of incentive for adopters is to increase the degree of relative advantage of the new idea. He observed that incentives are direct and or indirect payments of either cash or kind that are given to an individual or a system to encourage some overt behavioural change.

Rogers (1995) again noted that some incentive policies are designed only to encourage trial of a new idea. He observed that the strategy is to facilitate trial use and that full-scale adoption will follow if the innovation possesses a potential relative advantage that can be perceived by the receiver. The transfer of Technology cannot therefore be productive in the absence of incentives that make it worthwhile for farmers to adopt and use the new techniques and new knowledge (Swanson, 1984).

Adoption is defined as the decision to apply an innovation and to continue to use it (Van den Ben and Hawkins, 1996). Adoption in the context of this study however denotes the Trial and the subsequent acceptance of the improved technology.

3.11 Technology Transfer and Education and Training

In the transfer of Technologies according to Anderson (1991), training and advice should be oriented to winning acceptance, not only of the technological package itself, but of the managerial and institutional changes necessary to ensure productive use of these technologies. There is also the need to give training in skills related to running small businesses, for example, groups need better skills in accounting and money management to keep track of loan payments and fees collected and to make purchasing and selling decisions (ILO /NCWD, 1985).

Education and training programmes are mentioned as one of the three basic mechanisms by which technologies are transferred. Anderson (1985) indicated that Training systems, for the use of the technology being transferred, will

complete the transfer process as project beneficiaries learn to use and maintain the technology. Thus training is one of the most vital tools of Human Resource Development (HRD). The term Human Resource Development (HRD) may be defined as a process of organizing and enhancing the physical, mental and emotional capacities of individuals for productive work (Arya and Tandon, 1991).

Training is the organized procedure by which people learn knowledge and/or skills or attitudes for a definite purpose. It is a process of skill building of man. It is also a total of developing an individual's ability and effectiveness to perform in his present and future jobs. It can strengthen the interpersonal relationship, increase team work and collaboration and reduce wastage. It was recognized that instead of merely imparting knowledge, training must play an effective and important role in helping to actually improve the performance of the individual on the job (Bansal, 1991).

It is crystal clear that the success of an enterprise depends on the quality of its people. "It is the man at work who is important not the machine". It is only where the working force is sufficiently literate, educated, trained and mobile to take advantage of new advances in techniques in organization of production that the creation of a built-in industry of progress becomes possible (Singer, 1973). Provision of formal education from elementary to higher level, technical and professional, on-the-job training and adult education are some of the avenues available for developing human resources. Provision of any of these forms of education and training also create a state of rationality, which in turn predisposes

an individual to the trial and adoption of new practices. The assumption according to Lionberger (1968) is that schooling facilitates learning which in turn is assumed to instill a favourable attitude toward the use of improved technologies. Petzel (1976) also stated that farmers with better education are earlier adopters of modern technology and apply modern inputs more efficiently through the process.

Education may thus make a farmer more receptive to advice from an extension agency or more able to deal with technical recommendations that require a certain level of numeracy or literacy. Feder, Just and Zilberman (1982) found that education plays a strong role in determining rates of trial and adoption of new technologies in developing agriculture. Kebede, Gunjal and Coffin (1991) indicated that adoption of technology by farmers increased dramatically with the level of education of farmers. It is also reported that the level of education of target users of technologies is significantly related to its adoption in progressive communities (Kumar and Wasnik, 1989)

3.12 Technology Transfer and Gender

According to Anderson (1985) literature on technology transfer now acknowledges that technologies are not value free or value neutral. She further stated that it is true, though less often acknowledged, that technologies are not gender neutral. She explained that in every society there is a gender-based division of labour and technologies have different and differential impact on men and women. She observed further that if men and women do different things, then any particular technology would affect the roles of men and women differently. A technology

may alter the components of a productive task, breaking it into separate functions in a way that alters the gender roles in the separate, changed parts of an activity.

An improved technology may focus on a single component of a job rather than the entire tasks and by so doing alter productive relations between men and women. Improved technologies also affect doers of activities by saving labour or generating employment. In certain circumstances, a decision to employ a labour intensive technology may draw women into the labour force to tasks not previously and traditionally theirs (Hart, 1986). Anderson (1985) also noted that improved technologies may change the doer of a productive activity by changing the production process itself, the effects of which may be employment generating or labour saving. She also observed that when technologies change the location of any tasks, they might result in the exclusion of women from the work or in changes in traditional work patterns.

Anderson (1985) found out that in every case where machinery was introduced in activities traditionally done by women, men either completely replaced women or the activity became subdivided. Men then took over the tasks that used the technology and required greater skill while women were relegated to the less skilled menial tasks. These shifts, according to the study are accompanied by loss of income earning opportunities or marginalization and lower income for women. Boserup (1970) also observed that men monopolise the use of new equipment and modern methods hence men's labour productivity tends to rise while women's remain static. Marginalization of any group in relation to technology development

and use not only leaves them out of current benefits to be derived from the technology, but also consigns them to an inferior position in relation to future developments. It limits, if not prohibits, their ability to participate in self-sustaining development based on the invention and application of techniques and technological systems. Williams (1982) pointed out how technological change in gari processing which has traditionally been the occupation of women has shifted the job of operating machinery from women to men and boys, depriving women of an important source of income. Masculinization of agriculture which is believed to be the phenomenon when technologies are applied to agriculture, according to Anderson (1985) is also found in industry. She indicated that as rice milling became industrialized in Indonesia men run the mills thus the modernization of milling brought also its masculinization.

Novicki (1995) noted that Technological changes often aggravate the disadvantaged situation of women. A study by FAO (1987) revealed that technological changes in agriculture add disproportionately to the labour demands on women. According to the report, the use of plough or fertilizer requires additional weeding of fields if the gains are to be fully realized. When such technical improvements are applied to men's crops, time available to women for their own productive activities and their other household and food related tasks are reduced.

Apart from the alteration of roles played by women in particular through technological changes, women also perceive technological innovations in different

other ways. It has been observed that of late various technological innovations have been placed at the hands of women processors. However most rural women do not use the improved technologies because of their perception about the taste of the product. For example it was observed that in Burkina Faso mechanical mills introduced to decrease the time spent by women ended up being used only when they are tired or busy because they perceived the taste of the grain to be poorer than when hand ground (Huffman, 1987).

It has also been revealed that women often prefer working in home industries, which often employ traditional technologies, rather than large-scale industries, which often employ improved technologies, because of a great advantage of a more flexible working hours in home industry. The woman is able to keep an eye on the children when working and can interrupt the work when domestic duties require attention. Employment in home industry is also preferred because it does not entail contact with persons outside the woman's own family and particularly because the woman does not have the risk being under the supervision of men who are not members of the family (Boserup, 1989). Olawoye (1993) contended that the rural man has traditionally been the recipient of most agricultural extension services. However Spring (1986) pointed out that the assumption that agricultural messages given to men would trickle down to their wives has not usually occurred.

3.13 Characteristics of Technology

The perceived attributes of an innovation are one important explanation of the rate of acceptance or adoption of an innovation. It is believed that from 49 to 87

percent of the variance in rate of adoption is explained by five attributes namely Relative advantage, compatibility, trialability, complexity and observability (Rogers, 1983). Other variables, notably, the type of innovation-decision, the nature of communication channels diffusing the innovation at various stages in the innovation-decision process and the nature of the social system in which the innovation is diffusing affect the adoption of technologies . Also the extent of change agent's promotional efforts in diffusing the innovation affect an innovation's rate of adoption.

On the relative advantage of an innovation, Fliegel and Kivlin (1966) observed that innovations perceived as most rewarding and involving least risk and uncertainty are accepted most rapidly. According to Rogers (1962) technology stands the chance of being accepted if there is evidence of it having a comparative advantage over an old practice in place. The degree of relative advantage is often expressed in economic profitability, saving of discomfort, in status giving among others depending on the perception of the beneficiary of the innovation. Kivlin and Fliegel (1966) explained relative advantage as saving of discomfort. Rogers (1995) also explained that the advantage of 2, 4-D Weedspray over previous methods of weed control was a reduction in unpleasant labour requirements rather than a direct financial gain from higher crop yields. Fliegel, Kivlin and Sekhon (1968) also explained relative advantage as saving of discomfort. The relative advantage of an innovation as perceived by members of a social system has been found to be positively related to its rate of adoption (Rogers, 1995).

Tetteh (1987) believed that the compatibility of new ideas and practices with the values and experiences of people constitute a significant determinant of the rate of adoption of improved technologies. An innovation may be compatible or non-compatible with socio-cultural values and beliefs, with previously introduced innovations or with target group needs. A technology that is at variance with the potential adopter's value system and management objectives is unlikely to be acceptable (Adams, 1982). Thus an innovation's incompatibility with cultural values of the target public or group can block its adoption. For instance, farmers in America place a strong value on increasing farm production, however, soil conservation innovations are perceived as conflicting with this production value and have generally been adopted slowly (Rogers, 1995). An innovation may also be non-compatible not only with deeply imbedded cultural values but also with previously adopted practices or ideas. Old ideas or practices are the main tools with which new ideas are assessed. Another indication of compatibility of an innovation is the degree to which it meets the needs felt by the clients or the target group. An innovation that addresses the expressed needs of the target group has a faster rate of adoption (Celis, Milimo and Wanmali, 1991).

Complexity is the degree to which a technology is perceived to be relatively difficult to understand and use. Some innovations are clear in their meaning to potential adopters whereas others are not. The complexity of an innovation, as perceived by members of a social system is negatively related to its rate of adoption (Rogers, 1995).

Farmers will be more inclined to adopt an innovation which they have tried first on a small-scale and which performed better than the innovation they have to adopt immediately on a large scale. A United Nations study (1989) revealed that a typical rural dweller may be reluctant to jeopardise his family's livelihood by adopting innovations that to him are untested. Thus before accepting a technology he prefers to try it on a small-scale. Rogers (1995) observed that new ideas that can be tried on the installment plan are generally adopted more rapidly than innovations that are not divisible.

The results of some ideas are easily observed and communicated to others, whereas some innovations are difficult to observe or to describe to others. The quicker the perception of the results and advantages of a technology by a farmer the more likely he is to accept it. The perceived observability of an innovation is positively related to its rate of adoption (Rogers, 1995).

3.14 Trial of Innovations

Trial is the tentative trying out of a practice or idea, accompanied by acquisition of information on how to do it (Lionberger, 1968). For a technology to be tried a careful explanation of the farmers duties and expectations must be made prior to initiating the trial (Swanson, 1984). Farmers will also try and finally accept a new practice or technology when they perceive that the benefits are great enough to outweigh the costs (Swanson 1984). He however hinted that every farm trial has to be closely monitored in order to provide the maximum amount of information concerning the production technology.

Zandstra et al (1981) stated that it is better to have less complex trials in order to meet the limited resources of co-operating farmers and to facilitate eventual diffusion by extension agents. It is also noted that more progressive farmers are usually easier to work with, and ensure a higher degree of success with trials. However, results from such trials are probably not representative and may provide biased answers to the appropriateness of the technology (Kirby, Gallegos and Cornick, 1981).

Zandstra et al (1981) noted that an important criteria for trying technologies lies in the variation in yield and economic measures of the returns from the new practice. He noted further that an experimental practice that offers returns above variable costs more than 30% greater than that of prevalent farmers' practices might be recommended for adoption. Rogers (1995) observed that new ideas that can be tried on the installment plan are generally adopted more rapidly than innovations that are not divisible.

Wealthier farmers may be first to try a new technology especially if it involves purchasing of inputs. This may be because wealthier farmers are more able to take risk or have better access to extension information or to credit, or they may be able to use their own cash resources to experiment with new techniques.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results of the study carried out at Dodome and Tsyome to determine the demographic characteristics of the Palm oil processors, how the Improved technology was introduced into these communities and the factors which influenced the acceptance and non -acceptance of the innovation. The chapter also deals with the discussion of the findings of the study.

The chapter is presented in the following order:

- Demographic characteristics of the oil palm Processors
- Other relevant information on the use of the improved technology
- Technology transfer process
- Communication and Knowledge generation
- Socio-econo-cultural factors
- Major problems encountered using the improved technology
- Technology Transfer and gender
- Characteristics of the improved technology
- Participation of beneficiaries in the implementation of the project
- Ownership of project
- Benefits of the improved technology
- Acceptance of the improved technology
- Reasons for non-acceptance of the improved technology

4.2 Demographic Characteristics of Palm Oil Processors

The demographic characteristics of the Palm oil Processors looked at the Gender of the Processors, the Age distribution of the Processors, their Level of Education, Marital Status, Whether the Processors have Dependants or not, and also the Experience of the Processors in the Palm oil processing business.

4.2.1 Gender

Out of the one hundred and thirty two (132) palm oil processors interviewed, one hundred and four (104) of them representing 78.8% were women and twenty eight of them representing 21.2% were men as shown in Table 4.1 below.

