Assessment of Local Value Chain of Garlic (*Allium sativum* L.) in Chilgaworeda of North Gondar Zone

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Abstract

Garlic (*Allium sativum* L.) belongs to the family Alliaceae and genus *Allium*, and is a shallow rooted vegetable crop. It is cultivated in most countries both in the tropic and temperate zones including Ethiopia. With the aim to investigate the local value chain of garlic in Chilga district, range of methods and techniques were used. The study has addressed smallholder garlic producers, traders and other actors involved in garlic value chain. Household survey from 129 smallholder garlic producers and 15 traders, interview of experienced farmers, focus group discussions with farmers and experts of different fields and key informant interview of concerned technical experts along with field visits and on-spot observation of the cultivation practices, infrastructure and market centers were data collection methods used. The study revealed that there is an increasing trend in term of land allocation for garlic and production over the last five year in the study area. Local variety of garlic is the only seed that smallholders are using. High cost of seed during peak times of planting, water pump, fuel and lubricant, shortage of water and associated disputes in some areas are found to be constraints in relation to input. Smallholder garlic production in Chilga areas is characterized by traditional means of cultivation and associated with occurrence of pest, diseases and field loss. There are also gaps in using the recommended packages of garlic production and the support of extension for this specific agricultural commodity. Field and post harvest loss of garlic are commonly observed problems of smallholder garlic producers mainly weight loss and contamination. The post harvest handling and processing of garlic for different purposes are traditional. As far as trading is concerned, the dominant garlic traders in Chilga are found to be retailers linking the local market with producers. The area is marked as known garlic trading center not only for local products but also garlic products of the other areas. The majority of smallholder producers get finance from their own followed by informal way of accessing credit. The attachment of the smallholder producer with formal credit institution is weak partly due to cumbersome procedures, absence of formal collateral and small and limited loan size. There are different irrigation, multipurpose and credit and saving cooperatives, which could serve as important engines to facilitate the garlic value chain development. However, they have technical and managerial problems for normal functioning and meeting the anticipated objectives. Thus, governmental and non-governmental organizations and the identified stakeholders should work more to alleviate the identified gaps.

Key words: Value chain, Garlic, production and marketing

Introduction

Garlic (*Allium sativum*L.) belongs to the family Alliaceae and genus *Allium*, and is a shallow rooted vegetable crop (CSA, 2014). It is an ancient crop that originated in Central Asia and it has been grown for culinary, medicinal, and religious purposes for several millennia (Hannanand Sorensen, 2001). The alliums are distributed widely throughout the temperate, warm temperate and boreal zones of the northern hemisphere (Brewster, 1994).

Garlic is cultivated in most countries both in the tropic and temperate zones. In Asia, it is commercially grown in China, Indonesia, Pakistan, Republic of Korea, Thailand, and India.
World trade in garlic is dominated by the developing countries and their share of trade has been growing at the expense of that of the developed countries during the past ten years (FAO, 2004).

Garlic cultivation in the world increased from 771,000 ha of land in 1989/90 to 1,204,711 ha of land in 2007 with total production from 6.5 million to 15.68 million tons, and productivity from 8.43t/ha and 13.02 t/ha, respectively (www.faostat.fao.org., 2007). In Ethiopia, the total area under garlic production in 2006/07 reached 9,266 hectares and the production is estimated to be over 683,000 quintals (MoARD, 2007). Despite its importance and increased production, garlic productivity, in many parts of the world, is low due to genetic and environmental factors affecting its yield and yield related traits (Nonnecke, 1989).

