## Assessment of Pre and Post-Harvest Factors Influencing Quality of Coffee in the Coffee Value Chain of Chole District, Oromia Region, Ethiopia

A Research Project Submitted to Van Hall Larenstein University of Applied Sciences in Partial Fulfillment of the Requirement for the Degree of Master of Science in Agriculture Production Chain Management Specialization in Horticulture Chain

BY

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**DEDICATION**

This work is dedicated to my Brothers and sisters in Christ, who shared my burden and put spiritual contribution during my study in the Netherlands.

## ACKNOWLEDGEMENT

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## ABBREVIATIONS

| | |
|---|---|
| CBD | Coffee Berry Disease |
| CDANRMO | Chole District Agriculture and Natural Resource Management Office |
| CLR | Coffee Leaf Rust |
| CSA | Central Statistics Agency |
| CWD | Coffee Wild Disease |
| DA | Development Agent |
| EACWSE | Ethiopian Agricultural Commodities and Warehouse Service Enterprise |
| ECX | Ethiopian Coffee Exchange |
| FAO | Food and Agriculture Organization |
| FGD | Focus Group Discussion |
| GIS | Geographic Information System |
| GTZ | German Development Organization |
| HA | Hectare (10000-meter square) |
| ICO | International Coffee Organization |
| ISO | International Standard Organization |
| ITC | International Trade Center |
| MT | Metric tonne |
| MTI | Ministry of Trade and Industry |
| QT | Quintal which is equal to 100 kg in weight |
| SNNP | Southern Nation Nationalities People |
| SWOT | Strengths, Weaknesses, Opportunities and Threats |
| UNIDO | UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION ITC |
| USAID | United States Aid International Development |
| USD | United States Dollar |
| USDA | United State development of Agriculture |

## DEFINITION OF TERMS

**Bean:**   The final product of the hulling process. Natural coffee considered as beans.

**Cherr**y: The Ripe fruit of the coffee plant, whose colour may be red or yellow, depending on the variety.

**Cup test:** Test carried out by trained professionals to classify the coffee according to the beverage characteristics.

**Defect:** Features of the beans which lower their quality and reduce the marketing price. (Ex.: Sticks, beans with borer holes, hollow beans, green beans).

**Drying:** Process of reduction of moisture content in the coffee fruit until it reaches 11-12% of moisture content.

**Green defect:** Defect caused by the presence of immature fruits in the lot, which is very detrimental for the beverage.

**Harvest:** The process of removing fruits from the coffee plant.

**Hulled coffee:** coffee that has finished the process of hulling and is ready for market.

**Hulling:** The process of husk removal, cleaning and simple classification of coffee in the processing process.

**Immature fruits:** Fruits which did not complete the maturation stage.

**Moisture Content:** The moisture content, expressed as the free moisture (water) content shall be determined using approved moisture meter device.

**Parchment:** Endocarp or dried but not hulled coffee bean.

**Postharvest handling practices:** Activities undertaken from harvesting time till reaching final consumer, that cover harvesting, handling, drying, processing, packaging, storage and transportation.

**Preharvest practices:** Cultivation practices carried out through the production process of coffee from bean seedling to cherry for harvesting.

**Preliminary Assessment:** Raw and cup analysis to differentiate between potential speciality coffee and commercial coffee.

**Primary Defect:** Full Black, Insect Attacked, Foreign Matter, Dried Cherry / Pod, *Cordia africana* tree seed "Wanza seed", Earth.

**Sample:** Portion of coffee used for quality grading of assessment purposes.

**Secondary Defect:** Partial Black, Floater, immature, Withered, Shell, Slightly Pest Damaged, Broken, Foxy, White, soiled, Parchment, Hull/Husk, stinker, Faded defect.

**Unwashed Coffee:** Coffee prepared by dry processing of the fruit.

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 and come up with an applied recommendation for the interventions to be facilitated by the Arsi University as a commissioner of the study. Different research strategies were employed to answer the research questions, which include; desk study, field survey, interview, focus group discussion, and physical observation were utilised to collect pertinent information about the pre-harvest and post-harvest factors within the chain. Information was gathered from actors and supporters that took part in the district coffee value chain. Moreover, the field survey targeted at the smallholder farmers' production and post-harvest factors, and the interview was employed to coffee marketing actors to get the post-harvest handling factors. The supporters were interviewed on their support and facilitation roles that they have to support the chain.

Data were collected and analysed by different methods to identify which practices are the possible factors deteriorating the quality of the coffee in the value chain. The result identified that at the pre-harvest level, inadequate use of fertilisers, limited moisture, lack of practising rejuvenation and pruning, coffee wilt and berry diseases, insect pest incidence were the significant factors to affect quality coffee production. At the post-harvest level, carrying out improper harvesting practices, use of unrecommended 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. Correspondingly, to the factors above, weak marketing infrastructure and linkage, low price setting by traders and cooperative organisational problems were identified as core factors affecting smallholder farmers from producing quality coffee in the district.

To address the factors that influence the quality of coffee at the pre and postharvest level along the coffee value chain applied recommendations were given to selected stakeholders. Primarily, Arsi University has the facilitator of the stakeholders and provide training and capacity building to the District Agricultural Office and farmers to address coffee quality problems at smallholder farmers level in the district and identified different stakeholders' roles and responsibilities according to the sectors mission and visions.

Keywords: coffee, value chain, quality, pre-harvest, post-harvest

# CHAPTER ONE: INTRODUCTION

## 1.1 Background information

Agriculture is the backbone of the Ethiopian's economy (UNIDO, 2014). It contributes close to 50 percent of the Gross Domestic Product (GDP) and up to 90 percent of export earnings. The Agriculture sector provides an income to about 83 percent of the population of Ethiopia (Davis et al., 2017). 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). The world coffee production is estimated at approximately 8.75 million tons which are accounted for about 23.4 billion US dollar in export value in 2013. 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). The coffee sector employs more than 100 million people in different parts of the World (Petit, 2007). In the global market, coffee is a strategic crop since it is a primary source of livelihood for many farmers (ITC, 2011).

## 1.2 Coffee Production in Ethiopia

Coffee is Ethiopia's largest export crop, (Petit, 2007). Oromia is the leading region in coffee production in Ethiopia with a total production area of 417,557 hectares, with an annual of 2,586,654 tons (CSA, 2016).

Ethiopia produces only Arabica coffee which is considered as superior to Robusta coffee due to its fine aroma, strong body, and pleasant acidity (Zewdu, 2016). The country produces premium quality Arabica coffee in Africa and is the third largest producer in the world (ICO,2014). A quarter of the total population of Ethiopia is directly or indirectly dependent on the income they generate from growing coffee for their livelihood (Zewdu ,2016). The coffee production sector in Ethiopia is being supported by both Regional and Federal Governments (Berhanu, 2017). The country has enormous potential to become the leading coffee producer in the world, (Gole,2015), primarily because of quality characteristics of the coffee (Alemseged, 2012). The Ethiopian coffee is characterised by its rich in aroma and flavour makes it desirable for blending with coffee from other countries.

The change in consumer behaviour and the increasing consumption of high-quality coffee is an opportunity for the coffee producing countries like Ethiopia. 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). 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. This is mainly due to poor agronomic practices, poor post-harvest and storage practices and inadequate infrastructure. Hence, the coffee quality problems in Ethiopia affect both local and international market, therefore, due to poor quality, Ethiopian coffee cannot adequately compete in the international market for higher selling price (Birhanu, 2013).

Despite the favourable climatic conditions and local varieties for quality coffee production with farmers having an experience in coffee farming, still, there are gaps intense assessments work to identify the quality problems in the Chole district. Therefore, assessing these impeding factors at the production and post-harvest stages of the coffee value chain in the study area is essential. The study mainly focused on the identification of the main factors in the coffee value chain which affect the quality of the coffee.The aim is to obtain relevant information that can be used to develop improved quality management system within the coffee value chain.

## 1.3 Research problem

Coffee is a primary income earner in Chole district providing rural employment and improving the livelihood of the majority of residents. Coffee is one of crucial horticultural crop was grown and cultivated by smallholder and state farmers in various districts in Arsi zone. Despite coffee's importance and contribution to the community in this area, there is a significant problem of poor quality coffee.Which is mainly attributed to pre and post-harvest practices in the coffee value chain that has resulted in a low price from the coffee sector for both farmers and at the national level (Gole and Senbeta, 2008).

Therefore, this research will come out with recommendations that will alleviate the factors that cause poor quality coffee within the coffee value chain. The findings not only useful for smallholder coffee farmers in this district but also to other districts in Ethiopia with similar quality problems.

## 1.4 Problem Owner: Arsi University

The research was commissioned by Arsi University, which is one of the public higher education institution at Arsi zonal Administration of Oromia Regional State in Ethiopia. The university was established with the objectives of teaching, research and community development. The university provides postgraduate training that focuses on poverty alleviation and commercialisation of agriculture. By identifying the existing challenges in farming and improve productivity, quality and marketing along the value chain. Identification of the challenges affecting the quality of coffee in the value chain was one of the recommendations made by the university to improve the sub-sector performance.

**1.5 Objective of the Research**

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 to recommend practices to produce high-quality coffee through the intervention of the stakeholders and facilitation of the commissioner.

**1.6 Research questions**

1: What is the existing structure of coffee value chain in the Chole district?
   1.1    Who are key stakeholders and their role in the coffee value chain of Chole district?
   1.2    What does the relationship exist among actors in the coffee value chain?
   1.3    What are the cost, price and value shares of actors in the coffee value chain?
   1.4    What are the hindering and supporting factors of coffee value chain in the district?

2: What are the pre-harvest and post-harvest management practices that influence dry coffee quality along the value chain in Chole District?
   2.1.    What are the production management practices carried out by farmers to produce coffee?
   2.2.    What are the post-harvesting handlings practices made at different stages in the chain?
   2.3.    What are the major factors affecting the quality of coffee?
   2.4.    What are the existing coffee quality controlling and grading procedures to the market?

**1.7 The scope  and limitation of the study**

The extent of this study was limited to the Arsi Zone Chole district in the Oromia Regional State, southeast Ethiopia; Data was collected from the survey area on the coffee quality influencing factors both at the pre-harvest and post-harvest stages. Two peasant associations (Lega Buna and Magna Warki) were selected based on their remoteness and the fact that they had not researched previously. The study was undertaken with a limited number of interviewees from a part that may not be representative of the entire region. The marketing data and information obtained in the study area may have errors. This is because farmers do not have a farm recording or invoices. Traders were reluctant to provide sufficient information to the researcher. The export marketing was limited to wholesalers level to calculate the value share fully via the export chain. Notwithstanding the limitations mentioned above exist, the results of the study can be useful to develop intervention strategies to improve the quality of coffee in the area.

# CHAPTER TWO: LITERATURE REVIEW

## 2.1: Value chain concept

According to Dankwa (2015) "Value Chain concept is a business-oriented approach, which aims at capturing the best value at all stages to the final consumer". 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. However, this also happens when there are supporters within the value chain such as a Government. According to Ross and West (2013), "A typical value chain will contain input providers, producers, traders, processors, suppliers and retailers with supporter". In this sense, the concept of the value chain is relational. From this finding, coffee production in Chole can be described as a value chain, since it contains the value chain characteristics such as actor and supporters. According to (USAID, 2011) the coffee value chain of Ethiopia involves different stakeholders, but most importantly farmers who are the primary actors. Most of these farmers are smallholders with limited knowledge of market requirements when it comes to quality attributes.

Roduner (2007) also defined value chain as an analytical and operational model where the product is hardly ever consumed at the place of production before transformed. This is seen in Chole district where smallholder's farmers produce coffee, then turned into parchment and then exported to different roasters and consumed to foreign consumers. Ross and West (2013) argued that value chain development can understand as any concerted effort to improve the conditions in the value chain. By assessing the pre and postharvest factors that influence the quality of coffee will contribute to the development of coffee value chain development in Ethiopia. The following figure illustrates the value chain process with actors and roles in the value chain process.

Figure 1 Value chain process
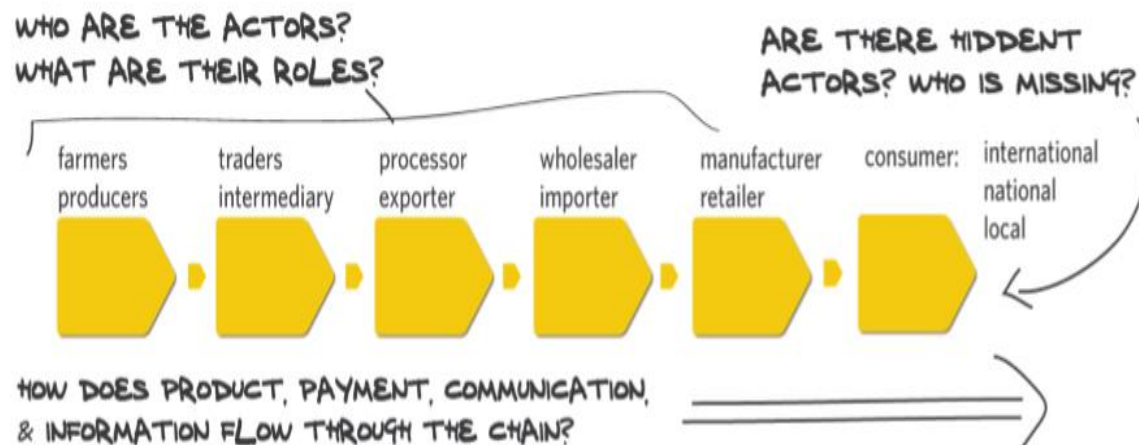


Source: CIAT, 2012

**2.2: Coffee production in Ethiopia**

Ethiopia has a diverse genetic base of Arabica coffee with many heterogeneities. It produces ranges of typical Arabica coffees and possesses the high potential to market a large number of speciality coffee (Nure,2008). According to the new report on climate change issues of coffee by   Davis et al. (2017) in Ethiopia, Arabica coffee offer Ethiopia with its most key agricultural commodity, contributing about one-quarter of its entire export incomes. In 2015/16, Ethiopia exported nearly 180,000 metric tons of coffee at a value also of 800 million USD, making it Africa's major coffee producer and the world's fifth largest coffee exporter although around half of the coffee produced used by domestic consumers use each year. The domestic consumption rate often becomes increasing with an increment of the population and roadside coffee making has become the new opportunity for females in most parts of the country. The graph below shows that coffee production seems not increasing, but the local consumption is growing because of the above-stated reason over the export market.

Table 1   Coffee production trends in  Ethiopia in metric tons (1994 -2014)
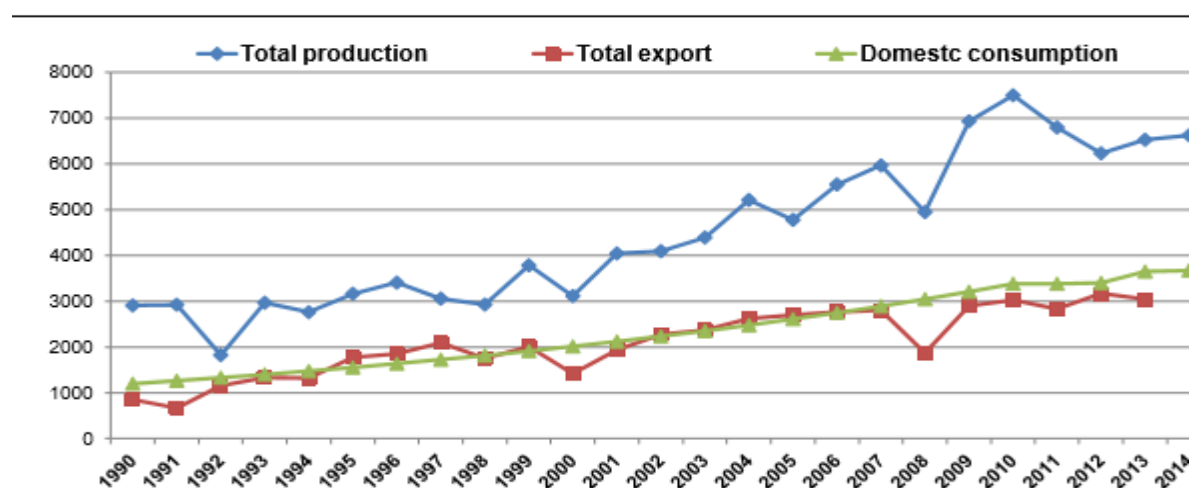


Source:  ICO, 2014

In Ethiopia, the coffee is produced within specific agro-ecological zones, in several geographical and political boundaries. The main coffee-production areas of Ethiopia are the south-west and south-east, with modest and minor production in the north part of the country.  According to Davis et al., (2017), stated that "coffee production had been negatively influenced by changes in climate". Coffee produced in different production systems that include forest, semi-forest, garden, and a modern plantation. There are differences of opinion on the amount of farm size for coffee production area by smallholders. More than 90 percent of coffee produced in the country comes from smallholder farmers, and the rest 10 percent is from medium and large scale producers (USDA,2016). The majority of production is on the small garden field and on average less than 2 hectares with yields remaining low at around 0.7 - 0.8 metric tons per hectare (USDA,2016). The production is mainly by smallholder farmers on average reported about 0.67 ha.

### 2.3: Product quality

Product quality is a means to integrate features that can meet consumers need(wants) and gives customers satisfaction by altering products(goods) to make them free from deficiencies or defects. The following figure illustrates the requirements or attributes for product quality determination in the product value chain (Kalyan, 2017).

Figure 2 Product quality definition
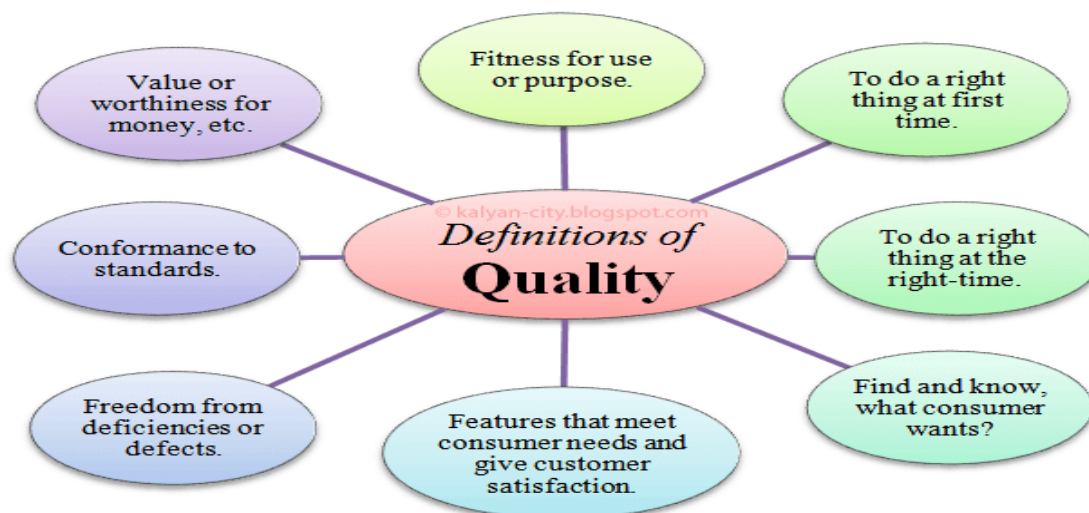


Source: Kalyan , 2017

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. Maintaining the quality is essential to control physical, chemical, and microbiological damages that caused by pre and postharvest practices. These parts and elements of quality features rely on composition of product, harvesting, sorting methods, packaging and packaging materials, storage and transport used. Coffee quality is attributable to its botanical variety, weather and topographical conditions, handling and care during growing, harvesting, storage, preparation for export and transport (ITC, 2011).

