Potato Value Chain Analysis and Development in Ethiopia

Case of Tigray and SNNP Regions





Reported by:
Bezabih Emana and Mengistu Nigussie
Financial Support by USAID
October 2011

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TABLE OF CONTENTS

LIST OF TABLES iii
LIST OF FIGURES v
ACKNOWLEDGMENTS vi
ACRONYMS/ABBREVIATIONS vii
EXECUTIVE SUMMARY viii

1. INTRODUCTION 1
1.1 Background 1
1.2 Objective 2
1.3 Study area 2

2. REVIEW OF LITERATURE 4
2.1 Conceptual Framework of Value Chain 4
2.2 Value Chain Study Approaches 6
2.3 Application of Value chain Analysis in Potato 7
2.4 Seed and Ware Potato Production in Ethiopia 8
2.4.1 Seed potato production and marketing system 8
2.4.2 Major problems of seed potato 9
2.4.3 Ware potato production 9

3. METHODOLOGY 11
3.1 Data Source and Method of Collection 11
3.2 Data Analysis 12

4. RESULTS AND DISCUSSION 13
4.1 Potato Seed System 13
4.1.1 Seed potato production and marketing in SNNPR and Shashemene 13
4.1.2 Potato varieties grown in Tigray and seed distribution channel 15
4.2 Ware Potato Production and Utilization in SNNPR and Shashemene 16
4.2.1 Ware potato production and productivity 16
4.2.2 Potato production and utilization 18
4.3 Ware Potato Production and Utilization in Tigray 19
4.3.1 Production and productivity 19
4.3.2 Potato production and utilization 20
4.4 Value Chain Actors and Functions in SNNPR 21
4.4.1 Input suppliers 22
4.4.2 Potato producers 23
4.4.3 Traders/Brokers 25
4.4.4 Potato processing 25
4.4.5 Potato retailers 26
4.4.6 Potato consumers 26
4.4.7 Potato support service providers 27

4.4.8 Value chain governance 28
4.5 Value Chain Actors and Functions in Tigray 29
4.5.1 Input suppliers 29
4.5.2 Potato producers 29
4.5.3 Traders/Brokers 31
4.5.4 Potato processing 31
4.5.5 Potato retailers 31
4.5.6 Potato consumers 32
4.5.7 Potato support service providers 32
4.6 Value Chain Analysis in SNNPR and Shashemene 33
4.6.1 Value chain map 33
4.6.2 Marketing analysis 34
4.6.3 Economic analysis of potato value chain 37
4.6.4 Factors of competitiveness in potato value chain 38
4.6.5 Constraints in potato value chain 40
4.7 Value Chain Analysis in Tigray 42
4.7.1 Value chain map 42
4.7.2 Marketing analysis 42
4.7.3 Economic analysis of potato value chain 44
4.7.4 Factors of competitiveness in potato value chain 46
4.7.5 Constraints in potato value chain 47

5. RECOMMENDATIONS FOR VALUE CHAIN DEVELOPMENT 50
5.1 Summary of Interventions 50
5.2 Intervention Strategy 53

References 55
Annexes 57
Annex 1: Description of Value Chain Tools 57
Annex 2: Sample Potato Producers by Sex 58
Annex 3: Sample Potato Retailers and Wholesalers by Region 59
Annex 4 :Companies with Potential to use Potato for Value Addition in Ethiopia 59
Annex 5: Suggested Interventions/Solutions 60
Annex 6: Contact Addresses of Selected Potato Traders 63
Annex 7: Data Collection Instruments 64

LIST OF TABLES

Table 1: Proportion of sample farmers growing potato varieties in Hulla and Shashemene (%) 13
Table 2: Proportion of farmers at Hulla and Shashemene selling seed potato to different buyers (%) 14
Table 3: Proportion of sample farmers growing potato varieties in Tigray project woredas (%) 15
Table 4: Proportion of farmers selling potato seeds to different buyers (%) 16
Table 5: Potato activity calendar in at Hulla (% of producers undertaking the activities)* 17
Table 6: Potato activity calendar at Shashemene (% of producers undertaking the activities)* 17
Table 7: Average yield of potato for rainfed system in 2010/11 production year (t/ha) 18
Table 8: Potato production and utilization per household in Hulla and Shashemene woredas 19
Table 9: Potato production activities in Tigray 19
Table 10: Average yield of Potato for the 2010/11 production year (t/ha) 20
Table 11: Potato production and utilization in Tigray 21
Table 12: Summary of potato value chain actors and functions 22
Table 13: Sources of potato seed in study areas (% of respondents) 22
Table 14: Proportion of framers and amount of fertilizer and seed used, Hulla and Shashemene 23
Table 15: Descriptive statistics of land allocated to potato in the south, rainfed in 2010/11 (ha/HH) 23
Table 16: Potato cropping methods (% of respondents) 24
Table 17: Proportion of potato producers using different stores in Hulla and Shashemene (%) 24
Table 18: Percent of producers using different means of transporting potation the south 25
Table 19: Proportion of farmers who sold ware potato through different channels in 2010/11 (%) 25
Table 20: Quantity of potato handled by retailers and effective months of potato trading 26
Table 21: Potato consumption in Hawassa 27
Table 22: Sources of potato seed in study areas (% of respondents) 29
Table 23: Proportion of framers and amount of fertilizer and seed used, Tigray 29
Table 24: Land allocated to potato production (ha) in Tigray in 2010/11 30
Table 25: Potato cropping methods (% of respondents) 30
Table 26: Proportion of farmers using different types of stores (%) 30
Table 27: Transportation means to take potato to market 31
Table 28: Proportion of producers who sold potato to different buyers (%) 31
Table 29: Quantity of potato handled by retailers and effective months of potato trading 32
Table 30: Potato consumption in Mekele (Amount per year) 32
Table 31: Proportion of farmers who sold ware potato to different actors (%) 36
Table 32: Average producer price (Birr/t) by location in 2010/11 37
Table 33: Cost of potato production in study areas (2010/11) 37
Table 34: Distribution of value addition among major chain actors at Hulla 38

Table 35: Distribution of value addition among major chain actors at Shashemene 38
Table 36: Proportion of farmers indicating marketing problems in the south (% of respondents) 41
Table 37: Potato transportation problems proportion of farmers citing the problem (% of respondents) . 41
Table 38: Major problems related to potato post harvesting (% of respondents) 41
Table 39: Cost of potato production in Tigary 45
Table 40: Distribution of value addition among major chain actors at Atsibi-Wonberta 46
Table 41: Distribution of value addition among major chain actors at Saesi-Tsaeda Emba 46
Table 43: Proportion of farmers stating transportation problem (% of respondents) 48
Table 44: Major problems related to potato post harvesting (% of respondents) 49
Table 42: Strategic intervention areas and actions to be taken 54

LIST OF FIGURES

Figure 1: Value chain Functions 4
Figure 2: Value chain actors and support framework 5
Figure 3: Proportion of potato produced by regions 10
Figure 3: Potato seed flow system in the south: Shashemene is a HUB 14
Figure 4: Potato seed flow system in Tigray 16
Figure 5: Proportion of households producing different levels of yield (%) 18
Figure 6: Proportion of households producing different levels of yield (%). Tigray (%) 20
Figure 7: Processes and functions in potato value chain in SNNPR 21
Figure 8: Map of support service providers for potato 27
Figure 9: Potato value chain in SNNPR 34
Figure 10: Source of potato supplied to Shashemene market (%) 34
Figure 11: Destination of potato supplied from Shashemene market (% of 19,417 t) 35
Figure 12: Marketing channels for ware potato in the south 35
Figure 13: Seed potato marketing channel in the south 36
Figure 14: Core constraints in potato value chain 40
Figure 15: Potato Value Chain in Tigray Region 42
Figure 16: Distribution of quantity of potato supplied to Mekele market (t) 43
Figure 17: Proportion of Supply of potato to Mekele market (1,800 t in 2010) 43
Figure 18: Price variability within a year Mekele market (2010/11) 44
Figure 19: Trend of retail potato price at two market centers in Tigary from 2007-2011 (Birr/kg) 45

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ACRONYMS/ABBREVIATIONS

CIP	International Potato Center
CSA	Central Statistical Authority
DLS	Diffused Light Store
FGD	Focus Group Discussion
ha	Hectare
Kg	Kilogram
m	Meter
MoA	Ministry of Agriculture
SNNPR	Southern Nations, Nationalities and Peoples Region
t	ton

EXECUTIVE SUMMARY

The objectives of the potato value chain analysis are to provide a descriptive analysis of seed and ware potato value chains, identifying the major constraints of the ware and seed production and marketing, understanding support service provisions, and suggesting the specific areas of intervention to strengthen potato value chains in SNNPR and Tigray regions. The study employed value chain framework for analysis of the data. Participatory approach was employed to collect the data. The "Better Potato for Better Life" project stakeholders were trained in value chain study tools and involved in data collection of qualitative and quantitative data from potato producers, traders, transporters, processors and consumers. Secondary data were obtained through review of documents. The key findings are summarized as follows:

i) The major potato value chain actors include input (seed, fertilizer, fungicide, farm implement) suppliers, producers, wholesalers, brokers, retailers and consumers. There is no significant structural difference between the potato value chain in SNNPR and Tigray. The main difference is the quantity of potato marketed and associated prices at different levels and the level of value addition by the different market actors.

ii) Shashemene is the major source of seed potato used in the SNNPR and Tigray. However, the quality of the seed is low and variety hardly traced.

iii) Input supply in both regions is not adequate and the planning of input supply through the extension system focuses on rainfed crops and excludes the irrigated ones.

iv) Production of potato is both for seed as well as consumption. This system of production is serious constraint for the establishment of economically viable seed sector. The specific needs of the consumers are not adequately considered in variety selection. Farmers are not getting adequate advisory service to increase potato productivity. Post harvest loss is also high due to lack of adequate storage. Potato is also damaged when transported due to inadequate transportation facility and poor handling.

v) Farmers grow potato mainly for marketing purpose. On average, 0.8 t to 3.2 t of potato is sold per household during 2010 production season which is 52% to 86% of total potato produced by the household. The role of potato for food security is also significant as an average of 0.3 t and 0.4 t and 0.9 t of potato was consumed per household per year in Tigray, SNNPR and Shashemene respectively.

vi) Potato marketing takes place in all the four study areas but Shashemene serves as distribution center for potato purchased and sold in the SNNPR and other parts of the country including Tigray.

vii) Potato price fluctuates based on the season of harvest. Prices are set by the traders who increase or decrease the price considering the supply situation. Wholesalers are the value chain regulators and the role of producers in value chain management is minimal.

viii) Potato processing is not well developed in the country. Only small scale chips making and cooking of potato is made. Processing industries are not developed. Even some super markets are preparing chips for sale due to absence of processing industries. Lack of scale is one of the reasons for a huge lag in this case. But the future for potato use for starch extraction exists.

ix) Consumption of potato is limited. At household level, knowhow of different ways of utilizing potato is limited.

x) The potato value chain is constrained by many problems. These problems and suggestions have been included in the last chapter of this report.

1. INTRODUCTION

1.1 Background

African economies are increasingly confronted with changing food and commodity markets, due to globalization, economic liberalization and urbanization (Hoeffler, 2005). As a result, consumer preferences change. This poses new opportunities but also challenges to small-scale producers, traders and processors along agricultural value chains.

To address this situation, development agencies, donors and NGOs are placing more emphasis on enabling farmers to increase their level of competitiveness, to produce for an identified market, rather than trying to sell what they have already produced and also seeking new market opportunities that offer higher levels of income. Such goals can be achieved through better economic coordination and institutional linkages. Farmer organizations can play a key role of organizing economic activities beyond local boundaries. They can build up relationships with various chain actors and securing commitments from various actors to cooperate on mutually beneficial actions and investments and thus create value chains.

Potato provides an opportunity for value chain development. It is one of the most productive food crops in terms of yields of edible energy and good quality protein per unit area and per unit of time fitting into intensive cropping systems (Burton, 1989). Nutritionally, the crop is considered to be a well-balanced major plant food with a good ratio between protein and calories, and has substantial amounts of vitamins, especially vitamin C, minerals, and trace elements. Due to its correct balance between protein and calories, it is considered a good weaning food (Berga *et al.*, 1993). Ethiopia has good climatic and edaphic conditions for higher potato production and productivity (Endale, et al., 2008a).

Compared to cereals, potato is short duration crop that can yield up to 30-35 t/ha potato in 3-4 months in Ethiopia (Endale et al. 2008b). In Bhutan, it is reported that the potential yield of potato can reach up to 50 t/ha (Joshi, et al., 2009). In Ethiopia, average tuber yield of potato was almost constant between 6-8 t/ha in the last 20-30 years while the area planted with potato increased from 30,000 ha to about 160,000ha in 2001 (Endale, et al., 2008a). The development and dissemination of many improved varieties of potato contributed to the improvement and expansion of potato production in Ethiopia. Most of the potato germplasm used for selection in Ethiopia are obtained from the CIP.

Despite the research and development efforts in improving the production and productivity of potato, little has been done to improve the performance of the entire potato value chain. Some studies conducted on horticulture value chains considered potato as one of vegetable products and often dealt with ware potato only (e.g. Emana, 2008). Shortage of appropriate potato seed is a major bottleneck in potato supply. To fill the gap, “Better Potato for Better Life Project” has taken the initiative to improve the seed supply system in Tigray and Southern Nations, Nationalities and Peoples Regions. The project is funded by USAID and implemented by CIP together with regional partners.

CIP-Ethiopia commissioned a participatory value chain study in the two regions to understand the main constraints along the potato value chain and identify strategic intervention areas. The study was conducted during May-June 2011.

1.2 Objective

The main objectives of the value chain analysis were to provide a descriptive analysis of seed and ware potato value chains in Tigray and SNNP regions, identify the major constraints of the ware and seed potato production and marketing, understand support service provisions, and suggest the specific areas of intervention to strengthen potato value chains in the two regions. The specific objectives of the value chain analysis were:

- Develop value chain maps and identify the major potato value chain actors in SNNP and Tigray regions;
- Carry out Value Chain Analyses with SNNP and Tigray regions
- Identify the constraints faced by potato value chain actors in both regions;
- Identify strategic intervention areas for increasing the competitiveness of potato value chain in the two regions.

1.3 Study area

The study was conducted in two regions: SNNPR and Tigray. The study sites were purposefully selected to represent the “Better Potato for Better Life Project” sites. In Tigray, Atsibi-Wonberta and Saesi-Tseada Emba woredas were included to study the production side of the value chain. In the SNNPR, Hula Woreda was selected. The selection of another project woreda was shifted to Shashemene area after the training workshop conducted in Hawass for simple reason that the potato produced in SNNPR are largely sold in Shashemene market. It is a hub of potato production where seed and ware potato are produced twice in a year without using supplementary irrigation and distributed to other regions of the country. By the nature of value chain study, it is also good to see the whole chain from input supply up to the end market. Without including Shashemene, the value chain study would be incomplete.

Southern Nations, Nationalities and Peoples Region (SNNPR)

SNNPR is one of the regional states occupying the southern parts of Ethiopia. It is bordered by Oromia in the north and eastern part, by Gambella regional state in the western part and by Kenya in the south. It is the third agriculturally potential crop producing regions of the country.
According to the Ethiopian population census of 2007 (CSA, 2008/09), the population of SNNPR was estimated at 15,042,531 with 49.7% male and 50.3% female ratio. The majority of the population (89.7%) lives in the rural area and only 10.3% lives in urban area.

The regional crop production data shows that the total area allocated to potato production in 2006/07 was estimated at 14,032 ha and total production was 97,435.4 tons for Meher season (CSA, 2007). The average potato yield was 6.95 t/ha which is low confirming the appropriateness of the project intervention with the aim to enhance production and

productivity. In the region, an estimated 430,582 people were involved in the production of potato in 2006/07, which is about 15% of the households in the region (CSA, 2008/09).

Tigray Regional State

Tigray regional state is located in the northern part of Ethiopia. It shares boundaries with Eretria in the north, Sudan in the west, Amhara in the south and Afar in the east. According to CSA (2008), the population of Tigray was estimated at 4,314,456 people of whom 50.8% are female. About 19.5% of the population resides in urban areas showing a higher rate of urbanization in Tigray than it is in the SNNPR.

The total land allocated to potato production in 2006/07 Meher season was estimated at 622 ha with a total production of 5,773.8 t. (CSA, 2007). The average yield was 9.29 t per ha which is relatively higher than the yield in the SNNPR. The total potato growers in the region were estimated at 37,361, which is about 5% of the households in the region. With the increase in the introduction of irrigation technology, the potential for potato production in the region is growing.

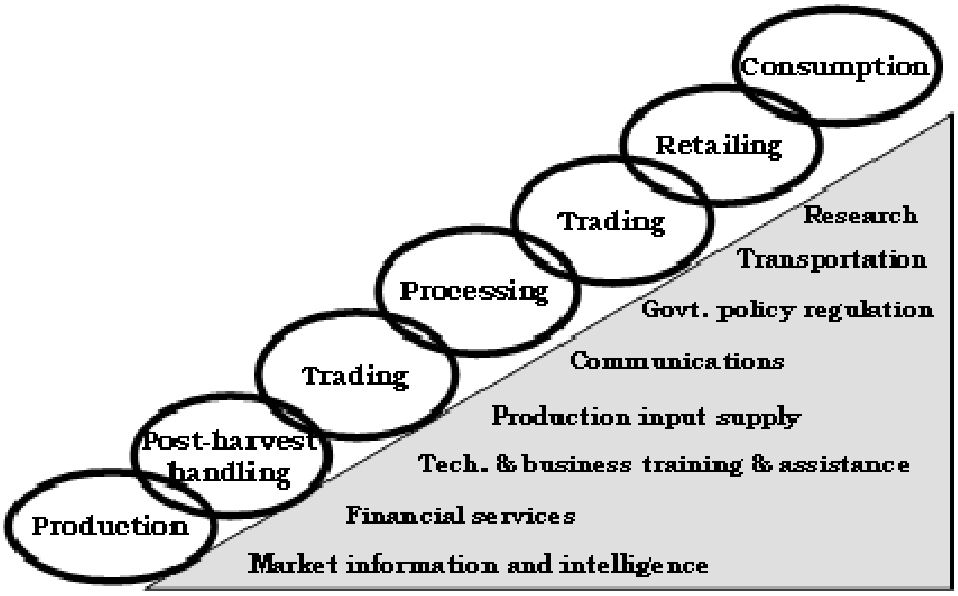
2. REVIEW OF LITERATURE

2.1 Conceptual Framework of Value Chain

A value chain encompasses the full range of activities and services required to bring a product or service from its production to its end use (Kaplinsky, 2000). Value chains include process actors like input suppliers, producers, processors, traders and consumers. At one end are the producers – the farmers who grow the crops and raise the animals. At the other end are consumers, who eat, drink and wear the final products. In the middle are hundreds and thousands of individuals and firms, each performing one small step in the chain: transporting, processing, storing, selling, buying, packaging, checking, monitoring, making decisions, etc. It also includes a range of services needed in the value chain including technical support (extension), business enabling and financial services, innovation and communication, information brokering, etc.). The value chain actors and service providers interact in different ways starting from local to national and international levels.

The multitude of functions that are performed to produce goods and make them available for the consumers is also expressed in the concept of market chain. The market chain refers to the system that consists of actors and organizations, relations, functions, and product, cash and value flows that make possible the transfer of goods or services from the producer to the final consumer. Figure 1 shows the value chain of functions.

