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\*Corresponding author: Girma  
Gezimu Gebre, Agricultural  
Economics, Aksum University, Aksum,  
Ethiopia  
E-mail: [girma.gezimu@gmail.com](mailto:girma.gezimu@gmail.com)

Reviewing editor:  
Fatih Yildiz, Food Engineering and  
Biotechnology, Middle East  
Technical University, Ankara, Turkey

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## FOOD SCIENCE & TECHNOLOGY | RESEARCH ARTICLE

# Analysis of banana value chain in Ethiopia: Approaches to sustainable value chain development

Girma Gezimu Gebre<sup>1\*</sup>, Eweg Rik<sup>2</sup> and Albertien Kijne<sup>2</sup>

**Abstract:** Banana is an important commercial fruit crop for smallholder farmers in Arba Minch, southern Ethiopia. However, its sector is experiencing many constraints and limited attention given to productivity and marketing. Therefore, this study was conducted to analyze the banana value chain in order to identify constraints on productivity and marketing, and possibilities of improvements towards a sustainable value chain in Arba Minch. Data were collected through a survey, key informants' interviews, and focus group discussions. Different analytical and statistical tools were used for data analysis. Results describe actors, supporters, and influencers of the existing banana chain. The current banana chain has three different distribution channels in Arba Minch. The channel that connects with rural consumers has the highest value share for farmers while the channel that includes traveling traders has the lowest value share for farmers. The marketing cooperative channel has an intermediate value share for farmers in the chain. Poor agronomic practice, diseases, pests, and climate change were the major constraints for the banana yield while limited market information, lack of cold store and refrigerated

### ABOUT THE AUTHORS



Girma Gezimu Gebre

Girma Gezimus Gebre (Mr) is an academic staff member of the Department of Agricultural Economics at Aksum University. He is a doctoral fellow at the Department of Agricultural and Resource Economics at Kyushu University, Japan. His research focus includes agricultural value chain, gender, technology adoption, agricultural production, agricultural policy, innovation, and food security.

Eweg Rik is Professor in a sustainable agribusiness in metropolitan areas, Van Hall Larstien University of Applied Sciences, The Netherlands.

Albertien Kijne is a Lecturer, researcher and project leader in Van Hall Larstien University of Applied Sciences, The Netherlands. She is coordinator for master program in Agricultural Production Chain Management: Horticulture Chain.

### STATEMENT OF PUBLIC INTEREST

Around the world, urbanization and human population are growing. These urbanizing as well as growing population need sufficient, nutritious, and healthy food for their productive life. Banana is the one of healthy and nutritious fruit demanded by both urban and rural populations. Thus, farmers around the world will have to constantly produce a sufficient amount of banana fruit for these populations. However, they do not have equal capability to produce and supply to the international market. Particularly, farmers in developing countries such as Ethiopia are facing many challenges in producing such highly marketable crops to the international market. The value chain that connects a series of banana production and marketing activities are not well coordinated in Ethiopia. Thus, this paper explores the organization of the existing banana value chain and its sustainability performances in major banana-growing areas of Ethiopia.

trucks, poor post-harvest handling, lack of alternative markets, and weak capacity of cooperatives were the main constraints for banana marketing in Arba Minch. Economic, social and environmental indicators have a moderate sustainability performance within the Ethiopian context. The chain has an advantage in terms of profitability, employment, emission of air pollutants and constraints in terms of coordination, value share, profit margin, market diversity, product and market information, transportation, waste management, and safety and hygiene.

**Subjects:** Environment & Business; Political Ecology; Consumer Psychology; Development Studies; Human Geography

**Keywords:** banana; marketing; profit margin; sustainability; value chain; Arba Minch; Ethiopia

### 1. Introduction

Banana (*Musa* spp.) is a crop of major economic importance in the world. It is the fourth most important crop of the food market next to rice, wheat, and maize (Food and Agriculture Organization Statistical Division [FAOSTAT], 2012). This makes banana the prime leading fruit crop in terms of volume and value in the global market (Woldu et al., 2015a). In 2017, banana was the world's most productive fruit crop with an annual production of 113,918,763 metric tons (Food and Agriculture Organization Statistical Division [FAOSTAT], 2019). In terms of production and export potential, India is the largest producer of banana while Ecuador is a leading exporter followed by the Philippines (ibid). In 2017, the global export of banana reached an estimated quantity of 18.1 million tones, a 6 percent increase compared with 2016. In the same year, the net global import volume reached 17.4 million tones, an increase of 7 percent compared with 2016. The European Union, United States, the Russian Federation, China, and Japan are the leading importers of banana in the world. Particularly, the two largest net importers, the European Union and the United States, registered strong growth rates of 7 percent and 5 percent, respectively. In both export markets, rising health awareness is contributing to higher fruit consumption, with bananas among the most popular choice due to their nutritious, filling and convenient characteristics (Food and Agriculture Organization of the United Nations [FAO], 2018). Bananas are rich in high nutritional contents such as potassium, fiber, magnesium, and vitamin C and B6. It is also believed as bananas help to fight depression, kidney cancer and diabetes (Dodo, 2014).

Furthermore, Banana is an important source of income for many sub-Saharan African small-holder farmers (FAOSTAT, 2012). However, in 2017, Africa's export decreased by an estimated 3 percent from the level of 2016, with the highest decline in Cameroon, the second leading exporting country in the continent, followed by Cote d'Ivoire. Adverse weather conditions hampered production in the country, which resulted in an 8 percent decline in export between October 2016 and October 2017 (Food and Agriculture Organization of the United Nations [FAO], 2018). Banana production and marketing, in East Africa, is more challenging compared to other African regions. In East Africa, banana chains to markets are characterized by many links that add little value and result in only a small proportion of the retail price-reaching farmers, providing little incentive for investment to improve production (Beed et al., 2012). This applies for the banana value chain in Ethiopia too.

Due to Ethiopia's suitable agro-climatic conditions, it has a big potential for banana and other fruits production (Wiersinga et al., 2008). Cavendish banana is the major fruit crop that is most widely grown and consumed in the country. Especially in the south and southwestern parts of the country, it is of great socioeconomic importance contributing much to the overall well-being of the rural communities including food security, income generation, and job creation (Woldu et al., 2015a). Banana contributes around 48% for producers' own consumption, 49% for income generation, less than 1% for animal feed and less than 3% for other purposes in Ethiopia. It covers



about 60% of the total fruit area, about 68% of the total fruits produced, and about 38% of the total fruit-producing farmers in Ethiopia (Central Statistical Agency of the Ethiopia [CSA], 2015).

The Southern Nations Nationalities and People Regional State is the main banana-producing region in Ethiopia. Arba Minch, Bench Maji, and Sidama are the major banana producing districts in the Southern Nations Nationalities and People Regional State in Ethiopia of which Arba Minch alone covers over 80% of the Addis Ababa market, which is the biggest domestic market in the country (Temesgen, 2014). A banana from the Arba Minch district has more demand than other bananas in Ethiopia due to its better taste for consumers (Alemu, 2017).

Ethiopia started banana export from the Arba Minch district in 1961 where the country started at about 5,000 tons. This figure, however, increased to 60,000 tons by the year 1972 when the country exported to different countries of Europe, Asia and Africa. In 1975 the total production of banana in the country has reached about 100,000 tons (Alemu, 2017; Berhe et al., 2008; Bezuneh, 1975). Until 2013, organic farmers from Arba Minch, were exporting to the Middle East and European markets. However, Ethiopia is geographically close to the Middle East and European markets, today, banana produced by smallholders in Arba Minch are not exported to these markets. The main reason is the quality does not meet the required standards of the export markets in a sustainable way due to problems related to production management, post-harvest handling and lack of refrigerated trucks. Because the smallholder banana producers in Arba Minch cannot supply the required quality to the European and Middle East markets, they are supplying to the domestic markets. Meanwhile, banana continues to be an important commercial commodity and a major source of livelihood for farmers and traders in the Arba Minch district. It is the main source of livelihood of about 131,453 smallholder producers in Arba Minch (CSA, 2015).

The government of Ethiopia through its Agriculture and Rural Development office has established an agricultural extension program to improve productivity and marketing of agricultural products. This office has worked with farmers to improve productivity and market links in the country. Linking smallholder farmers to the market can embrace a whole range of activities. It requires a development of long-term business relationships. Agricultural extension workers can link farmers to market (buyers) by identifying traders and arranging for them to meet with the farmers. Non-governmental organizations (NGOs) and other stakeholders can find markets for particular products and organize farmers into groups to supply those markets. Traders can work with farmers (suppliers) to develop new or improved products. This situation is however not yet explored in the context of smallholder banana farmers in Arba Minch district.

Though the living standard of the banana producers in Arba Minch has substantially improved in recent years, still they face many challenges. According to Mekonnen (2014), banana yield per unit area of land is declining in Arba Minch. Irrigation water is applied in an inefficient way in many farm fields. As a result, banana farmers waste a significant amount of irrigation water during the dry season (Alemu, 2017). The current marketing system benefits traders rather than producers. The banana cooperatives are not strong enough to compete with the private traders and hence do not benefit their members as much as expected. Farmers sell their banana for local private traders who decide unilaterally on market prices (Mekonnen, 2014). The farm gate price of smallholder banana farmers is lower than the potential. To improve the existing production and marketing system, this study was aimed to investigate the status of the existing value chain, productivity and marketing constraints of banana in Arba Minch district, Ethiopia. It also looked at possibilities to improve the chain into a sustainable banana value chain in the study area.

## 2. Literature review

### 2.1. Value chain concepts

A value chain encompasses the full range of activities required to bring a product to consumers passing through the different phases of production, processing, and delivery (Rota & Sperandini,

2010; U.S. Agency for International Development (USAID), Micro links value chain wiki). These activities occur in a sequence and are carried out by different participants, including input suppliers, producers, processors and buyers (Bijman & Ton, 2008). They are supported by a range of technical, business and financial service providers (USAID, Micro links value chain wiki). Each link in the chain adds value to the product (Bijman & Ton, 2008). There is coordination among different stakeholders along the chain. These stakeholders are connected by flows of resources, materials, and information that goes towards the production and trade of particular products (Arias et al., 2013). Thus, a value chain is a connected series of organizations, resources and knowledge streams involved in the creation and delivery of value to the end customer (Lundy et al., 2014).