Table 4.1: Frequency Distribution of Respondents (Processors) by their Demographic characteristics

CHARACTERISTICS	Freq.	%	cum.%	Mean	SD
GENDER					
Male	28	21.2	21.1		
Female	104	78.8	100.0		
Total	132	100.0	-	-	-
AGE					
21-40	47	35.6	35.6		
41-60	63	47.7	83.3		
61-80	21	15.9	99.2		
81 and above	1	0.8	100.0		
Total	132	100.0	-	47.3	13.6
LEVEL OF EDUCATION					
No formal education	10	7.6	7.6		
Primary	73	55.3	62.9		
JSS	2	1.5	64.4		
Middle	35	26.5	90.9		
SSS	3	2.3	93.2		
Tertiary	9	6.8	100.0		
Total	132	100.0	-	-	-
MARITAL STATUS					
Single	2	1.5	1.5		
Married	111	84.1	85.6		
Separated	3	2.3	87.9		
Divorced	6	4.5	92.4		
Widowed	10	7.6	100.0		
Total	132	100.0	-		
DEPENDANTS					
1 - 5	93	70.5	70.5		
6 - 11	35	26.5	97.0		
12 - 17	2	1.5	98.5		
18 and above	2	1.5	100.0		
Total	132	100.0	-	4.7	2.8
EXPERIENCE (YRS)					
Traditional					
1-10	63	47.7	47.7		
11-20	37	28.0	75.7		
21-30	12	9.1	84.8		
31-40	7	5.3	90.1		
41-50	10	7.6	97.7		
51 and above	3	2.3	100.0		
Total	132	100.0	-	15.21	

Source: Data from the field.

4.2.2 Age

The ages of the processors ranged from 21 to 82 years. The average age of the processors was 47.3 years as indicated in Table 4.1. Majority of the processors were within the age group of 41 to 60 years. It is however important to note that a sizeable proportion of the respondents (35%) were also found to be in the 21 to 40 age group.

4.2.3 Level of Education

As shown in Table 4.1, majority of the processors numbering seventy-three (73) had their highest level of education up to Primary school. This number represents 55.3 % of the total number of processors. It is significant to note that about 26.5 percent of them had up to Middle school education while 7.6 % of them had no formal education. From this analysis it is obvious that the level of education among the processors is quite low.

4.2.4 Marital status

The results show that most of the processors are married. From Table 4.1 it can be noted that 111 of the respondents representing 84.1 percent were married. The rest representing 15.9 percent were either single, separated, divorced or widowed.

4.2.5 Dependants

The Table 4.1 shows that every respondent had at least one dependant. Majority (70.5%) of them had less than six (6) dependants. Only 29.5 % of the processors had dependants numbering more than six.

4.2.5 Experience

The results of the study showed that each of the processors had some experience in the processing of palm oil. As shown in Table 4.1 above, 109 out of the total number of 132 respondents, representing over 90% had been processing palm oil for the past 40 years.

It is significant to note that 75.7 % of them had up to 20 years experience. Worthy of note is the fact that three individuals have been processing palm oil for the past fifty-one (51) years.

4.3 Other relevant personal information on the use of the improved Technology

Apart from the Demographic Characteristics of the Processors, other Personal information on them which are worthy of note include; the continual use of the improved technology, the regularity of use, Reasons for stopping the use of the Improved Technology and Use of the Traditional method.

Table 4.2: Frequency Distribution of Processors on other relevant personal information on the use of the improved technology

CHARACTERISTICS	Freq.	%	cum.%	Mean	SD
CONTINUAL USE OF IMPROVED TECHNOLOGY					
Yes	97	73.5	73.5		
No	35	26.5	100.0		
Total	132	100.0	-	-	
REGULARITY OF USE					
Once a week (regular)	85	87.6	87.6		
Depends on avail. of fruits (irregular.)	12	12.4	100.0		
Total	97	100.0	-	-	
REASONS FOR STOPPING					
Lack of raw materials	6	17.2	17.2		
Mismanagement of funds	4	11.4	28.6		
Farming activities	7	20.0	48.6		
Lack of skills	2	5.7	54.3		
Technical fault	9	25.7	80.0		
Lack of credit	7	20.0	100.0		
Total	35	100.0	-	-	
USE OF THE TRADITIONAL METHOD					
Yes	35	100.0	100.0		
No	0	0.0	100.0		
Total	35	100.0	-	-	

Source: Data from the field.

4.3.1 Continual use of Improved Technology

On the continual use of the technology, there is the indication from Table 4.2 above that 73.5% still use the improved technology. This represents ninety-seven of the total respondents.

4.3.2 Regularity of use

The frequency of the use of the improved technology was captured by this question. Out of the total number of respondents who still use the technology, 87.6 % of them indicated that they process oil once a week. The rest, representing 12.4 % mentioned that they make use of the improved technology based on the availability of fruits.

4.3.3 Reasons for stopping

The study revealed that a number of problems are associated with the continual use of the improved technology. The problems encountered include poor management of the funds of the palm oil processors association, interference of processing time with farming activities, inadequate fruits all year round, frequent cracking of the nuts by the machine in the course of processing and lack of credit.

As indicated in Table 1 above, 25.7 percent of the respondents mentioned Technical fault as the major problem facing the introduction and use of the improved technology. It is significant to note that lack of credit and farming activities have also been accounted for by 5.7 percent and 20.0 percent respectively as being reasons or stopping the use of the improved technology.

4.3.4 Use of the traditional method

All the respondents (35) who stopped using the improved technology for one reason or the other have resorted to the use of the traditional method of

processing palm oil. According to them in view of the problems being encountered using the improved technology, there is a considerable loss of revenue to them. Thus despite the perceived benefits of the improved technology of which drudgery reduction is paramount they have no other option than to resort to the use of the Traditional method.

4.4 Technology Transfer Process

This section treats the Technology Transfer Process used from the perspective of the Beneficiaries of the technology (Palm oil Processors) and the Implementers of the technology. The Technology Transfer Process discussed in this section which is also in conformity with the existing literature entails:

- the Initiation of the idea of the Improved technology,
- awareness creation,
- medium of information transfer,
- need identification,
- selection of equipment,
- factors considered in the selection of the equipment,
- training of beneficiaries,
- form of training,
- duration of training,
- skill in the use of the improved technology,
- visits by implementers (monitoring),
- use of incentives in the transfer of the improved technology.

4.4.1 initiation of idea of improved technology

From table 4.3, it is apparent that the initiation of the idea to transfer the technology to the beneficiaries was an external manifestation mooted by 31st December Women's Movement, Government and Helping Hand Association for Women's Development.

Table 4.3: Frequency Distribution of Processors on the Initiation of the idea of the Transfer of the Improved Technology

Initiator	Freq.	%
Government	10	7.6
ASIP	27	20.4
HHAWD	15	11.4
31st DWM	80	60.6
Total	132	100.0

Source: Data from the field.

The initiation of the idea to transfer the technology to the said communities was due to the high quality palm oil produced in these areas. Also the indication by the majority of respondents 62.5% that the idea to transfer the technology to the area was initiated by the 31st December Women's Movement was due to the large number of women in the area that belongs to the movement.

The results therefore showed that the beneficiaries themselves were not involved in deciding whether the palm oil processing technology was a felt need or not. Thus the introduction of the improved technology did not emanate from the felt need of the people since palm oil processing is not their major occupation hence

the reluctance of the people to accept the improved technology. One would expect that the introduction of a technology into such a minor sector should be demand driven so that its acceptability and sustainability could be enhanced.

4.4.2 Awareness Creation

Majority of Palm oil processors representing 78.8% (Table 4.4) said they got to know of the existence of the improved technology in 1996. It is worthwhile mentioning that a small number of them representing 6.8% indicated that they heard of the existence of the improved technology in 1995.

Table 4.4: Frequency Distribution of Processors on the time the idea of the Improved Technology got to them

Time	Processors	
	Freq.	%
1995	9	6.8
1996	104	78.8
1997	19	14.4
Total	132	100.0

Source: Data from the field.

Investigations also revealed that the information on the improved technology was carried to the beneficiaries from 1995 through to 1996 by the officials of the implementing agencies. It is therefore not surprising that 6.8% of the beneficiaries mentioned they became aware of the existence of the improved technology in 1995.



This small group of processors could belong to the innovative group in the adopter categories. They could also be termed the contact group or the opinion leaders used to disseminate the information to other people in the community. The information could have spread to others through the sharing of the information with one another. Byrnes (1978) stated that change agents usually contact the target group through contact groups or opinion leaders. He also noted that opinion leaders are often the first recipients of information regarding innovations since change agents attempt to reach their target population through them.

4.4.3 Source/medium of information transfer

With regards to how they received information on the improved technology, 51.5% of the processors mentioned that the idea of the improved Technology reached them through friends. About 38.6% mentioned ASIP as those who carried the information to them. On the other hand, the two groups of implementers namely ASIP and Helping Hand Association for Women's Development (HHAWD) claimed to be responsible for carrying the idea of the improved technology to the beneficiary communities (Table 4.5)

Table 4.5: Frequency distribution of Processors on Source of information on the transfer of the Improved technology and the Medium of information transfer

Source of Information	Processors		Medium of information Transfer	Processors	
	Freq.	%		Freq.	%
ASIP	117	88.6	Radio	10	7.6
HHAWD	15	11.4	Friend	122	92.4
Total	132	100.0	Total	132	100.0

Source: Data from the field.

Potential adopters are likely to adopt innovations depending on the source from which they obtain the information and the medium of transfer. Appropriate information is needed at each stage of the adoption process. Information which is detailed and specific to each particular individual and his situation is necessary, particularly through the active decision making stage. The appropriate information will help the potential adopter to take care of risks and uncertainties and also make the right decisions and then act.

The contention by a good number of the beneficiaries that they got the information from friends could mean that the implementers did not have the chance of meeting all the Processors during their visit and so passed on the information to some social references or those who were available at the time who in turn passed the information to their friends and relatives. Thus friends featured prominently in the diffusion process. Often interventions by cosmopolite change agents are usually unwelcome by the target community, because the community

members doubt the credibility of the change agents. Change agents from the target community are more acceptable to potential adopters because they are known to the local people and are part of their culture.

The result agrees with the findings of Feder and Slade (1985) who revealed that in areas where T&V system was introduced in India, 47% of the farmers mentioned fellow farmers as primary source of information, 19% mentioned village extension officer and only 10% mentioned radio programme as their primary source of information. Where T&V system was not introduced 82% of the farmers mentioned fellow farmers as primary source of information whilst 9% mentioned radio. It also agrees with the findings of Van den Ben and Hawkins (1988) working on sources from which Dutch market gardeners and Indian Peasants first heard of innovations. According to them 30% of the gardeners in India first heard about innovations from local people (friends and neighbours) and only 12% through mass media.

It is evident from the study that friends and neighbours played a vital role in the dissemination of the new idea and that individuals are important information sources providing initial knowledge on a practice and a definite advise as to the course of action to take. The result further conforms to the findings of Adams (1982) that even though large numbers of clients can be made aware of innovations by mass media, trial and adoption will depend on the initial message being reinforced through personal contacts with opinion leaders within the social system.

The result does not therefore agree with the assertion by Lionberger (1968) that mass media are the most useful as source of initial information on innovation. Mass media might probably be more appropriate as an initial source of information in elite and semi- literate societies but not in rural areas such as Dodome and Tsyome with quite a low level of education. It demands therefore that implementers of improved technologies make thorough investigation into the level of education of the people innovations are meant for so as to use a more appropriate means of carrying the information to them.

4.4.4 Need Identification

From Table 4.6, the majority of the Palm oil Processors expressed the feeling that there was the need for the improved technology. As many as 122 Palm oil Processors (92.4%) indicated that there was the need for the technology.

Table 4.6: Frequency distribution of Processors on the need for the Improved Technology

Response	Processors	
	Freq.	%
YES	122	92.4
NO	10	7.6
Total	132	100.0

Source: Data from the field.

Obviously all the officials of the implementing agencies interviewed also indicated that there was the need for the beneficiaries to have and use the improved technology for processing oil. According to the beneficiaries they believed the improved technology could tremendously reduce the immense physical stress and high labour requirement associated with the traditional method of processing palm oil.

The identification of needs and priorities of beneficiaries as a pre-requisite in the transfer of innovations is of a paramount importance and also a right step in the planning process. Proper identification of the felt need of beneficiaries is believed to enhance the acceptance and efficient use of technologies.

According to Gockah (1994) the timely determination of the need of the women in the north for the use of less tedious and more efficient mechanized sheabutter processor has made it possible for the women to produce more and good quality sheabutter for sale in Ghana and abroad. Essandoh (1994) also stated that even though it takes time for innovations to be accepted, the ready acceptance of mechanized sheabutter processing methods introduced to women in the Upper East region was a proof of technology efficiency, proper determination of the needs of the users and the massive campaign used to educate the small-scale industrialists on the benefits of the improved technology.

