VALUE CHAIN ANALYSIS OF *WARQE* FOOD PRODUCTS IN ETHIOPIA

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ABSTRACT

This article is all about to analyse the value chain of warqe (Ensete ventricosum (Welw) Cheesman) food products in Ethiopia. For this, two survey studies were conducted between 2013 and 2015. Theory of value chain approach was employed to analyse the value chain. The study mapped the value chain of kocho and bulla. The result indicated that warqe growing farmers, collectors, processors, wholesalers, retailers, and consumers are principal value chain actors. Weak product and information flow were observed among value chain actors within and across different levels of the chain. Moreover, the performance of kocho value chain was not efficient since farmers did not get a better share of the of consumers' price. Farmers generated the most added values in the chain but only gained a small share of profit (27 %). However, there are opportunities for further upgrading the value chain performance of these foods. Thus, the findings of the present study suggest that the role of the farmers and bulla processors could be supported by providing credit, developing and supplying improved warqe varieties, extension services, market facilities and market information. While this paper focuses on value chain analysis of warqe foods, the information could apply to other traditional food products.

KEYWORDS

Bulla, *Ensete ventricosum*, Ethiopia, *Kocho*, Value chain analysis

1. INTRODUCTION

Warqe (*Ensete ventricosum* (Welw.) Cheesman) is a multipurpose perennial plant and is known to exist in Asia and Africa as a wild plant (Gebremariam, 1993, Mesfin and Gebremedhin, 2008). It is a banana-like plant and sometimes called "false banana" because of its close resemblance to banana plant but unlike banana, the seedy leathery fruits of *warqe* plant are inedible so that the main source of food is its corm (*amicho*) and pseudo-stem after processing (Brandt *et al*., 1997). All parts of the plant are used for different purposes that why people call it *warqe* (golden plant).
In Ethiopia, *warqe* based farming system plays an important role in food security. *Warqe* complex farming system is the most sustainable indigenous farming in South and South-western part of Ethiopia and which can support the densely populated in the highlands of this part of the country (Tsegaye and Struik, 2002). As described by Brandt *et al*. (1997), *warqe* food products are used as staple and co-staple for millions of Ethiopians. In 2013 about 300, 000 hectares of land covered by *warqe*, it makes largest perennial food crop in the country (Olango *et al*., 2014). *Kocko* and *bulla* are the two types of food that are produced for the market from *warqe*. *Kocho* is made from the pseudo-stem pulp and underground corm after fermentation. *Bulla* is an unfermented product made from the pulverized underground corm and decorticated pseudo-stem.

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Every part of the plant is thoroughly used, not only for food but also for several non-food applications (Figure 1). As described by Gebresenbet (2012) the plant is used for reducing soil erosion, it used as an ornamental plant and leaves are used for wrapping bread during baking. Brandt *et al*. (1997) and Shigeta (1993) indicated about multipurpose uses of *warqe* plant particularly in food and cultural application in Southwestern parts of Ethiopia. Belehu (1993) also mentioned *warqe* has a wide range of use in Ethiopia and all part of plant uses for various purposes. These all reports show the tremendous importance of *warqe* in the socio-economic life of different ethnic groups of *warqe* growing areas. *Warqe* played an important role in the livelihood of the farmer households in Ethiopia. This is due to the fact that *warqe* is the main source of food and feed throughout of the year. It was also income source of family and an indication of wealth and prestige in a society.

Most parts of *warqe* plants are good to feed to livestock as the plant bears large leaves and the pseudo-stem contains a lot of water. Feeding different parts of *warqe* as an ingredient or alone and supplementing with legume in sheep was reported in helping gain body weight during dry periods (Nurfeta *et al*., 2008). A recent report of Bekele and Reddy (2015) also indicated that some *warqe* varieties are used as traditional medicine to treat diseases such as abdominal pain and amoebic dysentery by using *warqe* roots.

The fresh leaves and dried leaf sheath are used for a packaging material for *kocho*, *bulla*, cheese, butter and *khat* (*Catha edulis*). The leaves also used as a dish in the home and traditional restaurants. Bags, ropes, twines, cordage and mats made from fibre extracted from *warqe*. Fibre commonly used as construction materials to build house and fence. It is also used as raw material for sack and string industries. Starch extracted from *bulla* uses as raw materials for paper and textiles industry. It is also reported that *warqe* starch can be used as an alternative starch in pharmaceutical industries (Wondimu *et al*., 2014). Therefore, *warqe*, as the name indicated, is truly golden plant since all parts of it is useful for multipurpose and it also has environmental and social value.

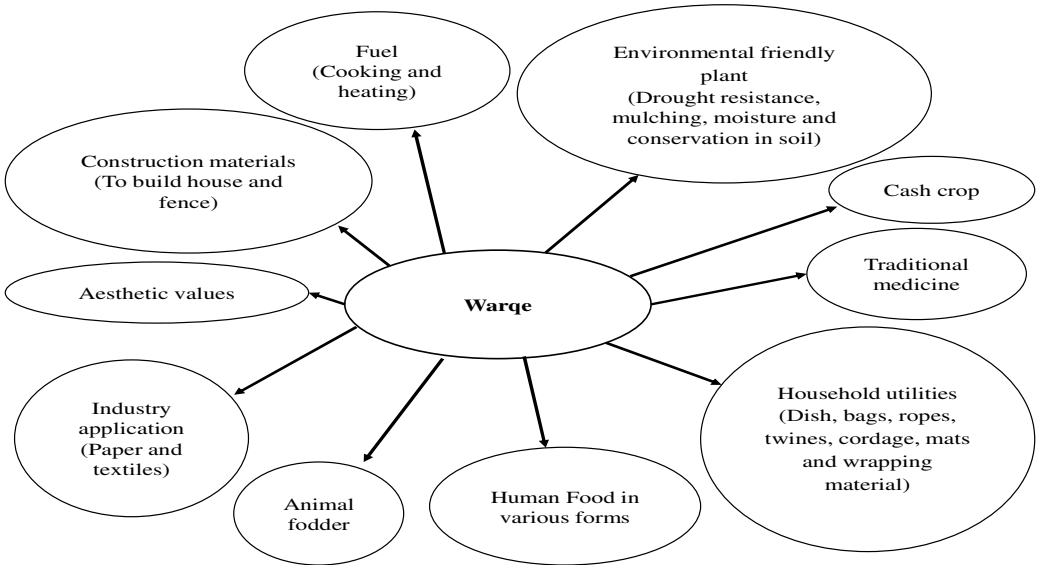

Figure 1. Multipurpose uses of *warqe* plant (Gebresenbet, 2012)

Value chain analysis of *warqe* is required to identify key players in the chain and it is helping to understand their interactions and linkages in the chain. The value chain can be defined in various ways. Kaplinsky (2000) and Kaplinsky and Morris (2001) defined as: *"value chain is the full range of activities which are required to bring a product or service from conception, through the different phase of production which involving a combination of physical transformation and the input of various producer services, delivery to final consumers, and final disposal after use. In value chain system independent actors are performing a sequence of value adding activities from conception over to phase of production to final consumption."* The value chain can also be defined as a "*sequence of related enterprises conducting activities so as to add value to a product from its primary production, through its processing and marketing to the final of the product to consumers*" (Macfadyen *et al*., 2012).