Garlic production is concentrated both internationally and domestically. With 13 billion pounds annually, China is the leading producer, accounting for 66 percent of world output. South Korea and India are second and third with 5 percent each, and the U.S. ranks fourth with 3 percent of the world production. Ethiopia is 12th, 17th and 10th ranked in terms of volume of garlic production, productivity and area coverage, respectively. Moreover, the international garlic market share of Ethiopia is 0.7% (FAOSTAT, 2015). Garlic falls into three broad product segments-fresh-market, dehydrating, and seed stock-with each differentiated by the way the crop is grown, handled, and used. Under average market conditions, there is little overlap among these three markets, although some lower grade fresh-market garlic is occasionally sold to dehydrators. Changes in relative market prices and stock levels can prompt some shifting of sales between the segments, particularly between fresh and processing markets. While seed and dehydrating garlic are mechanically harvested, fresh-market garlic is hand-harvested. Fresh product is carefully handled to preserve appearance (including sizing, grading, and storing) and is shipped and sold in the same manner as fresh produce. Fresh garlic can be marketed for up to 3 months from the time of harvest with standard warehouse storage, up to 6 months if kept in cold storage, and up to a year under controlled-atmosphere storage. Fresh garlic is used to manufacture crushed, chopped, peeled, and pureed garlic products (Agricultural Outlook, 2000).

The trend in garlic use is unique among vegetables in that demand has increased steadily over many decades and grown at an increasing rate. The strong surge in used likely reflects several factors: rising popularity of ethnic foods and restaurants; - persistent health messages circulating in the press about garlic; demand from the health supplements industry; and the never-ending quest by consumers for new taste experiences.

These demand factors reflect a broadening view of garlic as a "functional food"-one that imparts the usual taste and nutritional attributes of food, plus certain perceived health enhancing benefits. It is used primarily in cooking to flavor a wide variety of foods, garlic provides vitamin C, potassium, phosphorous, selenium, several amino acids, and a variety of sulfur compounds, including allicin naturally occurring compound whose promising health effects are now being studied at several major universities. Garlic has proven itself as a popular food and nutrition item, and is gaining scientific credibility as a significant contributor to good health (Agricultural outlook, 2000). Garlic is the second most widely cultivated Allium used next to onion (Rubatzky and Yamaguchi, 1997). Garlic has played an important dietary, as well as medicinal role for centuries. Even today the medicinal value of garlic is widespread and fast growing. Garlic is one of the best studied medicinal plants that its antibacterial and antiseptic property is well known. It contains remedies against headache, bites, worms and tumours (Keusgen, 2002). Han et al. (1995) also reported that garlic has antibiotic properties, and has been used to treat wounds when other antibiotics were not available. Proponents advise eating a raw clove of garlic a day to boost the immune system (Siegel et al., 2004). Experiments in Germany, for instance, have shown that certain compounds in garlic block the blood platelets from forming into blood clots, which could cause heart attacks (coronarythrombosis) and strokes (Rabinowitch and Currah, 2002).
Generally, garlic can rightfully be called one of nature wonder. It can inhibit and kill bacteria, fungi, parasites, lower blood pressure, blood cholesterol and blood sugar, prevent blood clotting, protect the liver and contains antitumor properties (Sovová M and SovaP, 2004). Reported in market circulation, it is one of competitive commodity and high value crop. In Germany alone, the sale of garlic preparations rank with those of the leading prescription drugs (Lawso, 1994).

Ethiopian Garlic production, productivity and sales volume (value) trend was increasing for the last 20 years (i.e.1994-2013) FAOSTAT, 2015). Extension system was concentrated on other commercials vegetables like onion and pepper rather than garlic. That is to say, there was no garlic production and marketing extension package even up to this research was conducted at Chilga District. Garlic production and marketing challenges must be assessed that may be lack of improved input( seeds, irrigation technologies, etc), seasonal price fluctuation and existence of unlicensed retailers, unidentified pests and diseases(ChilgaWoreda Agriculture Office, 2016). This study was conducted therefore, to assess the local value chain of garlic in ChilgaWoreda.