The essence of need assessment as an aspect of technology transfer process was highlighted by Enos (1985) who stipulated that for a technology transfer process to be complete and for the technology to be accepted, the need and

aspirations of the people must be determined. Woodworth and Dashiell (1995) also asserted that the development of adoptable technologies to small-scale farmers especially in developing countries requires the understanding of farmers conditions, needs and priorities.

Even though the result of the study indicated that the needs of the Palm oil Processors were assessed, and the Improved technology identified as the priority need of the beneficiaries in the Palm oil business, the trend of acceptance and trial of the improved technology by the Palm oil Processors do not agree with the assertions made earlier on.

It therefore be deduced from this situation that the identification needs and impact assessment of the transfer of the Improved technology on the Palm oil processors were not properly or efficiently carried out initially. Even though the Improved technology could be the priority need of the processors in the palm oil business, Palm oil processing is not however the major economic activity in the area. The question then is did the Palm oil processors attribute a high priority to this need? Some of the sentiments expressed by the Processors are that even though they have some knowledge of some advantages of the improved technology they were not convinced of the economic benefits of the equipment when compared with the traditional processing method.

Thus according to ILO/NCWD (1985) since the rural women's existence in their communities is influenced by social and economic factors such as farming, child bearing, domestic chores and petty trading, an introduction of any technology to

rural women without an appraisal of other social and economic factors that affect their daily chores will be tantamount to an imposition of alien technology on them.

4.4.5 Selection of equipment

Results shown in Table 4.7 indicated that the implementers of the technology made the selection and choice of equipment.

Table 4.7: Frequency Distribution of Implementers on who decided on the equipment introduced

Agency	Freq.	%
Manufacturers	18	13.6
ASIP	99	75.0
HHAWD	15	11.4
Total	132	100.0

Source: Data from the field.

Majority of the respondents representing 75% mentioned ASIP officials as those who decided on the type of equipment introduced whilst 25% mentioned HHAWD. The result clearly shows that even though the beneficiaries expressed their interest and need for the improved technology (Table 4.6), they played no role in the selection of the equipment's introduced. The trend does not therefore conform to the assertion by UNIFEM (1993) that in view of considerable range of technologies for improved extraction of oil, the selection of the most appropriate one for a given community requires the involvement of the people, a careful examination of the socio-economic aspects of the people especially the ownership and availability of

the major resources. The exclusion of beneficiaries in the choice and selection of technologies especially machinery is bound to have serious negative repercussions on the smooth operations and sustenance of the equipment.

In this study for example, Technical fault on the equipment was mentioned by 48.8% of the Processors as one of the major problems faced generally trying the improved technology (Table 4.26).

The beneficiaries explained that during the pounding of fruits the nuts are cracked by the teeth of the fruit pounder. This results in a considerable loss in revenue to the processors. It implies therefore that the implementers of the technology did not thoroughly investigate the resource base of the beneficiaries to determine the appropriateness or otherwise of the equipment introduced. It is worth noting that even though the communities are naturally endowed with local palm tress the fruits have large kernels with very thin pericarp and thus making it unsuitable for processing with the kind of equipment introduced. The sort of equipment introduced is ideally suitable for processing high yielding hybrid varieties with very thick flesh. The selection of any processing equipment requires knowledge of the availability of resources, the appropriateness of the equipment in relation to the type of raw material and the quality of the available material and most importantly consultation with the people on the selection and design of the equipment if equipment introduced to rural areas are not to turn into white elephants or abandoned. The non-suitability of the equipment could stem from the fact that the people were not consulted when it was being designed. This result corroborates

with the findings of Ilkkaracan et al (1994) where machines to crack and crush sheanuts were developed and proved acceptable but was abandoned by most women after a few trials because the women were not consulted over the design of the machines.

4.4.6 Factors considered in the selection of the equipment

On the major factor considered in the selection of the equipment, 87.5% of the implementers mentioned the quantity of fruits to process at a time whilst 12.5% mentioned that cost of the equipment was considered. (See Table 4.8)

Table 4.8: Frequency Distribution of implementers on the main factor considered in the selection of the equipment

Factor	Fruit Pounder		Press	
	Freq.	%	Freq.	%
Cost	1	12.5	1	12.5
Quantity of fruits to Process	7	87.5	7	87.5
Total	8	100.0	8	100.0

Source: Data from the field.

Majority of the officials of the implementing agencies believed that the equipment introduced would help process larger quantities of fruits as compared to the traditional method. The result conforms to the findings of Kordylas (1991) that with improved equipment about 65% of oil can be extracted and a greater quantity of the fruit can be handled.

The reason given by the implementers that the selection of the equipment was based on the quantity of fruits to process however did fall in line with the main reason given by the Palm oil Processors for accepting to try the improved technology. Majority of the Processors are appreciative of the improved technology on the grounds of drudgery reduction (Table 4.24). The disparity in the sentiments expressed by both parties is a manifestation of improper analysis of the situation of the people and the consequences of non-involvement of the people in deciding what is appropriate for them. The experience of the project suggests that needs did not guide the selection of the equipment. If a chosen technology is to be truly appropriate, it must be fully understood and accepted by those who are to operate and maintain it. Observance of this could forestall the imposition of projects, which have littered rural areas, by those who claim to have the best interest of the local people in mind.

Imposed technologies seldom take root since the responsibility for achieving objectives is not transferred from decision-takers to those who are in a position to make the project work. Objectives are achieved where the people concerned have contributed to making the original choice.

4.4.7 Training of Beneficiaries

Majority of the Palm oil processors interviewed (88.6%) stated that they received training on the use of the improved technology. Similarly all the officials of the implementing agencies claimed the processors received a training of a sort (Table 4.9).

Table 4.9: Frequency Distribution of Processors and Implementers on whether beneficiaries were trained to use the equipment

Response	Processors		Implementers	
	Freq.	%	Freq.	%
YES	117	88.6	8	100.0
NO	15	11.4	0	0.0
Total	132	100.0	8	100.0

Source: Data from the field.

Training which is the organized procedure by which people learn knowledge or skills or attitudes forms a very crucial aspect of Technology Transfer Process and therefore indispensable.

The provision of training as projected by the result conforms to the findings of Agricultural and Rural Development Department (1990) which identified training as one of the means at hand for implementing extension programmes. It also agrees with Anderson (1985) who identified training systems for the use of technology being transferred as a means of completing the transfer process as project beneficiaries learn to use and maintain the technology.

Provision of training is also necessary as a means of acquiring skills related to running small business. ILO/NCWD (1985) found out that training is important because groups need better skills in accounting and money management to keep track of loan payments and fees collected and to make purchasing and selling

decisions. Training also strengthens interpersonal relationship, increase teamwork and collaboration and reduces wastage. Bansal (1991) stated that instead of merely imparting knowledge, training must play an effective and important role in helping to actually improve the performance of the individual on the job.

4.4.8 Form of Training

As many as 82.9% and 75.0% of the Processors and Implementers respectively indicated that the form of training provided was Demonstration. However 17.1% of the Processors and 12.5% of the Implementers mentioned on the job training as the form of training employed.

Table 4.10: Frequency Distribution of Processors and Implementers on the form of training given to Processors on the use of the technology

Form of Training	Processors		Implementers	
	Freq.	%	Freq.	%
Demonstration	97	82.9	6	75.0
On the job training	20	17.1	1	12.5
Lecture and Demonstration	0	0.0	1	12.5
Total	117	100.0	8	100.0

Source: Data from the field.

It is evident from the result that Demonstration was basically used as the form of training to teach the beneficiaries how to operate the equipment. Change agents, to increase the observability of an innovation and thus help speed up its rate of trial

and subsequent adoption often use demonstrations. The use of demonstration by the implementers of the technology could possibly be due to the fact that they wanted the beneficiaries to believe that the innovation works and so stimulate its acceptance. The use of Demonstration as a form of training in this study agrees with the findings of Beaudeau et al (1992) working on the implementation of a mill project that, there must be a day's demonstration on equipment being introduced.

It also agrees with Swanson (1984) who identified field demonstration as the centre of most extension work when implementing programmes.

The assumption here therefore is that Demonstrations enhance the acceptance of technologies.

4.4.9 Duration of Training

Indications from the results are that only one day's training was given to the beneficiaries on the use of the equipment.

As many as one hundred and two Palm oil Processors representing 87.2% indicated they were given a day's training. However 75% of the implementers indicated that the training was provided for two days.

Table 4.11: Frequency Distribution of Processors and Implementers on duration of training

Duration	Processors		Implementers	
	Freq.	%	Freq.	%
One day	102	87.2	2	25.0
Two days	15	12.8	6	75.0
Total	117	100.0	8	100.0

Source: Data from the field.

The result gives the impression that apart from the demonstration made to the beneficiaries on the use of the equipment no special training was provided. The demonstration provided was thus termed training by the beneficiaries. There was no elaborate training which could encourage the people to try the machines. This situation could erode the confidence of the beneficiaries in the use of the technology since there would be that sense of insecurity and lack of assurance of the effectiveness of the technology.

4.4.10 Skill in the use of the Improved Technology

On the skill of the beneficiaries in the use of the equipment the result shows that 52.3% and 53.1% mentioned that their ability to manipulate the fruit pounder and the press respectively was medium. (See Table 4.12). That is neither very high nor very low whilst 43.2% and 42.4% said their skill in the use of the fruit pounder and the press respectively was low.

Table 4.12: Frequency Distribution of Processors on the skill in the use of the equipment

Response	Fruit Pounder		Press	
	Freq.	%	Freq.	%
High	2	1.5	2	1.5
Medium	69	52.3	70	53.1
Low	57	43.2	56	42.4
Very low	4	3.0	4	3.0
Total	132	100.0	132	100.0

Source: Data from the field.

This comparatively low skill of the Processors could be attributed to the fact that the training provided them was not enough. Training is a vital tool for human resource development since it is a process of skill building of man. In the words of Singer (1973), it is only where the working force is sufficiently literate, educated, trained and mobile to take advantage of new advances in techniques in the organization of production that progress becomes possible.

Adequate education and training in the use of technologies creates a state of rationality which in turn predisposes an individual to the trial and adoption of innovations. The level of education of the beneficiaries is quite low (Table 4.1). A day's training in the handling of equipment introduced would therefore not give the Processors the requisite skills and expertise to operate and maintain the equipment. Training is therefore important in helping to improve the performance of the individual on the job.

4.4.11 Visits by Implementers (Monitoring)

Indications are that visits to the project site as a means of monitoring the activities of the Processors were not regular. Whilst only 36.4% of the Processors said there were some occasional visits by the implementers, majority representing 63.6% said there were no visits. All the implementers however indicated that visits were made occasionally.

Table 4.13: Frequency Distribution of Processors and Implementers on the Frequency of Visit

Frequency of Visit	Processors		Implementers	
	Freq.	%	Freq.	%
No visit	84	63.6	0	0.0
Occasionally	48	36.4	7	100.0
Total	132	100.0	7	100.0

Source: Data from the field.

Monitoring provides an in-depth and critical knowledge of development actions being carried out. It is a tool for control, capable of checking whether or not results match forecasts. It is therefore a mechanism through which problems and progress associated with projects and programmes are identified and the necessary adjustments made where possible. Lack of knowledge on the inappropriateness of the fruit pounder by the implementers could be attributed to irregular monitoring. Whilst the Processors complained bitterly of fault on the pounder which is responsible for the cracking of the nuts, the implementers attribute it to lack of skill on the part of the processors in the handling of the equipment. Regular monitoring as a management tool is therefore necessary to

enable corrections and adaptations to be made on innovations introduced and also to enhance their adoption.

4.4.12 Use of Incentives in the transfer of improved Technology

As shown in Table 4.14, 30.3% of the Processors mentioned that they received incentives from the Implementers of the Improved technology during the time the Technology was being introduced, whilst 69.7% said they did not receive any incentives.

Table 4.14: Frequency Distribution of Processors and Implementers on whether incentives were given.

Response	Processors		Implementers	
	Freq.	%	Freq.	%
YES	40	30.3	0	0.0
NO	92	69.7	8	100.0
Total	132	100.0	8	100.0

Source: Data from the field.

The implementers on their part mentioned that no incentives were given. They explained that the cooking utensils given to the Processors were not incentives per se but form part of the equipment which would be partly paid for.

For quite a good number of the Processors to have the impression that the utensils were incentives conveys the idea that there was not enough information flow between the implementers and the beneficiaries or the beneficiaries were not well informed of the terms of the project.