According to Trienekens (2011), the main objectives of a value chain is to produce value added products or service for a market, by transforming resources and by the use of available physical infrastructure in available opportunities and constraints of its institutional environment. Food value chain analysis is a vital and flexible methodology to improve the values to producers and end-consumers (Van Hoang, 2014). According to Kaplinsky and Morris (2001) value chain analysis is particularly useful for new producers in less developed countries to trying to enter global markets in a manner which would provide for sustainable income growth. Value chain analysis is an excellent means to assess on growth distribution issues and gender equitable growth, to analyse the relative importance of factors affecting competitiveness and the cost and earning of those involved in the value chain, to identify weaknesses in value chain performance and to improve value chain performance (Macfadyen *et al*., 2012). In the study of Irvine, (2015) indicated that value chain analysis provides a holistic view of the value system and which can be used as a systematic framework to evaluate businesses in poultry food system value chain.

Thus, to view *warqe* food products vale system, to improve the quality of *warqe* based food and to get a competitive advantage from the production of *warqe*, there should be value chain analysis at every stage. Value chain analysis of the *warqe* food products could provide important insight value addition and creation activities. Up to now, no comprehensive study has been undertaken to understand *warqe* food products value chain in the study areas. Thus, the main objective of this study was to analyse the value chain of *warqe* food products in Ethiopia. Specific objective were to: (1) map out the range of value addition activities in the *kocho* and *bulla* products, (2) identify the major *warqe* food products value chain actors and to describe their major role and activities in the chain, and (3) to provide an alternative to improve value chain performance of *warqe* food products in terms of processing and product upgrading.

2. MATERIAL AND METHODS

2.1. Method of Value Chain Analysis

This study employed the frameworks of value chain analysis developed by M4P (2008) and GtZ (2007). These adopted frameworks were used as a method of value chain analysis of pomelo sector in Vietnam in the work of Van Hoang (2014). M4P (Making market work better for the poor) is the manual called "*Toolbook*" and it developed for analysis value chain with a focus on poverty reduction. This manual has eight practical value chain analysis tools that can be used to analyse different dimension within value chains. A manual developed by GtZ called "*ValueLinks*" and used as the methodology of value chain promotion which is given to a systematic compilation of action-oriented methods for promoting economic development with a

value chain perspective. The framework used for analysing value chain of *warqe* food products focused on the planting, processing, and trading of the products and comparing the performance of chains. Therefore, in presented paper, the term "value chain" refers to all activities of value addition and/or value creation from producing *warqe*, trading, processing, distributing to end customers and producing of different kind of *warqe* foods. The value chain comprises directly concerned actors such as *warqe* growing farmers, collectors, *bulla* processors, wholesalers, retailers and consumers and indirectly concerned actors, like input and service suppliers, transportation, market facilitators and authorities.

2.2. Study Area, Data Collection and Sample Size

Two survey studies were conducted and the data were collected between 2013 and 2015 in Ethiopia (Figure 2). First, a preliminary study was conducted in the major *warqe* growing areas of Ethiopia using structured questionnaires. This survey was conducted through face to face interview methods. Three types of survey questioners were developed for the preliminary survey study. These questionnaires targeted nine groups of *warqe* farmers, four group of traders particularly wholesalers and retailers and four research and technology developing institutions. The study focused mainly on identifying stakeholder, crop varieties used, harvesting stage, equipment used for harvesting and processing, types of *warqe* food and non-food products and methods of processing.

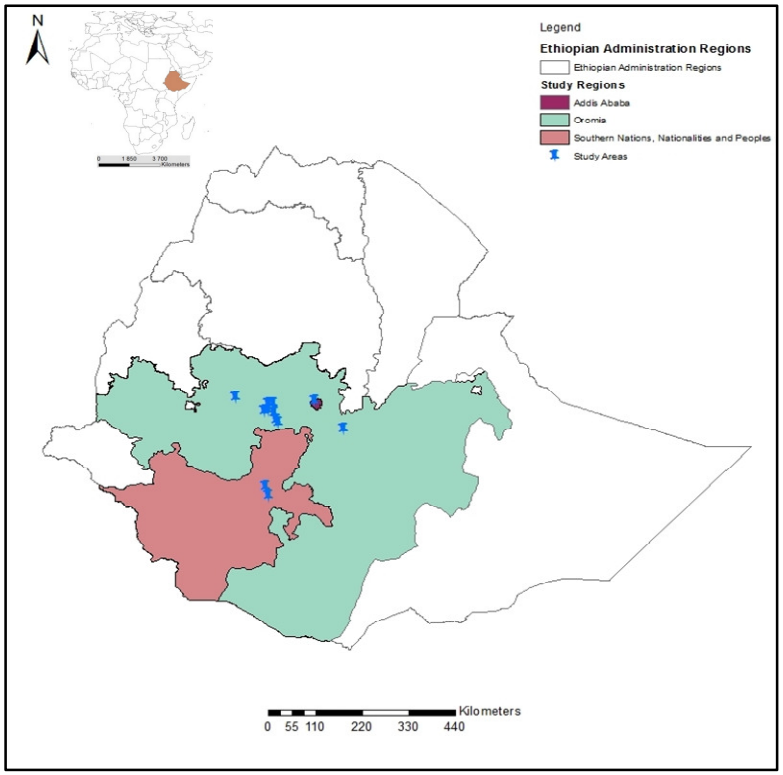

Figure 2. Map of the study areas

The preliminary study was carried out on main *warqe* producers around Ambo, Toke Kutaye, Tikur Enchini, Haro Wanchi, Melkassa, Bako, Wolaita Sodo and Areka areas. During this survey,

a detail discussion was made with these target groups on aspects of *warqe* value chain, *warqe* logistics, *warqe* market chains, *warqe* varieties used and *warqe* food and non-food products supported by field visit at selected *warqe* growing areas of Ethiopia.

Based on the result of preliminary survey study, a second survey study was conducted in two major *warqe* growing areas of Haro Wanchi and Maruf districts and four towns: Guder, Ambo, Woliso and Addis Ababa. For this study, five pre-tested separated questioners were designed for all entities including *warqe* farmers, traders, processors, transporters, and consumers. The questionnaires were pre-tested and modified based on the results of pre-testing. A questionnaire survey was mainly conducted to collect primary data about *warqe* production, trading, transporting, linkage, value addition, value creation and related information. Besides, focus group discussions with key informants were conducted to get additional insight into the sector. The samples of the second survey study comprised 209 *warqe* growing households, 56 traders, 8 small scale food processors, 15 transporters, 11 traditional Ethiopian restaurants and 223 consumer households.

2.3. Value Chain Analysis Step

Analysis of the value chain in six steps:

- Step 1: Describing and defining *warqe* food products
- Step 2: Identifying actors
- Step 3: Mapping major processing steps
- Step 4: Mapping the value chain
- Step 5: Analysing market margin share
- Step 6: Strengths, weaknesses, opportunities and threats (SWOT) analysis and upgrading strategies.

