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Mango Value Chain Analysis: The Case of Boloso Bombe Woreda, Wolaita Zone, Southern Ethiopia

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Abstract
This study was conducted with the main objective of identifying mango value chain actors and their respective functions, analyze distribution of the benefits among the actors and identify constraints and potential opportunities of mango production and marketing in the study area. About 138 smallholder mango producers were selected randomly from four kebele administrations proportionally. Both qualitative and quantitative types of data were used. Primary data was collected by using both close ended and open ended (semi- structured) questionnaire and personal interview, focus group discussion and key informant interview was used to collect the data. Descriptive statistics were used to analyze the data. Margin analysis method was used to analyze distribution of benefits among the value chain actors. The study has indicated that direct actors along mango value chain may include input supplier, producers, collectors, wholesalers, retailers, processors and consumers and also indirect actors such as extension service providers, credit and saving service providers, marketing and cooperative office, and non-governmental organizations. Margin analysis for value chain actors indicated that about 89.43% of gross marketing margin in mango value chain goes to mango traders and producers earn about 10.57% of gross marketing margin. The major constraints of mango production and marketing during the survey period include lack of technology, limited supply of improved mango variety, low level of extension service provision, low level of knowledge and skill, lack of use of credit, lack of farmers' cooperative, perishability, low price of mango, lack of postharvest management and lack of market information. Therefore, policy initiatives aiming at increasing farmers' access to mango technologies, developing and improving market information, cooperative development, postharvest loss, innovation, improving extension system, price and credit are recommended to accelerate the development of mango value chain in the study area.
Keywords: Boloso Bombe, Mango, Margin Analysis, Value Chain Analysis

INTRODUCTION

Tropical and sub-tropical fruit can make a significant direct contribution to the subsistence of small-scale farmers by providing locally generate nutritious food that is often available when other agricultural crops have not yet been harvested. Fruits are a versatile product that, depending on need, can be consumed within the household or sold. Marketing fresh and processed fruit products generates income which can act as an economic buffer and seasonal safety net for poor farm households. Diversification into fruit production can generate employment and enable small-scale farmers to embark on a range of production, processing and marketing activities to complement existing income-generating activities (Clarke et al., 2011).

Mango (Mangifera indica) is a fleshy stone fruit belonging to the panes Mangifera, consisting of numerous tropical fruiting trees in the flowering plant family Anacardiaceae. Mango is native to the south Asia from where it was distributed worldwide to become one of the most cultivated fruit in the tropics. Mango is produced in most frost free tropical and sub tropical climates, more than 85 countries in the world cultivate mango. Mango is one of the most widely cultivated and globally traded tropical and subtropical fruit trees in the world (ibid). The total production area of mango in the world is around 3.69 million hectares. The total amount of mango production in the world was around 35 million tons (FAO, 2009).

Mango serves as a fruit crop and as a subsistence crop for family farms. As it ripens at the end of the dry season and at the start of the rainy season, the mango is a fundamental source of nutrition for rural populations (Vayssières et al., 2012). Mango fruit is an excellent source of dietary antioxidants, such as ascorbic acid, carotenoids, and especially phenolic compounds (Ma et al., 2011). In Sub-Saharan Africa (SSA), growing both domesticated and wild fruit species on farms diversifies the crop production options of small-scale farmers and can bring significant health, ecological and economic revenues (Keatinge et al., 2010; Weinberger and Lumpkin, 2005). Dozens of indigenous fruit tree species although relatively unknown in global markets, are locally of large importance for food/nutrition security and income generation. Akinnifesi et al. (2008) showed the high potential of many wild fruit species from different African regions for undergoing domestication followed by successful on-farm production. Fruit markets in SSA are estimated to grow substantially due to economic and human population growth and increasing urbanization rates.

Ethiopia is agro-ecologically diverse and has a total area of 1.13 million km. Many parts of the country

are suitable for growing temperate, sub-tropical or tropical fruits. For example, substantial areas in the Southern and South-Western parts of the country receive sufficient rainfall to support fruits adapted to the respective climatic conditions. Ethiopia has a potential irrigable area of 3.5 million ha with net irrigation area of about 1.61 million ha, of which currently only 4.6 % is utilized (Amer, 2002). Total fruit production in Ethiopia is about 500 thousand tones. Fruits have significant importance with a potential for domestic and export markets and industrial processing in Ethiopia. The main fruits produced and exported are banana, citrus fruits, mango, avocado, papaya and grape fruits (Zeberga, 2010). In Ethiopia mango is produced mainly in West and East of Oromia, SNNPR, Benishangul Gumuz and Amhara regions (Desta, 2005). Mango production in Ethiopia is fluctuated conditions, because of occurrence of diseases, lack of proper management and also weather conditions (CSA, 2009). More than 47 thousand hectares of land is under fruit crops in Ethiopia and 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. However, less than 2% of the produce is exported (Joosten, 2007). Mango is one of the famous fruit crops in SNNPR. The region holds 27% of market share in Addis Ababa whole sale market and the second largest mango producing region in the country (Aithal and Wangila, 2006). The total area of land allocated for the mango production in the region is more than 3,375.89 hectare. The volume of mango production and level of productivity in the region is 343,910.27 and 101.87 quintal per year per hectare, respectively (CSA, 2013).

Wolaita Zone is one of the known mango producing Zones in the SNNPR with the total number of producers accounting about more than 131,667 private smallholder farmers with area of land allotted more than 1,152.25 hectare. Volume of mango production and productivity is 118,060.84 and 102.46 quintal per year per hectare, respectively (CSA, 2013) and holds 5% of market share in Addis Ababa wholesale mango market (Aithal and Wangila,2006).

Mango is one of potential fruit crop produced in Boloso Bombe Woreda in Wolaita zone which has a significant contribution to the livelihood of small scale farmers in the area thereby contributing to the income of the majority of smallholder producers as well as ensuring of food security. Moreover, mango is playing a crucial role in creation of business and employment opportunities for the many firms and commercial agents in the area. Although mango production in Boloso Bombe Woreda in Southern Ethiopia is high, mango value chain analysis has not yet been conducted and analyzed for the target area even if there is high extent of mango production and transaction of mango from the production point to the different spatial markets. Therefore, this study was conducted with the main purpose of investigating mango value chain, distribution of market margin along the mango value chain and identifying constraints and opportunities of mango production and marketing which will narrow the information gap on the subject and will contribute to better understanding of improved strategies for reorienting marketing system for the benefit of smallholder farmers and traders.

Objectives of the Study

General objective of the study

The general objective of this study was to analyze mango value chain in Boloso Bombe Woreda of Wolaita Zone, Southern Ethiopia.

Specific Objective of the Study

1. To identify mango value chain actors and their respective functions in the study area
2. To analyze distribution of margins along mango value chain in the study area
3. To identify the constraints and opportunities of mango production and marketing in the area

METHODOLOGY OF THE STUDY

Description of the Study Area

Boloso Bombe Woreda is one of the 12 Woredas in Wolaita Zone, SNNPR. The area is situated along Ajora falls in Wolaita Zone with a capital town of Bombe which is located325 km and 55 km away from Addis Ababa and Wolaita Sodo town through Hossana exit, respectively. The relative location of the Woreda is Kambata Tambaro at North, Boloso Sore Woreda at East, Sodo Zuria and Kindo Koysha Woreda at South, and Damot Sore woreda at West. Astronomically, the area locates 7.03-7.19 North (Latitude) and 37.44-37.66 East (Longitude). The altitude of the Woreda is 501-2500 meter above sea level. The total area of the Woreda is 272.2 square km and contains 18 rural kebeles and 2 town kebeles in total of 20 kebele administrations (WZFEDD, 2014).

The population size of the Woreda is 106,898 from which male and female account 52,078 and 54,820, respectively. About 50%, 48.3% and 1.6% of the population of the Woreda is under the age interval of 0-14, 15-65 and above 65 year, respectively indicating that majority of population is under young and productive age category and more than half of the population is under the dependency age structure (WZFEDD, 2014).

The amount, duration and intensity of rainfall in the Woreda vary considerably. The climatic data of the area shows that the area gets a mean annual rainfall of 1200-1600 mm per year and mean annual temperature ranging from 12.6-25^{0}c in a year. The Woreda has diverse agro-ecological zones ranging from

kola to dega. From the total area dega accounts 14.28%, woyna dega accounts 23.44 % and kola accounts 62.28% (WZFEDD, 2014).

The Woreda is characterized by subsistence mixed farming system in which production of both crops and livestock is common economic activity. Due to varied agro-ecology of the area, major agricultural crops growing in the area may include cereals, legumes, vegetables, root crops, perennials and fruits, etc. Commonly produced crops in the area may include maize, teff, coffee; root crops such as sweet potato, yam, taro; haricot bean, enset, and fruits. Agricultural production system is relying on traditional method in which tame animals such as oxen supply drought power. There is tendency of making the system modernized in terms of technological input adoption such as, improved varieties, fertilizer, chemicals, etc. Livelihood system of the area is mainly based on agriculture. Small scale trade, off-farm and non-farm activities are also serving as the way of sustaining life and meeting basic needs for the certain portion of population in the area (WZFEDD, 2014).