Value chain approaches provide a systematic process to improve market linkage for farmers (Ferris et al., 2014). It provides a framework for identifying key constraints and considering appropriate solutions (Arias et al., 2013). These constraints and solutions require a coordinated response by different stakeholders in the chain, which necessitates trust and a willingness to collaborate (USAID, Micro links value chain wiki). Through value chain approach, one can understand farmer-trader relationship, power dynamics and the distribution of benefits in the chain.

According to Rota and Sperandini (2010), value chain analysis is essential to an understanding of markets, their relationships, the participation of different actors, and the critical constraints that limit the growth of agricultural production and consequently the competitiveness of smallholder farmers. These farmers currently receive only a small fraction of the ultimate value of their output.

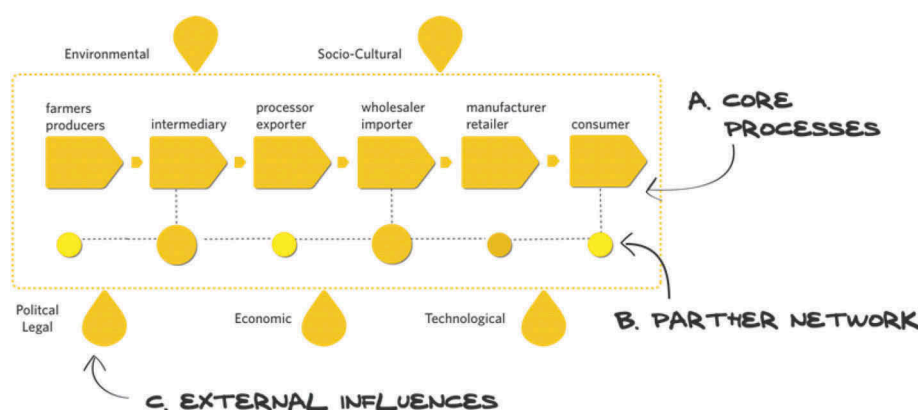
## 2.2. The value chain map

The value chain map helps us to understand how different businesses interconnect to form one system. It is a potential starting point for the inclusion of smallholder farmers in the chain (Lundy et al., 2014). A visual map of the value chain has the capacity to reveal stakeholders involved in the chain, boundaries of the system, inter-relationships and functional roles; a flow of goods, services, payments, and information along the chain; and linkage points and gaps between stakeholders. According to Lundy et al. (2012), agricultural value chain mapping has three levels or dimensions (Figure 1). These are core processes (direct actors), partner (indirect actors) network and external influencers.

### 2.2.1. The core processes of the value chain

The core process is essential to understand how different business links function together as a system (Lundy et al., 2012). The core process includes chain actors which are commercially involved in the chain (producers, collectors, wholesalers, retailers, consumers) of a particular agricultural product (Royal Tropical Institute [KIT], 2008). According to KIT (2008), there are many kinds of traders involved in agricultural value chains in many African countries including Ethiopia. These are travelling traders who meet the farmer at the farm gate to collect the produce. They normally make payments for the banana farmers before harvest and assume ownership of

**Figure 1. Agricultural value chain Map, Source: Lundy et al. (2012): Link Model.**



the produce at the farm gate. This kind of situation is common in the Arba Minch banana value chain. Wholesalers stay in the larger markets to receive goods from traveling traders and large farmers, which they resell to retailers and large, regular buyers such as schools, restaurants, and prisons. In Arba Minch, local traveling traders distribute banana produce to wholesalers in different major cities in Ethiopia (Mekonnen, 2014). Retailers sell goods in whatever quantity consumer wishes to buy at one time.

#### 2.2.2. *The partner network*

The partner network includes stakeholders that support, intervene or assist the different links of the chain and facilitate the development of the business. They are external actors or organizations that are not included in the value chain's core stages but occupy a critical role in the functioning of the business and enable the chain to operate efficiently. They support and provide service at critical points of the core stages (input supply, production, post-harvest and marketing) of the agricultural value chain (Lundy et al., 2012).

#### 2.2.3. *The external influences*

According to Lundy et al. (2012), the external influence of agricultural value chains mainly includes economic, political, environmental socio-cultural and technological factors. These factors can facilitate, limit or be neutral to the sustainable development of the value chain. This implies a clear link. However, sustainable development is not only connected to smallholder farmers participation. It is important to assess how these factors affect the participation of the smallholder farmers in the banana value chain in Arba Minch.

### 2.3. *Value shares in the chain*

According to Royal Tropical Institute (2008), calculating profit margins in the value chain is not straightforward. It requires information on costs (fixed and variable) and revenues of each actor in the chain. Once the costs and revenues of each actor in the chain are known, their financial position can be calculated in the following steps:

- **Gross income or operating profit:** This is calculated by deducting variable costs from revenues.
- **Gross margin:** this is calculated by dividing the gross income by the revenue earned from sales. Then multiply by 100 to give a percentage.
- **Added value:** This is the difference between the price the actor pays for the produce and the price she or he sells it for.
- **Value share:** This is the percentage of the final, retail price that the actor earns. It can be calculated as the added value divided by the final retail price. Then multiply by 100 to give a percentage.

### 2.4. *Sustainability of value chain*

The sustainability of the value chain can be expressed simultaneously along three dimensions: economic, social and environmental or triple bottom line (profit, people and planet) (Gebre & Rik, 2016). On the economic dimension, an existing or proposed upgraded value chain is considered sustainable if the required activities at the level of each actor or support provider are commercially profitable. On the social dimension, sustainability refers to socially acceptable outcomes in terms of the distribution of the benefits and costs associated with increased value creation. On the environmental dimension, sustainability is determined largely by the ability of value chain actors to show little or no negative impact on the natural environment from their value-adding activities; where possible, they should show a positive impact (Neven, 2014).

### 2.5. *Sustainability indicators*

Sustainability indicators are particularly hard to define and measure. The basic problem is that sustainability is only occurs in the future while the indicators are measured in the present (USAID, 2012). Although the three sustainability dimensions (social, environmental, and economic) are

**Table 1. Selected indicators for the sustainability of banana value chain in Arba Minch district of Ethiopia**

Economic	Social	Environmental
<ul style="list-style-type: none"> <li>• Profitability</li> <li>• Value added received</li> <li>• Governance/power</li> <li>• Fair trade</li> <li>• Productivity</li> <li>• Product loss</li> <li>• Market diversity</li> </ul>	<ul style="list-style-type: none"> <li>• Employment</li> <li>• Labor condition</li> <li>• Gender/equity</li> <li>• Market information</li> <li>• Product information</li> <li>• Farmers' cooperation for bargaining power</li> <li>• Safety and hygiene</li> <li>• Product quality</li> <li>• Stakeholder Relation</li> <li>• Road and transportation</li> </ul>	<ul style="list-style-type: none"> <li>• Emission of air pollutants</li> <li>• Water usage</li> <li>• waste management</li> <li>• Soil degradation</li> <li>• Biodiversity</li> </ul>

Sources: Gebre and Rik (2016), Food and Agriculture Organizations for United Nations (FAO 2012), and Moreno and Salgado (2012).

treated individually here for clarity, in practice they overlap (USAID, 2012). Once the core processes of the value chain are mapped, indicators must be associated with each chain, for the three sustainability dimensions. The indicator selection depends on the level of the organization and the type of activities (Moreno & Salgado, 2012).

Moreover, many academic studies have assessed the sustainability of agri-food chains, but no agreement has been reached about the overall sustainability performance of local food systems (Durham et al., 2009; Galli et al., 2015; Hand & Martinez, 2010). Indeed, those assessments are challenging in their attempts to integrate agri-food production and consumption within comprehensive decision-making tools. However, the scientific community has not yet agreed on a shared methodology which allows for robust and simultaneous comparisons over the sustainability dimensions of agri-food chains.

Therefore, for this study, the selection of indicators was specifically adapted to the Ethiopian context concerning the banana sector in Arba Minch district. The assessment for each dimension was made based on the local situation in the study area. Accordingly, the selected sustainability indicators that relate to economic, social and environmental elements of the banana value chain in Arba Minch are shown in Table 1.

## 2.6. Smallholder farm

According to International Finance Corporation (International Finance Corporation [IFC], 2013), smallholder farms in the developing world is explained as a family-owned enterprise that produces crops or livestock on two or fewer hectares. In some countries and sectors, however, smallholdings can exceed 10 hectares. In Ethiopia, the average size of the small farm is 1 hectare. The farm plot size of smallholder banana farmers in Arba Minch varies depends on the location. In the moist lowland part of the district where semi-commercial banana is practiced, a farmer can have farm 0.13 hectares to 2 hectares (Mekonnen, 2014).

## 2.7. Marketing, marketing system and types of market

According to Dixie (2005), horticultural marketing is a series of inter-connected activities include: planning production, growing and harvesting; grading of products and their packing; transport, storage, processing, distribution and sale; and sending information from the production area to the market. These activities are links to the production-marketing chain.



Marketing systems are competitive and involve continuous change and improvement (ibid). So that each farmer has different needs and a different type of market (informal, formal or structured public markets) they are best suited to enter into the system. For smallholder farmers in developing countries, the most and easily accessible markets are informal markets (Ferris et al., 2014). Smallholders sell their crops through traditional supply chains. They may also wait by the roadside with their crops, hoping to sell to traveling traders. Village collectors usually extend credit on a loan basis, with repayment coming at the expected harvest. In some areas, there may not be a clear distinction between traditional village collector networks and cooperatives (IFC, 2013). The market linkage cannot be achieved without effective policies and strategies that create and sustain an enabling environment for integrating small producers into markets (Arias et al., 2013). The above situations work in the case of banana marketing in the Arba Minch district of Ethiopia.

Formal markets are characterized by modern value chain systems. These markets can link smallholder farmers to larger commercial buyers. It provides an opportunity for farmers to link with clear market signals coming from the buyers. To work within the formal market sector, farmers must comply with the stringent quality standards and regular volume requirements of formal buyers (Ferris et al., 2014). Banana cooperatives in Arba Minch link smallholder farmers to formal markets but farmers are not complying with the requirement of the formal market. On the other hand, there is an emerging market opportunity led by governments and in public procurement of stable agricultural crops in Ethiopia. The government purchases surplus stable crops from smallholder farmers and transport to the food-deficit area. But this type of market is not happening in vegetable and fruit sectors including Arba Minch banana.

