Review paper

Review on Mango (*Mangifera indica*) value chain in Dilla Zuriya District,

Dilla Ethiopia

Abstract

Dilla Zuriya have suitable agro-climatic condition for production of horticultural crops. There are ample garden mango trees in Dilla zuriya at farmer's holdings. The livelihood of most of these farmers is highly supplemented by sale of mango fruits and other horticultural. The analysis of sub sector was done to identify general constraints and causes of main problem. Information for the analysis of sub sector was gathered through a desk study from a wide range of secondary sources. In addition to reliance on personal experience as a player in the sector, there was also personal communication by email to agricultural officer in the district. After reviewing existing data, contextual factors surrounding Mango value chain were identified. The analysis of gathered information done using different analytical tools i.e. PESTEC, chain map, problem tree and SWOT. Dilla zuriya smallholder farmers earn less income from mango production because of post-harvest losses, low price of mango and low productivity that results limited capital to improve their farm and low living standard. The yield is low as compared to other mango growing areas in Ethiopia. Most farmers are use poor harvest and post-harvest handling practices due to lack of awareness and lack post-harvest handling technologies. In addition, they are having limited access to central market. These problems are not caused because of a single actor. Solving these problems need collaboration between different stakeholders in the chain. So stakeholders must work hand in hand to improve the smallholder farmers' income and sub sector in the district.

Key words: Mango Value chain, production challenges and opportunities

1. Introduction

1.1 Over view of mango sub sector in Ethiopia

The fruit production in Ethiopia has been small compared to other crops but it has a great potential since the climate is favorable for many horticulture products. According to Humble and Reneby (2014) the mango industry in Ethiopia is in its infant stage. However, mango is grown in many parts, mainly in the west and east of Oromia, SNNPR, Benshangul and Amhara regions (Hussena and Yimerb*a*, 2013). Mangoes contributed about 12.61% of the area allocated for fruit production and took up 12.78% of fruit production in comparison to other fruits growing in the country and the annual consumption of mango by the processing plant at full production capacity is 8.6 tones which is only 1.8% of the current production of mango (Elias, 2007).

According to FAOSTAT (2010) the total cultivated area for mango in Ethiopia is not more than 12, 000 hectares. The highest annual production estimate in the past five years is 180,000 Mt and more area coverage is expected in the south-western and other parts of the country due to more conducive climatic and edaphic factors. According to Yeshitela (2004), even if the farmer's livelihood is highly supplemented by the income from their mango trees, there is a declining trend in yield and quality of mango trees.

1.2 Description of the study area

Gedio Zone is one of the 13 Zones of Southern Nations and Nationalities Peoples Regional State (SNNPRS) of Ethiopia; it has six rural Districts; Dill Zuria, Wenago, Yirgachefe, Kocherie, Bule and Gedeb. Dilla town is found on the main road from Addis Ababa to Kenya, 375 km south of the national capital, and 90 km south of hawassa (Ethiopian Mapping Authority, 1988). The Dilla Zuria district has 17 peasant associations (PA) and it is 1 kilometers far from Dilla town. Dilla Zuriya is a potential area for production of different horticultural crops (CSA,2013).

1.3 Mango production in Dilla zuriya

Dilla Zuriya have suitable agro-climatic condition for production of different horticultural crops including Mango, Avocado, coffee, enset, sweet potato, taro and cabbage. There are ample garden mango trees in Dilla zuriya at farmer's holdings. The livelihood of most of these farmers

is highly supplemented by the sale of mango fruits and other horticultural products (Taddesse, 2016).

1.4 objectives

The objective of the review was:

- To identify general constraints in mango chain in Dilla Zuriya district
- To identify the causes of the main problem
- To formulate preliminary recommendations for the areas of intervention

2. Methodology

2.1. Data collection

Information for analysis was gathered through desk study from a wide range of secondary sources such as books and journals and Internet services using Google and Google scholar. In addition to reliance on personal experience as a player in the sector, there was also personal communication by email to agricultural officer in the district.

2.2. Process related to the problem statement

After reviewing existing data, contextual factors surrounding Mango value chain were identified. A PESTEC analysis was done. Analysis of quantitative data, qualitative aspects of the chain, information flow and quality management was done. Constraints facing the chain were also identified. This process led to the identification of the main problem affecting the Mango chain in Dilla Zuriya district.

