

Assessment of Performance and Adoption of Improved Enset Processing Technologies: A Case Study in Enemorena Ener District, Guragie Zone, Southern Nations, Nationalities and Peoples Regional State, Ethiopia

*Asfaw Zewdie Tiruneh

Lecturer, School of Governance and Development Studies, Hawassa University, Hawassa, SNNPRS, Ethiopia

Abstract: The main objective of this study is to assess the impact of introduced enset processing technologies in terms of time saving, income change and role distribution. Enset (*Enset ventricosum*) is one of the most important food crops in Southern, South- Western and Western parts of Ethiopia. It supports about 12 million people in the Southern region of Ethiopia. It is a multipurpose crop used for various functions, such as human food, animal feed, shading other crops like coffee and decoration. It is a drought resistant crop which makes it a risk coping crop. Traditionally, enset production, which involves harvesting and processing, is one of the most cumbersome household responsibilities of women in the region. The traditional processing methods are inconvenient and unhealthy to women. Accordingly, technologies of various types have been introduced by different institutions to help solve these problems of the household. The introduced technologies include mainly enset scraping and squeezing devices. The results show that farmers' adoption rate of these technologies is very low. There is a paramount workload difference (labour hour) between the traditional methods and the introduced technologies. The new technologies are efficient in the sense that they saved women's time. The change in role distribution among households due to the introduced technologies is in a way that more boys, girls, and men are involved in the scraping and squeezing activities when a household used the introduced technologies. Income generated from the sale of enset products is controlled by the women in more than 90% of the time irrespective of the two enset processing methods. The findings of the study revealed that the introduction of the new technologies has also improved gender relations among the households since women started participating in productive roles. Given such effects of the technologies, designing new strategies, establishing networks and collaboration between partners would help to increase adoption rates of the technologies and to empower women in the household.

Key Words: Women, *Enset ventricosum*, Process, Gender Relations, Technology, Adoption

Date of Submission: 06-02-2020

Date of Acceptance: 21-02-2020

I. INTRODUCTION

Enset (*Enset ventricosum*) is commonly known as "false banana" and it is a traditional staple crop or co-staple food in the densely populated South and South-Western parts of Ethiopia. It serves as food security for about twelve million people in Southern region of Ethiopia (Brandt et al. 1997). It is a multipurpose crop used as human food, animal feed, to shade other crops like coffee, decoration, is a drought resistant crop which makes it risk avoidance crop. It resembles the banana plant and is produced primarily for the large quantity of carbohydrate – rich food found in the false stem (pseudo stem) and an underground bulb (corm). Enset is grown at an altitude that ranges from 1,100 to more than 3,000 meters above sea level (Brandt et al. 1997).

However, little effort or research is made to improve the processing aspect of the crop and thus traditional processes are predominantly used by farmers. Both men and women are involved in growing and managing enset at field level in most cases, however, there are places where it is most commonly associated with women. Women are mainly responsible for harvesting and processing enset. Enset processing requires more labour and thus it is additional burden for women beside to handling daily house routines. The burden remains as a challenge of women for a long time and this has influence on gender relations at household level. Some enset processing technologies (e.g. scraping and squeezing tools) have been developed by Sodo Rural Technology promotion Research Centre and Melkassa Agriculture Research Institution.

The different technologies that farmers used in the area were traditional and introduced technologies. The introduced technologies mainly differ from traditional methods in terms of time and labour taking, and their provided yield of quantities and qualities. Traditional methods are processing the whole plant is uprooted with the help of a special knife and brought to the processing site-an open place within the plantation. The traditional

harvesting and post harvesting procedures are cumbersome; labour intensive, unhygienic, impose a lot of inconvenience to the working women, and associated with great yield lose. On the other hand the introduced technologies improve the process of the enset products, some devices such as enset scraper and squeezer.

These technologies have been disseminated at different times to farmers through government organizations (GOs) and non-government organizations (NGO) to alleviate the burden of women related to enset processing. However, the performance, adoption and contributions of these technologies in reducing women burden and improving gender relations have not been systematically assessed.

Gender relations are the way in which a culture or society defines rights, responsibilities, and the identities of men and women in relation to one another (Bravo-Baumann, 2000). Unlike biological characteristics of women and men, gender relations are context specific. They vary between and within countries (e.g. rural/urban regions), but also between households. Often, household presents different patterns of male-female relations depending on their structure e.g. if they are women-headed, nuclear or extended. Because women and men interact in all aspects of life, gender relations are omnipresent in the private sphere (i.e. household level) as well as the public sphere where women and men interact as community members or colleagues. Gender relations are intrinsic to all aspect of life. Whatever our age, religion, ethnicity, class etc. we are always either a woman or a man, with the limitations and opportunities that are associated with it a particular context (OECD).

Statement of the Problem

Women in rural community of Ethiopia have more workload in general as compared to men. The workload is expressed in household, farm and social activities. Almost all the household activities (including child care) are performed by women alone. Therefore, women are busy all the day from very early in the morning to late in the evening. Men do not involve in household activities and in some places, like in Guragie women are not allowed even to share bread with their husbands in some cases, i.e., women eat what is left from their husbands. Women are also involved in farm operations mainly at planting, weeding and harvesting of different crops. Some crops are more managed by women than men. Such crops include enset, vegetables and spices. Moreover, milking and managing calves is among the daily routines of women. Processing of the staple food source enset is entirely done by women because traditionally men are not allowed to involve on such activities.

Enset processing is labour demanding and time consuming activity which calls for technology to make it efficient and lighten the burden on women. It is unimaginable to perform social activities such as wedding, funeral and circumcisions ceremony without active involvement of women. Due to all these workload, women may not have enough time to have adequate care for their child and may not perform the house needs to the satisfaction of men. This at times creates conflict among spouses. In general the existing enset processing coupled with other farm and household activities has negatively affected the relationship between men and women biasing the work load to women and affecting maternity health (Sodo Rural Technology Promotion Center report document, 2010). Thus, different development programs have introduced enset processing technologies as a solution to lessen the burden on women. The introduction these technologies are assumed to increase efficiency of enset processing, and change role distribution and decision making power. However, there is a knowledge gap as to how the introduction of technologies has been adopted and improved efficiency and change role distribution.

Objective of the Study

The objective of this research was to gain knowledge and assessed the impact of introduced enset processing technologies in terms of time saving, income change and role distribution in Guragie zone, Enemorena Ener district.

Research questions

1. What are the performances and adoption of introduced technologies and their effect on time saving, income change and role distribution?
2. What are the introduced enset processing technologies in the area?
3. What are the main functional differences between the introduced technologies and the traditional enset processing practices?
4. How efficient are the introduced technologies in terms of labour and processing time per unit of output? How economical is the introduced technologies? (Affordability)
5. What is the adoption rate of the introduced technologies? (Acceptance by the society) Reason for non-adoption?
6. What was the labour division in relation to enset processing before the introduction of technologies? What has been changed after the introduction of the technologies?

Research framework

The research framework in Figure.1 shown was an important part of the researcher that used as a guidance to conduct the study. The research was undertaken on basis of the research framework. The first column shows the objectives of the study in line with the research questions, the second, the methodologies which indicated the methods of data were collected. The third one was analysis of data. Based on this analysis, the report was prepared by used descriptive statistics and finally, the report was produced.