2.3.1. Describing and Defining of Terms of Warqe Food Products

There are three primary food products of the *warqe* plant: *kocho*, *bulla* and *amicho*. From these three food products, different kinds of foods are produced. Thus, it is necessary to provide a clear definition of the terms used for *warqe* products: *kocho*, *qummusi*, *holeta*, *bulla* and *amicho*.
Kocho is a dough-like material made from bulk fermented starch obtained from a mixture of decorticated leaf sheaths and pulverised corm. *Qummusi* is bread made from *kocho* mixed with cereal flour. *Holeta* is a white, high-quality *kocho* product that differs from ordinary *kocho* in that it is made from the innermost parts of leaf sheaths and corm and in that a different treatment is used during the fermentation period. *Holeta* is highly appreciated among *kocho*-loving consumers because it does not contain fibres and its high-quality bread. Food made from *holeta* is served to highly respected guests and it is usually prepared on special occasions.

Bulla is a white dry powder or semi-liquid food *warqe* product extracted from freshly decorticated pseudo-stem or pulverised corm mass. There are two types of *bulla* available in markets: fresh *bulla*, which is a semi-liquid cream like the product, and processed or dried, powdered *bulla*. From *bulla*, porridge and soup are commonly prepared, with or without mixing with wheat flour. *Amicho* is the non-fermented corm of the *warqe* plant, which is consumed after boiling just like other root and tuber crops. *Amicho* from younger plants is usually preferred and it is mostly consumed during a shortage of food.

2.3.2. Value Chain Actor Identification

In this paper, value chain actors refer to persons who were involved in the value chain of *warqe* food products from farm to central market and performed a certain function in value addition or value creation activities. Actors who were involved in the value chain were identified in field observation and key informant interviews. Every value added activity in the chain was identified and the role of actors was narrated. The actor identificaion started from production site and then local market to the final destination of the products to central market. It also included attribution route from the central market. Value chain mapping and actor identification were directed by a supply chain of *kocho* and *bulla*.

2.3.3. Mapping Major Processing Steps

Main processing steps, starting from mature plant selection to final *warqe* food products were mapped, followed by on-site verification of the flow diagram. Each step in *kocho* and *bulla* processing was described and analysed. Different maturity indices that farmers use for the harvesting of *warqe*, the time required for *kocho* fermentation and the *bulla* drying process were described.

2.3.4. Mapping Value Chain

Mapping of the value chain was carried out after principal actor identification. This mapping included all activities, starting from farm input supply through product delivery to final consumers. The work focused on obtaining detailed information about the range of value-adding activities along with a chain, the role of actors in each level and the governing environment in the chain.

2.3.5. Analysis of Market Margin Share

Value chain performance of *kocho* and processed *bulla* was analysed by estimating the marketing margin, by taking into consideration the associated marketing cost for key marketing channels. Based on prices charged by the major market participants along the chain, margins at producer, collector, processor, and wholesaler and retailer level were estimated and analysed. Value chain performance was analysed using the commodity subsystem approach based on market cost and margin devised by Mendoza (1995). The marketing margin was compared with marketing service costs and the results were interpreted. Margins at each stage were calculated and the shares were also compared. Estimated marketing margin, calculated as the difference between producer and retail prices, was the tool used to analysis performance of the value chain. The retail price, *i.e*. the end consumer price, was then considered as the base, or the common denominator, for all marketing margins. The producers' share is the commonly employed ratio calculated mathematically, as the ratio of producer price to consumer price.

Mathematically, the producers' share (PS) can be expressed as:

$$PS = \frac{Px}{Pr} = 1 - \frac{MM}{Pr} \quad (1)$$

Where in the present case Px is the producers' price for *kocho* or *bulla*, Pr is the retail price of *kocho* or *bulla*, *i.e*. the consumer price, and MM is the marketing margin.

As equation (1) indicates, a higher market margin diminishes the producers' share and *vice versa*. It also shows welfare distribution among production and marketing agent. The total market

margin was calculated using equation (2). The Total Gross Marketing Margin (TGMM) is always related to the final price paid by the end buyer, expressed as a percentage (Mendoza, 1995).

$$TGMM = \frac{Pr - Px}{Pr}\ x\ 100 \quad (2)$$

Where in the present case Px and Pr are as defined for equation (1).
Producer's gross margin (GMM_p) is the proportion of the price paid by the end consumer that is received by the farmer as the producer. It should be emphasised that growers who act as middlemen also receive an additional marketing margin. GMM_p is calculated by difference as:

$$GMMP = \frac{Pr - MM}{Pr}\ x\ 100 \quad (3)$$

Where in the present case Px, Pr, and MM are as defined for equation (1).

Net Marketing Margin (NMM) is the percentage of the final price earned by the intermediary as net income once marketing costs are deducted. It is thus the percentage of net income that can be classified as pure profit (*i.e*. return on capital). As equation (4) indicates, a higher NMM diminishes the producers' share and *vice versa*. Equation (4) also provides an indication of welfare distribution among production and marketing agents.

$$NMM = \frac{GMM - MC}{Pr}\ x\ 100 \quad (4)$$

Where GMM is gross margin, MC is marketing costs and Pr is the retail price of *kocho* or *bulla* in the present case.

From the NMM, it is possible to see the locative efficiency of markets. Higher NMM or profit of the marketing intermediaries reflects reduced downward and unfair income distribution, which depresses market participation by producers. An efficient marketing system is where the net margin is near to reasonable profit.

2.2.6. SWOT Analysis and Upgrading Strategies

To identify the challenges and opportunities of the sector, a SWOT analysis was performed during focus group discussions with key informants. SWOT analysis is essential to recognise internal strengths and weaknesses, as well as external opportunities and threats to a company (Houben *et al*., 1999). The SWOT analysis in this paper was based on interviews conducted in the two survey studies and a summary of major points discussed in group discussions with key informants. The analysis to upgrade the value chain of *warqe* food products adopted the Kaplinsky and Morris (2001) four trajectory areas of process upgrading, product upgrading, functional upgrading and chain upgrading. Suggestions were devised for upgrading *kocho* and *bulla* value chain performance in three strategic areas: 1) input supply; 2) production, post-harvest and processing development; and 3) product distribution and marketing factors.

3. RESULTS AND DISCUSSION

3.1. Value Chain Analysis

3.1.1. Actor Identification

It was found that there are two main routes of *kocho* and *bulla* supply to central market (Figure 3). The more important of these is the Woliso to Addis Merkato route. The Woliso *kocho* market is fed by major *warqe*-growing areas such as Chebo, Darian or Chitu, Haro Wanchi, Merega,

Shegege, and Tepi. The second supply route is the Guder to Addis Merkato route. The Guder market is supplied by the Tikur Enchi, Ginbi Bila, Maruf and Melke areas and the majority of products from Addis Merkato are supplied to Addis Ababa consumers and a small amount to towns outside Addis Ababa, such as Dire Dawa and Adma. A very small amount of *bulla* is exported from Wiliso and Addis Ababa through purchasing from *bulla* processors. By following these two *kocho* and *bulla* supply routes, value chain actors were identified.