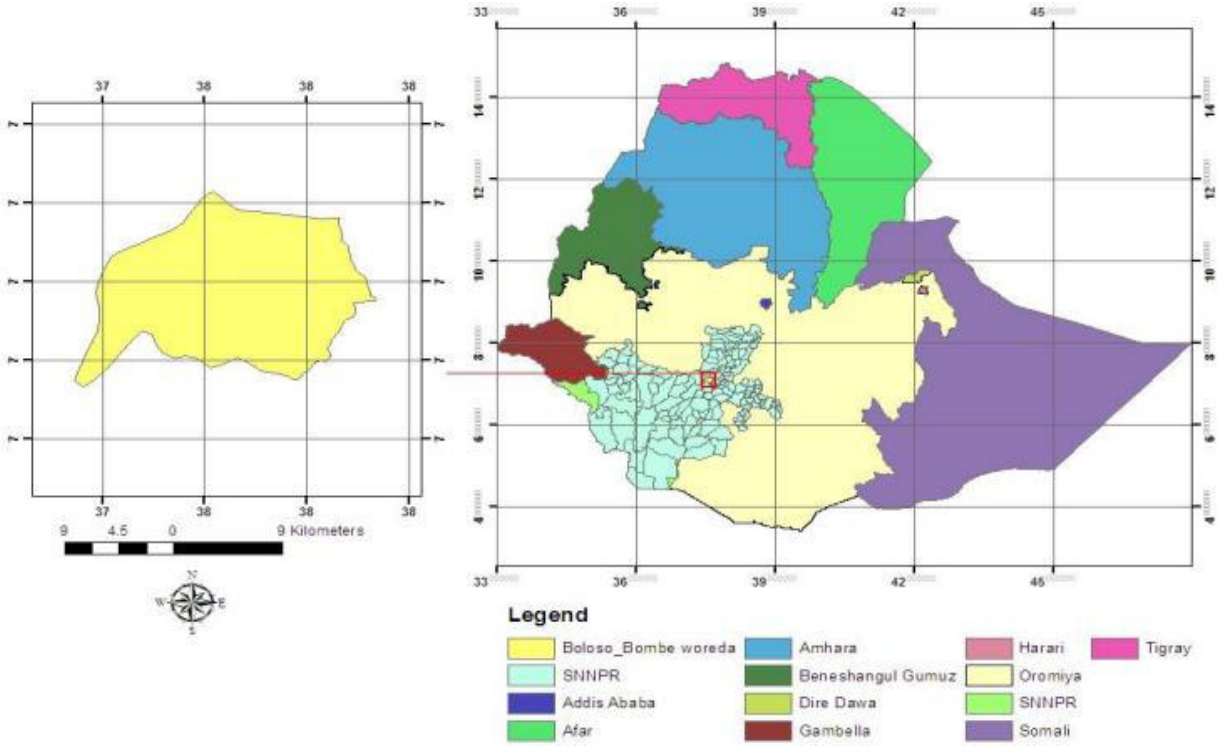

Figure 1: Location map of the study area

Sample Size Determination and Sampling Techniques

The sample for this study was drawn from all actors involved along mango value chain such as producers, rural collectors, wholesalers, processors, retailers and consumers. Based on their distribution, mango value chain actors have been selected by using their appropriate sampling techniques.

Producer's sampling

Boloso Bombe Woreda was selected purposively as the study area based on the extent of mango production and participation of farmers in mango marketing. There are 18 rural kebele administrations in the Boloso Bombe Woreda. From these rural kebele administrations, 4 kebele administrations were selected randomly. Accordingly, Adila, Bombe, Mehal Ambe and Para Wocha kebele administrations were selected randomly. There are about 1150, 1210, 1220, and 1360 mango producers in Adila, Mehal Ambe, Bombe and Para Wocha kebele administration, respectively. Sample frame was drawn for the study population of selected kebele administration and by employing Probability Proportional to Size (PPS), the number of farmers taken from each kebele was determined. Finally, based on the sampling frame drawn from each kebele administration, simple random sampling technique was applied to select the sample mango producing farmers. In addition to the purpose of the study and population size, three criteria usually need to be specified to determine the appropriate sample size: the level of precision, the level of confidence or risk and the degree of variability in the attributes being measured (Miaoulis and Michener, 1976). Since population in the selected kebele administrations is greater than 1,000, Cochran (1963) sample determination formula was adopted to determine sample representatives of the study population.

$$n = \frac{Z^2 p(1-p)}{d^2} \quad \text{..... (1)}$$

Where: n = is the sample size, Z^2= is equals the desired confidence level at 95% which is 1.96, d is the desired level of precision which is 5%, p is the estimated proportion of an attribute (homogeneity of the study population) that is present in the mango producers at 10%, and q is 1-p. The value for Z is found in statistical tables which contain the area under the normal curve. Accordingly, 138 mango producers were selected from the selected kebele administrations.

Table1: Sample size determination of mango producers

Kebele	Number of mango producers (N)	Proportion (%)	Sample size (n)
Adila	1,150	0.23	32
Bombe	1,210	0.245	34
Mehal Ambe	1,220	0.25	34
Para Wocha	1,360	0.275	38
Total	4,940	1.00	138

Source: BBWARDO

Trader's sampling

This survey includes intermediary value chain actors involved in mango marketing such as wholesalers, assemblers, retailers, processors and consumers. Selection of these actors is range from the study area to the major towns and marketing centers such as Bombe town, Areka town and Sodo town in Wolaita zone. These actors were selected purposively based on their direct involvement in the mango value chain coming from the production point of the study area up to the final market. Because of lack of secondary data record on mango traders, traceability and snow ball sampling technique was employed to select wholesalers, collectors and processors. Retailers were selected randomly from Bombe town market. Accordingly, 10 wholesalers, 12 retailers, 6 collectors and 7 processors were selected purposively based on their involvement in transaction of mango originating from the study Woreda. About 25 consumers were selected randomly from the study area and major towns in the Wolaita Zone.

Types, Sources and Methods of Data Collection

Types of data

To conduct this study, both qualitative and quantitative types of data were used. Qualitative data collected may include actors and their respective functions, marketing condition, support services aligned along value chain, socio-economic characteristics of mango producers, mango production systems, value additions, mango distribution pattern, market outlets available in the area, and constraints and opportunities of mango production and marketing. Quantitative data like direct and overhead costs incurred by each actor, market margin, postharvest loss, percentage share of mango among actors, income from sale of mango, volume of mango production, volume of mango sold and bought, selling and buying price of the mango in unit of measurement, other sources of income, etc. were collected.

Sources of the Data

The study used both primary and secondary sources of the data that are consistent, available, adequate and reliable for the objectives intended to be addressed. The primary sources of the data include sample respondents, key informants, extension workers, agricultural office workers and mango traders and consumers. Secondary sources of data include statistical abstracts, reports, journals and documents of Woreda Agriculture and Rural Development Office and Marketing and Cooperative Office.

Method of data collection

To capture adequate data for the study, both close ended and open ended (semi- structured) questionnaire was prepared. To collect the data, personal interview and Participatory Rural Appraisal (PRA) tools such as focus group discussion and key informant interview were used. Enumerators who have college diploma and working as development agents were recruited and trained for data collection. Before data collection, the questionnaire was pretested on five farmers and three traders to evaluate the appropriateness of the design, clarity and interpretation of the questions, relevance of the questions and time taken for an interview. Hence, appropriate modifications and corrections were made on the questionnaire based on the feedback obtained. Data were collected under continuous supervision of the researcher**.** Document review was made to take secondary data related with the study.

Method of Data Analysis

To change the raw data of the study into fact descriptive statistics such as frequency, mean, percentage, and standard deviation were used in the process of comparing socio-economic, demographic and institutional characteristics of households. In addition to this, descriptive tools such as tables, figures and graphs were used to

present the results. Maps in the process of examining and describing marketing functions, facilities, services, and household characteristics were used to illustrate the overall system of mango production and marketing in the area. Strength, weakness, opportunities and threats matrix was used to identify constraints and potential opportunities of mango production and marketing in the study area.

Mapping value chain

To illustrate the value chain map of the study area, various procedures of value chain mapping were adopted as an analytical tool. Drawing value chain map has gone through the following steps. In the first step the core processes in the value chain were identified. After identification of value chain process, identifying and mapping the main actors involved in their respective functions was conducted. In the third step, mapping flows of products, information and knowledge was made followed by mapping of the processes, actors and specific functions along the chain. The reason for the existence of value chain is that goods, services or information is passed on between different actors. In the fourth step mapping the geographical flow of the product or service was made. Finally, mapping business services that feed into the value chain was identified and connected with their respective beneficiaries. Mapping these services gives an overview of the potential for interventions outside the value chain itself.

Analyzing marketing margins

Cost and price information is used to construct marketing cost and margin. Computing the Total Gross Marketing Margin (TGMM) is always related to the final price paid by the end buyer and is expressed as percentage (Mendoza, 1995).

$$TGMM = \frac{\text{End buyer price} - \text{first seller price}}{\text{End buyer price}} \times 100 \quad \ldots\ldots (2)$$

Where, TGMM is total gross marketing margin. It is useful to introduce the idea of Producers' Gross Margin (GMMp) which is the portion of the price paid by the consumer that goes to the producer. The producers' margin is calculated as:

$$GMMp = \frac{\text{End buyer price} - \text{Gross marketing margin}}{\text{End buyer price}} \times 100 \quad \ldots\ldots (3)$$

Where, GMMp = the producer's share in consumer price

The Net Marketing Margin (NMM) is the percentage of the final price earned by the intermediaries as their net income after their marketing costs are deducted. The percentages of net income that can be classified as pure profit (i.e. return on capital) depends on the extension to such factors as the intermediaries' own (working capital) costs. The equation tells us that a higher marketing margin diminishes the producer's share and vice versa. It also provides an indication of welfare distribution among production and marketing agents.

$$NMM = \frac{\text{Gross marketing margin} - \text{Marketing cost}}{\text{End buyer price}} \times 100 \quad \ldots\ldots (4)$$

Where, NMM is the net marketing margin

Higher NMM or profit of the marketing intermediaries reflects reduced downward and unfair income distribution, which depresses market participation of smallholders.