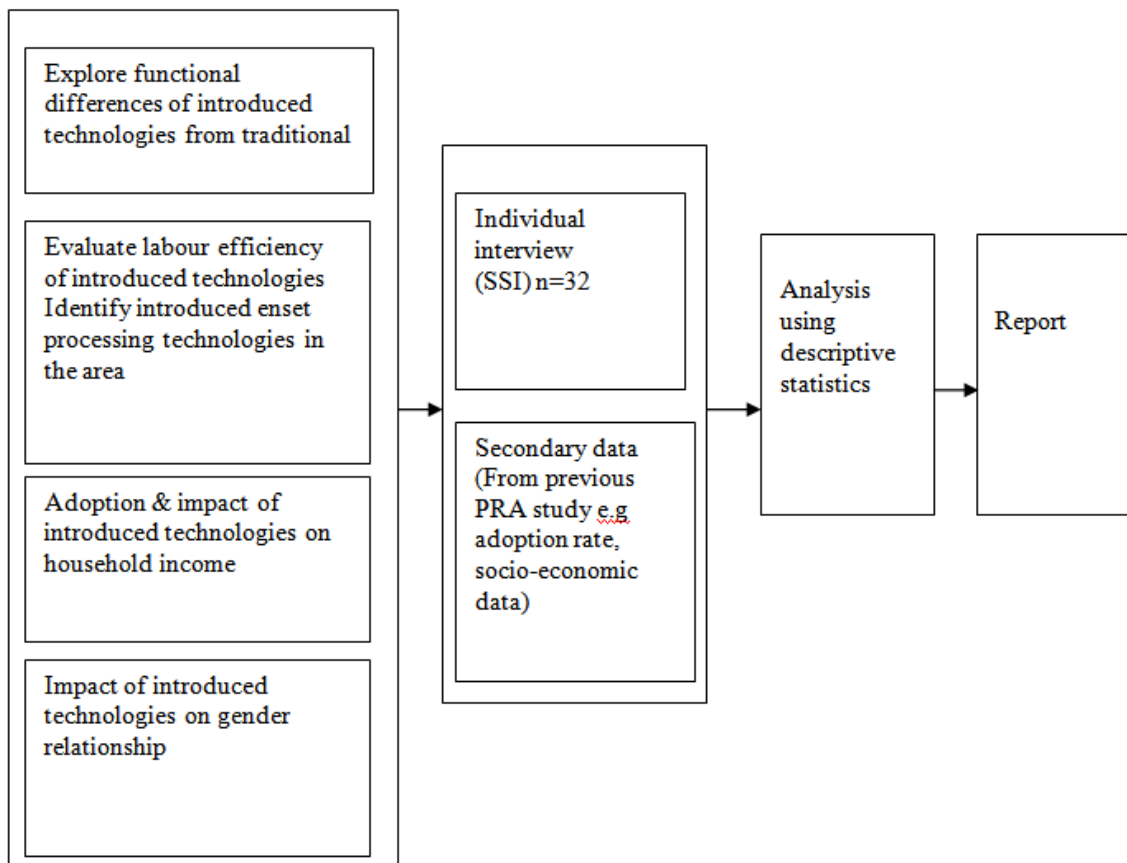


Figure 1: Research Framework

Source: Researcher’s Own Sketch

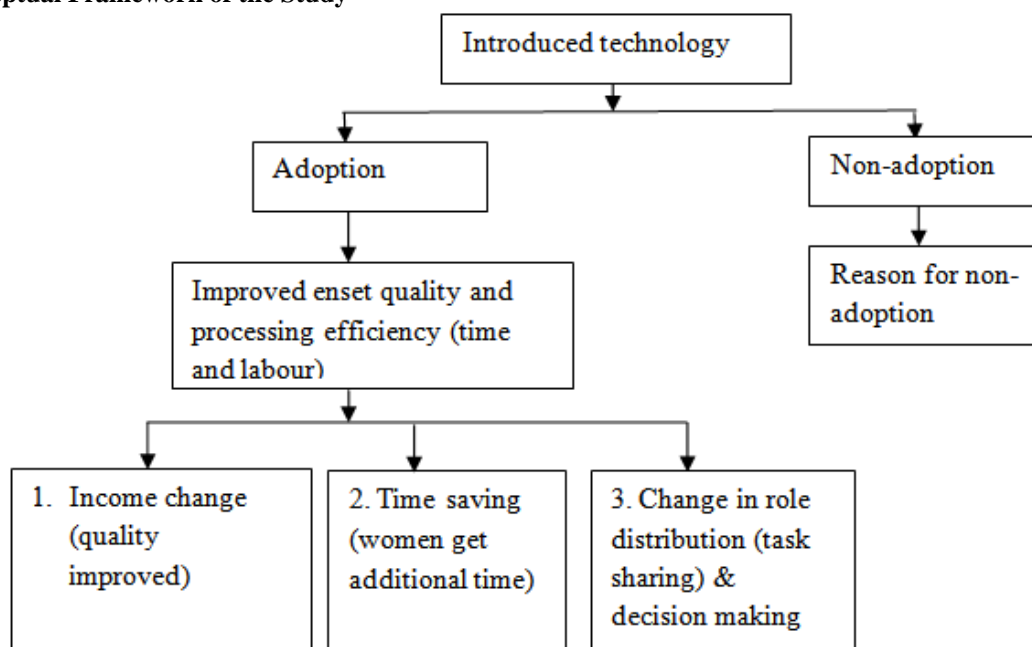
Explanation of key terms.

Enset processing technologies-In this research, enset processing technologies means the technologies that are to processing enset scrapers and squeezers devices which aimed to solve the problems related to traditional enset processing methods which are inconvenient to and unhealthy to women. As it requires bowing or raising one leg and pressing the pseudo stem leaf sheaths with the heel so that it will not slip down. All these processed also make the processed unhygienic.

Adoption- implies the farmers those who are currently often used their enset processing activities that by the introduced technologies (such as scrapers and squeezers) which are manufactured by Sodo Rural Technology Promotion Center and Melkassa Research Agriculture institute.

Performance- in this research implies that how the introduced technologies are operated or processed the enset with efficiently and effectively to those farmers that comparing with the traditional enset processing methods. In the framework bellow shown that introduced technology are distributed to adoption or non- adoption of farmers to enset processing technology devices.

Conceptual Framework of the Study



Selection of the study area

The main reason for selection of these areas is that in the Enemorena Ener district enset processing technologies have been introduced by Melkassa and Sodo Rural Technology Centres in different times for the past 11 years. Besides the area is the project area of CASCAPE. Moreover, enset is widely used food in the area as compared to others districts of CASCAPE projects. The site was selected in consultation with respective staff members of district offices of agriculture.

The study Design and approach

In this study, data were collected mainly in qualitative way through desk study and case study research design. Checklist was prepared in line with the research questions. In the desk study relevant literature was reviewed while the case study was conducted by interviewing individual farmers and personal observation on the performance of traditional enset processing and introduced technologies.

The qualitative method was chosen as it was the main approach appropriate for conducting case study. It was more effective in gaining knowledge and assessing the impact and adoption of introduced enset processing technologies in terms of time saving, income change and role distribution.

The data set and data type

For data set both Primary and secondary data were used. The primary data was collected from both technology users and non-users of women. Secondary data was gathered from specialized journals, scientific books, Sodo Rural Technology Promotion Centres evaluation reports and documents, regional and district departmental published and unpublished documents, CASCAPE project PRA studies reports documents and online sources. The primary respondents were reflected their own experiences, ideas, feelings, and suggestions to its improvements in their practiced of both traditional processing and introduced enset technology users.

Sampling method and sample size

Data was collected mainly using individual interview that included both technology users and non-users. Purposive sampling was used for individual interview targeting women. A total of 32 individuals were interviewed from four Kebeles. All (16) farmers from each kebele who were supplied with enset processing technology were interviewed whereas the rest 16 non user farmers were selected randomly. Secondary data was searched on the introduced technologies and the rate of adoption and socio-economic characteristics of the study areas.

Data collection procedure

The researcher first takes took an appointment with his own organization manager and the Hawassa University South Capacity building for scaling up of evidence-based practices in agricultural production in

Ethiopia (CASCAPE) project coordinators. After that he was discussed with each individual about the overall objectives of his research. Then the researcher travelled to the Enemorena Ener district.

The case study was conducted by the researcher himself. A checklist is used for semi-structure interview (SSI). Before the actual case study, pre-testing of check list was undertaken. On the basis of the pre-test, some modifications were made on the check list.

The interview was carried out based on purposive selected for technologies users and random sample technique for non-user farmers. Finally, the study was conducted preparing and using Checklist. Most of the data were collected through individual interview or SSI. In addition personal observation was collected on the current status of the introduced technologies and on the application of the traditional method.

In the research all the research ethics were considered during the data collection. During the data collection period, it was adjusted the time with individual willing that farmers were free of work to be able to give information for the researcher. The researcher led the overall process and discussion with the concerned individuals.