### 2.4: Factors affecting coffee quality

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. They comprise intervention by human beings, whose motivation is the main factor in the determination of the final quality of a part of green coffee. Several factors contribute to the quality of the coffee that producers and environment widely handle them(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.

#### 2.4.1: Pre-harvest factors

**Genetic factor:** The more we know about the coffee's origin, the more confident we can be about its uniformity and quality (Leroy et al., 2006). According to Selvakumar and Sreenivasan (1989) finding, the genotype is a major factor since it determines to a great scope of the key characteristics such as the size and shape of the beans as well as their colour, chemical composition and flavour. Producers, coffee users, and agricultural development experts described the presence of considerable cup quality variation among different Arabica coffee genotypes grown in Ethiopia (Mekonen, 2009).

**Physiological Effects:** The coffee tree physiology, the age of the coffee, and of picking time all interrelate to give the final characteristics of the end coffee bean product. A report showed that coffee tree age, place of the fruits of the tree, and fruit-to-leaf ratio had a substantial effect on the chemical content of green beans (Vaast et al., 2006) and affected the sink-source ratio. Physiological variations reflect variations in bean size, biochemical contents, and cup quality. In other findings the C. Arabica in Costa Rica, that picked early as a red cherries gave the best coffee quality (Leroy et al., 2006). Accordingly, Yigzaw (2005) described that samples harvested from young trees are possible to be mild and thin, but fine in flavour. Coffee samples from old trees give strong taste and a harsh characteristic brew. Medium aged coffee trees, 15 to 20 years old, bear beans with good flavour as well as acidity and body (Yigzaw, 2005).

**Edaphic and Climatic factors:** The growing atmosphere plays a crucial influence on coffee bean quality (Decasy et al., 2003). Altitude, daily temperature fluctuations, quantity and distribution of rainfall and the physical and chemical characteristics of the soil are critical factors. The quality of Arabica coffee species is strongly affected by temperature increases since, for optimal growth and taste. A heat of about 18–21∘C is required, while the having to temperatures of 23∘Cor higher can in most cases hasten to ripen of fruits and harmfully affect the quality of the coffee (Poltronieri &Rossi,2016). Yigzaw (2005) described that if other factors are kept constant, better quality coffee can be found at higher altitudes, while lowland coffee discovered to be somewhat bland, with considerable body. Moreover, coffee from high-altitude areas was more acidic, with better aroma and flavour. Periods of extended drought may also consequence in lower quality beans. Most of the coffee tasters agree now that it is little or no difference in flavour at all between the Arabica pure breeds cultivated under similar agro-climatic conditions (Wintgens, 2004).

**Shade management:** Shade has different effects depending on the geographical location of the coffee tree. For instance, at higher altitudes shade hurts fragrance, acidity, body, sweetness and preference of the beverage, while no effect seen on the physical quality of the bean. At a lower altitude, shade did not possess a significant effect on sensorial attributes but significantly reduced the number of small beans. Coffee trees profoundly love shade due to its forest origin (GOLE, 2015).

**Coffee tree pruning:** According to Adriana et al., (2009), coffee tree pruning is a significant pre-harvest action for reducing frequencies of diseases, adjusting air movement within the plantation, which in turn reduces the leaf drying time and helps to maintain the framework of the plants in the desired shape. It contributes to achieving the plant shape, and contribute to sustainable higher yields while contributing to disease and pest control that might affect the coffee bean resulted in direct deteriorating the inherent bean quality. Complete rejuvenation or removal of the entire coffee stem recommended when coffee become older to get better yield and a quality product (Gole, 2015).

**Weed control***:* The weed is found to be a severe constraint that decreases the yield and quality of coffee in the most area (Techale et al.,2013). It is true that quality declines, because of the competition for light, nutrients and moisture with diverse types of weeds growing in the coffee farm field, that finally severely affect cup taste. Comparable findings were reported by (Adriana et al., 2009). Ploughing, mulching and intercropping with cover crops may suppress weeds. Mulching and cover crops also used in intensively managed systems like a plantation, home gardens and semi-forest. The proper growth situations like weed control, mulching, irrigation, appropriate planting density and pruning usually have a positive result on bean size and flavour (Gole, 2015).

**Pest and Disease prevalence**: Significant fraction of coffee yields annually lost due to the persistent problem of disease and pest incidence. The main coffee diseases in Ethiopia are coffee wilt disease (CWD), coffee berry disease (CBD) and Coffee leaf rust (CLR) is common (Gole,2015). Coffee pests and

diseases attacks can severely affect the cherries directly or cause them to decline by devastating the plants, which then produce immature or damaged fruits that hurt the final quality. Coffee disease and insects attack could also profoundly affect the quality of the coffee by the lower quality result of the beans at the end market (Wintgens,2004). The disease and insect attack (such as leaf miner and mites) may also lead to worsening the quality of beans (Wintgens, 2004).

### 2.4.2: Postharvest Factors

The quality of coffee deterioration at harvesting and post-harvesting levels estimated 60% of the total chain (Richard et., al. 2007).

**Harvesting Factors:** According to Adugnaw (2014) explanation, handpicking of coffee cherries are practised commonly in Ethiopia. In this operation, the fresh ripe fruits are selectively handpicked and transported to processing plants. Coffee picking is a step-wise process, which may take up to five rounds to harvest a unit land of coffee depending on the sequence of flowering. Selective hand picking yields the best quality green coffee by declining the fraction of defects in coffee batches conversely to mechanical or strip harvesting. Strip harvesting does not distinguish between the ripening stages of fruits, and it produces mixed characters of green berries, fresh ripe cherries, and overripe cherries that results in a bad quality bean composition. According to Endale et al. (2008) found out that low caffeine content found in bean harvested at an immature stage and in over-ripe coffee beans with current quality taste.

**Post-harvest factors:** During post-harvest processing and handling practices period the chemical structure of green coffee and consequently the final coffee quality adequately determined using post-harvest treatment of the wet and dry processing. As recently shown, there are distinct differences in the chemical composition of various processed coffee beans (Bytof et al., 2007). Thus, processing is a crucial activity in coffee production and plays a critical role in the quality classification (Mburu, 1999).

**Coffee processing:** In Ethiopia, both dry and wet processing methods are operated, which accounts for 70% and 30% of coffee production respectively (Jacquet et al., 2008). According to Bytof et al. (2007), report the defined ambient conditions of any post-harvest processing can have a high effect on the time course of the metabolic reactions that occur during that processing period. Recently, it has shown that the variation in the drying procedure in the course of dry and wet processing strongly affects the abundance of various sugars, representing essential aroma precursors (Kleinwächter and Selmar, 2010).

**Coffee drying practices:** Coffee drying practice is additional vital factor accountable for the coffee quality decline. Worse coffee drying operations, by mixing dry and unwanted layer depth of coffee upon drying and heaping of coffee earlier drying favour the development of fungus and bacteria which without doubt cause quality deterioration (Berhanu et al., (2014). Berhanu et al. (2014) reported that coffee drying on raised beds covered with mesh wire or bamboo mat produced best quality coffee by scoring the highest raw and cup quality value of coffee bean. As indicated by Anwar (2010) report, coffees drying by using raised bed with mesh wire, wood and bamboo mats have improved intrinsic quality.

### Green coffee storage and transportation

The coffee must transport with clean and dry transportation medium. The storage place should also be kept clean, cool, shaded, dry and well aerated. Transport and storage have similar risks to coffee quality. Re-wetting of beans due to leaky covers, or high water inside containers standing for long periods hotter area, can result in the coffee developing mouldy or musty flavours (Horizon plc, 2017). Proper techniques for handling bulk or bagged green beans for container shipping are now well known

in environments of high relative humidity and temperatures; coffee beans will absorb moisture and grow mould (Techale et al. 2013).

Coffee storage place must be kept isolated from a strong smelling liquid such as petrol or diesel, or agricultural inputs, as its odour will affect the final cup. Poorly aired warehouses and relative humidity conditions over 65% will create mould problems (Horizon plc, 2017).

**2.5: Coffee quality control, grading and marketing system in Ethiopia**

Coffee quality control working systems in Ethiopia is used to check the quality requirements to fulfil for the market in the country at different levels. It starts at the districts; here district regional governments have the power to control the quality of the coffee. On the regional basis, ECX has the mandate to oversee the quality aspects of the coffee. At the centre hub level, Ministry of Agriculture has the responsibility to control quality issues of the coffee (EXC, 2008). According to Bernhard (2015) report, the Ethiopian Commodity Exchange (ECX) a vital institution serves as the hub for the coffee marketing system. Within this system, coffee can be exported by three actors: coffee exporting companies, cooperative unions and commercial farmers, with the opportunity for the latter two exporters to bypass the ECX (Figure 1).

Recently, Ethiopia has introduced new trade approach for export coffee bypass permission with a particular focus.

> According to the coffee supplier, Trabocca (2017) reported that the new marketing looks Exporters with a valid export license are allowed to sell directly to the international markets under special conditions. Trucks with parchment arriving at the warehouses and mills have three days to sell internationally. When the coffee is unsold after three days, it will go into the existing ECX system, but they will keep the traceability, which is also new. This would mean that the coffee flow would be the same again as during the previous system" "Breaking news from our Ethiopian team in Addis Ababa: The Ethiopian government in collaboration with the coffee board have approved to allow a trial to bypass ECX, starting by the 30th of April.

The quality performance of the country shows that there was an improvement in grade performance in 2015 than 2014(Figure 1).

Figure 3 Coffee quality grade performance in numbers of the sample taken.
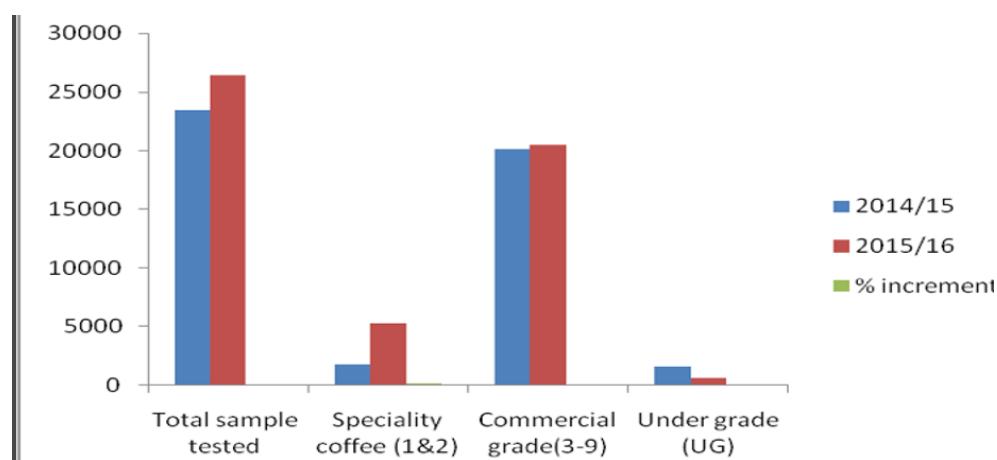


Source: Adapted from Berhanu ,2017

## 2.6: Chain Relations

According to Banwet, Ilyas and Shanker (2007) "the primary objective of value chain management is the combination of the value chain partners leading to improvement in efficiencies and resulting in value creation for the stakeholders"**.** Strong chain relations in the coffee value chain characterised by strong organisations, trust, open and frequent communication and cooperation for mutual growth. KIT and IIRR (2008) stated that "weak chain relations often characterised by farmers and buyers fragmented, mistrust, fight over prices, few long-term relationships, delivery of poor products and services". It is common that firm-farm relations operate between these two extremes whereby they cooperate to a greater or lesser degree.

Farmers and other stakeholders will benefit if they manage to make their chain relationships more stable, more transparent and better organised. It known that in coffee, chain relations will help all the parties to reduce the costs, risks and market access that they facing in their business such quality challenges (KIT and IIRR, 2008)

## 2.7: The Conceptual Framework

The core concept of the study is coffee quality influencing factors, and the key dimensions are existing structure of coffee value chain and production(pre-harvest) operations. Moreover, dimensions are followed under each dimension as aspects to be focused as seen in the diagram below.

Figure 4 Research Conceptual Frame Work
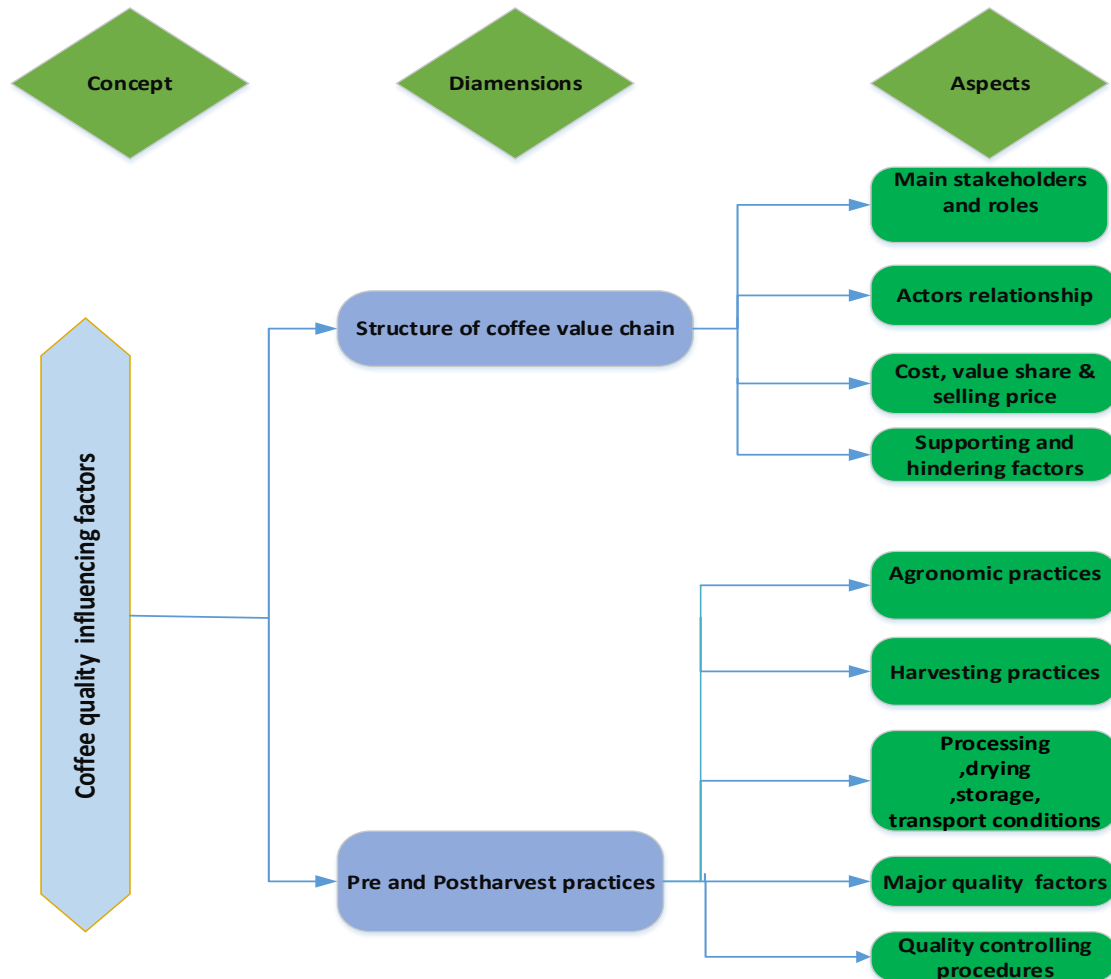
# CHAPTER THREE: METHODOLOGY

## 3.1: Selection of the study area

Arsi zone has 26 Districts out of which five known for high coffee production status by smallholder farmers. In the zone, coffee cultivated in medium and large scale or state farms production system particularly at Gololcha district which borders Chole district where the research was conducted. In consultation with Zonal Agricultural expert Chole district was selected. The selection criteria based on the need for studies in the Zone because of its remoteness and the fact that no there is no adequate information on factors hindering high coffee production which is in line with the objective Arsi University in developing intervention strategies.

## 3.2: Description of the area

Chole district is located in the Arsi zone of Oromia regional state, located 219 km from Addis Ababa to the East, and it is 144 km from Asella the capital town of the area. The town has a total area of 68200 hectares with different land use system. The town borders Amigna and Sude district in the South and Guna district North. While in the East and west sides borders Gololcha and Sude districts respectively (CDoANRM,2017). Approximately 21,922 hectares of the total land is used for cultivation purpose, while 1860 and 3500 hectares are under forest and grazing land respectively. The minimum temperature of the district is $15^0$c and maximum $25^0$c with an average rainfall of 1000mm per year. The district has bimodal seasons and the first season starts from March to June and the second is from July to September. The district divided into three agro-ecologies, Highland, Midland and lowland. The main crops grown in the district include; wheat, barley, coffee, maize, faba bean, teff, Sorghum, and Khat. The district has a total of 22 peasant association of which eight peasant associations classified as high potential for coffee production and the fives of them are medium and the rest considered as marginally suitable for coffee production(CDoANRM,2017).

Figure 5: Map of Research Study Area: Chole district
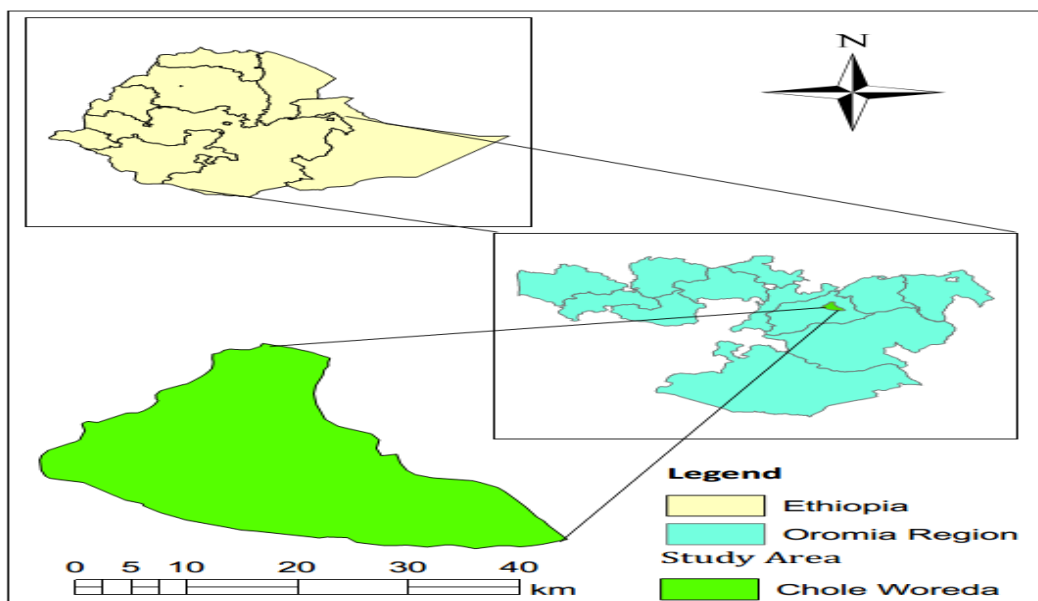


Source: GIS map ,2017

### 3.3: Data collection strategy

The data collected by desk study, survey, interview and focus group discussion. To start data fieldwork, the researcher contacted with the District agricultural officer to discuss the objective and scope of the study. Also met with district coffee development and marketing office team for further details on the general information about the coffee sub-sector through. After that, able to identify and select the peasant associations for smallholder farmers' coffee producers interview.

