Tomato Value Chain Analysis in North Mecha, Bahir Dar Zuria, Fogera and Dera Woredas of Amhara National Regional State

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Submitted to
Programme for Agribusiness Induced Growth in the Amhara region (AgroBIG)

August 2018

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ACRONYMS AND ABBREVIATIONS

AgroBIG	Agro-Business Induced Growth in Amhara National Regional State
AIC	Amhara Investment Commission
ARARI	Amhara Agricultural Research Institute
ASCI	Amhara Saving and Credit Institution
BOAM	Business Opportunities and their Access to Market
DAP	Di-Ammonium Phosphate
DDT	Dichloro Diphenyl Trichloroethane
EIAR	Ethiopian Institute of Agriculture
ERA	Ethiopian Road Authority
ERCA	Ethiopian Revenue and Customs Authority
EHPEA	Ethiopian Horticulture Producer Exporter Association
ESACC	Ethiopian Sectoral Association and Chamber of Commerce
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
FMHACA	Food, Medicine and Health Care Administration and Control Authority
GO	Governmental Organizations
ha	Hectare
kg	Killo gram
LC	Letter of Credit
lt	Liter
m.a.s.l	Meter Above Sea level
MoE	Ministry of Education
MoJ	Ministry of Justice
MoT	Ministry of Trade
NGO	Non-Governmental Organizations
NPS	Nitrogen-Phosphorus-Sulfur
OoA	Office of Agriculture
OPV	Open Pollinated Varieties
ORDA	Organization for Rehabilitation and Development in Amhara
qt	Quintal (100 kg)
SGM	Simplified Gross Margin
SME	Small and Medium Enterprise
SNV	The Netherlands Development Organization
USD	United States Dollar
VCA	Value Chain Analysis

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EXECUTIVE SUMMARY

Tomatoes are one of the important mainly irrigated and to some extent rainfed crop in Four of the Eight AgroBIG project woredas, namely North Mecha, Dera, Fogera and Bahir Dar Zuria. It is produced mainly as cash crop and to some extent for fresh use by farmers.

This tomato value chain analysis report is prepared based on the study conducted in July 2018 in the aforementioned woredas using individual household (HH) surveys, Focus Group Discussions (FGDs), physical observations and key informant surveys. The study found that the main actors of the value chain in the region are small scale farmers, brokers, traders and consumers. Although tomato is one of the export crops in Ethiopia, which generated about 9.2 million USD in 2015 (ERCA, 2015), the value chain was found to be short without value addition activity where by fresh tomatoes are supplied to the local market for fresh consumption only.

According to the marketing analysis results, tomatoes produced in the project woredas are collected either directly from farmers by traders (through brokers) or from local markers and supplied to Bahirdar, Gondar, Dessie and Wollo areas in general, Humera and Dansha (now stopped for reasons explained below in the document), Jigjiga and Debremarkos and the surroundings.

Many farmers and AgroBIG itself believe that the value chain analysis assignment should focus on ways of creating market linkages and thought that the market problem that the farmers have been facing is due to external factor other than the production factors. The study revealed that the way tomato is produced and the productivity have created the market problem. The productivity (production of tomato per unit area) is very low in all the project woredas. The biological potential of the crop is about 100,000 kg/ha (100 tons/ha) although there is a huge variation depending on the varieties and production practices. Hybrid varieties give even more than 100 tons/ha, whereas open pollinated varieties (OPVs) give lesser yield than hybrid ones. The maximum average yield of OPVs reported by Asfaw and Eshetu (2015) was about 470 tons/ha. However, farmers in the project woredas are getting on average 175 quintals/hectare (qt/ha). When the production or productivity is low then the farmers demand high price per kg of tomato. This factor (a) could not let the farmers to have long term contract with big buyers such as Etfruit, (b) could not let the traders to sell the product to the country's biggest market place, Addis Ababa, and (c) limits the supply regions to a few areas.

Unless and otherwise serious measures are taken on improving production and productivity as per the interest of the different buyer types, the same reason will continue creating problem in the relationship between farmers and the traders and upcoming processors. Usually processors may specify the kind of varieties that suit to the products they manufacture. Under this situation processors may supply seeds or seedlings to be produced and supplied to them on contractual basis. If farmers do not strictly follow the production standard and be able to produce near to the optimum yield, the envisaged relationship between producers and processors that the regional government and the project want to have will not be sustainable. The reason being the processor will lose much more than the farmers because of the high cost of hybrid processing tomato varieties which is between 0.2 to 2.0 United States Dollar (USD) per seed.

According to information obtained from the Amhara Investment Commission (AIC) and the Consultant's own source, there are 22 processors in the region in different stages. Of these, one of them, Africa PLC, is said operational in Shewa Robit area in AIC's report (but at the moment it only has Mango plantation and the manufacturing part is not yet started), 4 are under implementation and the rest 17 are in pre-implementation stages. In addition, there are small scale tomato processing establishments for Small and Micro Enterprises (SMEs) like the ones visited in Debretabor and Woretta. If all the processing investments become functional, it would be very good opportunity for tomato producers in the project woredas as well as in the region as whole. The nearly completed and the biggest of all tomato processing plants is the one established by Nur Belay PLC's at Kombolcha. The plant will receive 150,000 tons of tomato per a day and it can also process onions.

The current marketing system with traders has been done in unorganized way without contract and regulation to govern it. The buyers and sellers are connected through brokers, and the farmers complain about the price fixation by the middlemen. Traders do not want to have contractual agreement with farmers due to high uncertainty of the market, but farmers do. Farmers' cooperatives, even specialized ones for marketing, have not yet started collecting tomato from fellow members for trading. For these reasons, the farmers have no alternatives other than traders which are sourcing the products through brokers.

Six major marketing channels have been identified in the study. These include:

- Project woredas to Bahirdar and Debretabor
- Project woredas to Gondar
- Project woredas to Dessie and Wollo areas in general
- Project woredas to Markos, Dilamo, Kosober, and Chagni areas
- Project woredas to Jigjiga
- Project woredas to Humera, Dansha and rarely to Shire

In the simplified gross margin (SGM) analysis summarized in Table 8, producers earn the highest margin even with the current production level. This however discourage wholesalers from buying their product and this has created loss of income to farmers as it happened last year. Higher SGM to farmers does not mean farmers are benefiting more than the traders; in fact, they are the least beneficiaries amongst all since they are producing little and their supply volume is very low. Instead, it shows that farmers could maximize their income if they can enhance tomato production and productivity per unit area. Among the marketing channels, the Dessie and Wollo area route is most profitable one followed by Jigjiga and Gondar routes. The least profitable one is the supply to Bahir Dar city.

Detail information on opportunities, constraints and suggested solutions for each actor have been described in *Section-3.8*. In the summary part of this report, the opportunities, constraints and suggested solutions for producers only have been presented below.
The opportunities in the tomato production by farmers are:

- Availability of water and irrigation schemes in some of the woredas
- Suitable environmental conditions
- Access to land during the so-called off-season time and proximity to infrastructures and markets
- Support from Office of Agriculture, AgroBIG and other NGOs

The major limitations raised by farmers and/or observed by the Consultant are:

- Prevalence of diseases and pests and non-effective pesticides availed by traders
- Shortage of improved tomato varieties affordable to farmers, low yield and mixed/strange plant characters observed in the field
- Water shortage around spring time especially for canal irrigation users at Koga
- High input (fuel, seed, chemicals and fertilizer) cost and adulterated fuel and oil for pumps
- At Fogera where they plant tomato during rainy season, they sometimes face hailstorm problem
- Market problem for fresh tomato, absence of alternative market such as processors, price fixation by brokers, and price fluctuation
- Haphazard pest control strategy among the neighboring farms led to repeated spraying of chemicals (beyond recommended rate and frequency) which makes crop protection costly, unfriendly to the environment, and unsafe to the consumers
- Absence of crop rotation in most of the tomato production field led to development of disease and pests

Suggested solutions for the aforementioned constraints:

- For the chemicals, seed, and improved seeds availability and effectiveness problems, the support institutions such as bureau of agriculture, AgroBIG, and other GOs and NGOs shall have basic research and adaptation trails in order to sustainably solve the problems. AgroBIG may assist in adaptation research trials, which can be completed in one or two years.
- Water shortage arise due to the application of an old and water wasting irrigation technology by the government. Temporarily, this problem can be solved by staggered production by having consensus with farmers. In the long run, incorporation of water saving technology might be good to consider.
- Farmers should be advised to get used to high input cost because it is what they will face time and again based on the international market price. They should learn paying high price for quality, and should not expect subsidy or donation for their own advantage.
- Tomato is not a crop of choice for rainy season due to susceptibility to diseases and pest. Farmers who have well-drained soil produce tomato during rainy season, which sometimes has hailstorm problem. Therefore, the decision that the farmers should make is either not to produce tomato during rainy season or to have rainout shelter or protected agriculture.
- The solution that are suggested to market problem include:
  (a) to encourage the investors who have plans to establish processing facilities and then to strengthen contractual farming (out-grower scheme) development with processors.
  (b) to increase bargaining power of the farmers by capacitating marketing cooperatives
  (c) In the absence of the aforementioned alternative solutions, farmers can think of having their own processing plants by organizing themselves into processing cooperatives.
- Farmers need to adopt programmed/staggered planting and pest control in a cluster so that they will have extended harvesting time whereby the market price is relatively higher, reduced cost of production, safe environmental and human health conditions
- Tomatoes should be grown on the same field once every 2 to 3 years, and related crops such as potatoes and hot pepper should not be used in the years rotation to avoid diseases build ups. The crops to be considered for crop rotation shall not be members of

Solanaceae family which are related to tomato. Cereals and pulse crops can be used rotation purposes.

In addition to the suggested solutions for each actor, the major recommendations and interventions are:

- Tomato production packages or research recommendation on husbandry practices should be respected by farmers (please see details in *Section-4.4*) in order to get optimum yield and quality.
- The marketing problem can be solved (a) by increasing the number of buyer types such as processors and exporters, (b) specializing the type of tomato to be produced, and (c) adopting staggered production. For all these options detail strategies have been given in *Section-4.3*.
- Creating a platform to bring as many stakeholders as possible from (research institutions, agriculture bureau, regional government office, trade bureau, finance and economic cooperation bureau, farmers, licensed brokers, traders, consumer associations, and possible processors) to discuss on the opportunities, problems and solutions in tomato value chain.
- Capacity building by providing training to different stakeholders of the value chain. For instance, training on (a) good agricultural practice and basic record keeping to farmers; (b) procurement of reliable agricultural input to suppliers; and (c) crop management skill to development agents are some of the major needs. The platform that is recommended in this report to be established serves to identify further training needs amongst the value chain actors.
- Technology transfer, which are difficult to implement by the government budget.
- Research institutions and bureau/office of agriculture should take the leading role towards improving the production and productivity of the crop.
- The regional government should intervene (a) to strictly support and follow up the progress of investors who are supposed to engage in processing sector; enforcement of the investment regulation should be done, (b) to take actions on the processing plants such as the ones in Woreta and Debretabor, which were established by its own resources, and (c) to support marketing cooperatives to get into the business that they are intended to.
- The long-term strategy that should be implemented by the regional government (at least in areas where it heavily invests in irrigation infrastructure) is to adopt cluster-based production system with state-of-the-art technologies instead of focusing on small-scale farming. This can be done by selecting a model farms and communities first and then expand based on the lessons to be learned from the predecessors.

1. INTRODUCTION

1.1. Background of the Project in ANRS

Programme for Agro-Business Induced Growth in Amhara National Regional State (AgroBIG) is a bilateral programme funded by the governments of Finland and Ethiopia. It has been supporting farmers, agri-businesses and institutions in the region in order to improve the livelihood of the rural communities. The first phase of the program run for 5 years between 2013 and 2017.

The second phase started in mid-2017 and will run to the end of 2021. It operates in Eight woredas (North Achefer, South Achefer, North Mecha, South Mecha, Bahir Dar Zuria, Dera, Fogera and Libo Kemkem) belonging to two administrative zones, namely West-Gojam and South Gondar. The total population in the selected project woredas are 1.7 million excluding town woreda dwellers. The program aims to enhance job creation and improved livelihoods among farmer households, service providers, traders, processors, and retailers in the project woredas. The woredas where Agro-BIG II is operating are known for their mixed crop-livestock agriculture. Since the project woredas are found in Koga, Rib and Gumara catchments, most of them have irrigation access in dry seasons in addition to rain-fed agriculture. Value chain approach is one of the tools being implemented to improve the livelihood of farmers as well as to downstream businesses in a selected commodity. Among the value chains which are being used as vehicles to accomplish the project objectives are tomato, potato and onion crops. This report is therefore the value chain analysis conducted for tomato in Fogera, North Mecha, Bahir Dar Zuria, and Dera woredas.

1.2. Objective of the Study

The objective of the study was to conduct full scale value chain analysis for tomato in 4 woredas (North Mecha, Bahir Dar Zuria, Dera and Fogera), to pin point opportunities and constraints of the actors, and to suggest possible solutions for upscaling the value chain.