## **2.8. Producer organization**

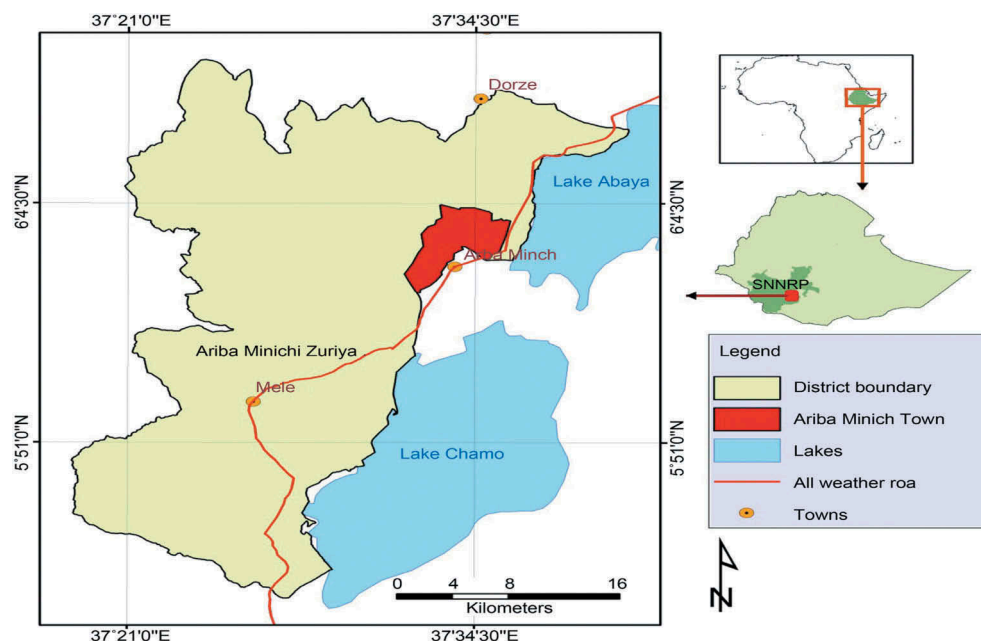
For smallholder farmers in developing countries like Ethiopia, access to the market is a challenging issue. Producer organizations like cooperatives and grower associations are good possibilities of link smallholder farmers to market (Birthal et al., 2007; Mangnus & Piter, 2010). The producer organization helps farmers to improve their position in value chains (Bijman & Ton, 2008). Within the agri-food chain, its main role is to find a market for the products that its members produce (Bijman, 2007). Member commitment or willingness to continue selling through (buying from) producers' organization is an important issue for the institution like cooperatives (Bijman & Verhees, 2011). Some smallholders have the capability and the willingness to participate in markets or cooperatives; others do not (Arias et al., 2013). They lack knowledge about the importance of cooperatives. Increased access to information can change the way smallholders organize and interact with markets (IFC, 2013).

## **2.9. Constraints of smallholder farmers production and marketing**

Several studies (Arias et al., 2013; Dixie, 2005; Ferris et al., 2014; IFC, 2013; Mather, 2008; Zossa & Pletziger, 2007) have been conducted on the linking smallholder farmers to market. Their studies could contribute to existing knowledge by assessing the subject matter in the Ethiopian context. They found out that production and marketing of smallholder farmers are constrained by farm size, location, limited access to agricultural inputs, quality inputs, finance, infrastructure, extension services, market information, water and production technologies; skill and lack of knowledge, poor farm management, level of farm household dependence structure, product quality, seasonality of production, weather, culture and tradition, institutional arrangement, price volatility, pests and diseases, inconsistent policies, gender, high cost of storage and transportation. These studies concluded that quality and productivity vary widely among smallholder farmers. Not all farmers can take advantage of the market developments. Their access to evolving agricultural markets, especially, to value chains are commonly constrained. Raising smallholder productivity will have limited success if smallholder linkages to markets are not strengthened simultaneously. Similarly, strengthening market linkages will have little benefit with existing low levels of productivity. Smallholder productivity and marketing improvement are keys to ensuring the sustainability of agricultural value chains in developing countries. These studies have commonly recommended

**Figure 2. Location map of the Arba Minch Zuriya district, Ethiopia.**

Source: Ministry of Agriculture and Rural Development [MoARD] (2005)



that effective policies and strategies that create and sustain an enabling environment for integrating small producers into markets is needed. Further, multiple programs and approaches should be developed in support of promoting greater integration of smallholders into markets

Further, Mangnus and Piters (2010) in their study on linking producer and buyer stated that small-scale producers generally do not have access to all factors that are needed for delivering a product that responds to market demand. They often face strong economic, social and physical disadvantages: in some areas, the infrastructure is poor, while in other areas up to date market information are not always available to everyone.

### 3. Methods and materials

#### 3.1. Study area

The study was conducted in Arba Minch Zuriya district, the major banana producing area in Ethiopia. Arba Minch Zuriya is located at about 505 kilometers south of Addis Ababa and 275 km southwest of Hawassa, the capital city of Southern Nations, Nationalities and People Regional state in Ethiopia. Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia (CSA), this district has a total population of 164,529, of whom 82,199 are men and 82,330 women. It lies at an altitude ranging between 746 to 1800 meters above sea level, with the average temperature ranging between 15°C and 30°C and on average annual rainfall above 888 mm (Yishak, 2013). According to the Haifa-group, Cavendish bananas grow best in areas where average rainfall ranges from 1200 to 2500 mm/annum. It grows well in the temperature range of 13 to 38 Celsius with a relative humidity regime of 65-85% (Haifa-group n.d). Hence, the agro-climatic condition of Arba Minch makes it a suitable place for banana production. Additionally, Arba Minch district has high potential for availability of quality water for irrigation. The district is surrounded by the two Rift Valley lakes Chamo and Abaya, which have a great economic as well as ecological value for the area (Figure 2). Moreover, it has a big river crossing the banana farmlands. The introduction of banana in Arba Minch has also contributed to the development of new irrigation schemes in the area. A number of traditional and modern irrigation schemes were established for banana cultivation. Irrigated banana (Dwarf, Medium height and Giant Cavendish) covers more than 11,000 ha of land in the district (Mekonnen, 2014).

The soil of irrigated banana production areas in Arba Minch district are dominantly vertisols (Yishak, 2013). These types of soils are rich in clay content. They are characterized as soils with a high-water retention capacity, neutral or alkaline PH, high contents of  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  parent materials and rich in potassium. The consistency of vertisols varies from plastic and sticky when wet, friable when moist to hard and a coarse prismatic structure in the topsoil when dry season holds. Rain fed farming in vertisols is very difficult because it can be worked only under a very narrow range of moisture conditions. When irrigation is available, crops like banana can be grown (Food and Agriculture Organization [FAO], 1998). According to the Haifa-group (n.d), the ideal soil for banana production should be well-drained but with a good water retention capacity. The ideal range for soil PH for Cavendish banana is 5.5 to 6.5. This makes Arba Minch a suitable place for irrigated banana production. In Arba Minch most of the banana plants at the pilot farms bear bunches easily and give good yields some 10 months after planting. Arba Minch is also an important source of banana seedlings for many other parts of the country (Temesgen, 2014).

### 3.2. Data and data collection

Both secondary and primary data sources were used for this study. The secondary data was collected from the available books, professional scientific journals and annual reports of the Central Statistical Agency of Ethiopia on smallholder value chains, banana production and marketing. Since there are wide range of books and journals available, the selection of latest books and journal articles based on their relevance to this study and reputability of the journals. The primary data was collected through individual farmers' survey, observation, focus group discussion and key informant interview from the chain actors, supporters, and influencers by using a semi-structured questionnaires and checklists. Semi-structure questionnaires were used for farmers' survey and checklists were used for focus group discussion and interview in the chain. Generally, data collected from primary sources includes information on the age and educations levels of banana farmer, size of land covered by the banana, farming experience, membership in cooperatives, type of banana varieties used for production, agronomic practices, the input used, disease and pests, harvesting and post-harvest handling, production and marketing costs, market price information, amount harvested and sold, market outlet, extension services, transportation, storage, and stakeholders suggestions to enhance sustainable banana value chain in Arba Minch district.

The selection of banana farmers was done with the assistance of the experts from the Arba Minch Agriculture and Rural Development office. This is because they were constantly in touch with the smallholder banana producers and know the areas in the district where banana farmers are located. Accordingly, from the total of 12 bananas producing *kebeles* in the district, two *kebeles* namely "Shele and Lante," were selected on the basis of the volume of production and existence of banana cooperatives.<sup>1</sup> Random samples of 43 farmers were selected from two *kebeles* (21 from Lante and 22 from Shele) to undertake the survey. This was done by using lists of the banana farmers from the *kebele* agricultural development agents and then individual farmer was randomly selected from lists for the survey.

Two focus group discussions were conducted with a group of 4 farmers from each *kebele* by using the checklist. The selection of farmers for group discussion was done with the assistance of development agents from the Agriculture and Rural Development office. The qualitative data on current production and marketing situation and possibilities for sustainable banana chain improvement in Arba Minch was collected through group discussion.

An interview was conducted among selected wholesalers, retailers, consumers, supporters, and influencers in the chain by using checklists. Separate checklists were used for traders, consumers and other stakeholders based on their role in the chain. Accordingly, 6 local traveling traders, 4 wholesalers, 6 retailers (2 rural and 4 Urban) and 6 consumers were selected for an interview. Local traveling traders and rural retailers were selected from Arba Minch whereas wholesalers and retailers were selected from Hawassa city.

Local traveling traders were selected based on information from banana farmers in each *kebele*. They were interviewed while they collecting and buying the banana at the farm gate. Selections of wholesalers were supported by information from local traders and cooperatives in their linkage. Retailers were selected based on information from wholesalers in the market center.

