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Value Chain Analysis of the Pre and Post-Harvest Factors Deteriorating the Quality of Coffee in the Chole District, Oromia Region, Ethiopia

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Abstract
The research aimed to identify the quality deteriorating factors at pre and post-harvest level of the coffee value chain in the Arsi Zone of Chole district. Different research strategies were employed to answer the research questions, which include; desk study, interview, focus group discussion, field survey and observation were employed to collect pertinent information on the pre-harvest and post-harvest factors within the value chain. Data were collected and analyzed by different methods to identify which practices were the possible factors deteriorating the quality of the coffee in the value chain. The result indicated that, at the pre-harvest level, inadequate use of fertilizers, limited moisture, lack of practicing rejuvenation and pruning, coffee wilt and berry diseases, insect pest incidence were the main factors to deteriorate the quality coffee production. At the post-harvest level, carrying out of improper harvesting practices, hardly use of recommended packaging materials, unconducive storage system, mixing of water and foreign matters on dried coffee were some of the factors affecting the quality of the coffee. To address the identified factors, at the pre and postharvest level along the coffee value chain, applied recommendations were given to selected stakeholders.
Keywords: coffee, value chain, quality, pre-harvest, post-harvest

1. Introduction

Ethiopia is endowed with a high potential for agricultural production of various agro-ecological (UNIDO, 2014). Smallholder farming traditionally dominates the agricultural production system under rainfed conditions with low agricultural productivity (Birhanu et al., 2013). Coffee is one of the leading traded commodities on the global market in both volume and value (Zewdu, 2016). Arabica coffee is cultivated in 85% of the coffee producing countries, and the American Continent accounts for approximately 60-70% of the world coffee production (ICO, 2014). In the global market, coffee is a strategic crop since it is a primary source of livelihood for many farmers (ITC, 2011).

Ethiopia produces premium quality Arabica coffee in Africa and is the third largest producer in the world (ICO,2014). The coffee production sector in Ethiopia is being supported by both Regional and Federal Governments (Berhanu, 2017). Oromia Regional State is the leading region in coffee production in Ethiopia (CSA, 2016). Improving coffee quality is a key prospect for increasing coffee exports and may be a good strategy to get better prices for the coffee. (Kassaye,2017). The change in consumer behavior and the increasing consumption of high-quality coffee is an opportunity for the coffee producing countries like Ethiopia.

According to Herhaus (2014), Ethiopia is known for producing the finest Arabica coffee to the world market. However, the deterioration of the quality of coffee produced is a major challenge in the country (Birhanu, 2013). The main objective of the study was to explore and get information on the pre- and post-harvest factors that influence the quality of dry coffee within the Chole district coffee value chain. And to recommend practices to produce high-quality coffee through the intervention of the stakeholders. The extent of this study was limited to the Arsi Zone, Chole district in the Oromia Regional State, southeast Ethiopia.

2. Literature

The value chain concept describes how a product in this coffee produced, transformed from seedling to processed coffee through different actors until it reaches the final consumers as coffee ready to be consumed. According to Ross and West (2013), “A typical value chain will contain input providers, producers, traders, processors, suppliers and retailers with supporter”.

According to Luning and Marcelis (2009) “Quality is meeting or exceeding customer and consumer expectations”. There are different quality attributes in coffee from a consumer point of view like colour, texture, size and shape. Quality can be a section of coffee comes from a combination of the botanical variety, topographical conditions, weather conditions, and the management given during growing spell, harvesting, storage, preparation for export and transport (ITC,2011). According to Richard et., al. (2007) the quality of coffee is impacted by 40% at the pre-harvest stage, 40% at post-harvest practices stage and 20% at export handling.

3. Methodology

The core concept of the research was coffee quality influencing factors, and the key dimensions were the existing structure of coffee value chain and production(pre-harvest) and post-harvest operations. Moreover, dimensions are followed under each dimension as aspects to be focused as seen in the diagram below represent the main and the sub research questions represented by aspects.