### 3.3.1: Desk study

This method was carried out using internet google search engine, using books in the library and district reports to get relevant information on the study area. This included information about Ethiopian coffee value chain analysis, pre and post-harvest practices/technology, coffee production and postharvest factors on quality.

### 3.3.2: Survey.

Two peasant associations(PA) selected purposively from 22 PA's of Chole district namely Laga buna and Magna Warki PAs. These two were the highest producing pas relatively from others in the district. From each PA 17 smallholder's farmers were selected randomly and interview embarked on. In total 34 farmers were interviewed from the two PAs. A semi-structured questionnaire, field observation was used as data collection tool. This survey was undertaken to distinguish the major factors affecting the quality of coffee at the pre-harvest and post-harvest stages in the district coffee value chain (see Annex 1). **Observation:** It was done during fieldwork and photos were taken at the data collection process.

### 3.3.3: Interview

District agriculture officer, collectors, wholesalers, exporter, processors, retailers, cooperative officer, quality inspection and certification officers interviewed. This was helpful to gain understanding the existing coffee value chain, relationship, the problem of quality deteriorating factors at different stages in pre-harvest and post-harvest phases. The list of stakeholders interviewed during data collection is attached to annex parts (see annexe 10). The questions related to the post-harvest handling of coffee, quality controlling and grading procedures, limitations at the different stages of pre and post-harvest handling was interviewed with checklists (see annexes 7 & 8).

### 3.3.4: Focus group Discussions

The focus group discussion was used to get information about the supporting and hindering factors in the district coffee value chain. At the end of fieldwork, the researcher presented the main findings of the district interviews to get the respondents feedback on the findings (see annexe 2).

### 3.4: Data analysis techniques

Both quantitative and qualitative data collected from the field research was tabulated and analysed separately based on the information obtained.

The data entry and analysis was undertaken by using excel for quantitative parts for counting and ranking, and tabulation, a pie chart of the major quality affecting factors in the chain done for descriptive statistics. The SPSS version 24 used for processing and preparation of the graphs, piechart and tables based on the data gathered for a descriptive statistical analysis.Problem ranking and graph was done by the researcher to identify the magnitude of various factors which are affecting coffee

quality.Stakeholder matrix was used to show the stakeholders and their roles in the district coffee value chain.

Chain mapping was used to show the current structure of district coffee value chain. SWOT analysis was carried out to find out strength, weakness, opportunity and threats of the district coffee value chain.

The value share received by the farmer expressed as a percentage of the retail price. It was calculated by the formula Ps= (Pfg/Pr) *100. Where Ps = producer share, Pfg= Producer price and Pr = Retailer price.

Table 2: Operational Data and Sources

| Main research questions | Sub research questions | Keywords | Source of information | Research strategies /tools |
|---|---|---|---|---|
| | | The main stakeholders and roles | Stakeholders, Coffee value chain analysis of the district stakeholders | Survey Interview |
| | | Actors relation | Actors, Coffee value chain analysis | Survey Interview |
| | | Cost, price and Value share | Value chain analysis | Survey and Interview |
| | | Hindering and supporting factors | Smallholder farmers and District Agriculture experts | FGD Interview |
| | | Pre-harvest practices | Coffee production books/ interviewing the farmers and district officers | Survey Observation |
| | | Post-harvest handling practices | Coffee processing and handling books, stakeholders | Survey Interview Observation |
| | | Major quality factors | Preharvest and postharvest practices survey and interview data | Interview survey |
| | | Quality and grading procedures | Coffee value chain analysis /stakeholders | Interview |

## 3.5: Research Framework

Research framework illustrated that the research begins by the strategy of desk study, literature review, survey and interviews.The focus group discussion and observation were used as research tools to collect data. Moreover, then the collected data of the study were processed and analysed to obtain results of the survey. Next, the results discussed in line with referred literature review. At the summation, the conclusions were made based on the results and discussions to answer the main questions and recommendations were given based on the outcome of findings and discussions held to answer the objective of the study.

Figure 6: Research Framework
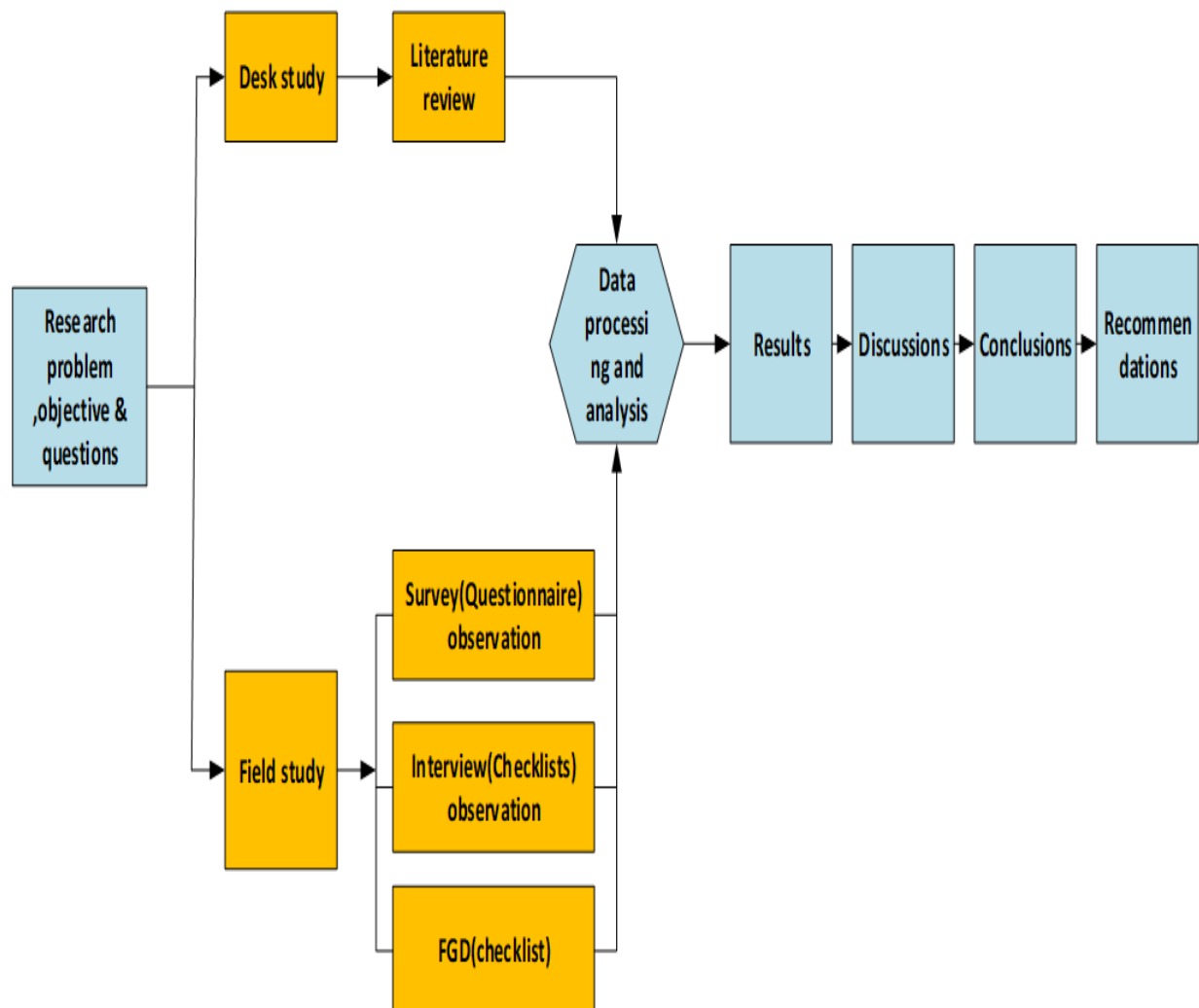
# CHAPTER FOUR: FINDING OF THE STUDY

This chapter includes the findings collected by survey, interview, focuses group discussion and observations from the smallholder coffee farmers fields, interviews with coffee traders and supporters and desk study analysis, concentrating on the factors affecting the quality of coffee at pre and post-harvest stage.

## 4.1: The current structure of district coffee value chain

## 4.1.1: The main stakeholders and their roles

The following chain map figure presents the current structure of coffee value chain in the Chole area (figure 7). For the overlays on the chain map, the amount of coffee stated at producer to wholesaler's assembly level was in parchment form (not hulled) and at the export and retailer level described in a bean form. The assumption was taken two kg of parchment equal to one kg bean sold at the market.

Figure 7: Structure of District Coffee Value Chain
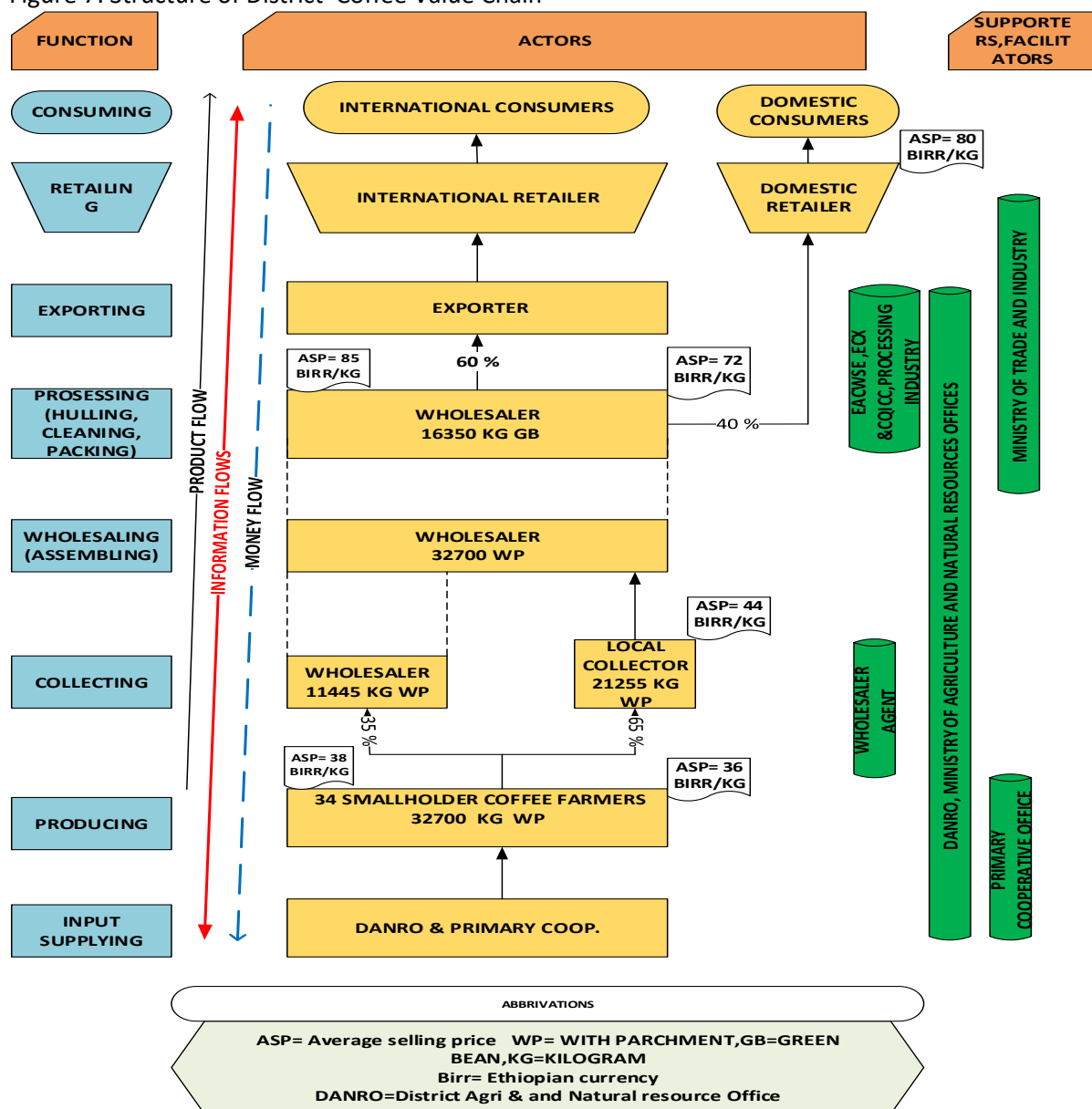
Table 3: Stakeholders matrix

| The main stakeholder's analysis | | |
|---|---|---|
| **Functions** | **Actors** | **Roles** |
| Input Supplying | • DANO & DCPCO | • Supply seedlings<br>• Supply fertilisers and packaging materials |
| Producing | • Smallholder farmers | • Land preparation, planting, weeding, application of fertilisers and compost, harvesting, drying , packaging and supply of coffee to buyers |
| Collecting | • Local collector<br>• Wholesalers | • Collect coffee product from smallholder farmers and supply to the wholesalers |
| Wholesaling | • Wholesalers | • Play coffee bulking role<br>• Supply to local ( 40%) and exporters (60%) district coffee to market at ECX |
| Processing | • Wholesaler | • Process bulked coffee at processing industry |
| Exporting | • Exporters | • Exports high-quality coffee to the international coffee buyers<br>• Do blending of different grade to comply with buyers interest |
| Retailing | • Local retailers<br><br>• International buyers | • Sell under graded or low-quality coffee to local market, shops<br>• Buy high-quality coffee and supply to global market |
| Consuming | • Consumers | • End users of coffee from domestic or international market depending on their income and quality preference |
| Functions | • Supporters | ▪ Role |
| Supporting | • Agricultural and Natural Resource Office (ANRO) | • Provide support of coffee seedling in discount and limited extension support |
| Supporting | • Processing industry | • It is a private industry to provide processing, drying and storing service in the hulling station to the wholesalers |

| Facilitation | • District Primary Cooperative Promotion Office (DPCPO) | • It is under government office<br>• Facilitate fertilisers and packaging materials in limited amount |
|---|---|---|
| Facilitation | • Ethiopian Commodity Exchange(ECX) | • It is public, private partnership enterprise type<br>• Facilitation or influencing role in the coffee transaction for marketing actors<br>• Marketing information, online payment services, insurance and facilitate quality assessment<br>• Provides weighing and sealing service |
| Facilitation | • Ethiopian Agricultural Commodities Warehousing Service Enterprise(EACWSE) | • Provide warehousing service and assessment of coffee quality grading |
| Facilitation | • Coffee Quality Inspection and Certification Center(CQICC) | • It is under the ministry of Agriculture to play a role in certifying the level of quality standard for export market through quality inspection and control.<br>• Inspect and approve the export standard coffee quality against the assessment criteria and give traders with a certificate to export<br>• Performs quality checks on arrival at the export market and also grants export clearance |
| Facilitation | • Ministry of Trade and Industry (MTI) | • Providing trade license to traders,<br>• Controlling, gathering and disseminating market information to the stakeholders |
| Facilitation | • Commission agent | • Gather coffee to wholesalers and get commission for the service |

**4.1.2: Actors relationship in the  coffee value chain**

The active coffee value chain actors in the district were smallholder farmers, collectors and wholesalers. The wholesalers dominated the coffee market in the district. They access coffee from the farmers and collectors. The wholesalers buy coffee from the farmers through the commission agents. There was no formal business relationship between the farmers and wholesalers. It was just selling and buying of coffee without any quality standards. Furthermore, the collectors buy coffee from the farmers with little quality consideration. They focused on quantity of the produce. As a result of this, the relationship between farmers and collectors were also weak regarding the quality of the coffee. Their relationship was dependent on the existence of the coffee harvesting season. The relationship between the actors was merely quantity based. It was not a quality based relationship. The wholesalers and collectors want to make a profit from a large volume of coffee regardless of its quality.

Smallholder farmers share local information on how to get coffee seedlings and cultivation practices. There is weak linkage with the district primary cooperative promotion office except for the supply of agricultural inputs. Moreover, no relationship existed for the support of the smallholder farmers by the trading actors in the district. There is a weak horizontal relationship among the farmers in the district to work in a cooperative.

Exporters buy coffee from wholesalers at ECX open floor market at Dire Dawa and export to the different world markets. The exporters need quality from the wholesalers. The wholesalers did the processing. The exporters said that there is good support and training relationship with ECX and Ministry of trade on quality and trading aspects of the coffee value chain. Exporters link up with CQICC for quality certification and approval for exporters.

According to the interview with district agriculture expert, the relationship among the stakeholders in the coffee value chain is weak in coordination in the district coffee value chain to produce quality coffee. As a result of the absence of coordination and support, farmers often felt less satisfaction from coffee selling price due to traders effect.

**4.1.3: Cost price, value share calculation**

The conversion rate for parchment coffee to raw or green bean estimated at one kg of processed raw green bean assumed to be equal to two kg of dry parchment or unprocessed coffee. For quantitative analysis, the researchers used this conversion rate as informed from coffee traders and processors and personal experience. The average productivity per farmer was 428 kg per hectare of clean coffee.

Farmers incurred 5140 Birr per hectare to produce 428 kg of green bean in average. Framers received 36 (22 farmers) Birr from collectors and 38 (12 farmers) Birr from wholesaler's agent collectors.

Table 4: Total variable costs

| Activities | Cost per hectare (Br) |
|---|---|
| Weed control | 2,150 |
| Fertilizer and composting | 1,540 |
| Harvesting | 750 |
| Drying | 225 |
| Packaging materials | 175 |
| Transportation | 200 |
| Other costs | 100 |
| **Total Estimated Cost** | **5,140** |

Coffee smallholder farmers incur a variable cost of 12 Birr to produce one kg of dry coffee for the 2016/17 crop season (see table 5).

Table 5: Cost price, selling price and revenue of coffee for local chain of 2016/17 crop season

| Total variable cost (VC)/ ha in Br | Total yield (TY) kg/ha | Cost price(CP)= (VC/Y)/ha Br | Selling price (SP)/kg Br | Total Revenue (TR)/ha =TY*SP | Revenue /kg (SP-CP) |
|---|---|---|---|---|---|
| 5,140 | 428 | 12 | 36 | 15,408 | 24 |

NB= 1 Euro is equal to 27.23 Birr.