Moreover, 13 key informants from stakeholders were selected for an interview. The selected stakeholders were Arba Minch the research center, Arba Minch University, Agriculture and Rural Development office, Banana marketing cooperatives, marketing, and cooperative office, and NGO (LIVES, Livestock and Irrigation Value chains for Ethiopian Smallholders). Two key informants were selected from each stakeholder to obtain data on current banana production and marketing status, constraints, and possibilities for chain improvement. The expert knowledge from key informants on the sustainability performance of the banana value chain evaluated based on selected indicators from economic, social and environmental dimensions regarding the banana production and marketing activities in the study area. Moreover, observations were made concerning logistics, handling practice during transportation, farm field, banana fruit management, wholesale and retail markets, waste management practice at marketing and transportation site

Table 2 provides the summary of basic research questions and its corresponding data collection methods designed to meet the objectives this study.

### 3.3. Method of data analysis

The collected data were analyzed by analytical and statistical tools. Analytical tools used were chain map, economic parameters (e.g., profit margin, gross margin and value share), PESTEC (political, economic, social, technical/technological, environmental and cultural), and sustainability performance assessment. In order to have a visual representation of the whole chain in the district, chain mapping was employed with quantity and price at each actor level. Analysis specifying functions of each stakeholder across the chain was described under the map. Banana chain governance (information flow and linkage between actors) was analyzed to show how the chain is performing in the district. Economic parameters like profit margin were used to analyze gross margin and added value share across the chain. PESTEC tool was used to analyses constraints and possibilities for smallholders' banana value chain in the district. A sustainability

**Table 2. Summary of research questions and data collection methods**

Questions	Details	Method or tool used
1	What is the structure of existing banana value chain in Arba Minch?	
1.1	What are key stakeholders (actors, partners and external influencers) and their role in the chain?	Survey, interview, and group discussion
1.2	How do products, payment and information flow through the chain?	Survey, interview, and group discussion
1.3	What is the division of profit margins throughout the chain?	Farmer survey and traders' interview
1.4	What is sustainability performance of the banana value chain looks like?	Survey, interview, group discussion, and observation
2	What are factors for smallholders' banana productivity in the Arba Minch?	Survey, interview, and group discussion
2.1	What are possibilities to improve sustainable banana productivity for smallholders?	Interview and group discussion
3	What are factors affecting smallholders' banana marketing in Arba Minch?	Survey, interview, and group discussion
3.1	What are possibilities to improve sustainable banana marketing situation?	Interview and group discussion

Source: Developed by author's for data collection from Arba Minch in 2016.

performance assessment was used to measure selected sustainability indicators in the banana value chain. For this the Sustainability Assessment of Food and Agriculture systems (SAFA) guidelines from the Food and Agriculture Organizations for United Nations (FAO 2012) were used. This FAO assessment assesses the impact of food and agriculture operations on the environment, economy and society. The assessment was done by a means of five qualitative score categories. For each of the selected indicators, a minimum threshold was defined (1 = for the unacceptable situations) and a maximum (5 = the best situations). The reference points for the performance assessment were local realities in Ethiopia. This was done by researchers and other experts' judgment. For some indicators, the reference values were the results of the questionnaire. Then, the result obtained by each indicator has been converted into a score on a percentage scale.

Elements of the Statistical Package for Social Science (SPSS version 24) were used to analyze data collected from farmer surveys. The demographic and socio-economic data from banana farmers were presented by descriptive statistics such as percentages and averages.

#### 4. Results and analysis

##### 4.1. Demographic and socio-economic characteristics of banana farmers

From the 43 sampled farmers included in the study, 20 were found to be a member in a banana marketing cooperative and 23 were not a member of banana cooperative or private farmers. Farmers were asked the reason for not being a member of banana cooperative, about 70% responded that they were not aware of the importance of joining cooperatives whereas 22% responded that they have no interest to join cooperatives. About 5% of farmers responded that they lacked money to afford cooperative membership.

The average age of smallholder banana farmers was found to be nearly 43 years while the average age for cooperative members and private were 39 and 46 respectively (Table 3). The SPSS result showed that there is a significant difference in the mean age between the cooperative members and private banana farmers. Regarding the level of education, the results showed that cooperative members were more educated than private farmers in Arba Minch. The average years of education for cooperative members were 4.87 while private were 4.30. These imply younger and educated farmers have more awareness to organize themselves in cooperative than older and less educated farmers. The experience of smallholder farmers in banana production on average was 11.95 years. Meanwhile, the average farming experience of cooperative members and private was 11.60 and 12.26, respectively. This result implies that there is no difference between cooperative members and private farmers regarding banana farming experience.

Results show that the area of land planted with banana on average was 1.35 hectares. The area covered with the banana plant by cooperative members and private were 1.47 ha and 0.98 ha,

**Table 3. Demographic and socio-economic characteristics of sampled banana farmers**

Items	All	Cooperative members (N = 20)	Private farmers (N = 23)	Mean difference
Age of the farmers	42.63	38.60	46.13	-7.53***
Education level	4.41	4.87	4.30	0.57
Experience in banana farming	11.95	11.60	12.26	-0.66
Land planted with banana/ha	1.35	1.47	0.98	0.49**
Banana productivity Qt/ha	99.16	99.75	98.57	1.18

Source: Survey result (2016), \*\*\* significant at 1%, \*\* significant at 5%.



respectively. Results show this difference is significant. Experts from district Agriculture and rural development offices reported that the difference in size between farmers that are members of cooperative and farmers that are not increased from year to year. The average yield reported by the banana farmers was 99.16 quintal per hectare. The average yields of cooperative members and private farmers were 99.75 and 98.57 quintals per hectare, respectively. But SPSS results show that this difference in average yield is no significant. This implies that cooperatives have small contribution to supporting farmers to improve their banana yield.

Farmers were asked whether they face constraints to improve banana productivity or not in the 2016 production year. About 49% responded that moisture stress is the major constraint for their banana productivity while the remaining responded the canopy, flooding, weeds, diseases, and pests were the main constraints for their banana productivity. Moreover, key experts from Agriculture and Rural Development office added that moisture stress had a major contribution to banana productivity in the production year 2016 due to the effect from “El Nino”. They pointed out that poor agronomic practices such as over-application of irrigation water, lack of manure/compost, lack of crop rotation, inappropriate sucker removal; over the canopy and mono-cropping /old age were major constraints that reduced the productivity of banana in Arba Minch. Moreover, researchers from Arba Minch research center reported that banana diseases such as bacterial wilt, Fusarium wilt (Panama disease), banana anthracnose, Sigatoka leaf spot, and banana bunchy top virus contributed to reduction of banana productivity in the study area. Fruit fly and banana spotting bug were common pests reported by researchers. They told that farmers lack awareness about the effect of these pests on their banana production. Disease and pest occurrence was directly related to the “El Nino” effect as well as poor agronomic practices such as lack of frequent weeding and soil management.

#### **4.2. Banana chain map in Arba Minch**

Banana value chain mapping was done by identifying and charting the current value chain as discovered during the smallholder farmers’ survey, key informant interviews, and focus group discussions. The value chain map (Figure 3) shows the flow of payment, information, and the quantity of banana in the chain. It also depicts activities carried out and the relationship between different stakeholders at each stage of the banana chain. The identified stages of the banana chain are input supplying, production, collection, and transportation, wholesaling, retailing and consumption.

#### **4.3. Actors and their role in banana value chain**

Value chain actors are those individuals or organizations that conduct transactions in a banana product as it moves through the chain. In this study, they include input suppliers, producers, collectors/traveling traders, wholesalers, retailers, and consumers in the banana chain.

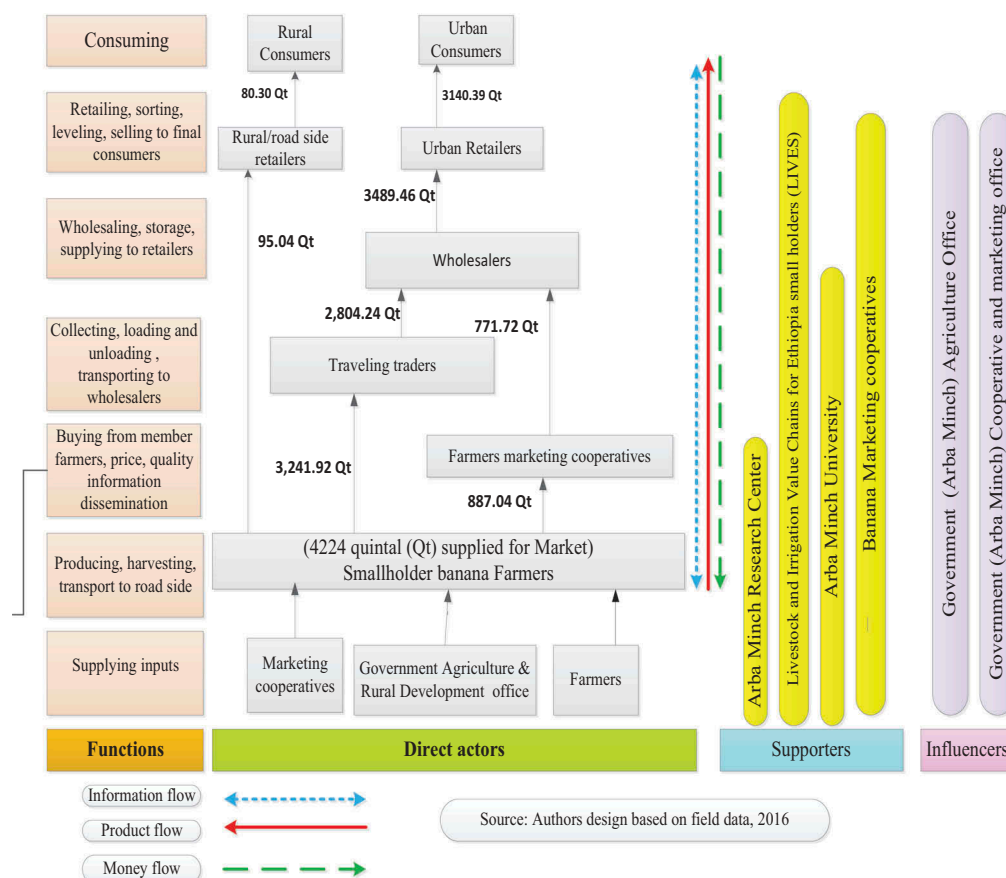
##### **4.3.1. Input suppliers**

Agricultural inputs are important elements for the production and productivity of banana. The various inputs demanded by the banana producers were supplied by Arba Minch research center, banana marketing cooperatives, agriculture and rural development office, Arba Minch University, and non-governmental organizations (NGO) such as Livestock and Irrigation Value Chains for Ethiopian Smallholders (LIVES).