In cases where farmers were challenged to give enough information (such as quantification of enset product and estimation of annual income), consultation was made with professionals for estimation. Accordingly, the annual income of a household was estimated as the product of average number of ensets processed per annum per household X average product per plant X average price of the product. The number of enset processed per annum per household was estimated to be 20 plants. The amount of area allotted to enset grown was also estimated as the sum of the area/ha estimated by respondents before using the introduced technologies and after used or the introduction of the introduced technologies divided by the total respondents. Ranking was made for activities that women do with the time saved due to the introduced technology considering the frequency of the response given for each rank.

Introduced Technology in this paper means those manufacturing by Sodo Rural Technology Promotion Centre (SRTPC) and Melkassa Institute of Agriculture Research (MIAR) (such as enset scraper and squeezer).

Method of Data analysis and interpretation

The data was analysed using descriptive statistics through clustering the qualitative data. The result was interpreted and discussed in comparison with other findings.

II. RESULTS AND DISCUSSION

The study area and respondents

The case study was conducted in Enemorena Ener district where improved enset processing devices had been distributed. In the study area, enset processing is mostly carried out using traditional methods. Introduced technologies were delivered to the study area in 1997 and 2004 by Sodo Rural Technology Promotion Centre (SRTPC), and latter in 2012 by Melkasa Agricultural Research Centre (MARC). Scrapers and squeezers are the main introduced enset processing technologies available in the study area. These technologies were locally manufactured by the SRTPC and MARC. The SRTPC has manufactured 3373 introduced technologies, consisting of 2214 scrapers and 1159 squeezers. According to the district office of agriculture staffs reported document, a total of 94 introduced technologies (such as 80 scraping and 14 squeezing) are distributed to farmers that manufactured from Sodo Agriculture Research Promotion Centre in 1997 and 2004. And later in 2012 about 10 scrapers were distributed by Melkassa Agriculture Research Institute. These technologies perform different functions to make different products. While scrapers are used to make a product called “Kocho”, squeezers are used to make the fine product called “Bulla”.

Based on consultation of Office of Agriculture, thirty two respondents were selected from four kebeles of the district. All of the selected respondents were women of which 50% of them were given the introduced technology while the rest were not given. The main reasons for only selecting women respondents were (1) The technologies are distributed for Women that aim to reduce burden of women; (2) Enset processing activities are usually done by women.

Types of enset processing technologies in use and reason

Table 1 provides a descriptive statistics about the use of traditional and introduced enset processing technology. Accordingly, this study was identified that the traditional methods are the most commonly used enset processing equipment. From those who used the introduced technology, only 6 (or 38%) used frequently the introduced technologies often. This implies that farmers are mostly used frequently by their introduced technologies to scraping and squeezing their enset plants. Accordingly the women have their own plan to process their enset plants. Once they started to process the enset plant they spent about 4 to 5 hours. That is, even those who had access to the introduced technology 10 continued to use the traditional enset processing technology often. All the users of the traditional method and those that used both cited lack of access to (50 %) and lack of money (50 %) about the introduced technology as the main reasons for not using the introduced

technology. It should be noted that those (all 16) who had access to the introduced enset processing technology had to share the equipment with four other people. However, high cost and lack of knowledge and lack of acceptance were not mentioned as reasons for not adopting the introduced technologies.

Table 1: Types often used enset processing technology

Type of technology use	No. of respondents	Percentage	Often uses	percentage
Traditional only (n=16)	16	100	16	100
Introduced only (n=0)	0	0	0	0
Both (n=16)	16	100	6	38
If not what are the reasons for not using introduced technologies (N=26)	No. of respondents	Percentage		
Don't like (accept)	0	0		
Lack of money	13	50		
High cost	0	0		
Lack of skill how to use it	0	0		
Lack of access	13	50		

Source: Computed from Primary Data

Affordability of introduced technology

The affordability of the introduced enset processing technology is displayed in Table 2. Accordingly, 9 of the respondents (28%) said they can afford to buy the technology. Whereas majority (72%) of the respondents replied that they could not afford to buy the introduced technologies. Of those who said they did not afford, 57% of them cited lack of money and 35% said high cost of the introduced technology and lack of arrangement to buy it in groups as the main reasons. However, very few farmers responded that they did not purchase the introduced technology due to their preference to the traditional processing method and the decision to purchase requires also the involvement of husbands.

Table 2: Afford to buy introduced technology (n=32)

Affordable to buy	No. of respondents	Percentage
Yes	9	28
No	23	72
If no, reasons not afford to buy introduced technology		
Lack of money	13	57
High cost and no arrangement buying in group	8	35
Prefer to traditional processing	1	4
Could not decided by myself without my husband decision	1	4

Source: Computed from Primary data

Functional difference between traditional and introduced technology

Decisions made to process matured enset plant: Under the traditional technology, the decision to process the matured enset was largely made by both women and men (47%), followed by women (34%) and men (19%). Likewise, under the introduced technology, the decision to process the matured enset was largely made by both women and men (56%), followed by women (31%) and men (13%) (Table 3).

Table 3 Decision to make process matured enset plant

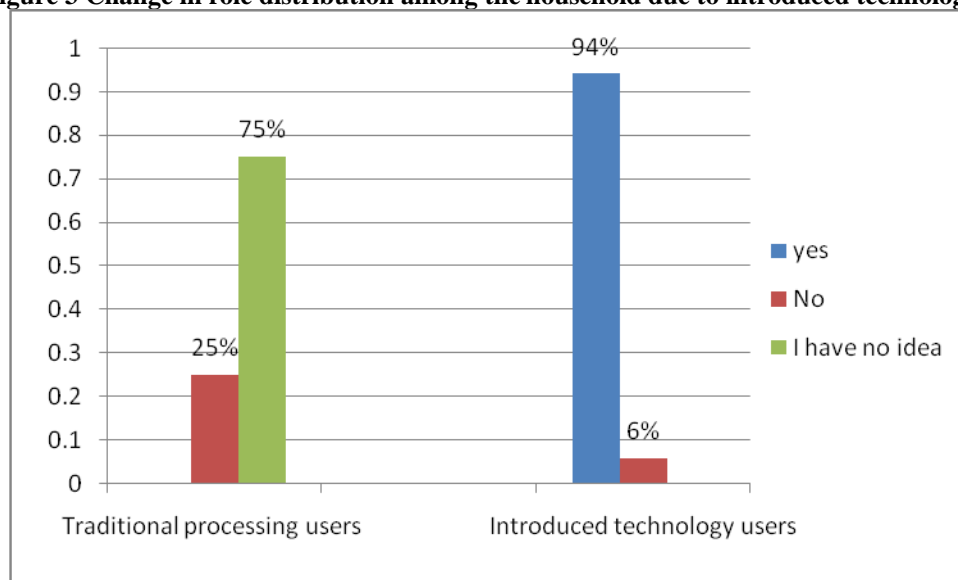
List of enset processing method and technologies	women	Men	Women and men
Traditional (n=32)	11	6	15
Percentage	34	19	47
Introduced technologies (n=16)	5	2	9
Percentage	31	13	56

**Note: respondents who use traditional technology alone did not respond to introduced technology*

Change in role distribution among the household: As shown in Fig. 8, 94% of the respondents who used the introduced technology claimed that the introduction of the introduced technology changed the role distribution in the household.

Very few of them replied to the contrary that there is no role change. On the other hand, most of respondent farmers (75%) who are using only the traditional processing method replied that they have no idea on the role change over time while others (25%) said no change.

Figure 3 Change in role distribution among the household due to introduced technologies



Source: Primary Data

Role of household members in different enset processing activities: Table. 4 display the enset processing activities within the household under the introduced enset processing technology. When using introduced technology; the respondents replied that enset plant cutting and carrying activities were mainly carried out by men with some support from other household members – boys, women and girls, respectively. Whereas, activities like peeling, scraping, squeezing and transporting extracts are more done by women with little support from other family members. But men are not at all involved in squeezing and follow-up of kocho fermentation whereas boys have supporting role in squeezing. Follow-up of kocho fermentation is the duty of merely women. Dig the land to bury scraped products is more done by men. In general, women are involved in all enset processing activities and men take biggest share in cutting and carrying the plant while boys and girls have supporting role.