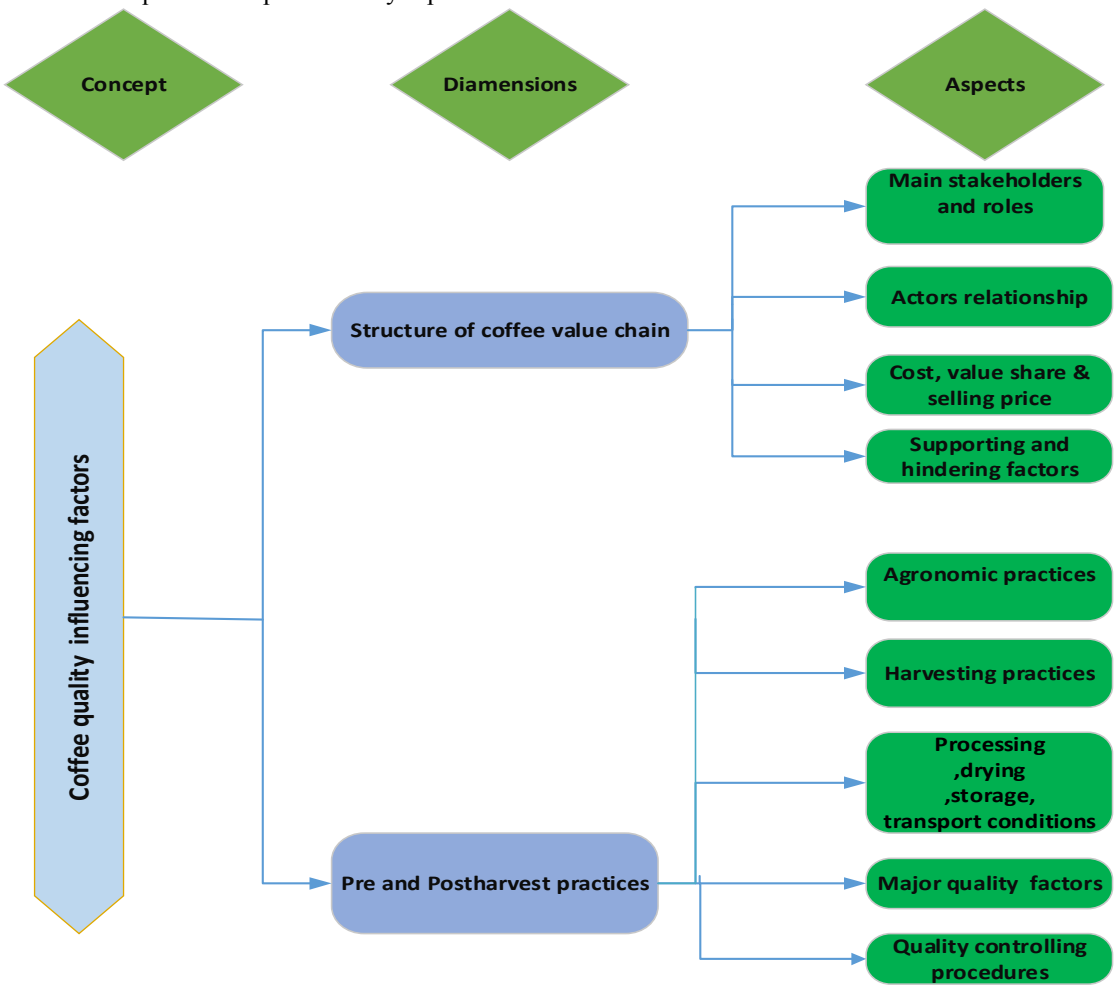


Figure 1: Research Conceptual Frame Work

3.1 Data collection strategy

The data was collected by desk study, survey, interview and focus group discussion. Both quantitative and qualitative data collected from the field research was tabulated and analyzed separately based on the information obtained. Data analysis was done by using SPSS 24, excel for quantitative parts and tabulation, pie chart of the major quality affecting factors in the chain done for descriptive statistics.

Research framework illustrated that the research began by strategy elaborated as follows (see the figure 2) given based on the outcome of findings and discussions held to give answer for the objective of the study.