##### **4.3.2. Smallholder farmers**

In Arba Minch, most banana farmers are smallholders who sell their products at their farm gate or roadside near to the banana farm. Local traveling traders and banana marketing cooperatives are the major sale outlets for banana farmers. Banana marketing cooperatives were directly connected with wholesalers; however, the demand of the wholesalers for the banana appeared to be lower than the potential supply and farmers were therefore forced to sell the product to local traveling traders or retailers. For private farmers, marketing was done on an individual basis. This

**Figure 3. Banana value chain map in Arba Minch district, Ethiopia.**



marketing situation put farmers' bargaining power on prices lower and they had to accept what the buying traders offered in order to avoid loss due to lack of an alternate market.

Smallholder farmers performed the functions of land preparation, growing/planting/, protection (from weed, pest/disease, and animals), maturity checking, harvesting and transport to the road-side for loading on the truck. They hired casual labor for land preparation, planting, weeding, desuckering, watering, and harvesting. The harvested bananas were transported to the roadside by animals and human shoulders, particularly daily laborers. They were also responsible for post-harvest handling activities before loading to the truck on the roadside. We observed that farmers use banana leaves as packaging material for banana fruit (Figure 4).

According to experts from Arba Minch research center, the improved banana varieties produced in Arba Minch were giant Cavendish, Medium Cavendish (Williams), Dwarf Cavendish and other local varieties. Farmers were asked whether they use a local or an improved variety of banana suckers. The largest proportion of the producers (84%) responded that they grew medium Cavendish and the remaining farmers grew giant Cavendish, Dwarf Cavendish, and other local varieties. The main reason they would like to grow medium Cavendish varieties was that its high productivity and better disease resistance than other varieties in the district.

Regarding the method of banana growing, about 72% of farmers reported that they grew banana in a mono-cropping system while 21% stated that at the start of banana cultivation they intercrop banana with maize and sometimes with sweet potatoes. After three months, they harvest the maize or sweet potato and in the later stage, banana grows alone. They use maize and

**Figure 4. Banana plantations and harvested banana fruit waiting for collectors at road side in Arba Minch.**

Source: Authors



**Figure 5. Banana leaves and sucker management in Arba Minch.**

Source: Authors



sweet potatoes for their home consumption and banana for marketing. About 7% of farmers responded that they were using both intercropping and mono-cropping methods.

Farmers were also asked whether they use chemicals like inorganic fertilizers, pesticides, and insecticides for banana production, all farmers responded that they did not use chemicals for their banana production. Regarding water, they noted that their banana production was based on both irrigation and rainfall conditions. Their sources of water for irrigation were river diversions and ponds by using gravity-fed irrigation schemes.

Farmers involved in the focus group discussions were asked about the banana weed, sucker removal, and watering. They said that the banana weeding was done by the manually by using a machete every 2 to 3 months (Figure 5). Concerning sucker removal and watering, the farmers removed suckers once and applied irrigation water twice in a production cycle. Farmers left 4–6 banana plants on each mat. Farmers were not aware of leaf removal, banana fruit protection (deflowering, removal of lateral fingers, dehanding and removal of bunch inflorescence).

Farmers stated that diseases and pests are rarely occur on the banana plantations in Arba Minch. The main reason was that the ecology of Arba Minch is not suitable for the occurrence of, particularly banana disease. However, as we mentioned in the introduction, there were outbreaks of banana diseases in Arba Minch. This might be related to the farmers' awareness of the symptoms of banana diseases.

Farmers were also asked about constraints for them to market of banana in the district. They reported that lower price, a lack of organized market information, cheating in banana weight balance measurements, trader interconnection, farmers limited awareness on benefits of joining farmers organization, an advance loan provided from traders, lack of a common banana marketing

center, lack of cooled facilities, refrigerated truck, quality control and standards, poor packaging and lack of alternative markets were constraints in banana marketing for farmers.

#### 4.3.3. *Banana marketing cooperatives*

Banana marketing cooperatives, in Arba Minch, were formally organized and owned by smallholder farmers in order to market their banana. Organized farmers supply banana to their cooperative and on the other hand, they jointly own the cooperative due to their membership. According to experts from the cooperative and marketing office, only five were active in Arba Minch from nine formally organized banana cooperatives. The number of members varied among the cooperatives. Cooperatives had their general manager and other committee members elected from their member farmers. Cooperatives performed the functions of market linkage, price negotiation and quality control for their members. Cooperatives sold banana to a wholesaler on behalf of its members. From the total produced bananas in the district, about 21% marketed through the cooperative outlet. Experts from the marketing cooperatives expressed that good quality bananas were supplied by farmers who used irrigation whereas lower quality bananas were supplied by farmers who grew their bananas under rain fed conditions or in area with a low water table.

The cooperatives are unable to break the trader network and lack the bargaining power to decide on the banana price. Management committee members of cooperatives lack skills in business management and market linkage. The organization also has organizational problems in terms of lack of human resources, materials, and finance. Moreover, lack of cooled store and refrigerated truck, lack of quality control system, absence of grading and leveling, and poor packaging system limit cooperatives' potential to accommodate total supplies of banana from its members. As a result, farmers organized in the cooperative were forced to sell their banana to traveling traders.

#### 4.3.4. *Local traveling traders*

These are sometimes called farm gate collectors. They are village-based middlemen who meet banana farmers at their farm gate or roadside to purchase newly harvested banana and transport to wholesalers who live in the major regional and central markets. Traveling traders bought 6.5–10 bunches as one quintal (100 kilograms) while a single bunch could weigh anywhere from 15–20 kilograms. Cheating with the banana weight during balance measurement was common among traveling traders. Traveling traders provide credit to farmers for future banana purchases. Each traveling trader has its own network with wholesalers from Addis Ababa and other major cities throughout the country. They perform collection, weighing, loading, transporting and unloading functions in the banana value chain in the district. They load banana bunches onto open trucks covered with banana leaves for transportation. Their workers (handlers) usually stand, sit, or walk on the banana fruits during loading (Figure 6). This careless handling leads to mechanical injuries to the banana fruits. It was found from results that about 77% of bananas were marketed through traveling traders in Arba Minch.

**Figure 6.** Figure bananas weighing and loading by traveling traders in Arba Minch.

Source: Authors





**Figure 7. Banana retail market in Hawassa, Ethiopia.**

Source: Authors



#### 4.3.5. Wholesalers

The result from interview and checklist showed that wholesalers were involved in buying the banana from marketing cooperatives and/or traveling traders and supplying to retailers. Before buying the bananas, wholesaler collected information on market prices and the amount available in the area. Then, they set the price for the banana and informed for traveling traders and marketing cooperatives to transport to their store, which is in the major urban areas. They had an agreement with marketing cooperatives to cover transportation costs of banana from Arba Minch to their store. Wholesalers usually store bananas for a maximum of two to three days depending on their qualities. They dehanded bunches of bananas, sort and distributed to retailers via the open wooden box. Some wholesalers distributed bananas without dehanging the bunches. They had more access to communication networks and had more financial capability than other actors in the chain.

#### 4.3.6. Retailers

Retailer involvement in the banana chain included purchasing from wholesalers, transport to retail shops, displaying and selling to consumers. They are the last link between the farmers and consumers. Retailers not only sold banana but also traded other fruits (Figure 7). They kept small amounts of banana with avocado, mangoes, oranges, and other fruits in their retail shop and/or open market. They mostly bought from wholesalers and sometimes directly from the farmers. There were urban and rural retailers in the study area. Rural retailers are based in rural markets or roadside selling and are involved in direct purchase from farmers. They sell to rural consumers. Urban retailers like supermarket, and street and open market vendors sell to urban consumers. It was found that about 98% of banana in Arba Minch is marketed through urban retailers in Addis Ababa, Hawassa, and other major cities while the remaining 2% traded through rural retailers.

Consumers of Arba Minch bananas were individuals, households, cafés, restaurants, hotels, and schools. They perform the functions of buying and utilizing the bananas.

#### 4.4. Banana chain supporters and their role

Supporters were essential for banana value chain development. In Arba Minch, there are many organizations supporting the banana value chain in one or another way. They provide supportive services including improved banana varieties, training and advice, information and other agricultural inputs for banana producers in the chain. Improved banana varieties and practical training on raw planting, soil management, weeding, water and compost applications, and post-harvest handling were provided by the agriculture and rural development office, Arba Minch University and LIVES (Livestock and Irrigation Value chains for Ethiopia Smallholders) project. Banana marketing cooperatives provided advice and training on maturity testing, post-harvest handling, and marketing for banana farmers under the membership of cooperatives in Arba Minch. They provide advices on business plan development and other capacity building training for organized banana marketing cooperatives. Furthermore, NGO (LIVES) supported farmers by advice on market linkage and supply of calibrated weight balances measures through cooperatives. They supported the government agriculture and rural development office for the construction of irrigation channels for



banana farmers. Arba Minch research center provided improved banana varieties for farmers through agriculture and rural development office. Then, agriculture and rural development office distribute for farmers through their development agents in each *kebele*.

#### **4.5. Banana value chain influencers**

Banana value chain influencers in Arba Minch are agriculture and rural development and cooperative and marketing offices. The agriculture and rural development office is responsible for the improvement of the whole banana value chain in Arba Minch. The office assigned development agents in each village in order to support farmers and coordinate with other stakeholders involved in the banana value chain. The office constructed farmers' training centers in each *kebele*. As a result, other stakeholders used their center to support farmers. Improved banana suckers from the research center and NGO (LIVES) were multiplied at demonstration sites of the farmers' training center under the control of development agents. It also constructed rural road and irrigation channels for banana transport facilitation and irrigation water distribution in the village. The governmental cooperative and marketing office influenced banana value chain through strengthening farmer cooperatives, certifying farmer organization in the form of cooperatives and applying rules and regulation of the government for cooperative formation

#### **4.6. Product, payment and information flow**

##### **4.6.1. Banana product flow**

As illustrated in the chain map (Figure 4) the product flow begins from the farmer and ends with the consumer. The result showed that banana farmers sold approximately 3,242, 88 and 95 quintals of the banana through traveling traders, marketing cooperatives, and rural retailers, respectively. The study identified three major banana channels in the district. They are:

Channel 1: Producer → rural retailers' → consumers = 2.25% (95 quintals)

Channel 2: Producer → traveling traders → wholesalers → Urban Retailers → consumers = 76.75% (3,242 quintals)

Channel 3: Producer → marketing cooperatives → Wholesaler → Urban Retailers → Consumer = 21% (887 quintals).