Incentives however are capable of arousing sustaining people's interests in agricultural projects. The lackadaisical manner in which the improved technology is being tried could be attributed to the non-existence of an incentive package accompanying the technology. This agrees with Swanson (1984) that without incentives there cannot be that dedication and sense of duty and honesty required in order to mobilize resources and efforts to achieve results and that the transfer of technology cannot be productive in the absence of incentives that make it worthwhile for farmers to accept and use the new technologies and new knowledge. The data collected also pointed to the fact that incentives contribute to the acceptance of technologies since a number of the processors mentioned that they decided to try the improved technology with the intention that incentives would be given.

4.5 Communication and Knowledge Generation

4.5.1 Processors previous encounter with improved Oil Palm Processing Plant

Indications are that some of the beneficiaries have ever used similar improved technology before. According to them some problems were encountered when using the processing plants. Problems experienced include excessive and frequent wear of the beaters and the auger which lie in the drum of the pounder. According to them these parts have to be removed and serviced creating an excessive down time. The teeth of some of the plants crack the entire palm fruits resulting in poor quality oil and loss of revenue.

In the case of the screw press, they noted that often the pull ring and the shank of the press cage lock pin fail at the welded joint. Also the press cage at high pressures turns with the mass of the pounded fruit, resulting in the reduction of the effectiveness of the screw press. Another problem mentioned was that the exposed belt of the plant is viewed as a hazard to processors who may use loose clothing. The experience the affected beneficiaries indicated was shared with the implementers and other colleagues during a discussion with the implementers on the introduction of the equipment. They suggested modification of the parts before the introduction of the equipment into their community. The response of the implementers was said to be very positive since they promised rectifying those anomalies. After the introduction of the processing plant to the beneficiaries however, the problems discussed with the implementers earlier were encountered again during the trial of the plant.

The occurrence of these problems after the introduction of the equipment to the beneficiaries indicated that the suggestions made for the modification of the plant were not heeded even though they appreciated the suggestions. The suggestion made by the beneficiaries for the modification of the equipment was a manifestation of knowledge generated from the use of the technology somewhere. The failure of the implementers to rectify the problems implies that they failed to appreciate the fact that a lot of knowledge could be generated through intuition or interaction.

Many experts have not considered that they may have something to learn from beneficiaries' technical knowledge skills and experiences. Hedebro (1986) believed that if any major positive outcome is to be expected by means of innovations, change agents have to engage in a dialogue with users of new ideas. They have to listen to their problems and adapt their efforts to solving the problems.

During the trial of innovations farmers often discuss among themselves and make suggestions for the modification or rectification of certain problems associated with certain aspects of the innovation. The suggestion made for the modification of the fruit pounder at the trial stage is a manifestation of knowledge generation. Modification is a desirable quality. Some implementation problems by an individual or organization are unpredictable by nature so changes in the originally planned innovation often should occur. As a result of modification an innovation may be more appropriate in matching an adopter's preexisting problems and more responsive to new problems that arise during the innovation-decision process.

The result conforms to the findings of Box (1987) that there is the existence of local network of farmers who regularly discuss among themselves and form concepts, adapt ideas, integrate knowledge and determine acceptable action. It also agrees with Swanson (1984) that as a result of knowledge developed from technology trials it is possible for the farmers to define the conditions for which technologies are suitable and formulate recommendations for their transfer.

The result also conforms with the work of Reijntjes *et al* (1995) that apart from adaptation of innovations introduced from elsewhere, farmers routinely make careful observations and trials of new ideas and trial of new procedures and work method and that most agricultural technologies in use in the world today are developed by farmers and not by formally educated scientists. Institutional science and technology does have things to offer to grassroots knowledge, but technical change is most successful when based on the knowledge and skills of local people, and under their full control.

It is imperative therefore that change agents accept suggestions made by users of technologies being developed so that the most appropriate technologies are carried to the beneficiaries. There must be constant dialogue and effective feedback mechanism between implementing agencies and beneficiaries during and after introduction of technologies to the rural areas so that problems which crop up would be readily identified and rectified.

4.6 Socio-economic factors

Information gathered from respondents showed that a number of economic and social activities such as farming, petty- trading, sewing among others are also undertaken by the palm oil processors. The socio-economic factors therefore looked at:

- major business done before the introduction of the improved technology,
- the business that is more lucrative.

4.6.1 Major business done before the introduction of the improved technology

There is the indication that the Palm oil Processors do some other businesses apart from Processing Palm oil. Majority of them representing 82.6% said they undertake farming as their major business, 3.0% mentioned teaching whilst 9.9% said they do petty trading (Table 4.15). A good number of them expressed their sentiments on problems encountered combining Processing of oil with the other businesses undertaken.

According to them farming is an indispensable business in the area. However they are able to combine other businesses conveniently with the farming since it is not done collectively. They explained that since Palm oil processing using the improved technology is a group work, time for processing often interferes with their major business. Meanwhile Processors who absent themselves from group processing are sanctioned. These developments are noted to produce drawback to the trial of the improved technology since they do not make it convenient for people to combine farming with the group processing.

Table 4.15: Frequency Distribution of Processors on major business done before the introduction of the improved technology

Major Business	Processors	
	Freq.	%
Farming	109	82.6
Teaching	4	3.0
Sewing	6	4.5
Petty trading	13	9.9
Total	132	100.0

Source: Data from the field.

4.6.2 Business which is more lucrative

Results shown on table 4.16 give the indication that not only is farming the major business in the area but also the people derive more income from it than any other business. About 76.5% of the Processors indicated that farming provides them with more income per period of time, 9.8% stated they derive more income from petty trading whilst only 5.3% said palm oil processing gives them more income within a period of time.

Table 4.16: Frequency Distribution of Processors and Implementers on business which gives more income

Business	Processors		Implementers	
	Freq.	%	Freq.	%
Palm oil Processing	7	5.3	0	0.0
Farming	101	76.5	8	100.0
Sewing	6	4.6	0	0.0
Teaching	5	3.8	0	0.0
Petty trading	13	9.8	8	0.0
Total	132	100.0	8	100.0

Source: Data from the field.

Granted the fact that farming is the major business of the people and moreover more income is derived from it within a period of time, the beneficiaries the improved technology would obviously not readily accept the technology to process palm oil. The processing of palm oil is a seasonal job since fruits from local palm trees ripen periodically. Women could not therefore rely solely on the processing of palm oil so the business is regarded as a supplementary source of income.

The result corroborates with the finding of ILO/NCWD (1985) that since palm fruits are seasonal women usually add other work to their annual schedules. If they actually get more income from these activities, their interest in palm oil processing weakens.

It implies that thorough investigation was not conducted and understanding reached on the entire socio-econo-cultural behaviours of the beneficiaries before deciding on the introduction of the improved technology. If investigations were well executed a more desirable and a more sustainable programme, would have been adopted. For example a programme geared towards the improvement of the farming activities of the people or encouraging the people as a first step to cultivate hybrid varieties of oil palm which could produce fruits almost all year round. This could help attract people to and sustain the palm oil processing business.

The low patronage of the use of the improved technology could be attributed to improper analysis of the economic situation of the people. Often the subsistence activities on which rural people's lives depend are not reflected in development plans and priorities. Policies most of the time tend to favour large-scale production over small-scale production.

A world survey by UN (1989) revealed that technological innovations such as food processing tools and improved cooking stoves intended to benefit women have not necessarily been very successful. This is because they were introduced without

sufficient research on women's traditional task, socio-cultural norms and habits and that in some cases the technologies were rejected from the beginning.

UNIFEM (1993) pointed out that socio-economic research needs to be conducted alongside technical research if technologies which seem to be applicable, relevant and acceptable are to be introduced. It therefore implies that, in transferring technologies to rural communities it is advisable that change agents do not simply move from the status quo to the new condition until they have obtained agreement on the method of transition if resistance to change is to be avoided.

4.7 Major problem encountered using the improved Technology

There is an indication that there are certain problems associated with the use of improved Technology. The major problem identified is lack of credit to purchase palm fruits for processing. As many as 53.0% of the Processors identified lack of credit as a hindrance to the use of the technology (Table 4.17). Technical fault on the fruit pounder is also identified by 30.3% of the Processors as the major hindrance to the effective use of the technology whilst 1.5 % attributed lack of skills to operate the equipment as the major problem.

Table 4.17: Frequency Distribution of Processors and Implementers on the Problem with Improved Technology

Problem	Processors		Implementers	
	Freq.	%	Freq.	%
Lack of raw material	12	9.1	4	50.0
Mismanagement of funds	8	6.1	2	25.0
Lack of skills	2	1.5	2	25.0
Technical faults	40	30.3	0	0.0
Lack of credit	70	53.0	0	0.0
Total	132	100.0	8	100.0

Source: Data from the field.

Insufficient fruit to meet the capacity of the equipment has necessitated the demand for credit to purchase fruits from elsewhere. Even though farming is the main economic activity in the beneficiary communities food production is centred on crops such as cassava, maize, plantain and cocoyam. Oil palm is not intensively cultivated. Unfortunately the very few cultivated farms are not of the hybrid varieties and so do not produce fruits enough to be conveniently utilised by the type of technology introduced. The cry of the people for credit to purchase fruits to meet the production capacity of the equipment introduced cannot be overemphasized.

The beneficiaries believed, given credit, they would be able to purchase fruits from some established farms so as to have regular production of oil. The inability of the women to fully appreciate the use of the improved technology could probably be

due to lack of credit to purchase fruits and other items to boost the production of the oil.

The result therefore conforms to UNIFEM report (1993) that economic factors are a constraint in the acceptance of Improved Technologies. It also agrees with Swanson (1984) that the inability of farmers to adopt innovations can stem from lack of resources, inability to qualify for credit and general poverty. The processors moreover are very ignorant about means by which they can get credit or mobilize funds effectively for running the business. It is evident that the Processors have not been introduced to any formal or informal line of credit through which money or other resources could be mobilized. The inability of the implementers of the technology to assist the beneficiaries in this direction therefore falls contrary to the assertion by UNIFEM (1993) that in formulating any project, planning should include defining, motivation management, administration, organization of the participants and above all training and credit. Their action also falls short of the findings of the Ministry of Agriculture (1990) that the options for strengthening the small-scale agro-processing subsector, should include promoting stronger women's groups to achieve economies of scale, securing group credit and expanding their market outlets. Njoku (1981) observed that increasing extension supervision, and improving access to credit enhance technology adoption much more than merely developing technologies and making them available.

The call of the Processors for credit conforms to the observation made by Goka (1989) that there is the need for capital in the form of credit to be made available to the producer for production with the anticipation of future repayment with interest.

The issue of technical fault raised, as a major problem hindering the use of the Improved technology could have been resolved if modification suggested had been adhered to. As mentioned earlier, the Processors alleged that there is a considerable loss of revenue through the cracking of palm kernels during the pounding of the fruits by the fruit pounder.

The point here is that the kind of pounder introduced to the people is not appropriate for processing the local palm fruits, which have very large kernels and very thin flesh (pericarp), available in the area. During the pounding the large nuts are not able to escape the teeth of the pounder resulting in the cracking of kernels together with the pericarp containing the oil. This situation results in the first place the production of poor quality palm oil and most importantly loss of revenue through the loss of the nuts which could also be processed to obtain palm kernel oil. This according to the people is a serious drawback to the use of the improved technology.

The indication is that the resource base of the beneficiaries was not properly investigated. Sufficient consideration was not given to the type of fruits used in the processing. It also appears the implementers were desirous to provide the people with the equipment in an anticipation of boosting the production of palm oil in the

area without thorough analysis of the prevailing situation in the area. The improved technology is therefore seen in this vein as not having much advantage over the traditional one.

According to Rogers (1962), a technology stands the chance of being accepted if there is an evidence of it having a comparative advantage over an old practice in place. Since the improved technology contributes rather to the loss of revenue to the Processors, a lot of the women are therefore reluctant to accept it. The result also confirms the observation of Fliegel and Kivlin (1966) that innovations perceived as most rewarding and involving least risk and uncertainty are accepted and tried most rapidly. The problems experienced by the beneficiaries brings home the fact that any attempts to introduce new technologies for rural women require well-planned feasibility study and provisions for critical factors in the design of the technology.

4.8 Technology Transfer and Gender

As shown in table 4.18, the officials of the implementing agencies viewed the improved technology as being gender neutral. They believed both men and women could use it without much difficulty even though it was intended to be utilized solely by women.

Table 4.18: Frequency Distribution of Implementers on how Improved Technology is considered

Response	Freq.	%
Gender neutral	6	100.0
Gender specific	0	0.0
Total	6	100.0

Source: Data from the field.

The assertion that the improved technology is gender neutral does not conform to the findings of Anderson (1985) who stated that: "It is true, though less often acknowledged that technologies are not gender neutral"

She believes that since technology as a technique affects the ways in which people do things, if men and women do different things any particular technology will therefore affect the roles of men and women in a different way.