Based on the preliminary survey results, six principal value chain actors were identified along the *warqe* supply chain in Ethiopia. These were *warqe*-rowing farmers, collectors, processors, wholesalers, retailers, and consumers. The role of actors in value adding activities, farm input supplying, production and processing of the products also identified. The method used for actor identification in this study was in line with the methodology developed by Lelea *et al*. (2014) for stakeholder analysis for application in transdisciplinary research projects focusing on actors in food supply chain. Grimble and Wellard (1997) defined stakeholders as "*any group of people organized, who share a common interest or stake in a particular issue or system; they can be at any level or position in society*". They also point out the importance of stakeholder analysis for understanding a system and change in it, by identifying key actors and assessing their respective interests in the system. Other supporting actors in the value chain are who supply inputs, market information, transportation and technical services such as market infrastructure owners, transporters, and agricultural development agents were also identified.

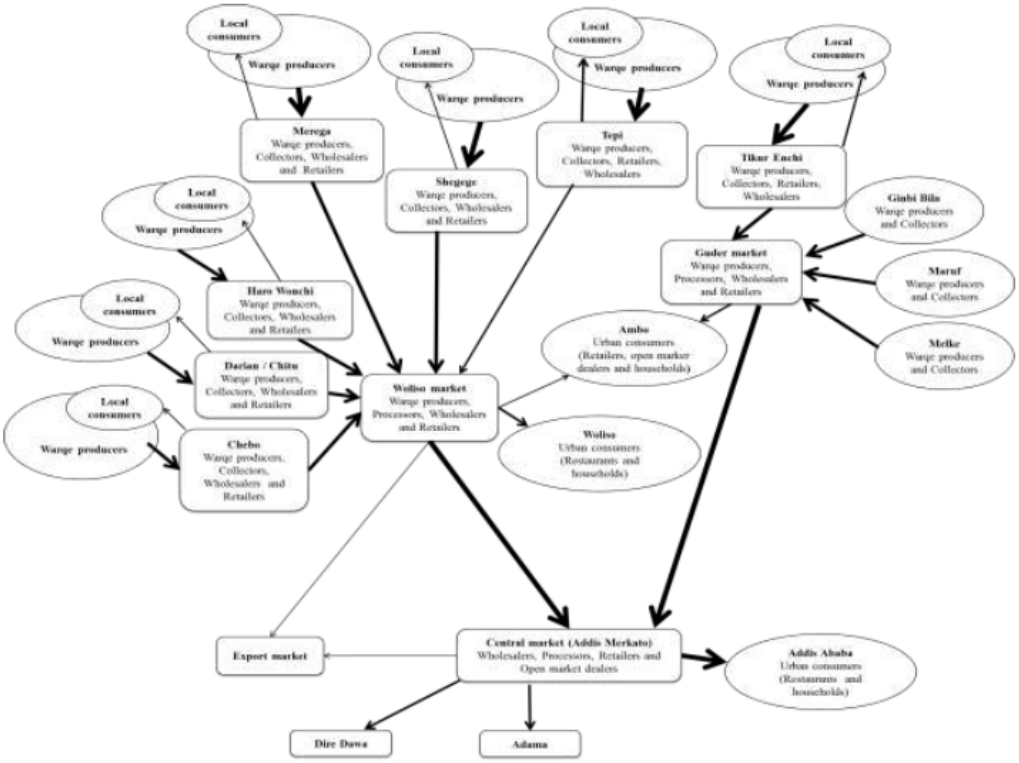

Figure 3. Value chain actors identified in *warqe* foods supply chain in Ethiopia

3.1.2. Mapping Flow Diagram of Warqe Products

Warqe food products were processed in the traditional processing procedures by using locally made tools which had been passed from generation to generation. Main processing steps starting from selection of a mature plant to final food product of *warqe* is presented in Figure 4. It was observed that there was a slight difference in steps of *warqe* processing from place to place. Similar to our finding, Gebremariam (1993) indicated that the steps of traditional *warqe* processing techniques differ between regions and also between localities in the same region. This difference in the procedure of processing was mainly due to experience that women had acquired from their ancestors. In addition, the micro-climate condition of the area, the season of a year and cultural difference contributed to the difference in processing procedures.

According to our study, main steps of traditional *warqe* processing in central parts of Ethiopia started from identification and selection of mature plant, preparation of working area and fermentation pit, removing of leaves from the plant and digging out the plant by remaining some parts corm at the place. Farmers used different maturity indexes for the harvesting of *warqe*. The most common maturity indicators are flowering emergence, the appearance of the corm slightly above the ground. Others also responded that leaf becomes shorter as the crop approaches maturity. As an additional maturity indicator, the time between planting to harvesting and pseudo-stem thickness may also be considered. Then the selected plant dividing or cutting into three parts. The main processing is pulverization and decortication and fibre separation (fibre is a by-product) are done. Meanwhile, *bulla* extraction is done. Preparation of fermentation starters (*gamma* or *racheta*) is another operation at the same time putting pulverized and decorticated mass into fermentation pit, mixing thoroughly starters with pulverized and decorticated mass and put into a concave shaped empty corm.

Respondents indicated that *kocho* processing involved a two-stage fermentation process, primary and secondary fermentation stages. In the primary fermentation stage, the mass in the concave-shaped corm and in the pit was fermented separately for one month. In the second fermentation stage, the contents of the corms were mixed together with the pit mass and left in the pit for a further approximately two months of fermentation. The mass was turned and checked and the leaves were changed or the mass was remixed and wrapped with new leaves as necessary during the fermentation period.

After two or three months, fully fermented *kocho* was obtained. It underwent further processing steps to break down tiny fibres by tamping (*tumuu*) to upgrade the quality, and finally, *holeta* was obtained. Similarly, *bulla* was serially further processed by *bulla* processors to produce dried *bulla* product (Figure 4). In this process, fresh *bulla* was mixed with pure water and stirred to dissolve it completely in water, after which unwanted materials were removed by filtering. The filtrate was left for one day to sediment and the supernatant was then removed, mixed again with pure water and stirred to dissolve, left for one more day to sediment and then decanted and finally sun-dried. This yielded a sediment or crystalline deposit which was dried further under continual turning and crushing of aggregated particles to produce dry, very fine powdered *bulla*.