Figure 1: Value chain Functions

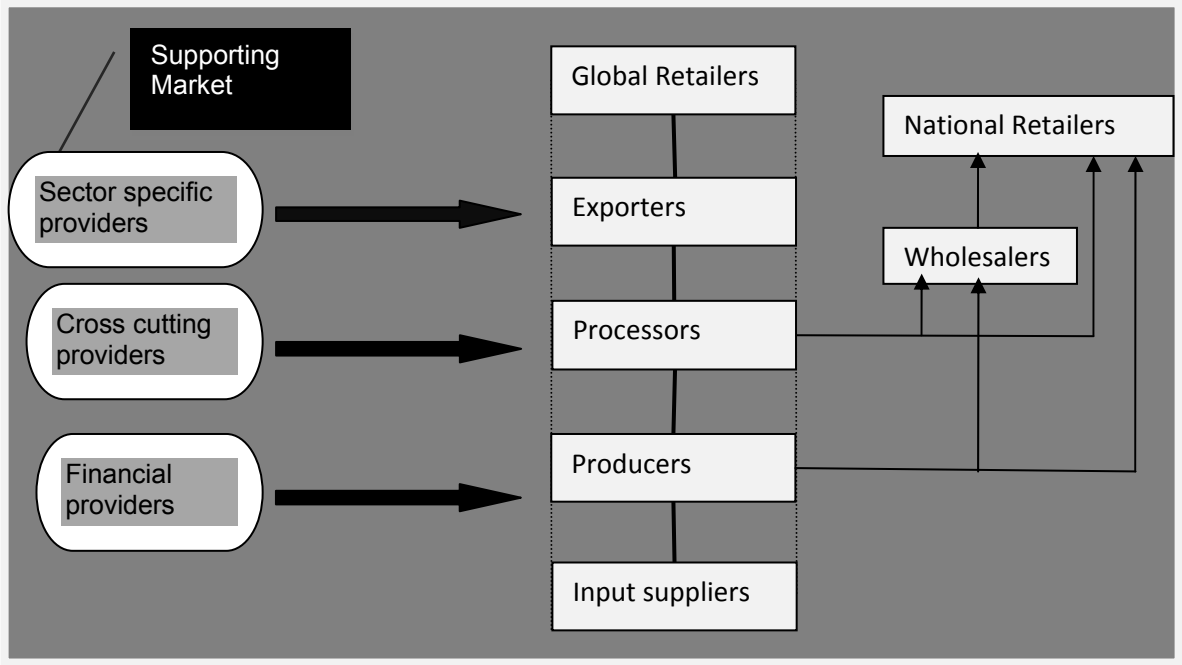


According to KIT et al. (2006), farmers who are involved in the supply chain functions have little negotiating power and make little money and have no incentive to improve their products, and the traders face a great deal of risk and can buy only low-quality produce. Through their associations, farmers can negotiate a deal with a trader who buys a certain amount of high-quality product. The trader in turn has a contract with the end

users/consumers. The function through which each actor is prepared to invest and support other actors to maximize the benefit from the chain performance is known as a value chain. This makes the chain to function smoothly and develops the sense of benefiting all actors from having a smooth supply of top quality products in a sustainable manner.

Value chain include direct actors which are commercially involved in the chain (producers, traders, retailers, consumers) and indirect actors which provide services or support the functioning of value chain. These include financial or non-financial service provides such as bankers and credit agencies, business service providers, government, researchers and extension agents. Figure 2 illustrates the general framework for value chain actors and support system.

Figure 2: Value chain actors and support framework



The chains can be simple when producers directly sell to the consumers but long and complex when the other actors play role in buying, processing, transporting and selling to the end user, the consumer. The complex chain, however, offers a multitude of choice to farmers. They may choose to supply a specific market segment, and produce the crop or animal that is tailored to that segment. They may also try to process their produce to add value to it: they may dry chilies rather than selling them fresh, or they may make cheese rather than selling the unprocessed milk or cook rather than selling row potato. Farmers need to understand the players in the chain and the requirements of the different branches so they can supply the product which that branch requires. That will increase their bargaining power in the chain, and improve their price they get for their product. This in turn increases farmers' comparative advantage by increasing the volume of supply, quality of the

product and consistency of supply, which is often possible when farmers act as a group (Mayoux, 2003)[1]

2.2 Value Chain Study Approaches

An approach used in value-chain analysis depends on the research question (Kaplinsky and Morris 2001). Accordingly, four aspects of value-chain analysis have been applied in agriculture:

i. ***Value chain mapping:*** a value-chain analysis systematically maps the actors participating in the production, distribution, processing, marketing and consumption of a particular product (or products). This mapping assesses the characteristics of actors, profit and cost structures, and flows of goods throughout the chain, employment characteristics, and the destination and volumes of domestic and foreign sales**.**

ii. ***Identifying the distribution of benefits of actors in the chain:*** Through the analysis of margins and profits within the chain, one can determine who benefits from participation in the chain and which actors could benefit from increased support or organization. This is particularly important in the context of developing countries (and agriculture in particular), given concerns that the poor in particular are vulnerable to the process of globalization.

iii. ***Examining the role of upgrading within the chain*****:** Upgrading can involve improvements in quality and product design that enable producers to gain higher-value or through diversification in the product lines served. An analysis of the upgrading process includes an assessment of the profitability of actors within the chain as well as information on constraints that are currently present. Governance issues play a key role in defining how such upgrading occurs. In addition, the structure of regulations, entry barriers, trade restrictions, and standards can further shape and influence the environment in which upgrading can take place. Possible forms of upgrading include: process upgrading, product upgrading and function upgrading.

iv. ***Role of governance in the value-chain:*** Governance in a value-chain refers to the structure of relationships and coordination mechanisms that exist between actors in the value-chain. Governance is important from a policy perspective by identifying the institutional arrangements that may need to be targeted to improve capabilities in the value-chain, remedy distributional distortions, and increase value-added in the sector.

By systematically understanding these linkages within a network, one can better prescribe policy recommendations and, moreover, further understand their reverberations throughout

[1] Participatory Value Chain Analysis, DFID and Institute for Development Policy and Management at the University of Manchester and Women in Sustainable Enterprise (WISE) Development Ltd. Available at http://lists.man.ac.uk/mailman/ listinfo/enterprise-impact

the chain. The value chain approaches apply the following tools and steps (Berg et al., 2005):

Different value chain study tools parallel the approaches discussed above. Generally, six sets of tools are used: (i) the analysis starts with prioritizing a commodity for value chain development; (ii) mapping of the value chain; (iii) analysis of the value chain performance in terms of costs, prices and margins; (iv) analysis of technology, knowledge and upgrading possibilities through assessment of gaps in technology and knowledge and existing or future opportunities; (v) value chain governance which is used to identify stakeholders influencing governance, rules and regulations and their enforcement and (vi) linkages among the stakeholder, referring to their relationships. For detailed description of value chain tools see Annex 1.

2.3 Application of Value chain Analysis in Potato

Value chain approach is used by many organizations across the globe. Following the pioneering contributions, of Porter (1985) who focused on how individual firms can create value and build up their competitive advantage and Gereffi (1994) who focused primarily on the economic governance patterns in “global” value chains, different institutions and individuals applied value chain approach. The World Bank Group is already engaged in value chain studies in various countries and regions of the world, including Africa, Latin America, Central Asia, South Asia, East Asia, and the Middle East and North Africa. In addition, many other international development agencies such as GTZ, USAID, the ComMark Trust and International Labour Organization use the approach. FAO is currently utilizing value chain approach for livestock development in IGAD countries.

The application of value chain analysis in agriculture is growing due to market failure and non competitive setting of small scale agricultural production. Value chain and innovations are also interlinked. Improvement in productivity and competitiveness of the value chain is the litmus test for value chain innovation (Anandajayasekeram and Gebremedhin, 2009). The concept of value chains has been extended to the analysis of globalization (Gereffi and Korzeniewicz 1994; Kaplinsky 1999).

However, value chain research related to potato is scanty. Most literature and research in the past has focused on potato production and some on marketing. The potato value chain conducted in Bhutan (Joshi and Gurung, 2009) analyzed the context of potato production, mapped chain actors, factors affecting value chain and chain relationships. A case study of the potato value chain conducted in Kenya has shown that contract farming can be used to reduce transaction costs and risks, and to improve the organization and governance of value chains by creating stable business relationships (Kirumba et al., 2004). The study also indicated that potato value chain is constrained by a number of market and institutional failures. The potato chain in Kenya is fragmented, characterized by little cooperation and integration, cartels, high transaction costs, deep mistrust, price inefficiencies and quality losses.

Horticulture value chain study conducted in Eastern parts of Ethiopia indicated that potato is one of the major horticulture crops exported to Djibouti and Somali land (Emana, 2008).

The same study indicated that potato accounted for about 70% of the total vegetables (i.e. 42,172.5 t) marketed in 2007 in Kombolcha district of eastern Ethiopia. The major constraints of marketing identified by the same study include lack of markets to absorb the production, low price for the products, large number of middlemen in the marketing system, lack of marketing institutions safeguarding farmers' interest and rights over their marketable produces (e.g. cooperatives), lack of coordination among producers to increase their bargaining power, poor product handling and packaging, imperfect pricing system and lack of transparency in market information communications.

In potato marketing, low prices offered for ware potato used to be reported by producers. This is attributed to non-diversified potato consumption culture in the country. However, recently, processing and consumption of value added potato products, such as chips is showing an increasing trend especially in urban areas. A study by Agajie et al. (2007) indicated that demand for potato chips by both high and low income households has increased in recent years especially in Addis Ababa. Therefore, the sector has great potential for growth. This future growth should be geared towards improving the performance of the whole potato value chain. It is also important to link value chain with innovation system perspective in agricultural research for development so that one re-enforce the other.

2.4 Seed and Ware Potato Production in Ethiopia

2.4.1 Seed potato production and marketing system

The production of high-grade basic seed remains a key constraint in the development of a competitive potato seed industry in Eastern and Central Africa. In Ethiopia several varieties of potato are grown by farmers some of which are local and others are improved varieties. About 20 varieties have been reported to be grown in different parts of Ethiopia (Gebremedin et al., 2008).

Seed systems can be defined as the ways in which farmers produce, select, save and acquire seeds (Sthapit et al., 2008). Different authors classify seed systems into different types. Struik and Wiersema (1999) and Endale et al. (2008a) classified seed systems into informal and formal, while others classified the system into local and formal (World Bank, 2009), or farmers' and formal (Almekinders and Louwaars, 1999). The farmers', informal or local seed systems cover methods of local seed selection, production and distribution (Louwaars, 2007). The formal seed systems cover seed production and supply mechanisms operated by public or private sector specialists in different aspects of the seed system, ruled by well-defined methodologies, with controlled multiplication, and in most cases regulated by national legislation and international standardization methodologies (Louwaars 2007).

The informal seed potato system is a seed potato system in which tubers to be used for planting are produced and distributed by farmers without any regulation. This seed system exists in all potato growing areas of Ethiopia. It is the major seed potato system. According to Gildemacher et al. (2009), it supplies 98.7% of the seed tubers required in Ethiopia. The seed tubers supplied by this system have poor sanitary, physiological, physical and genetic qualities (Lemaga et al., 1994; Mulatu et al., 2005; Endale et al., 2008b; Gildemacher et al., 2009).

There is no public formal seed potato supply system in Ethiopia. The contribution of the formal seed potato system to the overall seed tuber use in Ethiopia is very meager as both the private sector and the cooperatives are at the incipient stage (Hirpha et al 2010). The Ethiopian Seed Enterprise (ESE) is not involved in seed potato production and supply because of its limited capacity and there is only one modern seed Potato Company in Ethiopia, i.e. the SolaGrow PLC (ibid).

2.4.2 Major problems of seed potato

The supply of quality seed tubers is insufficient. All the three seed potato systems operating in Ethiopia have problems in undertaking their functions as a seed system (Hirpha et al., 2010). The major problems reported are poor in health, unsuitable physiological age, poor genetic quality, impurity (varietal mix-up), and physically damaged and inappropriate seed size. These constraints can be explained in some details as follows:

i. **Disease:** Late blight [*Phytophthora infestans* (Mont.) de Bary] is common in all potato growing areas of Ethiopia. It is the most important and damaging potato disease worldwide. Because of the use of home saved seed, use of seed potatoes of unknown origin from local markets, limited use of resistant varieties, poor storage practices like leaving potato underground un-harvested and only limited adoption of haulm killing and selection practices by farmers, the seed tubers used by most potato producers are of poor quality.

ii. **Use of small seed size:** Ethiopian smallholder farmers commonly practice saving tubers for seed that are too small and inferior to be sold for consumption (Mulatu et al., 2005; Endale et al., 2008a; Gildemacher et al., 2007).

iii. **Seed potato physical damage:** Physical damage includes cuts, bruises and holes, inflicted on tubers during harvesting, storage, packaging and transportation. Use of sharp/long fork tools to dig out tuber, throwing potato during harvest, packing potato in sack and transporting on donkey back, piling one sack on another and transporting by lorry, unsafe loading and unloading from lorry contribute to physical damage of potato seed.

iv. **Use of potato seeds of unknown origin**: Farmers usually use varieties of unknown origin and improved varieties are not available to the majority of the farmers. Long dormancy period of potato (stored for more than 3 months in eastern parts of Ethiopia) and lack of well sprouted good quality seed potato tubers are also among key potato seed problems frequently raised by potato growers. Potato growing farmers in Ethiopia do not usually remove haulms which greatly improves sprouting of potato seed (Assefa, 2011). According to Assefa (2011) farmers are key innovators especially in enhancing potato seed quality by controlling dormancy by removing the flowers after tuber maturity and maintaining the tuber in the soil.

2.4.3 Ware potato production

Ethiopia has suitable edaphic and climatic condition for the production of high quality seed potato and ware potato. About 70% available agricultural land is located at an altitude of

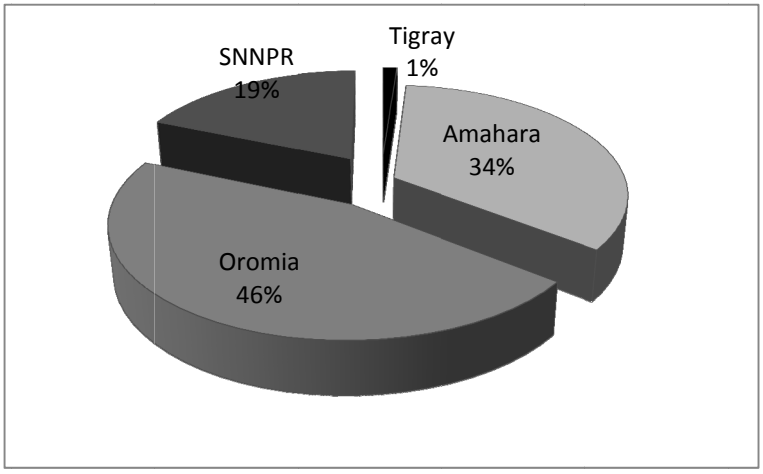
1800-2500 m which is suitable for potato production (Solomon, 1987 as cited in Tasew, 2006).

The study by Tesfaye et al. (2002) on production and marketing of potato in Ethiopia indicates that the total acreage of potato in Ethiopia exceeds 160,000 ha with an annual production of 1.28 million tons (CSA, 2008/09). Regional distribution of the potato production is depicted on Figure 4. Accordingly, Oromia, Amhara, SNNPR and Tigray constitute 46%, 34%, 19% and 1%, of the national potato production, respectively (Figure 3). Oromia is a major potato producing region due to the ecological suitability of areas like Shashemene, the rift valley area, east and west Hararghe and west Shewa which are the major suppliers of potato.

Given the highly rugged topography and past environmental degradation, the contribution of Tigray to national potato production cannot be understated. In recent years, due to environmental rehabilitation and investment in irrigation infrastructure, farmers have started expanding potato production.

The southern area of Ethiopia where potato is grown, is mainly located in the Southern Nations', Nationalities and Peoples' Regional State (SNNPR) and partly in the Oromia region. The major potato producing zones in this area are Gurage, Gamo Goffa, Hadiya, Wolyta, Kambata, Siltie and Sidama in the SNNPRS and West Arsi zone and Shashemene in Oromia. The favourable climate and soil conditions enable Shashemene to produce potato twice a year using rainfall.

Figure 3: Proportion of potato produced by regions



Source: Computed from CSA sample agricultural survey data

The average yield of potato in Ethiopia is estimated to be 8 t/ha Tesfaye et al., 2007). Indeed a recent study put the national average yield of potato at 10.5 t/ha which is very much low compared to the potential 50t/ha elsewhere in the world. In Ethiopia, the yield of improved varieties ranges between 19 t/ha to 46 t/ha reported on-station depending on varieties, location and other factors. Under farmers' condition, the average yield reported for improved seed is between 19 and 38 t/ha for different varieties at different locations.

3. METHODOLOGY

3.1 Data Source and Method of Collection

Different approaches of data collection and analysis were employed in this study. Brief descriptions of the methodologies used are given as follows:

i) Review of literature:

The assessment started with review of relevant literature on ware and seed potatoes. Project documents, reports, published and unpublished documents, website data, publications of the International Potato Centre (CIP), CSA data and MOA data were reviewed. Moreover, concepts of value chain and value chain study tools were reviewed and used for training the stakeholders for a clear understanding of the concepts and approach to build their capacity and also apply it for the collection of data used in this report. The review of the literature is integrated into relevant sections of this report.

ii) Participatory training and data collection:

The data were collected in a participatory manner by involving project stakeholders in Tigray and SNNP regional states. For this purpose, training workshop was conducted for 2 days in both regions: in Hawassa on May 9-10, 2011 and in Mekele on May 30-31, 2011. The workshop served dual purposes viz. training of participants on concepts of value chain through learning by doing approach and secondly collection of actual data on potato value chain through group discussions. The participants were representatives of farmers and traders, regional research institute, regional agriculture bureau, cooperatives, agricultural marketing agency, NGOs, and the project staff.

The training involves concepts of value chain, the purpose of value chain, how the potato value chain benefits the poor, general approach to value chain studies and application of the value chain studies in potato, identification of value chain actors, economic analysis in potato including the actors' margins, constraints in potato value chain and expert suggestions for interventions. The training approach was presentation of theory, concepts and application tools by consultants and group work by the participants to apply the tools to potato sector of the region. The results of the group work were presented to the plenary and discussed. Potato value chain maps of the respective region and identification of actors and constraints were done during the workshop. Because of the immense experiences of the workshop participants, relevant data on potato value chain actors, chain support service systems and constraints were identified. The role of the producers and traders who participated in the workshop was significant.

Following the training, orientation was given on the survey questionnaire prepared for actual data collection. Market visits were made at three major markets (Shashemene, Hawassa and Mekele) in the study areas to get in-depth understanding about potato market channels, actors, costs of marketing, and consumption of potato.

Survey questionnaire and data collection:

Primary data were collected through structured questionnaire from main value chain actors such as farmers, traders (wholesalers and retailers), processors, brokers, transporters, consumers (household and institutions) and support providers (MFIs, Research, Bureaus of Agriculture). For each actor a separate questionnaire was prepared and administered to respondents by value chain trainees. In Tigray region the questionnaire for producers and traders (retailers, wholesalers) were translated into Amharic to help the trainees quickly understand and properly convey to respondents. The questionnaire used for each of the actor is given in Annex 1. A total of 202 respondents of whom 160 potato producers (8 female), 40 retailers (22 female) and 12 wholesalers (1 female) were interviewed (See Annex 2).

Moreover, about 40 potato retailers (55% female) were interviewed (see Annex 2). Similarly, 16 potato wholesalers were interviewed at the three major potato markets i.e. Shashemene, Hawassa and Mekele. The wholesalers in the different markets have close market linkage tracing the sources of potato supplied to different markets. Wholesalers sell in bulk whereas retailers sell potato in small quantities as needed by the consumer. The data collection instrument is given in Annex 7.

3.2 Data Analysis

The data collected from different sources were analyzed using descriptive statistics. The tools of value chain analysis indicated in chapter 2 and described in Annex 1 were applied. The results of the analysis are presented in the following chapter.

4. RESULTS AND DISCUSSION

4.1 Potato Seed System

Potato growers used seeds from different sources. Most common seed sources are farmers themselves. Some farmers select small sized potato, from the ware potato, and use them as seed. The notion of producing potato for seed purpose is a new phenomenon in Ethiopia.

4.1.1 Seed potato production and marketing in SNNPR and Shashemene

Potato varieties

In the southern part of the country including the project sites, farmers recognize local and improved potato varieties. The improved varieties (often also grown for long in the area) are *Agea* (farmers call *Agazi*), *Jalene, Gudene, Netch Ababa, Key Ababa, and China* (Table 1). The local ones seem to have been grown in the area for longer periods and farmers consider them as own seed and hence local. In Hulla woreda, the largest proportion of the farmers (71%) grows the local seed. Among the improved potato varieties, *Netch Ababa* and *Jalene* are the most widely grown in Hulla woreda, mostly due to the "Better Potato for Better Life" project.

Table 1: Proportion of sample farmers growing potato varieties in Hulla and Shashemene (%)

Woreda	Local Variety	Jalene	Gudene	Nech Abeba	Key Abeba	Agazea	China
Hulla	71	11	5	11	3	-	-
Shashemene	25	4	4	54	-	32	4

In Shashemene area which is considered to be the hub of potato seed supply, *Nech Ababa* (local name for white flowering potato" and *Agazea* are popularly grown. The two varieties are considered as disease resistant and preferred by the farmers. They are also evaluated as being good in taste and having relatively longer shelf life.

Potato seed marketing

In both Hulla and Shashemene woredas, the farmers are the major buyers of the seed potato produced in the area. The survey result shows that 57% of the informal seed potato growers in Hulla woreda sold it to fellow farmers whereas the proportion of seed potato growers in Shashemene woreda who sold it to other farmers is 50% (Table 2). This indicates that farmer to farmer seed transfer (through market mechanism) is a dominant seed distribution system in the study areas.

The second important seed potato marketing channel is through intermediaries such as traders and brokers. The brokers play an important role in Shashemene area where they purchase the potato from the producers and sell to wholesalers. Cooperatives are entering

into potato seed business and hence started buying potato for seed and ware potato production. Accordingly, 25% of the producers in Shashemene area sold seed potato to cooperatives.