Wholesalers expend 46.6 Birr per kg to purchase the coffee from the collectors. They also expend 41.04 Birr per kg of coffee if they directly buy from the farmers through their commission agents. The other channel was the export market. The wholesalers expend on average 43.82 Birr per kg of coffee for the exporters. They sell a kilo of coffee to the exporters at 85 Birr (See table 6). Farmers got better value share in the second channel as compared to the other channels.

It essential to note that computing the value shares among the actors in the value chain, the figures are estimated based on the information gathered from the survey and interview with respondents. There were limitations due to inaccessibility of records as well as no verifiable information given by the chain actors. Hence, the figures are reported facts from respondents during the interviews.

Table 6: Value share of Chole coffee value chain

| Chain actors | Total Variable cost/kg | Revenue = Selling price Br | Gross income Revenue - Costs | Added value Revenue - previous actor revenue in Br | Value share % Added value ×100/retail price |
|---|---|---|---|---|---|
| **Local chain farmer, collector, wholesaler & retailer chain** | | | | | |
| Smallholder Farmer | 12 | 36 | 24 | 36 | 45 |
| Collector | 38.3 | 44 | 5.7 | 8 | 10 |
| Wholesaler | 46.6 | 72 | 25.4 | 28 | 35 |
| Retailer | 72.45 | 80 | 7.55 | 8 | 10 |
| Total | | | | | 100 |
| **Local chain of farmer, wholesaler & retailer** | | | | | |
| Smallholder Farmer | 12 | 38 | 26 | 38 | 47.5 |
| Wholesaler | 41.04 | 72 | 30.96 | 34 | 42.5 |
| Retailer | 72.45 | 80 | 7.55 | 8 | 10 |
| Total | | | | | 100 |
| ***export chain of the farmer to wholesaler & export*** | | | | | |
| Smallholder Farmer | 12 | 37 | 25 | 37 | 43.53 |
| Wholesaler Exporter | 42.55 | 85 | 42.45 | 48 | 56.47 |
| Total | | | | | 100 |

**4.1.4: Supporting and hindering factors of district coffee value chain**

The finding from focus group discussion with smallholder farmers and interview with district coffee quality experts indicated the following as supporting factors (see table 7) and hindering factors (see table 8) in the district coffee value chain.

Photo 1 Focus group discussion with smallholder farmers and district experts



Table 7: Supporting factors

| List of supporting factors | Descriptions |
|---|---|
| Support from Government | • Coffee seedlings at a discount from the district, facilitating fertilisers and packaging materials<br>• Construction of new road and institutions |
| Availability of Favorable Climatic condition | • The district endowed with the favourable agro-climatic condition to produce coffee.<br>• Diverse agroecology and genetic biodiversity |
| Experience of producers | • Indigenous knowledge to produce coffee<br>• Cultural ties with coffee crop |
| Availability of High demand for coffee product | • District coffee classified as Harar brand, reputable coffee by international buyers |

Table 8: Hindering factors

| List of hindering factors | Description |
|---|---|
| Production management Problem | • Limited accessibility of high technical skill knowledge, low productivity, production driven production<br>• Biennial effect due to biotic and abiotic factors, lack of improved coffee seedlings<br>• Lack of adequate linkage between research institutes, extension workers in the districts |
| Lack of better and transparent market access | • Farmers get low farm gate price because of coffee traders lower purchasing price, absence of licensed traders in the district<br>• Low producers' prices making farmers shift from coffee to other high-value cash crops |
| Primary coffee marketing problem | • Even though there is a primary marketing place in the district not giving service |
| Poor cooperative organisation and management | • Poorly organised for current coffee cooperative, non-committed of the cooperative leaders'<br>• Influence of low price fixation by traders |
| Unavailability of Processing and warehouse facilities | • Hinders the value addition and quality production of coffee |
| Climate change problem | • Result in biennial and low productivity and less income from coffee production,<br>• Farmers raised recurrent drought and scarcity of rain |
| The Existence of Diseases and Insect | • Insect pests & diseases impede production of coffee both in quality and quantity aspect |
| Lack of sustainability | • Planet: due to climate change the environment is declining to conserve the biodiversity,<br>• People: lack of inclusive training empowerment<br>• Profit: less growing interest in coffee farming due to its low return affect the sustainability (No premium market) |
| Crop replacement or land competition | • "Khat" is market driven production because of high market demand in the district |
| Lack of awareness about coffee quality | • Farmers do not know that quality attributes of the market need, mainly because they did not get an opportunity to get information on quality issues |
| Farmers resistance | • Some farmers resisted to use fertilisers and stumping older coffee tree |

**4.2: Pre-harvest and post-harvest management practices influencing coffee quality**
**4.2.1: Coffee production management practices**

Characteristics of respondents and their coffee farm

**Sex:** Regarding the respondents involved in the coffee production in the district survey shows that majority of the interviewees were male 94% (N=32) and the rest (N=2) were female smallholder farmers.

**Literacy level: The** survey results discovered that from 34 smallholder coffee producers  26 %(9) of the coffee producers were not to school.About 44 % of the producers found at literacy level of grade 1-8, and 24 %  of the producers found grade 9-12 interval and the rest 6 %  of the producers found at the literacy level of certificate and above (See figure 8).

Figure 8: Literacy status of respondents
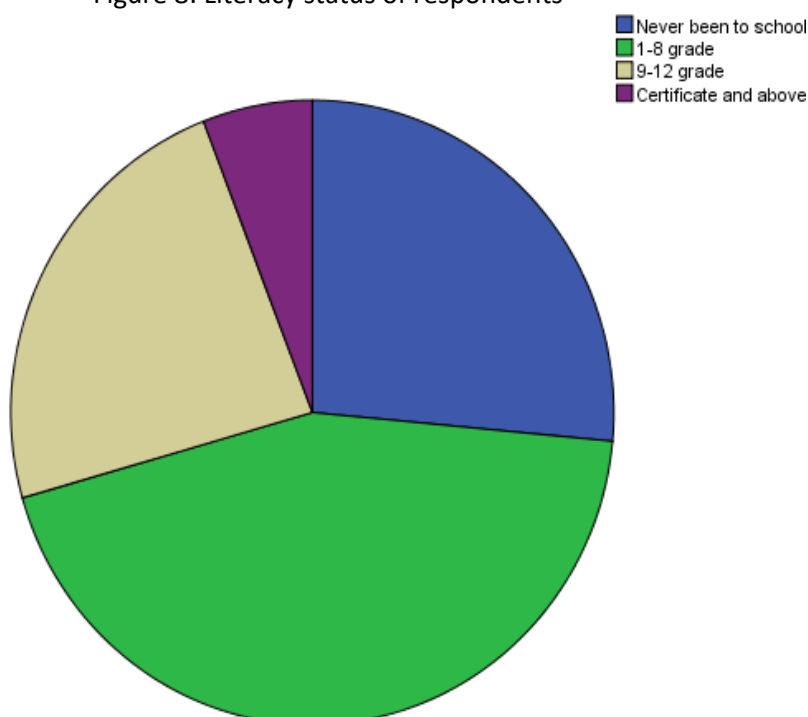


Source: Author survey data (2017)

The survey results identified that the average coffee production experience that smallholder farmers had 18 years with a minimum of 4 and maximum 40 years. From the respondents' coffee farm size ranged from a quarter to three hectares. The average farm size was 1.12 ha and with average coffee trees 1376 per ha (See table 9).

Table 9: Characteristics of smallholder farmers
Farm characteristics of smallholder coffee farmers in the study area (N=34)

| Variables | Mean | min | max |
|---|---|---|---|
| Coffee land size in ha | 1.12 | 0.25 | 3 |
| Number of coffee trees in ha | 1376 | 650 | 2100 |
| Coffee production experience | 18 | 4 | 40 |

**Coffee Production trends in the study area**

The survey results showed the average production of coffee per hectare in the past three coffee seasons (2015-2017) was 590, 580 and 480 Kg respectively. The minimum and maximum amount of coffee produced per farmer per year were 300 and 1100 kg per year in 2015, and 300 and 900 kg per year in 2016, and 2500 and 700 kg per year in 2017 coffee production time respectively.

Table10: Coffee production trends per smallholder farmer (N=34)

| Year | Mean Kg/ ha | Min | Max |
|---|---|---|---|
| 2015 | 590 | 300 | 1100 |
| 2016 | 580 | 300 | 900 |
| 2017 | 480 | 250 | 700 |
| Average | 550 | 283 | 900 |

The age of coffee trees found in different ranges. Survey results showed that majority of the farmers had coffee trees with more than twenty years old. The following figure illustrates the responses of the farmers about the age of their coffee trees.

Figure 9: Age of Coffee trees
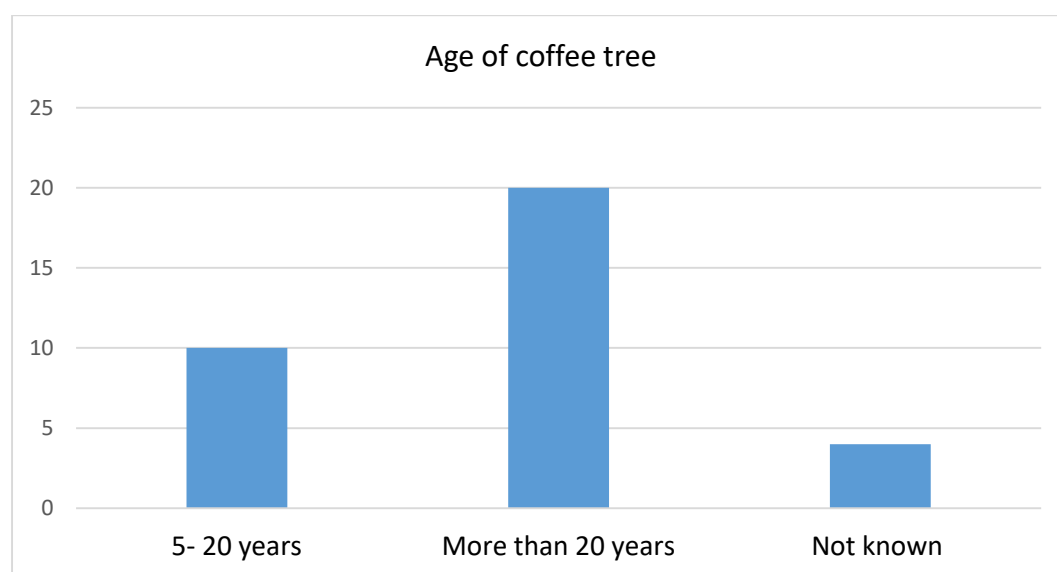
**Source of coffee planting materials or seedling**

The study indicated that 65 % of the respondents obtained seedling from district agriculture office and 26 % from farmers own field. The rest 9% was from both Agriculture office and own sources.

Figure 10: Coffee seedling source
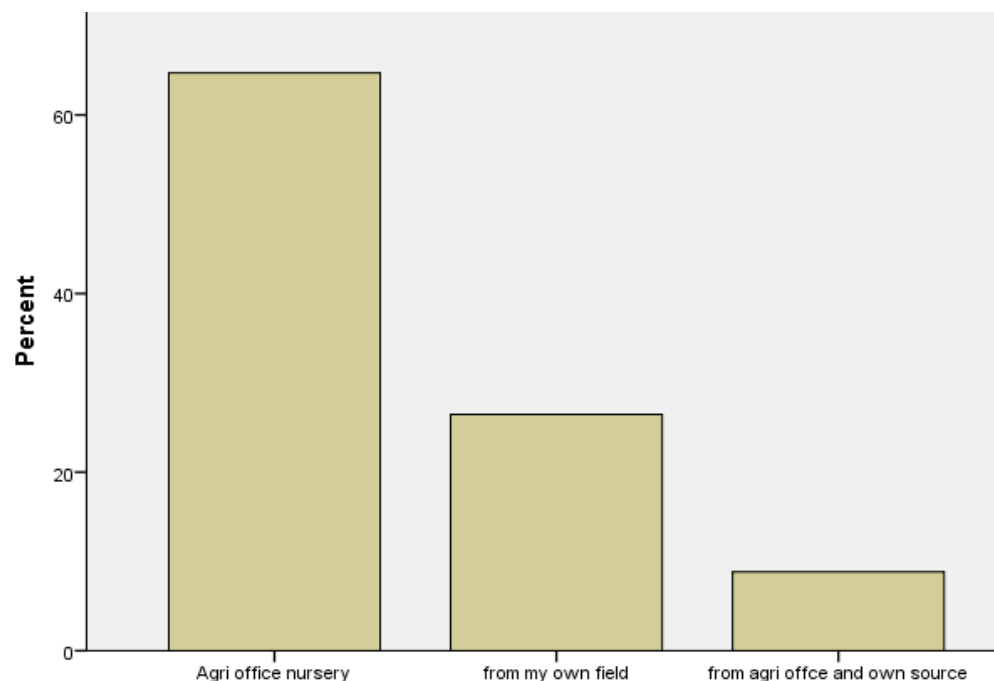


**Coffee variety grow in the area**

The survey results indicated that the respondents were growing different kinds of coffee varieties. Buna guracha and buna Dima varieties were more widely cultivated coffee varieties in the study area. These varieties constituted about 29 %  and 23 % of the coffee varieties used by the farmers respectively.  The coffee varieties are grown by the farmers shown in the following figure 11.

Figure 11: Coffee varieties  grown in the district
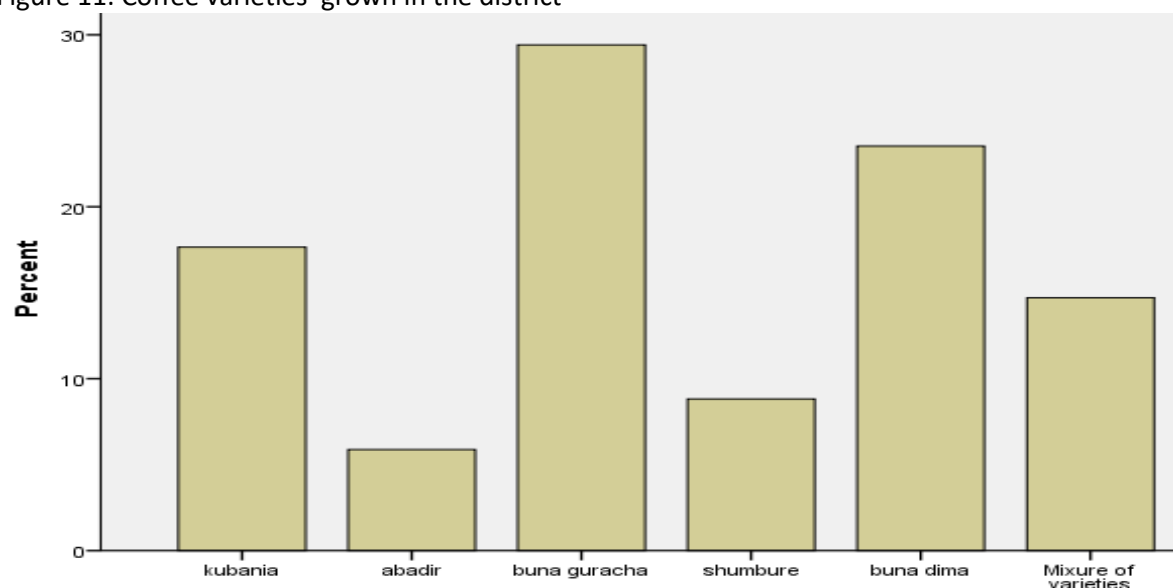
**The characteristics of coffee variety cultivated in the district:**

**Kubaniya:** It is known by its brown and dark red fruit at maturity. Affected by dieback and biennial bearing causes in decline the production.

**Abadir:** It sustainably has better potential to give high yield as compared to other varieties, it has a big and oval fruit shape and commonly susceptible to stem borer, CWD and CBD disease problem.

**Buna Guracha:** Gives poor yield and has dark red fruits, with good flavour and oil at the roasting process. It is better to resist CBD and withstand moisture deficit relatively from other varieties grown in the area.

S**humbure**: Has a characteristic of high-yield and affected by the alternate bearing problem, it takes a minimum of two years to recover from the problem of alternate bearing, but affected by stem borer, CBD and CWD.

**Buna Dima:** It has a sweet taste relatively from other coffee varieties. Frequently affected by diseases such as CWD, CBD, and dieback problem.

**Coffee cropping system**

In the district, sole cropping and intercropping system in coffee production were commonly practised. About 75% of the farmers used the intercropping system while the remaining 25% of the farmers applied single cropping system. The chat was the major crop that intercropped with coffee.

Figure 12: Intercropping practices
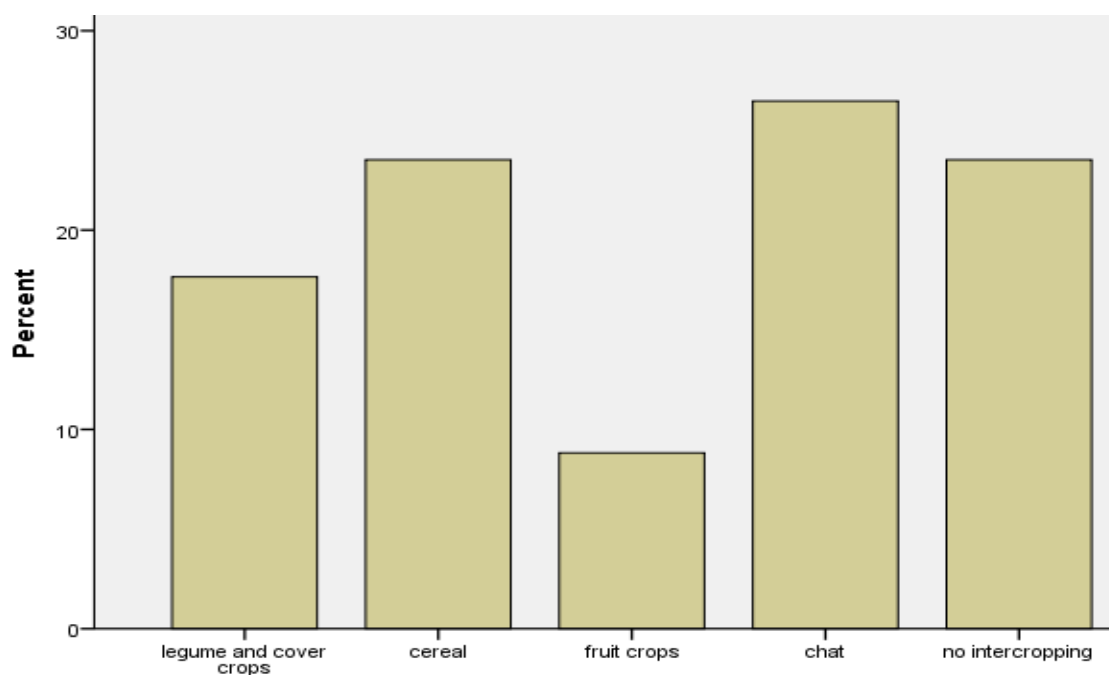
**Weed management practices**

The farmers were applying various weed control practices. Manual weeding, hoeing and slashing were the major weedings controlling practices in the study area. Most of the farmers (23) applied single weed controlling practice. The remaining farmers used the combination of the three practices.