3. Value chain analysis

3.1 Stakeholder Analysis

3.1.1 Actors of mango value chain in Dilla Zuriya

Input supplier

Dilla agricultural office is the first actor who supply input for Dilla zuriya farmers (Taddesse, 2016).

Producer

There are 2000 small scale farmers in Dilla zuriya district (Taddesse, 2016). They are the one

who produce the mango and supply to the next actor in the chain.

Collectors

In supply chains of mango, it is common with a large number of middlemen, which can complement the undeveloped infrastructure. Middlemen are the one who buy mango directly on farm and sell it to wholesalers or directly to retailers.

Wholesalers

There are two types of wholesalers in this sub sector. The first is Dilla wholesalers, these wholesalers mostly buy mangos from middlemen. The second wholesaler is Addis Abeba wholesalers, they directly buy mangos from Dilla Zuria farmers (Taddesse, 2016).

Processing

Processing is apparently limited to juice making where cafes or juice houses takes the leads in preparation.

Retailer

Retailers are the ultimate sellers in the market chain that purchase and deliver mango to consumers. There are different retailers in the chain; open market retailers, Juice Cafes, fruit shops, street vendors. The retailers buy mango from wholesalers or middlemen and sell to the end users in Dilla town or Addis Abeba (central fruit market). Mostly 80% of retailing in open market and street vendor is done by women and the rest 20 % by children (Taddesse, 2016).

Consumers

Consumers are end user in the value chain. There are different types of consumer in the area; i.e. Dilla town consumers, institutional consumers and Dilla Zuria (Village) consumers.

3.1.2 Supporters / facilitators in mango value chain in Dilla Zuriya

Dilla University is one of the governmental institution which is found in Dilla. The research and dissemination office of Agriculture College in this university select horticultural crops including Mango as a priority area for development and promotion of the sector in the district for the year of 2016-2017. Currently the horticulture department in this university is conducting researches on challenges of mango in the district. Dilla University also support the farmers by giving training in different aspects of the subsector. District agricultural offices another facilitator in the chain.

They support small scale farmers at the district by providing impute, giving training through extension and reporting the problems of the area related to agriculture. Depending on the information get from District agricultural office Ministry of agriculture and rural development (MOAD) try to help the farmers, reforming strategies and making policies, also support by financing the extension work, training and capacity building activities (Taddesse, 2016). OMO micro finance also provide financial support for small scale farmers who are able to return. Awada research center also supports the producers through giving extension services and trainings.

3.2 External factors of influence in the Mango value chain

3.2.1 Importance of the chain

CSA (2013) showed as mango is one of the second potential fruit crop produced in Ethiopia next to banana. MoARD identified Mango as one of the fruits and vegetable products with potential for export and aimed to increase the land under mango cultivation to reach more than 12,000 ha in the selected regions of Oromia, SNNPR, Amhara and Tigray (Honja, 2014). Gedio zone is found in SNNPR region. It is suitable for production of different horticultural crops including Mango, coffee, enset, sweet potato, taro, Ethiopian cabbage and Avocado. From six rural Districts of the Gedio zone; Dill Zuria, Gedeb and Bule districts are known by fruit and vegetable production. But Bule is the only highland district which is suitable for production of highland fruits including apple. Dill Zuria have suitable agro ecological condition for production of Mango and other vegetables. The other districts are highly dominated by coffee production (Kebedome *et al*., 2015**;** Taddesse, 2016**)**.

3.2.2 Contextual factors in mango value chain

Mango production and value chain in Ethiopia is in fluctuated conditions, because of occurrence of diseases, lack of proper management and lack of adequate infrastructure (CSA, 2009). According to CSA (2013) cropping season mangoes contributed about 14.21% of the area of land allocated for fruit production and holds 14.55% of quintals of fruits produced in the country. However, less than 2% of the produce is exported. The mango fruit processing industry in Ethiopia is very weak, considering the substantial amount of fruit that is grown in the country. The national research system has developed a number of varieties but is not widely spread.