Traditionally, the processing of palm oil in the rural areas in Ghana has been the preserve of women. In view of this if the lots of women are to be improved, their interest should be protected. Introducing a technology which is gender neutral would mean drawing men to a business which traditionally should be limited to women. According to Anderson (1985) as technologies affect the ways in which people think about what they do, the transfer of a technique from an area with one set of norms affecting work roles to another with different expectations, beliefs and norms, will often bring about surprising and sometimes unfortunate outcomes. Thus even though the improved technology was intended to be used solely by

women, certain aspects of the technology which requires masculinity, for example the starting of the machine, have drawn men into the business. The data collected indicated that the operation of the equipment is done by men with the activities of women limited to the boiling of the oil. It implies that the women do not have full control over the technology.

This observation agrees with Anderson (1985) that improved technologies may change the doer of a productive activity by changing the production process itself and that when technologies change the location of any task, they may result in the exclusion of women from the work patterns. The result also confirms the findings of ILO 1967 cited in Anderson (1985) that in every case where machinery was introduced in activities traditionally done by women, men either completely replaced women or the activity became subdivided. Men then took over the tasks that used the technology and required greater skill while women were relegated to the less menial tasks and that these shifts are accompanied by loss of income earning opportunities or marginalization and lower income for women.

The result again confirms the observation of Boserup (1970) that men often monopolize the use of new equipment and modern methods hence men's labour productivity tends to rise while women's remain static. The result further agrees with the findings of Williams (1982) who pointed out how technological change in gari processing which has traditionally been the occupation of women has shifted the job of operating machinery from women to men and boys depriving women of an important source of income.

Anderson (1985) also noted that masculinization of agriculture which is believed to be the phenomenon when technologies are applied to agriculture is also found in industry. That when milling became industrialized in Indonesia, men ran the mills thus the modernization of milling brought also its masculinization.

The implication is that in the situation where improved technologies being introduced solely to women are not gender specific, there is the tendency that men could easily take over the use of the technology at the expense of the women it might be intended for. Often technology programmes that are designed and conducted in a "gender neutral" way end up having gender-segregated results, and even among women themselves, quite different effects on different groups. Ilkkaraken and Appleton (1994) observed that the custom rice miller introduced into Bangladesh reduces the time that women in a household spend milling rice for their family. Whitehead however noted that for the poor women, who previously earned money by milling rice for richer families, the improved technology has deprived them of a livelihood. The effects of this technology according to him have not been 'neutral' or 'gender neutral' since the few jobs created by the use of the custom miller have gone to men.

4.9 CHARACTERISTICS OF THE IMPROVED TECHNOLOGY

This section tried to find out whether any of the perceived characteristics of the improved technology such as the compatibility and relative advantage has any influence on the adoption of the technology.

4.9.1 Compatibility of technology

Out of the five qualities of oil namely Taste, Colour, Aroma, Observance of sanitation and Storability assessed in relation to the Improved technology, Taste and Observance of Sanitation were found to have influence on the acceptance of the improved technology. See Table 4.19

More than 60% of the Processors indicated that the taste of oil produced using the traditional method is good and 44.0% said the taste of oil is the same for both the traditional and Improved Technologies.

Table 4.19: Frequency Distribution of Processors on Comparative Assessment of the quality of oil (Taste and Observance of sanitation) using the traditional and Improved Technologies

Response	Taste				Observance of Sanitation			
	Traditional		Improved		Trad.		Improved	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Very good	2	1.5	0	0.0	0	0.0	0	0.0
Good	72	54.5	0	0.0	0	0.0	114	86.4
Medium	0	0.0	7	5.3	0	0.0	4	3.0
Quite good	0	0.0	65	49.2	117	88.6	2	1.5
Bad	0	0.0	0	0.0	3	2.3	0	0.0
Same	58	44.0	30	45.5	12	9.1	12	9.1
Total	132	100.0	132	100.0	132	100.0	132	100.0

Source: Data from the field.

On the other hand 49.2% of the Processors indicated that the taste of oil produced using the Improved technology was quite good whilst 45.5% said the tastes were the same (Table 4.20). The result gives the impression that the taste of oil

produced using the Improved technology is not better off than that produced by the Traditional method. They argued that it is not easy to wash the film of oil completely off the pounder and the press and so there is some amount of pollution of the subsequent oil processed rendering the taste of the oil less palatable whilst in the case of the traditional methods it is easier to wash the mortar and pestle thoroughly leaving no film of oil which could contaminate oil produced subsequently. Compatibility of an innovation in term of needs felt by the clients or the target group is important in determining the rate of acceptance of the innovation. The difference in taste brought about by the washing process in the case of the improved technology, which the people consider more laborious, makes the Improved technology not compatible to the needs and the existing practice of the people.

The result therefore confirms the findings of Tetteh (1987) that compatibility of new ideas and practices with the values and experiences of people constitute a significant determinant of the rate of adoption of improved technologies. It also agrees with the findings of Adams (1982) who stated that a technology that is at variance with the potential adopter's value system and management objectives are unlikely to be acceptable. The result also confirms the findings of Huffman (1987) that most rural women do not use improved technologies because of their perception about the taste of the product. He observed that in Burkina Faso mechanical mills introduced to decrease the time spent by women grinding grains ended up being used only when they are tired or busy because they perceived the taste of the grain to be poorer than when hand ground. The result also agrees with

UNIFEM (1987) that in Ivory Coast it was noticed that villagers tend to use the improved presses introduced to them when processing oil for commercial use and revert to the traditional process when the oil is destined for personal consumption. Studies carried out by Santopolo (1961), Yecaris (1961), and Jones (1972) show that compatibility is an important factor influencing the adoption of innovations.

It is worth mentioning that it became apparent during the investigations that most of the processors who were fifty years and above were emphatic that the taste of oil produced using the traditional method was better. They expressed the view that they prefer that method of oil extraction especially when the oil is meant for personal consumption. Age of an individual is known to influence innovativeness. Young people are generally more venturesome and receptive to change and are willing to accept risks. The old people are conservative, localite and they feel insecure adopting innovations because the decisions they take do not affect them only but also the entire family.

On the observance of sanitation, (Table 4.19) 89.6% of the Processors mentioned that processing oil using the Traditional method is low in the case where the fruits have to be trampled on by the feet during the maceration of the pericarp whilst 9.1% said there is no difference. On the other hand 86.4% said better sanitary conditions are observed with the Improved Technology whilst 9.1% said there was no difference.

The contention that the quality of oil processed using the traditional method is low in terms of sanitation, agrees with Kordylas (1991) that the lined pit provides an

immediate source of contamination and degradation since it is difficult to keep clean and sterile.

4.9.2 Relative Advantage of Technology

There is the indication that relatively more oil is obtained when the Improved Technology is used in the production process (Table 4.20). Using the traditional method, 96.0% indicated they obtain an average of two bottles of palm oil processing a basketful of fruits weighing 9kg. Only 4.0% stated they obtain on the average one bottle, processing the same quantity of fruits.

Table 4.20: Frequency Distribution by quantity of oil (bottles) per basket obtained using Traditional and Improved Technologies

Quantity of oil (bottles)	Traditional		Improved	
	Freq.	%	Freq.	%
One bottle	4	3.8	0	0.0
Two bottles	100	96.2	4	3.0
Three bottles	0	0.0	128	97.0
Total	104	100.0	132	100.0

Source: Data from the field.

On the other hand 97.0% of the Processors indicated they obtain on the average three bottles of palm oil using the Improved technology. Whilst 3.0% mentioned that they obtain on the average two bottles from the 9kg of fruits processed.

The Processors explained that the slightly higher quantity of oil obtained from using the Improved Technology is due to the fact that the pounding is more efficiently done with the Improved Technology. Thus making it possible to retrieve more oil from the fibre.

Even though the difference in the quantity of oil obtained from both methods is not considerable the trend conforms with the observation of Kordylas (1991) that Traditional methods employed for palm oil production are only 50% efficient whilst improved equipment are about 65% efficient.

The trend also agrees with the findings of ILO (1984) which stipulated the extraction efficiency of the traditional methods to be 30% whilst the improved equipment have an efficiency of 75-83%.

Taking into consideration the financial commitment of the Processors in terms of Project cost and other recurrent expenditure, coupled with some problems associated with the Improved technology such as inadequate fruits, lack of credit and Technical fault on the equipment, in relation to output, the Improved technology could be seen to have no relative advantage over the Traditional method.

It should be noted that farmers or beneficiaries would be prepared to try and eventually accept new practices if they perceive that the benefits are great enough to outweigh the costs.

4.10 Participation of beneficiaries in the Implementation of Project

The main contribution made by the Processors towards the implementation of the project was the provision of communal labour as seen in Table 4.21. Majority of the Processors representing 84.8% mentioned that they participated in the project by providing labour during the construction of the structures.

Table 4.21: Frequency Distribution of Processors and Implementers on contributions made by beneficiaries towards the implementation of project

Contribution	Processors		Implementers	
	Freq.	%	Freq.	%
Monetary	0	0.0	1	14.3
Advice	0	0.0	0	0.0
Communal Labour	112	84.8	6	85.7
Security	0	0.0	0	0.0
Building Materials	0	0.0	0	0.0
Not applicable	20	15.2	0	0.0
Total	132	100.0	7	100.0

Source: Data from the field.

Similarly 85.7% of the officials of the implementing agencies also indicated that the beneficiaries contributed by providing communal labour whilst 14.3% said they made monetary contribution.

The result as it stands points to the fact that apart from the construction of the physical structure in which the beneficiaries actively participated and may be some

financial obligations made, they were not involved in any other major aspect of the programme. It should be noted that the advice and views of rural people are central to development but these people are seldom consulted during the planning and implementation of projects. Moreover not only is the knowledge of the local people utilized when consulted at the preliminary stages of projects but also they themselves feel involved. If the local people are provided with meaningful roles within the project, they come to view it as "their project" and are more likely to commit themselves as individuals and as a community. This ensures a high level of acceptability and sustainability of the project that may otherwise be lacking. The seemingly slow pace of trying the improved technology could probably be attributed to the limited involvement of the beneficiaries during the implementation of the project.

A survey conducted by UN in (1989) showed that if women are not given the opportunity to participate in planning, designing and eventually disseminating innovations such as food processing tools, they often produced no obvious improvement in the lives of the women and in most cases the technologies were rejected. Choguill (1986) noted that participation of beneficiaries in the development of projects is considered socially desirable in promoting the acceptance of innovations because it develops people's consciousness.

The result is also in line with the statement of Axinn (1991) that the learning and adoption of improved practices are facilitated by the existence of and participation of the rural people in organized groups and that clear understanding of goals of such practices is necessary for the achievement of the programme goals.

It is acknowledged also that the effect of change of technology on women for example will depend to a large extent on their traditional role in particular, socio-economic settings and above all to the ways in which they as producers and end users of a technology are able to participate in decisions relating to it. Participation in agriculture and rural development activities requires interaction with people of different knowledge, skills, attitude, beliefs and values.

4.11 Ownership of Project

On the ownership of the project, 61.4% of the Processors said the project belongs to the Government, 22.7% mentioned 31st December Women's Movement as the owners of the project whilst 14.4% mentioned that the project belongs to the community. On the part of the Implementers, 57.1% stated that the project belongs to the community whilst 14.3% mentioned 31st December Women's Movement. (Table 4.22) There is no indication that the project belongs to the Palm Oil Processors who are the users.

Table 4.22: Frequency Distribution of Processors and Implementers on ownership of Project.

Category of people	Processors		Implementers	
	Freq.	%	Freq.	%
Government	81	61.4	0	0.0
Community	19	14.4	4	57.1
HHAWD	2	1.5	2	28.6
31st Dec. Women's Movement	30	22.7	1	14.3
Total	132	100.0	7	100.0

Source: Data from the field.

The beneficiaries explained that they were made to understand that the project would be deemed to become theirs if they are able to settle their portion of the project cost. They therefore explained that since the cost is not yet met, some have the belief that the project belongs to the Government. Others are of the opinion that since the project is in the community, it should be considered to be for the community.

It is certain from the responses received from the beneficiaries that they are not fully aware whom the project belongs to. It implies that the implementers of the project did not give full details of the project to the beneficiaries on its ownership.

In a situation where the users of a technology do not have the conviction or the feeling that a project belongs to them, the willingness of the people to accept and use the technology is marred.

This state of uncertainty on the part of the Processors as to who owns the project could be responsible for the unwillingness to accept and use the improved technology by a good number of the women.

4.12 Benefits of the Improved Technology

Results of the data analysis indicated that 80.3% of the Processors accepted to try the improved technology on the grounds that it would reduce the drudgery associated with the Traditional Technology and 18.9% mention economic reasons (Profit).

Table 4.23: Frequency distribution of Processors on main reason for accepting to try the Improved Technology

Reason for accepting to try Improved technology	Freq.	%
Economic reasons	25	18.9
Drudgery reduction	106	80.9
Incentives	1	1.1
Total	132	100.0

Source: Data from the field.