Figure 13: Weed management practices
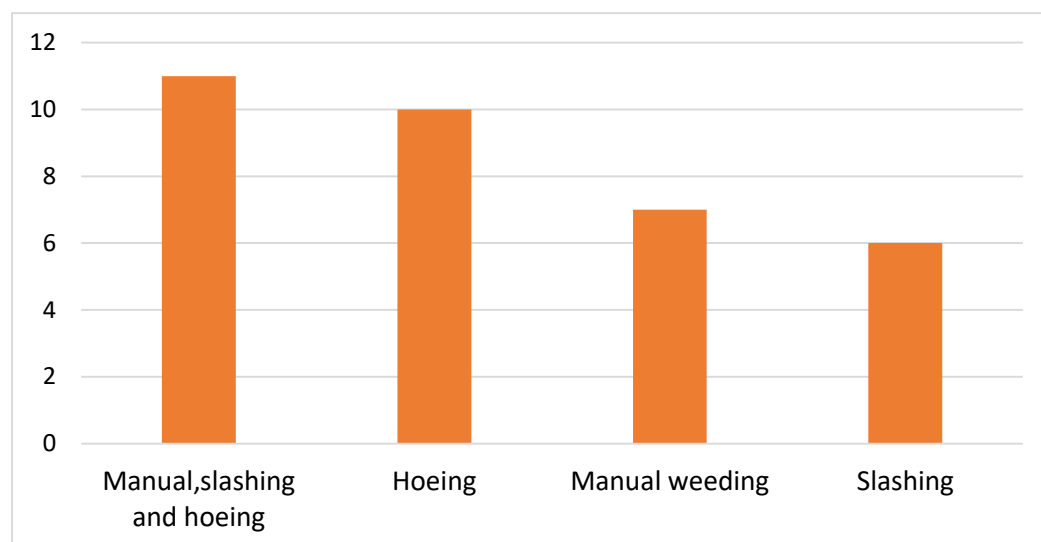


**Application of inputs**

The basic inputs used in coffee production in the study area were farmyard manure, fertilisers and compost. The research found that 82% of the farmers were not using fertilisers. All the farmers used farmyard manure, and 29 % of them used compost.

Figure 14: Input use

| Fertilizer type | Count | N% |
|---|---|---|
| Farmyard manure | 26 | 47 % |
| Farm yard manure and fertilizer | 6 | 18 % |
| Farmyard manure and compost | 10 | 29 % |
| Total | 34 | 100% |

**Coffee tree rejuvenation and pruning**

About 65 % of farmers did not undertake any coffee tree rejuvenation practices. The remaining farmers undertook different types of coffee rejuvenation practices. The following pie chart shows coffee rejuvenation practices in the study area.

Figure 15: Coffee rejuvenation
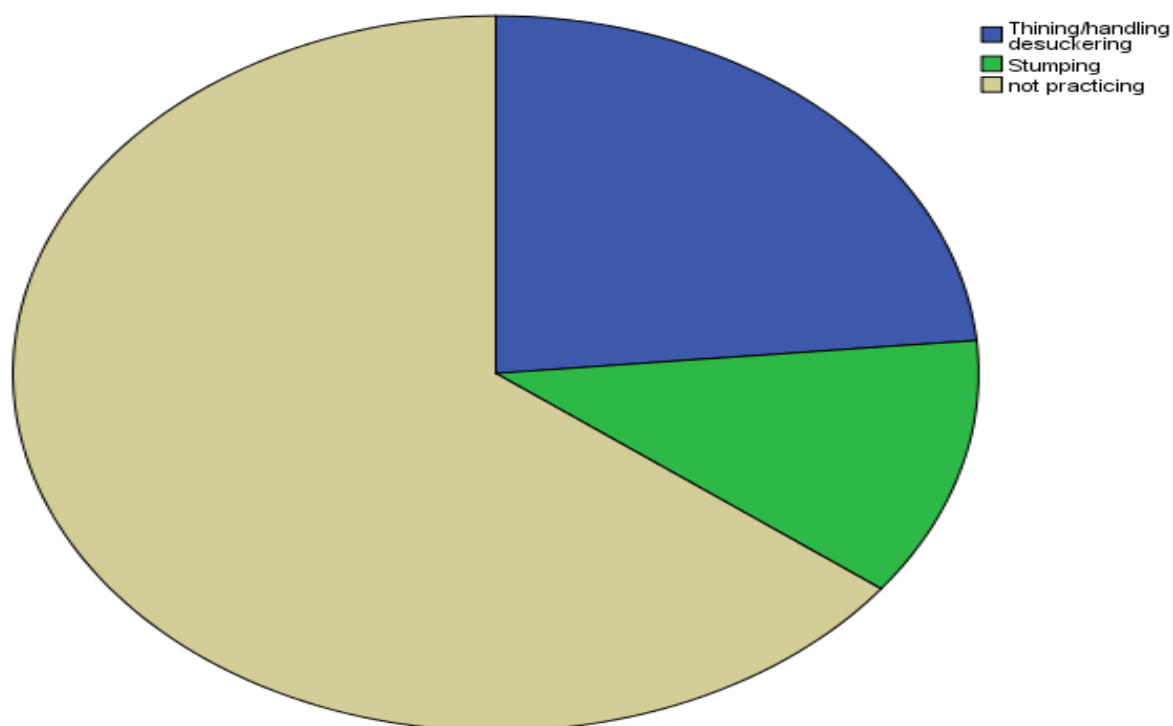


**Application of Mulch and Irrigation for the coffee field**

Majority of the farmers applied mulching. However, few of the farmers used irrigation for their coffee fields as It shown in table 11 below.

Table 11: Mulching and irrigation application

| Practices | Applied (%) | Not applied (%) |
| --- | --- | --- |
| Mulching | 65 | 35 |
| Irrigation | 15 | 85 |

**Coffee shade tree use**

Survey interview result indicated that 26% of producers coffee field covered by permanent shade tree Whereas, 38 % of the respondents coffee fields covered by the temporary shade. It was observed that fruit trees like mango and avocado used as a shade for their coffee. The rest 29% of the respondents do not use shade (figure 16).

Figure 16: Coffee shade tree coverage
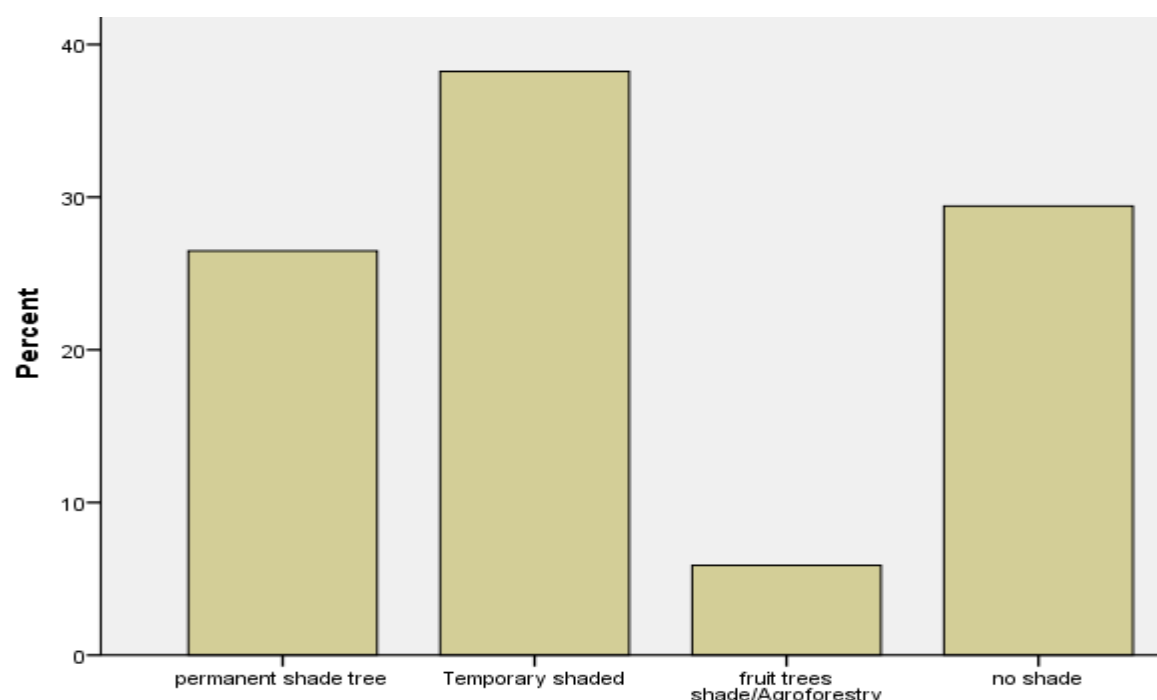


**Coffee diseases and pest prevalence**

The survey results showed that coffee wilt disease and coffee berry disease were the most severe diseases that affect coffee production and coffee quality. Some of the farmers reported that coffee leaf rust and Dieback diseases rarely occurred. Moreover, there were also pests that affect coffee production and quality. The most severe pest in the study area was stem borer that followed by berry borer. Thrips and thermites occurred in rare cases. Farmers control the stem borer pest by applying hot ash and killing the larvae by clogging the hole with a stick. Moreover, none of the respondents were using chemicals to control disease problem.

Figure 17 : Coffee diseases and pest prevalence
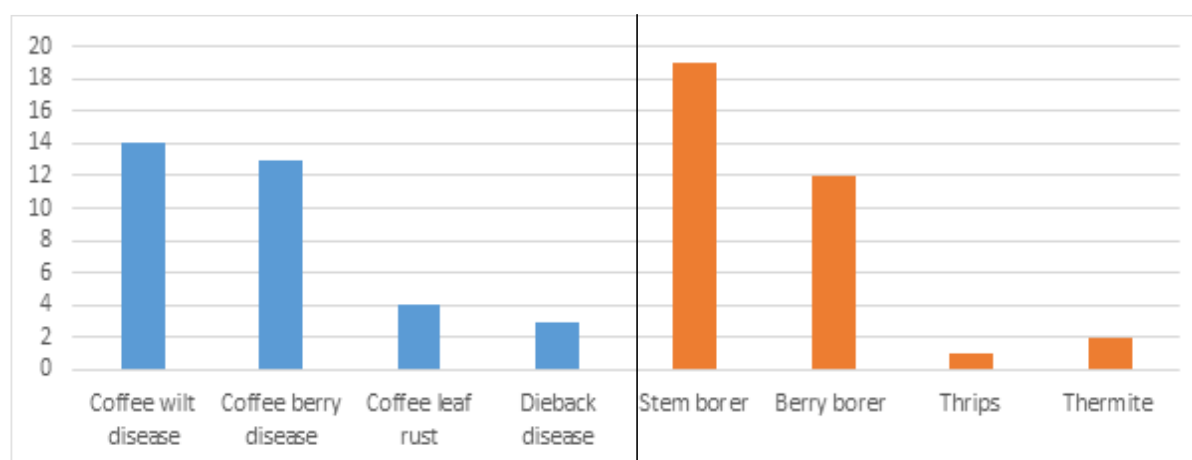
From field observation, the following photos were captured on the disease and pest problem that affects quality coffee production (see photo 2 and 3).

Photo 2: Coffee wilt disease and Leaf rust problems

Coffee wilt disease                                        coffee rust disease



Photo 3: Coffee stem borer incidence

**4.2.2: Harvest and post-harvest practices**

Harvesting and post-harvesting practices results from the study presented as follows;

**Determination of harvesting**

According to the survey, the 24 % of the respondents revealed that harvesting determination based on looking at red maturity status of the coffee. On the another hand 38% of the respondents were made the harvesting determination on the proper maturity status of the field. Nearly 18% of the respondents responded that they determine to harvest at the green stage. 20% of the interviewees indicated that harvesting determination based on looking the dried cherry on the tree.

Figure 18: Harvesting determination



| | |
|---|---|
| ■ | by looking at all red coffee cherries |
| ■ | by looking  red and yellow cherries in cyclic harvest |
| ■ | At green level |
| ■ | After dried on the trees |
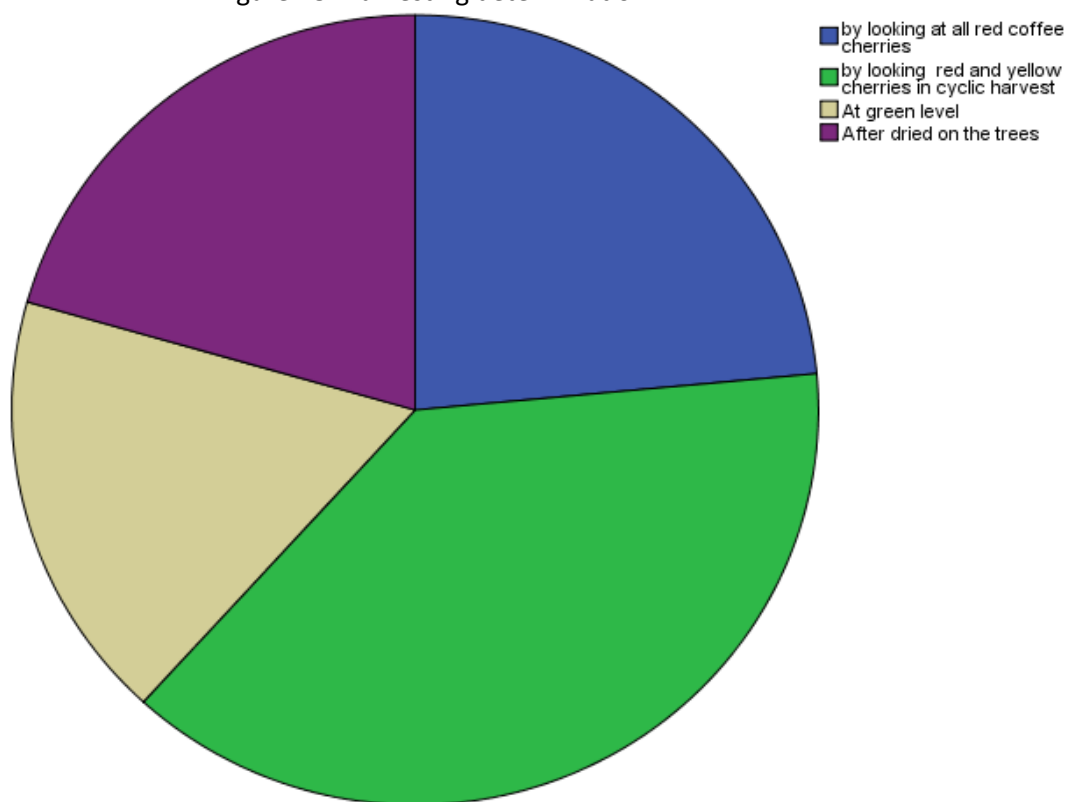
**Coffee harvesting practice**

The survey results indicated that minimal amount of respondents were practising selective manual harvesting. The higher number of respondents revealed that during the crop, they practised stripping all coffee cherry together. The farmers also did harvesting coffee cherry dried & fallen to the ground and by shaking the trees too. This method of harvesting constituted about 18% and 23 % of harvesting methods respectively.

Figure 19: Harvesting practices
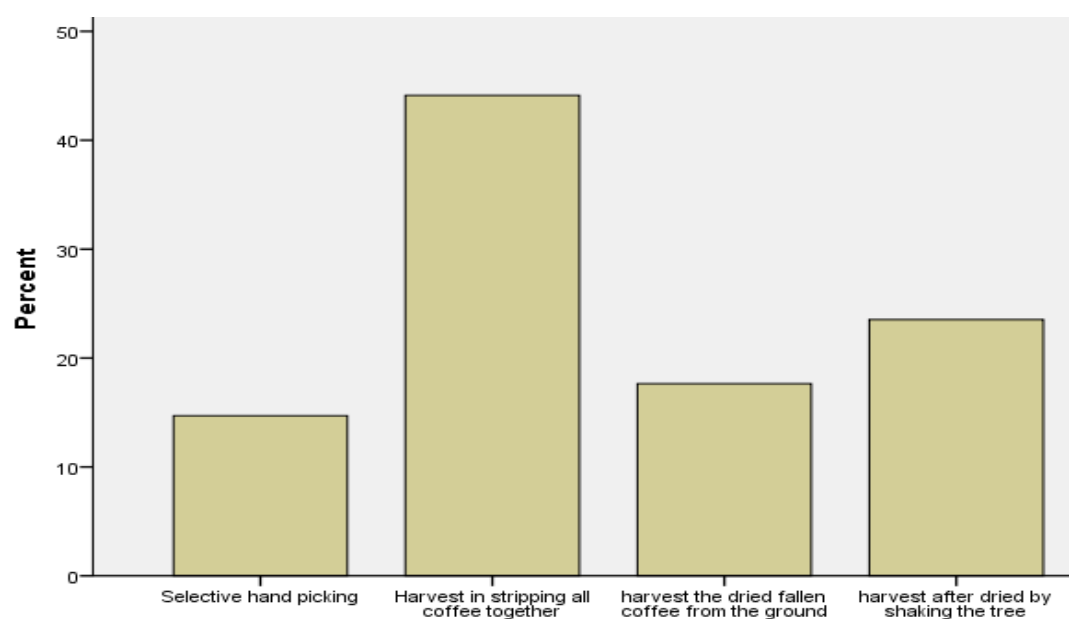


**Coffee drying practices**

The farmers used various kinds of coffee drying practices. The research found that only 18% the farmers were practising proper drying techniques raise wooden frame through timely rotating the cherry. Coffee drying practices carried out in the sun on mat or polyethene sheet accounted half of the percent of the total respondents. The other nearly 33% of the interviewees depicted that drying of coffee practised on cow dung polished ground.