Since Gedio Zone is remains a major center of the coffee trade most of the concerned governm ental and non-governmental stakeholders don't give much emphasis for fruit production. There i s no farmer union or cooperative amongst mango growers in the Zone. Smallholder farmers in Dilla Zuriya intercrop mango with coffee, taro, chat, avocado and banana. They do not give attention to spacing. The small farm holders in Dilla Zuriya are mainly confined to local or traditional varieties (Taddesse, 2016). Most of the farmers have plant two types of local varieties,
which are not identified by names. These local varieties are fibrous (Timoteos, 2009). Research and dissemination and extension services to promote improved, marketable mango varieties introduction is also limited. There are also pre and post- harvest losses of mango in dilla zuriya. Major loss of mango also occurs during harvesting between the field and market because of har vesting methods, maturity of the crop, use of inappropriate harvesting materials and poor infrast ructure. A study conducted by Tadesse (2011) identified that anthracnose and stem- end rot are important post- harvest diseases in mango production. Generally, these problems in post- harvest handling and management practices can relate with lack of knowledge, skills and faciliti es in
production and agronomic practices, harvesting, post- harvest handling and limited capacity in R&D and extension services to promote improved and marketable mango varieties introduction, prevalence of mango fruit diseases and pests (Timoteos, 2009).

In supply chains of mango, it is common with a large number of middlemen, which can complement the undeveloped infrastructure (Taddesse, 2016). The producers also face problem to deliver their products for potential market (Addis Abeba) because of lack of adequate infrastructure and majority of producers has small holdings and cannot afford to own their own transport vehicles. Smallholder farmers use pack animal (donkey), human back and cart as means of transportation during marketing of mango (Seid and Zeru, 2013).

3.2.3 External factor analysis

Table 1. PESTEC of Mango value chain

Political factors	• Reforming strategies and making policies • Inadequate institutional framework • Poor governance • Weak governmental support
Economic factors	• Small size farm • Price disincentives for smallholder farmers • large number of middlemen who lower prices for producers and wholesalers
Social factors	• Unorganized producers leading to exploitation by middlemen
Technological factors	• harvesting and post-harvest handling equipment • Lack of improved Variety • training on agronomic and management practices
Environmental factors	• Favorable agro-climatic condition • Prevalence of disease and pest
Cultural factors	• Using traditional transportation system • Involvement of only female and children in open markets and street vendor

3.3 Quantitative Analysis

Volume of mango produces and productivity in the district

There are 2000 mango growers in Dilla zuriya district. The volume of production of mango was about 41,100 in the year of 2015. Average productivity of 137 quintals per hectare of mango in the same year as reported by Dilla agricultural office (Taddesse, 2016). This productivity is low as compared to other mango producing areas; evidenced by Garedew and Tsegaye (2010) and Shumeta (2010) who reported better average yield of 156-780 qt per hectare reported in the southwestern part of Ethiopia. From the total amount of mango produced by small scale farmers and 70 percent (28770 quintals) of mango pass through middlemen and 20 percent (8,220 quintals) is sold by them self (small scale mango growers) in their village and. There are some small scale farmers who have directly link with Addis Abeba wholesalers, from the total amount of mango produced the rest 10 percent (4110 quintal) is taken by Addis Abeba wholesaler.

Table 2.purchasing and selling price of mango for different actors

Actors	Purchasing price /kg	selling price ETB /kg	Added value (ETB /kg)
Farm get of small scale farmer	-	2.5	2.5
Farm get of small scale farmer (small scale farmers who have direct link with Addis Abeba wholesalers)	-	3	3
Middlemen	2.5	5	2.5
Addis Abeba Wholesaler	3	10	7
Dilla wholesaler	5	8	3
Open market retailers	8	10	2
Fruit shop retailers	8	11	3
Street vendor retailers	-	2	2
Piazza retailers	10	15	5
Juice cafes	8	45	37
Total			67

Source: Taddesse, 2016

3.4 Qualitative Analysis

3.4.1 Chain relations

Actor relations

There are 2000 small scale farmers in Dilla zuriya district (Taddesse, 2016). They are the one who produce the mango and supply to the next actor in the chain. Most middlemen buy mango directly on farm and sell it to wholesalers or to retailers in Dilla town. Some time they are the one who fix the price on farm level. The wholesalers trade the mangos for Dilla town retailers, Juice houses and to small fruit shops. There are also other wholesalers (Addis Abeba wholesalers) who have a direct link to some of the small scale farmers and buy directly from the

farm. This wholesaler sells their fruit for Piazza retailers (which is a valuable fruit and vegetable market in Ethiopia). The retailers in Dilla buy mango from wholesalers or sometimes from middlemen and sell to the end users in Dilla town (Taddesse, 2016). Juice houses are the one who change mango fruit into processed goods like juice.