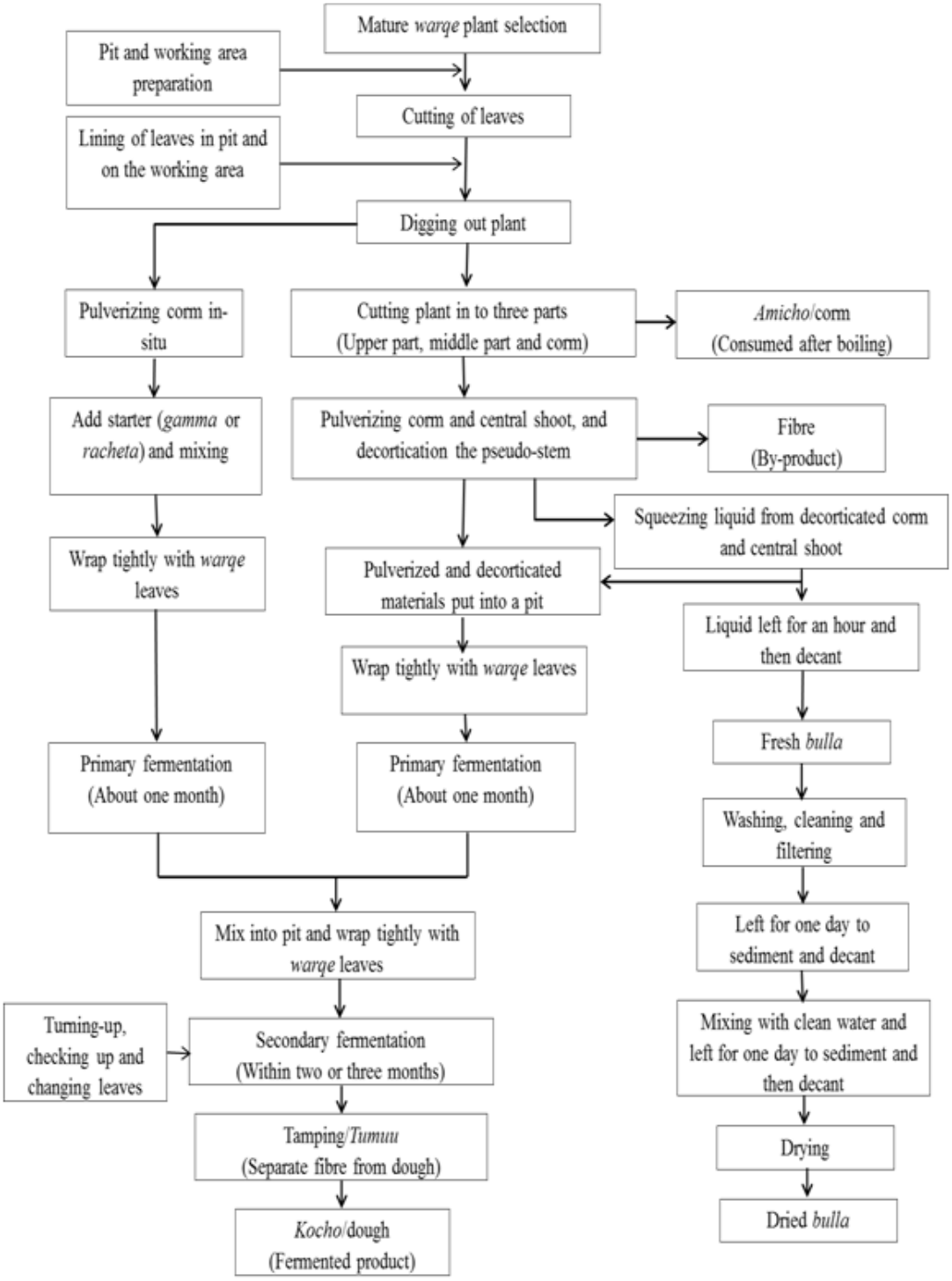

Figure 4. Flow chart of traditional *warqe* food processing in central parts of Ethiopia

3.1.3. Mapping Value Chain

The study mapped the value chain of *kocho* and *bulla* (Figure 5 and 7). It was shown that weak coordination exists in products flow and information exchanging between value chain actors within and across different level of the chain. The chains depend on links between farmers, processors, collectors, wholesalers, retailers and consumers. The value chain of *kocho* and *bulla* starts with farming input suppliers. *Warqe* growing farmers and *bulla* processors are the basic actors and create the most values in the chain. Actors such as collectors, wholesalers and retailers are mainly working in trading activities and value addition. Collectors link farmers to wholesalers in rural and urban markets. *Bulla* processors are the biggest actors in the *bulla* value chain and supply to wholesalers, retailers, and export markets. Wholesalers supply mostly to retailers and consumers like restaurants. Retailers sell *warqe* foods to end users. The value chain of *kocho* and *bulla* are very complex for example besides the main supply chain *warqe* growing farmers also selling to consumers at the local market. However, the presented paper focuses mainly on analysis of value chain on main supply chain only.

3.1.4. Input Supply

About 82% *warqe* producing farmers used their own farming inputs such as planting materials and organic fertilizer mainly farmyard manure. Ten percent of *warqe* growing farmers used purchased planting materials from the local market and the remaining 8% of farmers used planting materials which were granted from their relatives. All farmers used local varieties of *warqe* plant. It was found that more than 13 *warqe* varieties were grown in the Maruf and Wanchi Haro areas for different purposes. These varieties had their local names based on their morphology difference and purposes of uses. From these varieties, six varieties were the most common in both places. The most important varieties as per farmers' ranked list were: *badadetti*, *farase*, *hawegne*, *sabara*, *jobiri,* and *sheretiye*.

The findings show that farmers have their own classification of variety based on the purpose or uses and morphological characterization among tradition of *warqe* cultivation communities. In the work of Shumbulo *et al.* (2012), it was reported that diversity of *warqe* clones grown in Wolaita area for utilization of intended specific purpose. Olango *et al.* (2014) indicated that this folk classification of *warqe* in Wolaita area is based on plant domestication status, sex of plant, agro-ecological adaptability and landrace suitability for different food and fibre, feed and medicinal uses. Thus, our findings recall for further study on genetic variability of these *warqe* varieties to associate with purposes.

Farmers used own family labours mainly, however some farmers also used locally hired workers for hard works like digging the planting hole, transplanting to permanent planting fields and weeding. Traditional and cultural cooperation among male and female farmers called "*Daboo*" and "*Daadoo*" were practiced during peak harvesting and processing operation. "*Daboo*" and "*Daadoo*" are two systems of traditional or cultural cooperation formed by people (either male or female) in Ethiopia. In "*Daboo*" individual come together and contribute labour and skills without payment. *Daadoo* is a system of group work cooperation where the people work together one day on one person's and the other day on other person's job; it is a kind labour lending to be repaid by the same labour time/day. In these cooperations, farmers share labour and experiences.

3.1.5. Warqe Production and Processing

Warqe farmers in the study areas held 1.45 ha farmland per household on average and the *warqe* plant covered about 0.29 ha/household which was about 20% of the total household land. The average *warqe* (*kocho* and *bulla*) production yielded 678 kg/year/household and from this 275

kg/year/household was sold. About 41% of *warqe* food products were supplied to market per household. All farm activities such as site selection, land preparation, variety selection, planting; cultural practice and pest and disease control are done mainly by family labour. However, farming and processing activities, which were a gender-based division of labour were presented in (Figure 6). All pre-harvest activities except cultural practices such as weeding and manuring were done by men. Whereas unlike other crops, all post-harvest activities were mainly done by women. However, in marketing the products both men and women are involved in the local market. Thus, gender-based working activities in the *warqe* production, post-harvest processing, and marketing were observed. In the report of Tsegaye and Struik (2002) indicated that clear gender division of labour in *warqe* cultivation practices in major *warqe*-growing regions of southern Ethiopia. However, our finding shown that men dominantly involved in marketing *warqe* products to control the income generate from *warqe* production at producers level.