RESULTS AND DISCUSSION

Demographic and Socio-economic Characteristics of the Households

Analysis of demographic and socio-economic characteristics of the sample unit is quite important to infer their intimate relationship with agricultural marketing pattern of sample households in the study area. As indicated in Table2, the mean age of sample households in the study area is around 43 years. Age of the household is related with the effort to produce and market a remarkable quantity of mango. The mean family size of sample households is 6.54 which is above the national average family size of Ethiopia (5.4). Family size affects market participation of smallholder farmers thereby contributing to an efficient production or by consuming a high proportion of the good produced.

Table 1: Demographic and socio-economic characteristics of the households for continuous variables

Variables	Mean	SD
Age in years	42.9	13.477
Family size in number	6.54	2.555
Distance to the nearest market in minute of walk	27.45	22.32
Mango production experience in years	16.97	6.084
Marketing experience in years	9.28	5.287
Income from sale of other crops in birr	2004.34	1406.456

*SD stands for standard deviation

Source: Survey result (2015)

The mean distance to the market is 27.45 minutes of walk from mango production point to the final sale. A long distance to market discourages the intensive participation of farmers as it needs a lot of time and effort to deliver final market. The mean mango production experience of farmers' in the study area is around 17 years. The mean mango marketing experience of sample households is 9.28 years. When farmers are getting more experienced in marketing, they have clear decision making ability either to participate or not participate intensively in marketing. The mean income obtained by sample households from sale of other crops is 2004.34 birr. When income from sale of other crops increases, farmers tend to invest their time and effort on that sector while putting low income sector aside.

As depicted in Table3, from the total of 138 sample households about 89% and 11% were male headed and female headed households, respectively. About 60% and 40% of sample households are illiterate and literate, respectively. This indicates that more than half of the sample households in the study area are illiterate. As indicated in the Table3, about 91.3%, 70.3%, 67.4%, and 65.9%, of sample households have access to market, market information, credit, and extension service, respectively. Correspondingly, about 34.1%, 32.6%, 29.7% and 8.7% of the sample households have no access to extension service, credit, market information, and market, respectively. About 85.5% and 14.5% of the sample households have membership in group and no membership in group, respectively. This is the organization in which farmers have been grouped for small scale mango processing launched by non-governmental organization rather than for group marketing of mango. This is to mean that there is no mango marketing cooperative in the study area.

The survey has further revealed that despite credit service is accessible for majority of the households in the study area; no farmer has used credit for mango production and marketing purpose. In addition to this, farmers obtain market information from traders, brokers, other farmers and by formally attending the market rather than from formal market information service. Small scale farmers' access to extension, credit and market information is quite prominent for the commercialization of rural economic sector. Therefore, allocation of institutional service should be strengthened and target all members of the rural community.

Table 2: Demographic and institutional characteristics of the households for dummy variables

Variables	Category	N	%
Sex	Female	15	11
	Male	123	89
Educational status	Illiterate	83	60
	Literate	55	40
Access to extension service	No	47	34.1
	Yes	91	65.9
Access to credit	No	45	32.6
	Yes	93	67.4
Access to market	No	12	8.7
	Yes	126	91.3
Access to market information	No	41	29.7
	Yes	97	70.3
Membership in group	No	118	85.5
	Yes	20	14.5

N = frequency, % = percentage
Source: Survey result (2015)

Livelihood and Farming System of the Households

Farming is the major livelihood system for the majority of the sample households in the study area as depicted in Table 4. About 73.2% of sample households use farming as the major means of sustaining life in the area and the remaining 24.6%, 1.4% and 0.7% use farming together with the trading, farming together with carpenting and farming together with the office working, respectively, as a means of livelihood.

Table 3: Livelihood of sample respondents

Livelihood system	N	%
Farming	101	73.2
Farming and trading	34	24.6
Farming and carpenting	2	1.4
Farming and office working	1	0.7
Total	138	100.0

N= frequency, %= percentage
Source: Survey result (2015)

As depicted in the Table5, farming system of the area is dominated by traditional crop-livestock production system. About 87% of sample respondents practice crop-livestock production system whereas the

remaining 13% practice only crop production. Major plant crops grown in the area may include maize, teff, haricot bean, ginger, coffee and perennial crops such as mango, avocado, banana, papaya, orange and root crops such as enset, yam, sweet potato, and taro are the common crops cultivated in the area. The major livestock animals reared under mixed farming system of the area may include cattle, sheep, goat, equine, and poultry. Thus, mixed farming system is the major livelihood system of majority of the sample households in the study area.

Table 4: Farming system of sample households

Items	N	%
Crop-livestock production	120	87.0
Only crop	18	13.0
Total	138	100.0

N=frequency, % = percentage
Source: Survey result (2015)

Mango production system

Mango is one of perennial crop grow under lowland agro ecology with a minimum moisture requirement. Sole planting is the major mango production practice adopted in the study area. Majority of sample respondents in the area practice sole planting of mango because of the competition for nutrient and they believe that mango suppresses the growth performance of other crop. During the early stage of maturity, farmers intercrop mango with other perennial crops and coffee at home garden for seedling purpose. Then, seedling of mango is transported from backyard garden to the outside in order to minimize nutrient competition and to provide canopy during sunny season as mango tolerates dry weather. This is in agreement with the Vanmelle and Buschmann (2013) who found that production of mango is less vulnerable to drought than other crops in selected areas of Benin, Ghana, and Burkinafaso.

During planting seedling were planted sparsely, without giving consideration for spacing of orchards despite orchards spacing is important for productivity of mango tree. Seedling of mango taken off from backyard garden to the outside is fenced in order to protect from the tame animals. This is in agreement with the Ian (2006) who reported that it is necessary to fence off mango young trees for the first 3–4 years to protect them from livestock.

Table 5: Mango production systems in the study area

Items	N	%
Sole planting	90	65.2
Sole planting and intercropping	25	18.1
Intercropping	23	16.6
Total	138	100

N = frequency, % = percentage
Source: Survey result (2015)

The survey result has further revealed that about 65.2%, 15.5%, 11.6% and 6.5% of sample respondents practice sole planting, intercropping, sole planting and intercropping, respectively, as shown in the Table 6. Intercropping of mango with maize, coffee, yam and taro in backyard at early stage is also a usual practice in study area. This is in agreement with Ayelech (2011) who found that farmers intercrop mango with maize, taro, ginger, chat, cabbage and banana at early stage in Goma woreda, Oromia regional state.

Purpose of mango production

Small scale farmers in the study area produce mango for variety of purpose such as for sale, consumption and canopy or combination of all. About 86.2%, 71.7% and 65.2% of sample respondents produce mango for a variety of purposes such as sale, consumption and canopy , respectively.

Table 6: Purpose of mango production in the study area

Particulars	N	%
Sale	119	86.2
Consumption	99	71.7
Canopy	90	65.2
Total	138	100.0

N = frequency, % = percent
Source: Survey result (2015)

This finding is in line with Akinnifesi *et al*. (2008) who indicated that the dozens of indigenous fruit tree species although relatively unknown in global markets, are locally of large importance for food/nutrition security and income generation. Also Ian (2006) reported that canopy of mango is evergreen with a generally

spreading habit and heavy canopy of the mango is a source of shelter and shade for both animals and humans.

Contribution of mango to the household income

Mango is one of the fourth most important crops for the livelihood of the households in the study area there by contributing to the income of the households as indicated in Figure2. The survey has indicated that mango contributes about 7% of the annual income obtained from sale of crops and livestock at household level.

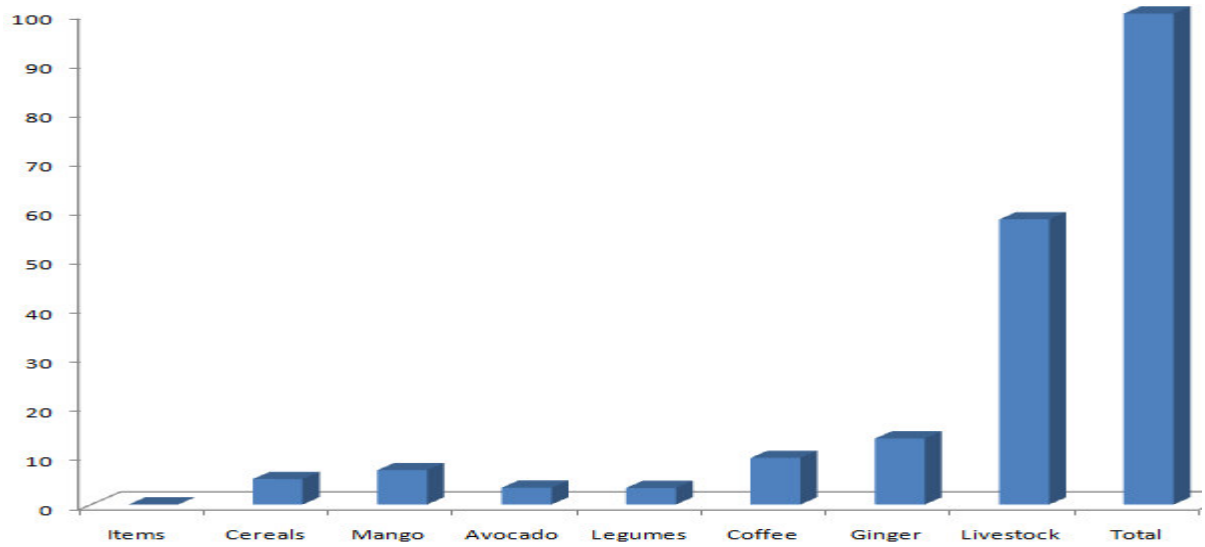

Figure 2: Contribution of mango to households' income in comparison to other crops
Source: Survey result (2015)

Inputs used for mango production

Majority of sample mango producers use local mango variety for their production. Some portion of sample households used improved mango variety together with the local variety. As shown in Table 8, about 81.2% and 18.8% of sample households use local variety and local variety with the improved variety, respectively. The survey has further revealed that no mango producer use only improved variety for production. Among the improved mango variety apple mango is available for a limited number of mango producers in the study area. Framers in the study area use different types of inputs for mango production. The main types of inputs used for mango production in the study area may include family labor, compost/farmyard manure, seed/seedling and rain water during summer season.