Chain coordination and power

The middlemen are the co-coordinators in the value chain. They have access to market information with regard to prices which producers lack. The middlemen control the largest part of value chain as they are involved in collection of mango directly on farm and sell it to wholesalers or to retailers in Dilla town which can complement the undeveloped infrastructure.

Vulnerable relations

The producers are the most vulnerable actors in the chain. Since Gedio Zone is remains a majo r center of coffee trade most of concerned governmental and non-governmental stakeholders do n't give much emphasis for fruit production. Most of farmers have plant two types of local varieti es they don't have access to improved verities (Timoteos, 2009). Research and dissemination a nd extension services to promote improved, marketable mango varieties introduction is also limited in the zone. Lack of adequate infrastructure, lack appropriate harvest and post-harvest handling facilities with perishable nature of the product sometimes forced them to sell their mangos at lower price. Additionally, Emana & Gebremedhin, (2007) stated that a seasonal nature of the product and price is inversely related to supply. During peak supply period, prices decline. The situation is worsened by the perishability of the products and poor storage facilities. Small scale producers often do not have any direct communication with traders but only through middlemen (Emana & Gebremedhin 2007). There is no farmer cooperative amongst mango gro wers in the Gedio Zone. Lack of organization in to marketing groups or cooperatives also make producer vulnerable as they lack bargaining power in market.

3.4.2 Gender aspects

Mostly women and children are the one who involve in retailing of mango for consumers. Culturally retailing of fruit is considered as female and children work in most part of Ethiopia. Especially in direct sell of mangos in street vendor and open markets around 80% of retailing is done by females and the rest 20 % is done by children (Taddesse, 2016).

3.4.3 Sustainability profile

People standard

Basic needs – in most mango growing areas, basic facilities such as good health care and education facilities are inadequate.

Discrimination – most Gedio zone district are marginalized and are not given as much attention as other areas in the country in terms of infrastructural development.

Access to water – most Dilla zuriya areas lack clean and adequate water facilities for their consumption. This forces them to use unclean water.

Planet standards

Natural resources – most farmers intercrop mangos with other plants like avocado, coffee, taro, this is a best way for diversification of natural resource.

Profit standards

Fair and clear agreements – mango growers do not make any agreements with the market forces and thus they are prone to exploitation by middlemen (Taddesse, 2016).

Market infrastructure – markets are not well organized in mango growing areas.

Market power – small scale mango growers lack market power as it is in the hands of middlemen and traders who control the markets. This makes them vulnerable actors.

3.5 Information Flow

3.5.1 Market institutions

It is common in Ethiopia that majority of mango producers sell their products to middlemen and nearby local village market (Humble and Reneby ,2014). The main central market for horticultural products in Ethiopia is in the capital Addis Ababa. Addis Abeba is around 347 km. far from Dilla. Geographic position of many producers where they face long distances to central and valuable markets. The infrastructure for both regarding information and distribution are not suitable in Gedio zone. In addition to the infrastructure problem most of small scale producers do not have capital to distribute their product to potential market.

3.5.2 Price information and Information flow within the chain

The producers often have low amount of information as the farmers and traders often do not have any direct communication about price information with each other but only through middleman. But some of the farmers have direct communication about the price and amount of product with Addis Abeba wholesalers by telephone (Taddesse, 2016).