Table 2: Proportion of farmers at Hulla and Shashemene selling seed potato to different buyers (%)

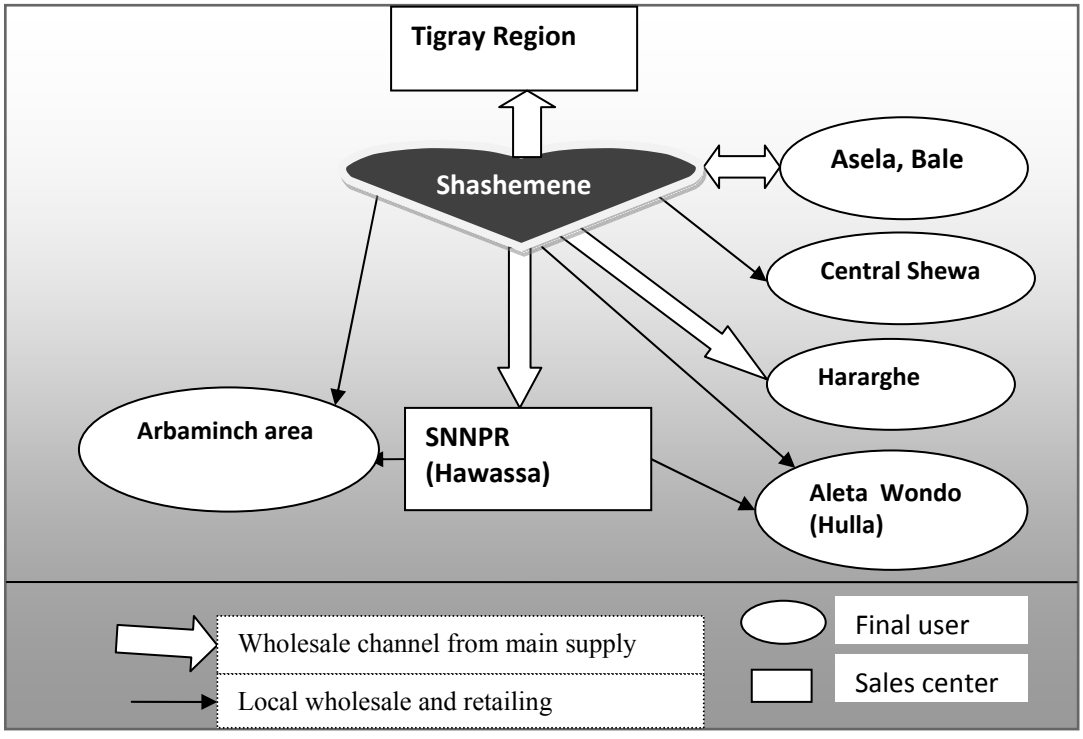
Buyers of seed potato	Hulla woreda	Shashemene woreda
Trader	21	17
Broker		8
Processors	14	
Cooperative		25
Producers	57	50
NGO	7	

Source: Own survey data (2011)

Potato seed distribution channel

The potato seed flow system in the study areas is mapped based on the primary data from producers and traders. The seed potato flow principally starts from Shashemene area which serves as a HUB for the potato seed supply system (Figure 3). Every 2-3 years, the Shashemene farmers replace the potato seed grown in their area by the seed produced in Arsi/Bale with the main aim to reduce disease susceptibility. Thus, Arsi and Bale zones are also major seed sources in the seed potato supply system.

Figure 3: Potato seed flow system in the south: Shashemene is a HUB



Potato seed is purchased from Shashemene by wholesalers and transported to major towns like Mekele, Hawassa, Arbaminch and Hararghe (such as Harar, Haramaya, Langay, Gara Muleta, etc.). From these towns, the wholesalers sell the seed to other traders in smaller rural towns or directly to the farmers in their vicinity. It has been stated that potato seed from Aris/Bale is sold at Shashemene market and also the seed from Shashemene is sold to farmers in Arsi/Bale. The flow of the potato seed in either direction is used as a mechanism to reduce disease incidence by growing potato coming from a different environment.

4.1.2 Potato varieties grown in Tigray and seed distribution channel

Variety

The potato varieties used by the farmers in the Tigray region are local as well as introduced from other places. Varieties such as *Gudene, Jalene* and what farmers call *Shashemene* are the varieties grown in Shashemene area (Table 3). Other varieties might have been introduced from Holeta Agricultural Research Center, directly, or from Amhara region. In Atsibi-Wonberta woreda, most of the farmers grow new varieties of potato, which are introduced through the 'Better Potato for Better Life" project. The project promoted *Jalene* and *Gudene* varieties by creating potato producer groups and created access to finance for the farmers who need to buy the seed. Farmers in Saesi-Tsaeda Emba woreda predominately grow the *Shashemene* variety, indicating that they rely on market to access seed potato. The "Better Potato for Better Life" project is one of the means by which the farmers accessed improved potato seeds.

Table 3: Proportion of sample farmers growing potato varieties in Tigray project woredas (%)

Woreda	Local Variety	*Shashemene*	*Jalene*	*Gera*	*Gudene*
Atsibi-Wonberta	3	-	42	36	18
Saesi-Tsaeda Emba	19	62	-	12	8

Source: Own survey (2011)

Marketing

The survey result shows that the producers sell their seed potato mostly to farmers in their area. For instance, producers in the two study woredas in Tigray sold approximately 54% of the seed potato produced in 2010 production season to other farmers (Table 4). Nowadays, NGOs and research institutions are involving in the strengthening local seed production by financially and technically supporting farmers' groups. These institutions also purchase the seeds from the project beneficiaries to create access to seed for other farmers as well as to promote potato production. This also enables the local seed groups to access market for the seed. In Atsbi-Wonberta woreda 'Better Potato for Better Life' project is impacting the seed supply system where 12.50% of the producers sold the seed produced through the project and 4.17% of them sold it to NGOs.

Table 4: Proportion of farmers selling potato seeds to different buyers (%)

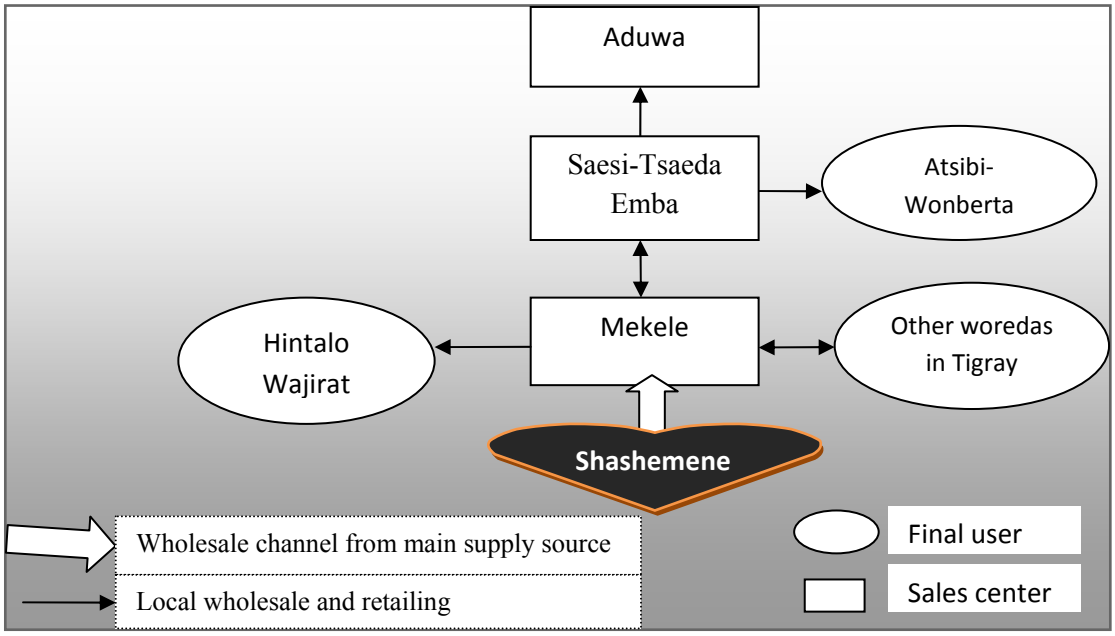
Buyers	Atsibi-Wonberta	Saesi-Tsaeda Emba
Trader	13	42
Broker	4	4
Cooperative	4	
CIP	13	
Farmers	54	54
Research institute	8	
NGO	4	

Source: Own survey data (2011)

Distribution channel

Potato farmers in Tigray region in general and in the project woredas in particular, use seed potato mainly coming from Shashemene. The seed arrives in Makele market and is then further sold to traders in the different woredas of the region (Figure 4). The distribution channel is, therefore, as follows: the wholesalers in Mekele buy seed potato from wholesalers in Shashemene and sell it to the retailers in woredas of the region or directly to the farmers. Some of the traders e.g. from Aduwa sell the seed potato to other woredas. It was also indicated that farmers consider potato seeds coming from Shashemene area as improved indicating the significance of the Shashemene as source of seed.

Figure 4: Potato seed flow system in Tigray



4.2 Ware Potato Production and Utilization in SNNPR and Shashemene

4.2.1 Ware potato production and productivity

Production season: There are two main potato production seasons in Ethiopia: belg (January to June, short rain season), Meher (June to December, long rain season), residual moisture and irrigation based production systems. In many areas, the belg crop

supplemented with irrigation constitutes the bulk of potato production. This is due to low incidence of the late blight and favorable market during this season. In SNNPR and Shashemene area, the main potato production season is the belg season.

Calendar: The activity calendar of potato production in Hulla and Shashemene woredas is given in Tables 5 and 6 respectively. The majority of the producers prepare the land in January to February, plant it in February-March and harvest it during June-July. Thus, June-July is the peak potato production and marketing seasons which also characterized by low price.

Table 5: Potato activity calendar in at Hulla (% of producers undertaking the activities)*

Activity	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
Land preparation	49	83	34	17	5	10	17	20	12	2	-	2
Planting	-	5	68	54	2	-	7	15	15	7	-	-
Weeding	-	-	-	27	61	22	7	12	15	22	2	2
Harvesting	7	-	-	-	2	20	76	51	2	5	12	24
Marketing	7	2	2	-	5	7	46	44	24	15	7	20

* Number under each month indicates the number of responses for the specific activity
* The shaded part is the predominant activity calendar;
Legend: Common land preparation; peak planting time; common weeding time; peak harvesting time; peak marketing time
Source: Computed from Potato Producers survey

Table 6: Potato activity calendar at Shashemene (% of producers undertaking the activities)*

Activity	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
Land preparation	68	29	7	-	4	7	32	25	-	-	7	14
Planting	14	71	21	4	-	-	11	25	-	7	-	-
Weeding	-	4	50	57	18	-	4	7	11	14	11	-
Harvesting	7	-	4	4	25	61	36	21	4	4	18	18
Marketing	18	14	11	-	14	32	29	36	18	11	32	14

* Number under each month indicates the number of responses for the specific activity.
* The shaded part is the predominant activity calendar.
Legend: Common land preparation; peak planting time; common weeding time; peak harvesting time; peak marketing time
Source: Computed from Potato Producers survey

Productivity: In the SNNPR, due to high population density, the land size is small compared to the land holding in Shashemene area. Hence, the area located to potato production is small. During 2010, farmers in Hulla woreda, on average, allocated 0.28 ha to potato whereas the area allocated to potato in Shashemene woreda is 0.45 ha/HH.

Moreover, the average potato yield is higher in Shashemene (i.e. 14.3 t/ha) as compared to 10.4 t/ha in Hulla woreda (Table 7). In both sites, the average yield is lower than the level reported in the literature. The low yield may be attributed to the type of variety farmers are growing which is usually local or old improved variety, poor seed quality, disease, and poor management practices. There is also a huge yield difference among the households.

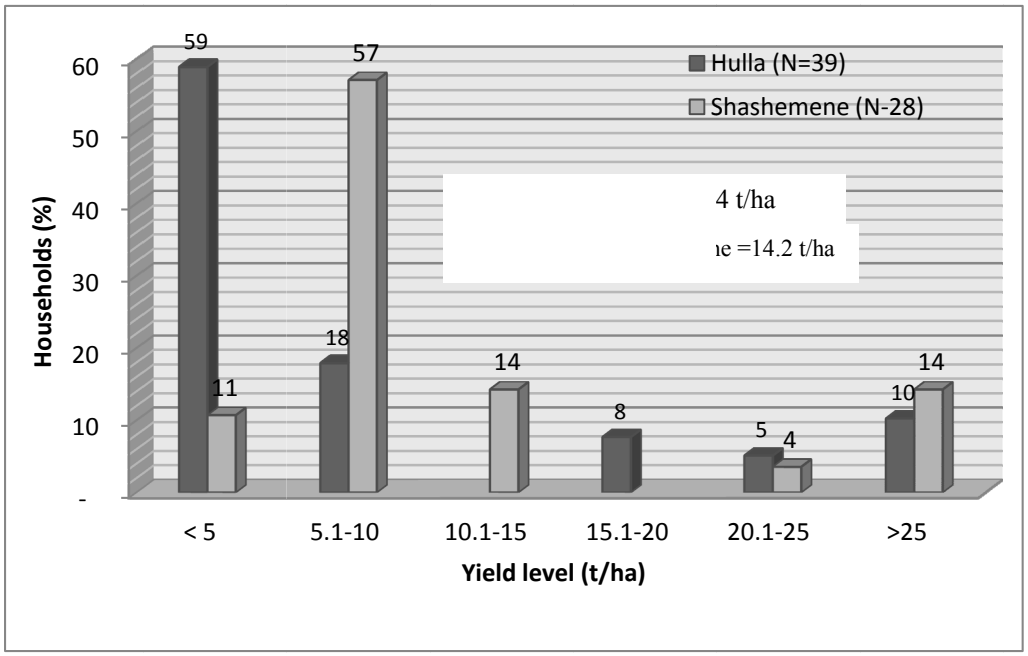
Table 7: Average yield of potato for rainfed system in 2010/11 production year (t/ha)

Woreda	N	Minimum	Maximum	Mean	Std. Deviation
Hulla	40	0.6	61.5	10.4	14.2
Shashemene	28	1.6	64.0	14.3	15.4

Source: Computed from survey data

Figure 5 reveals that the majority of the producers in both study areas harvested below the average yield of their respective areas. The result shows a clear yield variation between the locations where Sheshemene performs better.

Figure 5: Proportion of households producing different levels of yield (%)



Source: Computed from survey data

4.2.2 Potato production and utilization

The result of the household survey shows that the average quantity of ware potato produced per household during 2010 production season at Hulla and Shashemene was 1.6 t and 4.9 t respectively (Table 8). The largest proportion of the produce especially in Shashemene (67%) was sold. The contribution of ware potato to the food security is also high. The average quantity of ware potato produced and consumed was 0.42 t and 0.94 t per household in Hulla and Shashemene, respectively. As own potato is a major source of seed, about 22% and 14% of the potato produced was used for seed in Hulla and Shashemene woredas respectively. Obviously, these seed tubers are in fact ware potatoes that will be used as seed in the next season.

Table 8: Potato production and utilization per household in Hulla and Shashemene woredas

Woredas	Production (t)	Utilization (t)			Utilization (%)		
		Consumption	Seed	Sold	Consumption	Seed	Sold
Hulla	1.6	0.4	0.4	0.8	26	22	52
Shashemene	4.9	0.9	0.7	3.3	19	14	67

Source: Computed from survey data

4.3 Ware Potato Production and Utilization in Tigray

4.3.1 Production and productivity

Calendar: In Tigary, the largest proportion of the potato growers stated that land is prepared between December and January and planting in January to February for the irrigated field and in June for the rainfed fields. Thus weeding other crop management practices are done starting from February (for the irrigated) and July (for the rainfed). The two peak harvesting times are between June and July and between October to December (Table 9).

Table 9: Potato production activities in Tigray

Activity	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
Land preparation	38	21	25	31	37	19	25	26	18	16	37	46
Planting	48	24	11	4	23	34	12	12	20	-	3	15
Weeding	15	33	34	22	8	15	44	40	23	16	12	5
Harvesting	8	1	7	7	26	38	12	13	18	29	26	32
Marketing	16	1	2	7	19	25	14	14	13	21	23	24

* Number under each month indicates the number of responses for the specific activity
* The shaded part is the predominant activity calendar;
Legend: Common land preparation; peak planting time; common weeding time; peak harvesting time; peak marketing time

Source: Computed from Potato Producers survey

Productivity: The survey result shows that farmers at Atsibi-Wonberta woreda grow potato more on irrigated area (0.47 ha) compared to rainfed area (0.18 ha). Generally, the area allocated to potato production is small in Saesi-Tsaeda Emba woreda. The average area allocated to potato (irrigated as well as rainfed) is about 0.2 ha in Saesi-Tsaeda Emba woreda whereas the average area per household in Atsibi-Wonberta woreda is 0.35 ha.

The average yield reported by the sample potato producers was 7.5 t/ha in Saesi-Tsaeda Emba woreda and 8.4 t/ha at Atsibi-Wonberta woreda under rainfed system (Table 10). The average yield level in this region is smaller than the average in Shashemene (14.2 t/ha). The low yield may be attributed to the type of variety farmers are growing which is usually local or old improved variety, poor seed quality, disease, and poor management practices. As shown in Figure 6, larger number of farmers produce below average yield, showing that

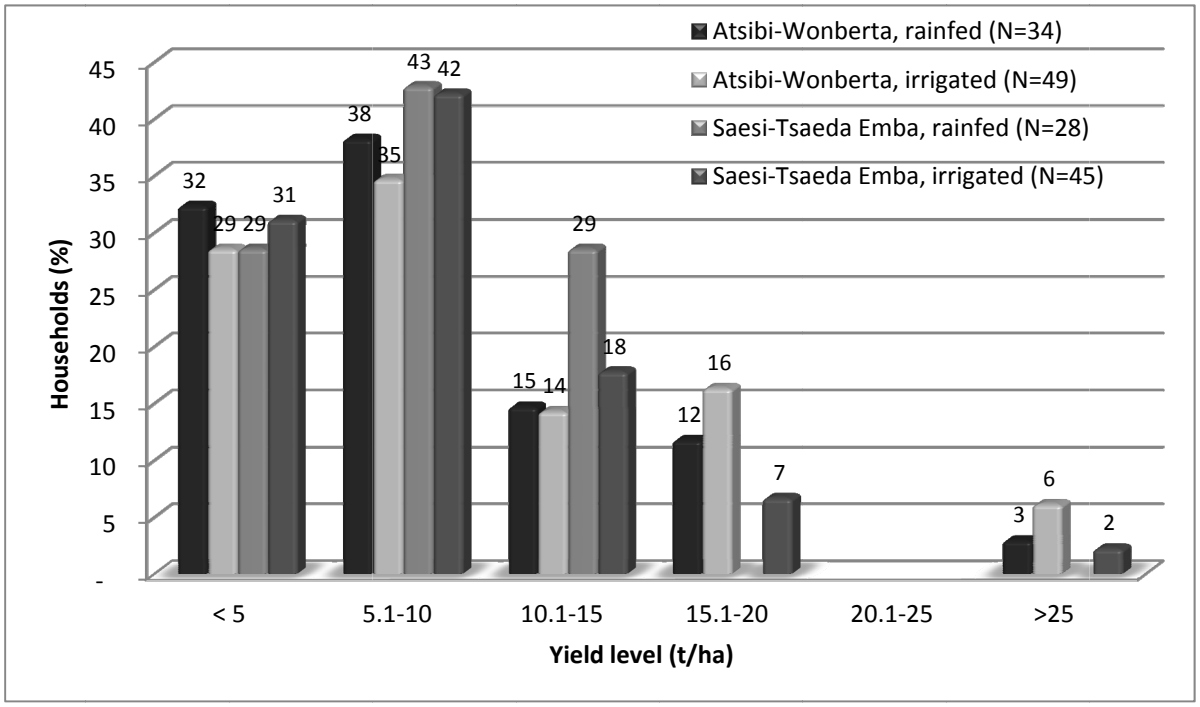
improving the variety and management of potato can increase the yield level for many farmers and improve the food security of their households.

Table 10: Average yield of Potato for the 2010/11 production year (t/ha)

Woreda	Production system	N	Minimum	Maximum	Mean	Std. Deviation
Atsibi-Wonberta	Rainfed	34	0.4	32.0	8.6	6.5
	Irrigated	49	0.1	32.0	9.7	7.8
Saesi-Tsaeda Emba	Rainfed	28	2.4	13.3	7.5	3.3
	Irrigated	45	0.4	40.0	8.4	6.5

Source: Computed from survey data

Figure 6: Proportion of households producing different levels of yield (%). Tigray (%)



Source: Computed from survey data

4.3.2 Potato production and utilization

Analysis of the potato production and utilization in the two woredas of Tigray shows that farmers produced an average of about 3.7t and 3.4t of ware potato in Atsibi-Wonberta and Saeesi-Tsaeda woredas respectively during 2010 production year (Table 11). The largest proportion of the produce was sold in both woredas. On average of 75% of ware potato produced was sold during the same year. This indicates that potato is mainly produced for market purposes with the aim to generate income which can be used to access other food items, meet social obligation or investment.