Table 7: Mango varieties used by households in the study area

What kind of mango variety do you use?	N	%
Local variety only	112	81.2
Local and improved variety	26	18.8
Total	138	100

Source: Survey result (2015)

As depicted in Table 9, about 30.4%, 27.5%, and 20.2% of sample households in the study area use compost/farmyard manure, water, a combination of compost/farmyard manure and water, respectively as input for mango production. The survey has further revealed that about 21.7% of sample households did not use any input for mango production because they assume that mango do not need any input after it has reached at maturity stage. Application of compost/farmyard manure in circular form around the stem of mango tree during the sunny season is the common practice in the study area. During the rainy season farmers divert the rain water by digging in circular form around the mango tree which capable it to reduce transpiration and keep it evergreen during sunny season. The survey has further indicated that none of the mango producer in the area used inorganic fertilizer for mango production.

This finding is in agreement with the Ayelech (2011) who indicated that FYM principally transported from homestead to the field mostly during the dry season and spread in the bottom of each tree in circular form and chemical inputs entirely evaded neither for fertilization nor for pest treatment.

Table 8: Inputs used for mango production in study area

Inputs	N	%
None	30	21.7
Compost/farmyard manure	42	30.4
Rain water	38	27.5
Compost/farmyard manure and water	28	20.2
Total	138	100

N = frequency, % = percentage
Source: Survey result (2015)

2.1.1. Input supply

Farmers acquire mango varieties from other farmers, own stocks, from market and extension centre as indicated in Figure 4. Mango varieties acquired from other farmers and market is the local one whereas mango variety acquired from extension centre is the improved variety like apple mango. Farmers in the study area obtain mango seedling from the market through buying from other farmers or find mang o seed from the market. The survey revealed that all famers in the study area acquire inputs used for mango production like compost/farmyard manure and garbage from their own stock. As indicated in the figure 3, majority of households acquire mango seed from other farmers and insignificant number of households acquire mango from extension centre and market. Therefore, strengthening of agricultural extension service in dissemination of improved mango variety is quite important.

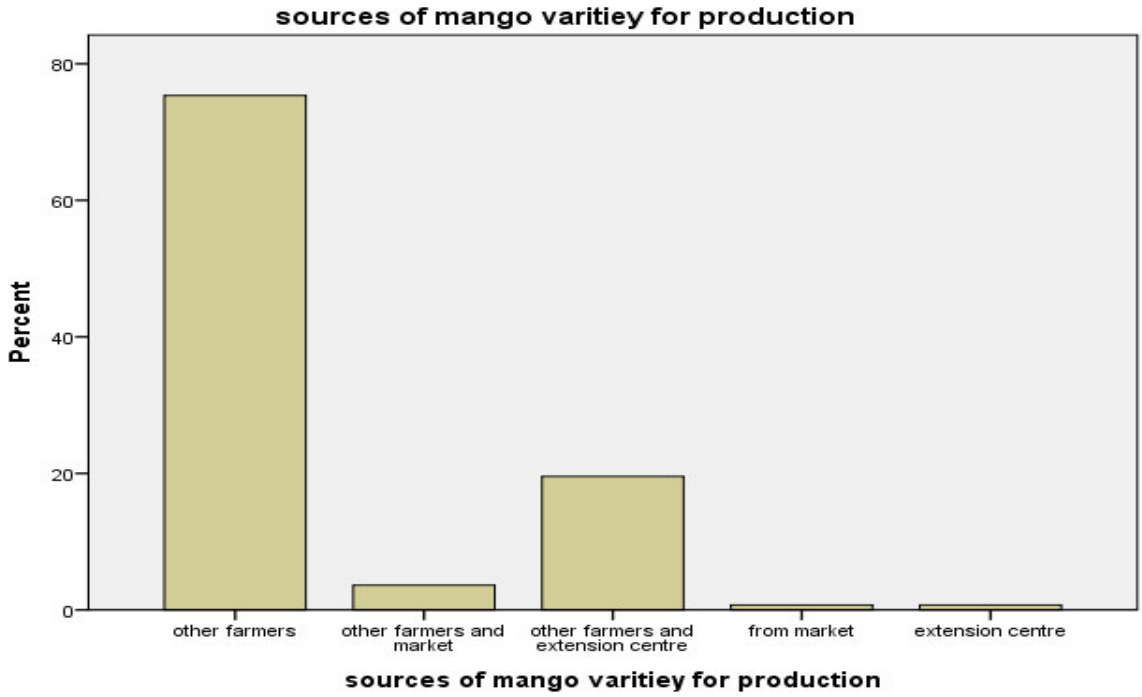

Figure 3: Sources of mango varieties in study area
Source: Survey result (2015)

Harvesting of mango

Harvesting of mango in the study area begin after the mango fruit show a maturity index. The peak period of harvesting mango in the study area is December-February (first phase) and march-may (second phase). The mean frequency of harvesting mango is at least 3 times in a year. The basic maturity index for harvesting of mango in the area is the formation of colour change on the surface of mango fruit. Another maturity index for harvesting of mango is the downfall of mango fruit form the tree on the surface of the earth. This is in line with Ayelech (2011) who found that harvesting usually starting after fruit dropping-which is principal maturity index. Harvesting fully ripen, partially ripen and unripe mango is the common stages of harvesting mango in the study area as shown in the Table 10. The survey has indicated that about 87.7%, 35% and 45.6% of households harvest ripe, partially ripe and unripe mango, respectively.

Table 9: Harvesting stages of mango in the study area

Harvesting stages	N	%
Harvest ripe mango	121	87.7
Harvest partially ripe mango	48	35
Harvest unripe mango	63	45.6
Total	138	100

N = frequency, % = percentage
Source: Survey result (2015)

Harvesting methods adopted in the area may include hand picking, using stick, cutting by scissor and children climb on mango tree with bag. Hand picking and using stick are the most common practices of harvesting mango in the study area as indicated in Table11. Hand picking is applicable when mango fruit is near to the surface of the ground and this method is so safe to protect mango fruit from mechanical damage and bruising. Using of stick is mainly to harvest mango which is far above the ground and not harvestable by hand.

As alternative to stick picking, children climb on mango tree with box to harvest mango which is far from surface of the ground and cannot picked by hand. This is to mean that children climb on tree with wood box and hang the box on tree branch. This is mainly to protect mango from serious mechanical damage which occurs while using stick method. Cutting by scissor is also practiced to harvest mango in the study area but at lower rate as depicted in Table11. Hand picking method of harvesting produce can maintain good quality of fruit and protect the fruit from mechanical damage. The proportion in the Table11 indicates that sample households can use more than one harvesting method in the study area. This finding is in line with (Seid and Zeru, 2013) who found that hand picking can produce the fruit with stem and reduce fruit bruising and damage but stick structure result in fruit dropping and leave the fruit without stem which facilitate fruit bruise and mechanical damage.

Table 10: Harvesting methods of mango in the study area

Harvesting Methods	N	%
Cut by scissor	3	2.2
Using sticks	135	97.8
Hand picking	125	90.6
Children climb on tree with bag	18	13
Total	138	100

N= frequency, % = percentage
Source: Survey result (2015)

Results of Mango Value Chain Analysis

Value chain approach is mainly a descriptive tool to look at the interactions between different actors. Value chain analysis concerned with the contribution of value adding functions of each and every actor along the commodity chain. This is to mean that value chain analysis highlights the actors and their respective function/role along the commodity chain which in turn contributes to the addition of value in the chain for the satisfaction of the final user. It also helps to estimate the distribution of benefits among actors in the commodity chain.

Mango value chain actors and their functions

Value chain actors are agents playing their own role along a given commodity chain from the conception to final consumption. They may be direct and indirect actors who can take their part in each and every stages of the commodity chain. The direct actors are those who have product ownership and claim and engaged in transaction/transfer activities in order to gain economic benefit. Indirect actors are those who do not have product claim but, are aligned along the chain for the efficiency of the actors thereby providing necessary services and supports. The primary/direct actors in mango value chain in Boloso Bombe Woreda were input suppliers, farmers, traders and consumers. Each of these actors adds value in the process of changing product title. Some functions or roles are performed by more than one actor, and some actors perform more than one role. The indirect actors along mango value chain in the study area are both governmental and non-governmental organizations which have been engaged in providing financial, legal, and marketing services. Among the governmental organizations Agricultural Extension Centre, Marketing and Cooperative Office and Ministry of Agriculture are the major ones which provide services along mango value chain in study area. Non-governmental organizations such as Japanese International Cooperation Agency (JICA/OVOP) and Omo Micro-Finance (OMF) institution are also playing their own role in mango value chain in the study area. The role of each actor along mango value chain in the study area is discussed further.