Background of the study area
Chilgaworedais located 61 km west of Gondar town on the way to Metema. The woreda is an important stopping point on the historic Gondar-Sudan trade route. The Woreda is part of the Semien Gondar Zone, bordered on the south by Takusaworeda, on the West by MetemmaWoreda, on the North by Tach ArmachihoWoreda, on the North-East by Lay ArmachichoWoreda, and on the East by Dembiyaworeda. The woreda’s elevation ranges between 1000 and 1500 masl. 67% of the Woreda is lowland while the remaining 33% is mid-highland. The annual rain fall of the Woreda is between 995 and 1175 mm and the mean daily average temperature is 27 degree Celsius. From the survey result the land use of the woreda indicated that 21.7% is arable or cultivable, 1.9% is pasture, 22.3% is forest or shrub-land, and the remaining 54.1% is considered degraded and others. According to Central Statistical Agency of Ethiopia (2007), the woreda has a total population of 221,462, out of which 112,054 were and 109,408 were women; 20,745 or 9.37% are urban inhabitants while the remaining 90.63% live in rural areas. The Woreda has 48 kebele administrationsin which 41 are rural and 7 are urban. The Woreda has total area of 3,071.65 square kilometers and population density of 72.10 persons per square kilometer, which is greater than the Zone average of 63.76 persons per square kilometer. A total of 47,336 households were counted in this woreda, resulting in an average family size of 4.68 per household, and 45,352 housing units. The majority of the inhabitants practiced Ethiopian Orthodox Christianity, with 96.7% reporting that as their religion, while 3.1% of the population said they were Musliım.

The economy of Chilgaworeda is predominantly agricultural based. According to a sample enumeration performed by the central statistical agency (CSA) in (2001), the average land held by farmers in the woreda is 0.61 hectares. From the total land of the woreda used for cultivation, 64.53% was planted by cereals like teff, maize and finger millet, 2.81% in pulses like horse beans, 8.3% in oilseeds like neug, 0.72% in perennial crops like coffee, 0.62% in root crops, 0.45% in vegetables, and 12.57% all other crops. Permanent crops included 47.13 hectares planted in coffee, 337.01 in Gesho or hops, and 8.02 in fruit trees. Among the farmers of the woreda 88.76% of the farmers both raise crops and livestock, while 8.57% only grow crops and 2.68% only raise livestock.

Due to the existing market demand for garlic, its high economic importance as source of income and agro-ecological advantage of the area for garlic production, many households in Chilgaworeda produce Garlic both in irrigation and rain fed conditions. Garlic has become an important source of income for the smallholder garlic producers that farmers have increased their land allocation and production in recent years (unpublished ChilgaWoreda Agriculture Office, 2016).

Garlic has been produced in ChilgaWoreda since a long period of time that farmers have lifelong production experience and keen interest in producing garlic due to the agro-
ecological advantage of the area. Garlic has now become a key cash crop in ChilgaWoreda that land allocation has increased over the past five years from about 200 ha in 2011 to about 1000 ha in the year 2015. Production in the Woreda has also increased from about 40,000 quintals in 2011 to 160,000 quintals in 2015 (ChilgaWoreda Agriculture Office, 2016).

**Materials and Methods**

**Sample Size and Sampling Techniques:** Three stage sampling procedure was adopted for the selection of sample respondents. In the first stage, all potential garlic producing Kebele administrations (KAs) were selected purposively and they were ranked in a descending order based on the area of land cultivated for garlic in hectare and number of farm households participated. Based on the rank the first three KAs out of ten potential KAs were selected (Alemtsehay, Dilamba and Chandba respectively). In the second stage, first the household heads in the three sample KAs were identified and stratified into two strata: garlic producer and non producers. In the third stage, 5% of the total garlic producer households (total of 129 households) have been drawn using simple random sampling by taking in to account probability proportional to size of the identified number of households participated in garlic production in each of the three selected potential KAs. Finally 15 retailers have been drawn using non probability (purposive sampling) based on volume of trade and years of experience in garlic trading.

**Table1:** Summary lists of selected Kebele administrations and samples from the study woreda

<table>
<thead>
<tr>
<th>Name of PAs</th>
<th>Land cultivated for garlic</th>
<th>garlic producer HHs</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alemtsehay</td>
<td>231.25</td>
<td>1040</td>
<td>52</td>
</tr>
<tr>
<td>Dilamba</td>
<td>195</td>
<td>975</td>
<td>49</td>
</tr>
<tr>
<td>Chandiba</td>
<td>108.4</td>
<td>542</td>
<td>28</td>
</tr>
<tr>
<td>Total</td>
<td>129</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Data Collection method:** Both primary (cross-sectional data) and secondary data were collected using different techniques and tools. To collect quantitative data, interview schedule were used. Interview schedule for household survey and Checklist for Focus Group Discussion (FGD) were employed. Structured and semi-structured interview schedule were prepared and pre-tested and amended based on the feedback from the pre-test.