Potato also makes part of the diet of the households. In the project sites in Tigray, some 0.3t of the ware potato produced was consumed per household in 2010 production season which is about 9% of the production of the household. The producers also retained about 0.5t (14%) of potato for own seed.

Table 11: Potato production and utilization in Tigray

Woredas	Production (t)	Utilization (t)			Utilization (%)		
		Consumption	Seed	Sold	Consumption	Seed	Sold
Atsibi-Wonberta	3.7	0.3	0.5	2.8	9	14	77
Saesi-Tsaeda Emba	3.4	0.3	0.5	2.5	10	15	75

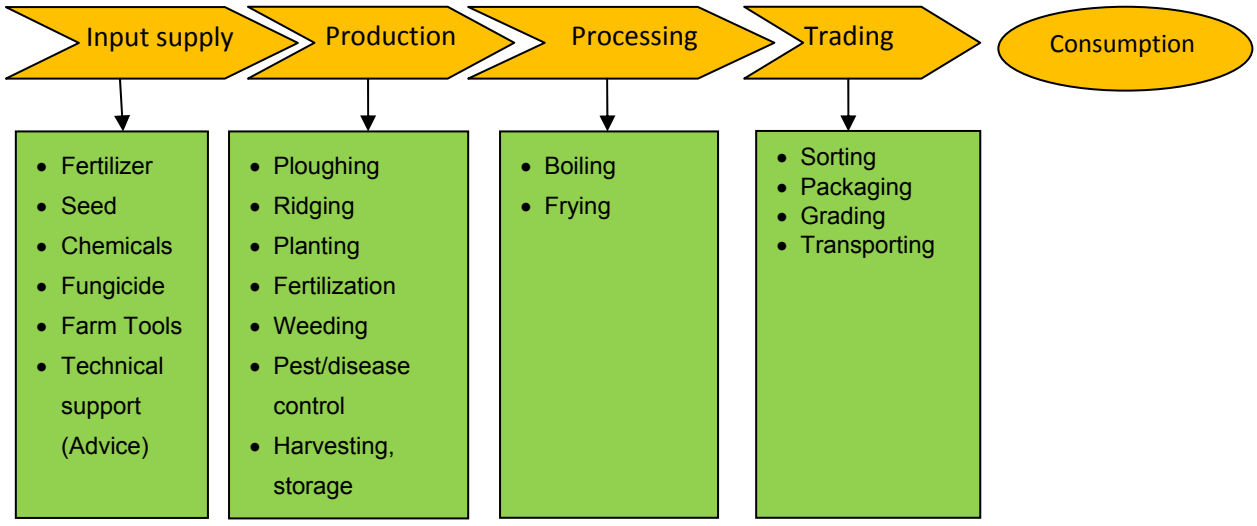
Source: Computed from survey data

4.4 Value Chain Actors and Functions in SNNPR

Value chain actors are classified as those individuals who take ownership of a product, through the exchange of money or equivalent goods or services, during the transaction process of moving the product from conception to the end user. Those individuals or firms providing a service without taking ownership of the product are classified as service providers. The primary actors in a potato value chain in both regions are seed and other input suppliers; farmers; traders; brokers; processors; retailers; and consumers. Each of these actors adds value in the process of changing product title.

The main processes of potato value chain include input supply, technical support (extension service), production, processing, trading, and consumption. The functions performed by the chain actors are depicted in Figure 7. The description of the value chain functions and actors is given in the subsequent sub-sections. Table 12 lists the major actors of value potato value chain in the study areas.

Figure 7: Processes and functions in potato value chain in SNNPR



Source: Own formulation based on the field survey

Table 12: Summary of potato value chain actors and functions

Potato Function	Actors performing the function
Input supply	• Cooperatives, unions, federations • Government institutions agriculture office (extension advise), research (seed), etc.; • Farmers, farmers groups • Private companies; NGOs
Production	• Smallholder farmers; farmers groups; cooperatives
Processors	• Street vendors • Supermarkets • Cafeteria
Grading	• Whole sellers; retailers; farmers • Collectors
Consumption	• Urban and rural residents • Universities; hospitals prisoners; military • Hotels; cafeterias; cafe

Source: Compiled from workshop discussion

4.4.1 Input suppliers

Potato farmers in the study areas, get seed from different sources. For instance, in Hulla and Shashemene woredas, the majority of the sample producers (54% and 48%, respectively), used their own seed (Table 13). Regarding fertilizers, some farmers used only organic fertilizer (manure and compost) while some farmers used both inorganic and organic fertilizers depending on the land size allocated to potato and the soil fertility status as perceived by the farmers. Potato growers obtained fertilizer from either cooperatives or private traders. Pesticides are supplied mostly by private vendors.

Table 13: Sources of potato seed in study areas (% of respondents)

Woreda	N	Own seed	Market, traders	MoA	Cooperatives
Hulla	41	54	32	5	10
Shashemene	28	48	44	4	4

Source: Computed from survey data

The intensity of fertilizer and input use is given in Table 12. Only 69% of the sample farmers responded that they applied fertilizer to potato field in Hulla woreda. The reason indicated for not using fertilizer were the use of organic fertilizer and high fertilizer price. In Hulla, the rate of fertilizer application by those users is also low (79 kg/ha). The rate of fertilizer and input use is higher in Shashemene area than it is in Hulla (Table 14).

Table 14: Proportion of framers and amount of fertilizer and seed used, Hulla and Shashemene

Woreda	N	Proportion of HH	Fertilizer		Seed	
			Average amount (kg/HH)	Rate (kg/ha)	Average amount (t/HH)	Rate (t/ha)
Hulla	41	69	22	79	0.4	2.0
Shashemene	28	100	75	167	0.7	1.8

Source: Computed from survey data

4.4.2 Potato producers

The next major potato value chain actors following input suppliers are potato growers. They are generally smallholder farmers having different land size. CSA's agricultural sample survey estimated the number of Ethiopian smallholder potato growing farmers at 1,386,670 in 2006/07 production year of whom 430,582 were in SNNPR. This implies that 31% of potato producers in 2006/07 were farmers in the SNNPR. There might be some increase since then but the general trend will not change much within just four years.

The descriptive statistics of land allocated to potato in Hulla and Shashemene woredas during 2010/11 production year is given in Table 15. Potato production in these two woredas was based on rainfed system and insignificant number of farmers indicated that they had used irrigation. As one moves to the rift valley area, the intensity of using irrigation for potato production increases. In Shashemene area, potato is produced at least twice using rainfall. Larger land size was allocated to potato in Shashemene woreda (0.5 ha) as compared to Hulla (0.2 ha).

Table 15: Descriptive statistics of land allocated to potato in the south, rainfed in 2010/11 (ha/HH)

Woreda	N	Minimum	Maximum	Mean	Std. Deviation
Hulla	41	0.1	0.5	0.2	0.2
Shashemene	28	0.1	1.8	0.5	0.4

Note: No irrigated potato during the year
Source: Computed from potato producers survey data

Potato growers are the major actors who perform most of the value chain functions right from farm inputs preparation on their farms or procurement of the inputs from other sources to post harvest handling and marketing. The major value chain functions that potato growers perform include ploughing, ridging, planting; fertilization, weeding, pest/disease control, harvesting and post harvest handling. The most difficult function according to the farmers is ridge making, since it is labour intensive.

Cropping system: Potato sole cropping is the most popularly practiced production system in both regions. More than 90% of producers reported that they practice sole cropping (Table 16). Farmers also occasionally intercrop potato with other crops like maize and beans.

Table 16: Potato cropping methods (% of respondents)

Woreda	N	Cropping method	
		Sole crop	Intercropped
Hulla	41	92	8
Shashemene	28	89	11

Source: Computed from producers survey data

Post harvest handling: Post harvest handling, which includes different activities like sorting, grading, packing, storing, transportation, loading and unloading, is done by the farmers themselves or traders or brokers. If potato is sold at the farm gate which is the case in Shashemene woreda, all aforementioned activities are performed by the buyer (traders or broker). After harvesting, potatoes are collected in sacks of various sizes ranging from 60 kg to 180 kg, a common measurement unit in Shashemene woreda. Most of the farmers use sacks and ground floor of their residential house as a potato store (Table 17). The majority of the farmers store potato in sacks in Hulla woreda, which is not very common in Shashemene.

Sorting and grading: The producers separate damaged and undamaged tubers. The bruised and damaged potato is consumed by the household. They select medium and large sized ware potatoes for immediate sale and keep small sized potatoes for seed. Using small size potato for seed is a common practice widely accepted by farmers in all the study areas.

Table 17: Proportion of potato producers using different stores in Hulla and Shashemene (%)

Type of store	Percentage of Respondents	
	Hulla (N=41)	Shashemene (N=28)
Sacks	42	12
In house floor	52	72
In the soil	6	4
Warehouse		12

Source: Computed from producers survey data

Transportation: In most of the potato growing areas, the producers transport their potato to the nearby markets be it rural or urban centers. However, in Shashemene area which is the hub of potato production in the country, traders go to the farmers' field and negotiate about price, purchase it and eventually transport the potato to urban markets. Traders prefer to buy on farm to get advantage of packing a lot of potato in large sacks but later sell it in smaller sacks.

Means of transportation varies among locations but predominately on pack animals (donkey). Sixty eight percent of farmers in Shashemene and 66% in Hulla transported potato to the market by donkeys while about 29% of the producers in Shashemene area used trucks (Table 18).

Table 18: Percent of producers using different means of transporting potation the south

Woreda	N	Means of transportation			
		Donkey	Horse	Truck	Cart
Hulla	41	66	29	6	-
Shashemene	28	68	-	29	4

Source: Computed from producers survey data

4.4.3 Traders/Brokers

Brokers play crucial role in potato marketing system of Ethiopia by facilitating potato transaction by linking producers with traders, a wholesaler with another wholesaler, and wholesalers with retailers. The role of brokers in potato selling at Shashemene woreda is high as indicated by 92% of the producers. However, only 7% of the producers in Shashemene area indicated that they sold potato through brokers (Table 19). In Hulla woreda, only 21% of the producers stated the interferences of brokers in potato marketing and none of them sold through brokers. The brokers sometimes go beyond facilitation of transaction and tend to control and fix prices, create price symmetry and make extra benefits from the process. The brokers in many parts of the country and here work in unregulated and informal way. They do not follow proper business conduct and as a result they constrain the marketing system more than they facilitate it.

Table 19: Proportion of farmers who sold ware potato through different channels in 2010/11 (%)

Actor	Hulla (N=41)	Shashemene (N=28)
Trader	85	86
Broker	-	7
Consumer	10	4
Processors	5	4
Coop	5	-

Source: Computed from producers survey data

4.4.4 Potato processing

Potato is commonly consumed in the form of boiled and cooked meals in different traditional dishes or 'wot'. Recently, consuming potato chips, crisps, and roasted potato are becoming common practices especially in cities like Addis Ababa, Hawassa, Adama, Mekele, etc. In urban areas it is also usually consumed mixed with other vegetables as salad.

Large scale potato processing is non-existent in Ethiopia. Few processors were interviewed during the survey although they could not tell about the volume of potato processed as the product is sold mixed with different products like vegetables. Hence, it is hardly possible to report on the volume of potato processed in the study areas. Those few processors interviewed said that they prefer large size potato for processing. Consistent with other research findings, *Jalene* variety is preferred for processing in Hawassa and Shashemene.

Supermarkets started to sell potato products like chips and crisps. In large cities like Addis Ababa, it is common to see hotels, restaurants and cafes prepare French Fries from

potatoes. Urban consumers when out for recreation go along French Fries for snacks. Street vendors also prepare French Fries and supply to consumers at dusk. What is limiting potato consumption in Ethiopia is that very little is known to make different dishes from potato. Household consumption is limited to using potato stew, boiled and sometimes fried potato. One of the major constraints to increased production that has not been addressed is "utilization" (Gebrenedhin et al., 2008).

4.4.5 Potato retailers

Retailers are key actors in potato value chain in Shashemene and Hawassa. They are the last link between producers and consumers. They mostly buy from wholesalers and sell to urban consumers. Sometimes they could also directly buy from the producers. Retailers not only sell potato but also trade other vegetables. Consumers usually buy the product from retailers as they offer according to requirement and purchasing power of the buyers. During the market visit, it was observed that retailers keep small amount of potato compared to tomato, onions and other vegetables.

Retailers were asked how long they have been in potato retailing business. The response shows that retailers in Hawassa have business experiences of range between 2 and 17 years. A retailer, on average, purchased 186 kg per week in Hawassa (Table 20). Potato retailing activities are effectively undertaken on average for 6 months while the remaining period is slack period with limited potato transaction.

Table 20: Quantity of potato handled by retailers and effective months of potato trading

Woreda	Variable	N	Minimum	Maximum	Mean	Std. Deviation
Hulla	Age of the retailer	11	18	35	26	6
	Year since potato retailing started	17	2	17	7	4
Shashemene	Potato purchased per market day (kg)	17	20	750	186	203
	Months of potato trading/year	17	1	12	4	3

Source: Computed from producers survey data

4.4.6 Potato consumers

About four types of potato consumers were identified: households, restaurants, cafés, and institutions which give services such as higher education institutions, hospitals, etc. (see Table 21). Overall the per capita potato consumption was 33 kg and 17 kg at peak (7 months) and slack (5 months) seasons respectively for all consumer types making the average annual per capita consumption about 50 kg. Peak season of potato consumption coincides with the harvest time and the slack season is when potato from local supply declines. Higher institutes provided higher demand for potato since the students cafeteria offers 500 kg per day for about 2,000 students during peak supply period and 300 kg during slack period. This implies that the per capita consumption at the university is 60 kg per person since there is regular budget allocated for the students service and potato provides alternative relish to meat.

Table 21: Potato consumption in Hawassa

Institution	Amount consumed per year (t per institution)	Amount (kg/capita)
Household	0.3	50
Restaurants	5.2	
Café	0.4	
College of Agriculture, Hawassa University	19.2	60

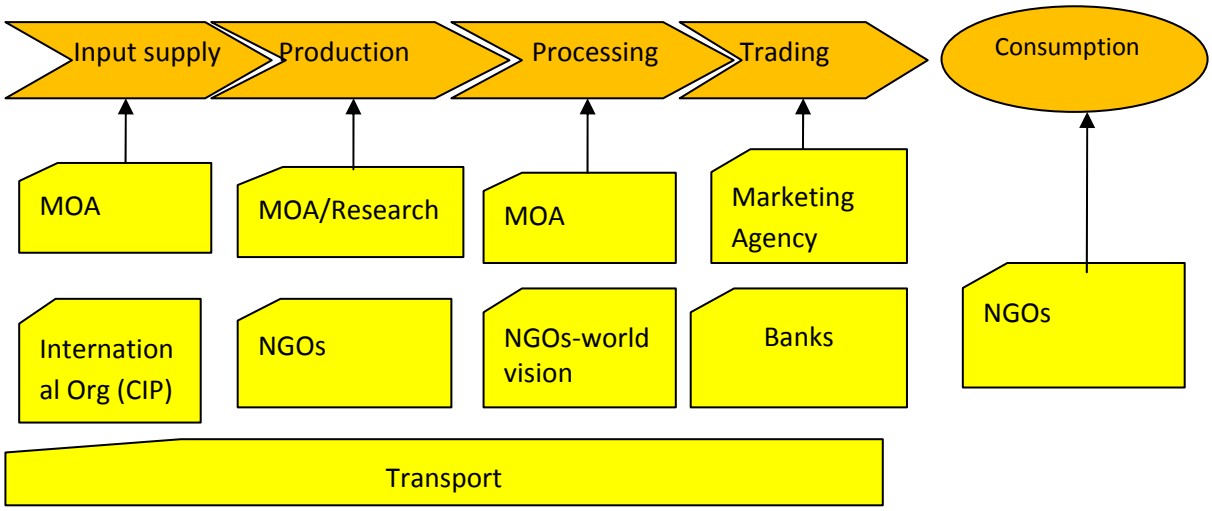
Source: computed from consumer survey

Consumers prefer big potato with smooth skin and free from damage. Restaurants, hotels and higher institutes prefer bigger potato size whereas households prefer medium size potato.

4.4.7 Potato support service providers

Support service providers are essential for value chain development and include sector-specific input and equipment providers, financial services, business management services, and market information access and dissemination, technology suppliers, advisory service, etc. The key support providers for potato in the SNNPR are pictorially depicted in Figure 8. Some service providers extend service beyond one function and others are limited to a specific function. For instance, agriculture offices provide service at input level, production and processing levels. whereas NGOs like the World vision participate in input supply. There is no organization involved in promoting the nutritional dimension of potato in the project sites (SNNPR).

Figure 8: Map of support service providers for potato



Agricultural development office provides agricultural extension services to farmers through development agents. The office provides advisory service, facilitate access to inputs and provide technical support in crop protection. One should note that the there is no specialized extension services for potato growers except that potato is considered as just one of the vegetables. Application of knowledge of general agriculture is not sufficient. The key informant's interview shows that the producers get extension service on general

agriculture and it is not sufficient to improve the technical skill of the farmers. As the experts who participated in training workshop confirmed, specific knowledge and skill in production management of potato is lacking and the agriculture experts apply what they learnt for horticulture or vegetables to potato.

In the SNNPR, “Better Potato for Better Life” is the only potato specific program providing input and innovation services to farmers. It focuses mainly on creating access to quality seed potato and technical support through capacity building. NGOs provide training service on potato production. Some traders get credit from banks if they can provide collateral. But this service is very much limited.

About 9 research centers and 1 university are involved in developing potato variety for wider adaptation, high yielding and resistant to biotic and abiotic stress. These are Holeta, Kulumsa, Jima, Bako, Hawassa, Adet, Sinana, Alamata, and Mekele from agricultural research centers and Haramaya University from higher institutions. In the project areas where this study was conducted, varieties released from Holeta have been introduced and being adopted. Reports also show that Holeta research center is prominent in improved potato variety development in Ethiopia. Of the 18 improved varieties of potato that have been released between 1987-2006, Holeta research center was involved in the release of 14 improved varieties while Haramaya University released the remaining balance. The other research centers popularize the varieties released by Holeta research center for wider adoption by the farmers in their vicinity.

4.4.8 Value chain governance

The dominant value chain actors play facilitation role. They determine the flow of commodities and level of prices. In effect they govern the value chain and most other chain actors subscribe to the rules set in the marketing process. The assessment made indicates that the wholesalers assisted by the brokers are the key value chain governors. They have sufficient information about the supply of potato and which direction it flows along the marketing channels and markets in different parts of the country. They also set prices.

The wholesalers in different markets are well networked but informally. For instance, a potato wholesaler in Shashemene networks (via telephone communication) with wholesaler in Mekele, Dire Dawa, Harar, Addis Ababa, etc. These traders exchange information on potato prices, local supply situation and the prospects of harvest in their area. Then, they agree on the price at which the buyer is willing to take the price so that the seller determines the farmers’ price taking into account his profit margins. Except this networking and business relation, there is no formal collateral when the transaction takes place. Money is transferred through banks and often the wholesalers in the different markets had never personally met. List of some potato wholesalers in Shashemene and Mekele is given in Annex 6.

The smallholder farmers are not organized and are not governing the value chain. Hence, they are price takers and hardly negotiate the price due to fear of post harvest loss, in case the product is not sold. The value chain governance is similar both in the SNNPR and Tigray. The major source of market information is the neighbours who sold potato during

the previous market days. Recently the use of cell phone in the rural areas is increasing. It is a rare phenomenon for the farmers to receive potato market price through mass media.

4.5 Value Chain Actors and Functions in Tigray

The major actors of potato value chain in Tigray are similar to that of the SNNPR as summaries in Table 11 and discussed below.

4.5.1 Input suppliers

Similar to farmers in the SNNPR, the farmers in Tigray region access seed potato from different sources. In Saesi-Tseada Emba woreda the majority of the farmers (76%) purchased the seed from traders/market while farmer in Atsibi-Wonberta woreda access seed potato from more diverse sources (Table 22).

Table 22: Sources of potato seed in study areas (% of respondents)

Woreda	Own	Market, traders	MoA	Cooperatives	Other farmers,	NGO, project, CIP	Research
Atsibi-Wonberta	26	7	28	7	7	11	17
Saesi-Tsaeda Emba	27	76	7	2	-	-	-

Source: Computed from survey data

The source of fertilizer as well as the situation of utilizing organic fertilizer (manure and compost) is similar to that of the SNNPR. Potato growers obtain fertilizer from either cooperatives or private traders. Pesticides are supplied mostly by private vendors as well as through the agriculture office.

The intensity of fertilizer and input use is given in Table 23. The results show that in both project woredas, the rate of fertilizer application averages at 169 kg/ha at Atsibi-Wonberta woreda and 178 kg/ha at Saesi-Tsaeda Emba. It was also indicated that about 10% of the potato growers did not report the use of fertilizer. The potato planting rate also averages at 2.3 t/ha and 2 t/ha at the respective woreda.