Input suppliers

These are actors which are engaged in supply and provision of raw materials for mango production in the area. The involvement of input suppliers in the mango sector of the study area is not intensive as much. The main reason for this is the low input demand for mango production and use of locally available inputs instead of the technological one. This result is in line with the James *et al.* (2008) who found that whilst the growing conditions are very well suited to growth of mangoes in Benishangul area, farmers are still mostly at a subsistence level with minimal use of production enhancement technologies or inputs. For this study, the major mango input supplier in the study area is the agricultural extension centre. Agricultural extension centre provides farmers with improved mango variety such as apple mango, harvesting equipment and technical advice on mango production. This institution brings improved mango variety from Arbaminch agricultural research centers and nursery sites and distributes to the farmers. But, the survey has further indicated that distribution of improved mango variety and harvesting equipment is not for all farmers because of the limited supply and provision of mango variety is mainly for comparative analysis of local mango variety against the improved one. In addition to this, there are no private input suppliers who have been engaged in agro seed and chemical enterprises in the area. Therefore, it is necessary to improve mango sector of the study area by enhancing modernized way of production and marketing system.

Producers

These are small scale farmers who produce mango by using their own resources. They use either local or improved mango variety to produce and market to the forward actors involved along the mango value chain. From the production aspects, the main value chain functions performed by the small scale farmers are planting, tree management, pruning, transplanting and harvesting by using local planting materials such as mattock, zapa, and hummer. They use locally available inputs such as compost/farmyard manure and water for mango production so that they produce in organic manner. From the marketing point of view, they use their own manual labor such as human labor and cart to deliver their produce either to the local market such as Bombe and Adila town or other spatial markets such as Hadaro and Areka. They also sale mango at farm gate to mango traders like collectors and wholesalers. Table12 shows value adding functions performed by sample households and the result indicated that a given household can perform more than one value adding activities.

Table 11: Value adding activities performed by the mango producers

Activity	N	%
Grading	117	97.5
Sorting	117	97.5
Drying	41	34.2
Standardizing	48	40
Cleaning	80	66.7
Total	120	100.0

N= frequency, % = percentage

Source: Survey result (2015)

The main value adding activities performed by farmers prior to marketing is the post harvest handling activities such as grading and sorting, drying, cleaning, and standardizing. The primary aim of performing these activities is in order to deliver quality mango to the traders. They use materials such as basket, mica, plastic bag, sack, cartoon and wooden box for packaging of mango during marketing.

Collectors

These are farmers/mango traders who invest their own capital for mango assembling and part time traders in assembly markets who collect mango from farmers in village markets for the purpose of reselling it to wholesalers. They use their financial resources and their local knowledge to bulk and collect mango from the surrounding area. They collect and assemble unripe mango in farm gate for 5-7 days and sell at the assembly point to the wholesalers coming from Guraghe, Siltie, and Wolaita. During at the assembly point they use dry grass either to ripe mango or to protect mango from being contacted with the surface of the earth as well as from fog. They play important role by informing and they do know areas of surplus well. The trading activities of collectors include buying and assembling, repacking, sorting and selling to wholesale markets. They often receive cash from wholesalers after or before sell. The survey has further indicated that all mango collectors in the study area were unlicensed and they begin collecting of mango prior to peak maturity period. Collecting of mango prior to peak maturity period eventually leads to decrease in farmers' utility because farmers were obliged to sell unripe mango with a low price after it has been harvested. Some concerned bodies and farmers who have awareness are complaining the action taken by collectors.

Wholesalers: These are known for purchase of bulky products with better financial and information capacity and they are licensed mango traders. They purchase mango directly from farmers/local collectors and indirectly

through brokers. The survey has revealed that majority of wholesalers who receive mango from study area are coming from Guraghe and Siltie. They hire part time mango collectors to collect matured and partially ripe mango at village and this partially ripe mango is covered with the dry grass at village for 5-7 days. They are major actors in the mango value chain by transporting and distributing mango to the other mango traders in spatial markets such as Awassa, shashemene, Mekele, Desie, Bahirdar, Zeway, Adama and Addis Ababa. They sell mango to wholesalers in the regional markets who resell mango to the retailers, processors and consumers in terminal markets. They also sell mango to the retailers outside the study area. They use Isuzu as major transport means to deliver mango to other markets. They procure and consign large amount of mango to the regional markets and to terminal markets. The critical role played by wholesalers along mango value chain in the area is hiring of a significant amount of human resource from collection point to the final sell mainly for quality control activities such as grading and sorting and loading.

Retailers: These are known for their limited capacity of purchasing and handling products with low financial and information capacity. They purchase mango from Bombe local market and sell to consumers and processors in Areka, Hadaro and Sodo town. Their product handling capacity is a maximum of 10 quintal of mango in a given market day. They mainly purchase mango from farmers who bring either ripe or unripe mango. They travel at least 26-55 km to deliver mango from the study area to the other nearby markets aforementioned. Mango retailers in the study area purchase either ripe or unripe mango. Use of Isuzu as a transport means in rental form is a common mechanism of delivering mango to other nearby markets. Some others use cart as means of transport to deliver mango to the other markets. Those who purchase ripe mango mainly to sell to the consumers and processors as well as shops immediately and those who purchase unripe mango resell to other retailers in Areka who in further take away to the Hossana and Kambata markets. They hire a small number of labors for quality control activities such as sorting and grading and loading and unloading. But the assessment has further indicated that, all mango retailers in the study area were not licensed to purchase mango.

Processors: These are private hotels, cafeteria and restaurants and farmers' mango processing saving and credit cooperative organized by the non-governmental organization named as One Village One Product Promotion Project (OVOP). Mango processing in the study area is apparently skewed to juice making where cafés, restaurants, hotels and juice houses take the leading position in juice preparation. There is one agro-processing unit (Firafire Limat Mango Processing Saving and Credit Cooperative) which has been organized by JICA/OVOP in collaboration with Ministry of Agriculture (MoA) that underpin on mango. But, after a few months the project will cease its endeavor of promoting mango. Processors are known for their changing of fresh fully ripe mango into processed goods such as juice (hotels, cafeteria and restaurants) and jams (farmers' cooperative). They purchase fully ripe mango from retailers and farmers for the processing of juice and jam. They play role in satisfying form utility of mango consumers in the study area. Hotels, restaurants, and cafeteria process juice and supply to the consumers in their locality. Farmers' cooperative process mango jams and supplies sample of mango jam to their funding organization in Addis Ababa which in further export to the foreign market. The major inputs that processors use for processing of juice and jams are fully ripe mango, lemon, sugar, mango processing equipments, and cup. The main quality requirement of mango processors is purchasing of colorful red yellow mango, fully ripen, physically undamaged and not bruised mango. The main value adding activities performed by the mango processors in the study area is packing (mainly by farmers' cooperative), freezing, and better storage.

Consumers: These are final users of mango emerging from study area. Consumers for this particular study mean those households who bought and consume mango. They are individual households; they bought mango for their own consumption only either in processed or fresh form. They buy mango either in fresh or processed form from farmers, retailers and processors. Consumers prefer physically undamaged, not bruised, less fibrous and red mango for their immediate consumption.

Brokers: Brokers play an important role in linking farmers to market and other stakeholders of the commodity chain while the ability of market accession of farmers is limited and market demand requires an improvement in quantity as well as diversity of products type. The brokers sometimes go beyond facilitation of transaction and tend to control and fix prices, create price symmetry and make extra benefits from the process in addition to convincing the producers to sale their vegetables at the prices set by wholesalers. The major role of brokers in mango value chain in study area is serving as a bridge for two ways flow of information from traders to farmers and vice versa. The survey has indicated that brokers in the study area are village level brokers who facilitate transaction by convincing farmers to sale his mango and facilitating the process of searching good quality and quantity mango to traders. Moreover, they inform wholesalers about the harvesting season of mango and whether mango is reached for harvesting.

Supportive sectors/enabling environments

Agricultural Extension Centre: This is the governmental institution which provides extension service for small scale farmers in agricultural sector in the study area. This organization provides various extension services

specifically in mango sector in the study area. The major services which this organization is providing in the mango sector are mango breeding, provision of improved mango variety, compost application, harvesting and post harvest handling, and provision of improved harvesting material. The assessment has further indicated that despite extension service is providing technical advice in mango sector, provision of extension service is not covered the whole farming families in the study area.

Woreda Marketing and Cooperative Office: This is also governmental organization which provides marketing services in the certain stages of mango value chain in the study area. This organization provides services like quality control, licensing, and market place for wholesalers, collectors and retailers. The organization provides license to wholesalers emerging from the near area and certifies licensed mango traders to secure their freely involvement in mango transactions. At the same time, the organization prohibits direct entry of unlicensed mango traders in order to uphold the rights of traders who have been licensed. Interms of quality control, the organization prohibits traders who collect immature and unripe mango in rural village. Provision of market place to mango retailers is also through this organization. By performing all this responsibilities, the organization enables mango marketing environment for the traders and sets rules and regulations guiding traders in the study area. But, the study has further indicated that some mango traders like collectors act illegally by collecting immature mango and enter into the business without receiving trade license from the woreda marketing and cooperative office.