It is interesting to note that no Processor mentioned the quantity of fruits to be processed at a time as a pressing issue in the acceptance of the technology. It is evident that Processors wanted a technology which could reduce the fatigue they go through especially in the pounding of the fruits in the mortar. It was therefore erroneous for the implementers to consider the quantity of fruits to be processed at a time in the selection of the equipment (Table 4.8). This is

another indication that the people were not consulted on certain pertinent issues which could impact on their lives. Unless there is full participation of the rural people in the whole process of rural development, there will not be any sustainable development. The beneficiaries of projects should be involved in decision making process.

The contention of majority of the Processors that the Improved technology is believed to reduce the drudgery associated with the Traditional technology agrees with (ILO, 1984) that Improved technologies in palm oil production are required to relief the burden and reduce the time involved in traditional processing methods.

4.13 Acceptance of the Improved Technology

With regards to the acceptance of the improved technology, 37.9% mentioned that the technology is acceptable to them whilst 62.1% said it was not acceptable to them (Table 4.24). Most of those who indicated that the technology was acceptable explained that it is after all capable of reducing the arduous task of pounding the fruits, as is the case with the traditional method.

Table 4.24: Frequency distribution of Processors on the acceptance of the Improved Technology

Acceptance of Improved Technology	Freq.	%
Acceptable	50	37.9
Not acceptable	82	62.1
Total	132	100.0

Source: Data from the field.

Technology stands the chance of being accepted if there is the evidence of it having a comparative advantage over an old practice in place. Fliegel and Kivlin (1996) observed that innovations perceived as most rewarding are accepted and tried most rapidly. It is also noted that women will be reluctant to accept new technologies (particularly if they require capital investment) which do not reduce the more arduous aspect of the work and which do not prove to be viable and appropriate to their needs.

Dissatisfaction with a technology may also come about because the innovation is inappropriate for the individual and does not result in an adequate level of perceived relative advantage over alternative practice. Cusak (1983) noted that if beneficiaries are going to accept a new technology for trial then recommendations must be translated into terms they can understand and that recommendations must be specific to their operational requirements. Often technological innovations are rejected by rural women because they do not meet the priority needs of the people and that socio-economic and cultural factors are not considered in their design. Also crucial in the acceptance of improved technology is the involvement of the beneficiaries in the selection, development and its introduction. For improved technologies to impact positively on local women and for the technologies to be accepted and sustained, women should be invited to participate in planning, designing and eventually in their dissemination.

4.14 Reasons for Non-Acceptance of the Improved Technology

On the non- acceptability of the improved technology, 48.8% of the oil palm processors were of the view that technical problems on the equipment notably the pounder, was the major reason for non-acceptance. Also 20.7% of the respondents mentioned that they find it difficult combining farming which is their major occupation with the processing of palm oil using the improved technology. It should be noted however that only 2.4% mentioned inappropriate technology transfer process as the main reason for not accepting the improved technology (Table 4.25).

Table 4.25: Frequency distribution of Processors on the most important reason for not accepting the Improved Technology

Reason	Freq.	%
Technical fault	40	48.8
Problem combining farming with processing	17	20.7
Lack of credit	10	12.2
Management problems	8	9.8
Lack of skills to operate the equipment.	5	6.1
Inappropriate technology transfer process	2	2.4
Total	82	100.0

Source: Data from the field.

The processors who identified Technical fault as their major reason for not accepting the improved technology explained that even though the pounder for example relieves them of the drudgery associated with the pounding of the fruit in the mortar as pertains in traditional processing, it does not however assure them increased productivity and profit.

It is evident from the investigations that farming is the major occupation of most people in the study area. Any other business done by these people is considered supplementary. The fact that the use of the Improved technology requires that all processors participate in certain tasks such as conveying of palm fruits from places of harvest to the processing site, stripping, boiling of fruits and the extraction of the oil, at certain times of the week, is seen by a good number of the processors as a hindrance to their farming activities. The contention is that with the traditional method even though they go through the same process it is an individual affair and individuals plan what to do at what time. The point to stress here is that it is necessary that in introducing technological innovations, sufficient research be conducted into the tasks, socio-cultural norms and habits and attitudes of the people. Hasty decisions on the introduction of innovations do not benefit beneficiaries.

On the issue of credit, the Processors contended that since the area is not a major oil palm producing area and since improved varieties of oil palm which could conveniently be processed by the type of equipment introduced are not available in the area, credit in the form of cash would have been a better option to enable them

purchase fruits of improved varieties of oil palm from plantations outside so that they could utilize the improved technology. According to them the local palm trees on which they depend for their fruits are often burnt by bush fires making it difficult to get enough fruits for processing even during the main season. They further explained that the local palm trees are often felled for the production of palmwine and the local gin 'akpeteshie' during festive occasions and funerals.

Economic constraints could therefore be said to be one of the key factors affecting the trial of the improved technology. Njoku (1981) in a study on the adoption of improved technologies observed that improving access to credit enhances adoption much more than merely developing technologies and making them available. The inability of farmers to adopt innovations can therefore stem from lack of resources, inability to qualify for credit and in general poverty.

Indications are that only 2.4% of the processors believed the Technology transfer process used was the main reason for the non-acceptance of the Improved technology (Table 4.26). They asserted that even though they realized the need for the technology, enough education was not given on the benefits and prospects of the project. They also explained that they were not motivated enough to accept the technology. That they expected the Implementers of the technology to give them some incentives especially credit which could enable them to meet some production costs. It is observed that appropriate incentives are necessary if active interest of the people is to be sustained in such projects. According to Swanson (1984) without appropriate incentives there cannot be that dedication and sense of

duty and honesty required in order to mobilize resources and efforts to achieve results. He further observed that incentives are given to individuals or systems to encourage some overt behavioral change. Other defaults and omissions in the Transfer process according to the beneficiaries include their exclusion from the selection of the equipment and insufficient training in the use of the equipment.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

The chapter presents the summary, conclusion and recommendation of the study. The conclusion and recommendations are based on the results obtained from the analysis of the data taking into cognizance the objectives, hypothesis and the problem statement.

The study has shown that various factors influenced the Transfer and the Trial of the Improved Technology in the Dodome and Tsyome communities.

The summary and conclusions are presented under the following headings:

1. Technology Transfer Process.
2. Communication and Knowledge generation
3. Socio-economic environment
4. Gender issues
5. The characteristics of the Improved Technology



5.2 Technology Transfer Process

The Palm oil Processors' responses to items on the Technology Transfer Process reveal the following:

1. The technology transfer process is one of the factors that influenced the trial and acceptance of the improved technology. Indications are that

there was a limited application of the principles of technology transfer. Thorough analysis of the situation of the beneficiaries was not done. Issues such as involvement of beneficiaries in the introduction of the technology, the selection of the equipment, use of incentives to motivate the people, training of the beneficiaries and monitoring were not given due attention. Training, supervision and monitoring notably are critical elements if beneficiaries of improved technologies are to fully appreciate the usefulness of the technology.

2. Methodology and guidelines for the preparatory work often required to bring beneficiaries to organizational readiness prior to the introduction of the improved technology were not also followed. The results however revealed that the beneficiaries found the need for the improved technology as a means of reducing the drudgery associated with the processing traditionally. However the suitability or the appropriateness of the technology in relation to the available resources and the working environment were not considered. Designers of the fruit pounder for example, did not give sufficient consideration to the type of fruits used in the processing. Processors in the study area have access to wild groove palm. Since the beneficiaries were not involved in the design and installation of the equipment, whilst the Processors wanted an equipment which could reduce the arduous task of pounding, the focus of the Implementers was on the quantity of fruits to process at a time. The result therefore suggests that needs did not guide the selection and

design of the equipment but rather the equipment was imposed. It is important that beneficiaries be consulted on the selection and design of equipment if its mechanical features are to satisfy processing requirements and be perceived as appropriate improvements.

5.3 Communication and Knowledge Generation

On the basis of responses given by the Palm oil Processors, the following summary and conclusion are arrived at:

Some amount of knowledge was generated before and after the introduction of the technology by the beneficiaries. One of the respondents who ever used a similar technology during leadership training said she shared her experiences with the Implementers on some problems encountered during the training and also suggested some modifications to be made. However, after the introduction of the technology the same problems were encountered. This suggests that no modification was made as suggested. Modification is very important in the transfer of a technology. An innovation becomes more appropriate in matching an adopter's preexisting problems and more responsive to new problems that arise during the transfer of technologies if modifications are made.

5.4 Socio-economic environment

The Palm oil Processors' responses to items on the socio-economic and cultural environment revealed the following:

1. That the people in the study area perform a number of socio-economic and cultural activities. Socio-economic activities performed include farming, Petty trading, sewing among others. Majority of the people, 82.6% undertake farming as their major business. Moreover farming is considered the most lucrative business (76.5%) since it is an all year round business. Some of those who farm do some other businesses such as petty trading, sewing and processing of palm oil. According to them even though they can combine farming effectively with other businesses including the processing of palm oil using the traditional method, it is quite difficult to do same with the processing of palm oil using the Improved technology.
2. The results of the study have revealed that Farming as the major and more lucrative business in the area negatively affects the trial of the Improved technology.

The hypothesis that the non-acceptance of the Improved technology is not due to farming, which is the major and more lucrative business therefore, does not hold.

5.5 Gender Issues

Responses to gender issues revealed that even though the technology was meant for women who traditionally undertake palm oil processing in rural areas, the

features of the technology are more 'gender neutral' than 'gender specific'. The operation of certain aspects of the technology requires masculinity hence men have been drawn into the business. Even though the women Processors were emphatic that the involvement of the men in the business poses no threat to their performance, some of the Officials of the implementing agencies believe that with time there could be the marginalization of the women by men. Literature has it that in every case where machinery was introduced in activities traditionally performed by women, men either completely replaced women or the activity became subdivided and men took over the tasks that used the technology and required greater skills while women were relegated to the less skilled menial tasks and that these shifts are accompanied by loss of income earning opportunities or marginalization and lower income for women (Anderson, 1985).

5.6 Characteristics of the Improved Technology

Analysis of the responses of the Processors on the attributes of the innovation points to the following conclusion:

1. The attribute of drudgery reduction was the most important attribute that favoured the trial of the Improved Technology. Attributes of innovation such as the elimination of arduous tasks, time saving and often, increased production, increase the chances of innovation adoption.
2. Technical problems with the equipment have made a good number of the processors unwilling to accept the Improved technology. The technology which is meant to improve the economic well-being of the beneficiaries

tend to cause some economic losses in terms of the cracking of nuts from which kernel oil could be extracted. The acceptance of an innovation depends on its superiority over the one it supersedes either economically or technically.

5.7 Recommendations

The following recommendations are proposed based on the findings of this study. These recommendations when followed by policy makers and change agents would improve steps taken to introduce improved technologies to women in agro-processing areas so that they can be tried and adopted.

To avoid the rejection of improved technologies,

- The transfer of such technologies must be demand driven. This is to ensure that the technology is not imposed on the people.
- The needs and the resource base of the beneficiaries must be thoroughly investigated. A thorough pre-implementation feasibility study must be conducted and the findings incorporated into the designs of the technology itself and the project as a whole. Areas of study must include sociological analysis, thorough examination of technical and economic factors that could influence the design specifications and utilization of the equipment.
- Beneficiaries must be consulted and allowed to make their own suggestions on the design of equipment so that its mechanical features satisfy processing requirements and also perceived as appropriate improvements.

- Training of beneficiaries to acquire the needed skills in the use of newly introduced equipment is very necessary to enable them take full control of such equipment introduced to them.
- Since the existence of women in their various communities is influenced by social and economic factors such as farming, domestic chores, petty trading and membership of societies, the introduction of such technologies to rural women should consider the appraisal of the social and economic factors that affect their daily chores. This will ensure that occupations into which innovations are introduced are the major sources of livelihood, rather than a minor occupation.
- Introduction of such improved technologies should go with the organization of beneficiaries in groups to make it easier for them to qualify for bank loans and other assistance that will enhance the sustainability of the project.
- Since local male farmers often try to force their way into the women's group at some point to control the profitable new equipment, it would be very expedient to organize them into auxiliary group of palm planters, stressing the benefits to be derived from steady local demand for palm fruit. In such manner they can share the prestige of the palm oil group without sharing profits.
- There is the need to educate the beneficiaries on the ownership of such projects to allay their fears with respect of working for the government or some organization or the fear of paying tax. Often when projects are

viewed by beneficiaries as 'their project' they commit themselves fully to its sustainability.

- Regular visits to project sites as a means of supervising and monitoring are very important if beneficiaries are to appreciate the usefulness of innovations.