Table 23: Proportion of framers and amount of fertilizer and seed used, Tigray

Woreda	Proportion of HH	Fertilizer		Seed	
		Average amount (kg/HH)	Rate (kg/ha)	Average amount (t/HH)	Rate (t/ha)
Atsibi-Wonberta	100	44	169	0.7	2.3
Saesi-Tsaeda Emba	90	32	178	0.4	2.0

Source: Computed from survey data

4.5.2 Potato producers

In Tigray potato is produced by smallholder farmers. According to CSA data, there were 37,361 potato farmers in Tigray during 2006/07 production year, which is 3% of the national potato growers. The survey result shows that farmers produce potato using rainfed and irrigated systems. An average of 0.3 ha of land is allocated per HH in Atsibi-Wonberta

woreda and 0.2 ha in Saesi-Tsaeda Emba (Table 24). There is also variation among the households in terms of land allocated for potato production.

Table 24: Land allocated to potato production (ha) in Tigray in 2010/11

Woreda	Farming system	Minimum	Maximum	Mean	Std. Deviation
Atsibi-Wonberta	Rainfed	0.1	0.4	0.2	0.1
	Irrigation	0.1	1.2	0.5	0.9
	Total	**0.1**	**1.2**	**0.3**	**0.5**
Saesi-Tsaeda Emba	Rainfed	0.1	1.0	0.2	0.2
	Irrigation	0.1	0.4	0.2	0.1
	Total	**0.1**	**1.00**	**0.2**	**0.1**

Source: Computed from potato producers survey data

Potato is produced mainly as a sole crop and intercropping is done by only few farmers (Table 25). Relatively larger proportions (about 7%) of the farmers in Saesi-Tsaeda Emba woreda intercrop potato with other crops than their counterparts in Atsibi-Wonberta woreda. Farmers also grow potato intercropped with other crops like maize and beans occasionally.

Table 25: Potato cropping methods (% of respondents)

Woreda	Cropping method	
	Sole crop	Intercropped
Atsibi-Wonberta	98	2
Saesi-Tsaeda Emba	93	7

Source: Computed from producers survey data

Sorting and grading: Similar to the situation in the SNNPR and Shashemene, farmers select relatively bigger size potato and sell it as ware potato. Damaged and small sized potato is used for consumption and seed. Though there is some degree of price differentiation based on potato quality, prices are set arbitrarily and enhance discouraging farmers from sorting potato.

Potato is stored under different conditions. A more diverse storage option is available at Atsibi-Wonberta woreda and especially 15% of the sample respondents stated that they use warehouse for potato storage which is provided through projects. The largest proportion of farmers in Saesi-Tsaeda Emba woreda stores potato in sacks, which a traditional way of storing potato. Some 28% of the farmers in this woreda store potato in the soil i.e. delay the harvesting with the expectation of price rise (Table 26).

Table 26: Proportion of farmers using different types of stores (%)

Type of store	Percentage of Respondents	
	Atsibi-Wonberta	Saesi-Tsaeda Emba
Sacks	33	56
In house floor	36	16
In the soil	15	28
Warehouse	15	

Source: Computed from producers survey data

Transportation: Means of transporting potato is predominantly done by pack animal and truck in both study woredas in Tigray (Table 27). In Atsibi-Wonberta, 5% of the respondents reported that they transport potato by humans.

Table 27: Transportation means to take potato to market

Woreda	Percentage of respondent		
	Donkey	Truck	Human
Atsibi-Wonberta	80	15	5
Saesi-Tsaeda Emba	62	38	

Source: Computed from producers survey data

4.5.3 Traders/Brokers

In both Atsibi-Wonberta and Saesi-Tseada Emba woredas, the majority of the producers directly sold potato to traders (Table 28). The second larger group of farmers sold the product directly to consumers while 4% sold the produce to cooperatives and CIP (as it facilitates the finance for purchase of the seed by other needy farmers). From this, it is possible to understand that at producers level, the distinction between seed and ware potato is low confirming with the traditional definition of defining the seed potato as small sized potato.

Table 28: Proportion of producers who sold potato to different buyers (%)

Woreda	Trader	Broker	Consumer	Processors	Cooperatives	CIP
Atsibi-Wonberta	56	2	31	4	4	4
Saesi-Tsaeda Emba	91	7	26			

4.5.4 Potato processing

Small scale processors who make chips in Mekele buy potato from retailers or the producers, process it and sell it. The major processors are the cafés and restaurants, processing potato sold together with other food items. Large scale processing of potato does not exist.

4.5.5 Potato retailers

Retailers buy potato from the producers or from wholesalers to sell the product in smaller quantities to the consumers. They have business experience ranging from 1 to 11 years with an average of 4 years. The retailers practice potato trading for an average of 9 months per year though they also trade other vegetables to increase their business portfolio (Table 29). On average, the retailers market about 0.4 t per market day.

Table 29: Quantity of potato handled by retailers and effective months of potato trading

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Age of the retailer	25	18	50	31	9
Year since potato retailing started	25	1	11	4	3
Potato purchase per market day (kg)	28	8	5000	389	991
Months of potato trading/year	25	2	12	9	3

Source: Computed from retailers' survey data

4.5.6 Potato consumers

Households and institutions are the ultimate consumers of potato. The per capita potato consumption was 24 kg per person per year with higher consumption rate during the peak potato supply period and during fasting period. The consumption rate of the institutions purchasing and using potato and the type of potato they prefer is given in Table 30.

Table 30: Potato consumption in Mekele (Amount per year)

Institution	Amount consumed per year (t per institution)	Consumption per capita (kg)	Potato preference
Café	3.1		Medium size, circular, clean and bright color
Restaurants	3.4		Big size yellowish color
Household	0.1	50	Medium size, circular, bright color
Hotel	4.8		Yellowish color and big size
Mekele University	4,00	29	

Source: Survey (2011)

4.5.7 Potato support service providers

The key support providers for potato in the study areas are pictorially depicted in Figure 8 since there is no structural difference between Tigray and SNNPR in this case. The major difference with the support structure of the SNNPR is a more concrete work on the nutritional aspect of potato by an NGO called Mums for Mums. In Tigray region, Mums for Mums is promoting consumption of potato by educating the farmers how to prepare various kinds of dishes/recipes from potato. This NGO has produced a manual on how to prepare various kinds of products from potato and how it can be prepared using local materials, according to the representative from the NGO at the workshop. This kind of initiatives should be encouraged in the future as it helps in diversifying potato markets and thereby create sustainable demand for potato.

Agricultural development office provides agricultural extension services to farmers through development agents. The key informant's interview shows that the producers get extension service on general agriculture and even technical to increase farmers production skill. Extension services, for example focus on compost making or land preparation. But the DAs themselves lack knowledge or skill regarding the fertilizer requirement and time of

application of these inputs to potato. As the experts who participated in training workshop confirmed, specific knowledge and skill in production management of potato is lacking and the agriculture experts apply what they learnt for horticulture or vegetables to potato. In a similar approach some vegetable warehouses constructed by the Bureau of Agriculture in Tigray were found not suitable for potato due to its position relative to sun rise and design, though the major product in the area is potato. The farmers generally feel that there is no better extension advice given to them from the extension service. It appears that innovative ideas such as staggering the production system to catch up with the peak market demand for potato, investment in potato storage to enable farmers sell their produces when the price is relatively high, product quality improvement through sorting and grading, etc. are missing.

The marketing agency along with the Cooperative Agency also supports potato marketing. Together with the cooperative office, the agency works on market linkage but all of them focus on cooperatives and little or no attention for individual farmers. CIP is the only NGO that provides potato specific services to farmers. It focuses mainly on quality seed potato supply.

4.6 Value Chain Analysis in SNNPR and Shashemene

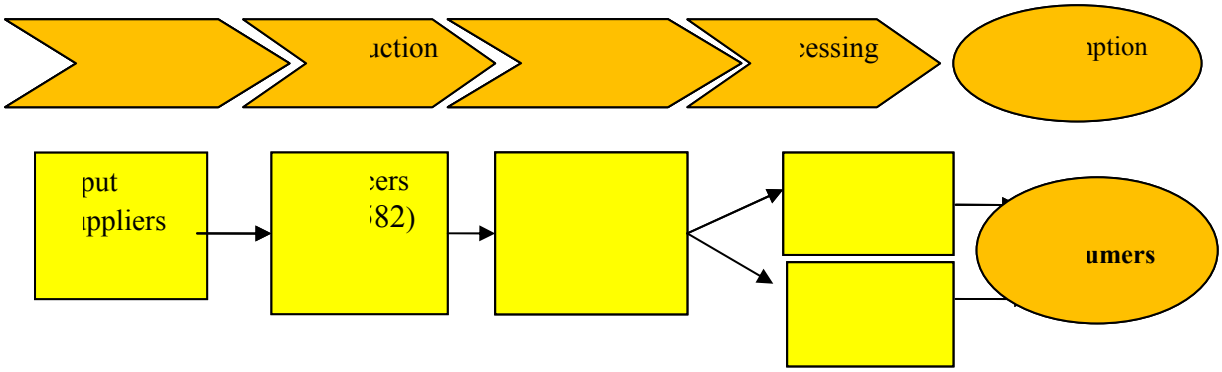
One of the dimensions of a value chain study is its flow, which is also called its input-output structure. In this sense, a chain is a set of products and services linked together in a sequence of value-adding economic activities. In other words, a value chain is a series of participants along the entire marketing spectrum who collaborate to satisfy market demands for specific products or services for their joint and collective mutual benefit.

The key objective of value chain analysis is to find the most pressing bottlenecks first and address them in a systemic manner. These bottlenecks can be either issues related to functions, actors, linkages among them or even external factors such as policy and infrastructure. In addition, the isolation of the value added by each link in the chain can give useful clues to the areas where remedies are most needed, and where the most benefit is likely to follow from further focus of resources directed to improvement.

4.6.1 Value chain map

Value chain mapping means drawing a visual representation of the chain, which involves various linkages among the potato growers, inputs and logistical service providers, transporters, middlemen and traders. The value chain map depicts the flow of potato in the market, activities carried out at each stage of the value chain, the structure of actors and the support involved in the value adding process. Figure 9 shows the potato value chain map in the SNNPR. The figure in parenthesis indicates approximate number of actors under the specified function. CSA's sample agricultural survey estimated farmers that grow potato at 430,582 in SNNPR. The number of traders were estimated based on some of the evidences the workshop participates had. It was, however, difficult to get data on the number of input suppliers, processors and retailers.

Figure 9: Potato value chain in SNNPR

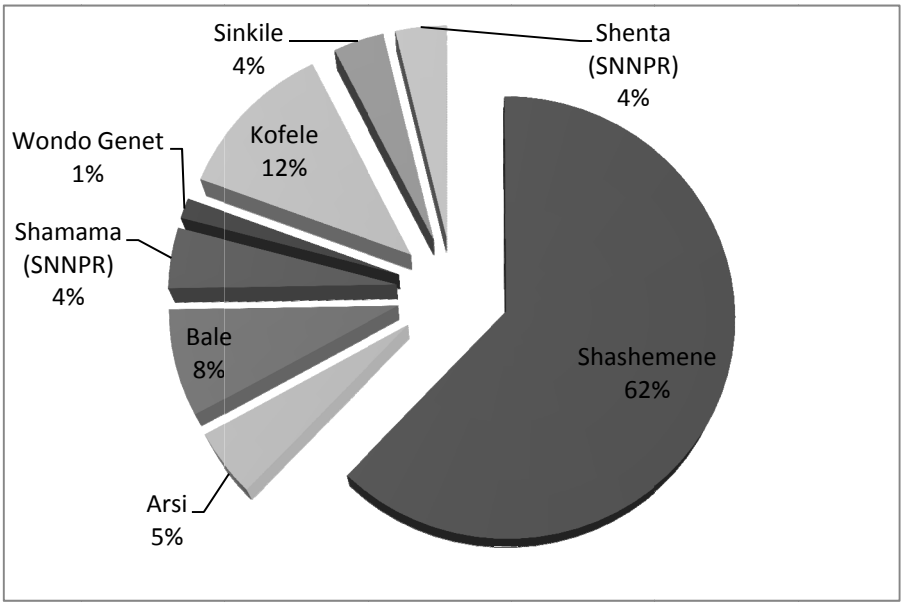


4.6.2 Marketing analysis

Quantity of potato marketed

As discussed above, Shashemene is the largest potato marketing center in the southern Ethiopia. Based on the discussions made with the wholesalers, an estimated 19,417 t of potato is marketed in Shashemene per year. The largest proportion of the product (62%) is supplied from around Shashemene while the SNNPR supplies about 12% of the total supply where Shamama, Shenta and Sikile supply equal proportion to the Shashemene market. The remaining balance comes from different areas in Oromia including Kofele (12%), Bale (8%) and Arsi (5%) (Figure 10)

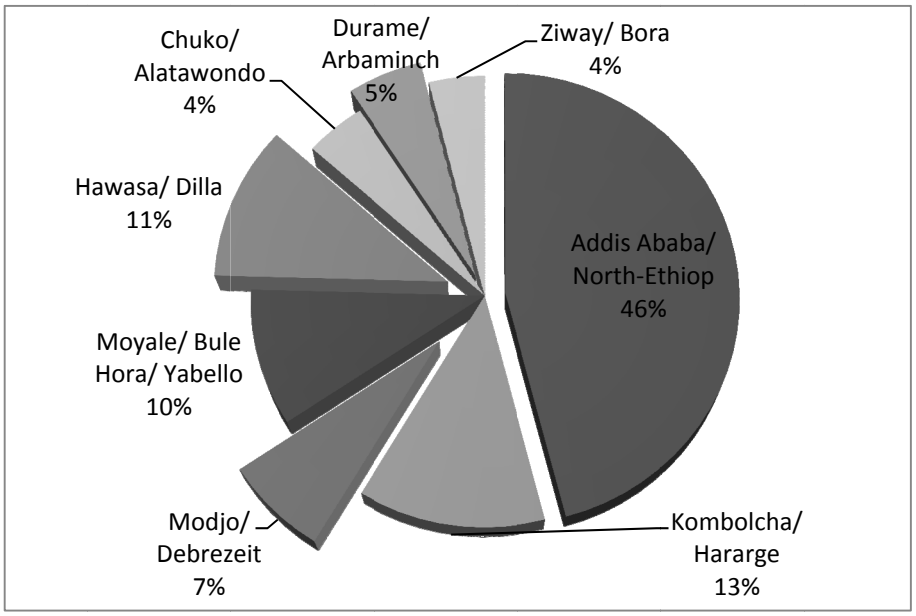
Figure 10: Source of potato supplied to Shashemene market (%)



The potato purchased in Shashemene is only partly consumed locally and largely transported to other towns. It goes to south as far as Moyale, to the west to Arba Minch, to the east to Hararghe where it can be exported to Djibouti via Dire Dawa and to Somale land via Kombolcha market. The largest proportion of potato (46%) is also transported to Addis

Ababa and part of this quantity is transferred to northern Ethiopia reaching Mekele and beyond. The destination of potato marketed in Shashemene is given in Figure 11.

Figure 11: Destination of potato supplied from Shashemene market (% of 19,417 t)

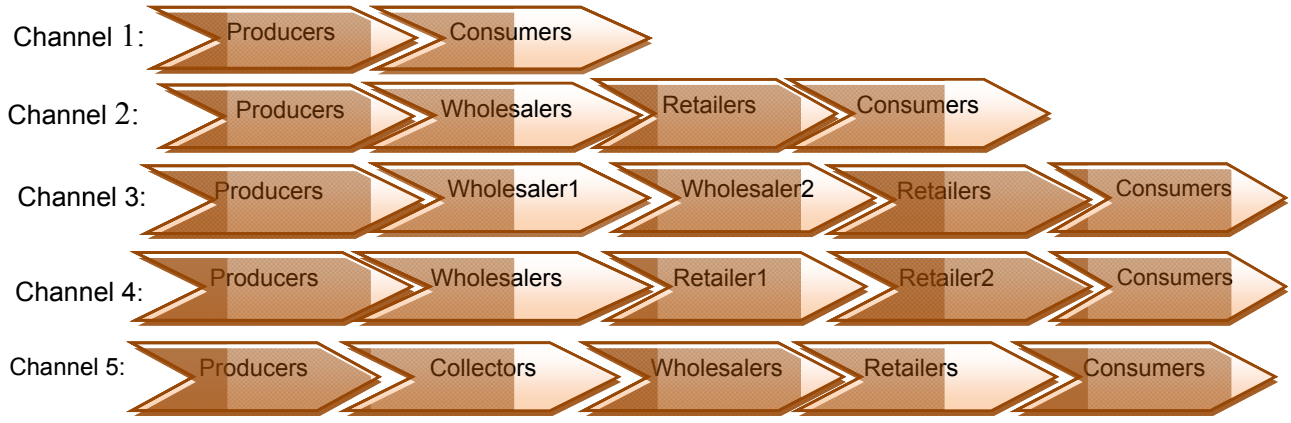


Source: Data collected by interviewing wholesalers in Shashemene market

Potato market channels

Marketing channels refer to the routes taken by products from producers to consumers. Potato passes through various channels until it reaches the final consumers. Some five channels have been identified for ware potato in the potato value chain study. The shortest channel occurs when producers directly sell it to the consumers (channel 1). This occurs when the farmer brings small quantity of the product to market and when the farm is closer to urban centers like it is in Shashemene areas. The most common type of potato market channel is channel 2 where the farmers sell it to wholesalers and wholesalers in turn sell it to retailers and the retailers to final consumers.

Figure 12: Marketing channels for ware potato in the south



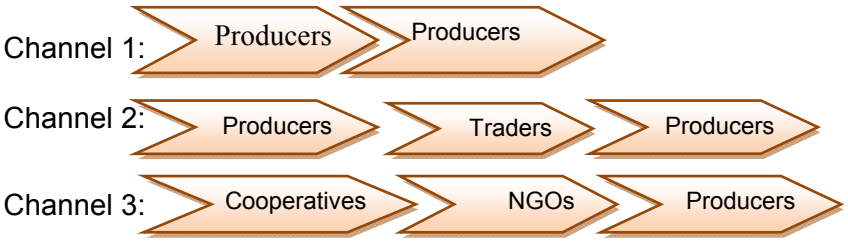
Channels 3 and 4 are very much prevalent in Shashemene and Hawassa markets. In the case of channel 4, farmers sell potato to wholesalers and the wholesalers transport it to the

urban area where the potato is temporarily stored and sold to retailers. In the case of channel 4, the second retailers in the channel are Kiosk owners in urban areas who keep small amount of potato along side with other goods and sell to consumers who do not want to regularly travel to vegetable market to buy small amount of potato.

Channel 5 is similar to channel 3 except that the collectors sell the product to wholesalers on farm after adding some margin on the price they paid to the farmers. This channel is common in Shashemene area. These farm level collectors make advantage of non-standard sack/bag size where they buy in large sack size weighing above 150 kg and sell it to traders in smaller sacks that weigh 100 kg or less. Use of non-standard containers negatively affects the producers by reducing their income.

For seed potato three main channels were identified (Figure 13). The shortest channel is farmer to farmer seed potato transaction. Traders also buy seed potato from farmers and then sell it to other producers. In both regions, the role of traders is significant in terms of collecting seed from producers and selling it to the needy farmers. In Tigray, for example, wholesalers purchase seed potato from Shashemene and sell to the Tigray farmers.

Figure 13: Seed potato marketing channel in the south



Traders are the major buyers of ware potato in both Hulla and Shashemene woredas (Table 31). Moreover, only few producers sold potato to the consumers, which actually happen when the volume of potato supplied to the market is small.

Table 31: Proportion of farmers who sold ware potato to different actors (%)

Actors	Hulla (N=41)	Shashemene (N=28)
Trader	92.1	88.9
Broker	5.3	7.4
Consumer		3.7
Cooperative	2.6	

Source: Own survey (2011)

The survey result shows that 41% of the retailers purchased potato from the producers while 29% of them purchased from the wholesalers. Another 29% of the retailers purchase potato from the middlemen such as brokers. It also shows that the wholesalers sell most of the potato they trade to other wholesalers who transport the product to other regions or markets in the same region.

4.6.3 Economic analysis of potato value chain

Potato price analysis

Prices of agricultural products have peculiar nature where the prices drastically drop at harvest time and increase substantially during planting time. For potato the price variability between harvest and planting is very high due to perishability of the product. The potato price fluctuation is very high in the southern region. During 2010, the ware potato price at which the traders sell ranged from Birr 1,500 per ton at the peak harvest time to Birr 6,000 per ton during the slack season. The survey result shows that the farmers' price ranged from Birr 800 per ton to Birr 6000 per ton in Hulla with an average of Birr 3,171 per ton. The price is further lower at Shashemene, with an average of Birr 2068 per ton (Table 32). The price of seed potato is higher by about 20%-50% of the average ware potato price due to late harvest of the potato seed, which means that the quantity of potato supplied to the market started to decrease and the price increases

Table 32: Average producer price (Birr/t) by location in 2010/11

Woreda	N	Minimum	Maximum	Mean	Std. Deviation
Hulla	38	1,000	6,000	3,171	1,799
Shashemene	33	1,000	3,700	2,068	1,003

Source: Computed from producers' survey

Cost of potato production

The average potato production cost was estimated at Birr 8,750 per ha at Hulla and Birr 10,000 per ha at Shashemene. This means that the production cost was about Birr 1000 per t. The largest input cost is the seed and it appears that the producers in the south have access to relatively cheap potato seed as compared to their counterparts in Tigray. Table 33 shows the cost per ha and ton of production based on survey data.