##### **4.6.2. Information and payment flows**

According to experts in the district, government agricultural development agents are disseminating information on technical practice to farmers, plant management, and post-harvest handling. About 88% of sampled farmers got extension service, though there was a variation in contact frequency with development agents. Information on the quantity of banana flows from producer to traders and consumers. There was no information enabling the traceability of banana products for consumers. The results showed that the information flow among the producers was very limited but there was a high information flow among traveling traders. The wholesalers also had much communication with each other. Overall, there was a horizontal and vertical flow of market information for traders, while horizontal flow information among farmers was limited.

About 74% of the sampled farmers had access to market information on price, quality, and buyers. Their sources were banana marketing cooperatives, traveling traders and rural retailers. The remaining proportion of farmers had limited access to information, which is from their friends and neighborhoods. For private farmers, local traveling traders set a low price for bananas. Proper negotiations between private farmers and traveling traders did not take place. As a result, traveling traders have monopolized banana marketing. Outsiders (traders come from another district) are not allowed to buy bananas. Because traveling traders block information from outsiders or provide credit for banana farmers in advance. On the other hand, banana marketing cooperatives had accesses to market information from wholesalers, but the price for banana was set by the wholesalers.

Market prices (payments) were flowed to producers through rural retailers, traveling traders, and banana marketing cooperatives channels. The result showed that the farm gate price for private farmers ranges from Ethiopian Birr (ETB) 3 to 5 per kg whereas for cooperative members it was ETB 5 per Kg and varies according to information they received from wholesalers. The average farm gate price was ETB 4.25 per kilogram. The average farm-gate price for private farmers was ETB 3.85 per kilogram whereas cooperative members were paid ETB 5.00 per Kg. The result showed that there is a significant difference in farm gate banana prices between private farmers and cooperative members where farmers in cooperation got higher prices. Regarding the payment method for the farmers, the traveling traders made advance or immediate payment for the amount of bananas they purchased, while cooperatives made late payment after receiving money from the wholesaler. As a result, private farmers sell to local traveling traders for the advance payment that was made by traders before harvest.

#### 4.7. Profit margin, added value and value shares

In this study, the profit margin calculation included production and marketing costs in the chain. Production cost includes variable and fixed costs of the farmer for banana production of one production season.

#### 5. Production cost

On average, the production cost of banana per hectare was ETB 9457.36 in the 2016 production year. In the same year, the volume of banana produce was 99.16 quintals per hectare and its cost price was ETB 95.37 per quintal.

Regarding the profit margin, the wholesalers' share was highest followed by retailers, traveling traders, and farmers. The share of profit margin for wholesaler, retailer, traveling traders, and farmers were 34.91%, 25.71%, 21.48% and 17.90%, respectively. The gross margin of the farmer

**Table 4. Production cost, cost price and volume of banana produced per hectare**

Activities	Cost in Ethiopian Birr (ETB)
<b>Labor cost</b>	
land preparation	1600
Planting	2560
Weeding and sucker removal	600
Watering	600
Harvesting and transport to road side	1000
Total labor costs	6984
Farm equipment, seeds & land costs	
Banana sucker/seed	1248
Machete	300
Hoe	200
Pickaxe	240
Land Rent	35
Total cost of farm equipment, land and seed	2023
Interest cost (5%) (opportunity cost)	450.35
Total production/operational cost	
Total cost per hectare	ETB 9457.36
Volume produced per hectare	99.16 quintal
Cost price (cost per ha/volume produced per/ha)	95.37 ETB

Source: Survey results, 2016. Note that farm equipment (machete, hoe, and pickaxe was used for one production period only. Quintal is a measurement unit equivalent to 100 kilograms.

**Table 5. Profit margin and value shares of producer and traders in Arba Minch**

Items (measured Birr/Qt)	Farmers	Traveling traders	Wholesalers	Retailers	Horizontal sum
Purchase price	-	425	670	1150	1800
Production cost	95.37	-	-	-	90.83
Marketing cost	-	-	-	-	-
Labor	25	10	11.5	18	54.5
Transport cost	-	12	20	15	35
Storage/shop house rent	-	-	20	100	120
Tax	-	8.4	172.5	23	195.5
Spoilage	180	65	13	115	308.71
Total marketing cost	205	95.4	237	271	713
Total cost	300.37	95.4	237	271	899.23
Sale price (Revenue)	425	670	1150	1600	3175
Profit margin	124.63	149.5	243	179	696.13
% share of profit margin	17.90	21.48	34.91	25.71	100
Gross Margin (%)	29.32	22.31	21.13	11.20	83.95
Added value	425	245	480	450	1600
Value Share (%)	26.56	15.32	30	28.12	100

Source: Survey results, 2016.

was 29.32% whereas the gross margin for traveling traders, wholesalers, and retailers were 22.31%, 21.13%, and 11.19%, respectively. On the other hand, each of the chain actors adds value to the product as the product passes from one actor to another. Actors change the form of the product by improving the level by sorting and time utility. The total value addition along the chain was ETB 1600 per quintal. The farmers earn about 26.56% of the final retail price while the traveling trader, wholesaler, and retailer earn 15.32%, 30%, and 28.12%, respectively (Table 5).

The gross margin of the banana value chain declined from farmers to retailers. It was found that the farmer earned the highest gross margin and retailers earned the lowest gross margin in the chain. Gross margin and value share in the Table 5 were based on the average market price of each actor. The distribution of added value share of the actors varied across market channels in the chain. Thus, Table 6 shows the distribution of added value share of the actors between market channels. From the three market channels, farmers got the highest value share from channel 1 (46.67%) and lowest from channel 2 (24.83%) due to the involvement of local traders in the channel. Farmers got higher value share (31.20%) in cooperative market outlet than through traveling traders' networks. Wholesalers got the highest value share from channel 3 (34.62%) and the lowest value shares from a channel 2 (29.67%) from the final retail market.

where,

- ETB = Ethiopian Birr (equivalent to 0.04 Euro at the time of the survey)
- Qt (quintal) = 100 kg
- Average farm gate price for rural retailers was ETB 350 per quintal and rural retailer sells for rural consumers in ETB 750 per quintal

**Table 6. Distribution of added value share of the actors in the marketing channels**

Actors	Farmers		Cooperative		Traveling traders		Wholesalers		Rural Retailer		Urban Retailer		Rural Consumer		Urban consumer	
	ETB/Qt	%	ETB/Qt	%	ETB/Qt	%	ETB/Qt	%	ETB/Qt	%	ETB/Qt	%	ETB/Qt	%	ETB/Qt	%
Unit																
Channel 1	350	46.67	-	-	-	-	-	-	400	53.33	-	-	750	-	-	-
Channel 2	385	24.83	-	-	255	15.45	460	29.67	-	-	450	28.125	-	-	1,550	-
Channel 3	500	31.25	80	5.00	-	-	570	34.62	-	-	450	28.125	-	-	1,600	-

Source: Survey results, 2016.

- Average farm gate price for traveling traders was ETB 385 per quintal
- Average traveling traders selling price to wholesalers was ETB 670
- Average wholesalers selling price to the urban retailer was ETB 1150 per quintal
- Average urban retailer selling price to the consumer, in channel 2 was ETB 1550 and channel 3 was ETB 1600 per quintal, respectively
- Cooperatives added ETB 80 per quintal for service charge.

### 5.1. Sustainability of banana value chain

Sustainability of the banana value chain was assessed through selected indicators related to the local level in the study area, see Section 2.5. The discussion was made with experts on selected sustainability performance indicators of the banana value chain with reference to the Ethiopian situation. Accordingly, we put judgment ranged from unacceptable to best (1 to 5) for the selected indicators. The result obtained by each indicator has been converted into a percentage scale.

As it is shown in Table 7, there are 8 indicators under economic dimension. Thus, the maximum potential score for the economic dimension was 8 indicators x 5 points (best/dark green) = 40. However, the actual ratings for the economic indicators were 1 dark green (1x5), 3 light yellow (3x3), 1 dark yellow (1x2) and 3 red (3x1) = 19. The actual total score by the maximum total score (19/40) = 0.475. The final score for the economic dimension was 19/40 = 47.5%. This is between 40 and 60 percent, which corresponds to light yellow rating or moderate performance. The maximum potential score for the social dimension was 12 indicators x 5 points = 60. The actual ratings of social indicators were 2 light green (2 x 4), 3 light yellow (3 x 3), 2 dark yellow (2 x 2) and 3 red (3 x 1) = 28. Dividing actual total score by maximum total score (28/60) = 0.466. The final score of the social dimension was 46.67%. This is between 40 and 60 percent, which corresponds to light yellow rating or moderate performance. The maximum potential score for Economic dimension was 5 indicators x 5 points = 25. The actual ratings of environmental indicators were 1 light green (1 x 4), 1 light yellow (1 x 3), 2 dark yellow (2 x 2) and 1 red (1 x 1) = 12. The final score of the environmental dimension was 12/25 = 0.48 or 48%, which is between 40 and 60% of the performance score or moderate performance. Therefore, the sustainability performance of the banana value chain related to economic, social and environmental dimensions is as in Table 8.

### 5.2. PESTC analysis of banana chain constraints

Banana production and marketing were limited by political, economic, social, technical, environmental and cultural factors in Arba Minch. Experts, farmers, and traders involved in the focus group discussion were suggested possibilities to enhance the sustainable banana value chain in Arba Minch. Table 9 presents constraints of existing banana chain along with its improvement mechanisms that can enhance the sustainable banana value chain in Arba Minch.

## 6. Discussion

### 6.1. Structure of the current banana value chain in Arba Minch

Farmers organized under the cooperative had relatively better bargaining power than private farmers for the banana price in the chain. As a result, average farm gate prices for cooperative members were higher than for private farmers. This implies that cooperatives empowered farmers to overcome problems line with banana handling, quality control and access to market information. This result has conformity with the study by Beed et al. (2012) in East Africa, who stated that the formation of marketing cooperatives has increased the bargaining position of smallholders by allowing them access to market price information in Ethiopia. This is also in line with the study by Woldu et al. (2015a) about banana production and marketing in Ethiopia, which found that cooperative farmers had higher farm gate prices than private farmers.