Table 4 Harvard matrix- household members division of labour indifferent enset processing activities when introduced technologies (enset scraper and bulla squeezer) are used (n=16)

(Multiple answers are possible)

List of activities	Women	Men	Girls	Boys
Cutting	2	12	0	4
Carrying	5	9	3	8
Peeling	14	6	3	5
Scraping	16	2	4	5
Squeezing	16	0	4	3
Transporting	16	3	7	6
Dig the land to bury scraped products	8	11	1	3
Follow up of kocho fermentation	16	0	0	0

Source: Primary Data

With regard to the traditional technology, the enset processing activities within the household are displayed in Table 5. When using traditional enset processing method, enset plant cutting and carrying activities were mainly carried out by men and women although men are more involved in cutting and women in carrying. Boys have more roles to support their parents in cutting and transporting as compared to girls. Activities like peeling, transporting extracts and dig the land to bury scraped products are more done by women with little support from other family members. Men and boys are not totally involved in scraping, squeezing and follow-up of kocho fermentation. More or less, scraping, squeezing and follow-up of kocho fermentation is the duty of merely women. In general, women are involved in all enset processing activities and men take biggest share in cutting and carrying the plant while boys and girls have supporting role in most activities.

Table 5 Harvard matrix- household members division of labour in different enset processing activities when traditional processing method is used (n=16) (Multiple answer are possible)

List of activities	Women	Men	Girls	Boys
Cutting	8	8	0	2
Carrying	9	9	2	5
Peeling	14	1	0	1
Scraping	15	0	0	0
squeezing	16	0	2	0
Transporting	15	4	5	3
Dig the land to bury scraped products	8	9	1	4
Follow up of kocho fermentation				

Efficiency of enset processing methods

Farmers were asked to give their general views on whether there is workload difference when using the traditional and the introduced enset processing technologies. Of the interviewed respondents (n=32), majority (63%) of them replied that there is workload difference when using the traditional and the introduced enset processing technologies (Fig. 9). However, 34% of the respondents did not realize whether there is work load difference or not while 3% of them said there is no difference.

Regarding the number of days required to follow up kocho fermentation, great majority (91%) of the respondents said that follow up of kocho fermentation takes 8 to 10 days (Fig.5). However, few farmers said that the follow up can take up to 15 days. This activity is similar under introduced and traditional methods.

Table 6 presents comparison of the introduced and traditional technology with regard average time spent in scrapping and squeezing activities. As estimated by the respondents, the average time required to scrape a single plant is 121min. and 73 min. hours with the traditional and introduced methods, respectively. Similarly, the average time required to squeeze a single plant is 103 min. and 66min. hours with the traditional and introduced methods, respectively.

All of the interviewed farmers (n=16) perceived that the introduced technologies saved their time in general and the women also explained that their husbands are happy, appreciate and recognized the time saved. Respondents were also asked how they utilize the time saved due to practicing the introduced technology. Most of the respondents said that they use the time saved mainly for farm activities, going to market and other household works, taking care of children and social activities, income generating activities, and for praying (Table 7). According to ranking made by them, they allot the saved time more perform household works, farming activities, looking after children (going to market), and income generating activities, other social activities, taking a rest, and praying, in this order of importance (Table 8). This activities are undertaken by farmers were after the introduction of technologies.

Figure 4 comparison of work load difference between the traditional and introduced enset Processing technology (n=13)

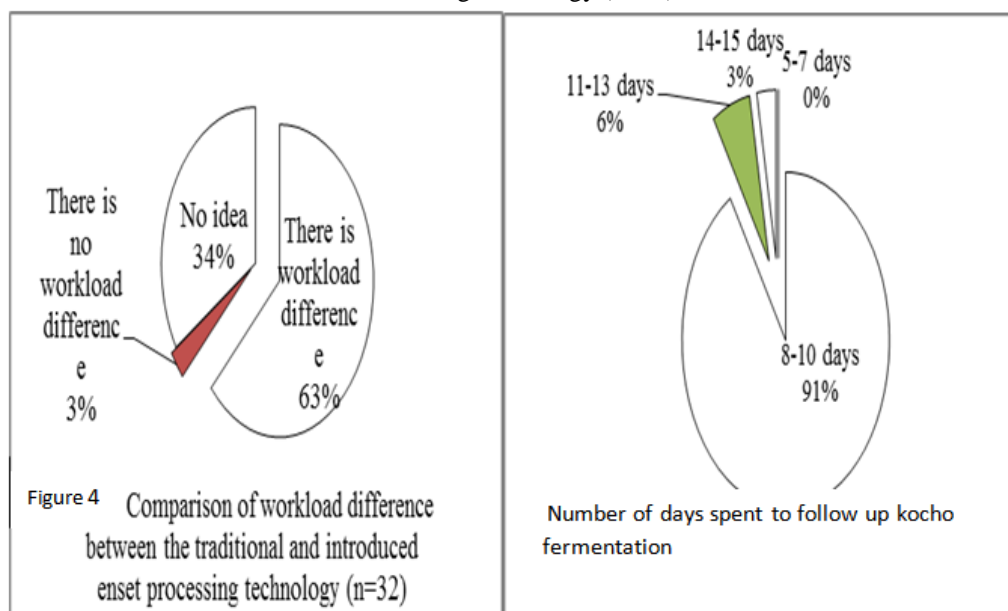


Table 6 Average time spent to scrap and squeeze one enset plant

Activities	Average* time spent (hours)		Difference
	Traditional	Introduced	
Scraping	121 minutes	73 minutes	48 minutes
Squeezing	103 minutes	66 minutes	37 minutes
Total no. of respondent	32	16	

* The sum of time estimated by respondents divided by number of respondents

Table 7 Activities those women do with the time saved due to the introduced technologies

Saved time by using introduced technologies (N=16)	No. of response
Yes	16
No	0
If yes, types of works that women do with the time saved (N=16)	
Farming activities (like sowing ,weeding , harvesting , digging the land, animal feeding etc)	15
Looking after children	14
Other household works	15
Engaging to income generating activities	6
Going to market	15
Take rest	5
Other social activities	14
Others (such as praying)	2

*Multiple responses was given

Table 8 Ranking activities that women do with the time saved due to the introduced technologies (n=16)

List of ranks	Farming activities	Looking after children	Household works	Engaging to income generating activities	Going to market	Take rest	Other social activities	Others (such as praying)
1 st	4	0	12	0	0	0	0	0
2 nd	5	3	2	1	3	0	0	0
3 rd	5	8	0	0	1	0	0	0
4 th	1	2	0	0	1	1	10	0
5 th	0	1	0	0	9	2	3	0

6 th	0	0	0	3	0	2	2	0
7 th	0	0	0	1	0	0	0	2
8 th	0	0	0	0	0	0	0	0
Overall rank	2 nd	3 rd	1 st	5 th	3 rd	7 th	6 th	8 th

Labour requirement: About 94% of the respondents (n=16) said that there is difference in labour requirement between the traditional and the introduced enset processing methods. However, the rest (6%) said that there is no difference in labour requirement between the two methods (Fig.10).

Division of labour: Respondents were asked to provide the labour required to process a single plant in terms of male labour and female labour (Table 9). Accordingly, cutting a single enset plant is mainly done by one person (male) with some support from female. Carrying is done mainly by one male and one female proportionally although in some cases two female are involved. Peeling is done mainly by one female and but in some cases one male is also involved. Scraping and squeezing are done in most cases by one female and in some cases by two female in traditional method. However, there is little involvement of male in scraping activity in the case of practicing introduced technology. Transporting processed products is done in most cases by two female but in some cases by one female and one male. Digging the land to bury scraped products and follow up of kocho fermentation is mainly carried out by one woman (Table 10).

As indicated in below Table 10. the introduced technology does not have the other activities like cutting, peeling, carrying, transporting extracted product, dig the land to burry scrape products, and follow up of kocho fermentation that is similar ways with traditional methods of enset processing activities.