1.3. Methodology of the Study

The tomato value chain analysis (VCA) was conducted by combining data from desk review of project related documents, field visits (household survey and focus group discussions with farmers) and individual interviews of chain actors and support institutions. Structured questionnaires were prepared for interviews of the HH surveys, FGDs, support institutions, and marketing and processing agents. A total of 35 hhs were interviewed from high potential and low potential kebeles of each woreda and 4 FGDs were held with about 37 farmers (of which 7 were women). Minimum of two actors were also contacted across the chain starting from collectors to processors. Finally, all actors of the tomato value chain were mapped; opportunities and constraints were identified; and recommendations were suggested as shown in the subchapters below.

2. OVERVIEW OF SUB SECTOR DESCRIPTION AND DYNAMICS

2.1 Importance of the Sub-sector, Dynamics & Trends

I. The tomato crop

Tomato *(Lycopersicon esculentum)* belongs to *the Solanaceae* family. The Central and South America are the origin and diversity of the crop. It became distributed to Europe and Asia in the early and mid-1960s (Asfaw and Eshetu, 2015). The crop spread *via* traders to Egypt, Sudan, South Africa, West Africa and to the rest. The different varieties of tomato vary in shape, size, and color. It varies from small cherry like, fresh market and processing types.

II. Tomato production: global and Ethiopia's situation

Tomato was grown on 4,782,753 ha of land all over the world with a production of about 177,042,359 tons (FAO 2016). Of this, China is the world's top tomato growing country with about 30% production followed by India and USA. The only African country in the top ten highest tomato producing country is Egypt ranking fifth in the world (Figure 1, Left). The crop is an important cash-generating crop to small-scale farmers and provides employment opportunity to many individuals in the production and processing industries.

In Ethiopia, according to the FAO's average data between 2011 and 2016 (Figure 1, Right), the total area under rain-fed tomato was 7,100 hectares with 50,150 tons of fruits (FAO, 2011-2016). In Ethiopia, tomato is mainly irrigated crop and the production area can be higher than this value.

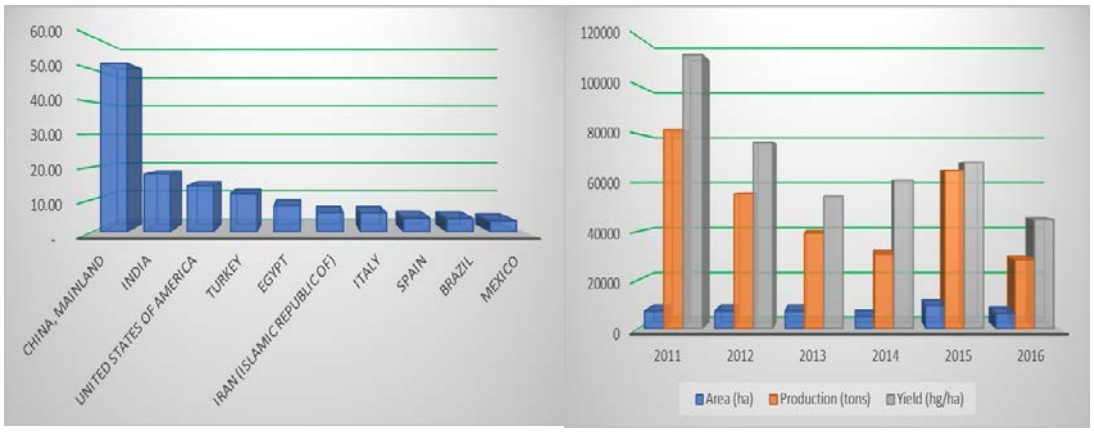

Figure 1. Left: Top 10 tomato producer countries (million tons) in the world; Right: tomato production area (ha), production (tons) and yield in (hg/ha) in Ethiopia (FAO, 2011 – 2016 average)

Tomatoes are one of the important irrigation crops in the project woredas specifically and in Amhara region in general. For instance, in Koga tomato production and area coverage has been increasing in the past five years due to the establishment of the irrigation facility. The area coverage grew from 21 ha in 2012/13 to 113 ha in 2016/17. In the same range of years total production grew from 460 to 2.836 tons (Figure 2). The overall data on tomatoes production and productivity in the region is inconsistent. According to CSA data, the total area for tomato production for the region is less than a thousand ha. In 2013/14, the area coverage was 526.2 ha.

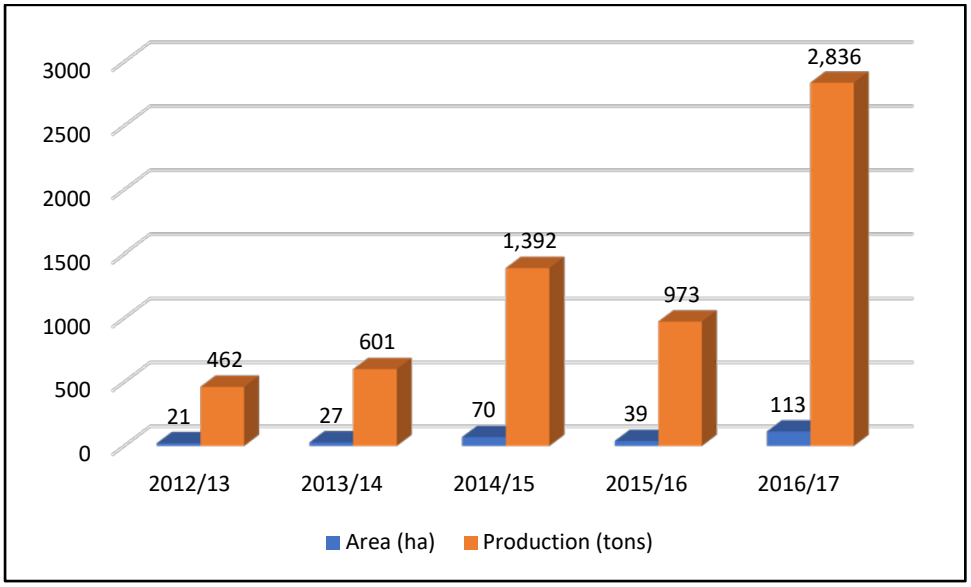

Figure 2. Area coverage (ha) and production (tons) of tomatoes by Koga irrigation users in North Mecha Woreda from 2012/13 to 2016/17

III. Tomato consumption: Tomato is served raw, baked, stewed, fried, and processed to pickles, sauce, juice and concentrated pastes. It is an excellent source of vitamin C, biotin, molybdenum, vitamin K, vitamin A (in the form of beta-carotene), vitamin B, vitamin E, foliate, niacin. It is also a good source of protein, chromium, pantothenic acid, molybdenum, choline, zinc, and iron.

IV. Tomato import and export

Studies indicated that most of Ethiopia's fruits and vegetables are grown for local consumption. However, considerable amounts of fruits and vegetables grown on small private farms in Eastern Ethiopia are exported. The export fruits include oranges, mangos, lemons, papaya, grapefruit, pineapple and banana. Ethiopia also sells some processed fruits and vegetables to Sudan, Nigeria, Yemen, Saudi Arabia and other Middle East countries. In 2015, Ethiopia exported tomatoes to 7 countries and earned 192,151,623 million ETB or 9,246,060 USD (ERCA, 2015). The trend in tomatoes (fresh or chilled as identified by HS Code 07020000) from 2010 to 2015 indicated that the export volume and value has been increasing (Figure 3 and 4).

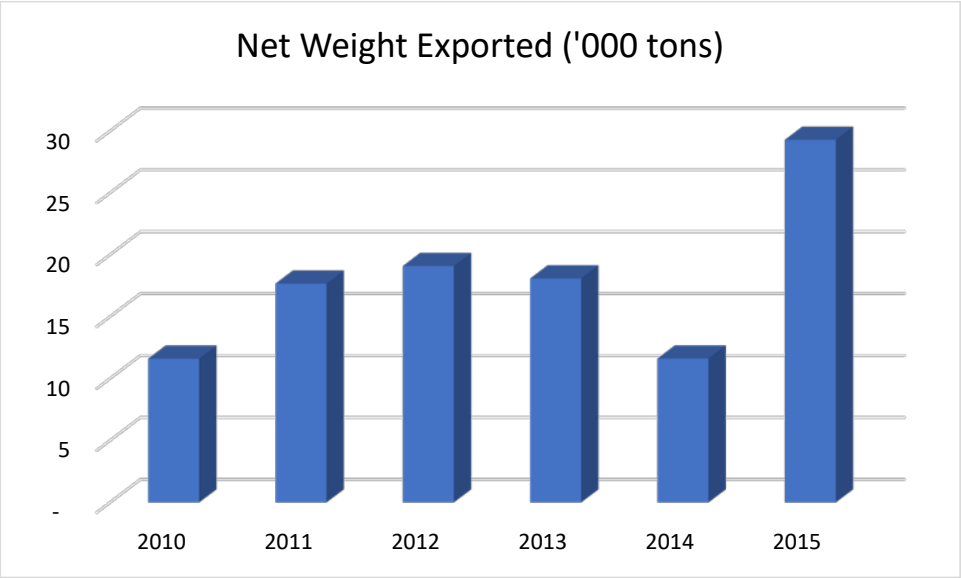

Figure 3. Trends of fresh and chilled tomatoes export volume in thousand tones from 2010 to 2015 (Note: the data for 2014, was only half a year from January to June)

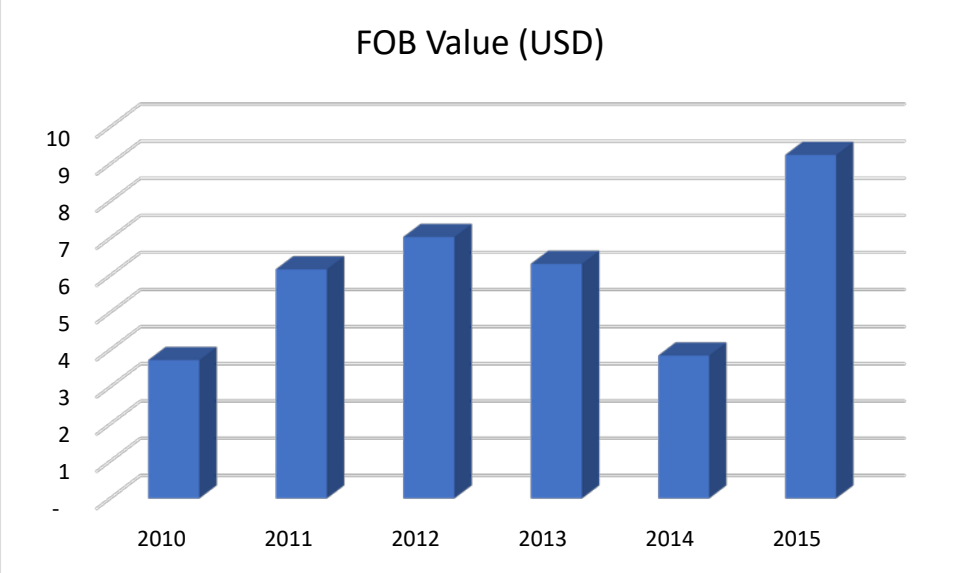

Figure 4. Trends of fresh and chilled tomatoes export value in Millions of USD from 2010 to 2015 (Note: the data for 2014, was only half a year from January to June)

V. Tomato processing

Products of processed tomato include peeled, dried, pickles, juice, sauce, paste/pulp, concentrated paste, and ketchups. In Ethiopia, only one processing plant has been operational at factory level for the last 3 decades in Upper Awash. Recently, some processing companies have been established and got investment licenses, although almost all of them are either under construction or have technical difficulties.

In Amhara region, there are 22 manufacturing investments related to tomato processing. Of these, one of them (at Shewa Robit) is reported operational, 4 are under implementation, and the rest 17 are under pre-implementation stages (Table 1).

In addition, there are two small scale processing units established as SMEs in Debretabor (Figure 5) and Woreta (Figure 6). The SME in Debretabor is called "Tafach Agro-processing cooperative union/association" and it comprises 30 youth members (3 women and 27 men). This company is not functional due to market problem and sub-standard equipment or facilities.

Figure 5**. Tomato paste processing compound at Debretabor**

The one in Woreta is called "Tenta Anguachina Guadegnochachew Tomato Processing S/C" and it has six shareholders. The company has had a problem with the supplier of the processing equipment since the machines were not working well.

Figure 6. Tomato paste processing compound at Woreta

VI. Tomato research recommendations

In Ethiopia, about 39 varieties of tomato have been registered till 2016 for both fresh use and processing types (MoANR, 2016). To mention some of the recent varieties, ARP-Tomato D2 and Fetan are fresh use varieties; whereas Emerald (Hybrid), Hawassa (Hybrid), Awash River (Hybrid), Galili (Hybrid), Gelilema (OPV) are varieties released for processing purposes. Most high yielding hybrid varieties are imported and registered in Ethiopia by private companies and hence the cost of seeds is relatively expensive when compared to open pollinated and hybrid varieties developed by the Ethiopian Institute of Agricultural Research. For research recommendations for optimum production, please refer *Section-4.4* below.