Table 33: Cost of potato production in study areas (2010/11)

Woreda	N	Cost of inputs (Birr/ha)	Unit cost of production (Birr/t)
Hulla	41	8,750	1,094
Shashemene	24	10,000	1,020

Distribution of value addition

Each of the potato value chain actor adds value to the product as the product passes from one actor to another. In a way, the actors change the form of the product through processing or improve the grade through sorting, cleaning or washing or create space and time utility. The distribution of value addition among the potato value chain actors in Hulla woreda is depicted in Table 34.

Value addition is the difference in sales price and cost of inputs (raw materials) at each stage of the value chain. Potato producers in Hulla woreda added 24% of the total value of ware potato in the woreda. Retailers are responsible for 59% of the value while wholesalers add about 17%. The price change from producer's price and consumer price is 182%,

which is high but not as high as in other countries such as Kenya, where the price differential between producers and consumers is as high as 300% (Muthoni and Nyamongo, 2009). The highest profit is earned by the retailers due to small operational cost. The scale of operation of the retailers is also small. On the other hand, the wholesalers make small profit margin per unit of potato handled but their operational scale is high making them the dominant value chain actors. It is also good to note that traders and retailers are not as genuine as producers in information provision. Traders/retailers understate price and profit as they associate the information with tax.

Table 34: Distribution of value addition among major chain actors at Hulla

Value chain:	Producer	Wholesaler	Retailer	Consumer
Sales price (Birr/kg)	2.2	3.2	6.25	
Cost of raw material	1.10	2.42	3.52	
Gross Value added	1.10	0.78	2.73	
% of total value added*	23.86	16.92	59.22	

* Total value added= Birr 4.61 per kg

The potato producers in Shashemene woreda reported lower price of Birr 1.5 per kg by adding a value of Birr 0.5 per kg which is 21% of the total value added in the woreda. Wholesalers add the least (15%) and the retailers add Birr 1.5 per kg which is about 64% of the total value added (Table 35). The price differential between what consumers pay and what farmers receive in Shashemene is 267%, which is the highest in all the studied areas.

Table 35: Distribution of value addition among major chain actors at Shashemene

Value chain:	Producer	Wholesaler	Retailer	Consumer
Sales price (Birr/kg)	1.50	2.00	3.70	
Cost of raw material	1.00	1.65	2.20	
Gross Value added	0.50	0.35	1.50	
% of total value added*	21.28	14.89	63.83	

* Total value added= Birr 2.35 per kg

4.6.4 Factors of competitiveness in potato value chain

The major factors of competitiveness in agricultural and agro-industrial products are fertility of land, planting materials, know-how, productive plantation, harvesting technology, packaging, fertilizer utilization, farm devices, quality control, cleaning and grading, branding, safe transport, and retail marketing. How, these factors apply to and affect development of potato value chain is briefly discussed as follows.

Fertility of land: In Aleta wondo area the soil is very suitable for potato production as reported by the farmers. The soil in Shashemene area is very fertile (sandy-loam type) which farmers stressed that moisture retention capacity of the soil in the area made is ideal for potato production. In addition, farmers also practice fallowing land and crop rotation to maintain soil fertility.

Planting materials: Seed is the most important factor that affects potato yield. In the workshop as well as from producers' survey results, it has been pinpointed that supply of improved potato varieties was inadequate. Thus, the supply of adequate good quality potato is determinant for improving potato supply to the market.

Know-how: Through practices, the farmers gained good know how of potato production. Farmers' know how agronomic management is improving over time due to the project: Better Potato for Better Life. The participants of the workshop indicated the improvement in crop management in the project areas compared to the non project areas. Farmers have modest knowledge on crop rotation though there is variability from location to location. Farmers have know-how on use of Ridomil to prevent potato late blight as reported during workshop held in Hawasa. Other important know-how missing among potato growers is fungicide and pesticide application on potato implying a poor extension service.

Harvesting technology: Harvesting technology farmers use greatly matters to increase benefit generated from potato production. Farmers use traditional tools (sharp spades, hoe, sometimes pull the potato with hand to harvest), to harvest potato and as a result a lot of loss occurs. The loss at harvest is estimated at 20% in Alata Wondo Area. To protect quick wilting, farmers cover the harvested potato with leaves which is a good practice.

Fertilizer utilization: Project farmers applied 0.079 t/ha in Hulla, which much less than the recommended rate and 0.167 t/ha in Shashemene area. The participants of the focus group discussion stated that the non-project farmers apply fertilizer far below recommended rate in SNNPR. In Shashemene area, some farmers have good culture of applying organic fertilizer (compost and manure) to their farm.

Farm advice: No special farm advice tailored to potato production has been given in the study areas**.** DAs give extension service to farmers along side with other crops and their knowledge is also limited.

Quality control: Quality of potato is mostly known through physical observations. Quality parameters used by consumers to select potato for consumption are size, color and no damage on potato tuber. There has been no potato quality control mechanism in the country be it seed production, ware potato transportation, and potato packaging.

Cleaning and grading: Washing off-soils from potato, sorting potato according to size and damage on pulp are some of the cleaning and grading practices done by farmers in Aleta Wondo area. In marketing, potato traders grade ware potato and classify it into three main grades. Big size (flush) potato is classified as 1st grade, medium size is 2nd grade and small size and some bruises potatoes are classified as the third grade. Price varies according to such grades in the market. The price of seed potato depends on the variety and the season. *Jalene* is attracts the highest price among the seed potatoes and the price can is higher than the aware potato by 20-50%.

Branding: No modern branding practices have been observed in all the study areas. Farmers use production area as branding to express quality differences. In Aleta Wondo area Durame Potato is quoted as best type. Other prominent potato variety Jalene which

means *we liked it*. Shashemene potato is prominent brand especially for seed in Tigray region. In the future, branding system that is based on location which is currently used for coffee grading should be adopted for potato as well to increase the competitiveness of the product.

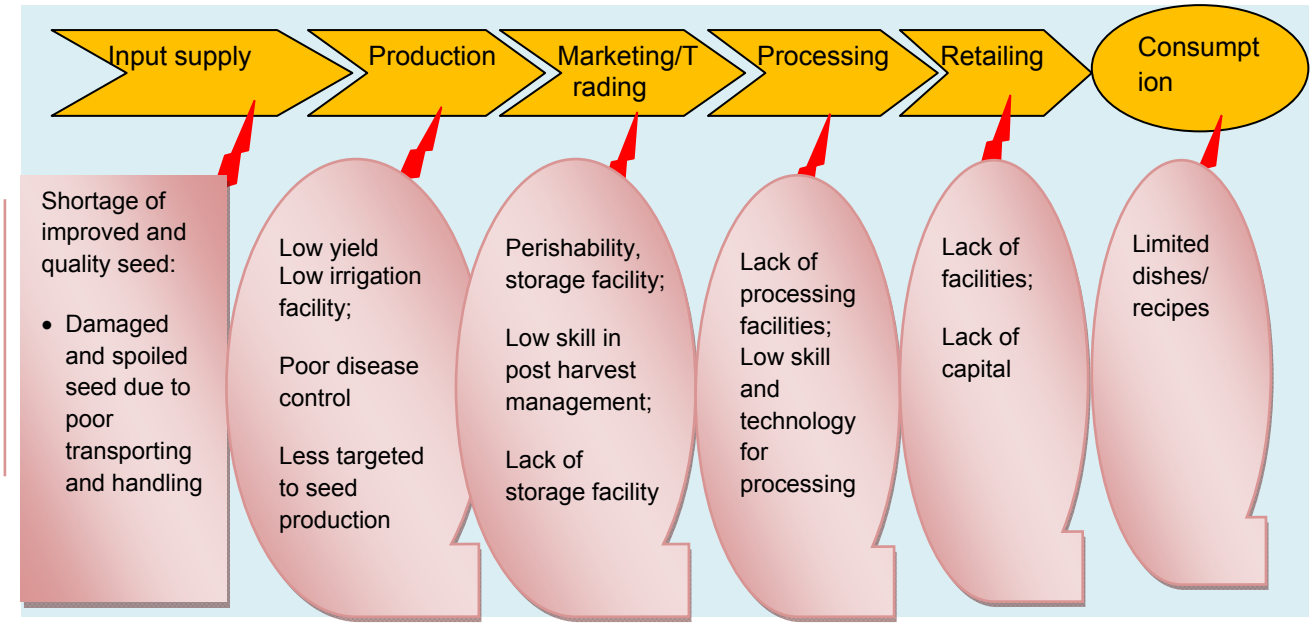
Packaging: Potato packaging in modern business context is non-existent in all the study areas. However, chain actors use sacks, plastic materials, baskets to transport potato from production to consumption center.

Safe transport: Poor transportation which leads to a lot of loss prevails in all the study areas. Some transporters load potato on floor of trucks and transport it a long distance which results in unpeeling of potato skin. One factor that greatly affects the competitiveness of potato value chain is lack of safe transportation means and equipments.

4.6.5 Constraints in potato value chain

One of the merits of value chain approaches is that it helps to clearly identify bottlenecks to the development of the chain right from input supply up until the consumption level in vivid way. Figure 14 summarizes the constraints identified in this study which is common for both regions.

Figure 14: Core constraints in potato value chain



Marketing problems indicated by farmers include high seed potato price, brokers interference in the market and traders suppressing of potato price differences (Table 36).

Table 36: Proportion of farmers indicating marketing problems in the south (% of respondents)

Marketing problems	Hulla (N=41)	Shashemene (N=28)
Low price of ware potato	66.7	79.2
High seed potato price	5.6	8.3
Price fluctuation	11.1	4.2
Brokers interference		8.3
Trader give same price	11.1	
No market	5.6	

Source: Computed from producer survey data

The proportion of respondents indicating problems related to potato transportation is given in Table 37. Though there is slight variation among location, high transportation cost has been cited as the main problem of potato transporting. Poor road access to production areas, shortage of truck and perishability are key problems of potato transportation.

Table 37: Potato transportation problems proportion of farmers citing the problem (% of respondents)

Woreda	High transport cost	Poor road	Shortage of truck to transport	Perishability
Hulla	69	15	8	8
Shashemene	57	21	21	

Source: computed from producer survey data

One of the major problems in potato production in Ethiopia is post harvest loss. In some studies, post-harvest loss of 30-50% of the produce was reported (Endale et al. 2008b). That may be the reason why about 83% in Hulla and 53 % in Shashemene raised shortage of warehouse to store ware potato as the major post harvest problem (Table 38). Potato pest, perishability, lack of market outlet and lack of access road are other problems reported by farmers related to potato post harvest.

Table 38: Major problems related to potato post harvesting (% of respondents)

Harvest problems	Hulla (N=41)	Shashemene (N=28)
Shortage of warehouse	83	53
Potato pest	13	47
Perishability	4	

Source: computed from producer survey data

Seed problems have been manifested in different forms: inadequate supply; poor quality or mixed; untimely supply and delay in supply. Some varieties are susceptible to disease and pests (potato late blight). Supply of improved *Jalene* variety had been good for some time

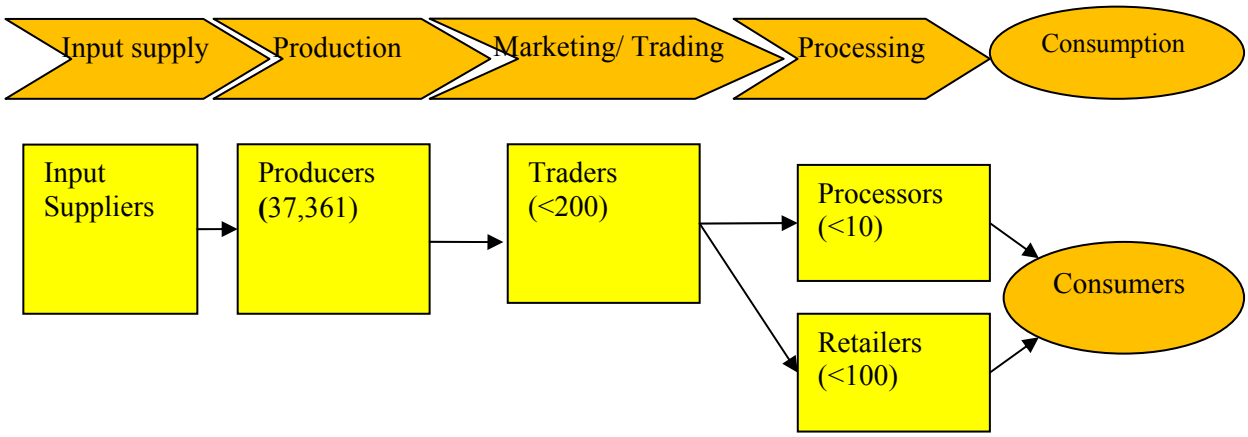
but now the variety is mixed with other poor quality seed potato as reported by some farmers in Aleta Wondo area. “Agazi” potato variety which has circular shape as described by consumers is highly preferred but unavailable in the market. This indicates that consumers demands are not communicated back to farmers through research and extension system. While Shashemene is the major supply source of potato seed for the farmers located at more than 100km radius, the area received little attention in terms of research and development support.

4.7 Value Chain Analysis in Tigray

4.7.1 Value chain map

Figure 15 shows the potato value chain map Tigray. The figure in parenthesis indicates approximate number of actors under the specified function. According to CSA’s sample agricultural survey estimate, about 37,361 farmers in Tigray produce potato (Figure 15). Approximately 200 traders have license in vegetables marketing including potato. There are very few potato processors although several restaurants and cafes use potato chips and food which includes potato as a component. The contact address of prominent potato wholesalers is given in Annex 6.

Figure 15: Potato Value Chain in Tigray Region

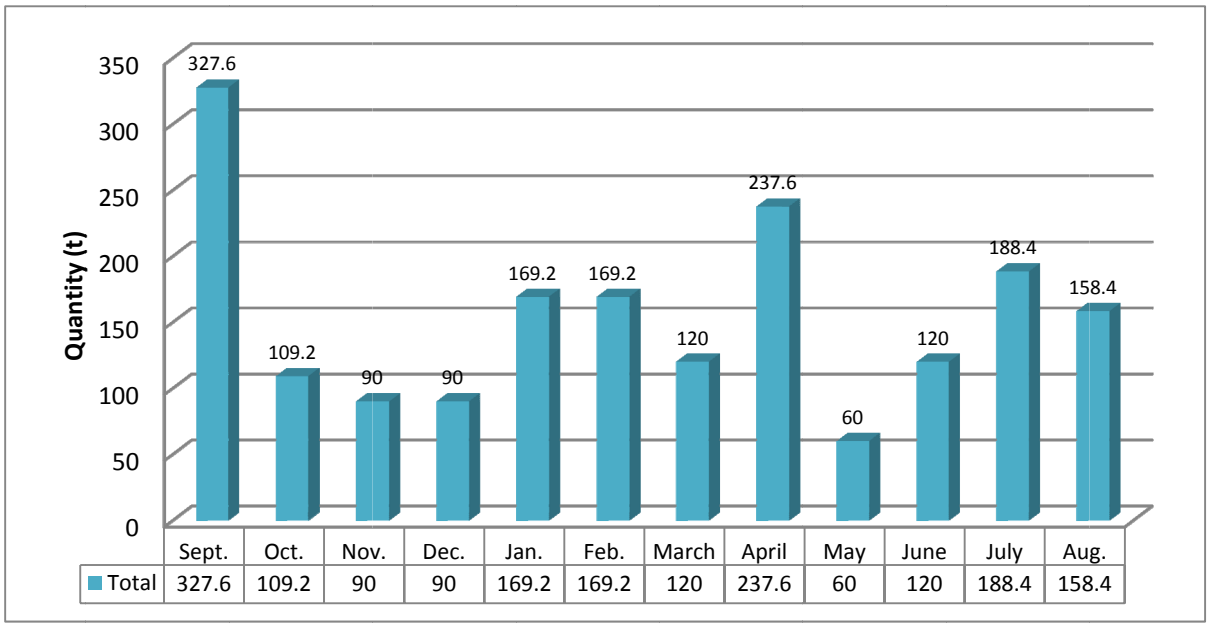


4.7.2 Marketing analysis

Quantity of potato marketed

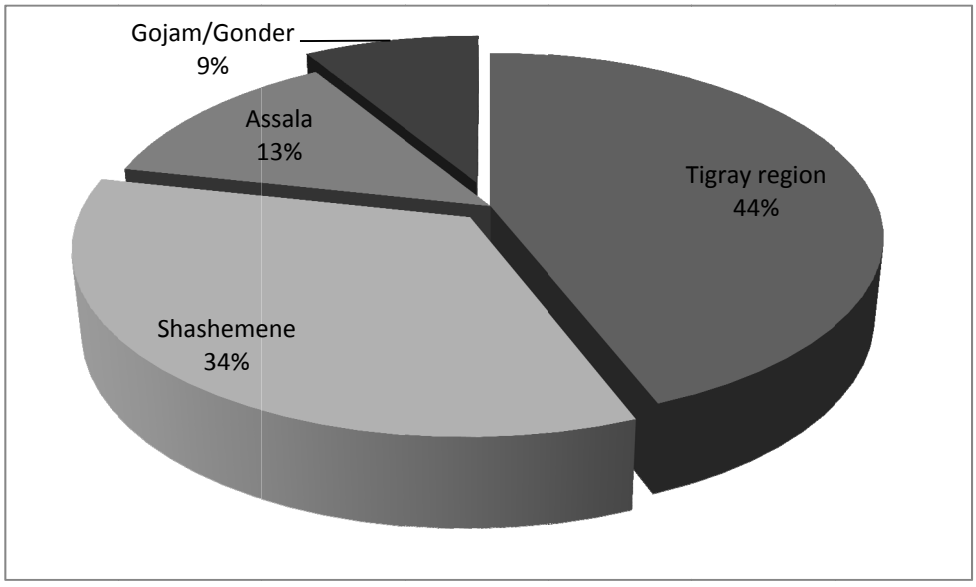
The estimates made by the wholesalers in Mekele indicates that a total of 1,800 t of ware potato was marketed in Mekele market during 2010. The product flow to the market fluctuates depending seasonality of production. Figure 16 shows the supply of potato to Mekele market in each month of the year 2010 and the pattern of this supply is the same every year.

Figure 16: Distribution of quantity of potato supplied to Mekele market (t)



Potato production within Tigray does not satisfy the regional demand. As a result, potato from different regions is marketed in Tigray. According to some wholesalers' estimate, Tigray produces only 44% of the potato traded in Mekele (Figure 17).

Figure 17: Proportion of Supply of potato to Mekele market (1,800 t in 2010)



Potato market channels

The potato marketing channels in Tigray are similar to that of the southern region shown in Figure 12. However, the channel representing potato sales by producers to traders dominates. Both wholesalers and retailers purchase from the producers. Accordingly, about 39% of the retailers stated that they purchase potato from the producers while 57% purchase potato from the wholesalers. The remaining balance (4%) purchase from brokers.

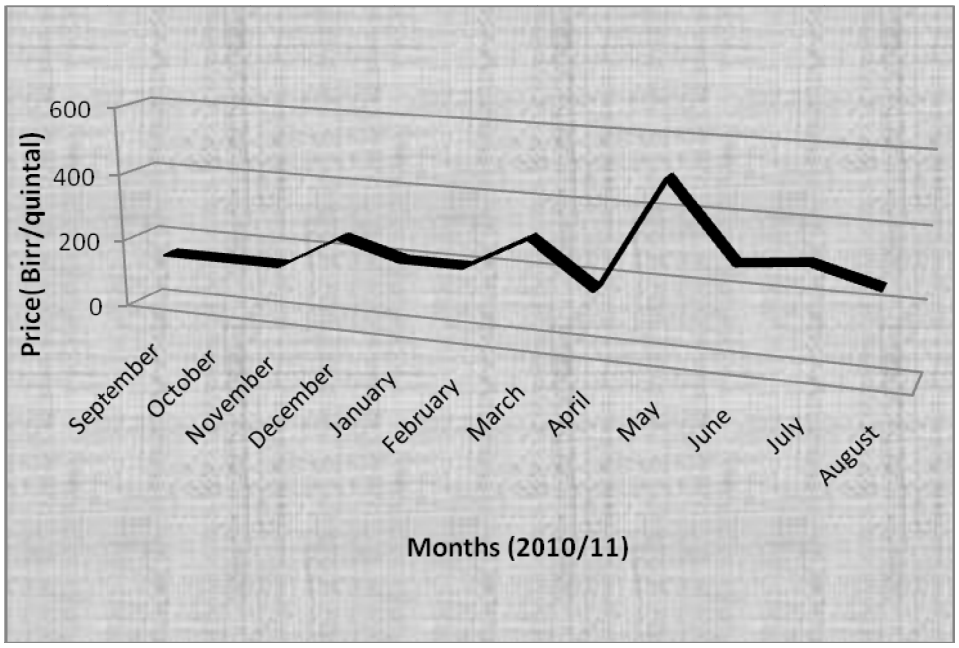
For seed potato three main channels identified in Figure (13) are valid in Tigray as well. The shortest channel is farmers to farmers' seed potato transaction which is popular in Tigray. Traders also buy seed potato from farmers and then sell to other producers. In both regions, the role of traders is significant in terms of collecting potato seed (which are selected from ware potato) from producers and selling it to the needy farmers. In Tigray, for example, wholesalers order potato seed from Shashemene and sell to the Tigry farmers. In the project area, potato seed is sold to other farmers through the linkage and support established by the "Potato for a Better Life" project. In this case standard potato seed which of medium size is sold and attracts higher price.