Table 9 Reaction of respondents on number of persons involved in to process a single enset plant using traditional and introduced methods by male labour

List of activities	Male Labour									
	1 person		2 person		3 person		Not men involved		I do not know	
1.	No. resp.	%	No.resp	%	No.re sp.	%	No.resp	%	No.res.	%
2. Traditiona l (n=32)										
Cutting (n=32)	24	75	8	25	0	0	0	0	0	0
Carrying (n=32)	21	66	0	0	0	0	11	34	0	0
Peeling (N=32)	14	44	0	0	0	0	10	31	8	25
Scraping (n=32)	0	0	0	0	0	0	32	100	0	0
Squeezing (n=32)	0	0	0	0	0	0	32	100	0	0
Transporting process products(n=32)	5	16	0	0	0	0	27	84	0	0
Dig the land to bury scrape products (n=32)	10	31	0	0	0	0	22	69	0	0
Follow up of kocho fermentation (n=32)	0	0	0	0	0	0	32	100	0	0
3. Introduced (n=16)				0		0		0		
Scraping (n=16)	1	6	0	0	0	0	15	94	0	0
Squeezing (n=16)	0	0	0	0	0	0	16	100	0	0

Table 10 Reaction of respondent on number of persons involved in to process a single enset plant using traditional and introduced methods by female labour

List of activities	Male Labour									
	1 person		2 person		3 person		Not men involved		I do not know	
1.	No. resp.	%	No.resp	%	No.re sp.	%	No.re sp.	%	No.re sp.	%
2. Traditional (n=32)										
Cutting (n=32)	8	25	1	3	0	0	23	72	0	0
Carrying (n=32)	20	32	12	63	0	37	0	0	0	0
Peeling (n=32)	20	63	10	31	2	6	0	0	0	0
Scraping (n=32)	15	47	13	41	4	12	0	0	0	0
Squeezing (n=32)	30	94	2	6	0	0	0	0	0	0
Transporting process products(n=32)	12	38	19	59	0	0	1	3	0	0
Dig the land to bury scrape products (n=32)	22	69	2	6	0	0	8	25	0	0
Follow up of kocho fermentation (n=32)	32	100	0	0	0	0	0	0	0	0
3. Introduced (n=16)								0		
Scraping (n=16)	12	75	3	19	1	6	0		0	0
Squeezing (n=16)	16	100	0	0	0	0	0	0	0	0

Income from enset product

About 59% and 63% of the respondents said that all enset products (including bulla and kocho) are sold by women only respectively (Fig 11). However, about 37% and 41% of the farmers do not sell enset products because they do not have surplus to sell. According to 75% of respondents the new technologies lead to higher prices for processed enset, few respondents said that they have not realized the price difference.

There is a price change in enset products processed by traditional and introduced technologies (Table 11). According to majority of enset product selling respondents, the price of kocho from an enset plant ranges from five to ten Birr with traditional enset processing method. Whereas, the price of same product per plant with introduced technology ranges from eleven to twenty Birr. Likewise, the price of bulla from an enset plant ranges from eleven to twenty Birr with traditional enset processing method and from twenty one to thirty Birr with introduced processing method.

The majority of the respondents (75%) claimed that there was income difference per processed enset depending on the type of technology being used. Accordingly, income from one processed enset under the traditional and introduced technology was about 275.00 and 382.00 Ethiopian birr respectively showed different amount of income due to the price change (Table 12).

When it comes to management of the earned money, all the respondents said that women had full control of the money (Table 10). Accordingly, the women spent the earned money mostly to buy household expenditures, such as kale, coffee, salt, kerosene, potatoes, injera, social contribution (edir and equb), oil, and shiro, in this order of importance (Table 13).

Figure 5: Responsibility of selling enset product against sex (n=32)

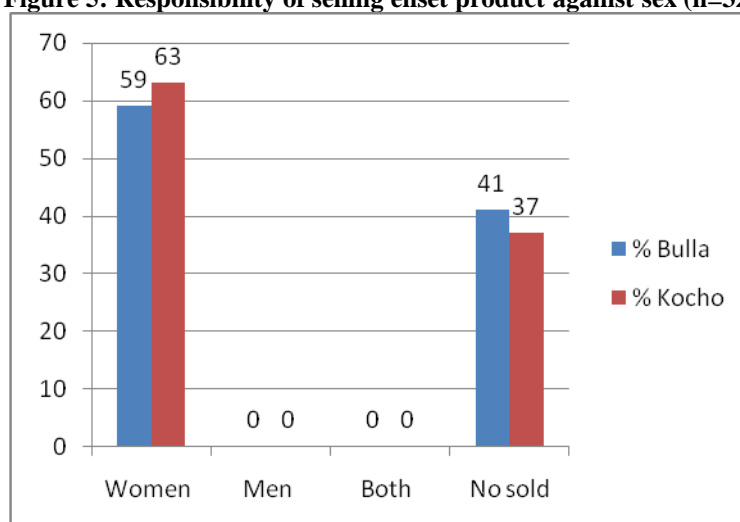


Table 11 Response of farmers to products sells per plant enset in traditional and introduced process (Ethiopian birr) and management of the earned money by sex

If yes, the price difference between enset product processed by traditional and introduced technologies	5-10 birr	11-20 birr	21-30 birr	31-40 birr	41-50 birr	No sell
1) Traditional						
Bulla	3	2	1	0	0	10
Kocho	1	4	1	0	0	10
2) Introduced						
Bulla	0	6	4	1	2	3
Kocho	0	1	6	3	3	3
Management of the earned money by sex (N=32)	No of respondent	Percentage				
Women	19	59				
Men	0	0				
Both	0	0				
Not applicable(used only for consumption)	13	41				

Estimation of the amount of income generated from one enset plant using traditional and introduced processing methods (Birr)

Product type (N=16)	Traditional	Introduced
Bulla	59.07 Birr	91.65 Birr
Kocho	216.00 Birr	290.28 Birr
Total income/year/farmer(HH)	5501.40 Birr	7638.6 Birr

Note: average no. of plants per HH =20

Table 12 Utilization of the enset sells (money) for different purposes (n=16)

Items of purchased	No. of respondents
Coffee	14
Salt	13
Oil	5
Kale	16
Onion	2
Red pepper	2
Injera*	7
Pea	3
Shiro*	5

Gas	11
Potatoes	8
Tax payment and labour wage	2
Saving and social contribution	6

*Multiple responses are given

*shiro -local food eating with injera usually prepared from peas or beans

*Injera s-staple food of Ethiopian people which made from teff crop

Enset products and area allotted to enset after introduction of technology

With regard to quantity difference, 75% of the respondents said that there was a quantity difference per enset processed depending on the type of processing technology used-Whereas few of respondents (25%) cited the absence of quantity difference between traditional and introduced technologies (Figure 5)-the- Majority of the respondents estimated that the amount of bulla product extracted using the traditional processing method ranges from 2 to 3kg per enset plant where as kocho product ranges from 6 to 7 kg per plant. Conversely, under using the introduced technologies, the amount of bulla and kocho product ranges from 4 to 5 and 6 to 7 kg per plant, respectively (Table14).

All of them respondents said that after introduction of the processing technology, the area allotted to enset cultivation showed an increasing trend as compared to the area before the introduction of the technology. They estimated the area allotted to be 0.22 ha and 0.34 ha before and after the introduction of the technology (Table 15).

According to the respondents (n=32) men have a major role in deciding whether to increase or decrease the land area of enset cultivation, whereas decision on cash was usually made by women (Fig. 13). Accordingly, with regard to amounts of cash, women did control 91% and 100% of the cash generated from sale of the enset products of bulla and Kocho under both the traditional and introduced technology (Table 16).