2.2 Importance of Tomato Production in Project Areas

2.2.1. Production

Seed: Most farmers in the AgroBIG woredas do not certainly know what kind of varieties they are producing. They mentioned some varieties such as “Senbersa”, “Kochoro” and recently introduced variety by SNV-Ethiopia called “Galilia”. It looks that they are producing very old (Kochoro and Senbersa) and relatively recent hybrid (Galilia) varieties. They get seeds mainly from traders and fellow farmers, and rarely from Office of Agriculture and non-governmental organizations (NGOs) like the Netherlands Development Organization (SNV) and Organization for Rehabilitation and Development in Amhara (ORDA). Farmers do not even know the difference between hybrid varieties and open pollinated varieties (OPV), and hence they extract seeds from hybrid varieties for use in the next production season. This has contributed to low productivity and production in the woredas.

Agronomic practice: All the woredas surveyed have almost similar agricultural practice. All woredas produce tomato almost at similar months in dry season; they in most cases plant starting October to February and harvest starting from January to June or July. In Fogera

woreda, however, farmers - who do not have access to irrigation and have well drained land with gentle slope - started producing tomato in rainy season (planting in July/August and harvesting as of December). Land preparation requires 3 to 6 plowings depending on the type of soil. Hand weeding is the common ways of weed control; and none of the farmers contacted have used chemicals. The number of hand weeding cycles reported ranged from 2 to 6, the maximum being from Kolela kebele of North Mecha. Almost all farmers do not use fertilizers as recommended by research institutions. Most farmers apply DAP/NPS at planting and two to three weeks after planting and Urea after crop establishment and just before flowering at a very low rate. In Bahir Dar Zuria woreda, specifically at Yogoma/Andasa kebele, they do not use DAP/NPS at all. Instead they only apply Urea again at marginal rate. Pesticides such as Ridomil, Mancozeb, Selecron, Dichloro Diphenyl Trichloroethane (DDT), and other that farmers could not name are used against insect pests and diseases. Although DDT is obsolete since 1972 in USA, it is being used by farmers in some countries. None of the interviewee ever used stalking to support the crop for better yield and to protect the tomato fruit from soil contamination. To conclude, the agricultural practices being followed by farmers are less intensive and hence the productivity is by far lower than the biological potential of the crop.

Water requirements/irrigation: Most of the woredas in this study have access to irrigation water since they are located around Koga, Rib and Gumara catchment areas. However, the irrigation types they are using is furrow irrigation either by pumping water from the river and underground sources or through canals constructed for this purpose by the regional government. Furrow irrigation system is wasting too much water and hence farmers are getting water once in 10 about days in the newly constructed irrigation scheme at Koga. Water shortage happened especially after March, and this force the farmers to grow tomato at the same time, which in turn has consequences in tomato market price. Staggered production to prolong the tomato supply is not possible due to the backward irrigation scheme implementation. Apart from that more or less most farmers have access to irrigation water sources.

Harvesting: Tomato is harvested by hand when the fruit is about to ripe. No machineries have been mentioned for harvesting. Harvesting cycles varies from place to place. In some woredas, the harvesting is extended to more than two months and is done every 3 to 7 days depending on maturity level and the market conditions.

2.2.2. Post-Harvest

Handling: After harvesting, tomato is handled with traditional baskets/ “Kuna” if the farmers themselves are fetching the product to market. When they have pre-arranged agreement with traders through broker-collectors, the collection and handling of the harvest will be using wooden-boxes so that it will be loaded to lorries immediately after harvest.

Storage requirements: Tomato is not a crop to be stored by farmers. If storage occurs, it is only for one day either on the field or transported to the house by farmers or donkeys. Otherwise, it is loaded to trucks immediately after harvest.

Shelf life: The shelf life of tomato fruit depends on type or purpose of the varieties (processing or fresh use), fruit size, shape, and harvesting stage. Mostly farmers grow varieties depending the needs of traders. Traders want to have long shelf (regardless of the type of varieties) in order to avoid loses during transportation and retailing. Hence, traders influence what kind of

varieties to grow. For this reason, most farmers prefer processing type of tomato (less juicy and hard skin) to fresh-use varieties, which are characterized with high water content and tasty. In order to manage shelf-life farmers implement selection of varieties (unknowingly processing type), shape (oval shaped is preferred), and harvesting when the fruit is just to start becoming reddish or before ripening.

Packaging: Farmers sell tomato harvest unpacked with wooden-boxes supplied by traders. Hence no packaging is involved in tomato marketing in all the woredas.

Transport: Depending on accessibility of farmers field for vehicles and the size of harvest, mostly trucks can load directly from the farm. Otherwise, farmers transport the harvest by carts, donkeys or human labor to bring the product to the accessible roads for trucks or to store it at home for next day marketing.

2.2.3. Marketing

Demand and supply situation: Recently, the tomato market is highly unpredictable due to high volume supply at certain time and less supply at another time due to price situations. In good years (good in terms price, which may be due to low supply volume), farmers will be encouraged to produce more in the next cropping season. This, however, result in high supply volume in that specific season or year and will drop the price. In some years, for instance in 2017, the price dropped too low to the extent that some farmers did not even harvest the yield from the field since the return was not even covering the labor cost. Because that effect farmers in the study areas reduce tomato production in 2018, and hence the price went up this year. Therefore, the demand and supply situation depend on price and supply conditions which are positively and negatively affecting each other. For this reason, most traders (collectors and wholesalers) did not want to have contractual agreement with farmers. However, farmers want to such agreement in order to secure the market.

Quality requirements: Once again quality or type of varieties to be grown depends on the market demand, that means the traders' interest. Consumers do not have choice in the market since they are buying whatever the traders are supplying to the market. Most tomato supplied to the market is processing types instead of fresh use ones. This is because the processing types are preferred by traders due to their long shelf life as compared to fresh-use varieties. Therefore, the quality parameters are oval shape fruit, medium size, less juicy, hard skin, and medium ripening stage. Contrary to other regions, the Somali region (especially Jigjiga) prefers small-sized tomato fruit of "Sembersa" variety from the AgroBig woredas because the Somalis "wrongly" believe that the small size fruits come from organic farms and the size fits to their tomato-paste preparation machines without splitting the fruit.

Marketing outlets/main segments/areas: Farmers in the project woredas have only two optional markets. Depending on the volume of production, they either retail themselves in the local markets/nearby towns or sell to traders (through brokers). Then the traders have many alternatives to sell the product:

- They supply the product to traders in Jigjiga
- They used to sell to Humera area near the Sudan, but now that region has become tomato producer and hence traders ceased sending there
- They supply to Gondar and Shire in Tigray

- They supply to Wollo direction up to Dessie

However, none of the project woredas supply to a real tomato processor so far.

Price fluctuations: Price fluctuation highly influenced production, trading, as well as consumption of tomato in the region. Farmers in AgroBIG beneficiaries woredas are sensitive to this and their decision whether to produce tomato or not depends on the price situation. Some wise and resource-rich farmers continue producing tomato even when the price drops in certain years and then they get good profit next season when the supply volume reduce.

Main actors: Tomato marketing actors in the project woredas include farmers, brokers/collectors, wholesalers, retailers, and consumers.

Service providers: The service providers include transporters, brokers, Office of Trade, Industry, and Market Development, Farmers Association or Cooperative Unions. In fact, farmers' association or marketing cooperatives have not yet started marketing tomato due to (a) the difficulty to forecast the market situation and (b) lack of market linkages to processors and exporters.

2.3. Sub-sector Maps

2.3.1 Functions and actors in the value chain

In Ethiopia the main functions for tomato value chain include input supply, production, marketing, processing, exporting, support provision, and consumption. In the project woredas, however, the functions and actors are limited in number and so do the chain actors. Below are functions and their main respective actors documented in the tomato value chain analysis assignment.

A. Input supply: Farmers source the following agricultural inputs, namely:
   - ❖ Seeds from traders, fellow farmers and their own extracts
   - ❖ Fertilizers from cooperatives only
   - ❖ Agro-chemicals from traders and in some woredas from cooperatives Tools from traders

B. Production: The production of tomato is almost entirely done by small-scale farmers. There is only one large-scale investment (to be operated by Gugsa Getachew Fisseha) registered for tomato farming in the project woredas (around Bahirdar) which will also conduct processing activities. However, the company is in pre-implementation phase.

C. Marketing: The actors in marketing of tomato include farmers themselves, brokers/collectors (who do not involve in financial transaction but assist traders to collect the product from farmers field), Traders (who buy and transport the harvest from production areas to where it is needed), and government offices (involved in licensing and provision of working space to traders).

D. Processing: This function is totally absent in the project woredas and also in the whole region. A number of private companies have been registered for tomato processing (Table 1). However, none of them are functional yet. In addition to the list shown in Table 1, there are small scale tomato processors planted since the last 5 years at Debretabor and Woretta.

However, these plants are not functional due to machine installation, machine quality (materials are not stainless steel), and organization or administrative problems. Out of the 22 processing plants which are under implementation or planning stage, the biggest and earliest one to start marketing linkage is Nur Belay Business PLC in Kombolacha (Figure 7). It has a capacity to receive 150 tons of tomato per day. It will be operational very soon after the machine available on site are installed, and hence it can be a candidate for contractual outgrower scheme agreement with tomato producers from AgroBIG project woredas. The owner (Mr Eskindir Nurye) has been contacted by the consultant and he is willing to work for farmers and cooperatives as long as they produce following his requirements. He has specific varieties which are processing type with high brix content (around 6) and he is expecting about 100 tons/ha.

The other two companies reported as they are in implementation stage in Merawi and Shewa Robit can also be additional outlets when they are operational. The other company in Bahir Dar which is reported as in implementation stage by AIC as tomato processing plant was contacted by the Consultant, but the owner said the business is converted to grain processing. The other one in Merawi is a very small plant under construction, it will receive only 5 to 10 tons of tomato per day when the machineries will be procured and installed.

In terms of the size, the second most important tomato processing company will be Africa PLC that has established 80 ha Mango plantations in Shewa Robit. The company has been reported as if it was under operation only because it established the farm. Otherwise, no processing plant is planted yet. The Consultant have contacted the owner (Mr Hussien Mohammed Nur and the Shewa Robit site manager, Mr. Elias) and learned that the company has been waiting for letter of credit (LC) to buy multi-purpose machinery to process mango and tomato. The daily tomato consumption will be 48 to 120 tons/day in three shifts. The management of the firm are highly interested to work with farmers and cooperatives for tomato production and supply. However, they also mentioned their concern on contract breach or reliability of the farmers. Contractual arrangement should be carefully devised and handled accordingly.

Figure 7. Tomato processing plant being established at Kombolcha by Nur Belay Business PLC

E. Exporting: There are no tomato exporters from the region or the project woredas. However, there are illegal traders from Jigjiga area, one of the destinations for tomato produced from AgroBIG project woredas, who are exporting to Somaliland. It is difficult to track that route too. Etfruit officially export tomato to Djibouti and Somaliland. However, although Etfruit has collaborative project with AgroBIG at Bahir Dar, it is not exporting tomato from the project woredas due to high price, expensive transportation cost and over maturity problem while transporting the products. Instead they source tomato from Hararghe and Rift-valley regions for export purpose. The one thing that Etfruit recommends for AgroBIG project woredas is to implement diversification and staggered production.

F. Consumers: Tomato consumption starts from the producers themselves and transcend to town/city dwellers within the woreda, the region and beyond. Consumers include households, hotel and restaurants, and buyers in importing countries. The quality requirement in these classes of consumers do vary. Normally hotels and restaurants need to have big sized tomato to be used in burgers and as an ingredient for salads. That means they need juicy varieties with good flavor, which is normally bred for fresh use. The export business is assumed to have similar quality since they are using the product for fresh use. Most individual household consumers in Ethiopia do not have detail information about the type of tomato they are buying; they do not differentiate the fresh use and processing tomato. They only look for the visual appearance, size and cleanness when they buy tomato.

G. Support provision: The support rendered to farmers by both governmental and non-governmental organizations, farmers associations, saving and credit institutions (especially the Amhara saving and Credit Institution- ASCI), research institutions, office of agriculture, office of Trade Industry and Market Development, AgroBIG, ORDA, and SNV are identified as support institution in the project woredas surveyed in this assignment. The government bodies provide technical support and provision of enabling environment for farmers; whereas farmers associations supply agricultural inputs to its members. ASCI is almost the major credit service provider in the project woredas and in the whole of Amhara region. Since the requirements for getting the credit is relatively easier than formal Banks, farmers do get credit from this institution for their farming activities. AgroBIG capacitate farmers through training and strengthening farmers association by availing facilities. SNV (through HortiLIFE project) and ORDA provide seeds and technical support including training to modernize the tomato farming activities of smallholder farmers.

2.3.2 Relationships between actors

The relationship between farmers and the traders and their helpers/brokers have been going on without any fixed contractual agreement. This is owing to the fragile nature of the tomato business due to price fluctuation and too much supply at the same time in a season. On top of this, farmers and even traders have limited marketing channels and market places, as they supply only for fresh tomato consumption purpose. Efforts have been made by different governmental and non-governmental organizations including AgroBIG to enhance actora' relationships for market linkage. However, it seems the effect is very limited and the working relationship continues business as usual.