Omo-Micro Finance Institution (OMF): This is a non-governmental organization which provides credit and saving services to mango processing cooperative organization and retailers in the study area. This organization provides credit service for the farmers organized by JICA in small scale mango processing and at the same time provides saving service to the farmers. The organization first provides credit to the farmers for capital investment in mango processing in annual base and in the second term allows farmers to save a certain portion of income obtained from their involvement in mango processing. The organization also provides credit service for mango retailers and wholesalers as initial capital.

JICA/OVOP: This is also the non-governmental organization which is working in the mango sector in the study area in collaboration with the Ministry of Agriculture (MoA). This organization emphasizes on promotion of major product of the particular community to the global market thereby linking particular producers with the market. As the name indicated above OVOP "one village one product promotion project" is working on promotion of mango of the study area at the domestic as well as international markets by organizing mango producers in small scale mango processing unit. The organization facilitates conditions and links mango producers with the OMF institution to acquire initial capital for the processing of mango jam in the form of credit. In addition to this, the organization is working in capacity building of the farmers on small scale mango processing and provides equipments required for mango processing activities. Producers organized in this project supply part of mango jam to the JICA coordination centre in Addis Ababa which in further exports to the foreign country like Japan.

Ministry of Agriculture (MoA): Is the macro level value chain enabler aligned along with the mango producers in collaboration with the JICA. It was engaged in enabling farmers produce one specific agricultural product and supplies it to market by adding some value to the product. The main objective of the program is building capacities of farmers to produce value added products and directly supply it to the market. Ministry of agriculture was also involved in providing training, technical and material support for associations with the support of JICA. The Ministry is promoting the value added products being produced by farmers through the program using bazaars taking place across the country.

Value chain map of mango

Value chain mapping is the process of developing a visual depiction of the basic structure of the value chain. A value chain map illustrates the way the product flows from raw material to end markets and presents how the industry functions. It is a compressed visual diagram of the data collected at different stages of the value chain analysis and supports the narrative description of the chain. Figure 4 shows the overall process of mango value chain in the study area.

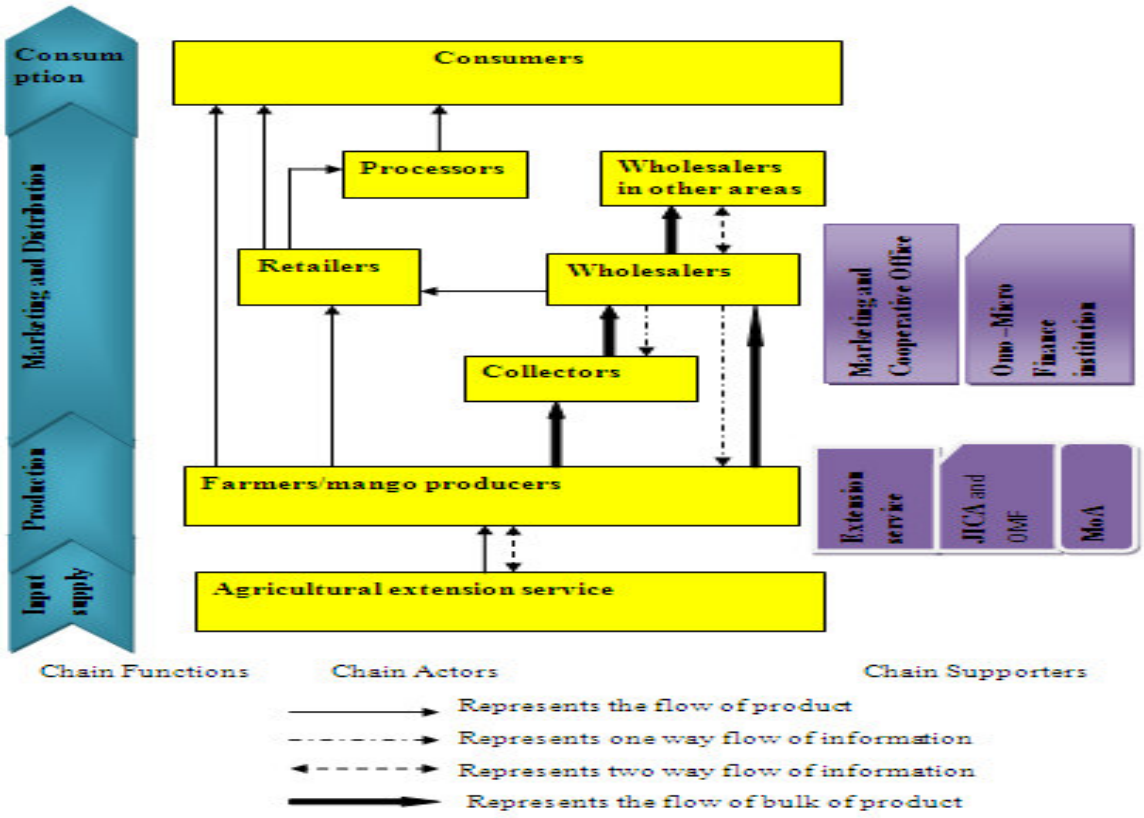

Figure 4: Mango value chain map of the study area
Source: Own sketch from survey result (2015)

Mango marketing channels in the study area

According to Mendoza (1995), marketing channel is the sequence of intermediaries through which whole mango passes from farmers to consumers. The analysis of mango marketing channel was intended to provide a systematic knowledge of how mango flows from its place of production to the final consumers. In order to quantify the volume of mango handled by each marketing actor along the marketing chain, the total purchased amount was multiplied by the share of each marketing actor as obtained from the survey.

About 9 marketing channels were identified together with their total carrying capacity. As shown in the marketing channels, the first 7 channels were found to be operated in around study area where as the next 2 channels were found to be extended to other spatial markets. Channel number 2 is the most important one interms of distributing mango to the end users around the study area thereby carrying about 119.3 quintal of mango. Among the 9 channels identified in the study area, channel number 8 is the most important one interms of the mango carrying capacity (247.55 quintals) followed by the channel number 9 which carries about 161.84 quintal of mango to the end users. The reason why these channels carry out large volume of mango is that wholesalers take away mango to the other mango traders in spatial markets such as Addis Ababa, Awassa, Adama, Desie, Bahirdar, Shashemene, Ziway and Mekele. The flow of mango from production point to the end market indicated that about 57% of mango marketed in 2015 production season was consumed outside the study area.

I. Producer-----Consumer (52.6 Qts)
II. Producer------Retailer------Consumer (119.3 Qts)
III. Producer------Retailer------Processor------Consumer (45 Qts)
IV. Producer-----Collector-----Wholesaler-----Retailer----Consumer (26.33 Qts)
V. Producer-----Collector-----Wholesaler----Retailer----Processor----Consumer (9.9 Qts)
VI. Producer-----Wholesaler---Retailer-----Consumer (40.25 Qts)
VII. Producer-----Wholesaler----Retailer------Processor----Consumer (15.2 Qts)
VIII. Producer-----Wholesaler----Wholesalers in Other Area (247.55 Qts)
IX. Producer----Collector------Wholesaler-----Wholesaler in Other Area (161.84 Qts)

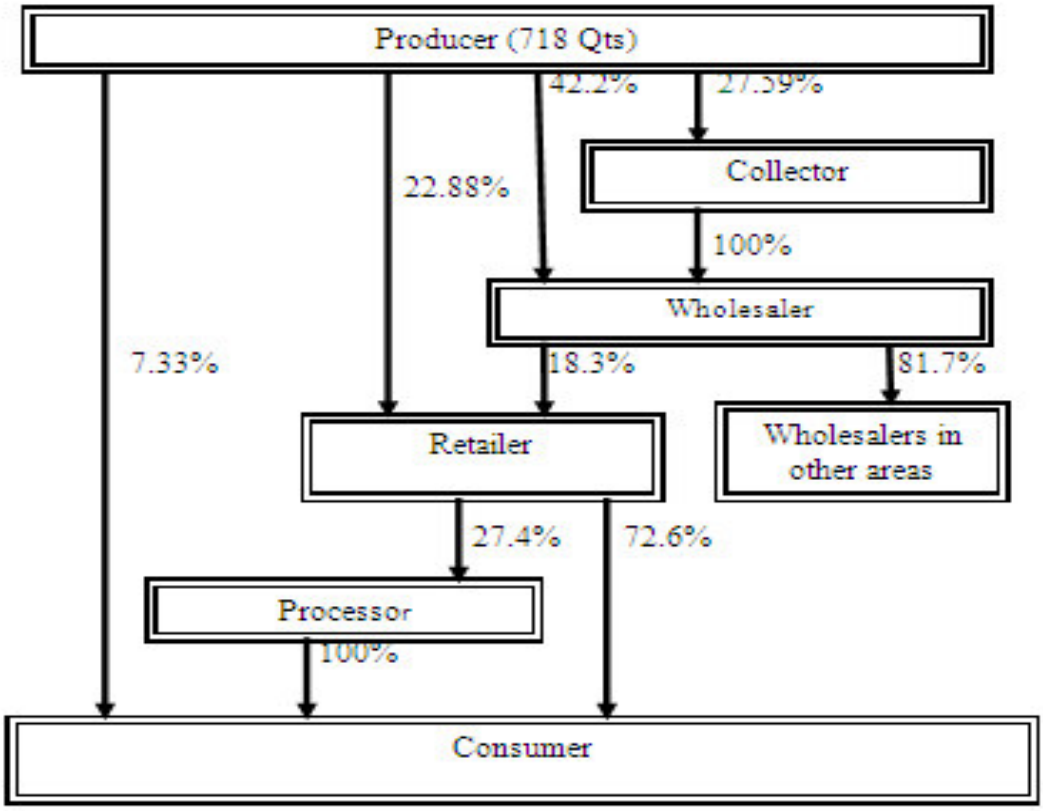

Figure 5: Marketing channel of mango
Source: Own sketch from survey result (2015)

Analysis of market margin along mango value chain

After the value chain has been mapped the next step is to study certain aspects of a value chain in depth. One of these is analysis of the distribution of costs and margins for the actors involved along the different stages of the value chain. The distribution of benefit in the value chain was examined by considering costs, returns and marketing margins. Marketing margin can be used to measure the share of the final selling price that is captured by a particular agent in the value chain. The relative size of various market participants' gross margins can indicate where in the marketing chain value is added and/or profits are made. In order to calculate the marketing margin of an agent, the average price of mango for that particular agent was taken. Marketing margins, cost structures and benefit share of value chain actors is presented in the Table 13.