**Table 7. Suitability assessment of banana value chain in Arba Minch**

	Indicators	Chain Performance	Judgment scale	Performance score
<b>Economic</b>	Profitability	Revenue earned from banana sales exceeded production and marketing costs for farmers and traders.	5	80-100%
	Added Value shares	30% of the added value was shared by wholesalers while 26.56% and 15% were shared by farmers and traveling trades	3	40-60%
	Chain Governance	Wholesaler set prices without negotiation with farmers.	1	0-20%
	Faire Trade	Traders were not paid a fair price for farmers	1	0-20%
	Diversity of market	Less effort was made to access alternative market channels, in case, relationship with existing traders are discontinued.	3	40-60%
	Productivity	Banana productivity was less than potentials of the area and not adapted to environmental shocks. According to experts from Arba Minch research center, the production potential of the banana is 300 quintal per hectare.	3	40-60%
	Value-adding activities	Only sorting and labeling was done by retailers. There were no processing activities for banana fruits.	2	20-40%
	Product loss	High loss of product due to postharvest handling and logistic problems	1	0-20%
<b>Social</b>	Employment	Created job opportunities for youths	4	60-80%
	Labor condition	No child labor	4	60-80%
	Gender	No gender equality in banana production & marketing. At the farm level, men were engaged in both production and marketing while at retailer level women was engaged in marketing.	2	20-40%
	Transportation	Transported by open truck for long-distance	1	0-20%
	Road	The road from farm gate to the distributor was not uniformly distributed for banana transportation.	2	20-40%
	Market information	100% of the market information was in hands of traders	1	0-20%
	Product information	There was no complete and accessible information on product quality and safety for consumers.	1	0-20%
	Stakeholders Relationship	There was a good relationship between farmers, input suppliers, supporters, and influencers. The relationship between farmers and traders was trust-based.	3	40-60%
	Safety and hygiene	Banana waste released at loading, unloading and marketing area. It affects the health of people in the market.	2	20-40%
	Product quality	Low banana product quality due to careless handling and logistic problem.	3	40-60%
	Farming method	72% of farmers used mono-cropping method	2	20-40%
	Farmers' cooperation for bargaining power	Cooperative members have relatively higher bargaining power than private farmers for the banana price.	3	40-60%
<b>Environmental</b>	Emission of air pollutants	Banana production was free of air emissions. No chemicals used in the production process.	4	60-80%
	Irrigation water usage	Inefficient use and application of irrigation water banana plant	2	20-40%
	Waste management	Inappropriate waste management (deposit of banana leaves at road and marketing center)	1	0-20%
	Soil degradation	Soil degradation due to poor farming practice	2	20-40%
	Biodiversity	Reduction of wild animals and plant species due to the expansion of banana farms. But introduction of new banana varieties	3	40-60%

Source: Case study results, 2016

**Legend**

Chain Performance rating	Points Scored	Percentage Score
Best	5	80-100%
Good	4	60-80%
Moderate	3	40-60%
Limited	2	20-40%
Unacceptable	1	0-20%

Source: Case study results, 2016.

## 6.2. Stakeholders relations in banana chain

Farmers and banana cooperatives were forced to sell their product at the price offered by traders and/or were hardly able to negotiate the price due to fear of loss, in case the product is not sold.

**Table 8. Sustainability performance of banana value chain in Arba Minch**

Economic (Profit)	Moderate score in relation to references
Social (people)	Moderate score in relation to references
Environmental (planet)	Moderate score in relation to references

Source: Case study results, 2016.

Due to a lack of awareness to join cooperatives as well as immediate payment and credit dependency; most of the banana producers sold to traveling traders rather than selling through cooperatives. Wholesalers set the prices and there by influenced the prices of retailers, traveling traders' banana cooperatives and producers. Wholesalers networked with wholesalers in other areas so that they dominated the governance of the banana value chain. They exchanged information on banana prices, local supply situation and the prospects of harvest in their area. The relationship among traders existed with a verbal agreement and high trust. The smallholder farmers were not organized enough to govern the value chain. There was a weak relationship between the banana marketing cooperatives. Each cooperative only had a relationship with traders in their respective market channels.

### 6.3. Gross margin and value shares

Each of the banana value chain actors adds value (price) to the product as the product passes from one actor to another without improving its grade. The only value addition activities were sorting and labeling which was done by the wholesalers and retailers. Compared to traders, farmers operating expense was one-third (33.4%) but their profit margin was less than one-fifth of traders. That means the traders which were for involved collection, transporting and distributing, and selling banana to final consumers took above 82% of the total profit margin whereas farmers involved in the production and bearing the associated risks took only 17.91% of the profit margin in the banana value chain. This disproportionate share of benefits is the reflection of power relations among actors. From the traders, 34.91% of the profit was shared by wholesalers who had the power to determine the price and quantity supplied to the market.

Farmers had the highest gross margins in the chain relative to traders. According to KIT (2008) in principle, the size of the gross margin reflects the amount of labor, expenses, and risk/loss of the perfect competition and transparent information. However, in the banana chain, the market was monopolized by a limited number of traders and market information was not transparent in Arba Minch. Because the production cost for banana in Arba Minch was low in relation to the farm gate price, as a result, the gross margin of the farmer was high. The gross margin of wholesaler was high next to the farmer gross margin. This implies that the wholesaler gross margin was increased by the expenses of other traders and farmers.

According to Royal Tropical Institute (KIT 2008), the size of the value share reflects a number of costs/risks that an actor has put into the chain. The distribution of value share tells us something about the type of product. The banana is a perishable product and is sold without processing in Arba Minch and elsewhere in Ethiopia. All actors sell it by only labeling and sorting. For this kind of product, a consumer has no contribution to value addition activities so that the producer gets the highest value share. Therefore, in reality for Arba Minch banana the value share division was different. Wholesalers have shared the highest value than any actors in the chain. This implies Arba Minch banana chain was not efficient regarding value sharing.

### 6.4. Market channel

Based on the direction of product flow, three different banana market channels were identified in the study. All channels start from producers and end with either rural or urban consumers. The volume of banana transacted in the channels was quite different. The highest volume was

**Table 9. PESTEC Analysis of banana value chain in Arba Minch**

PESTEC	Constraints	Suggested improvement or solutions
Political	Lack of intervention in the banana market to prevent illegal traders	Concerning body should intervene in the banana chain to eliminate illegal traders
Economic	Lack of the modern cooling store and cooling truck.	Support cooperatives to organize cooling stores and trucks.
	Lack of common banana marketing center in Arba Minch.	Organize common banana marketing center in Arba Minch.
	Shortage of road access to transport banana to main roadside/market	Construct all-weather and suitable road in an area where banana is producing
	Advance credit/payment by traders. Shortage of finance to join banana cooperatives	Creating awareness for farmers to access credit from formal financial institutions. Or place credit access for farmers from formal credit sources
	Lack of/limited access to alternative markets	Link farmers and cooperatives with an alternative market outlet like eat fruits and other regional markets.
	Limited access to market information	Access updated market information for producers through mobile, the internet, and local FM radio and television programs.
	Cheating banana weight balance measure	Create awareness for farmers on how to measure banana by using calibrated weight balance measures
Socio-Cultural	Men dominated farming as farming is culturally considered as men's task	Aware farmers and society on the contribution of women labor for banana production and marketing
	Limited awareness of farmers on the importance of joining cooperatives	Train and advise farmers about the importance of joining cooperatives
Technical	Poor Agronomic practice (mono-cropping, lack of crop rotation, over-application irrigation water, poor banana fruit management).	Improve farmers' skill and knowledge on agronomic practices like raw planting spacing, frequent weeding program, soil management, leaf and sucker removal, crop rotation, appropriate irrigation water application. Develop a well-structured irrigation channel that suits for the farmer. Improve farmers skill on compost production, disease, and pest management
	Poor harvesting and post-harvest handling	Train and advice farmers and traders on modern harvesting and post-harvest handling techniques.
	Limited abilities and skills of cooperative management members on business management and linking their organization to different markets	Improve the knowledge and skill of cooperative management members on business management and market linkage through training, advice and experience sharing.
Environmental	Moisture stress and over flooding	Intercropping with legumes plants such as desmodium to keep soil moisture and reduce water stress.
	Reduction of biodiversity	Conserve plant and animal species.
	Soil fertility loss,	Crop rotation to improve soil fertility
	Sanitation and safety problem from banana waste at roadside & marketing area	Use banana waste for compost production and animal feed. Or apply modern solid waste management mechanisms.
	Banana disease and pests	Introduce disease-resistant banana varieties

Source: Case study results, 2016

transacted through the traveling trader channel and the lowest volume transacted through rural retailers' channel. The distribution of the value share of the actors varied across the three channels in the banana chain. Farmers earned the highest value share from the rural retailer channel and

the lowest value share from the traveling trader channel. This implies that the involvement of local traders have reduced the farmer value share in the banana chain. In comparison, farmers earned higher value shares in the cooperative channel than traveling traders. This implies that the cooperative channel is more efficient than the traveling traders channel for farmers in the Arba Minch. Beed et al. (2012) found that banana supply chains to urban markets in East Africa are characterized by numerous links that add little value and result in only a small proportion of the retail price reaching farmers. They confirmed that the efficiency of supply chains is improved by organizing farmers. The study by Woldu et al. (2015a) confirmed that deregulated marketing practice resulted in marketing margin disparities across banana channels in Ethiopia.

#### **6.5. Productivity constraints**

Banana is produced predominantly by smallholder farmers in Arba Minch. The average yield reported by the banana farmers was 99.16 quintal per hectare which is less than the average yield (100 quintals per hectare), reported by Central Statistical Agency (CSA) in Southern Regions of Ethiopia in the 2015 production year. This is caused by the El Nino effect (moisture stress), disease and pest attack, flooding and poor agronomic practice such as inefficient water application, flooding, lack of frequent weeding, lack of leaf and sucker removal, poor mat management, lack of crop rotation, mono-cropping, over canopy and poor harvesting and handling practices. Beed et al. (2012) found that banana productivity in East Africa was limited by poor farm practices linked to small farm sizes. However, a decline in banana productivity was not linked with small farm size in Arba Minch. All reported farmers were not using inputs such as compost, fertilizer, pesticide, and insecticides for their banana production. This implies that a lack of using these inputs contributed to the reduction of banana productivity in Arba Minch. Farmers are not aware of the importance of these inputs for their banana production. Beed et al. (2012) in their banana study found that low use of inputs was a major limitation to efficient banana production in East Africa. Woldu et al. (2015a, 2015b) found that banana production in Ethiopia was limited by poor agronomic practices. Further, Mekonnen (2014) reported that banana productivity was limited by poor agronomic practice and infrastructure in Arba Minch.