2.3.3 Market channels and dynamics

Although the productivity of tomato by farmers in the Agro-BIG project woredas is between one-fourth to one-third of the biological potential of the crop due to poor farm management

practices, farmers are still complaining lack of sufficient markets for their products. This could be due to market saturation in Bahir Dar city, competition from other production areas (mainly the Rift-valley regions), and commencement of tomato production in previously nonproduction areas. The marketing channels are shrinking year-by-year. Traders in the region used to sell tomato to Humera, Jigjiga, Mekele, and wolo areas. However, recently Humera area become tomato-producer itself and the Mekele market is also being supplied by production from nearby woredas within Tigray or neighboring woredas of Amhara region such as Kobo. This situation has created big concern to producers in the study area, and hence they are desperately looking for alternative markets.

2.4. Enabling Environment: Policy Issues, Guidelines, and Resource Allocation

Ethiopia has been implementing agriculture-led and free-market economy for the last 3 decades. The project woredas of AgroBIG are among the naturally-favored areas where there is relatively better access to water resources and irrigation facilities have been rendered by the regional government. Hence, farmers are encouraged to produce at least two crops per year. Agricultural inputs are availed through farmers cooperatives and traders. Owing to the proximity of the woredas to the regional capital (Bahir Dar city), farmers have good access to farm inputs and other services.

2.5. Driving forces

The driving forces that encourage farmers to produce tomato are (a) the demand and market value, which s mostly attractive, (b) the availability of irrigation access, and (c) the “less intensive” nature of the crop for production, according to farmers assumption in the project woredas. Although tomato is among the horticultural crops which needs intensive management for good production, farmers in the survey woredas considered it as less intensive. Farmers are encouraged and/or discouraged to produce tomato based on the price situation in the previous production season. However, absence of market linkage to constant buyers like processors is one limitation that farmers spotted in the study.

Table 1. List of tomato processors in Amhara region

No	Investor's/ Project's Name	TELE	PROJECT'S ADDRESS		PROJECT TYPE	Status of Proj.
			ZONE	WEREDA/TOWN		
1	Adebabay Biru (Wrong contact number)	01-102240	Bahir Dar	Bahir Dar	Tomato Processing Plant	Implementation
2	Africa plc	0911252899	N/Shoa	Shoa Robit	Tomato Production & Processing	Operation
3	Alemu Nega (Converted to Grain Proc.)	0911505654	Bahir Dar	Bahir Dar	Tomato processing (for Export to Sudan)	Implementation
4	Gugsa Getachew Fisseha	0911673413	Amh,Afra	Bahir Dar	Tomato Farming & Processing	pre-implementation
5	Lidiya Abate	0911200103	N/Gondar	Gondar	Tomato Souse Production	pre-implementation
6	Saron investment PLC	0911225625	S/Gondar	Fogera	Tomato and rise processing	pre-implementation
7	Yehunie Dessie	0918713757	S/Gondar	Fogera	Tomato Factory	pre-implementation
8	Aema Akapa Trading plc	0912278359	N/Gondar	Denbia	Tomato processing	Pre-implementation
9	Asefa Alamirew Enyew	0918353620	Bahir Dar	Bahir Dar	Tomato, potato and onion processing	Pre-implementation
10	Esmal Ahemed	0918353550	W/Gojjam	Merawie	Tomato Processing (Under Construction)	Implementation
11	Fiseha Seteargie Amera	582221622	Bahir Dar	Bahir Dar	Tomato processing & marketing	Pre-implementation
12	Megechi Tomato Prod. & Processing plc	0924266750	N/Gondar	Dembia	Tomato production & processing	Pre-implementation
13	Mesret mekonnen	0911456276	N/Gondar	Gorgora	Tomato processing	Pre-implementation
14	Sisay Aseres	0918737830	N/Gondar	Metema Yoha	Tomato processing	Pre-implementation
15	Tena Dagnew	09181520001	N/Gondar	Denbia	Tomato processing	Pre-implementation
16	Wawa plc	-	N/Gondar	Chagni	Tomato processing	Pre-implementation
17	Vienus Gebreslasie	0911715965	N/Gondar	Denbia	Tomato processing	Pre-Implementation
18	Kidu Berehie	0911710370	N/Wollo	Kobo town	Tomato flour processing	Pre-implementation
19	Endalkachew Demelash Nega	0930001118	N/Gondar	Gondar	Tomato ketchup processing and packing	Pre-implementation
20	Andarge Minilik	0965179603	N/Gondar	N/Gondar	Tomato, onion, orang, mango processing	Pre-implementation
21	Fatuma Yesuf	0918776397	North Gondar	Dembya	Tomato processing and preserving	Pre-implementation

22	Nur Belay Business Plc	0911225132	S/Wollo	Kombolcha	Tomato, Onion, etc processing	Implementation
23	Tafach Agro-processing	0924268229	S. Gondar	Debretabor	Tomato and fruit processing	Implementation
24	Tenta Anguach and co. tomato proc.	0918702766	S. Gondar	Woreta	Tomato processing	Implementation

Source: AIC and Private communication

Note: Implementation means that the processors have started construction and/or installing machineries
Pre-implementation means that the investors have investment license, but they have not yet started construction
Operation means that the company has started working or processing. In this case Africa PLC has started farming but not processing

3. OVERVIEW OF TOMATO VALUE CHAINS

3.1 Value Chain: Competitiveness, Governance, Economic Gains, and Facilitating Organizations

Competitiveness:
The presence of water resources for irrigation in the three rivers' catchment areas and availability of sufficient land could increase competitiveness of tomato producing farmers in the project woredas from the resource availability perspective. However, due to improper management practice, the farmers are not competitive in the central market, for example, to other producers in the Rift-valley. Buyers say farmers tag high price since the cost of production per unit area is high. However, although the market is limited to one market in Eastern Ethiopia (Jigjiga), some varieties (small fruit size from what they call Sembersa) being grown in the project areas has a good acceptance. This can be considered as competitive advantage, but do we need to promote this variety for the sake of a single market? The answer should be "No" because the productivity of this variety is low compared to recent improved varieties. However, farmers who cannot afford to buy recent high yielding varieties and associated technologies might continue producing the variety, which has small-sized fruit. Hence, the niche-market for such variety should not be overlooked.

Governance: In all the tomato value chain functions and actors, there are no organized or contractual agreements. The cooperatives that were supported by the project to start collective marketing which would increase bargaining power of the farmers and their association have not started functioning. The way the tomato production and marketing business has been operating is just by mutual trust and luck.

Economic gains:
The farming communities in the project woredas have had the opportunity to produce at least twice in a year unlike the majority of the farmers in the country. Hence, they have economic gains from introducing horticultural crop production including tomatoes during off-season period and in some areas (Dera and Bahirdar Zuria woredas) in the main production season (rainy season) too. However, whether the farmers are getting as much as they should remain to be questioned. Economic gain by farmers should have been even doubled had they improved the crop management practices in a way described in the aforementioned sections of the report.

Facilitating organizations:
The office of agriculture in each project woredas has been primarily supporting the tomato value chain especially at upstream level (farmers). Secondly, other non-governmental organizations like AgroBIG, SNV, and ORDA have also been supporting farmers through provision of seeds and other agricultural inputs, training in crop husbandry, and supporting farmer organizations in infrastructure development and capacity building.

3.2. Market segments, products and trends

Most of the producers have access to road and the regional capital. Hence, farmers sell in one of the following ways.

- Farm gate to collectors/wholesalers through brokers: This is the most common way of tomato marketing to farmers, and is mediated by brokers who get commission from collectors or wholesaler. Although farmers complain about price fixation by brokers and absence of proper weighing system, it seems that both traders and farmers have used to this way of marketing.

- To collectors near their village: Farmers whose product is relatively smaller for collection by trucks bring their produce to market place and sell to collectors.
- Directly retailing at local markets near to their village: Producers take their harvest to the village or woreda town market and retail to consumers. In terms of volume of supply from an individual farmer, the product transaction is very low (between 30 to 50 kg) depending means of transportation they use. Farmers use this marketing system when their produce is very small and to cover small purchases of consumables for their home. In some areas, however, the direct supply to consumers by farmers creates problem for retailers.
- Transporting to Bahir Dar and sell to retailers, consumers, or collectors. Farmers rarely take their product directly to the regional capital and sell whoever they come across. However, farmers complain absence of space for retailing in the market and they sometimes do not even recover the transport cost. Of course, in good days farmers earn much better price than any of the above ways of marketing.

Once the products from the projects woredas are collected by traders, it goes to six major marketing channels which include:

- Project woredas to Bahirdar and Debretabor areas
- Project woredas to Gondar areas
- Project woredas to Dessie and Wollo areas in general
- Project woredas to Markos, Dilamo, Kosober, and Chagni areas
- Project woredas to Jigjiga
- Project woredas to Humera, Dansha and rarely to Shire areas

3.3 Value addition, transaction costs and price build ups

Value addition

Basically, there is no real value addition (product transformation) in tomato business that emanate from the project woredas. The products are being sold for fresh use purpose in the above-mentioned market channels regardless of the variety type. The only thing that the traders conduct is that they sort the product by size and to avoid disease and pest infected fruits.

Transaction costs

Transaction costs vary across the marketing hierarchy depending on the locations. The main ones include transport, labour, broker, store (insignificant in the project areas when distributed to kg of the product), equipment/box, and the collector's/trader's own expenses. Table 2 shows the transaction costs for different actors in the market channels relevant in the project woredas. Price trend in each market channel has also been indicated in Table 3.

Table 2. Transaction costs of wholesale traders involved in tomato marketing in each market channel

Locations: Source – Destinations	Market channel code	Transaction cost categories	Transaction cost (ETB/kg)	Remark
Project woredas to Bahir Dar/ Debretabot	MC1	Labour	0.06	**3 ETB/cassette**
		Transport	0.27	**1200 birr for 90 cassettes**
		Store	-	**1000 Etb/month**
		Broker	0.40	**20 Etb/cassette**
		Cassette	0.30	**15 Etb/cycle**
		Total	1.30/kg	
Project woredas to Gondar	MC2	Labour	0.06	**3 ETB/cassette**
		Transport	1.11	**5000 Etb for 90 cassettes**
		Store	-	**1000 Etb/month**
		Broker	0.40	**20 Etb/cassette**
		Cassette	0.30	**15 Etb/cycle**
		Total	1.87/kg	
Dessie and Wollo areas	MC3	Labour	0.06	**3 ETB/cassette**
		Transport	1.11	**5,000 Etb for 90 cassettes**
		Store	-	**1000 Etb/month**
		Broker	0.40	**20 Etb/cassette**
		Cassette	0.30	**15 Etb/cycle**
		Total	1.87/kg	
Markos, Dilano, Chagni and Kosober areas	MC4	Labour	0.06	**3 ETB/cassette**
		Transport	1.33	**6,000 Etb for 90 cassettes**
		Store	-	**1000 Etb/month**
		Broker	0.40	**20 Etb/cassette**
		Cassette	0.30	**15 Etb/cycle**
		Total	2.09/kg	
Jigjiga	MC5	Labour	0.06	**3 ETB/cassette**

		Transport	2.56	**15,000 Etb for 90 cassettes**
		Store	-	**1000 Etb/month**
		Broker	0.40	**20 Etb/cassette**
		Cassette	0.30	**15 Etb/cycle**
		Own expense	0.41	**3000 Etb for travel expenses**
		Miscellaneous	0.41	**3000 Etb for check point, broker, labour**
		Total	4.15/kg	
Shire/Humera	MC6	Labour		**3 ETB/cassette**
		Transport		**8500 Etb for 90 cassettes**
		Store		**1000 Etb/month**
		Broker		**20 Etb/cassette**
		Cassette		**15 Etb/cycle**
		Total	**2.65/kg**	

Table 3. Price trends in the project woredas and destination prices in each market channel

Market channel	Buying price at farm (Etb/kg) of the woredas	Buying price at collectors (Etb/kg) From woredas	Average selling price (Etb/kg) at each destination
MC1	3.80	5.26	**7.63**
MC2	3.80	5.26	**10.50**
MC3	3.80	5.26	**11.50**
MC4	3.80	5.26	**9.25**
MC5	3.80	5.26	**14.25**
MC6	3.80	5.26	**9.88**

3.4 Overlays: Number of Actors, Volumes and Supply Quantities

Tomato has become one of the important cash crops in the three catchment areas of the three rivers (Gumara, Koga and Rib). However, unlike the production data shown in the previous section, marketing of tomato in terms of volumes/supply quantity, and actors involved are not well documented both at woreda and kebele levels. Famers do not have record keeping habit on their production and productivity either. This is a limitation in the study. So many illegal collectors and traders involve in the business and this is why the actual data on transaction volume could not be accurately estimated.

However, based on the information obtained from major traders in Bahir Dar who supply tomato both to the regional capital and beyond, there are about 10 wholesalers that collect and transport up to five trucks (90 cassettes capacity) daily. This means that at least 50 trucks of tomato products are marketed daily during pick harvesting season (February and March) from the production areas in the region including the project woredas.