Figure 6: Responses of farmers on whether there is difference in the amount of enset product processed by traditional and introduced technologies

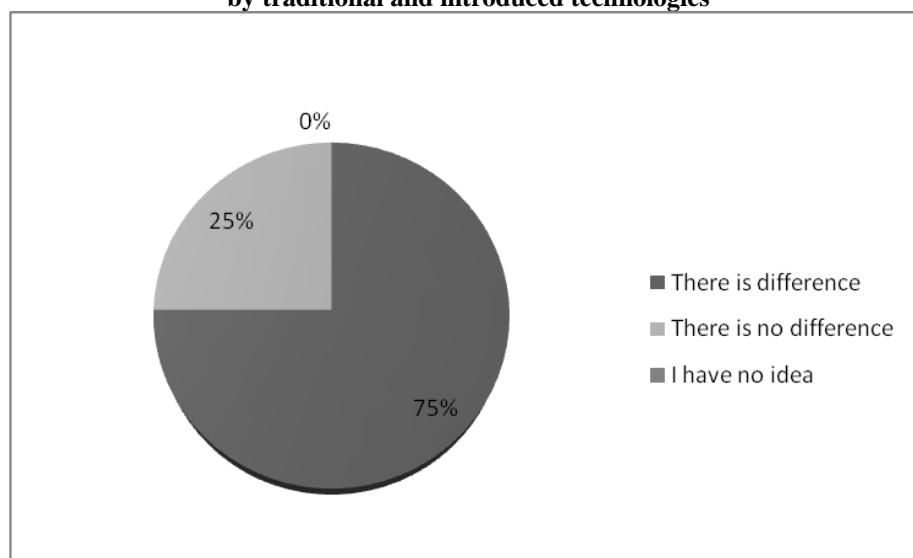


Table 13 Quantity difference in processed product between traditional and introduced technologies

If yes, the amount of processed product per plant having similar size in traditional and introduced processing	2-3kg	4-5kg	6-7kg	7-8kg	9-10kg	11-15kg	No answer
1) Traditional(n=32)							
Bulla	19	7	1	0	0	0	5
Kocho	0	1	14	8	1	3	5
2) Introduced(n=16)							
Bulla	4	9	0	0	0	0	3
Kocho	0	0	5	3	2	4	2

Table 14 Amount of area allotted to enset grown

Change in area allotted to grow enset before and after the introduction of the improved enset processing technologies (n=16)	No. of respondents	Percentage
Yes	16	100
No	0	0
If yes, types of practicing enset processing methods	*Average area per HH	
Before using introduced technology (traditional) (n=16)	0.22ha	-
After using introduced technology(n=16)	0.34ha	-

*The sum of area estimated by respondents divided by number of respondents

Figure 1 Decision by women and men to increase or decrease enset land and control over cash generated (n=32)

Table 15 Amounts of cash controlled by women and men in traditional and introduced enset processing (n=16)

Amounts of cash	Traditional				Introduced			
	Women	Men	percentage		Wom en	Men	percentage	
			women	men			Women	Men
10-30%	1	1	6	6	1	1	6	6
31-50%	2	1	13	6	2	2	13	13
51-70%	1	2	6	13	1	2	6	12
71-90%	2	0	12	0	0	0	0	0
91-100	6	0	38	0	7	0	44	0

Adoption of the introduced technology and reasons for not adopting

As far as the present status of the introduced technology is concerned 63% of them did not use the introduced technology any more. The main reasons cited by the respondents were unavailability of the equipment when needed (because five people had to share one), out of use, and time taking to take the enset where the equipment was located, in this order (Table 17).

In the study area, the agriculture office (75%) and World Vision (25%) were the ones that distributed the introduced technology. The introduced technologies were manufactured by the Sodo and Melkssa rural technology centres. However, 97% of the respondents (n=32) claimed that they had no access to credit to purchase the introduced technology. Only 1 respondent (3%) got credit from the agriculture office to purchase the equipment. Financial institutions like Omo Microfinance and NGOs were not suggested as credit sources by the respondents (Table18).

All of respondents claimed that there was no opportunity for repairing the equipment once the technology was being introduced. Institutes which manufacture the implements are not also giving repairing service.

Table 16 Current status of using introduced technologies

Still using the introduced technologies (n=16)	No of respondents	Percentage
Yes	6	37
No	10	63
If no, reasons not continuing to use introduced technologies (n=10)		
Not available when needed (group of five)	7	70
Time taking	1	10
Out of work (old)	2	20

Table 17 Institutes currently to supply the introduced

name of institute to supplied introduced technologies(n=16)			
Agriculture office	Sodo Rural technology centre	12	75
	Melkassa rural technology centre	0	0
World vision	Sodo Rural technology centre	0	0

	Melkassa Rural technology centre	4	25
Institute available to provide credit for purchasing the improved technologies (n=32)			
Yes		1	3
No		31	97
If yes, name of institute to provide credit for purchasing the improved technologies (n=32)			
Omo micro finance		0	0
Agriculture office		1	3
Other non government organizations		0	0

Farmers perception and feedback on the introduced technology

While 44 % of the user responded that they gave their feedback to extension agents to modify certain functionalities of the introduced technologies, 56% of the user did not give any feedback about the technology. This is because some women responded that the extension agents did not ask about their feedback on introduced technology. For those who gave their feed-back, the modification suggested by them included widening of the squeezer’s hole, replacement of the scraper rope, and increasing the plumber of the scraper length.

Table 19 summarises the major defects of the traditional method and the introduced technology. With regard to the traditional method, difficulties are: difficulty to work during pregnancy because of they have to put their legs on the stem of enset (picture 1), old age, and health complication, does not attract men to be involved in enset processing, consumes much time and energy, poor sanitation, and difficulty of scrapping. Likewise, with regard to the introduced technology, the scraper rope is tedious (part of scraper that used to tie the peel enset to process) and time taking and the technology is not easily accessible and affordable.

Respondents, on the other hand, listed the strong features of the traditional and the introduced methods (Table 20). The major good features of the traditional method included availability of the material at local level; farmers have well experience and can use their indigenous knowledge, and enable the family to work together in groups, and improves social bondage. With regards to this the researcher was interviewed farmers whether the introduced technologies are reduced their social bondage or not. Most of the respondents were explained due to the introduction of the introduced technology it was not reduced their social bondage. Because the introduced technologies reduced their time and labour so as farmers could enable to participate jointly by other social community works such as Equb, women saving and credit groups etc. Similarly, the major good features of the introduced method were good quality enset product, reduce workload and time, hygienic, and higher income due to high unit price amongst others.

Table 18 Farmers perceptions on defects of introduced technologies and traditional enset processing tools (n=32)

	No of respondent
Major defects or weakness of traditional enset processing and introduced technologies	
1) Traditional (n=32)	
Poor sanitation during processing	11
Time and energy consuming	12
Bulla scraper area is narrow and time and energy taking	0
Not easily accessible and affordable	0
Cannot work during pregnancy and old age, and affect women health	21
Difficulty to scrape the enset	10
Promoting the existing culture (not appropriate for men to involve)	14
2) Introduced (n=16)	
Bulla is squeezed by feet and bring untidy and labour burden	0
The scraper rope is tedious and time taking	12
Time and energy consuming	0
bulld scraper area is narrow and time and energy taking	4
Not easily accessible and affordable	12
Cannot work pregnancy and old women, and affect women health	0
Difficulty to scrape the enset (short, no supporter)	8
Promoting the existing culture (not involved male)	0
No answer	1

Table 19 Major strengths of traditional enset processing and introduced technologies (more answer possible)

Strengths	No of respondents
1) Traditional (n=32)	
Can participate family members	0
Enables to work in groups and improves social bondage	14
Experience and can easily use their indigenous knowledge	19
Decrease work load and time	8
Hygienic	0
Improved quality	0
Can sell with high price	0
Increased household income	1
Locally available	20
2) Introduced (n=16)	
Can participate family members	8
Enable to work in groups and increase social bondage	0
Experience and can easily use their indigenous knowledge	0
Decrease work load and time	13
Hygienic	9
Improved quality	15
Can sell with high price	8
Increased household income	5
Locally available	0

Source: computed from Primary Data

III. DISCUSSION

This chapter discusses the performance of the introduced enset processing technologies relative to the traditional methods in terms of time saving, income change, and role distribution.

Types of available enset processing technologies and their adoption

In the study area the types of enset processing technologies were identified related to the enset scraping and squeezing devices. Diffusion of the technologies to farmers is usually carried out through field demonstration. However, only few farmers use the introduced technologies. Based on the discussion with experts working for the rural development and agriculture office and responses of the women, the reasons for non-adoption could be attributed to a number of factors.