For *kocho*, the laborious and tedious processing activities were done by female family members or neighbouring women who traditionally cooperated in what they call "*Daadoo*". Main value adding activities in the *kocho* processing started from selection and cutting of mature *warqe* plant to packaging and marketing *kocho* local market done by producers (Figure 4 and 5). In the case of the fresh *bulla*, processing all pre-fermentation *kocho* processing activities were almost similar expect raw material used for *bulla* extraction is very high quality. Main value added and creation activities in fresh *bulla* processing were squeezing of the liquid from a decorticated corm and central part of shoot and dehydration of sediment material by decanting supernatant liquid and packaging and marketing (Figure 4 and 6).

3.1.6. Local Market Trading

Local markets trading have been acting in Ethiopian agricultural sectors for a long time. In the case of *kocho* and *bulla,* main actors in the local market are farmers, collectors, wholesalers and rural retailers. The local market has the important role of linking *warqe* producing farmers to market. It was observed that traders in the local market have long-term and trusted relationship with their client farmers. Traders do business with certain farmers based on their long time business relation and trust developed. Core value adding activities in the local market were grading and sorting based on their quality parameters, mixing, repacking, transporting, storing and selling. Traders are usually employing other workers to do value adding activities and transporting their commodities to central markets.

3.1.7. Bulla Processors

Bulla processors did their business by purchasing fresh *bulla* from many suppliers from farmers, wholesalers, and retailers. Then the fresh *bulla* was processed to dried powder forms and then sold to wholesalers, open market dealers and consumers in domestic markets. Some very small amount was also sold at foreign markets through exporters. Main value adding and creation activities in *bulla* processing were washing, cleaning, dehydrating, drying, packaging, storing and selling. Products were dried on a plastic sheet on the unlevelled ground using sun heat irregular basis. These are the processing steps in the *bulla* value chain. Processors used simple locally made traditional tools. Processors were generally specialised in dried *bulla* processing and packaging. The organizational structures of *bulla* processors were small-scale family-based enterprise and family people take the management of the key position in the enterprise. Most of the workers were hired and some of them were family members and all activities were done by women.

3.1.8. Central Market Trading

The central market called Merkato is located in Addis Ababa Ethiopia. Merkato is the largest market in Africa. In Merkato there is an especial place of *warqe* food market called "*kocho tera* or *kocho berenda*". Main actors in this market were wholesalers, retailers, and open market dealers. Traders were generally specialized in *kocho* and *bulla* trading. Main value adding activities in this value chain were sorting and grading, weighing and packaging, storing and selling in both *kocho* and *bulla*. In *kocho*, separation of fibre from the products is done to improve the quality of *kocho*. All value adding activities were done by women. However, men were involved in transporting and arranging the products in shops and stores. The survey results indicated that all owners in the central market were women. The employees in market activities were usually relatives and without labour contracts.

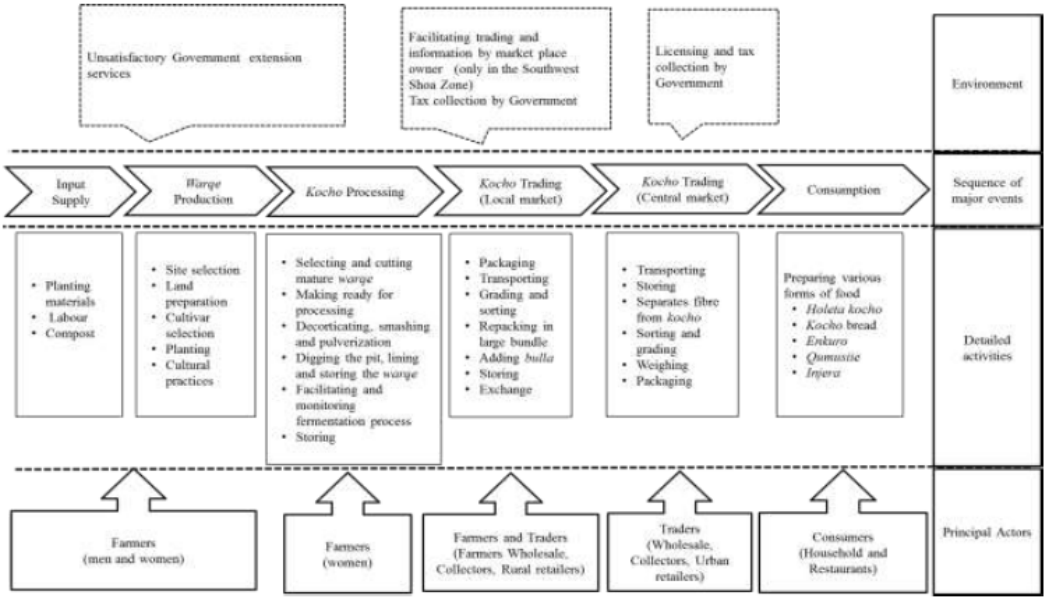

Figure 5. *Kocho* value chain in Central parts of Ethiopia

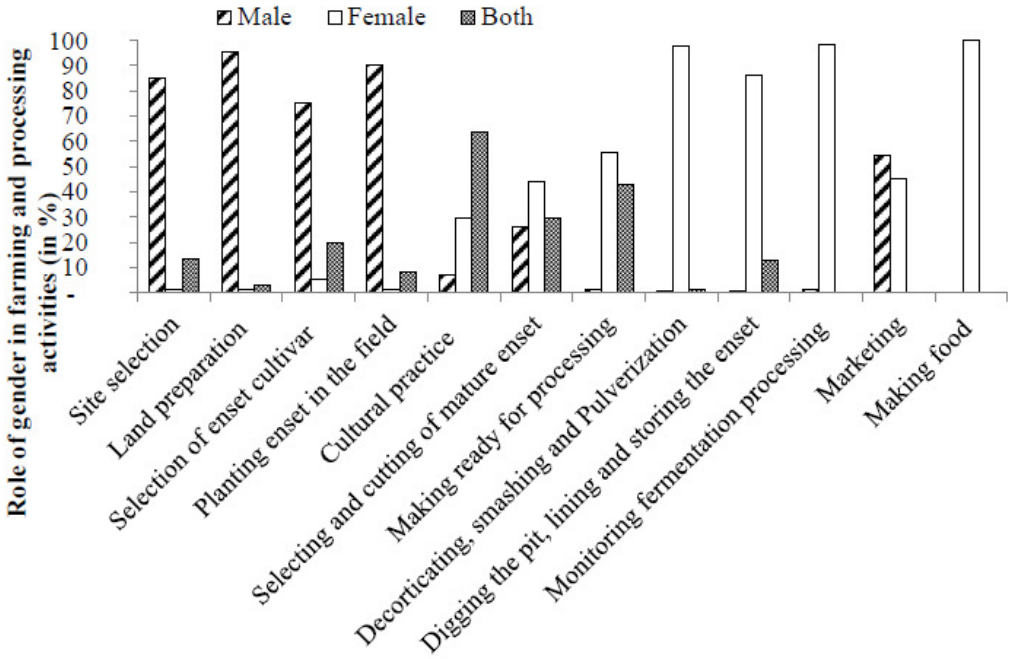

Figure 6. The role of gender in *warqe* farming and processing activities in the Central Part of Ethiopia