3.5 Profitability Analysis and Simplified Gross Margins (SGM)

3.5.1. Producers production cost and margin

According to the result from the study and presented below in Table 4, farmers on average allocated nearly a quarter of a hectare for tomato production. The productivity was found to be way below the potential of the crop since the average production is 175.3 quintals/hectare (qt/ha). The maximum yield from an elite farmer 478 qt/ha which is less than half yield that the farmers could obtain from tomato production. The minimum yield reported was 2.5 qt/ha due to disease and pest damage and absence of market in that specific year.

Production inputs incurred by farmers looks very marginal and the management practice is not up to the standard mentioned before. Farmers do not put staking to support tomatoes so that the fruit development will be high and contamination with soil will be avoided. The production cost for a hectare of tomatoes was 20,225.08 Etb (Table 5). When compared to major production areas, in rift valley for example, the production cost incurred per hectare in the project woredas is only about one-fourth.

Table 4. Average area of production, productivity and range of production in the sample households surveyed in the study

	2015	2016	2017	Average
Area (ha)	0.22	0.25	0.23	0.23
Yield (qt/ha)	204.5	156.3	165.1	175.3
Min yield (qt/ha)	80.0	2.5	42.0	41.5
Max yield (qt/ha)	338.0	364.0	478.4	393.5

Table 5. Average production cost of tomato production by farmers per ha

Seeds	Fertilizer	Insecticide	Plowing	Planting Fertilizer application	Weeding	Harvesting	Transport cost	Total Production cost/ha
1,694.55	2,894.60	2,386.47	1,708.57	1,948.57	382.86	8,000.00	403.15	806.31	20,225.08

Table 6. Average production cost of tomato production by farmers per ha and per average farm size (0.23 ha)

A. Results presented per qt

Total Production cost/ha	Total yield/ha	Production cost/qt	Average selling price (Etb/qt)	Total sells/ha (Etb)	Total sells income from average farm size (Etb)	Production cost /average farm size	Total margin from average farm size
20,225.08	175.28	115.38	525	92,024.48	21,165.63	4,651.77	16,513.86

B. Results presented per kg

Total Production cost/kg	Total yield/ha (kg)	Production cost/kg	Average selling price (Etb/qt)	Total sells/ha (Etb)	Total sells income from average farm size (Etb)	Production cost/average farm size (Etb)	Margin/kg (Etb)
20,225.08	17,528	1.15	5.25	(17,528*5.25) = 92,022.00	(17,528*0.23*5.25) = 21,165.06	(17,528*0.23*1.15) 4,636.16	4.1

Note: The variations between Table A and Table B are due to rounding of decimals

3.5.1. Collectors

Collectors are actors that operate between producers and wholesale traders. They collect mainly at their store gate in rural villages from farmers and sometimes directly at farms. Usually

collectors in rural villages also serve as retailers in addition to supplying to wholesale traders. Although the margin that rural collectors obtain from retail market is much higher than selling to wholesale traders, the volume of retain transaction is very low, less than one cassette/box a day. Hence, rural collectors benefit more from supplying to cross-regional traders. Moreover, farmers themselves compete with the retail market and reduce the margins of rural collectors (Table 7).

Table 7. Profitability analysis for rural collectors engaged in tomato transaction

Buying price from farm (Etb/kg)	Buying price from farmers (Etb/kg)	Operational cost (Etb/kg)	Selling price to traders (Etb/kg)	Retail price (Etb/kg)	Margin from farm purchase	Margin from farmers	Margin from retail
3.80	5.26	0.20	5.50	10	1.26	0.06	4.51

3.5.3. Retailers

Retailers can be found at all levels starting from kebele or village level markets to the regional capital. They often compete with farmers themselves for the market share. For this reason, those who reside in rural kebeles also work as collectors during harvest season and then focus on retail market when the supply from the woredas is low. Therefore, their profit margin is a bit high (3 to 5 birr/kg) compared to other actors, but their transaction volume is very low, usually 30 to 65 kg/day.

3.5.4. Wholesale traders across the different market channels

According to the findings depicted in Table 8, producers earn the highest margin even with the current production level. High farmgate price discourages wholesalers from buying their product and this has created loss of income to farmers as it happened last year. Higher SGM to farmers does not mean farmers are benefiting more than the traders; in fact, they are the least beneficiaries amongst all since they are producing little and their supply volume is very low. Instead, it shows that farmers could maximize their income if they can enhance tomato production and productivity.

Among the marketing channels, the Dessie and Wollo area route is most profitable one followed by Jigjiga and Gondar routes. The least profitable one is the supply to Bahir Dar city (Table 8).

Table 8. Simplified Gross Margin (SGM) per kg for major tomato value chain actors

	Producers	Local Collectors	Whole-salers to MC1	Whole-salers to MC2	Whole-salers to MC3	Whole-salers to MC4	Whole-salers to MC5	Whole-salers to MC6
Sales price	4.53	5.50	7.63	10.50	11.50	9.25	14.25	**9.88**
Buying price	-	4.53	5.50	5.50	5.50	5.50	5.50	**5.50**
Operational cost	1.15	0.20	1.03	1.87	1.87	2.09	4.15	**2.65**
Operational profit	3.38	0.77	1.11	3.13	4.13	1.66	4.60	**1.73**
SGM (%)	**74.61**	**14.04**	**14.50**	**29.80**	**35.90**	**17.91**	**32.27**	**17.48**

3.6 Market Support Structures: Services and Regulations

The study revealed that marketing of tomato at downstream level and also at collectors' level, is based on mutual trust between individuals. There are no strong market support structures in place so far at woreda level. However, with the establishment of the marketing cooperatives like Koga Irrigation Users Marketing Cooperative Union (which has not started collective marketing in tomato yet), the situation may improve in the future. Collective marketing centers like the one established in Merawi could play a great role in increasing bargaining power of farmers and the supply could be coordinated for big multi-regional buyers such as Etfruit.

Absence of processors in the region has limited the market alternative to producers; they depend only on local markets and traders which has created occasional disastrous lose of income.

Among the NGOs, AgroBIG, SNV, ORDA, and the like have been supporting farmers to create market linkages. However, due to high selling price of tomato and even other vegetable crops under study, buyers such as Etfruit that had a joint project with AgroBIG refrain to buy from farmers in the project woredas.

The Ethiopian government has favorable policies to support export business. To mention some of the privileges, exports do not pay export tax, avail loan without even collateral, and inspection services and facilitations of transit at ease as much as possible. Despite all these efforts, tomato export at national level are very limited. The products from the project woredas has not been exported due to the distance to exit boarder being used so far. Probably, the opening of access to Eritrea soon may have good future to Northern and North Eastern Ethiopia.

3.7 General Map of the Tomato Value Chain

Figure 8 below shows the complete value chain map which consists of the five functions, activities and actors involved under each function; list of support institutions at macro, messo and micro levels; and enablers (which decides on policy issues and infrastructure development). This map includes processors as an actor in the chain. However, the country has only one private owned tomato processing plant at Upper Awash Agro-Industry Enterprise in Merti. The other one which was government-owned and was located at Wondogenet has been closed.

At regional level or specific to project woredas, the tomato value chain map for major functions, activities, and support institutions has even become more simpler since there are no processors.

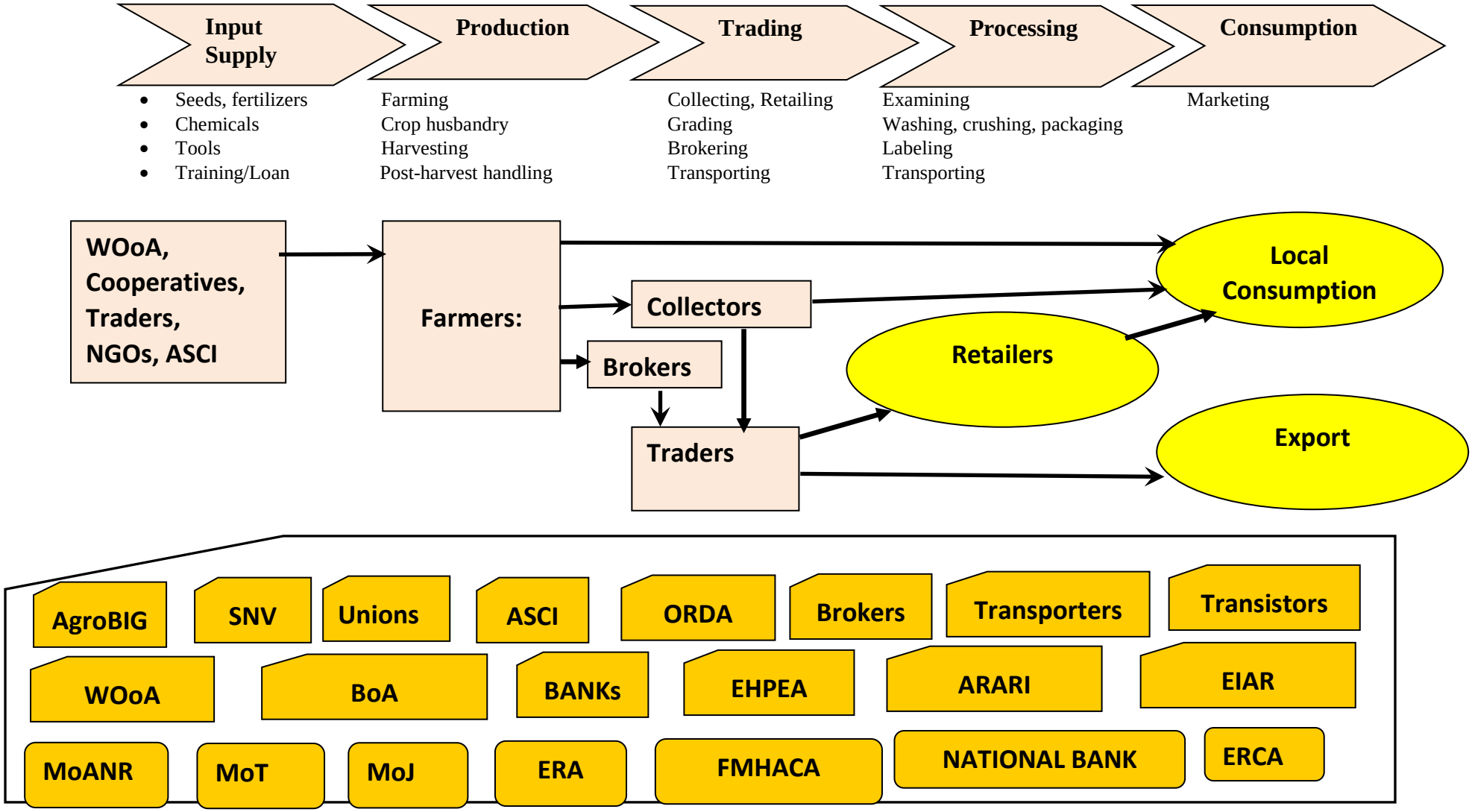

Figure 8. **Map of tomato value chain actors at national level**

3.8 Constraints, solutions and opportunity analysis for tomato value chain

In this section, the opportunities available to main actors in production, trading and processing are explained.

3.8.1 Analysis of opportunities, constraints and solutions at upstream level

Tomato producers in the project woredas are almost entirely small-scale farmers, and the study depicted the following conditions in relation to the above-mentioned sub-title.

Opportunities:

- Availability of water resource either through the irrigation facilities constructed by the government or from ground water
- Land and labor is available in off season time without any competition with other crops
- Proximity to road and other infrastructures
- Good weather and soil conditions for tomato production
- Support from Office of Agriculture, other non-governmental organization and bilateral projects such as AgroBIG

Constrains:

- Prevalence of disease and pests and non-effective pesticides availed by traders
- Shortage of improved tomato varieties affordable to farmers, low yield and mixed/strange plant characters observed in the field
- Water shortage around spring time especially for canal irrigation users at Koga
- High input (fuel, seed, chemicals and fertilizer) cost and adulterated fuel and oil for pumps
- At Fogera where they plant tomato during rainy season, they sometimes face hailstorm problem
- Market problem for fresh tomato, absence of alternative market such as processors, and Price fixation by brokers and price fluctuation
- Haphazard pest control strategy among the neighboring farms led to repeated spraying of chemicals (beyond recommended rate and frequency) which makes crop protection costly, unfriendly to the environment, and unsafe to the consumers
- Absence of crop rotation in most of the tomato production field led to development of disease and pests

Solutions:

- For the chemicals, seed, and improved seeds availability and effectiveness problems, the support institutions such as bureau of agriculture, AgroBIG, and other GOs and NGOs shall have basic research and adaptation trails in order to sustainably solve the problems. Then it will be only those adaptable and high yielding varieties and effective pesticides that should be grown in the areas. The way forward is that a platform can be established where the research centers and responsible support institutions sit together, discuss the problem, and then conduct research on farmers field with improved and farmers management practices. Eventually, varieties and chemicals adaptable to the farming system will be regionally registered or recommended for production. This will give an opportunity to farmers to learn improved way of agronomic practices such as the use of stalking to support the branches and to high and good quality fruit development, proper fertilizer rate applications, etc. The biological potential tomato exceeds 1000 qt/ha depending on the

varieties. Most hybrid varieties this amount; however, the yield on farmers field is expected qto be lower that the research output. With good management, hybrid varieties should provide 2/3rd of the potential of a variety. In reality, however, the farmers in the project woredas are obtaining 175 qt/ha, which is by far lower than expected. This is due to improper seed utilization coupled with poor field management. Hence, inclusion of research institutions to test new varieties and inputs, and to teach farmers on application of improved management is necessary in collaboration with other extension service providers such us the office of agriculture...