Moreover, researchers from Arba Minch research center have reported that the occurrence of banana disease and pests due to the El Nino effect while farmers noted that the rare occurrence of disease and pests in the banana plant. This implies that there are different levels of knowledge and information among stakeholders regarding banana diseases and pests in Arba Minch. Beed et al. (2012) in their banana development research found that there was a lack of skilled workers and extension agents in the banana sector in Ethiopia. This indicates, the development agents assigned to banana producing *kebeles* lack the skill to identify and inform banana disease and pests for farmers and agriculture offices.

#### **6.6. Marketing constraints**

The main constraint challenging the banana marketing system in Arba Minch were the presence of illegal traders, lack of cooling store and truck, the road access to the banana farm, lack of banana marketing center in Arba Minch, advance payments made by the trader for future banana purchase, lack of alternative markets, cheating in weight balance measurement, variability in supply, limited access to updated market information, lack of awareness for farmers to join banana marketing cooperatives, limited knowledge of cooperative committee members about business management and post-harvest handling practice. Woldu et al. (2015a) on their study mentioned that banana market in Ethiopia was constrained by unregulated marketing practices and inappropriate marketing facilities (transportation, packaging, and storage) largely on account of the absence of strong marketing institutions. This coupled with the bulky and highly perishable nature of the produce has rendered more particularly small-scale growers to fraud marketing practices by various intermediaries and obliges them to sell their produce at throwaway prices. Furthermore, in the same year in the different study, Woldu et al. (2015b) explained high yield variability as a constraint for banana marketing in Ethiopia. Studies by Getachew (2010), Beed et al. (2012), and Temesgen (2014) have clarified that lack of market infrastructure and market

information are the main problems that limit smallholder farmer access to the banana market in Ethiopia.

### **6.7. Sustainability performance indicators of banana value chain**

Based on researchers and experts' evaluation, the economic, social and environmental indicators of the banana value chain have moderate sustainability performance with reference to the Ethiopian context. As shown by the economic indicators in Table 4, the total chain is profitable, as the total revenue was greater than the total operational costs. This, however, does not imply economic efficiency, as yield per hectare of banana was less than the regional level for farmers. In addition, added values received by farmers were less than for traders in the chain. This indicates the inefficient earning of farmers from the final retail price in the banana chain. The traders particularly the wholesalers shared a higher amount of profit. This implies farmers have no/less power to decide on the price of the banana in the market. There was limited access to an alternative market for farmers for banana supply while wholesalers have many connections across the country. Concerning value-adding activities, there were no innovative activities that added value to banana products. Moreover, poor logistics in the banana value chain that led to a high amount of loss and reduced the quality and shelf life of the banana. Therefore, economic indicators of the banana value chain have moderate sustainability performance with reference to the Ethiopian context.

One advantage of the banana chain was the limited emission of air pollutants in the production site. There were no or limited pollutants released from banana plant to air. However, there was a safety and hygiene problem in the marketing place that released from banana waste, particularly packed materials. This affects the health of actors involved in the market. On the other hand, farmers inappropriately applying irrigation water for banana production, this reduces the productivity of banana due to waterlogging. There was a reduction of biodiversity such as wildlife and plant species due to a banana plantation. Overall, environmental indicators of the banana value chain have moderate sustainability performance with reference to the Ethiopian context.

Regarding the social dimensions of the banana value chain, there was no long-term business relationship between producers and traders as well as traders and traders. Traders had both vertical and horizontal linkages while producers only had vertical linkage across the chain. The information and communication between farmers and traders were based on trust. Producers had a relation with chain supporters and influencers, but they were unable to break the traders' network. However, the banana value chain has created an employment opportunity for the youth. At farm level, both production and men dominated farm gate marketing while women dominated the retail markets. This implies that men tend to control and dominate large volumes while women are engaged in much smaller volumes in retail markets. The sustainability performance indicators of agronomic practice and product information were insufficient for finding the best configuration of the value chain. Therefore, the social indicators of the banana value chain have moderate sustainability performance with reference to the Ethiopian context.

## **7. Conclusion and recommendation**

### **7.1. Conclusions**

The banana product flow starts with the farmer and ends with the consumer. This flow has three market channels which link farmer directly with either rural retailers, traveling traders or farmer cooperatives. The largest volume was sold through traveling traders channel while the smallest volume was sold via rural retailers channels. The banana payment flow begins from consumers and ends with input suppliers. The market information flow has vertical and horizontal directions in the banana chain. Banana traders have inter-linkage across all regions of the country. They have information about banana prices and available supply whereas producers and cooperatives have limited information. As a result, the traders control the banana chain governance.



The gross margin for the farmer was 29.32% while for the wholesaler it was 22.31%. The share of profit margin for the wholesaler was 34.91% while for the farmer it was 17.90%. The value share for the farmer was less than the share of wholesalers in the chain. This indicates that the banana value share distribution was inefficient across the chain. On the other hand, the distribution of value share for farmer across the market channels range from 24.83% to 46.67% while for wholesalers it ranges from 29.67% to 34.62%. Banana productivity was constrained by mainly poor agronomic practices and moisture stress due to the El Nino effect in 2015/16. Agronomic practice like over use of irrigation water, poor sucker and mat management, fruit management, planting, weed management, and harvesting practices were one of the major factors negatively affecting the productivity of banana. Natural factors like disease and pests also affected banana productivity in Arba Minch. Banana farmers had limited knowledge and skill on agronomic practices of banana production. Banana marketing by farmers in Arba Minch was constrained by lack of market information, traders cheating with weight balance measurements, dependence on credit from traders, presence of none licensed traders (illegal traders), lack of awareness of farmers in joining banana cooperatives, limited experience, and skills of cooperative committee members in business management, limited capacity and bargaining power of banana cooperatives, lack of a common banana marketing center in Arba Minch, and limited alternative markets.

Moving to sustainability, 25 (economic social and environmental) indicators were selected to measure the sustainability performance of the banana chain with reference to the Ethiopian context. These indicators showed moderate sustainability performance on the banana value chain in the study area. An overall conclusion, the finding, and discussion of this research identified political, economic, technical, socio-cultural and environmental constraints of the banana value chain with possibilities to improve sustainable production and marketing of banana in Arba Minch. Therefore, the study attested the positive effect on the development of the banana value chain in Arba Minch

## **7.2. Recommendations**

Based on the findings, discussion, and conclusion, the following are possible areas of intervention for the agriculture and rural development office and other stakeholders which are supporting banana value chain in Arba Minch.

## **8. Agriculture and rural development office**

- ❖ Strengthening the training and advice on the agronomic practice of banana production. The trainers shall comprise development agents and model farmers. Then, show farmers land preparation, planting, weed control, sucker removal, leaf removal, fruit management, irrigation water use, soil moisture control, compost preparation, harvesting and post-harvest handling practice for sustainable banana production and productivity. In the meantime, farmers can easily and practically recognize the difference in yield and production possibly obtained through adopting an appropriate agronomic practices, instead of old and traditional farming practice they have been adopting.
- ❖ Building the capacity of development agents on banana disease and pest management to provide proper advice and awareness for farmers regarding banana disease and pest.
- ❖ Awareness creation needed for farmers on the importance of input use. Therefore, constant advice should be given for farmers on the use of inputs to increase productivity.

## **9. Marketing and cooperative office**

- ❖ Continuous awareness creation for the farmer to organize and join cooperatives, who could take over the roles of the traveling traders/middlemen.
- ❖ Strengthening the training and advice for cooperative management members on business management and market linkage to improve bargaining power, provide update and regular market information for farmers and create better market linkage.
- ❖ Promote investments in logistics such as a modern cooling store, cooling truck to add value and gain better market price for farmers

- ❖ Support farmer cooperative to organize logistics such as a modern cooling store, cooling truck to add value and gain better market price.
- ❖ Support investment in the organization of banana marketing center in Arba Minch where buyers and sellers meet and negotiate. It enables farmers to have better access to market information.
- ❖ Putting in place credit service provision for banana farmers for routine and guaranteed household investments so as to reduce their dependence on local traders. This will increase the confidence of the banana farmers on the sustainability of the banana cooperatives.
- ❖ There should be a well-coordinated, reliable, up to date market information delivery service to farmers. Such market information should include product price and quality of the required product.

## 10. NGO (Livestock and irrigation value chain for Ethiopian smallholders)

- ❖ Strengthen the supply of calibrated weight balances measure for banana farmers. The development agents from agriculture and rural development office should advise farmers on the proper implementation of calibrated weight balances measurements for banana marketing to reduce cheating on weight balance.
- ❖ Advice needed for farmers and traders on the banana waste management including safety and hygiene at the banana marketing place.

## 11. Research center

- ❖ Introduce improved and disease resistance varieties of banana seed to increase the biodiversity of the area.

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### Author details

Girma Gezimu Gebre<sup>1</sup>  
 E-mail: [girma.gezimu@gmail.com](mailto:girma.gezimu@gmail.com)  
 ORCID ID: <http://orcid.org/0000-0003-4875-8825>  
 Eweg Rik<sup>2</sup>  
 E-mail: [rik.eweg@hvhl.nl](mailto:rik.eweg@hvhl.nl)  
 Albertien Kijne<sup>2</sup>  
 E-mail: [albertien.kijne@hvhl.nl](mailto:albertien.kijne@hvhl.nl)

<sup>1</sup> Department of Agricultural Economics, Aksum University, Aksum, Ethiopia.

<sup>2</sup> Van Hall Larstien University of Applied Sciences, The Netherlands.

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### Note

1. Kebele is the smallest administrative unit next to Woreda (district) in Ethiopia.

### Cover image

Source: Author.

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