Each of the mango value chain actors adding value to the product as the product passes from one actor to another. In a way, the actors change the form of the product through improving the grade by sorting, cleaning or washing or create space and time utility. Table13 indicates different types of marketing costs related with the transaction of mango by all actors and market margin for each actor along the mango value chain.

The arrangement of marketing cost revealed that storage loss is the highest cost for each marketing agents except for processors who incur large cost for processing (manufacturing). This is due to the perishable nature of the product. Thus, the storage loss is the amount highest followed by transportation cost. Processors incur highest cost of all other traders because they incur additional cost for processing.

Accordingly, margin analysis for value chain actors indicated that about 68.4% and 66.33% of profit margin and market margin, respectively, goes to mango processors. This is because they process 150 cup of juice from one quintal of mango and sell each cup of mango with the mean price of 11 birr excluding value added tax. Second to processors, farmers obtain about 10.57% and 12.4% of gross marketing margin and profit margin, respectively, because their marketing cost structure is minimum in relative to other traders. The analysis also revealed that about 10.66%, 7.13% and 5.31% of the gross marketing margin in the mango value chain goes to retailers, wholesalers and collectors, respectively. About 10.3%, 5.24% and 3.7% of the profit margin in the value chain goes to retailer, collector and wholesaler, respectively. The low marketing margin of traders is because of the highest marketing margin obtained by mango processors and their high marketing costs especially wholesalers. In general the study has indicated that about 89.43% of gross marketing margin in mango value chain goes to mango traders and producers earn only about 10.57% of gross marketing margin.

Table 12: Analysis of distribution of margin along mango value chain

Items in br/quintal	Actors along mango value chain					Horizontal summation
	Producer	Collector	Wholesaler	Retailer	Processor	
Purchase price	-	152.5	242.5	316.33	490	1241.33
Production cost	21	-	-	-	-	2
Marketing cost						
Labor for packing	-	1.25	3.00	1.30	-	5.55
Loading and unloading	-	-	4.77	3.50	3.00	11.27
Material cost	-	1.7	4.00	2.50	3.00	11.2
Transport cost	4.70	-	18.00	25	12.00	59.7
Sorting and grading	-	-	3.00	-	-	3.00
Telephone cost	-	5.00	5.00	-	-	10.00
Loss	3.50	8.50	11.50	7.5	3.20	34.20
Processing cost	-	-	-	-	150.00	150.00
Total marketing cost	8.20	16.45	49.27	39.8	171.20	284.92
Overhead costs	3.00	3.30	24.90	3.00	34.00	68.2
Total cost	11.20	19.75	74.17	42.8	205.2	353.12
Selling price	210.14	247.5	370	507	1676.7	3011.34
Marketing margin	189.14	95	127.5	190.67	1186.7	1789.01
% share of margin	10.57	5.31	7.13	10.66	66.33	100.00
Profit margin	177.94	75.25	53.33	147.87	981.5	1435.84
% share of profit	12.4	5.24	3.7	10.3	68.4	100.00

Source: Survey result (2015)

2.1.2. Marketing margins of actors in different channels

Marketing margins of mango in the selected channels for each group of market players is given in Table14. GMM_f, GMMc, GMMw, GMMr, and GMMp are gross marketing margins of producers, collectors, wholesalers, retailers and processors, respectively. NMMc, NMMw, NMMr and NMMp are net marketing margins of collectors, wholesalers, retailers and processors, respectively.

As depicted in the Table 14, Total Gross Marketing Margin (TGMM) is highest in the channel V, III and VII which is 90.6%, 88% and 86%, respectively. The main reason for this is the highest consumer price obtained by the mango processors. The farmers' Gross Marketing Margin (GMM) is highest in the channel I which is the 100% of the consumer price. This is because of the direct sale of mango to the consumers with a good price and lack of intermediaries in the channel. Correspondingly, farmers' gross marketing margin is lowest in the channel number V which is accounted 9.4% of the consumer price. This is because of the involvement of collectors in the channel which pays relatively low price for mango producers. The gross marketing margin of collector is highest in the channel number IV which is accounted about 18.18% of the consumer price. This is because they purchase in relatively cheap price and sell to the other traders with better price. The gross marketing margin of the wholesalers is highest in channel number VI and lowest in channel number V which is about 26.92% and 7.6% of the consumer price, respectively.

The highest Net Marketing Margin (NMM) of the processor, retailer, collector and wholesaler is 63.4%, 48.84%, 14.5%, and 12.66% in channel number III, II, IV and VI, respectively. The lowest net marketing margin of processors, collectors, wholesalers and retailers is 51.2%, 4.25%, 3.08%, and 2.81% in channel number V and VII, respectively. In general processors obtain the highest Gross Marketing Margin (GMM) and Net Marketing Margin (NMM) in the value chain which accounted about 75.67% and 63.4% of the consumer price, respectively, followed by retailers who obtain about 57.4% and 48.84% of the gross marketing margin and net marketing margin, respectively, of the consumer price along the value chain. This is in line with the Ayelech (2011) who indicated that juice houses (processors), get the highest gross market margin and net market margin of consumer's price in the given channels.

Table 14: Marketing margins for actors along different marketing channels

Marketing margins	I	II	III	IV	V	VI	VII
TGMM	0	57.4	88	72.72	90.6	53.85	86
GMMf	100	42.4	12	14	9.4	46.15	27.27
GMMc	-	-	-	18.18	5.45	-	-
GMMw	-	-	-	20.00	7.6	26.92	8
GMMr	-	57.4	12.2	34.54	14	26.92	5.45
GMMp	-	-	75.76	-	63.63	-	72.62
NMMc	-	-	-	14.5	4.25	-	-
NMMw	-	-	-	6.5	3.08	12.66	3.62
NMMr	-	48.84	9.66	26.7	11.34	18.7	2.81
NMMp	-	-	63.4	-	51.2	-	60.4

Source: survey result (2015)

Constraints and Opportunities of Mango Value Chain in the Study Area

Constraints of mango production

The survey assessment has revealed that major problems of mango production in the study area are lack of technology, limited supply of improved mango variety, seasonality and weather related problems, lack of use of credit service, lack of irrigation, pests and diseases, harvesting and post harvest handling problems, low level of extension service provision and low level of knowledge and skill on efficient use of the mango product as shown in Table15.

Table 15: Constraints of mango production in the study area

Items	N	%
Lack of technology	30	21.74
Limited supply of improved mango variety	27	19.56
Seasonality and weather related problems	12	8.7
Lack of use of credit service	23	16.67
Lack of irrigation	10	7.25
Pests and diseases	4	2.9
Low level of extension service provision	24	17.4
Low level of knowledge and skill	8	5.8
Total	138	100.00

N = frequency, % = percentage

Source: survey result (2015)

Lack of technology: About 21.74% of sample respondents have replied as there is lack of technology in mango production. This is related with low level of the use of improved mango production systems such as mango breeding, use of agro-chemicals which kill plant pests and mango planting systems. Traditional way of planting mango without keeping spacing is also common problem of mango production in the study area.

Limited supply of improved mango variety: Majority of mango producers in the study area use local mango variety. The current supply of improved mango variety is insignificant in comparison to the demand and distributions of improved mango variety do not covered the whole members of society. Extension centre provides only apple mango variety for a limited number of farmers mainly for practical purpose. There is no supply of diverse number of mango varieties like Tommy Atkins and Kent mango variety which are quite important for production and productivity.

Low level of extension service provision: Extension service in the area is mainly oriented on providing technical service for other crops such as cereals and grains production. There is limited implementation of technical packages in fruit in general and mango sector in particular in the study area which might reduce the awareness level of farmers on benefits of mango for income and food security. Moreover, provision of technical packages like mango breeding, harvesting and postharvest handling, transplanting, and compost/farmyard manure application is inadequate and significant members of the society are uncovered. This is in line with the Belay (2003) who indicated that agricultural extension service has failed to bring major impact on productivity of fruits due to weak link between stakes and associate workloads of extension agents.