- Water shortage arose due to the application of an old and water wasting irrigation technology by the government. Tomato should be irrigated at least once in a week. However, in some months of tomato production season at Koga, farmers get water almost fortnightly, this will affect production and productivity of the crop. Temporarily, this problem can be solved by staggered production by having consensus with farmers. In the long run, incorporation of water saving technology might be good to consider.
- Farmers should be advised to get used to high input cost because it is what they will face time and again based on the international market price. They should learn paying high price for quality, and should not expect subsidy or donation for their own advantage. Instead the produce quality product and charge accordingly. In general farmers should know market-oriented production and price differentiation based on quality. Adulteration of some inputs like fuel and oil which is affecting pumps is a crime, if it is done deliberately, by traders. Hence, farmers should be thought to get formal receipts for their purchases and then legally face the seller if they discovered wrong inputs. Making traders accountable to what they deliver to the market and awareness creation on good service provision ethics can solve the problem within short time.
- Tomato is not a crop of choice for rainy season due to susceptibility to diseases and pest. Farmers who have well-drained soil produce tomato during rainy season, which sometimes face hailstorm problem. Therefore, the decision that the farmers should make is either not to produce tomato during rainy season or to have rainout shelter or protected agriculture. The latter is not affordable to small-scale farmers unless they form a kind of association to merge their land and have the facility.
- The solutions that are suggested to market problem include:
  (a) to encourage the investors who are going to start processing facilities and then to strengthen contractual farming (out-grower scheme) development with processors. For this, farmers need to implement a paradigm shift in the way they produce tomato. Processing companies may come up with their own varieties (usually very expensive, up to 2 USD per seed) which have specific quality parameters for their purpose and may provide such expensive seedlings to farmers. Under this condition, if the farmers continue to follow their own management practice, it will not be profitable to processors and the relationship will not last long. The processors or whoever manages the out-growers should train farmers on production practices and follow whether or not they use proper agricultural inputs in order to get the maximum economic benefit for both parties.
  (b) to increase bargaining power of the farmers by capacitating marketing cooperatives
  (c) In the absence of the aforementioned alternative solutions, farmers can think of having their own processing plants by organizing themselves into processing cooperatives or by using the already existing unions such as Merkeb, Koga, etc.

- Farmers need to adopt programmed/staggered planting and pest control in a cluster so that they will have extended harvesting time whereby the market price is relatively higher, reduced cost of production, safe environmental and human health conditions
- Tomatoes should be grown on the same field once every 2 to 3 years, and related crops such as potatoes and hot pepper should not be used in the years rotation to avoid diseases build up (Lemma, 1998). This has to be implemented in the project woredas in order to protect build of diseases.

3.8.2 Analysis of opportunities, constraints and solutions at collectors/traders level

Opportunities:

- Tomato production and supply sites are located at short distance from the main market (Bahir Dar)
- Preference of small sized tomato from the region at Jigjiga market
- Although the quantity is small, the availability of summer-planted tomato is an advantage
- Accessibility of most of the tomato producing woredas by vehicles transport

Constraints:

- Supply of tomato is seasonal and the supply is too much at the same time
- Buying diseased, pest affected, mud-contaminated and small sized tomato put them at risk at the market
- Some varieties which are soft-skinned and juicy are perishable; farmers do not apply skin-hardening chemicals being used in other production environments
- Mixed varieties and tomatoes physical conditions create marketability problem
- Market competition is high since buyer regions are becoming producers recently
- There is shortage of working place/store at Bahir Dar (about 6 m2 for each)

 Some (like Etfruit) have said that farmers demand high price for their produce

Solutions:

- Enhancing productivity of tomato at low production seasons
- Orienting farmers to produce based on market requirement (clean, medium size, disease and insect free, uniform hard-skinned varieties)
- Advising farmers to use all necessary inputs that make them and traders competitive in the market
- Selection of varieties to have uniform product and careful grading of the product during collection and loading is mandatory
- Extending production season in order to get tomato harvest during low supply time in other regions using protected agriculture
- The municipality at Bahir Dar should assess the size and sanitary situation of the horticulture marketing place at Bahir Dar. It is worse during rainy season due to drainage problem and stinks too bad to the extent that it deters people from going there to buy vegetables. Therefore, due consideration should be considered.
- The farmers “high price” expectation claimed by Etfruit is because the farmers have high cost but less yield. In order for the farmers to get contractual agreement with big buyers such as Etfruit, they have to improve their agricultural practice and enhance their productivity, which will enable them to reduce production cost, and then reduce selling price.

3.8.3 Analysis of opportunities, constraints and solutions at processors/exporters level

At the moment there are no functional tomato processors and exporters in the region. Most of them are under construction, very few of them mentioned the foreign currency problem to procure the required instruments. Therefore, this sub-section totally focuses on the nearly completed small scale processors.

The opportunities for processors are availability of the tomato production in the region and easy access or transportation for sourcing the raw materials.

Constraints noted for the small-scale processors at Woreta and Debretabor include:

- Poor quality of the instruments since their parts are not stainless steel, incomplete parts and lack of commissioning service by the supplier
- Since the facilities are built for groups, lack of interest due to delayed action for the constraints disappointed members
- Lack of market for the processed products for Debretabor group since the only buyer they have contact with (Ecopia) has given lower price for dried tomato which was below the fresh tomato price and lack of interest in the products.

The solutions suggested from the Consultants view point are:

- The regional government should procure standard equipment with complete system and commissioning service by the supplier
- Look for continued support from government, NGOs like ORDA, Ecopia in order to (a) get quality materials for processing, (b) renew licenses, (c) get quality assurance certificates, (d) secure markets, and (e) reorganize former members
- Transfer the ownership of the facilities to active individuals from the group ownership and close follow up of the implementation process
- Quality certification of the processing system and then looking for alternative market

3.9 Critical Success Factors

Generally, there are limitations at all levels of function in the value chain. However, farmers continue producing the crop because there are irrigation schemes which can be considered as one of the success factors. In addition, land is available without any competition since the main production is taking place during off-season time. Otherwise, there are no such big success factors to be noted in the production regions.

4. INTERVENTIONS FOR OVERALL SUB-SECTOR AND TOMATO PRODUCTION AND MARKETING

4.1 Points of Leverage both at Sub Sector and Value Chain Level

In the project implementation woredas, the Consultant noticed that crop production in general and tomato production specifically are not being done as per the recommendations for optimum yield. In addition, there is no market-oriented tomato production and/or marketing agreement between farmers and traders or processors. Although the production and productivity of the crop by farmers is very low, there is not enough market even for the amount being produced.

This led the development practitioners to wrongly believe and say "we do not have production problem, instead we have marketing problem". However, in reality these two problems are interconnected. Therefore, the points of leverage are:

- Interventions at farmers to increasing productivity and reduce cost of production, which will eventually reduce price of tomato for big buyers and processors and also consumers.
- Strong linkage between research and agriculture bureau to develop technologies that enhance productivity or identify bottle necks that the farmer face and take actions for solutions.
- Creating a platform whereby possible processors and buyers can meet, discuss and come up with solution for problems to arise along the value chain.
- To organize farmers to have staggered production and to create marketing cooperatives in order to increase their bargaining power with buyers.
- To organize farmers into producer groups or cooperatives in order to implement staggered production and cluster-based pest control mechanisms.

AgroBIG, which has limited project duration, can support in establishing market-oriented production by (a) training farmers and DAs in good tomato agronomic practice, (b) linking farmers to processors and (c) creating platforms to bring together different stakeholders of the tomato value chain on a regular basis (let us say every three months) and discuss on opportunities, constraints and possible solutions.

4.2 Strategies in Up Scaling

The strategies for up scaling can be divided into short and long-term interventions. In the short term, actors can think of devising solution under the current production and marketing system, and these strategies have been mentioned under *Sub-Section 4.1*.

In the long term, the government should think at bigger scale if agriculture has to have paradigm shift in a way it will improve the regional and national economy. The small-holder approach makes investments in agriculture such as the irrigation scheme uneconomical both in terms of public resource utilization as well as livelihood improvement to farmers. Therefore, through the help of the government, producers need to organize themselves to use state-of-the-art agricultural technology in agriculture and involve in not only supplying to traders and processors, but also to have industrial investment for processing and export business.

4.3 Market Requirements, Market and Product Upgrading Strategies

In the current assignment, the major focus is market linkage. The upgrading strategies should be developed in the following four scenarios:

- The current buyers, traders mainly, do not want to have a kind of contractual agreement with farmers because their market is also volatile and full of risk due to competition with traders from other regions. This is because they are supplying mainly for fresh consumption, not for processing or export.
- The second type of buyers are like Etfruit which have access to markets in many regions of the country and even to export market. Etfruit, for instance, has been contacted by the Consultant and it is willing to work with farmers as long as they follow staggered production and reduce the selling price. With the current way of production, farmers cannot reduce price because the production cost is higher owing to low productivity. Therefore, the strategy can be increasing productivity, reduce price and then to have long term marketing agreement with Etfruit and other buyers.

- Marketing agreement with upcoming processors like Nur Belay Business PLC, whom the Consultant met and has agreed to work with farmers groups, and others under construction can only be possible and feasible when
  (a) Most varieties that the farmers are producing are fresh-use varieties and even the processing type might not have high brix content. Therefore, farmers produce processing type of tomato with acceptable brix quality (around 5.5). This needs negotiation and understanding between processors and farmers
  (b) Farmers should change the production practices and increase productivity so that the price will be benefiting both parties and the quality of the product will be acceptable for processing.
- The fourth scenario is a long-term strategy which needs government intervention to convince farmers to work as a group and engage in modern agriculture than thinking in a small-scale production forever. This enable them to use production technologies that can be applied to large scale production, protected agriculture, agro-processing, domestic and export trading, etc. In the discussion held with the deputy head of the agriculture bureau, we have come to know that the regional government has a plan to start protected agriculture in order to minimize the risks for horticulture production during rainy season. The regional government established plastic factory in order to supply construction input to this end. This preparation shows strong commitment to modernize the agriculture system. However, use of water saving technologies in the irrigation facilities already established and under established should be given due consideration in addition to the aforementioned effort to prolong production season using technologies.

4.4 Major Recommendations on Improving Tomato Production and Marketing

In order to improve tomato production and productivity, farmers should follow the following research recommendations/ strictly follow production and post-harvest handling packages (Asfaw and Eshetu 2015; Lemma 1998):

- Suitable site selection where the soil is friable and sandy-loam; pH is between 5.5 and 7; day and night temperature 25 – 28 and 15 degree Celsius, respectively; 700 to 2000 m.a.s.l. altitude
- Good seedling production and transplanting between 12 to 15 cm height (pencil size); 28 to 35 days stay in nursery beds
- Well prepared land with at least 3 times ploughing
- Spacing (1m between rows and 0.3 to 0.4m between plants) to achieve stand count of 25,000 to 33,300 plants/ha (this may depend the type of varieties grown and the harvesting method, and it may go down till 16,666 plants/ha)
- Plant support/staking and mulching: Plant support (staking) is an important practice for tomato production. The short set processing types that are hard skinned could be produced without support. However, all fresh market types should be provided with support or mulch to produce clean and healthy fruits for the fresh market. Staking is done with a pole placed about every one meter along the row and supported with horizontal trellises of two to three wires at 20 cm above the ground and between the wires. The plants are tied to the wires with fine ropes. Unstaked tomato varieties need mulching with straws in order to protect fruit loss by protecting the fruits from direct contact with the soil.

- Fertilizer rate: 200 kg DAP (Di-ammonium phosphate) and 100 kg/ha urea is recommended but the actual rate to be studied locally.
- Pest and disease control: The most important diseases are fusarium wilt, bacterial wilt, bacterial canker, early blight, late blight, septoria leaf spot, root knot nematode, and viruses. The major insect and mite pests of tomato include African bollworm (*He/icoverpciarmigera*), potato tuber moth (*Phthorimaeaopercule/la*) and tomato leaf miner/fruit borer (*Tutaabsoluta*), whiteflies and spider mites. Kebele experts, formerly known as development agents, should approach research institutions and/or buyer companies for possible disease and pest emergence in the specific areas and advise farmers which prevention and protection methods to follow.
- Watering frequency: depends on the stage of development of the crop (seedling, vegetative growth, flowering and fruiting). Furrow irrigation is recommended to be applied early in the day so that the field is dry before nightfall. Irrigating late in the afternoon and over irrigation creates favorable conditions for disease infection especially root rot' diseases.
- Harvesting and post-harvest handling: tomato requires careful attention in harvesting and post-harvest operations in order to reduce losses. Standard handling procedure ensure high price for producers, distributors, processors, and traders.

The marketing problem can be solved (a) by increasing the number of buyer types such as processors and exporters in addition to consumers for fresh use purpose, (b) specializing the type of tomato to be produced, and (c) adopting staggered production. For all these options detail strategies have been given in *Sub-Section 4.3*.