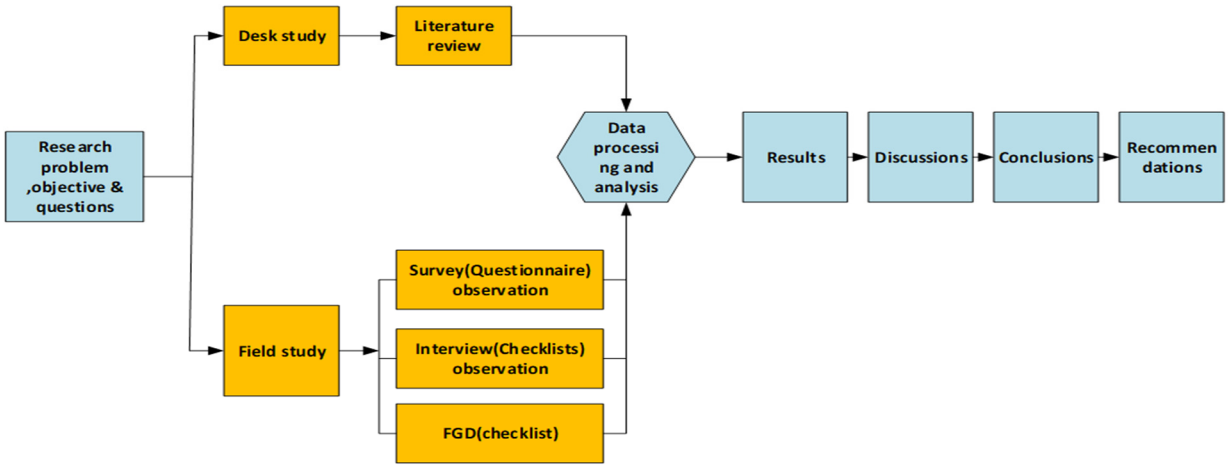


Figure 2. Research strategy

4. FINDINGS

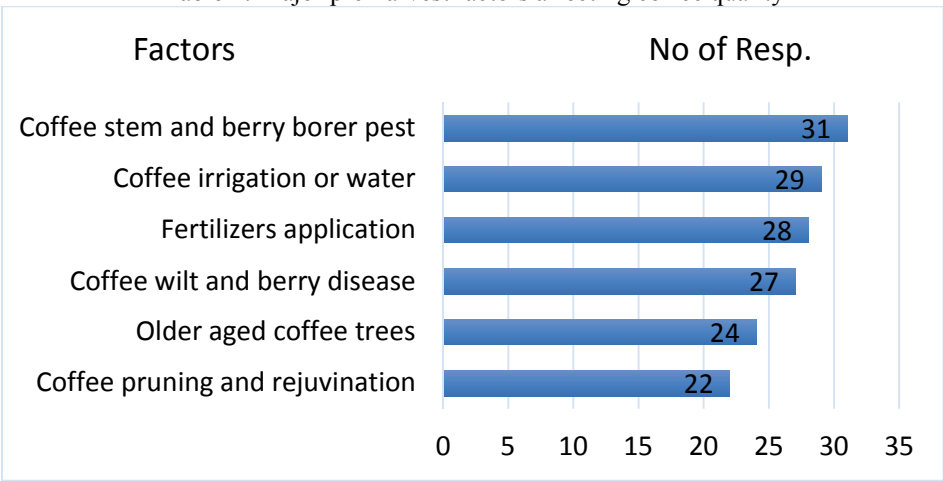
This study has provided information on the roles of stakeholders involved in the coffee value chain in Chole District, Ethiopia. This has shown that various stakeholders play an important role enabling the coffee beans to reach the final consumer in the various destinations. This is in agreement with the findings of Ross and West (2013) that a typical "value chain would contain input providers, producers, processors, packagers, suppliers and retailers with supporter".

The 60% of the coffee produced in the Chole district of the study area goes to the international market. There are weak relationships among actors within the chain, access to market information is difficult for farmers. KIT and IIRR (2008) stated that the weak chain relationship contributed to low-quality product supply by producers.

Climate change is found to be the main limiting factor to produce quality coffee in the study area. Poltronieri & Rossi (2016) stated that the quality of Arabica coffee species is strongly affected by high temperature due to climate change resulted in declining the optimal growth and taste of the coffee. Farmers do not have access to the processing facilities to process their coffee independently or in a cooperative. Ali (2013) stated that the absence of processing machine was the reason for low quality coffee production and supply in the coffee chain in the Eastern part of Ethiopia.

The availability of favorable climatic conditions in the district is considered as a supporting factor to produce quality coffee. As indicated by Nure (2008) Ethiopia has a diverse genetic base of Arabica coffee with many heterogeneities to produce coffee in a quality wise.