First, these technologies are not sufficiently available due to the limited human and financial capacity of the rural technology centres in the country. Second, enset agriculture seems to be given low emphasis by policymakers. This supports the findings of Steven et al. (1997) who revealed that enset agriculture has received little attention on research, development and extension. Third, lack of follow up by the rural technology centres or their collaborators to maintain the introduced technologies, which are available in the hands of the farmers. According to respondents, there was no responsible body to facilitate and solve women problems with regards to enset processing; (1) less attention given to both the manufactured centres and other government institutions;(2) there was no training activities, follow up actions and monitoring activities and; (3) no continuous assessment with regard to the efficiency of the introduced technologies after providing to those farmers. Fourth, low adoption could be attributed to lack of financial resources to buy the technologies. Fifth, enset agriculture seems to be given low emphasis by policy maker because it is not a cash crop, not a high production crop, region specific crop and it is usually women crops but in some cases men are involved in growing enset.

Other evidences agree with this result that financial problems are the main causes of non- adoption (Million, 2008). Other causes are of the insufficient number of introduced technologies that most farmers are non-adopter because farmers that did not feel like sharing it with other group members. According to this argument the introduced technologies are expected invite women in the adoption decisions positively since the burden of their work load and energy/labour taking will reduced due to involvement of their partners men and other male household members by applying these technology.

Affordability of introduced technology

From those currently using the introduced technologies, only 9 of them owned the technology individually; the other 7 farmers owned the technology in a group of five households. That means only 9 farmers were able to afford to buy the technology at the individual level. Hence, the large majority of the respondents were not able to afford to buy the technology. They cited lack of money and access to buy the technology. This is an expected result as many farmers living in rural area have lack of cash. However, it also implies lack of institutions that would provide credit for farmers to buy these technologies. Perhaps, collection action in the form of women groups may help them to access credit facilities. Studies elsewhere show the importance of the availability of credit for the adoption of new technologies (Carr, 1984). In terms of accessibility, it was observed that rural technology centres that are responsible to supply the technology were being located in far places.

Difference in performance between traditional and introduced technology

The main activities in enset processing include the following: decision to process matured enset plant, cutting of the enset, peeling, scrapping, squeezing to produce the bula, transporting extracted products, digging a pit, and fermentation of the kocho. Before starting all the enset processing activities the number of matured enset plant should be decided either by men or women or both to implement the task by one of the enset processing methods. However in both methods, the decision to process the matured enset plant is made jointly by men and women. The main functional difference between the traditional methods and the introduced technologies rests on the scrapping and squeezing activities.

In general, the introduced technology is expected to perform the scrapping and squeezing activities more efficiently and effectively than the traditional methods. Hence, any difference in role distribution, time saving, and income within the household is attributed to the difference in the two main enset processing activities (scrapping and squeezing).

Role distribution: In terms of change in role distribution due to the introduced technology, it is shown that more boys, girls, and men are involved in the scrapping and squeezing activities when a household used the introduced technology. Therefore, these technologies are required men and boys to help women. This was expected as labour-saving technologies and practices tend to affect household role distribution (IFAD, 2009). But under the traditional method, nearly all the scrapping and squeezing activities are performed by women. Under both methods, the cutting and carrying activities are often performed by men, with some support from the rest of the household members, while women involve in all the enset processing activities, particularly in scrapping, squeezing, and fermentation.

Efficiency of enset processing methods: As expected, the study showed the presence of workload difference (labour hour) between the traditional methods and the introduced technologies. As explained before, such difference mainly relates to the time saved from scrapping and squeezing activities. Accordingly, the results showed that farmers who used the introduced technologies on average saved 48 and 37 minutes per enset plant for scrapping and squeezing activities, respectively, compared to the processing time that could have been used to perform these activities under the traditional methods. The amount of labour used to process per one enset plant was found different on labour requirement between introduced and traditional methods of enset processing activities. Under the traditional methods, enset processing takes two women labours mostly in scrapping (41%). While under introduced technologies, majority of farmers, (75%) and (100%), could perform the tasks themselves without being assisted by other additional women labour to scrapping and squeezing, respectively. This is in line with the literature, such as Henderson and Ellen (1995:51-54) who claimed that improved technologies improve efficiency.

The women expressed that their husbands recognized the time saved and were happy about it. The main reason for the husbands being happy could relate to the extra time available for the women for other farming activities. This was confirmed from the respondents about the allocation of the saved time over other activities. That is, women spend the saved time primarily on farming activities, going to market, involve with their house hold works, and taking care of their children and other social activities, in this order. Studies elsewhere have shown that a labour-saving technology is beneficial if (1) it allows women to spend less time providing basic needs and more time on their preferred productive activities, (2) improves women's businesses, leading to increases in production, to new or changed products, or to products of higher quality (Henderson, 1995, P. 51; IFAD,2009, P.289; Evertsen, 1998, P.11).

Income effect of enset processing technologies: The study showed that the use of introduced technology has brought an increase in household income. The increase in income was mainly attributed to improved product quality (both kocho and bulla) and the resulting high price from the sale of these products. Furthermore, the

introduced technology has decreased wastages, particularly bulla, and, hence, improved the quantity of the processed products. Subsequently, the study showed that the estimated bulla product extracted by using the introduced technology was higher by 2 kg per enset plant than the traditional methods. This shows that there is some yield improvement with the improved processing method. Nevertheless, the estimation made by the respondents seems low according to the views of staff members of offices of the agriculture who estimated a higher output per enset. The third factor that generated higher income attributed to area expansion. This is because, when farmers started using the introduced technology, farmers increased the number of enset plants. However, the introduced technologies are saved the women time; due to the area expansion still the women time is left.

In the results, while area covered by the enset plant was 0.22ha before the introduction of the technology, the area coverage per farmer was 0.34ha after the introduction of the technology. Overall, there was an increase of 32.58 and 74.28 Ethiopian Birr for bulla and kocho per one enset, respectively, because of the use of the introduced technology.

In addition, the result showed that income generated from the sale of enset products is controlled by the women in more than 90% of the time irrespective of the two enset processing methods. The main reason could relate to cultural practices. In general, enset plants are grown around the house, and often enset management activities are left to the women by the society, as the enset processing is left for the women. Hence, by giving all the activities related to enset, including the money generated, to the women, the men can avoid giving money to the women for household expenditures, such as to buy sugar, salt, oil, and the like. This was reflected in the results (Table 10). Women spend the money generated from enset products to buy household expenditures, such as kale, coffee, salt, kerosene, potatoes, etc.

IV. CONCLUSION

The findings of study showed that in the study area, enset processing is mostly carried out using traditional methods. Enset processing is still mainly performed by women even after introduced technology (such as enset scraper and squeezer) is used. From the total introduced technologies (2214 scrapers and 1159 squeezers) manufactured by SRTPC about 94 introduced technologies (80 scraper and 14 squeezer) were distributed in 1997 and 2004 by Sodo Rural Technology Promotion Centre (SRTPC) and later in 2012 that only 10 scraper were introduced by Melkasa Agricultural Research Institute (MARI). However, only few farmers used the introduced technologies often.

Based on the discussion with (n=3) experts working for the rural development and agriculture office and responses of the women, the reasons for low adoption could be attributed to a number of factors, such as (1) these technologies are not sufficiently available due to the limited human and financial capacity of the rural technology centres in the country; (2) enset agriculture seems to be given low emphasis by policymakers. Because it is not a cash crop, not a high production crop, region specific crop and it is usually a women crop but in some cases men are involved growing enset; (3) lack of follow up by the responsible body and low communication among different organization working on promoting enset processing technologies to maintain the introduced technologies, which are available in the hands of the farmers;

(4) low adoption could be attributed to lack of financial resources to buy the technologies; (5) Though the technologies are saved women time and energy than the traditional methods, they had a little bit defects such as the squeezer hole and the flat scraper are narrow; as a result taking longer time to produce bulla and kocho; (6) lack of money and access to buy the technologies; and (7) lack of institutional support that would provide credit for farmers to buy these technologies.

In general, the adoption rates of these technologies were low. However, it could invite women in the adoption decisions positively since the burden of their work load and labour will reduced due to involvement of their partners men and other male household members by applying these technologies.