5. CONSIDERATION OF DISABLED PEOPLE

In the current sampling for this value chain study, we have not encountered any disabled individual in any of the all functions. This does not mean there are none in the value chain, but it is due to the limited sample requirement of the study that disabled people did not appear in the report.

6. CROSS CUTTING ISSUES

6.1. Gender Inequality

In tomato value chain at upstream level, most women do not involve in purchase of farm inputs since the men think that women do not know what to buy. For instance, for the purchase of tomato seeds for planting, 77% of the interview participants said the decision is made by men; while 23% said the decision is made by men and women together. Out of the 15 tomato production activities shown below in Table 9, There is no specific activity left only to women; 72% of the respondents said they conduct the farming activities together. Only 28% said some of the activities are conducted by men only (Table 9). Therefore, in the farming activities, one can say that, both genders involve almost equally. As in other rural areas in the country, children (regardless of sex) involve in farming activities mainly in weeding, harvesting, sorting and transporting products.

Table 9. Gender involvement in tomato production in AgroBIG project woredas of ANRS

		Men	Men: single	Women	Women (Single)	Together	Total	Total (without singles)	% (only men)	% (only women)	% (together)
1	Type of land	13	1	0	3	18	35	31	42	0	58
2	Frequency of plowing	15	1	0	3	16	35	31	48	0	52
3	Planting time	6	1	0	3	25	35	31	19	0	81
4	Method of planting	6	1	0	3	25	35	31	19	0	81
5	Type of seed	15	1	0	3	16	35	31	48	0	52
6	Source of seed	24	1	0	3	7	35	31	77	0	23
7	Type of fertilizer	15	1	0	3	16	35	31	48	0	52
8	Fertilizer rate (convert to ha)	15	1	0	3	16	35	31	48	0	52
9	Time of fertilizer application	12	1	0	3	19	35	31	39	0	61
10	Frequency of weeding	0	1	0	3	31	35	31	0	0	100
11	Pests and control measures	0	1	0	3	31	35	31	0	0	100
12	Time of harvesting	0	1	0	3	31	35	31	0	0	100
13	Method of harvesting	0	1	0	3	31	35	31	0	0	100
14	Storage duration	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
15	Value addition method	0	0	0	3	32	35	32	32	0	100
	Total count	121	13	0	42	314	490				
	Total count (Without singles)	121	0	0	0	314	435				
	% (with singles)	27	3	0	9	62	490				
	% (without singles)	28				72	435				

6.2. Reducing Social Inequalities

The study has not come across with social inequalities along the different functions and activities of the value chain. Due to the settlement positions, some farmers are benefitted more than others. For instance, in Dera woreda, farmers who were thought disadvantaged in former times due to swampy water and flooding conditions are now using the opportunity to enhance production of not only horticultural crops but also newly introduced crops such as rice. This has created some kind of income inequalities between people living in the swampy areas and those living in hilly sides.

6.3. Climate Change Adaptation

It has been debatable whether climate change is an advantage or disadvantage for sub-Saharan Africa. Some says climate change brings rainfall to areas which used to be dry for most of the year, and this has benefitted at least pastoralists by increasing availability of livestock feed in pasture/grazing lands. However, untimely rainfall and heat stress in agricultural lands have affected crop and livestock production. Therefore, the effect of climate change is mixed in Sub-Saharan regions. The project woredas seem not vulnerable for climate change effects at this stage. However, they do not have any preparation for untimely rain protection (if it happens, sometimes it does) during "winter and spring" production seasons since they do not yet have protected agriculture. Tomato production in greenhouses or at least rainout shelters would have been the best option in order to minimize the hailstorm, disease, water shortage, and untimely rain. However, greenhouse construction cost will be expensive to smallholder farmers. A simple rainout shelter technology being started in the project woredas by ARARI can be promoted so that the hailstorm and disease problems in summer cropping seasons. Soil management practices such as crop rotation and increasing organic matter in soils in order to improve water and nutrient absorption capacity and use of water saving technologies such as drip irrigation can be applied during drought conditions.

6.4. Environmental and Health Safety

Farmers in the project woredas said they spray chemicals to protect pests and diseases too frequently owing to their fear of total crop loss and also due to migration of insects from neighboring unsprayed plots. Eventually, the crop as well as the environment are getting chemical contamination beyond the recommended limit. Some chemicals have specified number of days for application before harvesting. Some farmers, however, spray two to three days before harvesting, and then supply to the market.

Surprisingly, the study found out that farmers still use an obsolete and banned chemical called Dichloro Diphenyl Trichloroethane (DDT) for pest control. This chemical is highly toxic, unstable and persistent for decades before degrading, evaporates and spreads across vast distances through the air or water, and accumulates in the fatty tissues of humans and wild species. It has been banned as insecticide in the seventies in many countries although some continue using it against malaria insect. These situations are alarming to human health and the environment.

Producers should get awareness on health and safety aspects of using agro-chemicals. Such problems might not be detected locally due to lack of appropriate laboratory, but we have got to remember to what happened to the Ethiopian coffee exported to Japan. The coffee was sent back to Ethiopia due to detection of trace DDT elements. Therefore, if we think of exporting

tomato in the future, producers need to be aware of ethical production of the crop. Although the effect is gradual and often not visible in short time, the health of the farming households and local consumers are being affected by the inappropriate handling of agro-chemicals. Therefore, the Amhara Forest and Wild Life Authority should assess the health and safety issues of pesticides in the region. The Kebele experts should teach the farmers on the choice and appropriate application of agro-chemicals for tomato production.

7. REQUIRED INTERVENTIONS BY SUPPORTING INSTITUTIONS

7.1. AgroBIG Interventions

AgroBIG, as a project, has a definite lifetime. It may not stay for long time and hence much should not be expected from it. However, in its project lifetime, AgroBIG can contribute:

- create the platform to bring as many stakeholders as possible from (research institutions, agriculture bureau, regional government office, trade and industry bureau, finance and economic cooperation bureau, farmers, brokers, traders, consumer associations, and possible processors) to discuss on the opportunities, problems and solutions in tomato value chain. This approach has been implemented for certain value chains by Business Opportunities and their Access to market (BOAM) project in Ethiopia by another NGO and the Ethiopian Sectoral Association and Chamber of Commerce (ESACC) and had considerably positive outcome. Similar events can be organized every 3 months so that each actor get to know what is going on in the value chain and hence plan, contribute and benefit out it.
- Capacity building by providing training to different stakeholders of the value chain.
- Technology transfer such as machineries for potato and onion harvesting and plowing/ land preparation described below in this report, which are difficult to implement by the government budget.

7.2. The role of Other Stakeholders

Research institutions and bureau/office of agriculture should take the leading role towards improving the production and productivity of the crop. Researchable problems pinpointed in this study can be handled by Amhara Agricultural Research Institute (ARARI) and stakeholders can be updated in the forum suggested to be established under *Section-7.1*. Due to budget limitation and lack of sufficient breeders, however, research institutions may not equally involve in detail research on each crop including tomatoes. In the absence of own breeding/crossing activities on tomato (which is the case in ARARI), the institute can conduct adaptation trials using locally bred and released varieties and/or imported varieties and thereby identify the best alternatives for the region.

The marketing issue has to be facilitated by the Woreda Trade Industry and Market Development Office (TIMDO) in vigorous way through continuous engagement or arrangement of traders/processors -farmers discussion. Enforcement of regulations on marketing should be implemented. When there are loopholes in the existing regulations, then the offices and decision makers at higher level should develop come up with immediate solutions.

Farmers should be trained in market-oriented production and should strictly follow recommended packages in order to increase the cost-benefit ratio. By doing so they will be more competitive as suppliers to traders and processors and have constant market opportunities.

7.3. The Regional Government

In order to improve the agriculture sector in general and the tomato value chain specifically, the regional government shall implement short and long-term interventions.

Short term interventions:

- the government should strictly support and follow up the progress of investors who are supposed to engage in processing sector. The provision of investment license and reporting figures is not enough; instead follow up and support to make sure the operation goes as planed is important. In this way the market linkage for tomato producers will be guaranteed because the processors are their own companies. In this way, farmers would be able to get two marketing segments; fresh tomatoes and processed tomato markets. The approach will create new opportunities to get new market contacts for the farmers. When producers and processors reach to that level, then they will start negotiation on the win-win situations. To conclude, enforcement of the investment regulation is expected from the government.
- The government should take actions on the processing plants such as the ones in Woreta and Debretabor (Figure 5 and 6), which were established by its own resources and ORDA, respectively. The facility at Woreta have equipment quality problem as we heard from the suppliers (Walia Capital Goods Supplier company), but the responsible bodies should amicably solve the problems or the buildings should be transferred to other interested investors. The one at Debretabor is also operating at small-scale level and the materials are not stainless steel to meet food-grade standards. This will affect shelf life of the processed products.
- Storage and processing facilities which were set up by farmers marketing cooperatives like the one in Merawi has to be encouraged to start collective marketing of tomato. they do have big storage (Figure 9) which is not being used by now. This and other facilities built for crop storage could be partitioned and used for collective marketing of farmers' produce. In fact, the Consultant has interviewed one of the Union leaders on why they do not yet start tomato collective marketing. They said that buyers have not yet requested them for tomato supply. It seems that the marketing concept is not well understood by the Union; instead of waiting for buyers to come to them, the Union should have done promotion of the products that members can supply.

Figure 9. Collective marketing store at Koga irrigation users marketing cooperative union in Merawi

Long term interventions:
As mentioned before, the regional government, together with other shareholders, have established a polyethylene sheet manufacturing plant in order to support the engagement in protected agriculture. However, the questions that one should ask are:

- Is this technology feasible for smallholder farmers in the region generally and in the project woredas specifically?
- Should we continue in the smallholder agriculture system if they are not suitable for modernizing our agriculture?
- Should we continue with the smallholder farming system and be able to feed our people for the next generations?
- What should Ethiopia learn from other developing and developed countries?

If modern technologies that can bring a paradigm shift in the agriculture sector have to employed, clustering of farms has to be implemented. We can take a case for explaining this suggestion in a better way. The government built the Koga canal irrigation scheme to irrigate about 7,000 ha of land. However, the irrigation facility is for furrow irrigation, which is not a preferred technology for efficient water utilization. Hence, farmers are complaining water shortage in some months of production. The problem associated with the investment is being raised by the users and it is not done in a way the irrigation facility can be used for multipurpose applications. Below, the Consultant suggested how best the irrigation facilities could have been used by the regional government.

- The farmers residing in the 7,000 ha irrigation areas could have been allocated to a township where they have all the necessary facilities for living (clean water, schools, health center or hospital, etc).
- The 7,000ha land could have been irrigated with other water saving irrigation technologies. For instance, pivot irrigation saves water 20-fold when compared to furrow irrigation. That means the water being used for 7,000 ha could have been used

to irrigate 140,000 ha land. The initial cost is by far lower than the furrow irrigation scheme established for large scale irrigation, and hence the extra expenditure could be used for cluster settlement formation or for farm machineries and agro-processing equipment.

- This clustering would enable farmers to produce by program intensively and would allow them to have large scale protected agriculture that in turn increase production of tomatoes (for example) throughout the year and earn high price.
- Along the water canals that supply water to the pivots, a series of wide but shallow (1-meter depth) ponds could have been constructed for massive fish production.
- The same farmers could have multiple economic function by having food processing agro-industries in addition to crop and livestock production. Under this situation, when there is no market for crops like tomatoes, then the produce could go to agroprocessing plant for value addition and supplied to the market in and out of the country.
- Therefore, the communities and their family members would be(a) industry workers in the township established, (b) laborer in the agricultural wing, (c) business operators and administrators in the trading and other activities of different value chains.

The local government should think beyond small scale agriculture and can try the aforementioned strategy integrated economic sector by taking one model system in one of the irrigation facilities being established or to be established. The model can then be replicated in different parts of the region and the country to bring agriculture-led industrialization.