Low level of knowledge and skill: Majority of farmers do not give special attention to mango production because of emphasizing mainly on production of staple food items like cereals and consider mango as petty agricultural commodity. This is because of their low level of accessing information related with the market demand of mango. Farmers do not have knowledge on improved production technology, and there is little or no use of fertilizers and pesticides. A significant portion of mango fruit is goes to loss at farm level due to poor management. Exploitation of immature mango by household members and tame animals is also a common limitation of mango production in the area. This is in line with the James, *et al*. (2008) who indicated that due to

the highly seasonal nature of the mango crop, and also the tendency to prioritize food security with grain crops, mango growing is not the main livelihood activity for most farmers, and is generally considered as a complementary activity to other farming practices.

Lack of use of credit service: Despite credit service is accessible to majority of farmers in the study area; there is limited use of credit for mango production and marketing. Even if credit is important to facilitate the introduction of innovative technologies and for input and output marketing arrangements, majority of the farmers believe that mango can be produced with the zero economic cost and they do not need to incur cost for mango transaction activities. In addition to this, credit provision arrangement is not targeted on mango production and marketing systems in the study area. This is in line with the Ayelech (2011) who indicated that even if micro-finance and governmental and private banks are available in the study area no credit is reported by the respondents from formal banks. In addition to this, lack of small scale irrigation, seasonality and weather related problems, pests and disease are also highlighted during the survey period as the major constraints of mango production in the study area.

Opportunities of mango production in study area

Potential opportunities perceived for the sustainable production of mango in the study area include suitable agro ecological zone with favorable weather conditions, abundance of locally accessible inputs like compost/farmyard manure, plenty of labor force, fertile arable land and market. Urbanization and rapidly growing population size is also perceived as a potential opportunity for mango production as these factors force farmers to produce more in order to meet market demand. In addition to this, woreda extension centre is intending to prepare nursery site for the rising of different mango cultivars which are friendly with the local conditions. Moreover, the current government policy dimension is emphasizing in horticultural sector in Growth and Transformation Plan (GTP) in order to promote the sector from small scale production to commercialization and agro processing. The assignment of crop experts at micro level based on their academic back ground for the increasing production and commercialization of agricultural sector is also important policy dimensions. Credit and saving institutions like OMF institution and commercial bank of Ethiopia are accessible for small scale farmers in the study area which boost their production and marketing capacity. Arbaminch agricultural research centre is engaged in specializing fruit and vegetable crops in the catchment areas. This is quite indispensable for research and development work in fruit sector and provision of improved mango cultivars in the regions.

Constraints of mango marketing

During the survey period, different constraints related with the mango marketing in the study area were identified in participatory manner with key informants, farmers, traders and woreda officials.

Table 16: Constraints of mango marketing in the study area

Items	N	%
Lack of farmers' cooperative	30	25
Low price of mango	17	14.2
Lack of potential market	5	4.2
Inadequacy of transport facility	11	9.2
Lack of market information	10	8.3
Low level of farmers' bargaining power	7	5.8
Perishability	23	19.2
Lack of proper storage and postharvest management	17	14.2
Total	120	100

N = frequency, % = percentage

Source: survey result (2015)

As depicted in the Table16, about 25%, 19.2%, 14.2%, 14.2%, 9.2% and 8.3% of sample households replied that lack of cooperative, perishability of mango, lack of proper storage and postharvest management, low price of mango, inadequacy of transport facility and lack of market information, respectively, are the major constraints of mango marketing in the study area. The survey has further revealed that low level of farmers' bargaining power and lack of potential market are also constraints that farmers' facing in the study area. Moreover, lack of agro processing enterprise is reportedly mentioned as the major constraint of mango marketing in the study area. Data obtained from mango traders indicated that high post harvest loss during transportation and collection point, price volatility, quality management, seasonality of mango; high transaction cost and illegal entry of some traders are the major problems of mango marketing. Exporting of mango to the Djibouti is completely blocked due to poor access to cargo facility at terminal market and lack of cold chain logistic and this is highlighted as potential constraint of mango marketing. In addition to this, the survey has further revealed that lack of government support is the major constraint of mango traders in the area.

2.1.3. Opportunities of mango marketing

The potential opportunities of mango marketing in the study area may include access to market, access to transport facility like road and vehicle, access to credit and so on. Woreda marketing and cooperative office is endeavoring to assure mango quality and regulates the market. Assignment of marketing experts for quality control and market follow up is considered as the opportunity for mango quality management. Potential entry of buyers in mango marketing and continuous demand for either fresh or processed mango products is also one of the potential opportunities of mango marketing. Moreover, the government policy dimension on commercialization of agriculture and major emphasis on horticultural and fruit sector stimulates the intensive involvement of small scale farmers as well as traders in mango marketing. Establishment of mango processing enterprises like Seka agro processing enterprises is quite important for absorption of mango from different regions of the country.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary and Conclusion

Mango sub-sector is a good entry point for tackling poverty and that the market for mangoes is significant and growing in Ethiopia. Mango is one of potential fruit crop which has a significant contribution to the livelihood of small scale farmers and creates business and employment opportunities for the many firms and commercial agents in the study area. This study was carried out with the main objective of identifying mango value chain actors and their respective functions, analyzing distribution of margins along mango value chain, identifying factors affecting intensity of farmers' participation in mango market and outlet choice decision.

In line with the objective of the study, value chain analysis indicated that there are direct and indirect actors who can take their part in each and every stages of the mango value chain in the study area. The direct actors of mango value chain are input suppliers, producers, collectors, wholesalers, retailers, processors and consumers. The indirect actors of mango value chain in the study area are both governmental and non-governmental organizations such as Agricultural Extension Centre, Marketing and Cooperative Office, Trade and Industry Department, Ministry of agriculture, (JICA/OVOP) and Omo Micro-Finance (OMF). In addition to this, major value adding activities performed by the mango value chain actors include provision of inputs, production, sorting, grading, drying, processing, transporting and distributing which in further adds form, time spatial value of the product.

The distribution of benefits in the value chain was examined by considering costs, returns and marketing margins along the chain. Accordingly, margin analysis for value chain actors indicated that about 66.33% and 68.4% of market margin and profit margin, respectively, goes to mango processors followed by producers who obtain about 10.57% of market margin. In general the study has indicated that about 89.43% of gross marketing margin in mango value chain goes to mango traders and producers earn about 10.57% of gross marketing margin. Marketing margins of mango in the channels for each group of market players has indicated that total gross marketing margin (TGMM) is highest in the channel V, III and VII which is 90.6%, 88% and 86%, respectively. The farmers' gross marketing margin (GMM) is highest in the channel I which is the 100% of the consumer price. The highest net marketing margin (NMM) of the processor, retailer, collector and wholesaler is 63.4%, 48.84%, 14.5% and 12.66%, in channel number III, II, IV, and VI, respectively. In general processors obtain the highest Gross Marketing Margin (GMM) and Net Marketing Margin (NMM) in the value chain which accounted about 75.67% and 63.4% of the consumer price, respectively.

The study has further indicated potential constraints and opportunities related with the mango production and marketing in the study area. Major problems of mango production in the study area are lack of technology, limited supply of improved mango variety, seasonality and weather related problems, lack of use of credit service, lack of irrigation, pests and diseases, harvesting and post harvest handling problems, low level of extension service provision and low level of knowledge and skill on efficient use of the mango product. Conversely, suitable agro ecological zone with favorable weather conditions, abundance of locally accessible inputs like compost/farmyard manure, plenty of labor force, fertile arable land and market, urbanization and rapidly growing population size and availability of credit and saving institutions is perceived as the potential opportunities of mango production. The major constraints of mango marketing are lack of cooperative, perishability, lack of proper storage and postharvest management, low price of mango, inadequacy of transport facility and lack of market information. Nevertheless, the government policy dimension on commercialization of agriculture and major emphasis on horticultural and fruit sector stimulates the intensive involvement of small scale farmers as well as traders in mango marketing.

RECOMMENDATION

Based on the result obtained from the current study the following are anticipated to be done for the further improvement of mango value chain in the study area.

Capacity building of farmers on agronomic practices like orchards spacing, technological application,

use of improved mango varieties and overall farm management are key to the development of the mango value chain thereby improving mango production system. Strengthening of agricultural extension service in dissemination of improved mango variety and technical service provision is quite important. Therefore, attention should be payed on enhancement of technological frameworks in mango sector.

Cooperative is quite important for group marketing and strengthening of farmers' bargaining power and pooling of resources for the intensive involvement of farmers' in the market and keeps up the farmers' economic benefit. Therefore, farmers' mango marketing cooperative should be established in the study area and programmes aimed at commercialization of mango sub-sector should be designed. Designing of development programmes on reduction of post harvest loss of mango and promoting cold chain logistic system along the mango value chain is quite important for all actors in the chain. In addition to this, provision of improved mango harvesting material is quite prominent to reduce postharvest loss of mango at farm level and attention should be given on it. Value chain governance and coordination among actors in mango value chain in the study area is poor. Therefore, creating marketing network among actors is quite important for value chain coordination, innovation and development. Access to market, access to market information, credit and quantity of mango produced should be promoted and strengthened for the further improvement of mango value chain and commercialization of smallholder farmers in the study area. In general, policy initiatives aiming at increasing farmers' access to mango technologies, developing and improving market information, cooperative development, postharvest loss, innovation, improving extension system and credit are recommended to accelerate the development of mango value chain in the study area. Further investigations emphasizing on economic analysis of post harvest loss of mango along the value chain in-depth and determinants of postharvest loss of mango at farm level and along the whole value chain should get attention.

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