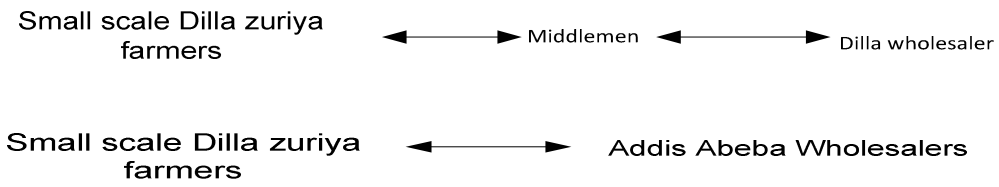

Figure 1. Information flow within the chain

3.6 Quality Management

3.6.1 Quality attributes

Intrinsic attributes

- Safety and Health–mostly in open market and street vendor the mangoes are not safe because in this market arear its comment to sell mangos by putting in plastic sheet in the ground. Most of this places are not safe because mostly this places are not clean and there is contamination of mangos with dust and other dirties. There is also mixing of different type of mangos; defected, rotted, ripen, over ripen and unripen mangos this can hasten the deterioration and reduce nutritional value of the products.
- Sensory – since I am one of the consumer of Dilla zuriya mango the test and odor of mango is good from consumer point of view.
- Shelf life –since mango is a perishables fruit it needs proper management to prolong shelf life. The shelf life of the mango is reduced because of lack of proper pre and post-harvest management methods, poor storage facilities and transportation method.
- Convenience – mango is convenient to use as a fresh or as juice form by making simple processing even at house hold level.

Extrinsic attributes

- Production system characteristics – Most mango growers in Ethiopia utilize organic inputs (Humble and Reneby, 2014). However, inadequate input, disease and pest may affect the quality of the mango.

3.6.2 Quality standard and management system

There are no quality standards for fruit in Dilla zuriya district. Actors on all levels sort mango but there is no official grading or sorting system. Some actors also desire quality controls at the markets (Taddesse, 2016). Mostly its done based on physical appearance, size, maturity, color,

defects and Sorting of mango produce are principally carried out on farm gates and at primary procurement centers through premises of primary procurers (Local collectors). Thus, it is sorted according to consignment needs of collectors where under-grades such as: Shrunken, smaller sizes and punctures are reasonably expelled from transactions. But under-grads are commonly consumed in farming household as best child foods (Tadesse, 2011).

3.6.3 Factors affecting quality

It is important to harvest mango fruits at a suitable stage of maturity since this determines the quality of the fruit and its durability. In Dilla zuriya practices for harvesting mango done by use of picking hooks, shaking of trees and knocking down fruits with wooden sticks and hand picking from the ground are a common practice. Fruits from the lower part of the tree can be harvested by hand while a picking pole is used for the fruits higher up in the tree. Pickers reach the fruit by climbing the trees or using ladders. Most of harvesting practices causes fruit droppings that may cause fruit cracks and physical injury at any time (Humble and Reneby, 2014; Taddesse, 2016). Which indicated cuts, punctures and bruises has increased ethylene production and hastened fruit softening and ultimately caused mechanical injuries and decay. On the other hand, pulling the fruit from the tree, causes scars where the stem was situated or damage on the skin (FAO, 2005).