Figure 20: Coffee drying methods
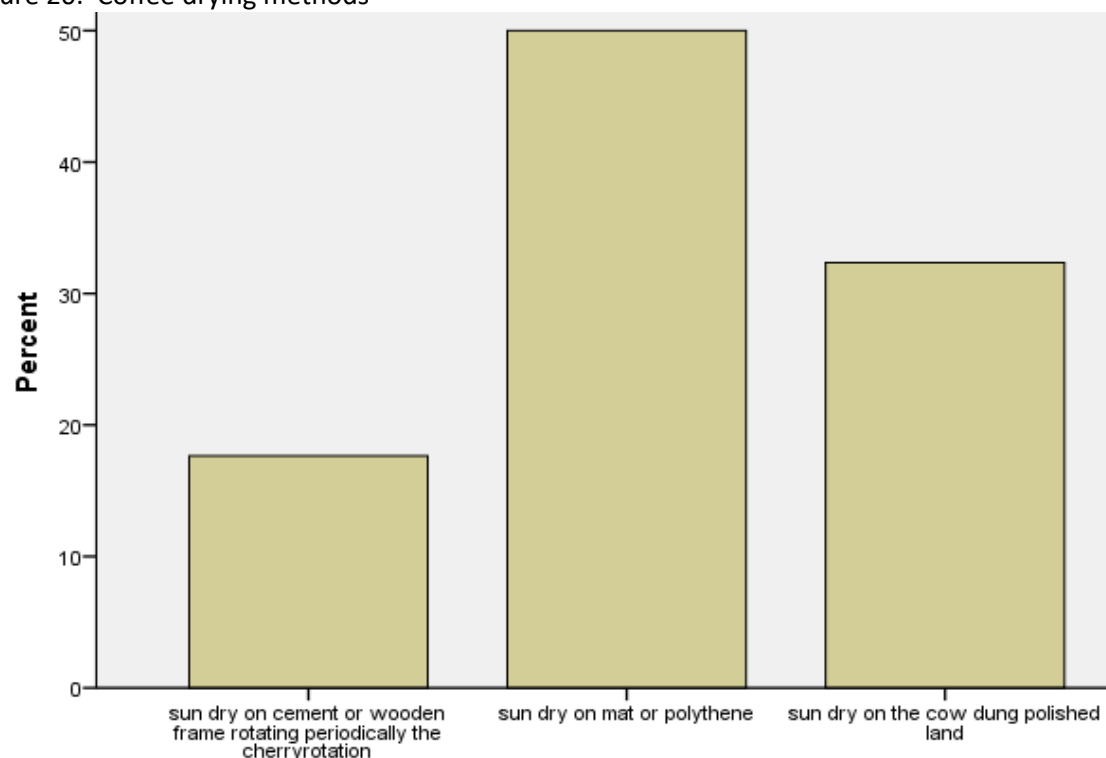
**Post-harvest handling practices**

Coffee producing farmers in the study area were applying various kind of postharvest handling practices. Postharvest handling practices such as the use of packaging materials, storage place, storage time and means of transportation. The results of these practices shown in the table below (see table 12).

Table 12: Post-harvest handling practices

| Variables | Frequency | % |
|---|---|---|
| **Packaging materials** | | |
| Jute sack | 14 | 41 |
| Polythene bag | 10 | 29 |
| Clay pot and buckets | 7 | 21 |
| Others | 3 | 9 |
| **Storage place** | | |
| Any place in the house | 12 | 35 |
| In the store | 4 | 12 |
| Store with grain in store | 10 | 29 |
| Raise bed inside home | 8 | 24 |
| **Storage time** | | |
| Less than six months | 22 | 65 |
| Greater than six months | 12 | 35 |
| **Means to transport** | | |
| Motor bicycle | 8 | 24 |
| Pack animals | 9 | 26 |
| Car | 7 | 21 |
| Human force | 10 | 29 |

**4.2.3: Major factors affecting quality of coffee**

According to the survey results, the pre-harvest factors that influence the coffee quality identified in the study were presented in the figure below (See table 13). These factors were coffee disease and pests, fertiliser application, irrigation, the age of coffee trees and rejuvenation.

Table 13: Major pre-harvest factors affecting coffee quality
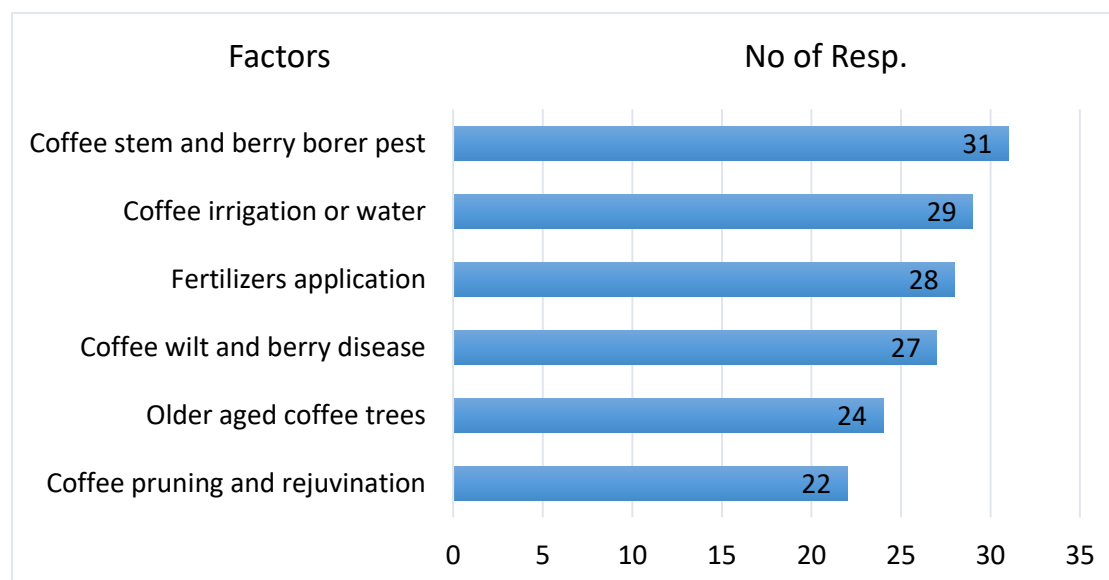


The research found that farmers applied improper implementation of practices during harvesting and postharvest handling stages. These practices were the main factors that affect the quality of coffee in the study area. As it is presented in the following table, harvesting practices and storage place highly influence the quality of the district coffee that is not practised by the respondents stated on the table (see table14).

Table 14: Major post-harvest factors affecting coffee quality
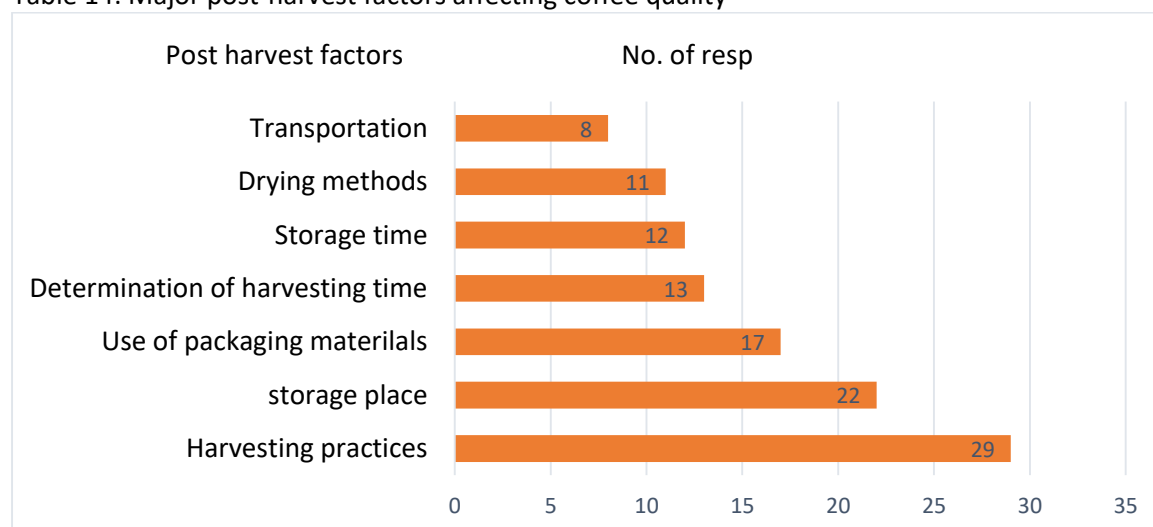
**Post-harvest quality handling problem from interview**

According to interview with collectors and wholesalers after collecting the coffee, they use proper packaging materials relatively from farmers. The traders stored their coffee for more than 3- 4 months if the market price is low at the processing warehouse and even though not allowed to do so legally. When the coffee stored for a longer time (more than six months) it causes a moisture and quality losses. Most problems observed at processing stage sometimes a mixture of undried parchment with dry, soil and stones. Some farmers and collectors apply water on dry parchment earlier before selling. Lack of sanitation in the processing industry and improper arrangement of collected coffee affect quality. Less attention for quality by traders to store the coffee in clean and dry places noted as a problem in the area. From the observation and interview with ECX quality inspector, common defects of coffee bean are from pest attack; deformed or shrivelled beans, undersize, black bean and inappropriate moisture content of the coffee bean. According to district coffee quality expert, pre-inspection of quality in the district is not working well, to test coffee moisture properly due to lack of moisture testing machine. They do only checking the shipment amount of bags to be delivered before sealing to the market.

Photo 4 Coffee warehouse storage system in the district



**Extension service satisfaction rate**

The survey results showed that 62% of the extension service given by DA's and the rest 38% provided by the government experts from the district. Extension service satisfaction by farmers on coffee production practices rated and 18 % of the respondents strongly disagree the sufficiency of the extension service. Moreover, 35 % disagree the extent that extension service is getting and 41% of them preferred to keep saying any, but 6% of the respondent agree the service given on coffee production was good for them. A significant portion of the respondents disagreed the service did not let them know the quality requirement on the market and 29% of them kept saying nothing about this service. 29 % of the respondents revealed that the extension service did not inform them to know the quality requirement in the market and the rest 3% of the respondents agree with the service.

Table 15: Extension service satisfaction level

| Variables | Frequency | % |
|---|---|---|
| **Extension service on coffee production practices** | | |
| Strongly disagree | 6 | 18 |
| Disagree | 12 | 35 |
| Neutral | 14 | 41 |
| Agree | 2 | 6 |
| Total | 34 | 100 |

| Extension service on coffee quality requirement on market | | |
|---|---|---|
| Strongly disagree | 10 | 29 |
| Disagree | 13 | 38 |
| Neutral | 10 | 30 |
| Agree | 1 | 3 |
| Total | 34 | 100 |

## 4.2.4: Quality controlling and grading procedures

According to the interview with ECX quality inspector of coffee quality control starts at the district level and grading is done at the central market at Dire Dawa. Four quality-controlling processes are starting from its origin of production until reached market. These areas;

- Pre-inspected by district coffee quality expert legally assigned by the district agriculture office have a responsibility to check the amount of coffee processed and check the formality and seal the truck and enclosed the forms and send to the ECX.
- The supply coffee sent to the ECX centre depending on the proof that it has been correctly sealed and supplied. Then graded through a proper assessment based on a taken sample at EACWSE for its quality.
- In case of export coffee, beforehand it is shipped, it shall certify by a Coffee Quality Inspection and Certification Center Delivered a certificate that it is set by the characteristics of the agroecology of its production area and meets the essential grade; then shall be sealed and sent to the port of consignment.
- In the case of local consumption coffee, it shall only be sealed and sent to consumer regions upon verification and issuance of a certificate by a Coffee Quality Inspection and Certification Center that it meets the grade requirements.

**Coffee grading assessment procedures in Quality Inspection centre**

According to the interview, coffee grading has its grading assessment criteria, and it is the summation of Raw (40%) and Organoleptic or cups analysis (60%). The quality grading process has raw analysis, roasting, ground coffee and cup preparation done uniformly after moisture tested by sampler at ECX and EACWSE.

**Raw analysis***:* It is a composition of physical bean shape and makes, colour and odour**.** A sample of 350 g green coffee drawn randomly and check the result given for moisture content and screen size tested by cuppers.

Photo 5: Physical quality assessment of coffee



**Roasting***: It is done within more than 1 minute and no more than 12 minutes. Its profile should be medium roasted. Medium roasted beans are standard for assessment purpose.

**Grounding:** The sample grounded directly before cupping and immediately within 15 minutes before distillation with water. Next grind each cup's code individually into the cupping glass. The beans ground to medium, and the ground coffee need not be too fine or too coarse.

**Cupping:** Cupping done by a minimum of three panels of cuppers. The collected ground coffee put in 250 ml capacity cup. Water used for coffee cupping should be clean and odour free.The water should be freshly drained and brought to approximately $93^0$ C at the time it poured onto the ground coffee.

Photo 6: Cup quality assessment process



**Coffee quality grading for criteria**

From the interview with the exporter, the summation of raw quality assessment and cup quality grading given to the whole supply based on a sample taken the evaluation. Quality attributes of bean physical and intrinsic quality considered for grading system at ECX, EACWSE & CQICC. The grade is given on the scale below classified as speciality and commercial points based on the assessment results.

Table 16: Coffee grading criteria

| Grade levels | Grade range levels in % | Variation between the highest and lowest points in % | Remarks |
|---|---|---|---|
| Grade 1 | >85 | 15 | Potential for Specialty 1 and 2 |
| Grade 2 | 75-84 | 9 | Potential for Specialty 1 and 2 |
| Grade 3 | 63-74 | 11 | commercial |
| Grade 4 | 47-62 | 15 | commercial |
| Grade 5 | 31-46 | 15 | commercial |
| Grade 6 | 15-30 | 15 | commercial |

**Source:** ECX ,2016

# CHAPTER FIVE: DISCUSSION OF THE FINDINGS

This chapter discusses and compares the results of this study with findings of other studies on agricultural value chains.

## 5.1: The current structure of district coffee value chain

### 5.1.1: Stakeholders, roles and relationships in the coffee value chain in Chole district

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 stakeholders in Chole District are taking coffee as a serious business which supports their livelihood, although many stakeholders may not be aware that quality issues could affect their business by not capturing the desired value within the chain. Of the coffee produced by farmers, local collectors collect 65 % more than wholesalers. The local collectors travel to the often remote areas to collect coffee at the farm gate, whereas wholesaler collects at a shop levels. Farmers prefer to minimise the travelling time and sell to the collectors at the farm gate, even if the price paid by the wholesaler is better. More than 60% of the coffee produced in the Chole district of the study area goes to the international market. This is mostly based on the best quality coffee, with the lower quality coffee being used in the domestic market.

There are no contractual agreements between farmers and buyers, with only informal relationships between farmers and coffee buyers the communiction faciltiated. Due to these 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.

### 5.1.2: Costs, Price and value shares along the coffee value chain

Farmers experience different costs during the production of coffee, including costs for weed control, fertilisers and compost during the production period. Whereas, harvesting and post-harvest handling practices also incur different costs to the farmers and traders at different levels accordingly. The costs at local collectors' two Ethiopian Birr per kilogram at farm gate levels. There is a higher cost of marketing by wholesalers from farm gate purchasing till rich in the central market, expense nearly 10 Birr per kilogram for both domestic and export chain. At the wholesalers, the cost is enormous because of the activities such as processing, cleaning and transportation till coffee supplied to the central market. The cost price calculation of the study area depicted that, due to limited agricultural practices held in their fields and farmers cost 12 Birr to produce one kilogram of coffee. According to Ali (2013) the farmers in the Meta district, Harar 20 Birr per kilogram to produce coffee privately. The cost shows higher because of the marketing costs and agricultural practices the farmers in Meta district have undertaken. Farmers in the study area get a better value share from local chains than export one. From local chains, farmers get higher value share when directly sell to wholesalers. This is because wholesalers paid the slightly better price than local collectors at the farm gate.

**5.1.3: Hindering and supporting factors**

Climate change was 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. As a result of climate change, quality coffee production is getting lower, and farmers prefer to grow "Khat" as it provides higher revenue and can withstand better the moisture deficit than coffee. Besides, Khat needs less field management practices to produce, unlike coffee. Farmers in the district shifted to growing khat as a survival strategy for agricultural activities from the risk of climate change they are facing.

Almost all farmers in the study area produce coffee privately and not in a cooperative. Price is determined by the buyers, and there is no premium for better quality coffee. There is no any institution or agent to initiate the district farmers to link with premium quality buyers in the market. Mainly because of the remoteness of the district from the main road and difficulty of accessibility of the infrastructure. Bijman (2008) found that if farmers organised they can get a better opportunity to improve coffee quality, which will increase their bargaining power and reduce the transaction cost.

The absence of processing facilities in the district limits the farmers from producing and supplying quality coffee to the central buyers. The result from a focus group discussion indicates that 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 research finding indicated that lack of quality awareness and market or processing linkage hinder the farmers from producing a market-oriented quality product and add value via processing to supply to the better buyers.

As indicated by Berhanu (2017) the coffee sub-sector is currently supported by the Regional and Federal Governments for the improvement of coffee subsector both in the quality and quantity aspects. The research finding depicted that the establishment of the new office at the district level by the government is the supporting factor to the coffee subsector regarding production, quality and marketing improvement of the existing coffee value chain. There is a weak concern on a coffee sector by the district officials mainly because of lack of attention for coffee. As the district is mainly known with cereal and cattle production, the focus of the district highly targeted on the other crops that coffee.

As indicated by Gole (2015) the coffee produced in the district classified geographically as Harar trademark and known, highly as premium quality coffee internationally in the World. Even though the district coffee is known by its trademark, due to market linkage problem farmers do not have access to use from the premium price as private coffee traders control the market. In the current market, the price is influenced by trademark to get a better profit. Hence, it is vital to stimulate awareness on the trademark that the district coffee has and liking with potential buyers to produce quality coffee by farmers.

The availability of favourable climatic conditions in the district is considered as a supporting factor to produce quality coffee. In the district coffee grown in potentially in good condition with diverse varieties to give ideal quality preferred by buyers given that if all managements are adequately given. Having diverse varieties in the district by itself nothing unless proper agronomic practices are done to maintain the quality and boost the productivity of the 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.

### 5.1.4: Coffee preharvest or production management 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 recognise 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 quality of the product can only improve through the proper use of health and improved seedlings. Quality coffee produced is challenged due to the scarcity of improved coffee seedlings farmers obtained at a discount from the district. Moreover, lack of awareness on the proper use of seedlings exposed farmers to use wild grown coffee seedlings as a planting material. Use of wild coffee seedling affects the quality and yield of the coffee as it can easily affect by biotic and abiotic factors on the field.

The finding revealed that few farmers' engaged in the coffee production without the using shade trees. Due to lack of shade tree, the coffee is grown in the open sun fields exposed to the biennial bearing problem that yields immature coffee, which is not good to get sustainable quality coffee. According to Bote and Striuk (2010) stated that coffee grown without shade gives lower size and quality coffee bean than the one grown in the shade.

Adding the compost to the soil helps to add the nutrient and plays to have a healthy coffee to produce coffee in quality and quantity aspects. 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. This is with the aim to produce organic coffee for export, but due to lack of proper training and follow up farmers continued to grow without applying fertiliser. Improper use of chemical fertiliser also killed their coffee as the study area encountered with moisture deficit to affect nutrient intake by the coffee plant. Provision of training on the integrated fertiliser use remains an important issue to produce quality coffee in the district. 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. Additionally, Kusters and Nguye (2015) stated that application of fertiliser affects to get better yield and quality in coffee production.

There are no trends of the use of chemicals, or herbicides as weed controlling mechanism in the study area due to the absence of chemicals, equipment in the area and lack of technical know-how to practice in recommended ways. Weed control is the essential practice to maintain coffee quality and yield of the coffee. Wintgens (2004) stated that proper control of weed usually has a positive effect on bean size and flavour.

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 flavour. 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. So, farmers not practiced the Irrigation of coffee in the study area of Chole district. It has a vital role to help in producing quality coffee in the moisture deficit area by using the irrigation for coffee production. 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 flavour of the coffee bean, which contributes to coffee quality.