The main activities in enset processing in the area decision to process matured enset plant, cutting of the enset, peeling, scrapping, squeezing to produce the bulla, transporting extracted products, digging a pit, and fermentation of the kocho. In both methods, the decision to process the matured enset plant is made jointly by men and women. This decision was undertaken mainly focussed only the cases that was to made decision to be processed or not.

This study was found that the change in role distribution among households due to the introduced technologies is in a way that more boys, girls, and men are involved in the scraping and squeezing activities when a household used the introduced technology. Under the traditional method, nearly all the scrapping and squeezing activities are performed by women. Under both methods, the cutting and carrying activities are often performed by men, with some support from the rest of the household members, while women involve in all the enset processing activities, particularly in scrapping, squeezing, and fermentation.

The study investigated the efficiency of introduced technologies in terms of labour and processing time per unit of output. As a result, it analysed and found that there is a paramount workload difference (labour hour) between the traditional methods and the introduced technologies. Such difference mainly relates to the time saved and labour reduced from scraping and squeezing activities. According to the results, farmers who used the introduced technologies on average saved 48 and 37 minutes for scraping and squeezing activities, respectively, compared to the processing time that could have been used to perform these activities under the traditional methods.

The amount of labour used to process per one enset plant was found different on labour requirement between introduced and traditional methods of enset processing activities. Under the traditional methods, enset processing takes two women labours mostly in scraping (41%). While under introduced technologies, majority of farmers, (75%) and (100%), could perform the tasks themselves without being assisted by other additional women labour to scraping and squeezing, respectively. Therefore, it is concluded that the introduced technologies were able to reduce the number of farmers labour involved than the traditional enset processing activities. However social bondage might be reduced.

This study also investigated the effects of introduced technologies by reducing burden of women time and labour. As such, women start spending the saved time primarily on farming activities, going to market, involving with their house hold works, and taking care of their children and other social activities. Even though women are still seems very busy, they got an advantage of some extra time to manage their rest of activities that women should do by their getting bed time.

The study also revealed that introduced technologies have a positive effect on the household income but the income is apparently not enough to cover for the expensive technology; because women mostly used the income to purchasing their household consumption. This income was mainly attributed to improved product quality (both kocho and bulla) and the resulting high price from the sale of these products. Furthermore, the technologies had decreased the wastages of the enset products during the processing, thereby improving the quantity of the processed products, particularly bulla, while regarding on kocho product, it was estimated similar quantities with traditional methods. There was also an area expansion where farmers increased the number of enset plants. In the results, while area covered by the enset plant was 0.22ha before the introduction of the technology, the area coverage per farmer was 0.34ha after the introduction of the technology. Overall, it was shown that the prices of bulla and kocho products were higher under the new technologies than traditional methods. As a result, the income per enset plant was increased to 32.58 and 74.28 Ethiopian Birr for bulla and kocho, respectively, because of the use of the introduced technology.

In addition, income generated from the sale of enset products is controlled by the women in more than 90% of the time irrespective of the two enset processing methods. The main reason could relate to cultural practices. Generally, enset plants are grown around the house, and often enset management activities are left to the women by the society, as well the enset processing is left for the women. On the other hand, the management of money from earned enset products were controlled by women. Women spend the money generated from enset products to buy household expenditures, such as kale, coffee, salt, kerosene, potatoes, etc.

Accordingly, the majority of respondents reported that the introduction of the new technologies has also improved gender relations among the households since women started participating in productive roles. As a result, their income creates the economic power of women so that they can play an important role in the economic spheres of the household income. In addition, it might change the negative attitudes of men and thereby enables them to increase their decision making role over resources of household. In general, the introduced technologies produce positive feature of improving gender relations among households.

REFERENCES

- [1]. Agric-service Ethiopia 2008. Enset value chain, Consultancy report, Amaro special district.
- [2]. Bekele A., Zewdue M., Yeshitila M., Tesfaye E., 2008. Post-harvest management of ensetproducts: In: Woldegiorgis, Endale Gebre and berga Lemega, Eds). Root and Tuber Crops: The Untapped Resources, Addis Ababa, Ethiopia. pp235-251.
- [3]. BoARD = Bureau of Agriculture and Rural Development Report Document, 2010. Hawassa. Ethiopia
- [4]. BoFED=Bureau of Finance Economic Development, 2012. Project based on 2007 Census Result document. Ethiopia.
- [5]. BoFED=Bureau of Finance Economic Development, 2010. Data Collection-Dissemination Core Process Regional Statistical Abstract Document. Ethiopia
- [6]. BOTA=Bureau of Transport Authority, 2010. Annual Report Document. Ethiopia.
- [7]. BoFED, 2011. Regional Stastical Abstract Document. Southern Nations Nationalities and Peoples Regional States Bureau of Finance Economic Development-Data Collection Core Process Regional Statistical Abstract. Hawassa.

- [8]. Bravo- Baumann, H. 2000. Capitalization of experiences on the contribution of livestock projects to gender issues. Working Document. Bern, Swiss Agency for Development and Cooperation.
- [9]. Brandt A. et al. 1997. The Tree against Hunger. Enset Based Agricultural Systems in Ethiopia. American Association for the advancement of Science with Awassa Agricultural Research Centre. Kyoto University Centre for African Area Studies and Universities of Florida.
- [10]. Everts,S. ed., 1998. Gender and technology: Empowering women, engendering development. United Kingdom: Biddles Ltd, Guildford and King's Lynn.
- [11]. Hawassa University, 2012. *Participatory Rural Appraisal study Report for Malga, Bulle, Enemorena Ener and East Azernet Berbere Weredas*. South Capacity building for scaling up of evidence-based practices in agricultural production in Ethiopia (ASCAPE). Hawassa, Ethiopia.
- [12]. IFAD= International Fund of Agriculture Development.2009. Gender in Agriculture sourcebook. World Bank Publications.
- [13]. Henderson, H. K. and Ellen H. eds., 1995. Gender and agricultural development: surveying the field. Arizona: The University of Arizona press/Tuscon.
- [14]. Leeuwis C. 2004. Communication for rural innovation: rethinking agricultural extension. 3rd edition. Black well publishing.
- [15]. Marilyn C. and Maria H., 2010. Lightening the Load Labour-saving technologies and practices for rural women Published by International Fund for Agricultural Development (IFAD) and Practical Action Publishing Ltd: available at <http://www.ifad.org/gender/pub/load.pdf> (accessed on 10 -9-2012)
- [16]. Million T. 2008. Socioeconomics and Technology Transfer. Gebremedihen Woldegiorgis, Endale Gebre and Berga Lemaga, (Eds). In: Root and Tuber Crops, The untapped Resources, Addis Ababa. Ethiopia.
- [17]. Million T., 2003. Determinants of adaptation of improved enset processing devices in Wolaita, Kembata-Tembaro and Gurage zones, Southern Ethiopia. Ethiopian journal of development research vol.25, No 2.
- [18]. OECD (Organization for Economic Co-operation and Development) available at: <http://www.oecd.org/dataoecd/47/52/44896176.pdf> (accessed on 25 May 2012).
- [19]. Office of Agriculture, 2012. Annual Report document. Guncherie. Ethiopia
- [20]. Office of Agriculture, 2012. Enemorena Ener, District Annual Report Document. Ethiopia
- [21]. Steven A. B., Anita S,Clifton H., Terrence J. M.,Endale T., Mulugeta D., Gizachew Wolde-M., Gebre Y., Masayoshi S., and shiferaw T. 1997.THE TREE AGAINST HANGER Enset-based Agricultural system in Ethiopia.Pp1-56. American Association for the Advancement of Science with Awassa Agricultural Research Center, Kyoto University center for African Area Studies and University of Florida.
- [22]. SRTPC=Sodo Rural Technology promotion Center, 2010. Enset Food Preparation Devices. Training Manual .Sodo.

Asfaw Zewdie Tiruneh. "Assessment of Performance and Adoption of Improved Enset Processing Technologies: A Case Study in Enemorena Ener District, Gurage Zone, Southern Nations, Nationalities and Peoples Regional State, Ethiopia." *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, 25(2), 2020, pp. 01-20.