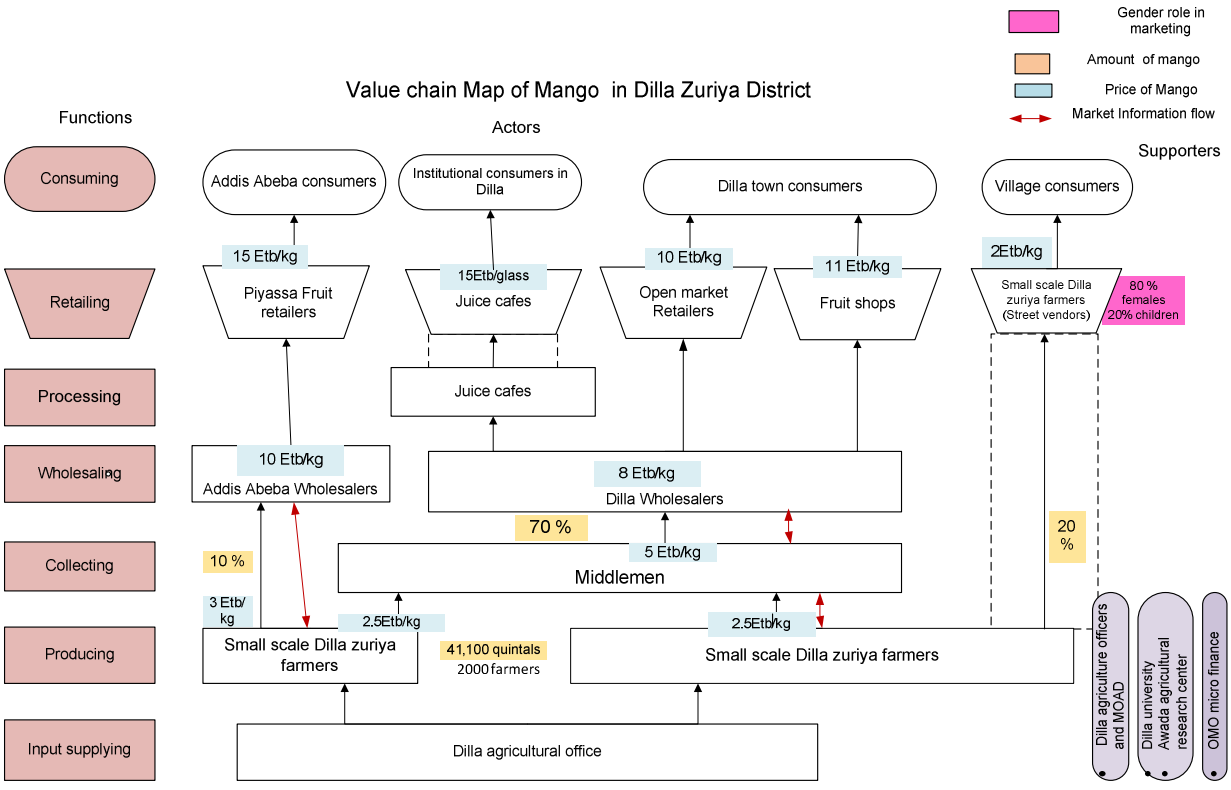

Figure 2. Value chain map of mango in Dilla zuriya district

4. Problem Related to Mango Value Chain in Dilla Zuriya District

4.1 Constraints in Mango value chain

Tadesse (2011) and Humble and Reneby (2014), identified the following constraining factors in Mango value chain. These findings also supported by Tadesse (2016).

- Prevalence diseases (anthracnose and stem- end rot) and pest
- Poor agronomic and management practices
- Low productivity
- Lack of knowledge and skills on harvest and post-harvest handling
- Lack of proper harvest and post-harvest handling facilities
- Poor infrastructure with a large number of middlemen
- Pre and Post- harvest losses
- Perishable and seasonal nature of the product with poor storage facility
- Lack of improved and marketable mango varieties
- Poor marketing infrastructure
- Poor market organization and information
- Price disincentives for smallholder farmers
- Mango Processing industry in Ethiopia is very weak
- Limited access to credit service
- Lack of coordination among producers to increase their bargaining power
- Gedio zone is dominated by coffee production
- Limited Research and dissemination and extension services

4.2 Problem statement

The productivity of mango in dilla zuriya is low as compared to other mango producing areas in t he country. Most of producers have limited access to improved and marketable mango varieties, there is also disease and pest problem. Most farmers use poor harvest and post-harvest handli ng this can causes high post-harvest losses because of perishable nature of the product. In addi tion, producers have limited market access to sell to valuable markets because of lack of adequate infrastructure both regarding information and distribution. Geographic position of many producers where they face long distances to central and valuable markets which can result low price of their product. These problems have direct effect on small scale farmers' income and livelihood. It can limit their capacity to improve their farm.

4.3 SWOT analysis

Table 3. SWOT analysis of Mango value chain in Dilla zuriya district

Strength	Weakness
• Good quality mango • Potential to increase productivity • Payment received at delivery • Organic input utilization	• Seasonal and perishable nature of mango • Pre and Post- harvest losses • Poor agronomic and management practices • Lack of knowledge and skills on harvest and post-harvest handling • Low productivity • Lack of coordination among producers to increase their bargaining power • Lack of improved and marketable mango varieties
Opportunities	**Threats**
• Favorable climatic conditions for production • Transformation and development plan • High market demand • Flexible crop for diversification-Can easily be combined with annual crops • Opportunity to increase yield	• Prevalence diseases (anthracnose and stem- end rot) and pest (fruit fly) • Mango Processing industry in Ethiopia is very weak • Poor harvest and post-harvest technology • Poor marketing infrastructure • Poor market organization and information • Poor infrastructure with a large number of middlemen • Price disincentives for smallholder farmers • Limited Research and dissemination and extension services • Limited access to credit service • Gedio zone is dominated by coffee production