To generate qualitative information focus group discussion were conducted with the key informant producers and traders, finance experts, trade and industry experts, cooperative experts, marketing experts, development agents, agriculture experts’ representatives. Three focus group discussions were conducted (two with garlic producers of the woreda in different KAs and one with the other stakeholders). Checklists were prepared, pretested, updated and used for focus group discussion to augment the data which is collected through interview schedule from primary sources such as garlic producers and traders. Moreover, key informant interview was conducted with one self initiated saving and credit cooperative leader. Observation was the other tool employed through transect walk to understand the farm site, FTCs, settlement pattern, water points, market centers and natural resources conservation practices of smallholder garlic producer.

**Method of Data Analysis:** Data from the field were edited, coded, and cleaned to ensure consistency, uniformity, and accuracy. SPSS version16 were used to process the data. Both descriptive statistics and qualitative analysis methods were employed to analyze the data. The descriptive analysis was made using, percentage, frequencies, means, maximum and minimum values of some important variables.

**Result and discussion**

In the contemporary World, the national and international market affects the local supply and production. The local supply and production in the other side depends and/or affected by the type and availability of inputs, method of production, quantity and quality of product, physical or infrastructural facilitates and targeted financial supports to producers, traders and the demand of consumers. The issue of garlic values chain in ChilgaWoredas is also seen from different perspectives. Based on data obtained from household survey of smallholder garlic producers and retailers, interview with experts and focus group discussion with identified actors, the main findings related to input, production
trading, financing and support from different organizations is discussed in the following sections.

Agricultural Input

Land, which is of the important production factors, is remaining the most important livelihood asset of the smallholder producer Genanew et al (2016). The same is true in the study area. The data obtained from household survey indicated that on average 0.23 hectare of land per household is allocated for garlic production in every production season. The land allocated for garlic production on average represents 15.97% of smallholders land holdings. The interesting finding in relation to land is that more than 80% of households reported that the farmlands they have are suitable for garlic production. Allocation of land over the last five years for garlic production is increasing.

Chart 1: Trend of land allocated in hectares for garlic production in Chilga

![Chart 1: Trend of land allocated in hectares for garlic production in Chilga](source)

The fertility enhancement by the garlic producers is limited to frequent tilling than application of the proper fertilizer with the recommended rates. The proportion of garlic producing households practicing application of organic fertilizers (locally made compost) is less than 1% of the study population. Though there is enough inorganic fertilizer supply, insignificant proportion of smallholder garlic producer has experienced its application. For crops other than garlic, farmers’ multipurpose cooperatives followed by office of agriculture through extension system are found to be dominant fertilizer supplier to the study area. The qualitative data obtained from experienced individuals, expert and focus group discussants show that high cost and low adoption of inorganic fertilizer is reported to be the major challenge for smallholder producers.

In Ethiopia, there are four known improved varieties of garlic, which include *BishaftuNech*, *Kriftu*, *MahilMeda 98 (MD-98)* and *Tsedays* (Asrat et al, 2015). However the dominant variety in Chilga district used by smallholders is predominantly local origin available either from reserves of famers for the next production or purchased from local market and neither of the mentioned improved varieties are used by producers. The same local garlic variety has two different name based on the production season and application of the water. The garlic, which is produced using the rain fed is locally known as *amdefelo* where as the same seed used to cultivate using irrigation is just called garlic or *necheshinkurt (yemesno)*. Smallholder producers in the area representing 43.4% of the farm households use their own seed and 34.9 % of smallholder producers buy seed from local market during the peak times of planting. However, buying the seed from local market during the peak times of planting garlic exposes them for high cost of seed.

Pesticides play significant role in coping with the problems of weed and pests. As it was reported by household respondents, garlic production is mainly constrained by diseases with no clearly known causes and treatment. Despite the existence of pesticides (herbicides and fungicides) from the local market, its application for garlic production is uncommon.