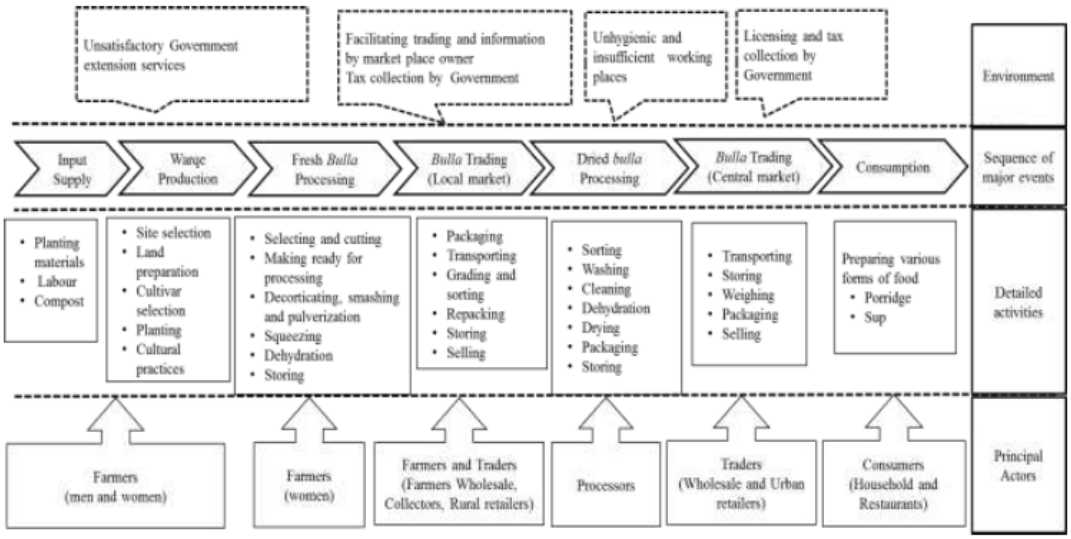

Figure 7. *Bulla* value chain in Central parts of Ethiopia

3.2. Analysis of Market Margin Share

The different marketing margin of *kocho* and processed *bulla* marketing along the value chain presented in Table 1 and Figure 8. *Kocho* and *bulla* production do not rely on external cost for chemical fertilizers, herbicides, and packaging materials purchase, however, the main external cost of *kocho* and *bulla* value chain includes labour and market costs.

The total gross marketing margin that was added to *kocho* while passing through marketing system to reach final consumers was 73 %. *Warqe* producer farmers only get the share from consumer prices was 27 %. Out of the total gross marketing margin of *kocho* retailers received the highest of the marketing margin which was 37 %. The remaining 31 % and 4.60% of marketing margin were received by wholesalers and collectors respectively along the value chain. Similarly, the total gross marketing margin that was added to processed *bulla* was 63 %. It was observed that highest total gross margin was received by processors, which is about 31 %. The remaining 23 % and 9 % of marketing margin were received by wholesalers and retailers respectively along the value chain. The farmer's share of the price of processed *bulla* to end user was 37 %.

The analysis of benefits distribution along the value chain indicated that unfair profit distribution in both *kocho* and *bulla* value chains (Figure 8). Market margin analysis indicated that the highest total gross margin received retailers in *kocho* marketing channel and in processed *bulla* marketing channels processors were received the highest total gross marketing margin. Therefore, *kocho* value chain performance does not have competence since the farmers not get a better share of the of consumers' price. Farmers generate the most added values in the chain but they only gain a small share of profit. However, in processed *bulla* value chain has competence because both farmers and *bulla* processors get fair profit share since both are generated the most added values in processed *bulla* value chain. The efficiency of any marketing system usually depends on the share of producers' to the consumers' price. The better the efficiency of marketing, the better will be farmers' share of the of consumers' price (Mendoza, 1995).

Table 1. Marketing cost (Birr∗) and margins per average 1 kg of *kocho* and processed *bulla*

Cost and margin	*Kocho*			Processed *Bulla*		
	Collectors	Wholesalers	Retailers	Wholesalers	Processors	Retailers
Marketing cost						
Purchase cost	5.97	6.97	13.77	14.94	24.29	37.14
Processing cost	-	0.06	1.50	0.10	3.00	-
Transport cost	0.20	0.41	0.38	0.33	0.45	0.38
Loading and unloading	-	0.06	0.13	0.06	0.06	0.13
Tax and licensing fee	-	0.19	0.25	0.30	0.49	0.57
Transaction cost						
Opportunity cost of labour	0.25	0.55	0.40	0.55	0.40	0.40
Opportunity cost of capital	0.30	0.48	0.69	0.75	1.21	1.86
Total cost	6.72	8.72	17.12	17.03	29.90	40.48

Sales	6.97	13.77	21.74	24.29	37.14	40.96
Gross margins	0.25	5.05	4.62	7.26	7.24	0.48
Total gross margins	4.60%	31.28%	36.66%	22.83%	31.37%	9.33%
Producer's gross margin	98.85%	76.77%	78.75%	82.28%	82.32%	98.83 %
Net marketing margin	1.15%	23.23%	21.25%	17.72%	17.68%	1.17%

∗Price of *kocho* and *bulla* based on 2014 price in Ethiopian Birr (1 US dollar ≈ 21 Ethiopian Birr)

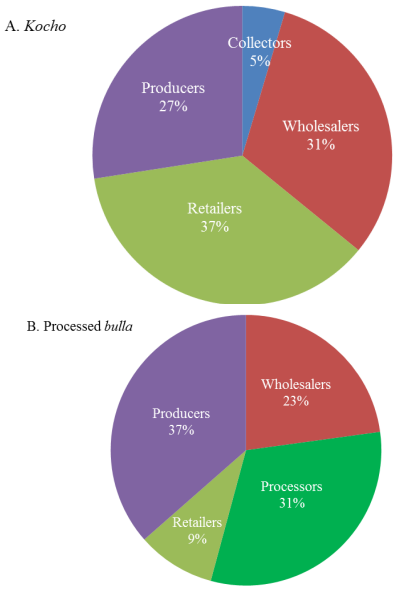

Figure 8. Farmers profit share and total gross marketing margin of A) *kocho* and B) processed *bulla* while passing through marketing system to reach final consumers.

3.4. SWOT Analysis and Value Chain Upgrading Strategies

Summarizing SWOT analysis is presented in Table 2. *Warqe* foods were one of the staple foods in Ethiopia and cash crop in our study areas. A large amount of *kocho* and *bulla* produced from these areas were supplied to the central market. *Warqe* production and marketing has the strong opportunity however, there were some problems and threats faced on this golden crop such as bacteria wilt (*Xanthomonas campestris*) disease and lack of improved technologies, planting materials, and post-harvest processing technologies. The lack of improved *warqe* varieties and absence of external farm inputs may affect production. Farmers mostly rely on organic farmyard manures to supply nutrients to the *warqe* plant, which may not sufficient for raising production. Another problem is *warqe* production done by subsistence farming system and it observed that not direct linked with the central market. There were several gaps and weaknesses in the production, processing, and marketing of *kocho* and *bulla*.