4.4 Problem Tree of mango sub sector in Dilla zuriya district

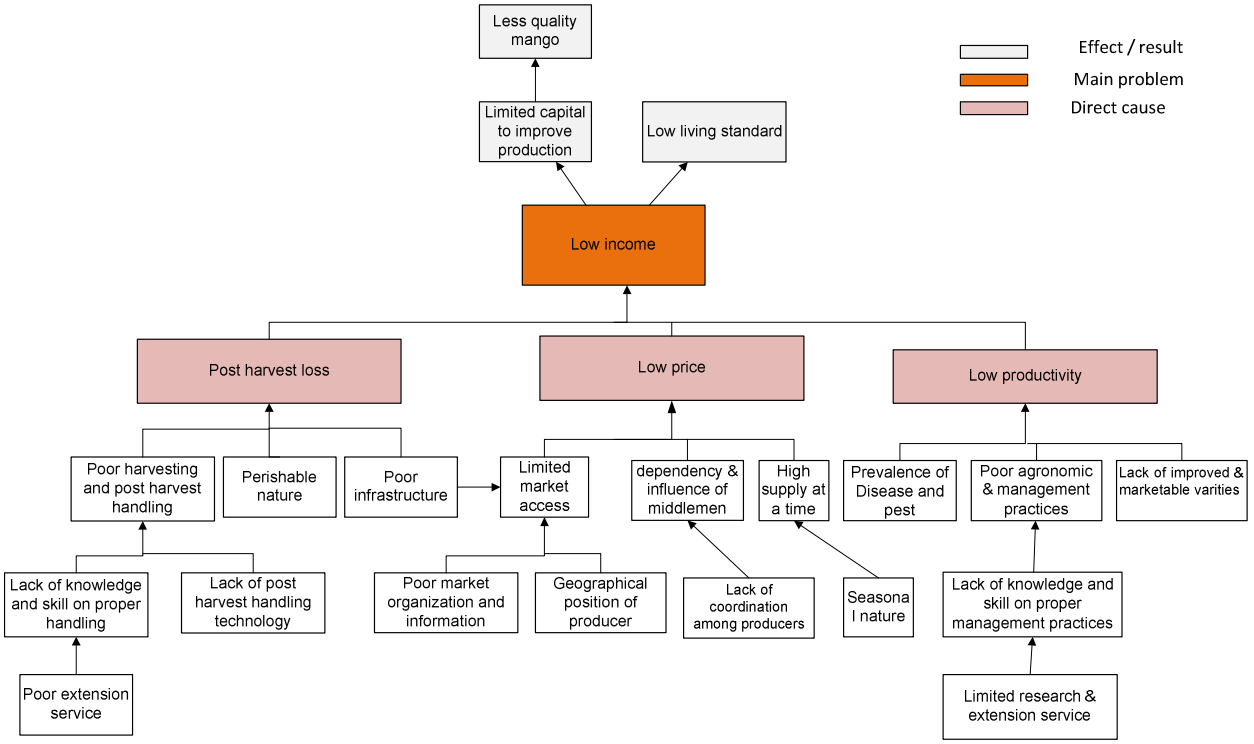

Figure 3. Problem tree of mango sub sector in Dilla Zuriya District

4.5 Problem definition

Dilla zuriya smallholder farmers earn less income from mango production because of post-harvest losses, low price of mango and low productivity that results limited capacity to improve their farm and low living standard.

5. Conclusion and preliminary recommendations

Dilla zuriya have a suitable agro-climatic condition for production of mango. The producers are not getting enough income from this sub sector. The yield is low as compared to other mango growing regions in Ethiopia. Since mango is perishable fruit it needs proper handling to maintain its quality in order to sell in better price but most farmers are use poor harvest and post-harvest handling practices. In addition, they are having limited access to central market. These problems are not caused because of a single actor. Solving these problems need collaboration between different stakeholders in the chain. So stakeholders must work hand in hand to improve the smallholder farmers' income and the sub sector in the district.

❖ **Preliminary recommendations**

- Improve market Infrastructure for information and distribution as well as producers' access to this information.
- Create horizontal relationships between farmers' in order to build cooperative or association. This helps to reduce the dependency and influence of middlemen in the chain. Activities such as coordination of selling and transport can be a way to increase their bargaining power in marketing.
- Introduction of improved varieties, application of improved inputs, using of modern techn ologies should be promoted to increase production and reduce losses.
- Improve efficiency through strengthened the production in infrastructure and efforts to reduce diseases and pests.
- Strengthen research and extension services to create awareness on post-harvest handling, agronomic and management practices.
- Integration of stakeholders in the chains should be increased.

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