With regard to farm implements, Ambasel Trading P.L.C is supplying motor water pumps and hoses for irrigation users for any crops cultivation, but not exclusively to garlic producers. There is no alternative technology in relation to irrigation. The problems associated with the motor water pump are the cost incurred for fuel and the gaps in technical support for smallholder producers on how to use.

With regard to irrigation infrastructure, the study has also revealed that the water structure constructed by AGP for small scale irrigation users in Alemtsehaykebele is not operational due to the problems of sediment.

The input issue of garlic production in general is constrained by absence of improved and alternative garlic seed, high cost of motor
pump and seed, limited technical support, high cost of fuel and lubricants and scarcity of water and water related conflicts in some kebeles.

Production Issues

The study has investigated garlic production capacity of smallholders, agronomic practices, constraints and the support of extension to this specific agricultural commodity. The major drivers behind producing garlic in the area are the rich experience of farmers and increasing demand of garlic in the local market. From randomly taken household respondents, more than 95% of farmers in Chilga area reported that they have more than six years of experience in garlic production. The maximum year of experience for garlic production is found to be 45 years, which signifies that smallholder have lifelong attachment with this specific agricultural commodity. For rich experience of smallholders, the agro-ecological advantage of the areas has also significantly contributed.

The production capacity of smallholder garlic procures is by far less than its maximum potential (60-80 quintals per hectare) (Asratet al, 2015). The average production capacity of smallholders is estimated to be 43.47 and 17.39 quintals per hectare in irrigation and rain fed respectively. With this productivity of smallholders, in Chilga district about 78,057.25 quintal of garlic is produced in 2015 production year and 88.73% of the amount produced is from irrigation. Despite its less productivity of smallholder compared to what is expected potential, garlic production trend over the last five years in the study area is found to be increasing.

![Figure 1: Smallholders garlic farm, photo taken on March 12, 2016](image)

The increase in trends of garlic production in the areas could be explained from different perspectives. One of the reasons for increasing trend of the commodity in terms of amount produced is due to increase demand of the product in the market. The other important reason is an increasing shift of smallholder production from rain fed system of garlic to small scale irrigation schemes mainly at household level.

**Chart 2: Trend of Garlic Production over five years in quintals**

![Chart 2: Trend of Garlic Production over five years in quintals](chart)

**Source:** Chilga District Agricultural Office, 2016

The agronomic practices of smallholder garlic producers are mostly dependent on traditional way of production starting from land preparation to harvesting. Smallholder farmers are coping with pest and insects (mainly cut worm), diseases (white rot, which caused by fungal infection) and field lost using traditional ways of management and pest control.

The gap in using recommended packages of garlic production is also observed as one production challenges. The attempts to increase garlic through improved production practices and technologies are limited. In this regard, the attention given by agricultural extension service to support garlic production is very poor unlike in teff and other crops.

Postharvest handling and processing

As many crops in the county, garlic product quantity and quality in the study area are affected by different post harvest losses. The causes of loss of garlic and smallholders postharvest handling and processing at different stage was assessed. The loss starts during harvesting from field as famers use traditional hand tools to uproot garlic. During these times, it is not uncommon that some of garlic bulbs are damaged, which in turn affects the quantity and quality.

There is also a loss of garlic during transportation at farmers level (transportation from filed to home and from store to market centers) as smallholder use animal as means of
transportation and during grading. Loss at trader level is caused by transportation from farmers to market center, from store to market center and back to the store. Weight loss (shirking) is a common problem of loss both at farmers and traders.

Smallholders have their own post harvest handling and grading mechanisms. Cleaning, cutting of roots, drying, chopping leaves and fumigating with smock are some of post harvest handling techniques of farmers and traders in the study area. However, performing such postharvest techniques depends on the purpose of farmers. The purpose could be for seed, sale, and household consumption. In farming households, it is common to dry and fumigate the garlic if it is required for seed and if the purpose is for the household consumption, smallholders chop leaves and different part of the product. The data obtained from household survey indicates that 40.3%, 49.6%, 72.1% and 48.1% of the total respondents perform cleaning, cutting roots, drying and chopping of the leaves respectively.