4.7.3 Economic analysis of potato value chain

Potato price trend

Two types of price trends were estimated: Monthly trend and yearly tread. The monthly price variation is shown in Figure 18 while the yearly trend was established based on the raw data collected by the Agricultural Marketing Agency of the regional state. The result clearly shows that price increase/decrease by as much as three to four folds within year. The price increased from Birr 150 in September to Birr 500 in May which was about 233% increase. For seed potato the price variation between planting period and harvesting time is high and some producers put the difference as high as fourfold.

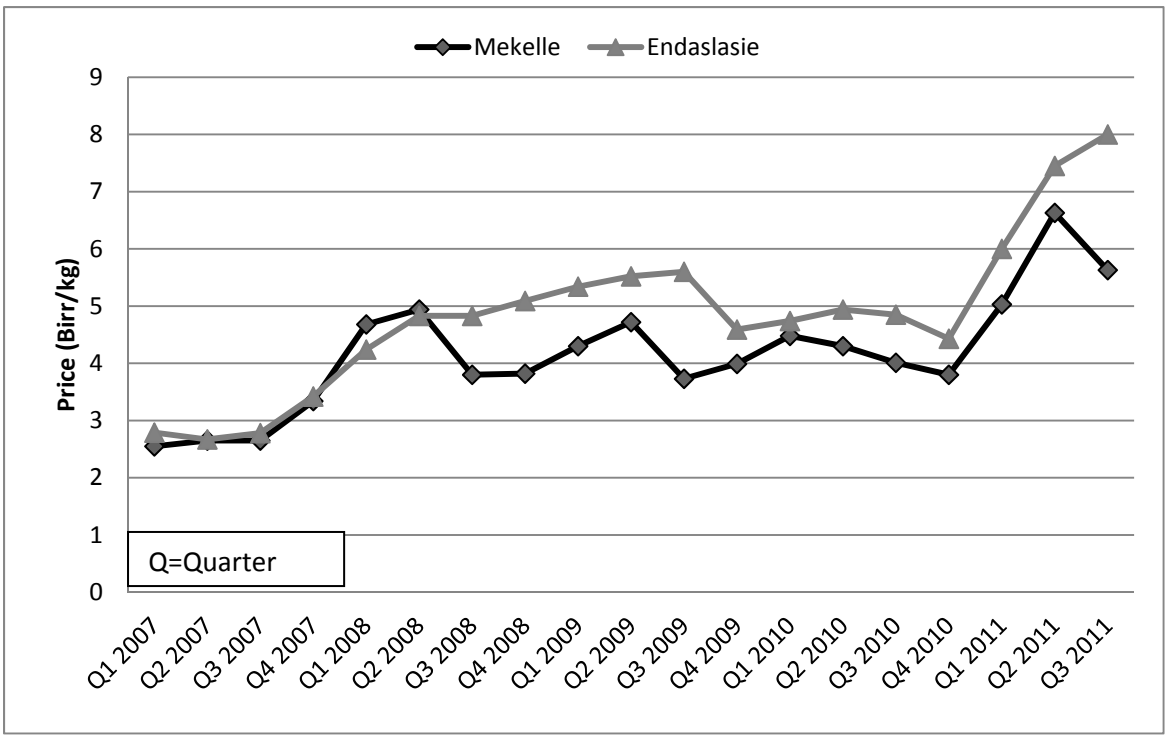
Figure 1: Price variability within a year Mekele market (2010/11)



Source: Compiled from trader survey

The potato price has steadily increased in nominal terms. Quarter 2 is most often characterized by least potato price and quarter 4 with highest price during the last 5 years (Figure 19). The price trend of the Mekele and Enderta follows the same pattern showing the existence of price integration between the two markets. The price trend has not been corrected for inflation due to lack of appropriate data on potato consumer price index. It is, however, apparent that food price inflation is observed in the market.

Figure 19: Trend of retail potato price at two market centers in Tigary from 2007-2011 (Birr/kg)



Cost of production

The average potato production cost was estimated at about Birr 14,500 per ha at Atsibi-Wonberta and Birr 16,000 per ha at Saesi-Tsaeda Emba. The production cost is relatively higher in Tigray as compared to in the SNNPR. Table 39 shows the cost per ha and ton of production based on survey data.

Table 39: Cost of potato production in Tigary

Woreda	N	Cost of inputs (Birr/ha)	Unit cost of production (Birr/t)
Atsibi-Wonberta	39	14,569	1,181
Saesi-Tsaeda Emba	45	15,938	938

Source: Own survey (2011)

Distribution of value addition

The distribution of value addition across potato value chain actors is depicted in Table 40. Value addition is the difference in sales price and cost of inputs (raw materials) at each stage of the value chain. In Atsibi-Wonberta, potato growers added about 36% of total value addition. Retailers made about 25% of total value addition while wholesalers added 39% of the potato value at the end of the value chain. The price differential between producer and consumer prices is 133% which is smaller than the margin in the southern part of the country.

Table 40: Distribution of value addition among major chain actors at Atsibi-Wonberta

Value chain:	Producer	Wholesaler	Retailer	Consumer
Sales price (Birr/kg)	3.00	5.25	7.00	
Cost of raw material	1.20	3.30	5.78	
Gross Value added	1.80	1.95	1.23	
% of total value added*	36.20	39.20	24.6	

*Total value added= Birr 4.96 per kg

The price of potato is generally higher in Tigray than in the SNNPR and Shashemene. The price reported by value chain actors in Saesi-Tsaeda Emba is slightly lower but not significantly different from that of Atsibi-Wonberta. But the total value added is slightly different at the Saesi-Tsaeda Emba and the share of the producers in the value added is higher (49%) and that of the wholesalers is smaller (about 13%) as shown in Table 41.

Table 41: Distribution of value addition among major chain actors at Saesi-Tsaeda Emba

Value chain:	Producer	Wholesaler	Retailer	Consumer
Sales price (Birr/kg)	3.50	4.50	6.90	
Cost of raw material	1.00	3.85	4.95	
Gross Value added	2.50	0.65	1.95	
% of total value added*	49.02	12.75	38.24	

*Total value added= Birr 5.10 per kg

4.7.4 Factors of competitiveness in potato value chain

Similar to that of the SNNPR and Shashemene area, the major factors of competitiveness in potato production and marketing in Tigray are fertility of land, planting materials, know-how, productive plantation, harvesting technology, packaging, fertilizer utilization, farm device, quality control, cleaning and grading, branding and safe transport. How, these factors apply to and affect development of potato value chain has been discussed in section 4.6.4. Here only typical situations in Tigary are briefly discussed.

Fertility of land: The soil fertility is good to promote potato production. But the land size is small. Irrigation technologies increasingly introduced and adopted by the farmers. This creates huge opportunity for increased production and productivity.

Planting materials: The seed supply in Tigray is linked to that of Shashemene. However, local seed potato supply in the region is increasingly emerging and this can result in a competitive situation by reducing transportation cost. In Tigray, the seed that comes from Shashemene is named as improved variety though they are not necessarily improved.
Know-how: Farmers lack the equipment necessary to apply pesticide for crop protection and know how is also limited. The impact on beekeeping is growing.

Crop Management: Similar to the situation in the SNNPR, the use of improved seeds is low. Hence, the productivity of the crop is low. However, if properly managed, the emerging irrigation facility can create a competitive condition for increased yield.

Harvesting technology: Harvesting technology farmers use greatly matters to increase benefit generated from potato production. It is non-existent in the study areas. Farmers use traditional tools (sharp spades, hoe, sometimes pull the potato with hand to harvest), to harvest potato and as a result a lot of loss occurs. The loss at harvest is estimated at 20% in Alata Wondo Area. To protect quick wilting, farmers cover the harvested potato with leaves which is a good practice.

Extension service: No special farm advice tailored to potato production has been given in the study areas**.** DAs give extension service to farmers along side with other crops and their knowledge is also limited.

Quality control: Quality of potato is mostly known through physical observations. Size, color and no damages on potato tuber are used as quality criteria in ware potato selection. There has been no potato quality control mechanism in the country be it seed production, ware potato transportation, and potato packaging.

Cleaning and grading: Washing off-soils from potato, sorting potato according to size and removing damaged ones are some of cleaning and grading practices done by farmers. In marketing, potato traders sort out and grade potato and classify it into three main grades and differentiate prices accordingly. Retailers mix different sizes when selling.

Branding: No modern branding practices have been observed in all the study area.

Packaging: Potato packaging in modern business context is non-existent in all the study areas. However, people use sacks, plastic materials, baskets to transport potato. Leaves are used to cover the sack to reduce evaporation.

Safe transport: Poor transportation which leads to a lot of loss prevails in all the study areas. Some transporters spread potato on floor of the truck and transport long distance. Major means of potato transportation to market is on donkey pack and horse pack and by people and rarely by trucks.

4.7.5 Constraints in potato value chain

Basically the potato value chain in Tigray is confronted with similar constraints in the SNNPR as illustrated in Figure 14, above. These are briefly discussed below:

- ***Input supply-*** Shortage of improved and quality seed potato, which is more serious in Tigray. Fertilizer application rate is reasonably high. But the supply of fertilizer depends on the time it is imported. Mostly, fertilizer is imported by considering the rainy season calendar in the planning frame. Irrigated vegetables use leftover fertilizer from the rainy season. Currently the problem is not significant as the rate of fertilizer adoption is the country in general is low. However, with the strengthening of the extension system which aims to double yield to transform the economy, the

fertilizer adoption rate is expected to increase. This will definitely put pressure on irrigated agriculture, including roots and tuber crops.

- ***Production-*** Low yield due to inadequate agronomic practices and untimely supply of agricultural inputs such as fertilizer;

- ***Marketing-*** Marketing problems cited by farmers include high seed potato price, brokers interference in the market and traders suppressing of potato price. As shown in Table 42, the largest proportion of the producers stress that low price of ware potato is a major problem followed by price fluctuation. Lack of grading and standards for potato created opportunity for the traders to determine weight and prices of the product. Farmers are generally price takers and the traders make margins whether the price increases or reduces.

Table 42: Proportion of farmers indicating marketing problems (% of respondents)

Marketing problems	Atsibi-Wonberta	Saesi-Tsaeda Emba
Low price of ware potato	45	55
High seed potato price	16	10
Price fluctuation	26	24
Brokers interference	3	7
Traders fix price/lack of competitiveness	7	5
No market	3	

Source: Computed from producer survey data

- ***Transportation problem:*** The proportion of respondents indicating problems related to potato transportation is given in Table 43. Though there is slight variation among locations, high transportation cost has been stated as the main problem related to potato transportation. Poor road access to production area, shortage of truck and perishability are key problems of potato transportation.

Table 43: Proportion of farmers stating transportation problem (% of respondents)

Woreda	High transport cost	Poor road	Shortage of truck to transport	Persishability
Atsibi-Wonberta	28	17	42	14
Saesi-Tseada Emba	65	19	17	
Hulla	69	15	8	8
Shashemene	57	21	21	

Source: computed from producer survey data

- ***Storage problem***: One of the major problems in potato production and marketing in Ethiopia is high post harvest loss. A post-harvest loss of 30-50% of the produce was reported in some studies (e.g. Endale et al., 2007). Lack of adequate storage is the major reason for post harvest loss. In this study, 63% of the producers in Atsibi Wonbertata and 62% in Saesi-Tseada Emba stated shortage of warehouse as the

major problem resulting in post harvest losses (Table 44). Potato pest, perishability, lack of market outlet and lack of access road are other problems reported by farmers related to potato post harvest.

Table 44: Major problems related to potato post harvesting (% of respondents)

Harvest problems	Atsibi-Wonberta	Saesi-Tsead a Emba
Shortage of warehouse	63	62
Potato pest	15	15
Perishability	15	15
No market	4	6
No Road	4	3

5. RECOMMENDATIONS FOR VALUE CHAIN DEVELOPMENT

A value chain is a supply chain consisting of the input suppliers, producers, processors and buyers that bring a product from its conception to its end use. A value chain approach to development seeks to address the major constraints at each level of the supply chain, rather than concentrating on just one group (e.g., producers) or on one geographical location. Constraints often include a lack of technical, business or financial support services, lack or a difficult regulatory framework, poor public infrastructure (roads, telecommunications, electricity, etc.), a lack of information about or weak connections to end markets, and/or inadequate coordination between firms.

The studied value chains i.e. that of the SNNPR and Tigray are constrained by similar problems as discussed under sections 4.6.5 and 4.7.5 respectively. Thus, the similar interventions will be needed unless uniquely specified below. The interventions are also based on the suggestions given in the participatory value chain assessment. A summary of the recommendations is given below and the details are given in Annex (5).

5.1 Summary of Interventions

Input supply

i. Establish and/or strengthen cooperatives/groups that engage in potato seed production to achieve the economies of scale needed to meet producers' high demand for improved potato seed;

ii. The study found out that Shashemene area is the hub of the seed potato supply for different areas in the country. Farmers of the area have long experience of good-quality potato production for seed or consumption purposes. Farmers of the area have comparative advantage in terms of location and agroecology. Along with increasing the traditional seed supply system, introducing improved seed production and marketing system can significantly contribute to the solution. The seed potato producers can then be linked with ware potato producers to create access to market for their business.

iii. Farmers continue to use improved potato variety distributed sometimes ago. Obviously, the productivity of the seed declines overtime. Thus improved potato seed replacement system should be put in place by involving the relevant stakeholders like Ministry of Agriculture, Bureaus of Agriculture, Research Institutions and Seed Producers. The system should enable farmers to replace the improved varieties at regular interval.

Storage facilities

Potato is highly perishable agricultural product. In all the study areas lack of storage facilities for ware and seed potato was raised by farmers and other actors as a priority problem. In few places where there is DLS farmers started to benefit a lot. It was also reported that in some places (in Tigray) DLS was inappropriately designed and constructed by some NGOs and the government department which eventually was not utilized by farmers. Therefore,

i. It is recommended to expand DLS in high potato producing areas as per standard DLS design and construction. Through technical support to the farmers, cost effective mechanism of expanding DLS should be considered.

ii. Build capacity of the government staff especially DAs to control the quality of the DLS constructed at household level. Training and experience sharing for local business persons may stimulate construction of DLS to making earning out of it. Individual farmers can invest in storage facilities if they are well aware of the benefits and could increase their productivity. This requires capacitating farmers' entrepreneurship.

Production

Producing diverse types of potato varieties can create attractive market. From consumer and processor surveys, it was learnt that preference for potato varies from location to location and by consumer type. Higher institutions and restaurants and cafes prefer large sized potato that can be easily peeled. Household consumers prefer medium sized local varieties such as Durame in the southern region. In most study areas variety called *Jalene* which is also an improved variety released by Holeta Agricultural Research Center is highly preferred but seed is in short supply. This variety is also confirmed by food specialist as the best quality potato for processing into chips and crisps.

i. Therefore, the extension system should be capacitated to communicate this and relevant feed back to the producers. Awareness raising program on potato food value and its processing techniques can promote potato consumption in the urban areas through health extension agents.

ii. Potato specific technical recommendations should be adequately disseminated to increase potato production and productivity. The extension service should take up potato as essential commodity and enhance its productivity.

iii. Input provision should be adequately scheduled to meet the cropping calendar of irrigated crops such as potato.

iv. Crop protection in Tigray is said to be set back due to lack of chemical sprayers. Cost sharing sprayer supply mechanism should be put in place. It is suggested that projects or the extension department avails sprayers and farmers pay reasonable service for the use.

Transportation

In the potato market survey, it was observed that potato is transported over long distance either spread on floor of the truck or put in congested sacks. During loading and unloading, there is mishandling of the products which lead to quick spoilage and high loss.

i. It is important to establish potato transportation standards and enforce it;

ii. Local seed production may reduce the need for long distance transportation. Hence, enhance the potato seed production in the project regions. For the ware potato, create awareness on potato transportation. It is also essential to establish linkage between producers and traders and promote the relationship between quality and price. As this goes along, the traders start to demand the use of appropriate means of transporting potato.

Marketing

i. Standardization of weighing scale in a participatory manner is needed through legal framework that defines standard measurements and mechanisms of protecting the uneducated farmers from being exploited. Build the capacity of the producers to claim their right. Moreover, providing weighing facility for the cooperatives contributes to realization of claiming the right. Awareness raising for traders and brokers on this is necessary.

ii. Brokers operate without license. As they do good in linking buyers and sellers, they also distort prices to make hidden margin from the deal. It is suggested to advocate for licensing the functions of brokers where they will be accountable for their actions. Building their capacity on how cooperation in value chain development is beneficiary and their role.

iii. Organize and capacitate producers to enhance their negotiation power and skill.

iv. Create value chain forum at woreda level where the different value chain actors come together and discuss the problems of potato value chain and solve them.

Processing

Potato processing facilities were non-existent in all the study areas. Introduction of potato varieties will increase the supply. Along this, it is important to introducing potato processing facilities that can induce consumption and also increase shelf life of the product. Involving the private sector in the enhancement of the processing of potato can result in sustainability of the intervention.

Consumption

i) The demand for the product in the total consumption bundle of rural and urban consumers is small which means that the product fetches low price. The low consumption attributes to lack of knowledge to prepare different recipe, dishes,

products from potato by most consumers in Ethiopia. Therefore, promotion of potato utilization through demonstration different ways of utilizing potato for food can induce higher demand their by motivating the producers to produce more.

ii) At a household level, it is good to emulate the experience of Mums for Mums in Tigray to create awareness on nutrition value of potato and different ways of processing potato to make it part of household diet.

iii) At an industry level, nearly no one is processing potato. Starch and alcohol could be produced from potato though there is a need for economic feasibility of the business. As the production of potato booms, it will be necessary to bring on board the potential industries such as starch extractors, alcohol producers and food complex industries such as the ones listed in Annex 5.

5.2 Intervention Strategy

The implementation of the above recommendations may require the adoption of the following strategies.

Table 42: Strategic intervention areas and actions to be taken

Strategic intervention areas	Supportive Tasks/Action
1. Strengthening seed and ware potato production, marketing linkages among key actors	• Foster horizontal cooperation among seed potato producer groups, cooperatives and potato producers through creation of regional potato boards; • Foster vertical linkage between Potato traders and Potato producers in surplus production areas through field visit and buyer contracting; • Establish ware Potato producing groups and link them with Potential Food processing plants at Addis Ababa
2. Engaging in public- private partnership in potato processing	• Facilitate the engagement of private food processing plants in processing potato as one component of balanced food preparation; • Help producers in concluding contract agreements with potential food processors; • Arrange field visit for food processing plants to watch excess Potato Producing areas such as Shashemene; • Link potato research centres, farmers and food processing plants in identifying and producing suitable potato variety for processing.
3. Strengthening services in potato value chains	• Work on improving the responsiveness of Potato research centres to improved market demanded Potato Variety development and supply; • Similarly work on improving the responsiveness of government fertilizer and fungicide input providers to timely provide these inputs as per the cropping calendar identified
4. Financing potato value chains	• Facilitate Potato value chain financing arrangements for instance for manufacturing of Potato processing equipments by SME; • Support Private Potato transporter who could engage in using standardized potato transporting equipments.
5. Introducing location based potato quality control mechanisms	• Facilitating the development of location based potato quality control mechanisms with emphasis on seed quality; • Promote quality and standard based pricing of Potato; • Work with relevant GOs in developing / adapting existing standards such that they can be implemented

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Annexes

Annex 1: Description of Value Chain Tools

Tool 1: Prioritizing value chains for analysis

Prior to undertaking a value chain analysis, a decision needs to be made on which sub-sectors, products or commodities should be prioritized for analysis.