Farming and post-harvest tools and implements are still traditional with low use efficiency. Similarly in the work of Hunduma and Ashenafi (2011) *warqe* processing is reported as an age-old technique and still used without any scientific modification. Moreover, equipment used in *warqe* processing is also very traditional tools and locally made. This indicates that there is need

of a lot of work to improve the processing methods. Gender-dependent work division on *warqe* processing has a negative impact on productivity. Plant attack and *kocho* loss by wild animals such as mole rat and porcupine are also substantial. *Kocho* storage traditional methods and *bulla* drying processing method are leading to losses of products. Marketing *kocho* and *bulla* in the local market are very liable for losses and spoilage due to lack of storage and market facilities.

Table 2. *Warqe* food products SWOT analysis in Central parts of Ethiopia

Strengths (S)	**Weaknesses (W)**
1. Valuable and multipurpose crop 2. High quality and delicious taste of *kocho* and *bulla* produced 3. Hard worker, experienced and endurance farmers 4. Cooperating on working culture both male and female by different traditional associations like *Daboo* and *Daadoo* 5. Product very suitable for processing and upgrading especially *bulla*	1. Lack of improved cultivars and fertilizers 2. It needs high labour 3. Working culture gives burden on women 4. Market facilities problem like warehouse 5. Poor market policies 6. Passive market developing 7. Small production scale and low specialization 8. Underdeveloped farming and post-harvest processing technology 9. Weak support from the government and scientists
Opportunities (O)	**Threats (T)**
1. Suitable climate for *warqe* production 2. Near to central marketplace 3. Availability of different kinds of *warqe* cultivars 4. High demanded products in local market 5. Potential export market especially *bulla* 6. Potential raw material for textiles and paper industries	1. New generation is not accepting hard working which is needs for production of *warqe* and migrating to cities 2. *Warqe* production required high labour 3. Road condition is poor and old 4. High disease incidences (bacterial wilt) 5. Shortage of land, poor soil fertilities and unsuitable topography for agriculture

In the upgrading of the value chain of *warqe* food products, it is important to adopt four trajectories which are pointed by Kaplinsky and Morris (2001) to pursuing the objective of upgrading of the value chain: Process upgrading; Product upgrading; Functional upgrading; and Chain upgrading. There are three strategic areas for *kocho* and *bulla* value chain can be upgrading based on the SWOT analysis presented in Table 3. The first strategic area is focused on input supply improvement to develop high yielding cultivars and farming tools which can help to produce high-quality *kocho* and *bulla* products. The second strategic area focuses on production, post-harvest and processing upgrading which may help to save time and labour and to reduced post-harvest loss. The third strategic area focuses on product distribution and marketing which can facilities marketing and information sharing among producers, processors, traders, and consumers.

Trienekens (2011) indicated that the presence of an adequate distribution and communication infrastructure is a basic condition for value chain development and upgrading. On the other hand, weak infrastructures hamper efficient flows of products to markets and exchange of market information, especially in upstream value chain level. Lack of favourable credit facilities for *warqe* growing farmers and *bulla* processors and no subsidy policy, lack of infrastructure, lack of government support in value addition of local products and weak enforcement of existing laws and regulations are the major problems observed in *warqe* production. Thus, this study argues that the role of the farmers should improve trough provide an enabling environment for the

producers, access to credit, supply improved varieties, extension services, market facilities, market information and disease control.

Table 3. Summary of critical strategic areas to improve value chain performance of *warqe* food products

Strategic areas	Critical issues or factors
Input supply	• Researching on nutrient requirement of *warqe* plant and developing fertilizer application rate and method of application • Developing and/or adopting labour saving farming tools • High yielder and quality varieties development by selection and breeding methods • Creating access to capital and finance from financial institutions to farmers, processors and traders. • Water availability and quality for *bulla* processor is limited at some time so it is should be one of the areas focussing on improving availability and quality to produces a high-quality product. • Access to working area for processor is one of the problems that they faced, therefore, it should government allocated areas with minimum cost • Human capacity development by training in production system, processing and marketing skill
Production, post-harvest, and processing development	• Developing modern agronomic practices and adopting it • Using preventive mechanisms methods of bacterial wilt disease and developing of resistant or tolerant varieties • Developing time saving and loss reducing processing tools and procedures • Improving fermentation process • Working on value addition and creation of *warqe* foods to improve food qualities
Product distribution and marketing factors	• Poor road networks to producers areas and it has an own impact on the ability of farmers and traders to get market so it should be improved road accessibility. • Creating efficient marketing information system to facilities marketing information sharing activities. • Work on improvement of packaging and transportation and handling technologies • Development of common warehouses at producers and market pleases • Development of convenient marketplace at local and central market areas • Organizing producers, processors, traders and consumers (cultural restaurants) co-operatives and creating linkages among themselves • Developing suitable market policies, and given financial and technical supports

4. CONCLUSION

Warqe is one of the major food crops in Ethiopia but its value chain has not yet been analysed to improve its value addition and creation and to benefit both producers and consumers. A large amount of *kocho* and *bulla* produced from Maruf and Wanchi areas are supplied to the central market. The result of our studies confirmed that there are six principal value chain actors involved in *kocho* and *bulla* value chains. These are *warqe* growing farmers, collectors, processors, wholesalers, retailers, and consumers. *Warqe* growing farmers and *bulla* processors are the basic actors and create the most value in the *kocho* and *bulla* value chains. Actors such as collectors, wholesalers and retailers are mainly working in trading activities and value addition. It was observed that weak coordination exists in product and information flow between value chain

actors within and across different level of the chain. Moreover, *warqe* production, processing and marketing are labour-intensive and gender-based labour division activities. In all post-harvest activities and marketing are mainly done by women. *Warqe* food products processed in the traditional processing procedures by using locality made tools which pass generation to generation.

Kocho value chain performance is not efficient since the farmers not get a better share of the of consumers' price. Farmers generated the most added values in the chain but only gained a small share of profit (27 %). However, there are opportunities for further upgrading the value chain performance these foods. In each *kocho* and *bulla* value chain, there is a potential opportunity for improving the value added activities. Thus, the findings of the present study suggest that the role of the farmers and *bulla* processors could be supported by providing credit, developing and supplying improved *warqe* varieties, extension services, facilitate market facilities and market information. *Bulla* processors should support in the capacity development and product upgrading through training. The need support from government to this sector by developing policy and legislation (on issues such as women cooperative and linkage with processors) human power capacity development on post-harvest processing, disease control, and given technical support on production, processing, and marketing. Finally, this paper has focused on value chain analysis *warqe* foods by using the theory of value chain approach. However, it is believed that methods used in this study could apply to other traditional food productions to analysis their value chain and to upgrading the performance of the chain.

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