There are three types of grading and handing of garlic in the study area. Handling is done in the form of “Guranda” which contains an average of 0.2 kg (200g) of weight. Guranda contains bulb, roots and dried shoot (leaf), the garlic with root and without shoots, and cleaned and separated bulbs. The first one is common to farmers and traders, whereas the last two are mostly exercised by traders to attract the diverse needs of consumers. At the household level of producers, handling is mostly done in the form of “Guranda”, and it is demonstrated by almost all smallholders in Chilga area. According to smallholder producers, the gurandais graded into different grades based on the quantity and quality of the product. Cleanness, drying stage, contamination with soil and other substances and attracting color are considered as quality parameters. However, the processing and grading of garlic at farmers level is dominated by traditional way of handling and grading. It was confirmed that there is no any support to modernize this indigenous knowledge of farming community.

The garlic in the form of guranda is handled in different ways. At the farm households it stored by hanging on stretched rope of the roof of residence house and kitchen houses to expose to smoke if it is for the purpose of seed. The traders handle the gurandain the form of accumulated or inside sack (see annexed photo). Processing plays great role to add value, aroma and to increase the shelf-life of the garlic. Despite the fact that garlic has different role as spice and medicinal value, processing of it into different forms is poor in the study area. Chopping and drying leaves, chopping and drying bulbs and scale leaves or bulb scales as ingredient for traditional red chilly making (such as dillih), buttering and as spice for cooking and readymade products such as shiro (Ethiopian wot mostly served during fasting times) are common ways of garlic processing. An interesting thing with regard to processing is it was reported that “garlic tea” is becoming important processed form in some service providing hotels, cafeterias and veranda coffee houses.

Garlic Trading

As discussed on the above sections, increasing demand of the garlic on the market is most important pulling factor of production. With the same token, it has also initiated different people to be interest on garlic trading. Traders of garlic in Chilga areas could be categorized into two categories – the retailers /collectors. The dominant traders in the study area, who have higher contact with producers, are retailers. Existence of more retailers of garlic in Chilga and around has created good market opportunity to producers. During observation of market
center, it was recognized that most of garlic traders are originated from different areas other than Chilga. The study has also revealed that garlic, which is collected from Maksegnit, Delgi, Aymba and other areas have been delivered to Chilga market center. This is because Chilga has been marked as known garlic market center for traders and end users. Metema and Gondar are some of market destination of garlic originated from Chilga area through merchant middlemen such as retailers/collectors whereas in the study area, it is uncommon to find agent middlemen namely brokers and commission agents.

The data collected from traders and focus group discussions show that there are different gaps related to garlic trading which include the presence of many unlicensed traders distorting the market and absence of the contractual marketing between producers and traders. An important issue to be pointed out is poor organization of the market center with traditional and uncontrolled traders, who are dynamic to change their trading roles.

Figure 3: Garlic marketing, photo taken March 19, 2016

Financial Issue

It is widely believed and understood that agriculture as sector should fulfill at least four major requirements (Pausewang et al., 1990). Among these requirements, the most important is the sectors capacity to finance itself for sustained production and productivity. Smallholder agriculture, which has largest share in GDP of the country, is suffering from financial incapability. Taken the issues into account, the financial aspect smallholder in Chilga area was assessed.

The finance for smallholder garlic producers in the study area is originated from different credit sources. Profit from previous season garlic production is the major source for the next production for about 79.7% of respondents, followed those who receive finance from the proceeds of other crops which account 44.5% of sampled households. Proceeds from other business, cash advance from buyers, input advance form government, borrowing from friends and bank loan are also found to the important sources of finance for garlic and other crops production. As it could be seen from the next table, the social network such as friend and intimacy has significant contribution in opening the room for smallholder agricultural investment as it serves as informal safety net for granting the next production.