## 5.2: Pre-harvest and post-harvest management practices influencing coffee quality

### 5.2.1: 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 are 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.

In the study area of Chole district, there is the availability of resources to construct the wood and simple drying beds, but due to less awareness and attention given to the coffee quality farmers not used this potential in the area. 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. Storage facilities also the next important part contributes to the quality of the coffee with proper moisture content and temperature storage to keep the quality. 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. So, awareness creation is important to the farmers and accessibility of the post-harvest handling facilities to maintain the quality of the coffee.

### 5.2.2: Major factors affecting the quality of coffee

The major factors affecting the quality of coffee in the study area mainly coffee stem and berry borer pet and moisture stress. This is maybe because of climate change in the study area and poor management practice of farmers used mainly contributed to the prevalence of the diseases. In addition, moisture stress is also the main issue due to lack of motivation in coffee sectors and farmers more focus on the Khat replacement in a farm area and irrigation practices which not applied for coffee yet. In general, due to limited extension services the factor affects the quality of coffee in the study area of Chole district. 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. Moreover, Wintgens (2004) noted that coffee disease and insect attack the coffee bean which leads to worsening the quality of the bean.

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. Moreover, Adugnaw (2014) noted that strip harvesting does not distinguish between the ripening stages of fruits, which is hardly useful to obtain best-standardised quality needed in the current market. It is hard to produce good quality coffee when the cherries are merely stripped all at once, irrespective of the degree of maturity (ITC, 2011).

Adultration of impurities with dry coffee affects the quality of coffee supplied to the market. Ali (2013) noted that adulteration of coffee is the constraints affecting the quality and marketability of coffee acted by actors

### 5.2.3: Quality controlling and grading procedures

Coffee quality controlling and grading is all about ensuring the compliance of the coffee quality against the grade assessment criteria. It is vital to evaluate the appropriate coffee quality to supply to the central market. The coffee quality inspection centre has preliminary unwashed, coffee quality assessment format, which is used for both raw (defect primary & secondary, make and shape, colour & odour) and the cup values in the coffee quality. Even those, the requirement for the coffee quality controlling stated above, not practiced in the study area according to the requirement. This is because of the limitation of communication among farmers, traders and quality inspection centre share/update the quality process and cause of quality defect feedback as well. There is no reliable 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. Hence, enhancing the awareness level of farmers on quality attributes is essential to settle basic quality understanding required in the current market.

**5.2.4: SWOT Analysis of Chole District**

Table 17: SWOT analysis for coffee value chain, Chole district

| SWOT | |
|---|---|
| **Strengths** | **Weaknesses** |
| <ul><li>Experience of farmers with indigenous skill on garden on semi/forest coffee production</li><li>Nature harmonised production system like agroforestry</li><li>Strong social bondage with coffee cropping</li><li>Interest of farmers for cooperative group</li></ul> | <ul><li>Inadequate improved seedlings of coffee to overcome drought, disease and pest constraints</li><li>Lack of processing industry</li><li>Poor production, quality and marketing system and processing linkage</li><li>Less technology usage and farmers' technical skills</li><li>Inadequate supporting institutions</li><li>Fewer literacy levels of farmers</li><li>Weak district quality and market control</li><li>Less follow-up and support for farmers' cooperative members by district leader</li><li>Low productivity</li></ul> |
| **Opportunities** | **Threats** |
| <ul><li>Establishment of new office for coffee sub-sectors promotion</li><li>Promotion of government for export quality product</li><li>Existence of primary coffee marketplace in the district</li><li>Availability of suitable agroecology</li><li>Less use of chemicals for organic product market</li><li>High market demand for Chole coffee branded as Harar C coffee</li><li>Existence of coffee genetic diversities to develop drought, disease, pest resistance by researcher</li><li>Farmers indigenous knowledge & existence of "Arba Gugu." Multi-purpose union</li><li>Availability of state farm, research and higher education institution</li><li>New ECX export rules to link farmers directly to International buyers</li></ul> | <ul><li>Climate change problem and deforestation, soil erosion</li><li>Quality requirement change in the market</li><li>Outbreak of Pests and diseases</li><li>Fluctuating of coffee prices</li><li>Land completion to grow *Catha edulis* locally called "Khat."</li><li>Lack of sustainability issues to be competent in the international market</li><li>Traders low price setting</li><li>Biennial effect of coffee bearing</li><li>Farmers resistance for technology moreover, fertilizers use</li></ul> |

# CHAPTER SIX: CONCLUSIONS

## 6.1: The current structure of coffee value chain in Chole district

- There are many stakeholders in Chole district coffee value chain. These include actors from input suppliers to consumers, supporters and chain facilitators. Every stakeholder plays its role in the district coffee value chain. The chain actors own the coffee product, and chain supporters play support and facilitation role at a different position of the chain.

- 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 organised 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. During the study, there is no quality controlling system in the area, such as premium in the current district coffee value chain structure.

- 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. Farmers get higher value share when they directly sell to wholesalers but generate lower value share when selling to collectors. The wholesalers mainly dominate the coffee value chain and get better value share than collectors.

- Traders mainly focus on quantity rather than on quality when buying coffee from farmers. Farmers' cooperative was affected by collectors and wholesalers, and non committed cooperative leaders. Farmers' cooperative can better produce, process, supply and market quality coffee, which enable to negotiate a price with buyers and exporters. Farmers do not get reliable market information which exposed them for traders cheating to sell coffee at a low price. As a result, farmers discouraged to produce quality coffee which hinders them from getting a better price from the market.

- 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. Moreover, poor cooperative organisation and market linkage problem are stated as hindering factors to produce quality coffee. Even though there is the existence of suitable agro-climate, the reputability of the district coffee in the world market and having support from the district government are some of the stimulating factors to produce quality coffee.

**6.2: The pre-harvest and post-harvest practices influencing the coffee quality**

- Farmers in the study area lack interest in the application of recommended coffee production practices due to limited availability of improved coffee seedlings varieties and production skill. They continue to use old varieties, which are limiting in both yield and quality of the coffee. Pruning and rejuvenation are hardly practised hence lowering quality of coffee being harvested.

- Diseases and pests affect coffee quality to a great extent. Majorly CBD and CWD, which are prevalent in the area. Pests such as coffee borer and stem borer are significant in the study area.

- Irrigation use in the area is limited, and farmers who have access to irrigation services prefer to grow *Khat* than coffee due to the high value obtained from khat than coffee. Farmers also resist applying inputs especially fertiliser which is expected to boost production and improve quality of the coffee. This is because they have a belief that chemicals kill coffee plant when applied.

- There is a limited extension support from district agriculture office in the study area.  As a result, coffee quality production is deteriorated which later hinder farmers to meet market requirements and supply quality coffee to the market to get a better price.

-  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 also use un-recommended packaging materials such as polythene bags, which limits airflows in packed beans, which lower quality of beans. Prolonged storage of beans is at poor storage facilities at both farmer and trader level affect the quality of the coffee.

- Ways of transport means for coffee transport is not ideal, for instance, the use of motorbikes leaks benzene and come into contact with beans, which affects aroma of the coffee which contributes to the coffee quality deterioration.

- 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 weak quality control and primary marketing system; and these affect trader's trustworthiness towards quality; they exploit farmers.

- 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.

# CHAPTER SEVEN: RECOMMENDATIONS

The objective of this study is to explore the pre and post-harvest practices that affect the quality of coffee production by smallholder farmers and come up with applied recommendations on appropriate agricultural practices at the pre- and post-harvest phases to add value through maintaining and improving the coffee quality. Hence, to answer the research objective, the following recommendations are drawn based on the conclusion of the research findings.

## 7.1: Smallholder farmers

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.
- Manage the excessive shades to increase air circulation and reduce the occurrence of fungal diseases and pest and plant shade for bare land.
- Uproot and burn on the spot to minimize the problem of coffee wilt disease.
- Apply fertilisers 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
- Use raised bed drying method to avoid direct contact of coffee with the ground.
- Avoid mixing of water and soil with coffee beans and use jute sack to store the coffee.

## 7.2: 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.

- The district should control the quality of the coffee trading system, as well as strengthened formal primary marketing system and avoid the effect of traders. The old traditional channel needs strengthening.

- The district should initiate other stakeholders to contribute towards enhancing good quality coffee through strengthening the farmers' cooperative, facilitate market information, and link them with processors and buyers.

- Facilitate stakeholders training on quality coffee aspects to create awareness on quality standards so that they can supply quality coffee.

### 7.3: Arsi University (commissioner)

- The university should facilitate the stakeholder meeting on the status of the crop and give training and advice to farmers through their technical staff. Areas of focus will be production technology, such as pruning, stumping and recommended disease and pest control.

- Facilitate and provide training on appropriate harvesting techniques, drying systems, and storage systems, which are ideal for coffee. They should also train on proper storage and packaging to minimize quality loss.

- University needs to support and train the district agricultural officers and establish demonstration sites for farmer learning in the selected peasant associations.

- Facilitate and establish research demonstration site in the district to give training by its researchers or staffs and undertake sustainable applied research on the identified quality coffee production problems both at pre-harvest and post-harvest level and capacitate farmers through on spot practical training.

### 7.4: Ethiopian Commodity Exchange (ECX)

- It should support the marketing system technically in the study area such as warehouses and conventional storage facilities for ease of aggregation and marketing. Facilitate training for the marketing actors and farmers on possible quality problems.

- Information is key to farmers when making decisions. Hence there is need to provide information to farmers through district offices.

- Provide training for traders on coffee quality handling practices to avoid mixture of foreign matters with coffee during marketing.

### 7.5: Traders (collectors and wholesalers)
- Should give focus on quality instead of quality only during 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.

# CHAPTER EIGHT: REFLEXIVITY

This research was performed for the partial fulfilment of the master's degree in the Agriculture Production Chain Management, Horticulture Chains Specialization. Hence, I had only limited experience with conducting research. Therefore, the reader or the user of this investigation should be aware of the constraints and limitations that come with it. During the research, I learned a lot and gained the broad experience from going through the development of the research proposal to research report write-up. However, this research work was not without facing challenges.

The initial difficulties I encountered at the time of the research related to the season, as it was the growing season farmers look after crops necessary for food value. In Chole district, mixed farming is practised by farmers.Because of this farmers spent more time for rainfed crop production. The farmers were unavailable in their home particularly those farmers who have their land both near the village and far from home. Therefore, the researchers had to adopt a different strategy for conducting the individual interviews. I made appointments with the randomly selected smallholder farmers based on their interest which applied for most of the farmers to carry out the survey.

Some farmers forget to tell me the yield of coffee for the last three years. To get the estimated yield, I use strategies asking his wife and ask together, through discussion they recall and get the estimated amount. A shortcoming I faced to do an interview with coffee traders was very tedious. Mainly because of tax leverage on traders by the government they were not interested when first met them. I use other strategies to get them. I got their mobile number met individually and made appointment alone and smoothly create conducive environment after telling them it is only for research purposes. This happened at Gololcha district where traders are from. I realised that collectors have close relationship each other to share information about my interview, after interviewing the first interviewee.So that the purchasing price given was almost the same and mention similar ideas that they did. I guess that collectors agreement have a direct effect on price fixation to buy at a lower price as triangulated by this interview.

Conducting FGD was another challenge especially having a sufficient number of participants from all categories in one place since the majority of the farmers were not available due to farming activities. Therefore, the researcher conducted the FDG during the religious ceremony day afternoon since most of the farmers were staying in their home. Apart from this challenge during particularly the field work it turned out to be the perfect time to gain practical experience in analysing traditional coffee production practices and its effect on the quality and productivity as compared to the large-scale production system I used to work. I gained additional knowledge in identifying opportunities in farming practices they are practising beside coffee production. I did not see how "Khat" is widely cultivated and observe that how farmers planted it in hilly and mountainous areas to conserve the soil and water by their indigenous knowledge. This is a new idea for me to share with my workmate for further study.

The methodology and the actual field observation I used for this research, where the most helpful to capture the issues in traditional coffee production practices done by smallholder farmers in the study area to analyses the pre-harvest factors affecting the quality of the coffee. Previously, as an agronomist, I conducted the experimental type of research on coffee fertilisation effect on biophysical components of the plant.
Data collection was by data sheet and measurement device to take quantitative data to analyse and draw conclusions based on collected data. However, now, I appreciate the method of data collection

I have been using, since the semi-structured questionnaire and checklists gave me the opportunity to find out thorough understanding about the situation and real life experiences of the smallholder farmers and stakeholders which was used to conclude the research.

In addition to this, FGD is an interesting tool for detailed investigation and understanding of new issues since the group embraces of several farmers with coffee production experiences. At the beginning of the FGD, I recognised that some of the farmers were not actively participating and that few dominated the discussion. At that time, I interfered, and provide a chance for those who were not actively involved in FGD to ensure the participation of all participants. In case different ideas rose in FGD, the final agreement was done by majority agreement. During the FGD, I was so curious about it. It helped me to understand and have in-depth knowledge on each issue argued in the FDG and to triangulate the information I had from the individual survey and interview data.

However, as a value chain practitioner and my experience in agricultural sector particularly in the coffee subsector, I expected to find a positive effect from traditional experienced natural based coffee production by smallholder farmers in the area could only produce high-quality coffee than large-scale commercial producers.
Unfortunately, this was not the situation. I was astonished about the final findings, and also I understood that addressing coffee quality is not straightforward but rather needs the involvement of many stakeholders along the entire chain from bean to seedling again from seedling to cup with the participation of many actors.

If you solve the problem of one issue at seedling, another will occur at marketing. This is the great thing I learned from my research work. I realised that for future as a value chain facilitator much expected from me as a part of the commissioner in linking the farmers with other stakeholders to intervene in the identified problems. Through this research output by creating an enabling environment for stakeholders to work with smallholder farmers to move forward together in the coffee value chain process.

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Annex 1: Questionnaires for smallholder farmers

General information:
Date of the interview:                                    Peasant Association:
1. What is your name?
2. Sex            1. Male        2. Female
3.Your age?
4. Literacy level?
     1. Never been to school 2. Basic education 3. elementary level (1-8) 4. Certificate and above
**INFORMATION ABOUT THE COFFEE FARM**
6.What is the total area of land allotted for coffee trees in ha?
7.What is the total number of coffee trees in?
8.Your coffee production experience?
1. less than 10 years 2. Between 11-20 years    3. More than 20 years
9. Estimated dry parchment coffee yield harvested in the last three years (2015-2017) in quintal
(Qt)? 2015_____ 2016_____& 2017_____
**Coffee cultivar/variety used to grow coffee**
10.Where did you get the majority of the seedlings)?
1.Agri office nursery site   2. From own field 3. Agri office & own source
11.  Which coffee variety do you grow?
     1. Kubania 2. Abadir 3. Buna Guracha, 4. Shumbure 5. Buna Dima 6. Mixture of varieties
  12.Which are the desirable characteristics among them and with what parameter?
**Coffee field management practice**
13. What crops do you intercrop with coffee cultivation?
   1. Legume and cover crops 2. Cereal crops 3. Fruit crops 4. Khat 5. No intercropping
14.what is the primary aim of practising intercropping?
15.What methods of weed controlling do you undertake?
1.Manual weeding    2. Slashing   3. Hoeing 4 manual, slashing and hoeing 5. Chemical/ Herbicide
16. Do you use any input for the coffee grown in the field?    1) Yes        2) No
If yes, what fertilizer type you used and applied amount per area?
17.If Q# 16 is No, why not used inputs? Organic fertilizers?
  18. What are the farm inputs for coffee production and other costs (inputs, labour for field
activities, for materials only for coffee crop) used?
19. What types of coffee tree improvement technology /practices do you carry out?
   1. pruning 2) thinning, handling and de-suckering 3. Stumping 4) not practising any
20. If Q 20 Not practising, any reasons for that?
21.Which types of materials do you use to mulch your coffee field if you practice mulching?
If no applying why?
22.Do you use irrigation water to irrigate your coffee trees?    1.yes 2. No
23.If Q# 22 is yes, from where do you get the water source for irrigation?
    If no, why?
24.  What type of shade coverage existed in your coffee field?
 1. permanent shade trees  2. Temporary shade trees 3.  Agroforestry shade 4. No shade
25.If # 25 is No, why?
26. which are the common coffee diseases in your coffee field?
1) CWD      2) CBD       3) CLR        4. Branch dieback   4. No disease
27.What is the disease controlling means you used to this problem?
28. Major coffee insect pest's problem in your coffee field?
1. Stem borer 2) berry borer 3. Thrips 4. No pest
29. What do insect pest control mechanisms you perform?
30. Do you use a chemical to control the diseases & insect pests before?    1) Yes   2) No

31. If Q # 34 Yes, which type of chemical you used?

**Harvesting and Post-Harvest Handling Practices**

32. How do you determine the harvesting stage of the coffee cherry?

1. by looking at all red coffee cherry 2. mixture of red and yellow cherries 3. A green level .4. After drying on the trees

33. How do you practice harvesting?

1.The selective hand is picking    2. Stripping  3. Harvest dried fallen coffee 4. Harvest after dry on tree by shaking

34. What value addition practice do you undertake after harvesting of your coffee?

35.Primary drying technique do you mainly use ?

1. Sun-dried on cement or wooden frame dried, rotated the cherry periodically

2. Sundry on mat or polythene sheet

3.Sundry on cow dung polished ground

**Handling practices**

36. What type of  packaging materials do you use for your coffee ?

1. Jute bag 2. Polythene bag 3. clay pot and bucket 4. Others

37. Where do you store your coffee?

1.At any places in the home 2. Store with grain 3.in the store   4. In elevated storage

38.  How long do you keep your coffee in store before selling?

1. < six  months. 2. More than six months  3. Sell without storing

39. What transport means do you use to supply the coffee to the market?

1. motor vehicle  2. Pack animals 3. Car 4. Myself and family labour

40. To whom do you sell your coffee at the primary coffee market?

1. village collector 2. collector for wholesalers/agent 3. cooperatives 4. Processors

41. Do you have any relationship with your buyers to sell the coffee?

42.Why do your sell the coffee to this buyer?

44.Do the buyers influence you to supply in quality based or focus on quantity of coffee?

45. From whom do you hear about selling price of coffee in the district?

46. What is the average selling price for dried coffee per kg you received in 2017?

47. What other problems are there affecting you from producing quality coffee??

48.Which organization gives you extension service on coffee production?

1. ANRO  2. DAs   3. Model farmers     4. Research and Higher education institution 5. NGO

49. If you get extension service support on coffee production rate them?

Extension Support Service Availability On Coffee

| S. no | question | Strongly Disagree | disagree | neutral | agree | strongly Agree |
|---|---|---|---|---|---|---|
| 50 | I am provided with sufficient knowledge on production, harvesting practices and post-harvest practices to keep the quality of coffee | 0 | 0 | 0 | 0 | 0 |
| 51 | I am provided with information on quality requirement or standard by coffee marketing actors or supporters | 0 | 0 | 0 | 0 | 0 |

52. What are the main factors affecting you from producing quality coffee?

Annex 2 Focus group discussion points

Date:

1. What are the supporting factors you get to produce quality coffee in your area?

2. What are the supporting factors you give to smallholder farmers to produce quality coffee in the district? (District coffee expert)

3.What are the hindering factors that affect you from coffee production?