Tool 2: Mapping the value chain

Mapping value chain helps to get a better understanding of connections between actors and processes and interdependency between actors and processes in a value chain. A value chain map allows one to depict all activities, actors, and relationships among segments of the chain, and the interactions between producers and intermediaries. A value chain has many dimensions: the actual product flow, the number of actors and the accrued value. Eight steps are involved in mapping value chain: Mapping the core processes in the value chain; identifying and mapping the main actors involved in these processes; mapping flows of products, information and knowledge; mapping the volume of products and number of actors; mapping the geographical flow of the product or service; mapping the value at different levels of the value chain; mapping relationships and linkages between value chain actors and mapping business services that feed into the value chain.

Tool 3: Measuring value chain performance: cost and margins

One of core activities in undertaking value chain analysis is to measure the performance of the chain in order to know the investment required to increase the competitiveness of the chain and measure the concentration/distribution of the value chain benefit. Cost and margin are key indicators of value chain performance. Measuring costs and margins enables the researcher to determine how pro-poor value chain should be developed. About seven major steps are involved to measure value chain performances. These are:

- Identifying costs and required investments;
- Calculating revenues per actor;
- Calculating financial ratios;
- Analysis cost and margin changes over time;
- Relative financial position of actors in the value chain;
- Calculating opportunity costs;
- Benchmarking and
- Going beyond the quantitative data.

Tool 4: Analyzing technology, knowledge and upgrading

Three main steps are involved in analysis of upgrading, technology and knowledge.

- Map the variation / differences in Knowledge and Technology in the separate processes in the Value Chain;
- Identify distinct market chains based on knowledge and technology;
- Identify and quantify gaps in knowledge & technology that hinder upgrading between market chains.

Tool 5: Governance and services

Governance encompasses the system of coordination, organization and control that preserves and enhances the generation of value along a chain. Governance and service analysis can help identifying levers for interventions aimed at increasing the overall efficiency of the value chain. The analysis of value chain governance and services is best approached by separating three dimensions: Rules and Regulations, Enforcement and Services. Four steps are involved in analysis of governance and service. These are:

- Map stakeholders influencing governance;
- Identify rules and regulations;
- Analyze enforcement and
- Analyze support services.

Tool 6: Linkages

Analysis of linkage helps to identify how value chain actors are linked along the value chain. Linkages analysis involves not only identifying which organizations and actors are linked with one another, but identifying the reasons for those linkages and whether the linkages are beneficial or not.

In this value chain analysis combinations of these tools have been applied where suitable. Through applications of the tools, potato value chain maps developed, potato value chain performance measured, governance and services and linkages of actors analyzed.

Annex 2: Sample Potato Producers by Sex

Region	Woreda	Sex		
		Male	Female	Total
Tigray	Atsibi-Wonberta	44	1	45
	Saesi-Tseada Emba	46	0	46
SNNPR	Hulla	34	7	41
Oromia	Shashemene	28	0	28
	Total	**152**	**8**	**160**

Annex 3: Sample Potato Retailers and Wholesalers by Region

Region	Actor	Male	Female	Total
Tigray	Retailers	13	15	28
	Wholesalers	10		10
SNNPR	Retailers	5	7	12
	Wholesalers	1	1	2
Oromia	Retailers	0	0	
	Wholesalers	4		3
Total	Retailers	18	22	40
	Wholesalers	11	1	12

Annex 4 : Companies with Potential to use Potato for Value Addition in Ethiopia

1. Bale Zaf Alcohol, P.o.Box 4855, Addis Ababa, Tel. 011 1860299

2. YITBAREK ALEMU STARCH, CHEMICAL & ADHESIVE INDUSTRY.
   Tel: 251-11-66281 61. Fax Icon Fax: 251-11-279 10 72. City: Addis Ababa.

3. Chips are produced super markets since they operate at e.g. ALL MART produces chips it sells in the shop. Others collect chips from small scale processors. These producers do not have labels or even address on the products.

4. Food processing companies are many in Addis Ababa, Adama and Dire Dawa. For example, Kaliti Food Share Company in Addis Ababa is one of the well established flour mill preparing biscuits, child food, breads, etc. The ingredients of the child food does not include potato and there is no plan to include it soon.

Annex 5: Suggested Interventions/Solutions

The stakeholders of the “Better Potato for Better Life” project suggested the following solutions for the problems occurring along the value chain in both regions.

Constraints in potato value chain and suggested solutions

Potato Value Chain Functions	Constraints	Possible Interventions by the project
Input Supply (Seed Potato)	Impurity of potato seed (high dormancy, mixed variety)	• Creating awareness about seed potato production, sorting, grading, quality control, • Support Construction of Affordable DLS; establish and introduce potato seed certification and distribution mechanisms
	Lack of improved potato variety	• Establish seed potato producing farmers groups, cooperatives; • Strengthen capacity of research centers engaged in Potato variety development
	Absence of formal potato seed supply	• Set-up suitable potato seed supply system involving relevant stakeholders; • Create market linkage between potato seed producers and buyers
	Use of small size potato for seed	• Teach farmers on merits and demerits of using small size potato; • Advise producers on proper potato seed size to use and demonstrate on farmers plot
Input Price (Seed Potato)	Exorbitant potato seed price	• Increase potato seed multiplication centers
Input(Fungicide)	Lack of know-how on fungicide application to potato by producers	• Train potato producers on appropriate application of fungicide to potato
Input supply (Fertilizer)	Adulteration of fertilizer by private traders	• Put in place good M & E system to check for expiry date of chemical fertilizers; • Awareness raising for farmers about fertilizer quality
	Low awareness of the optimum fertilizer rate on Potato	• Teach farmers on effect of using fertilizer below recommendation rate ; • Advise on proper rate to use and demonstrate on farmers plot impact of using appropriate rate
	Untimely supply of fertilizer	• Strictly follow cropping calendar in agricultural input supply • Teach input supply planning for input suppliers at various levels • Advocate for consideration of irrigated cropping in input supply planning and delivery

Potato Value Chain Functions	Constraints	Possible Interventions by the project
Ware Potato Marketing	Large number of brokers in the market	• License the brokers; • Provide business ethics training
	Lack of real time market information	• Create access to market information • Support Potato price information provision through FM radios to producers
	Lack of suitable transportation equipments	• Manufacture suitable potato transportation equipments; • Awareness creation of transporters and others involved on the issue
Potato Processing	Lack of potato processing technology	• Establishing factories that use potato; • Encourage establishment of SMEs on potato processing; • Expand potato production and create awareness and linkage
	Lack of awareness on potato value addition through processing	• Introduce potato processing facilities; • Promotion on potato processing and value addition through processing
	Small sized potato is not convenient for processing to consume at household level	• Introduce potato value addition by introducing knowledge like using it for livestock feed; • Promotion to large scale processors on processing potato to extract starch from it
Potato Consumption	Cereal based food habit	• Campaign on changing food habit to vegetables and fruits from predominant cereals based;
	Limited knowledge on recipes/dishes that could be made from potato by consumers	• Introduce home economics education to farmers and consumers;
	High potato price at slack production season (e.g. April-May)	• Increase efficiency of potato marketing; • Establish good ware potato marketing and distribution system
	Taste and preference variability by location	• Communicate consumers preference to producers; • Improve potato extension system
	Potato could not be stored in the soil for long period and consumption is limited to only 2 - 3 months	• Establish ware potato stores at strategic locations
Trading	Lack of proper potato sorting facilities	• Training to farmers and traders on potato sorting ;

Potato Value Chain Functions	Constraints	Possible Interventions by the project
		• Introduce quality based pricing
	Poor road to access rural potato growing areas	• Construct feeder roads; • Support community to construct cost effective feeder roads
	High transport cost	• Mobilize group sells to achieve economies of scale
	Inadequate ware and seed potato storage facility	• Establish DLS for seed potato and suitable storage for ware potato as well
	Lack of weighing scale at rural areas	• Avail standard weigh scale at affordable price
Production		
	In adequate potato management practice	• Train producers on appropriate potato management practice;
	Late blight diseases, rodents, termites attack on potato	• Develop appropriate harvesting technology; • Train farmers on appropriate time of potato planting in different locations
	High perishability of potato	• Introduce modern potato transportation equipments; • Create SME and Producers partnership for manufacturing and marketing of potato transportation equipments

Annex 6: Contact Addresses of Selected Potato Traders

No	Name	Location	Telephone
1	Tafesse Bared	Shashemene	0916 822182
2	Mulugeta Beyene	Shashemene	0916 908930
3	Tesema Wodajo	Shashemene	
4	Eshetu Melese	Shashemene	
5	Wosena Kindie	Shashemene	0916 822182
6	Tesfaye Gebru	Mekele	0914 134180
7	Merigeta G/Alem T/Haimanot	Mekele	0914 003746

Annex 7: Data Collection Instruments

PART I: General questions

Mapping Seed/Ware Potato Value Chain

1) What are the different (core) processes/functions in the potato value chain?
2) Who are the actors involved in these processes and what do they actually do?
3) What are the flows of product, information and knowledge in the value chain?
4) What is the number of actors, the volume of products, employment provided by the chain actors?
5) Where does the product (or service) originate from and where does it go?
6) How does the value change throughout the chain?
7) What types of relationships and linkages exist between the value chains?
8) How do you evaluate the relationship? Cooperative? Competitive? Rival?
9) What type of (business) services is feeding into the chain?
10) Who are the dominant players in the seed and ware potato value chain?

Cost and Margin of participating in Seed/Ware Potato Value Chain

1) What are the costs incurred by each value chain actor, both fixed and variable costs, and what are required investments for entering a value chain?
2) What are the revenues of each value chain actor i.e. what volumes of seed/ware potato are sold by each of the value chain actor and at what prices?
3) What are the net profits, margins and breakeven point for each of the value chain actors?
4) How are investments, costs, revenues, profits and margins changing over time?
5) How are investments, costs, revenues, profits and margins divided over the actors in the value chain?
6) Are the costs and margins of this value chain lower or higher compared to other product value chains? In other words what are the opportunity costs of employing production resources for this particular value chain?
7) Are the costs and margins of this value chain lower or higher compared to similar value chains in other places? Follow the marketing channel to determine the difference.
8) What are the underlying causes of the division of costs and margins in a value chain?

Analyzing technology and knowledge

1) What is the typology of current technology in use in the Value Chain (per processes, actors)?
    a. Varieties used by the producers
    b. Other input technologies used by all value chain actors (tools, machinery, storage, etc)
2) How effectiveness are the technologies?
3) What indigenous and other knowledge is being used in the Value Chain?
4) Does the Knowledge & Technology produce the required output?
5) What does the use of technology cost? What about the benefit?

6) Who determines orientation and investment in Knowledge & Technology in the Value Chain?

Upgrading

i) What upgrading options for potato value chain are available?
ii) Does investment in upgrading pay off? Does it bring enough added values to the poor? Who has access to knowledge and who provides knowledge (example the role of extension)?
iii) Can the costs of potato production/marketing/transporting be reduced?
iv) Can speed of delivery of potato to consumers/market be increased?
v) Can a farmer reduce the use of fertilizers while maintaining the same production levels for instance use compost/manure?
vi) Can a transporter use better potato container to reduce losses/damage?

Product upgrading:

- Can a processor use a better packaging to increase shelf life of potato?

Functional upgrading

- In your opinion should a farmer be producer, processor and transporter or should specialize in a given functions of a value chain?
- Can a group of small farmers in your area bring their potato together to the market in one small truck or should they all travel individually with the potato on the back of their donkey?

Linkage

- Existence of linkages (Yes/No)
- Number of different actors (Number of different people in each organization grouping)
- Frequency of contact (Number of times per year met)
- Level of formality (Informal/Verbal Agreement/Written Contract)?
- Reason for linkages / Reason for no linkages
- Relative Benefit/Costs of linkage (Benefits>Costs / Benefits=Costs / Benefits < Costs)
- Level of trust (distrust / no trust / little trust / some trust / fully trust)

PART II: Potato Value Chain Actor Specific Questions

Farmers/Producers

1. Region:_____; Zone:_____; Woreda:_____; Kebele : _____
2. Name of Farmer:_____; Sex(M/F)_____ Age: _____
3. Did you grow potato last year? 1)Yes 2) No
4. If **Yes to question3**, please provide us the following key information

Production system	Potato variety	Area (timad)	Production from the area (qt)	Quantity consumed (qt)	Quantity used for seed (qt)	Quantity Sold (qt)	Price (Birr/kg)	Sold as (1= seed 2= ware)
Rained								
Irrigation								

5. Do you grow potato as **sole crop or intercrop** with other crops?
   1) Sole crop 2) Intercrop with others
6. Where do you **get potato seed**?
   1) Use own 2) market 3) MOA 4) cooperatives 5) other specify--
7. What type of potato variety are you currently using?
   1) local 2) improved?
8. If improved potato, indicate year you first used improved seed? ____ years?
9. Do you get enough yield from potato variety you currently grow?
   1) Yes 2) No
10. If No, what are the major reasons for low results? (indicate all reasons)
    1) poor quality seed 2) disease 3) no enough land 4) others specify_____
11. Where do you **store potato after harvest**?
    1) in sacks 2) spread on the floor inside house
    3) keep in the soil and dig out when needed 4) others specify_____
12. Estimate **potato loss after harvest** (before sale). _____% of harvest.
13. How long do you store (usually) potato (between harvesting and selling)? _____ days
14. How do you transport potato to market? 1)on donkey back 2) by truck 3) on human back 4) other specify?
15. To **whom do you sell ware potato**?
16. Where do you sell ware potato?
17. To whom do you sell seed potato?
18. Where do you sell seed potato?
19. Who are involved in the sales of potato? Brokers, commission agents, traders, transporters, etc.
20. List the cost **of potato production (seed potato and ware potato) per qt** (estimate for ha and convert it to per qt)
21. List cost of marketing seed and ware potato (packaging/sack, loading/unloading, sorting, transporting, storage, tax).

22. Relation Matrix

	Linkage*				If linkage=Yes; Nature of Linkage**				If linkage=Yes; How Much Do You Trust***?				frequency of with other org meeting/year****			
	F	C	T	P	F	C	T	P	F	C	T	P	F	C	T	P
Farmers(F)																
Coop																
Traders (T)																
Processors(P)																

*: 1=Yes; 2=No; **:1= informal; 2=verbal arrangement; 3=written agreement;

:-1=distrust; 2=no trust; 3=a little trust; 4=some trust; 5=full trust; *: 1=ones; 2=twice; 3=three; 4= times; 5=irregularly

23. What are the major problems in potato production, post harvest, marketing and transportation in your area?
24. Production related problems:_____
25. Post harvest related problems:_____
26. Market related problems:_____
27. Transport related problems: _____

28. Please indicate potato activity calendar in your locality, mark with(☑)

Main Activity	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Land preparation												
Planting												
Weeding												
Harvesting												
Marketing												
Low price time												
Medium price												
High price time												

A. Traders (wholesalers)

A. Region:_____; Zone:_____; Woreda:_____; Kebele : _____
B. Name of Farmer:_____; Sex(M/F)_____ Age: _____

1) Do you buy and sell potato? 1) Yes 2) No
2) If yes, how long since you have started potato trading? _____ years
3) From whom do you buy potato?
   1) Farmers 2) Middle men 3) cooperatives 4) others specify_____
4) To whom do you sell potato?
   1) Whole sellers 2) retailers 3) consumers 4) others specify_____
5) Please indicate your costs, transaction volume and price of potato trading just last one year

Source & destination Markets (from----to-------	Quantity of potato purchase (qt/month)	#effective months of potato trading/year	Purchase Price (Birr/kg)	Sells price (Birr/kg)	Transportation cost (Birr/qt)	Loading/ unloading cost(Birr/qt)	Sacks cost (Birr)	Other costs specify

6) Other costs (storage, tax, etc)?
7) How long do you store potato before selling?
8) How do you transport potato to market? 1) on donkey back 2) by truck 3) on human back 4) other specify?
9) Please indicate the relationship you have with other organizations indicated below

	Linkage*				If linkage=Yes; Nature of Linkage**				If linkage=Yes; How Much Do You Trust***?				frequency of with other org meeting/year****			
	F	C	T	P	F	C	T	P	F	C	T	P	F	C	T	P
Farmers(F)																
Coop																
Traders (T)																
Processors(P)																

*: 1=Yes; 2=No; **:1= informal; 2=verbal arrangement; 3=written agreement;
:-1=distrust; 2=no trust; 3=a little trust; 4=some trust; 5=full trust; *: 1=ones; 2=twice; 3=three; 4= times; 5=irregularly

10) What are the major problems in potato harvest, marketing and transportation in your area?
11) Post harvest related problems:_____
12) Market related problems:_____
13) Transport related problems: _____

14) Please indicate potato activity calendar in your locality, mark with(☑)

Main Activity	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Harvesting												
Marketing												
Low price time												
Medium price												
High price time												

B) Traders (retailers)

a. Region:_____; Zone:_____; Woreda:_____; Kebele : _____
b. Name of Farmer:_____; Sex(M/F)_____ Age: _____

1) How long since you have started potato retailing? _____ years.
2) From whom do you buy potato?
1) Farmers 2) Middle men 3) wholesalers 4) others specify--------
3) To whom do you sell potato? 1) Individual consumers 2) cafes 3) others specify
4) Please indicate your costs, transaction volume and price of potato trading just last one year

Source & destination Markets (from—to--------	Quantity of potato purchase (kg/day)	#effective months of potato trading/ year	Purchase Price (Birr/ kg)	Sells price (Birr/kg)	Transportation cost (Birr/qt)	Loading/ unloading cost (Birr/qt)	Sacks cost (Birr)	Other costs specify

6) Other costs (storage, tax, etc)?
7) How long do you store potato before selling?
8) Estimate the loss (%)_____
9) How do you transport potato to retail site? 1) mini bus 2) on human back 3) on donkey back 4) other specify?
10) Please indicate the relationship you have with other organizations indicated below

	Linkage*				If linkage=Yes; Nature of Linkage**				If linkage=Yes; How Much Do You Trust***?				frequency of with other org meeting/year****			
	F	R	T	P	F	R	T	P	F	R	T	P	F	R	T	P
Farmers(F)																
Retailers(R)																
Traders(T)																
Processors(P)																

*: 1=Yes; 2=No; **:1= informal; 2=verbal arrangement; 3=written agreement;
:-1=distrust; 2=no trust; 3=a little trust; 4=some trust; 5=full trust; *: 1=ones; 2=twice; 3=three; 4= times; 5=irregularly

11) What are the major problems in potato harvest, marketing and transportation in your area?

- Post harvest related problems:_____
- Market related problems:_____
- Transport related problems: _____

12)Please indicate potato activity calendar in your locality, mark with (☑)

Main Activity	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Harvesting												
Marketing												
Low price time												
Medium price												
High price time												

C) Processors

a. Region:_____; Zone:_____; Woreda:_____; Kebele : _____

b. Name of Farmer:_____; Sex(M/F)_____ Age: _____

1) How long since you have started potato processing? _____ years

2) From whom do you buy potato?

1) Farmers 2) Middle men 3) Wholesalers 4) others specify_____

3) To whom do you sell potato?

1) Cafes 2) supper market 3) consumers 4) others specify_____

4) Please indicate your costs, transaction volume and price of potato trading just last one year

Type of processing	Quantity of potato purchase (qt/month)	#effective months of potato processing/ year	Purchase Price(Birr/ kg)	Sells price (Birr/kg)	Transportation cost (Birr/qt)	Loading/ unloading cost(Birr/ qt)	Packing	Other costs specify
Chips								
Crisp(?)								
Other….								

5) Other costs (cost of processing, storage, tax, etc)? _____Birr (give for each)

6) Please indicate the relationship you have with other organizations indicated below

	Linkage*				If linkage=Yes; Nature of Linkage**				If linkage=Yes; How Much Do You Trust***?				frequency of with other org meeting/year****			
	F	R	T	P	F	R	T	P	F	R	T	P	F	R	T	P
Farmers(F)																
Retailers(R)																
Traders(T)																
Processors(P)																

*: 1=Yes; 2=No; **:1= informal; 2=verbal arrangement; 3=written agreement;
:-1=distrust; 2=no trust; 3=a little trust; 4=some trust; 5=full trust; *: 1=ones; 2=twice; 3=three; 4= times; 5=irregularly

7) What are the major problems in potato harvest, marketing and transportation in your area?
- Post harvest related problems:_____
- Market related problems:_____
- Transport related problems: _____

8) Please indicate potato activity calendar in your locality, mark with (☑)

Main Activity	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Harvesting												
Marketing												
Low price time												
Medium price												
High price time												

D) Consumers/Restaurants/Cafes

a. Region:_____; Zone:_____; Woreda:_____; Kebele : _____
b. Name of Farmer:_____; Sex(M/F)_____ Age: _____
c. Household size:_____

1. Type of buyer
2. Income (Birr/year): _____
3. Do you consume potato in your household?
4. Quantity purchased per week: 1) Peak season___ kg; Scarce supply season: ____kg
5. From whom do you usually buy potato? 1) Farmers 2) Middle men 3) wholesalers 4) Retailers 5) Others specify_____
6. Preference (form of potato needed)_____ _____
7. Time when potato is available/scarce:

Potato availability	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Easily available												
Scarce												
Totally not available												

8. Problems related to potato marketing and consumption?