Table 2: Sources of credit for smallholders (n=129)

<table>
<thead>
<tr>
<th>Sources of credit</th>
<th>Household benefited (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit from previous seasons</td>
<td>79.7</td>
</tr>
<tr>
<td>Proceeds from crops</td>
<td>44.5</td>
</tr>
<tr>
<td>Proceeds from other crops</td>
<td>26.6</td>
</tr>
<tr>
<td>Cash advances from business</td>
<td>16.4</td>
</tr>
<tr>
<td>Input advances from buyers</td>
<td>3.9</td>
</tr>
<tr>
<td>Borrowing from friends</td>
<td>29.7</td>
</tr>
<tr>
<td>Bank loans (ACSI)</td>
<td>7</td>
</tr>
</tbody>
</table>

Source: Household Survey, 2016

The main reasons of getting credit for smallholders are mainly found to be to purchase seed and fertilizers, and they pay for hired labor during peak time of weeding and harvesting. The dominant formal credit and saving institute in the study is found to be Amhara Credit and Saving Institute (ACSI), which is aimed to support farmers through providing credit using group collateral system. It is clear that the experience of accessing credit from formal credit institutions as loan baking (ACSI and Bank in the case of the study area) is very less compared to other informal sources of the credit. It is because of three major reasons –absence of formal collaterals, higher interest rate and cumbersome procedure to get credit for such formal institutions.
Organization Issue
The social network including membership of certain organization serve as a safety net between people and actors involved in different activities. In Chilga area, there are different organizations established aiming to facilitate and support collecting activities related to agricultural production and marketing. The dominant organizations are found to cooperatives (farmers’ multipurpose cooperatives, irrigation water users’ primary cooperative and cooperative union).

As it was reported by the household respondents, more than 50% of smallholders are the members of certain organizations. Cooperatives are providing different services to the members and the local community at large. The farmers’ multipurpose cooperative is found to be instrumental in providing collective marketing to members and non members, inputs mainly fertilizer, seed and consumable good such as oil and sugar. There are four irrigation user primary cooperatives in Chilga area (namely, Alemtsehay, Dilamba, Negade Bahir and Chandiba) responsible for allocation and management of irrigation water related issue. The existence of such irrigation user cooperatives support production of main irrigation crops (garlic tomato and onion).

The good story with regard to cooperatives is the case which was observed in Alemtsehaykebele of Chilga area, where self-initiated farmers cooperative exist. This is unique farmers’ credit and saving cooperatives having 130 members and more than 500,000 birr capital (as of February, 2016). It proves that credit to the members with least interest rate (1%) at any time. Alemtsehay saving and credit cooperative is a member of Tsehay Cooperative Union, which is known cooperative Union in North Gondar Zone. Cooperatives in Chilga area have different technical and managerial problems, which hinder meeting the anticipated objective. The data generated from concerned bodies, district and zonal cooperative experts show that cooperatives in many parts of the country in general and Chilga area specifically are characterized as ineffective and inefficient due to gaps in managerial and technical knowledge. They have also the weak commitment and lack of skilled personnel of management committee. This in turn have exposed cooperatives for malfunctioning, embarrassment, theft, gaps in knowledge of rules, regulation, directive and principles among member. It was also reported that gaps in legal aspects and reaction on violation of cooperative related laws and poor financial management are some of predicaments in Chilga area. Experts in the areas have also pointed that the interference of the government bodies is increasingly becoming the exogenous challenge to cooperatives. The sum all aforementioned problems of cooperatives in the study area have resulted in loss of sense of ownership among the members.

Infrastructure
Infrastructure which include road, banking, telecommunication and electrification are important physical assets of traders, producers and any segment of economic actors, contributes in many ways. Taking it to the context of producers and traders involved in agricultural commodity in general and garlic value chain in particular, the infrastructure Chilga areas was assessed. Except few Kebele administrations, like Chandiba, most of garlic producing areas has nearby market centers, where producers and traders could interact with minimum cost and time. However, it is common to observe that smallholder producers mostly transports garlic and other agricultural commodities using donkey or carrying by themselves. Existence of the telecommunication service in many area of Chilga coupled with proximity to market center helped producers and traders to interact easily. From randomly selected smallholder respondents, 45.8% reported that they get market information from fellow farmers and telephone based communications followed by contacting trader in different market center, who represented 14% of the study population.

Key Partners and Facilitation of Value Chain Analysis
Based on value chain mapping at Chilgaworeda of North Gondar zone, the following actors/ partners are found to be involved in different ways in garlic production. Producers, retailers, consumers, restaurants, “baltina”, cafe and snack are identified as direct actors, which are commercially involved in the chain. While input suppliers (TsehayUnion,
Ambasel trading Private limited company, basic cooperatives of Chilgaworeda, traders, Amhara credit and saving institution (ACSI), office of environmental conservation, office of trade and industry, office of agriculture, Non-governmental organizations (World vision Ethiopia and Agricultural Growth Program) and leaders are identified as indirect actor (facilitator) in garlic value chain.