4. What do you think the resolution for these factors/ problems?

End of the interview

Thank you very much for responding the questions!

Annex 3 Checklist for coffee traders

Name of traders:
Date of Interview:
Address:
1.When did you start a coffee trading business and from where are you?
2.Who are the current actors in the coffee market and what function do they have?
3.From where and whom do you buy a coffee?
4.Do you have any unique market relation with the sellers?
5. What is your focus when you purchase coffee (Quality or quantity), Why?
6.To whom and where you sell your coffee?
7. If you buy coffee, how do you collect it and what materials used for packaging?
8.what methods and device do you use to test moisture content before storage?
9.For how long do stay your coffee in store?
10.Where do you store the purchased coffee?  Can you show me the store?
11. From whom do you hear about the price of today's coffee for a kg?
12. What procedures do you follow to control the quality of the bought coffee?
13.How much is the average of your purchasing and selling of coffee in this year
15.14.For wholesalers how much percent you sell for domestic and exporter?
16.What are the marketing cost or processing costs (inputs, labour, other materials) used?
17.Do you offer any support to your coffee suppliers, if so what kind of support?
18.For the last 12 months, have you took part in any training about coffee quality, marketing issues?
19.What are the hindering s and supporting factors in the existing marketing system regarding coffee     quality?

Annex 4 Checklist for coffee processor

Name of the processor:
Date:
Address:
1.When do you start the business of coffee processing?
2.What services do you provide?
3.From where and whom you buy or receive coffee to process?
4.Who are the current actors involved in the coffee business and their function?
5.Do you have any relation with your coffee suppliers, if so what kind of relationship?
6.What is the processing cost per kg of coffee and marketing cost (inputs, labour, other materials) used?
7.What is the current coffee quality standard graded in the hulling process?
8.After you hulled coffee, what type of quality maintenance activities do you carry out?
9.Do you practice defect cleaning?
10.Who is more involved in defect cleaning from a gender point of views?
11.What materials do you use during defect cleaning for coffee spreading?
12.One quantal of dried cherry coffee gives how much a kilo of green in ratio?
13.What are the key factors affects processing of coffee for the high quality?
14.Do you rend store service for coffee before and after the process and why?
15.For how long you store coffee before it delivered to central market?
16.Is there any loss in weight or quality of your coffee? If so who is accountable for the loss?
17. For the last 12 months, do you take any training about coffee processing and quality issues?

Annex 5 Checklist for Basic district cooperative office

Name:
Date of Interview:

1. When was this producer association set up?
2. What services do you provide and receive from the stakeholders?
3. What type of support do you provide to the farmers in the members of the cooperative?
4. Do you get any support from others  stakeholders, GOs, NGOs etc.?
5. What are the problems the primary cooperative faced to engage in coffee business fully ?
6. What are the opportunity, hindrance and stimulating factors  district coffee value chain ?
7. What could be the resolution to solve problems in the cooperative performance?

Annex 6 Checklist for coffee exporter

Trade name:

Name:

Date of Interview:                                    Address:

1. How long you engaged as an exporting business?
2. From whom you are purchasing coffee?
3. What is the purchasing price of one kg per grade for this year transaction?
4. How do you buy coffee from a supplier?
5. Which criteria do you consider while buying coffee for export market?
6. What is the quality requirement by your buyers' preferences?
7. What are the marketing cost or processing costs (inputs, labour, other materials) used?
8. What do you do to add value for exporting coffee?
9. What type of support do you provide to suppliers?
10. Which grade type is preferable by the exporter to supply for the market and why?
11. What are the quality parameters that most importers consider?
12. What losses do you face from the coffee at parchment or processed bean?
13. What are the opportunity, hindrance and stimulating factors to engage in coffee business?

Annex 7 Checklist for quality inspector

Name:                              Date:
Position:                          Address:

1.What is the main function or services you have in a coffee value chain as an organisation?
2.What is the current coffee quality controlling procedures functioning across the chain?
3.How and where has the coffee grading done?
4.What are the main coffee quality problems in the export chain?
5.What problems are you facing in the coffee quality value chain?
6. Do you have any relationship or link with actors and other stakeholders in the chain?
7.What kinds of support do you get and provide for whom and from whom?

Annex 8 Checklist for ECX

Name:                                    Position:

Date:                                    Address:

1.What is your main function in a coffee chain as an enterprise?

2.What are the current coffee quality controlling procedures exercised across the chain?

3.What is the quality parameter of coffee in the coffee value chain?

 4.What are the main constraints of quality of coffee seen during the quality assessment?

5. which quality standard do Chole coffee classified or characterized? In what criteria?

6. A number of coffee exporters found in the Chole coffee value chain?

7.What is the support you provide to the stakeholders in the chain?

 8.What type of linkage do you have among coffee actors?

9. What are the current main problems or opportunities in the coffee value chain?

Annex 9 Checklist for district coffee expert

Name:                                    Organization:

Date:                                    Position:

1. Do your office, or others provide any kinds of supports to coffee producers? If yes, what types of supports?

2. How are these services delivered to the farmers?

3. Do you have support related to coffee quality improvement or maintenance issues?

4.What are the coffee quality controlling guideline or procedures used to in the district

5. What are the pros and cons of current coffee quality control procedures in the Chole district?

6. What challenges do farmers face in the production, and post-harvest to improve coffee production and quality?

7.Who are in charge of facilitating or overlooking the coffee quality issues in the district?

8.What have corrective measures taken to legalize coffee trading in the district? Who is authorized to implement this?

Annex 10 List of interviewees

| S.no | Name | Sex | Age | Address /PA/ | Stakeholder |
|---|---|---|---|---|---|
| 1 | Adem Hamza | M | 32 | Magna Werki | Smallholder coffee farmer |
| 2 | Rijalu  M/Aimin | M | 22 | Magna Werki | Smallholder coffee farmer |
| 3 | Abdulkadir   Aliyi | M | 34 | Magna Werki | Smallholder coffee farmer |
| 4 | Amino Hamid | M | 65 | Magna Werki | Smallholder coffee farmer |
| 5 | Husen Hamido | M | 56 | Magna Werki | Smallholder coffee farmer |
| 6 | Kamal Husen | M | 21 | Magna Werki | Smallholder coffee farmer |
| 7 | Taju  Hajikadir | M | 36 | Magna Werki | Smallholder coffee farmer |
| 8 | Kelil Shemusa | M | 56 | Magna Werki | Smallholder coffee farmer |
| 9 | Jaanoo Ismael | M | 48 | Magna Werki | Smallholder coffee farmer |
| 10 | Shedini Jemalo | M | 44 | Magna Werki | Smallholder coffee farmer |
| 11 | Abdulkadir Mahimud | M | 27 | Magna Werki | Smallholder coffee farmer |
| 12 | Abduljabar Sheabdulrhaiman | M | 31 | Magna Werki | Smallholder coffee farmer |
| 13 | Amano Abdo | M | 26 | Magna Werki | Smallholder coffee farmer |
| 14 | Saliya Ali | F | 33 | Magna Werki | Smallholder coffee farmer |
| 15 | Mustefa Kelil | M | 56 | Magna Werki | Smallholder coffee farmer |
| 16 | Ganna Mohammed | M | 24 | Magna Werki | Smallholder coffee farmer |
| 17 | Bakure tato | M | 35 | Magna Werki | Smallholder coffee farmer |
| 18 | Badhasa Abdu | M | 41 | Lega Buna | Smallholder coffee farmer |
| 19 | Muzeyin Haji | M | 57 | Lega Buna | Smallholder coffee farmer |
| 20 | Jemal sharu | M | 62 | Lega Buna | Smallholder coffee farmer |
| 21 | Mideksa Jarar | M | 68 | Lega Buna | Smallholder coffee farmer |
| 22 | Abdurezak Husen | M | 24 | Lega Buna | Smallholder coffee farmer |
| 23 | Kamal Hajji | M | 29 | Lega Buna | Smallholder coffee farmer |
| 24 | Momia  Kadir | F | 38 | Lega Buna | Smallholder coffee farmer |
| 25 | Mujahid Faris | M | 48 | Lega Buna | Smallholder coffee farmer |
| 26 | Nuru  Hajibaso | M | 54 | Lega Buna | Smallholder coffee farmer |
| 27 | Abdella Amano | M | 32 | Lega Buna | Smallholder coffee farmer |
| 28 | Darar Jabir | M | 27 | Lega Buna | Smallholder coffee farmer |
| 29 | Sadu Ismael | M | 42 | Lega Buna | Smallholder coffee farmer |
| 30 | Nasif Gano | M | 45 | Lega Buna | Smallholder coffee farmer |
| 31 | Ifa Bilalo | M | 23 | Lega Buna | Smallholder coffee farmer |
| 32 | Chala Kamal | M | 40 | Lega Buna | Smallholder coffee farmer |
| 33 | Shmsedin Awal | M | 44 | Lega Buna | Smallholder coffee farmer |
| 34 | Awol Ajama | M | 37 | Lega Buna | Smallholder coffee farmer |
| **Marketing actors** | | | | | |
| 1 | Sharew Ingida | M | 38 | Gololcha | Collector |
| 2 | Abdulkadir Abdella | M | 44 | Gololcha | Collector |
| 3 | Megerssa Asefa | M | 48 | Gololcha | Collector |
| 4 | Selamu Kefelegn | M | 32 | Gololcha | Collector |
| 5 | Samson Wendimu | M | 41 | Chancho | Wholesaler |
| 6 | Jemal Ahimed | M | 44 | Chancho | Wholesaler |
| 7 | Alemayehu Yohannis | M | 55 | Addis Ababa | Exporter |

| 8 | Miftah Kochere | M | 33 | Dire Dawa | Retailer |
|---|---|---|---|---|---|
| **Chain Supporters** | | | | | |
| 1 | Kemal Haji | M | 30 | Chole | District coffee expert |
| 2 | Zenebu Hailu | F | 41 | Chole | District Cooperative expert |
| 3 | Animut Bililign | M | 37 | Chancho | Coffee processor |
| 4 | Mitiku Yisherga | M | 28 | Dire Dawa | ECX |
| 5 | Mekides Zerihun | F | 26 | Dire Dawa | CQICC |

Annex 11 Coffee quality grading assessment form



Ethiopian Agricultural Commodities Warehousing Service Enterprise
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Tel: +251 5547001 Fax: +251 554 7010 Alsam Chelelek Tower, Addis Ababa, Ethiopia www.ecx.com.et

№ 21674

**Preliminary Unwashed Coffee Quality Assessment**

Moisture Content 11.1 %
Retained on Screen 14  96 %

Date 12/04/16
Code No 103814904
Origin UHRC

Raw Value 22
Cup Value 40
Total Points 62

Grading Table

**RAW VALUE 40%**

| Defects | | | | Odor (10%) | | Cup Cleanness (15%) | | Acidity (15%) | |
|---|---|---|---|---|---|---|---|---|---|
| Primary (count) (15%) | Pts | Secondary (weight) (15%) | Pts | Quality | Pts | Quality | Pts | Intensity | Pts |
| <5 | 15 | <5 | 15 | Clean | 10 | Clean | 15 | Pointed | 15 |
| 6-10 | 12 | <10 | 12 | F. Clean | 8 | F. clean | 12 | M.pointed | 12 |
| 11-15 | 9 | <15 | 9 | Trace | 6 | 1 CD | 9 | Medium | 9 |
| 16-20 | 6 | <20 | 6 | Light | 4 | 2 CD | 6 | Light | 6 |
| 21-25 | 3 | <25 | 3 | Moderate | 2 | 3 CD | 3 | Lacking | 3 |
| >25 | 1 | >25 | 1 | Strong | 1 | >3 CD | 1 | N.D | 1 |

**CUP VALUE 60%**

| Body (15%) | | Flavour (15%) | |
|---|---|---|---|
| Quality | Pts | Quality | Pts |
| Full | 15 | Good | 15 |
| Medium full | 12 | F. good | 12 |
| Medium | 9 | Average | 9 |
| Light | 6 | Fair | 6 |
| Thin | 3 | Commonish | 3 |
| N.D | 1 | N.D | 1 |

**Classification**

| Yirgachefe A | UYCA |
| Yirgachefe B | UYCB |
| Jimma A | UJMA |
| Jimma B | UJMB |
| Sidama A | USDA |
| Sidama B | USDB |
| Sidama C | USDC |
| Harar A | UHRA |
| Harar B | UHRB |
| Harar C | UHRC |
| Bale | UBL |
| Nekempt | ULK |
| Forest A | UFRA |

**Grade & Points**

| Grade 1 ≥85 | |
| Grade 2=75-84 | |
| Grade 3= 63-74 | |
| Grade 4=47-62 | |
| Grade 5=31-46 | |
| Undergrade Unwashed Coffee | |
| Grade UG=15-30 | |
| Sound Beans <50% | |

**Raw Defects**

SCAA Primary Defects

| Type | Bean | Grade |
|---|---|---|
| Full Black | 7 | 7 |
| Full Sour | | |
| Fungus | 1 | 1 |
| F. Matter | 2 | 2 |
| Insect D. | 16 | 3 |
| Pod/Husk | 2 | 2 |

Total Primary Grade = (Transfer to Grading Table)  15

Secondary Defects Observations

| SCAA | 0 | 1 | 2 | 3 | Ethiopia | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|---|---|
| Partial Black | | | | | Foxy | | | | |
| Partial Sour | | | | | Under Dried | | | | |
| Floater | | | | | Over Dried | | | | |
| Immature | | | | | Mixed | | | | |
| Withered | | | | | Stinkers | | | | |
| Shell | | | | | Faded | | | | |
| S. Insect D. | | | | | Coated | | | | |
| Broken | | | | | Light | | | | |
| Soiled | | | | | Starved | | | | |

Total 74  21

Classification UHRC
Grade 3 (three)     2008

D- Cup Defect
D- Not Detected

| Name | Signature |
|---|---|
| Coordinator: Aman | |
| Cupper 1: Asemelet | |
| Cupper 2: | |

Annex 12 ECX coffee classification for unwashed export standard

## ECX COFFEE CONTRACTS

### 1.3 EXPORT - SPECIALTY – UNWASHED

| Coffee Contract | Origin (Woreda or Zone) | Symbol | Grades | Delivery Centre |
|---|---|---|---|---|
| YIRGACHEFE A* | Yirgachefe | UYCA | Q1,Q2 | Dilla |
| WENAGO A* | Wenago | UWNA | Q1,Q2 | Dilla |
| KOCHERE A* | Kochere | UKCA | Q1, Q2 | Dilla |
| GELENA ABAYA A* | Gelena/Abaya | UGAA | Q1, Q2 | Dilla |
| YIRGACHEF B** | Yirgachefe | UYCB | Q1, Q2 | Dilla |
| WENAGO B** | Wenago | UWNB | Q1, Q2 | Dilla |
| KOCHERE B** | Kochere | UKCB | Q1, Q2 | Dilla |
| GELENA ABAYA B** | Gelena/Abaya | UGAB | Q1, Q2 | Dilla |
| SIDAMA A | Borena( except Gelena/Abaya), Benssa, Guji, Arroressa, Arbigona, Chire, Bona Zuria | USDA | Q1, Q2 | Hawassa |
| SIDAMA B | Aleta Wendo, Dale, Chuko, Dara, Shebedino, Wensho, Loko Abaya, Amaro, Dilla zuria | USDB | Q1, Q2 | Hawassa |
| SIDAMA C | Kembata &Timbaro, Wollaita | USDC | Q1, Q2 | Soddo |
| SIDAMA D | Bale, W Arsi (Nansebo), Arsi (Chole) | USDD | Q1, Q2 | Hawassa |
| SIDAMA E | S.Ari, N.Ari, Melo, Denba gofa, Geze gofa, Arbaminch zuria, Basketo, Derashe, Konso, Konta, Gena bosa, Esera | USDE | Q1 Q2 | Soddo |
| JIMMA A | Limmu Seka, Limmu Kossa, Manna, Gomma, Gummay, Seka Chekoressa, Kersa, Shebe and Gera | UJMA | Q1 Q2 | Jimma |
| JIMMA B | Bedelle, Noppa, Chorra, Yayo, Alle, didu Dedessa | UJMB | Q1, Q2 | Bedelle |
| HARAR A | E.Harar, Gemechisa, Debesso, Gerawa, Gewgew and Dire Dawa Zuria | UHRA | Q1, Q2 | Dire Dawa |
| HARAR B | W.Hararghe | UHRB | Q1, Q2 | Dire Dawa |
| HARAR C | Bale (Berbere and Delomena) | UHRC | Q1, Q2 | Dire Dawa |
| HARAR D | Arssi Golgolcha | UHRD | Q1, Q2 | Dire Dawa |
| HARAR E | Hirna, Messela | UHRE | Q1, Q2 | Dire Dawa |
| KELEM WOLLEGA | Kelem Wollega | UKOW | Q1, Q2 | Gimbi |
| EAST WOLLEGA | East Wollega | UEW | Q1, Q2 | Gimbi |
| GIMBI | West Wollega | UGM | Q1, Q2 | Gimbi |
| FOREST A | Yeki, Anderacha, Sheko, S. Bench, N. Bench, Gura ferda, Bero, Godere, Gembo, Gewata, Chena | UFRA | Q1, Q2 | Bonga |
| FOREST B | S.Ari, N.Ari, Melo, Denba gofa, Geze gofa, Arbaminch zuria, Basketo, Derashe, Konso, Konta, Gena bosa, Esera | UFRB | Q1 Q2 | Soddo |
| BENCH MAJI | Yeki, Anderacha, Sheko, S.Bench, N.Bench, Gura ferda, Bero | UBM | Q1, Q2 | Bonga |
| KAFFA | Gembo, Gewata, Chena | UKF | Q1, Q2 | Bonga |

ECX Coffee Contracts 2009.v2                                                Page 3

Annex 13 Coffee quality result form for wholesaler recite



**Agricultural Commodities Warehousing Service**
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Tel: +251 115533969 Fax: +251 115539573 P.O.Box 5157 Alsam Chelelek Tow
Addis Ababa, Ethiopia

## Coffee Quality Result № 116335

**To be filled by Data Assistant**
Client Name _Ismail Ahmed_ Plate No. 3 -A16463
Signature _____ No of Bages ____60____

**To be filled by Quality Supervisor**
Code 103746335 S.No. _____
Type of Coffee _Unwashed_
Raw Value _17_
Cup Value _42_
Total Value _59_
Moisture Content _9.8_ % 2009
Retained on Screen 14 _95_ %
Clasification _UHRC_
Grade _(4our)_
Signature _____
Date _17/04/12_

Received by _____
Signature _8/5/2_
Date _____
Distribution:- Original – Client/Agent    2ᵈ Copy – GRN Creation    3ʳᵈ Copy – Pad
Commercial P E. 15349/08

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*Annex 14* Discussion with stakeholders and field observations