Table 1: Major pre-harvest factors affecting coffee quality



Coffee preharvest Practices

Farmers in the study area do not adequately practice the best agronomic practices to boost productivity and maintain the inherent quality of the coffee produced. It is essential to recognize the age of the coffee tree has a role in the quality of the coffee grown in the field. The research finding indicated that most of the district coffee is found in the interval of old coffee trees which give a low both in the quality and amount of product. It is noted in the prior finding by Yigzaw (2005) that older coffee trees provide strong taste and harsh cup brew quality, which is not preferred in the coffee market.

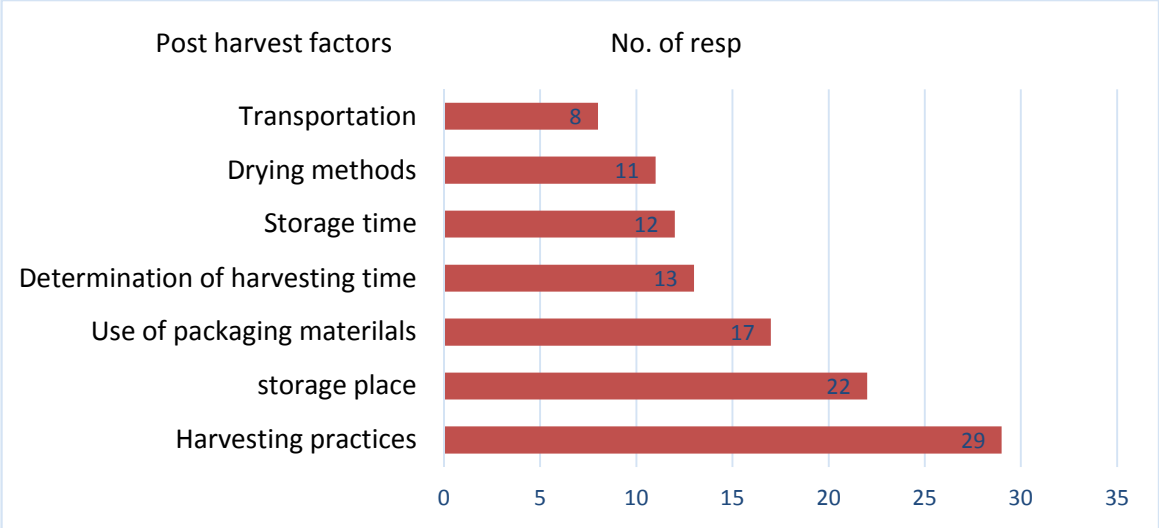
The findings indicated that only a few farmers are using artificial fertilisers for coffee production, though scarcity and lack of interest remain the limiting factors. The reason farmers lack the interest to use fertiliser is mainly that of the previous information given by the district agricultural experts to not apply fertiliser. According to Minten et al. (2015), only range of 1% to 2% of farmers applies mineral fertilisers to produce coffee in the south part of Ethiopia.

The major factors affecting the quality of coffee in the study area mainly coffee stem and berry borer pet and moisture stress. This is because of climate change in the study area and poor management practice of farmers used mainly contributed to the prevalence of the diseases. This analysis supported by different scholars Gole (2015) coffee pests and diseases attacks the cherries directly or cause them to decline by devastating the plants, which then produce immature or damaged fruits that influence the final quality.

The presence of older coffee trees without pruning or stumping affected the farmers to harvest both quality and quantity of coffee from their fields. Wintgens (2004) noted that coffee pruning enables the plant to give right bean size and flavor. The presence of disease and pest affects the quality and the quantity expected to harvest. This analysis supported by Wintgens (2004), the disease occurrences could disturb the cherries directly or cause them to decline quality and quantity of the coffee by wilting the plants, which damaged fruits severely to affect the coffee quality.

As farmers, mostly focused on Khat management than coffee in the study area, the quality of coffee production declined due to moisture stress. As indicated by Gole (2015) the proper growth situations such as appropriate application of mulching and irrigation usually have a positive result on bean size and flavor of the coffee bean, which contributes to coffee quality.

Table 2: Major post-harvest factors affecting coffee quality



Post-harvesting handlings practices

Farmers harvested coffee of different stages in the study area, such as green, partly ripe, red and black cherries, which mainly affects the quality of the coffee. The main reasons that farmers are shifting their farm to the Khat due to limited extension services and less price of the coffee as compared with Khat. The analysis supported by Wintgens (2004) noted that inferior coffee quality is mainly due to mixing of green, partly ripe, red and black cherries.