Table 3: The roles of indirect actors

<table>
<thead>
<tr>
<th>s/n</th>
<th>Actor</th>
<th>Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tsehay Cooperative Union</td>
<td>Supply DAP &amp; Urea</td>
</tr>
<tr>
<td>2</td>
<td>Ambasel trading P.L.C</td>
<td>Supply Motor Pump and spare parts</td>
</tr>
<tr>
<td>3</td>
<td>Basic cooperatives of Chilgaworeda</td>
<td>Transfer DAP &amp; Urea and Motor Pump to farmers</td>
</tr>
<tr>
<td>4</td>
<td>Traders</td>
<td>Supply pesticides and local seed</td>
</tr>
<tr>
<td>5</td>
<td>Amhara credit and saving institution</td>
<td>Access credit service</td>
</tr>
<tr>
<td>6</td>
<td>office of envir.conervation</td>
<td>Control utilization of irrigable land</td>
</tr>
<tr>
<td>7</td>
<td>office of trade and industry</td>
<td>Regulate the marketing system</td>
</tr>
<tr>
<td>8</td>
<td>Non-governmental organizations (World vision Ethiopia and AGP)</td>
<td>Provide motor pump, construct irrigation structure, offer training and provide financial support for partners.</td>
</tr>
</tbody>
</table>

In addition to the direct and indirect actors mentioned here, other potential actors are identified during the value chain mapping.

The main market chain of garlic in Chilga District is illustrated as follow.

1. Producer → retailer → consumer
2. Producer → traders/retailers → consumers
3. Producer → traders/retailers → collectors/retailers → consumers

Figure 4: Mapping during identification of stakeholders in garlic value chain, February, 2016

Conclusions and policy implications

There were different challenges that the garlic farmers and traders were facing with, but they are still able to make some margins because garlic consumption has increased significantly over the past years. Appropriate input such as improved seeds, fertilizer, chemicals, irrigation water and farm implements supply determine the quantity and quality of product. Both organic and inorganic fertilizers, improved variety and farm practices are recognized to increase the production and productivity of garlic crop by farmers.

- From the results of the study, lack of improved garlic seed variety, application of un-recommended rate of fertilizer and less practice of land fertility enhancement practices, traditional agronomic practices of garlic production were the most important problems identified. Therefore, governmental and non-governmental organizations should intervene in introducing nationally released varieties of improved garlic seed and proper application of fertilizer, and promote, train and demonstrate improved practices to increase garlic production.

- The critical problems identified during the study with regard to postharvest handling and processing were traditional means of post harvest handling, grading and processing. Therefore, researchers and extension offices had to work hard to address the problem.

- The trading problem identified during the study period were presence of unlicensed and seasonal traders, no standard grading
of garlic for market and unspecified market site were common. Thus, awareness creation through training on garlic business development and smoothing should be done by responsible organizations. In addition, production and supply, processing and promoting contract marketing of garlic, strengthening the integration between producers and buyers, promoting standardized grading and sorting of garlic, establishing commodity specific and standardized market center should be done by responsible organizations. In addition, production and supply, processing and promoting contract marketing of garlic, strengthening the integration between producers and buyers, promoting standardized grading and sorting of garlic, establishing commodity specific and standardized market center should be implemented.

- Financial capital is an important variable identified to improve the production and productivity of garlic in the study area. However, limited loan size, 50% down payment requirement for motor water pump and cumbersome lending procedure were the problems facing garlic producing farmers in the study area. Hence, responsible organizations should work in promoting alternative financing institutions and group collateral with minimum down payment.

- Multi-sectoral integration is vital for value chain development. In this regards, different stakeholders, who could directly or indirectly contribute and different cooperatives such as multipurpose, irrigation user and saving and credit cooperatives could be taken as corner stone in the process of garlic value chain development greed towards serving the needy people.

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