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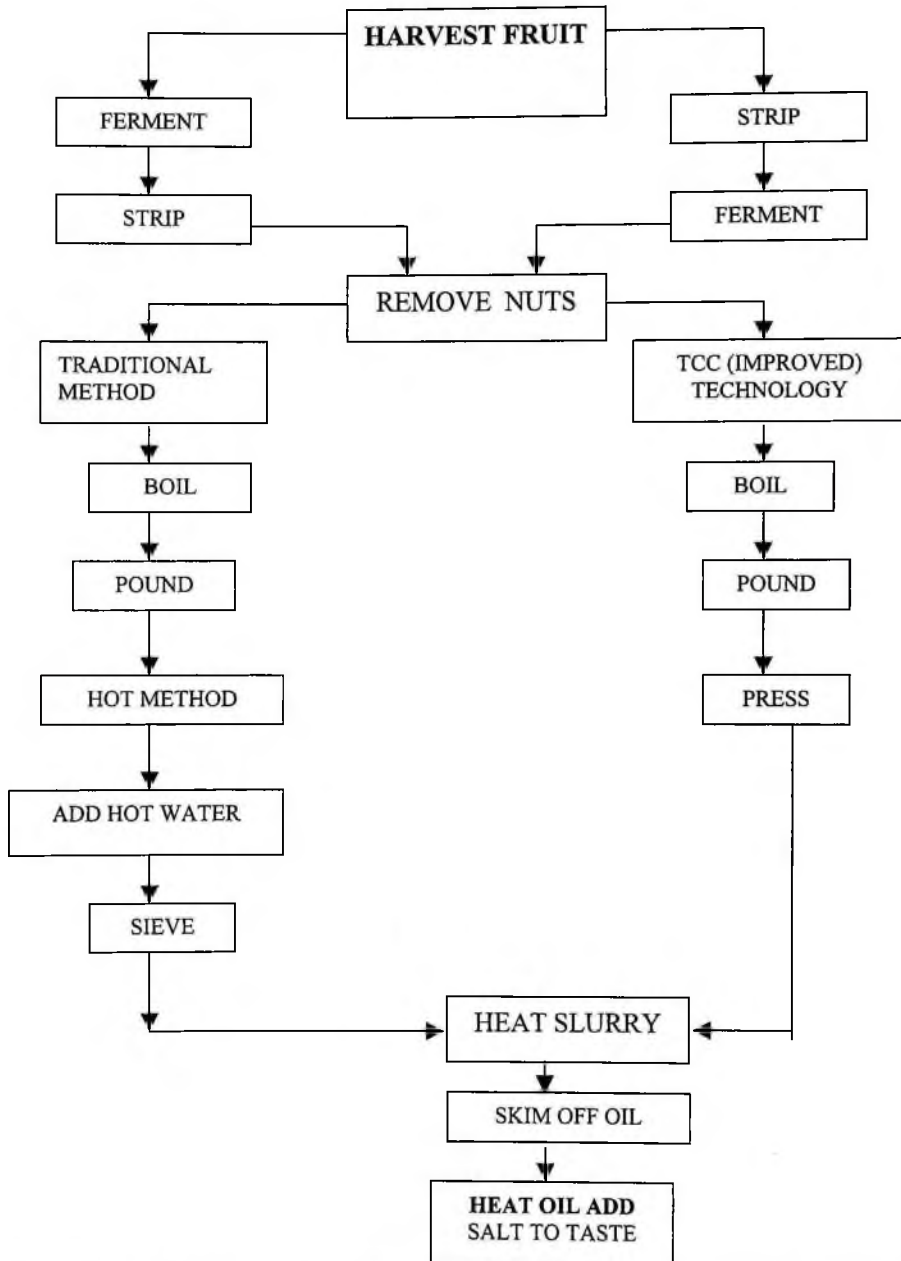
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APPENDIX 1

ALTERNATIVE METHODS OF PALM OIL EXTRACTION



SOURCE: Final Report for detailed study of the Dodome Milenorvisi Palm Oil Processing Project.

APPENDIX 2

TIME AND LABOUR REQUIREMENT FOR PALM OIL PROCESSING A DAY/ PERSON

Traditional Method:

Boiling	30 minutes
Pounding	3 hours
Processing	10 hours
Total time (1 person / day)	13.5 hours

Note: 'By day' is normally between 8 am to 12 noon (4 hours) at $\text{¢}10,000.00$

Therefore the labour cost / person / day is:

$$\frac{13.5 \text{ hours} \times \text{¢}10,000.00}{4 \text{ hours}} \\ = \text{¢}33750.00$$

Working once a week » 52 times a year

Labour cost processing 3 head pans a day = $\text{¢}33750.00$

Total labour cost/ year = 52weeks x $\text{¢}33750.00$
= $\text{¢}1,755000.00$

Adding other Production costs eg. Total Annual Fixed Cost and Total Annual Variable Cost we have

$\text{¢}1755000.00$

+ $\text{¢}968830.00$ (Total Annual production cost)

$\text{¢}2723830.00$

Therefore cost per litre = $\text{¢}2723830.00$

Volume/annum = 2080 litres
= $\text{¢}1309.53/ \text{litre}$

Improved Technology

Boiling	30 minutes
Pounding.....	40 minutes
Pressing	50 minutes
Refining	1hr. 40 minutes.
Total time (approx.)	4 hours

4 people working 4 hours = 1 hour per man / day

Processing once a week at ₺10000.00 per man / week

Labour cost / week = ₺10000.00

Working for 52 weeks, Total annual labour cost = ₺520000.00

Add to (Total Annual production Cost) ₺6931759.00

= ₺7451759.00

Volume / annum = 16000 litres

Total Production cost per litre = ₺7451759.00

16000 litres

= ₺465.73/ litre

% change in cost/ litre of oil = $\frac{\text{Cost/ litre (Improved)} - \text{Cost/ litre (Traditional)}}{\text{Cost/ litre (Traditional)}} \times 100$

₺465.73- ₺1309.53

× 100

₺1309.53

= 64%

Note: In the Project appraisal cost/litre of oil reduced by only 7.1% using the Improved technology Incorporating labour cost into the analysis the result indicated a decrease of 64% in the cost of producing a litre of oil using the improved technology.

APPENDIX 3

DEPARTMENT OF AGRICULTURAL EXTENSION INTERVIEW SCHEDULE FOR PALM OIL PROCESSORS

RESEARCH TOPIC:

ANALYSIS OF THE TECHNOLOGY TRANSFER PROCESS AND ITS IMPLICATION ON ADOPTION OF IMPROVED PALM OIL PROCESSING TECHNOLOGY IN HO DISTRICT

This interview schedule is meant to solicit information and opinion of palm oil processors on the transfer of Improved palm oil Processing Technology to some communities in the Ho District. The study is purely for academic purposes. All information provided would be treated as private and confidential.

TECHNOLOGY TRANSFER PROCESS

1. When did you first hear about the improved palm oil processing technology, introduced into your community?
.....
2. How did you first get to know of the existence of the improved technology? From:
 1. Radio Friend 3. Relative
 4. Officials from ASIP/Helping Hand Assoc. for Women Development
 5. Others (specify)
3. After learning of the improved technology for the first time was there a meeting with the palm oil processors to discuss the issue?
 1. YES 2. NO 3. NOT APPLICABLE
4. If YES, what was discussed?
.....
.....
5. After the discussion whom did you consult for further details on the improved technology?
 1. Friends
 2. ASIP / Helping Hand Assoc. for Women Development
 3. Relative 4. Nobody

6. Did you find the need for a different method of processing palm oil?
1. YES 2. NO.
8. If YES, to whom did you express that need?
1. Friend
 2. Relative
 3. ASIP/ Helping Hand Assoc. for Women Dev't.
 4. Nobody
 5. Others (specify).....
9. If NO, why?.....
9. In your opinion, is the improved technology for processing palm oil your priority?
1. YES 2. NO.
10. If NO, what did you say when it was introduced?

COMMUNICATION AND KNOWLEDGE GENERATION.

11. Did you have the chance of using a similar technology somewhere else before it was brought to you?
1. YES 2. NO
12. If YES, did you identify some problems associated with the technology?
1. YES 2. NO
13. If YES, to Question 12 did you mention some of these problems to the people who introduced the technology?
1. YES 2. NO.
14. If YES what was their response?

15. If NO, why?.....

16. Did you receive any training on the use of the improved technology?

1. YES 2. NO

17. If YES, who organised the training.?

1. A palm oil Processor 2. A group of Palm oil Processors

3. The community 4. ASP/Helping Hand Assoc. for Women Dev't.

5. Others (specify).....

18. How many times was the training organised ?
.....

19. What form did the training take?

1. Demonstration 2. On the job training

3. Workshop/ Seminar 4. Field trips

5. Others (specify)

20. How long did the training last?
.....

21. Rank your skills in the use of these components of the improved palm oil processing technology according to the following ratings:

Very High -1, High - 2, Medium - 3, Low - 4 , Very Low 5

(a) Fruit pounder (b) Press

22. Have you suggested a modification on the following after you have started using them?

(a) Fruit Pounder 1 YES 2. NO
(b) Press 1. YES 2. NO

22. If YES, what was the modification?

(a) Fruit Pounder

1. One that can be dismantled and cleaned
2. One that will not crack the palm kernels
3. Type that can deliver pounded mass direct into the press
4. Others (specify)

(b) Press

1. Type that can process 'dzomi'
2. Type that will not use manpower
3. One with small perforations on the case
4. Others (specify).....

24. What was the response of the Implementers?
.....

SOCIO-ECONOMIC FACTORS

25. What was the most important contribution you have made towards the implementation of the project?

- 1. Monetary
- 2. Advice
- 3. Communal Labour
- 4. Security
- 5. Donation of building materials
- 6. Not applicable
- 7. Others (specify).....

26. Why did you make the contribution indicated in question 25?

- 1. To defray the cost of building materials
- 2. Deposit against maintenance of machines
- 3. To reduce overall cost of project
- 4. Membership contribution
- 5. Not applicable
- 6. Others (specify).....

27. Who owns the project?

- 1. Government
- 2. Community
- 3. Palm oil Processors
- 4. An NGO
- 5. Others(specify).....

Give reasons for your answer

29. Have you been given any incentive? 1. YES 2. NO

30. If YES, what have you been given?

- 1. Money
- 2. Vehicles for carting palm fruits
- 3. Free fuel
- 4. Utensils
- 5. Others (specify).....

31. Upon what grounds were you convinced to try the improved technology?

- 1. Economic (improving standard of living)
- 2. Time saving

- 3. Drudgery reduction
 - 4. Because of incentives given
 - 5. To process large quantities of fruits
 - 6. Low cost of equipment
 - 7. Other (specify)
32. Do you do any other business apart from processing palm oil?
- 1. YES
 - 2. NO
33. What is the major business you do apart from processing palm oil?
- 1. Farming
 - 2. Hunting
 - 3. Teaching
 - 4. Sewing
 - 5. Sand winning
 - 6. Others (specify).....
34. Do you encounter any problem(s) combining your other business with the processing of palm oil using the improved technology?
- 1. YES
 - 2. NO
35. If YES, state problem(s).....
36. Which one of the following gives you more income in a given period of time?
- 1. Palm oil processing using improved technology
 - 2. Farming
 - 3. Sewing
 - 4. Hunting
 - 5. Teaching
 - 6. Sand winning
 - 7. Other (specify).....
37. Do the implementers of the improved technology visit you to see how you are working?
- 1. YES
 - 2. NO
38. How often do they visit you?
- 1. Once a month
 - 2. Twice in a month
 - 3. Once a year
 - 4. No visit
 - 5. Others (specify).....
39. What is the major problem faced generally with the improved technology?
- 1. Lack of raw materials
 - 2. Problem combining farming with processing of oil

- 3. Management problem
- 4. Lack of skills to operate the machines
- 5. Technical fault on the machine
- 6. Inappropriate technology transfer process
- 7. Lack of credit
- 8. Others (specify).....

40. Has the problem got any effect on the trial of the improved technology?

1. YES 2. NO

41. Suggest ways of solving the problem, if YES to question 40 above

.....

GENDER ISSUES

42. What role(s) do those of the opposite sexes play in the processing of oil using the improved technology?

MEN.....

WOMEN.....

43. Does the involvement of the opposite sex in the use of the improved technology interfere with your performance in processing the oil?

1. YES 2. NO

44. If YES, How?

.....

45. Is there any cordial relationship between the opposite sexes using the improved technology in the processing of the oil?.

1. YES 2. NO

46. If NO, why the friction?

.....

46. Do you have an association of palm oil processors?

1. YES 2. NO

48. If YES How many people form the Executive?
 1. No. of men 2. No. of women
49. How are executive members selected?
 1. By voting
 2. By appointment
 3. Self imposition
 4. Others (specify)
50. Rank the performance of the executives according the following ratings
 1. Very High 2. High 3. Medium
 4. Low 5. Very Low
51. What is the relationship between the executives and the other members of the association?
 1. Very High Cordiality 2. High Cordiality
 3. Medium Cordiality 4. Cordiality
 5. No Cordiality

CHARACTERISTICS OF THE TECHNOLOGY

A. RELATIVE ADVANTAGE

52. How much oil is obtained from processing one basket full (9 kg) of palm fruits using
 (1) Traditional Technology?
 (2) Improved Technology?