Raise bed drying method is very important to keep the inherent quality of coffee that all farmers expected to practice using the raised beds, which helps farmers to produce good quality of the coffee. As indicated by Berhanu et al. (2014) and Anwar (2010), use of proper drying facilities such as raised bed and mats, play a crucial role to maintain the quality of the coffee at raw and cup quality and storage is one of the essential facility in the processing of any agricultural product respectively.

In post-harvest practices the major factors affecting the quality of coffee mainly harvesting, mixing coffee with (water and soil) and storage practices, which highly deteriorate the quality of the coffee in the study area. According to different scholars, Endale et al. (2008) selective hand picking yields the best quality green coffee by declining the fraction of defects or strip harvesting coffee.

Coffee quality controlling and grading is all about ensuring the compliance of the coffee quality against the grade assessment criteria. There is lack of linkage on coffee quality controlling and grading guidelines introduced at the farm gate or district level to create awareness. This analysis supported by Dominic (2011) stated that the grading assessment information hardly reached farmers due to weak linkage among actors in the chain.

5. CONCLUSIONS

- There are many stakeholders in Chole district coffee value chain. These include actors from input suppliers to consumers, supporters and chain facilitators.
- From the study, it is concluded that the relationship between smallholder farmers and coffee collectors is weak, as the collectors are only concerned with the commodity. The coffee value chain actors are not organized in the study area. Farmers are also not aware of coffee quality aspects in the market. Hence they do not put in the effort to ensure quality.
- The coffee value chain performance showed that there is no formal value chain structure to influence quality coffee supply to the market by farmers. There is no difference in price based on the quality of the coffee.
- In the district coffee value chain, there are challenges confronting smallholder farmers to produce quality coffee at the farm level. These are climate change, crop replacement, unavailability of processing facilities and quality awareness identified as some of the hindering factors.
- Pruning and rejuvenation are hardly practiced hence lowering quality of coffee being harvested. Diseases and pests affect coffee quality to a great extent. Pests such as coffee borer and stem borer are found highly in the study area.
- Farmers harvesting practices; for instance, picking immature, fallen berries and stripping without separating or sorting also affect coffee quality. This leads to a mixture of cherries, which are immature hence, affect drying rates, and ultimately lowering quality.
- Limited post-harvest drying facilities influence the quality of coffee, as farmers currently used ground surfaces with mud lining; hence, it is easy to contact disease pathogens and pests, as well as impurities, which affect quality. Farmers and traders also mix coffee with water, soil and stones with the intention of increasing weight during marketing to fetch more money. This practice reduced the quality of coffee and shelf life of beans. In the study area, there is lack of coordination on quality control and linkage at every level of the value chain; farmers do not receive reliable information on quality standards and practices.

6. RECOMMENDATIONS

- In order to produce quality coffee, smallholder farmers should undertake the following agronomic and post-harvest handling practices given as advice.
- Better to use the recommended seedling or planting materials from nursery sources.
- Improve coffee tree management practices by removing old branches, weak and diseased branches to create better air circulation, improve quality and productivity of the tree.
- For old aged coffee, use stumping to rejuvenate the coffee tree and manage disease and pest safely.
- Apply fertilizers and compost to their coffee fields adequately.
- Improve harvesting practice by harvest red ripen cherries by hand-picking from the tree.
- Practice sorting after harvesting before drying, to avoid moisture variation due to mixed coffee harvesting and drying problem. Avoid mixing of water and soil with coffee beans and use jute sack to store the coffee.

District government offices

- This recommendation will be practical if District Agriculture and Natural Resource Management Offices facilitate training on quality dynamics and best-applied knowledge on; quality production and field management on stumping, pruning, and training on disease and pest control as well as support irrigation and recommended input use and supply. The district should support and facilitate with fertilizer supply, pruning and farm implements acquisition.

Traders (collectors and wholesalers)

- Should give focus on quality instead of quantity only at the time of harvesting or collection.
- Should differentiate price based on the quality of the coffee.
- Keep the quality of collected coffee by storing at safe places and collectors should avoid mixing of foreign matters with coffee.

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