8. REFERENCES

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9. ANNEX

9.1. Fresh or Chilled Tomato Export Values and Quantity by Countries in 2015

Year	Month	HS Code	Destination	Gross Wt. (Kg)	Net.Wt. (Kg)	FOB Value (ETB)	FOB Value (USD)
2015	01	07020000	Djibouti	996,820.50	827,553.00	3,695,477.42	177,821.07
2015	02	07020000	Djibouti	826,556.10	685,546.00	3,058,153.60	147,153.96
2015	03	07020000	Djibouti	916,590.40	762,784.25	3,422,771.28	164,698.84
2015	04	07020000	Djibouti	1,078,080.00	894,321.00	3,977,544.47	191,393.73
2015	05	07020000	Djibouti	977,708.00	811,923.00	3,769,517.06	181,383.75
2015	06	07020000	Djibouti	973,832.75	808,658.05	3,780,028.62	181,889.55
2015	07	07020000	Djibouti	1,053,537.00	872,705.50	3,888,411.75	187,104.79
2015	08	07020000	Djibouti	974,339.00	806,106.75	3,686,158.45	177,372.65
2015	09	07020000	Djibouti	1,043,319.00	883,319.75	4,017,684.30	193,325.20
2015	10	07020000	Djibouti	1,177,935.00	975,809.75	4,467,198.30	214,955.17
2015	11	07020000	Djibouti	1,014,974.00	841,559.00	3,817,788.71	183,706.51
2015	12	07020000	Djibouti	1,197,639.00	1,003,595.50	4,600,507.17	221,369.80
2015	05	07020000	Kenya	57.00	50.00	4,548.30	218.86
2015	01	07020000	Nigeria	6,177.50	4,211.50	10,082.97	485.18
2015	02	07020000	Nigeria	3,779.00	2,276.50	18,517.49	891.04
2015	03	07020000	Nigeria	3,849.00	2,416.25	10,765.26	518.01
2015	04	07020000	Nigeria	4,040.00	2,575.00	21,160.90	1,018.23
2015	05	07020000	Nigeria	2,400.00	1,880.00	6,814.06	327.88
2015	06	07020000	Nigeria	5,026.00	3,957.75	71,746.39	3,452.33
2015	07	07020000	Nigeria	2,495.00	2,012.00	17,902.76	861.46
2015	08	07020000	Nigeria	2,345.00	1,826.25	68,927.20	3,316.68
2015	09	07020000	Nigeria	3,973.00	3,037.25	105,355.78	5,069.57
2015	10	07020000	Nigeria	2,050.00	1,629.00	70,495.70	3,392.15
2015	11	07020000	Nigeria	260.00	210.00	3,065.22	147.49
2015	01	07020000	Saudi Arabia	110.00	63.75	538.30	25.90
2015	02	07020000	Saudi Arabia	275.00	157.50	5,021.40	241.62
2015	08	07020000	Saudi Arabia	170.00	108.75	12,535.68	603.20
2015	09	07020000	Saudi Arabia	50.00	30.00	10,466.60	503.64
2015	02	07020000	Somalia	1,103,566.00	921,891.00	6,757,633.85	325,167.64
2015	03	07020000	Somalia	1,812,828.00	1,514,358.00	11,713,823.47	563,652.37
2015	03	07020000	Somalia	200.00	192.00	1,418.14	68.24
2015	04	07020000	Somalia	2,443,270.00	2,035,177.50	15,057,071.81	724,524.68
2015	05	07020000	Somalia	2,119,265.00	1,766,581.00	13,061,665.31	628,508.58
2015	06	07020000	Somalia	2,647,004.00	2,205,544.00	16,370,720.45	787,735.56
2015	07	07020000	Somalia	2,570,736.00	2,143,796.00	16,479,374.03	792,963.82
2015	08	07020000	Somalia	2,257,480.00	1,884,614.00	14,126,971.05	679,769.56
2015	09	07020000	Somalia	1,996,825.00	1,664,931.00	12,569,428.77	604,822.86
2015	10	07020000	Somalia	1,847,780.00	1,534,329.00	11,659,864.01	561,055.91

Annex 9.1 cont'd

Year	Month	HS Code	Destination	Gross Wt. (Kg)	Net.Wt. (Kg)	FOB Value (ETB)	FOB Value (USD)
2015	11	07020000	Somalia	2,011,663.00	1,669,051.00	12,726,347.48	612,373.57
2015	11	07020000	Somalia	625.00	600.00	4,563.43	219.59
2015	12	07020000	Somalia	1,963,555.00	1,638,341.00	12,537,520.28	603,287.47
2015	12	07020000	Somalia	3,000.00	2,800.00	21,377.46	1,028.65
2015	08	07020000	Sudan	2,440.00	2,120.00	13,269.69	638.52
2015	01	07020000	United Arab Emirates	14,632.00	10,092.00	14,088.51	677.92
2015	02	07020000	United Arab Emirates	7,488.00	5,165.00	41,677.82	2,005.48
2015	03	07020000	United Arab Emirates	7,768.00	5,556.50	17,486.85	841.44
2015	04	07020000	United Arab Emirates	7,374.00	5,900.00	127,934.87	6,156.04
2015	05	07020000	United Arab Emirates	20,213.45	16,103.50	229,501.17	11,043.27
2015	06	07020000	United Arab Emirates	19,994.50	16,310.50	220,199.39	10,595.68
2015	07	07020000	United Arab Emirates	19,958.20	16,575.00	297,154.79	14,298.66
2015	08	07020000	United Arab Emirates	19,728.54	16,441.75	592,405.72	28,505.71
2015	09	07020000	United Arab Emirates	11,931.52	9,742.25	502,757.31	24,191.96
2015	10	07020000	United Arab Emirates	2,980.00	2,228.50	369,185.45	17,764.67
2015	11	07020000	United Arab Emirates	410.00	350.00	18,996.21	914.07
			Total	35,181,102.46	29,289,113.55	192,151,622.46	9,246,060.17

Source: Ethiopian Revenue and Customs Authority (ERCA)

9.2. Opportunities, constraints and solutions for candidate tomato processing plants

Major Opportunities, constraints, and solutions for tomato processing plants

S.No	Name of company	Opportunity	Constraint	Solutions
1	NurBelay Business PLC	Availability of tomato producers in Kombolcha, Shewa Robit, Kobo, and other areas in Amhara Region The presence of greenhouse facility at Dessie for seedling growing	Assembly of equipment has not been finished due to financial shortage Absence of own tomato farm to produce certain portion of the factory's daily input demand	Looking for finance as a loan, an advance from export market, or as a grant from projects working with farmers that can be contracted as outgrowers. Stablishing own farm to cover at least 30% of the tomato demand
2	Tafach Agro-processing	Proximity to Dera and Fogera tomato producers Members are actively engaged in the processing; and hence labour is not a problem at all	Market problem for processed tomato (paste and dried) Low price offer especially for dried tomato Finance allocated for the business from the federal government was not released by the woreda. The reason that the woreda finance gave to the youth association is that they believe the standard of operation is poor and there may not be market for the processed tomato.	Creation of market linkage by holding continued discussion with Ecopia, for instance. Negotiation with Ecopia on the low-price offer for dried tomatoes. Financial assistance or loan facilitation from projects
3	Fenta, Anguach and Co. Tomato Processing	Availability of tomato produce near woreta city	The processing plant had defects when it was supplied. Poor quality processing plant	The supplier of the processing plant should be questioned as per the contract to replace the mal-functioned processing plant. Replacing the existing non-functional processing plant with food-grade and certified equipment
4	Esmael Ahmed	Proximity to tomato production area in North Mecha	Knowledge gap for procurement of proper processing plant	Assistance in procurement of processing plant is needed.

9.3. List of contacted persons

A. Offices

S.No	Name	Organization	Location	Telephone
1	Birhanu Yeshamber	Office of Agriculture	N. Mecha	0918-072410
2	Yihune Minale	Office of Agriculture	N. Mecha	0918-070229
3	Ale Beze	Farmers' Multi-purpose Coop. Union	N. Mecha	0918-023323
4	Endalew	Koga Irrigation Users Marketing Coop. Union	N. Mecha	0918452517
5	Tewachew	Koga Irrigation Expert	N. Mecha	09-18747482
6	Banteamlak/Endalew	KogaVeg PLC	Bahir Dar	0920131116/ 0918452517
7	Mokanint Awoke	WTMDO, expert	Woreta/Fogera	0918095913
8	Asmarat Alamayo	WTMDO, Market Information Expert	Woreta/Fogera	0918811222
9	Inene Andarge	WTMDO, Vegetable Marketing Expert	Woreta/Fogera	0918035499
10	Ato Getasew Zewdu	Cooperative Marketing Office	Woreta/Fogera	0918186349
11	Ato Ishetu Dires	Irrigation Agronomist	Woreta/Fogera	0918162092
12		Office of Agriculture	Woreta/Fogera	0918186349
13		Office of Agriculture	Woreta/Fogera	0918162092
14	Setie Abdi	Woreda Agriculture office, extension team coordinator	Woreta/Fogera	0918026041
15	Asmamaw Yimer	WTMDO, expert	Dera	0923561773
16	Misgenew Daba	Woreda Cooperative Promotion office, mrk team leader	Dera	0932731287
17	Manaye Ayalew	Woreda Cooperative Promotion office, mrk expert	Dera	0942321890
18	Habtamu	Office of Agriculture	Bahir Dar Zuria	0918086791
19	Yenenat Barihe	Woreda Cooperative Promotion ofice, Team Leader	Bahir Dar Zuria	0918727717
20	Andarge Yimanu	Woreda Irrigation team, team leader	Bahir Dar Zuria	0918145891
21	Nardos Wasihun	Woreda irrigation team, irrigation agronomist	Bahir Dar Zuria	0918736609
22	Ayitenew Endashaw	BoA, Deputy Bureau Head	Bahir Dar	0975125123
23	Wondale Getahun	Walia Capital Goods Finance Business S.C	Bahir Dar	058-2206780
24	Hassen Ali	Technical and Vocational Education Development Bureau	Bahir Dar	058-2263842
25	Dr Alemayehu Assefa	ARARI, Crop Research Directorate	Bahir Dar	0582220952
26	Daniel Tolahun	ARARI, Socio-Economics	Bahir Dar	0918221637
27	Dr Semagn Asrade	ARARI, Seed multiplication directorate	Bahir Dar	0911-366431

B. Traders and candidate processors

S.N	Woreda/City	Name of Market Agent	Contact Information
1	North Mecha	Tilahun Abita (Purchaser and controller)	0918-459501
2	Fogera	Fenta and Tazeb from Fenta, Anguach and Co Agro-Processing S.C	0918703045/ 0918702766
3	Fogera	Habtamu Sisay	933184481
4	Fogera	Mequnint Asrat	918095321
5	Gondar	Semahegn Nigussie	918086576
6	Dera	Tedbab Wasie	9.18E+10
7	Dera	Ato Assafaw Alamnew	09-18089461
8	Dera	W/ro Milishu Garud	09-60836822
9	Fogera	Ato Abrarew Tilahun	09-18318793
10	Bahir Dar Zuriya	W/ro Yeshiwork Dagarag	
11	Bahir Dar Zuriya	W/ro Bizuyye Dasse	09-18026335
12	Bahirdar	Arega	
13	Bahirdar	Degu	
14	Processor	Tafach Agro-Processing Union	0924268229
16	Shewa Robit	Africa PLC (potential processor)	0911252899
17	Kombolcha	NurBelay Business PLC	Eskindir N. 0941-777777
18	Addis Ababa	EtFruit (Retailor and Exporter)	Ato Kedir: 0911-185268
19	Dera	Azage Yoseph, Collector	0918-094068
20	Input suppliers	Markos PLC	0111273319
21	Input trades	Ato Tamiru (Harvest G.T)	0910169918
22	Upper Awash	Kassaye Abebe (General Manager, Upper Awash Agro-Industry Enterprise)	0911999773

9.4. List of household survey participants

Woreda	Kebele	S. No.	Name
N. Mecha	Kudmi	1	Tena Kefale
		2	Tazeb Tsehay
		3	Zemene Abitu
		4	Miniyichil Laqe
		5	Tazeb Sime
		6	Mer/Tsige Abitew
	Kolela	7	Fekade Alemu
		8	Abiti Fetene
		9	Chale Zeleqe
Dera	Jigna	10	Eshete Jenber
		11	Abeju Gelaw
		12	Gizachew Gashaw
		13	Delelegn Asnakew
		14	Abebe Gashaw
		15	Liyunesh Asmare
	Woncheq	16	Sintayehu Bere
		17	Setegn Hailu
		18	Qes Bishaw Gete
Fogera	Wara Abo	19	Mergeta Alelign Mola
		20	Abebaw Shibabaw
		21	Mola Adugna
		22	Atanaw Mola
		23	Zebader Damite
		24	Abebu Yeshanew
	Rib Gebreal	26	Waga Sintayehu (F)
		27	Yezibtila Demilew (F)
		28	Bire Mirete (M)
Bahirdar Zuria	Wonjetta	29	Mergeta Tewhibo Bahirew
		30	Tihun Tebeje
		31	Yenealem Fetene
	Yigoma/Andasa	32	Yenatfenta Tebiqew
		33	Nigussie Ayichew
		34	Fantahun Tizazu
		35	Adebabay Sema

9.5. List of FGD participants

Woreda	Kebele	S. No.	Names
N. Mecha	Merawi	1	Maguay Getnet, Yidenek Alemu, Adga Enquhane, Mola Yihun, Gashu Dele, Emagnew Gezahegn, Salew Gezahegn, Alemu Yalew, Habtamu Gene, Alimit Mola, Geremew Ayehu
Dera	Jigna	2	Abey Fetene, Getnet Ferede, Chalachew Salew, Mengesha Fetene, Melkamu salew, Gizachew Admassie, Tilahun Endalew, Orion Taddese, Mengiste Moges, Belete tegegne
Fogera	Quara Abo	3	Enanu Tegegne, Densa Gobeze, Genet Molla, Alemu Nigussie, Dessie Gared, Mengiste Alemu, Mequanint Kassaw, Takele Alemu, Nigus Kebede, Mulunesh Tesfahun
Bahirdar Zuria	Huletu Yigoma	4	Mintamir Bizuneh, Zemenu Yitayih, Worku Wubneh, Ayele Yaze, Mulu Adugna, Gizat Afework