B. COMPATIBILITY

53. Rank the quality of oil produced according to the following rating :
- 1-Very High 2-High 3-Medium
 4-Low 5-Very low 6-Same.

	Traditional Technology	Improved Technology
Aroma		
Colour		
Health		
Storing ability		
Taste		

C. COMPLEXITY

53. The improved palm oil processing technology is ---- to use.

1. Very easy 2. Easy
3. Slightly easy 4. Not easy

55. The operation of the equipment is ----- to understand

1. Very easy 2. Easy
3. Slightly easy 4. Not easy

D. OBSERVABILITY

56. What is the maximum quantity of palm fruits (baskets) that can be processed per man/day using

1. The traditional technology?
2. The improved technology?.....

PERSONAL DATA

57. Town/Village.....

58. What is your sex? 1. Male 2. Female

59. How old are you?.....years.

60. What is your highest level of education?

1. No formal education 2. Primary
3. JSS 4. Middle School
5. Senior Secondary 6. Tertiary
7. Others specify).....

61. What is your marital status?

1. Single 2. Married
3. Separated 4. Divorced
5. Widowed
6. Others (specify).....

62. How many dependants do you have?

63. How long have you been processing palm oil?
.....

64. When did you start using the improved technology introduced by ASIP/Helping Hand Association for Women's development?.....

OTHER RELEVANT PERSONAL INFORMATION ON THE USE OF OTHER IMPROVED TECHNOLOGY

65. Do you still use the improved technology?

1. YES 2. NO

66. If YES, how often do you use it?.....
.....

67. If NO, to question 65, why have you stopped using it?

68. If you have stopped do you now process palm oil using the Traditional Method?

1. YES 2. NO

69. State whether the Improved Technology is

1. Acceptable 2. Not acceptable

70. If not acceptable, Tick the most important reason why?

- 1. Technical fault
- 2. Problem combining farming with processing of oil
- 3. Lack of credit
- 4. Mismanagement of funds
- 5. Lack of skills to operate the equipment
- 6. Inappropriate technology transfer process
- 7. Lack of raw materials
- 8. Others (specify)

APPENDIX 4

UNIVERSITY OF GHANA, LEGON,
DEPARTMENT OF AGRICULTURAL EXTENSION

QUESTIONNAIRE FOR IMPLEMENTERS OF IMPROVED PALM OIL
PROCESSING TECHNOLOGY

RESEARCH TOPIC:

ANALYSIS OF TECHNOLOGY TRANSFER PROCESS AND ITS IMPLICATION ON ADOPTION OF IMPROVED PALM OIL PROCESSING TECHNOLOGY BY WOMEN IN THE HO DISTRICT.

This questionnaire is meant to solicit information on the transfer of improved palm oil processing technology to some communities in the Ho District. The study is purely for academic purposes. All information provided would be treated as private and confidential.

1. Who initiated the idea of transferring the improved palm oil processing technology to Dodome and Tsyome?

- 1. Government
- 2. The community
- 3. Palm oil Processors Assoc.
- 4. An NGO
- 2. Others (specify).....

2. How was this idea first carried to the people? Through

- 1. Radio 2. Friend
- 3. Relative 4. ASIP/ Helping Assoc. for Women's Development
- 5. Other (specify).....

3. Is there the need for a different method of processing palm oil?

- 1. YES 2. NO

4. Did the beneficiaries take part in the determining the need for a different method of processing palm oil?

- 1. YES 2. NO

6. If YES, what was the most important need identified by them ?

- 1. Credit
- 2. Containers for storing oil
- 3. Transport for carting fruits for processing
- 4. Improved technology for processing oil
- 5. Others (specify).....

6. If NO, to question 3, what made you introduce the improved palm oil processing technology?

- 1. Availability of raw materials
- 2. Provision of job opportunities for the people
- 3. Low oil production
- 4. To reduce drudgery associated with the traditional method
- 5. Others (specify)

7. When was the improved technology introduced to the people?

.....

8. Who decided on the type of equipment introduced?

- 1. The manufacturers
- 2. ASIP / Helping Hand Assoc. for Women's Development
- 3. Beneficiaries
- 4. Others (specify).....

9. What was the major factor considered in selecting the fruit pounder?

- 1. Cost
- 2. Quantity of fruits to be processed at a time
- 3. Source of power
- 4. Ease of maintenance
- 5. Gender
- 6. Others (specify).....

10. What was the major factor considered in selecting the fruit press?

- 1. Cost
- 2. Quantity of fruits to be processed at a time?
- 3. Ease of use
- 4. Gender

COMMUNICATION AND KNOWLEDGE GENERATION

11. Has anybody in Dodome and Tsyome ever used the improved technology somewhere else?

1. YES 2. NO

12. If YES, what were some problems they encountered using the fruit pounder?

1. Screws wore out quickly
2. Fruits were not properly pounded
3. Machine difficult to operate
4. Others (specify).....

13. What were some problems encountered using the press?

1. A lot of oil remains in the fibre
2. Cannot be used to process dzomi
3. Manpower requirement is high
4. Others (specify).....

14. What lessons did you learn from questions 11 and 12?

.....
.....

15. How relevant are the experiences in questions 11 and 12 to Dodome and Tsyome palm soil quarterly contribution?

Have you organised any training for the beneficiaries on the use of the

1. YES 2. NO

16. If YES, what form did the training take?

1. Demonstration 2. On the job training
3. Workshop/Seminar 4. Field Trips
5. Others (specify).....

17. If NO, why?

How long did the training last, if organised?

18. How many training sessions did you have during the period?
.....

Rank the skill of the processors in the use of the listed components of the improved palm oil processing technology according to the following ratings:

Very high - 1, High - 2, Medium - 3, Low - 4, Very low - 5

(a) Fruit pounder (b) Press

19. Have the palm oil processors suggested any modification of the improved technology?

1. YES 2. NO

20. What modification is suggested on the fruit pounder?

1. One that can easily be dismantled and cleaned
2. One that will not crack the palm kernels
3. Type that can deliver pounded mass direct into the press
4. Others (specify).....

21. What modification was suggested on the press?

1. Type that can process "dzomi"
2. Type that will not use manpower
3. One with small perforations on the case
4. Others(specify).....

22. What has been your response to the suggestion?
.....



PRINCIPLES OF TECHNOLOGY TRANSFER

23. Did the beneficiaries make any contribution towards the project?

1. YES 2. NO

24. What was the most important contribution made?

1. Monetary
2. Advice
3. Communal labour
4. Security
5. Donation of building materials
6. Others (specify)

25. Why did they make the contribution indicated in question 27?

1. To defray the cost of building materials
2. Deposit against maintenance of machines
3. To reduce cost of the project
4. Membership contribution
5. Others (specify).....

26. Who owns the project?

- | | | | |
|------------------------|--------------------------|--------------|--------------------------|
| 1. Government | <input type="checkbox"/> | 2. Community | <input type="checkbox"/> |
| 3. Palm oil processors | <input type="checkbox"/> | 4. An NGO | <input type="checkbox"/> |

27. Do the people have any other source of income apart from palm oil processing?

- | | | | |
|--------|--------------------------|-------|--------------------------|
| 1. YES | <input type="checkbox"/> | 2. NO | <input type="checkbox"/> |
|--------|--------------------------|-------|--------------------------|

28. If YES, what is the major source of income?

- | | | | | | |
|-----------------|--------------------------|--------------------------|--------------------------|-------------|--------------------------|
| 1. Farming | <input type="checkbox"/> | 2. Hunting | <input type="checkbox"/> | 3. Teaching | <input type="checkbox"/> |
| 4. Sand winning | <input type="checkbox"/> | 5. Others (specify)..... | | | |

29. Were the processors given any incentives to motivate them to try the improved technology?

- | | | | |
|--------|--------------------------|-------|--------------------------|
| 1. YES | <input type="checkbox"/> | 2. NO | <input type="checkbox"/> |
|--------|--------------------------|-------|--------------------------|

GENDER ISSUES

30. Indicate whether the improved technology is considered

- | | | | |
|-------------------|--------------------------|--------------------|--------------------------|
| 1. Gender neutral | <input type="checkbox"/> | 2. Gender specific | <input type="checkbox"/> |
|-------------------|--------------------------|--------------------|--------------------------|

Which of the activities involved in the processing of oil using the improved technology are done by

1. Men
2. Women

31. What has been the work-relationship between men and women using the improved technology?

1. Very cordial 2. Cordial 3. Moderately cordial
 4. Not cordial 5. Others (specify)

32. If relationship is not cordial what problems have you identified between them?

1. Men not willing to help women
 2. Marginalization of women by men
 3. Men dictate to women
 4. Others (specify)

CHARACTERISTICS OF THE TECHNOLOGY

A. RELATIVE ADVANTAGE

32. Which of the following produces more oil using the same quantity of palm fruits?

1. Traditional Technology
 2. Improved Technology

B. COMPATIBILITY

34. Rank the quality of oil produced according to the following ratings.

- 1-Very high 2-High 3-Medium
 4-Low 5-Very low 6-Same

	Traditional Tech.	Improved Tech.
Taste		
Aroma		
Storing ability		
Colour		

C. COMPLEXITY

35. The Improved palm oil technology is to use.

1. Very easy 2. Easy 3. Slightly easy
4. Not easy

36. The operation of the machine is to understand.

1. Very easy 2. Easy 3. Slightly easy
4. Not easy

C. OBSERVABILITY

37. What is the maximum quantity of palm fruits (in kg) that can be produced per man/day using

1. Improved Technology
2. Traditional Technology

38. Do you visit the Palm oil Processors?

1. YES 2. NO

39. How often do you visit them?

1. Once a month 2. Twice in a month 3. Once a year

40. What problems do the beneficiaries face generally, trying the improved technology?

1. Lack of raw materials
2. Problem combining farming with processing of
3. Management problems
4. Lack of skills to operate the machines
5. Inefficiency of the machines
6. Inappropriate technology transfer process
7. Lack of credit
8. Others (specify)

41. In what ways can the problem(s) be solved?

.....
.....
.....

41. In your opinion, State whether the Improved Technology is to the beneficiaries.

1. Acceptable 2. Not acceptable

42. If not acceptable, Tick the most important reason why?

- 1. Technical fault
- 2. Problem combining farming with processing of oil
- 3. Lack of credit
- 4. Mismanagement of funds
- 5. Lack of skills to operate the equipment
- 6. Inappropriate technology transfer process
- 7. Lack of raw material
- 8. Others (specify)

APPENDIX 5

TOTAL PALM OIL PRODUCTION RECORD*

Palm Fruit (kg)	Palm Oil Produced (litres)		Total Processing Time (Hrs.)	
	Traditional	Improved	Traditional	Improved
360	48	54	13.50	5.00
554	78	110	17.75	6.58
640	91	128	19.98	6.43
700	100	140	21.35	7.40
840	117	168	25.67	8.17
865	131	174	23.00	8.17
900	120	135	28.47	8.50
960	134	192	24.18	8.83
989	138	197	26.10	8.87
1050	147	210	26.00	9.77
1200	168	240	28.50	10.17
1290	215	301	35.15	11.00
1429	238	329	33.17	11.75
1870	310	384	36.33	14.33

* Source: Birim Cottage Industries, Essam via Akim Oda, Eastern Region.
PALM OIL PROCESSING, Technologies for Rural Women in Ghana,
Technical Manual No. 1.

APPENDIX 6

PALM FRUIT, WATER AND FUEL WOOD INPUTS FOR THE PRODUCTION OF 100 LITRES* OF PALM OIL

Traditional (Trad,) and Improved (Imp.) Methods

Session	Palm Fruit (kg.)		Boiling Water (litres)		Fuel wood (kg.)	
	Trad.	Imp.	Trad.	Imp.	Trad.	Trad.
1	600	428	228	36	93	42
2	600	438	206	33	95	46
3	660	497	321	62	153	72
4	700	500	350	77	175	71
5	703	500	330	84	192	78
6	714	500	292	45	134	63
7	714	500	333	51	153	60
8	715	504	387	98	129	91
9	716	500	336	56	149	65
10	717	502	355	55	91	63
11	718	500	359	64	171	74
12	750	666	354	167	208	139
13	750	667	300	80	167	93
Average	667	515	319	70	147	74

* Weight from the following production range:

Traditional: 48 – 38 litres palm oil
Improved: 54 – 384 litres palm oil

Source: PALM OIL PROCESSING, Technologies for Rural Women in Ghana, Technical Manual No.1.