
Full Length Research Paper

Inclusive potato value chain: Cooperatives Vs SolaGrow Plc models in Ethiopia

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This article assesses inclusive potato value chain in Ethiopia. A prospect for potato production and marketing in Ethiopia is promising due to the agro-ecological suitability of the land and irrigation potential. However, at present the value chain is not well developed. The case analysis compared potato value chain initiated by the private sector company and the cooperative society in Ethiopia and the findings show that cooperative society's approach is traditional and underdeveloped while the SolaGrow's approach is more promising and innovative. Against the premises, the cooperative approach to potato value chain supported by the government and NGOs in the form of direct and indirect subsidy did not change the livelihoods of small farmers rather the new inclusive value chain promoted by SolaGrow PLC can build value chains which enable very poor farmers to improve their livelihoods.

Key words: Potato, value chain, mapping, cooperative, Solagrow, Sinan, Ethiopia.

INTRODUCTION

With over 80 million inhabitants, Ethiopia is the second most populous country in Africa, and one of the poorest in the world. Ethiopia faces poverty, which is broad, deep and structural. Its economy is heavily dependent on agriculture and suffered from recurrent droughts and extreme fluctuations of outputs (Devereux et al., 2005). Unprecedented population pressure has contributed to decreasing plot size, making an increasing number of households dependent on inadequately small and unproductive plots, and traditional farming practices (FAO, 2007). As a result, in Ethiopia, food insecurity is seen as the most important development challenge.

Potato has been considered as a strategic crop by the Ethiopian government aiming at enhancing food security and economic benefits to the country. As the population grows rapidly, increased productivity of potatoes can improve the livelihood of smallholder potato farmers and is required to meet the growing demand (Gildemacher, 2012). The potato subsector is potentially of great importance for pro-poor growth since it is the best option for many households to generate income in Ethiopia.

About 70% of the country's available agricultural land is located at an altitude of 1800-2500 mm which is suitable for potato production (Bezabih and Mengistu, 2011). In addition, potato is regarded a high-potential food security crop because of its ability to provide a high yield of high-quality product per unit of input with a shorter crop cycle

than major cereal crops like maize (Hirpa et al., 2010). Currently, many improved varieties of potato are disseminated by research centers, cooperatives and private suppliers to smallholders and this has contributed to the improvement and expansion of potato production in Ethiopia. However, little has been done to improve the performance of the entire potato value chain in the country and there is no clear evidence on which model works better for the overall performance of potato value chain in Ethiopia.

This study, therefore, investigates subsidized cooperative potato value chain model in Sinan and unsubsidized private investor [SolaGrow PLC] promoted potato value chain model in Debre Ziet so as to come up with valid conclusion on what model works better for inclusive value chain in the country. The next section presents the literature review followed by the methodology used in the study. The empirical results and discussion as well as conclusions follow subsequently.

LITERATURE REVIEW

Concept of value chain

Development practitioners and researchers have been used value chain approaches to capture the interactions

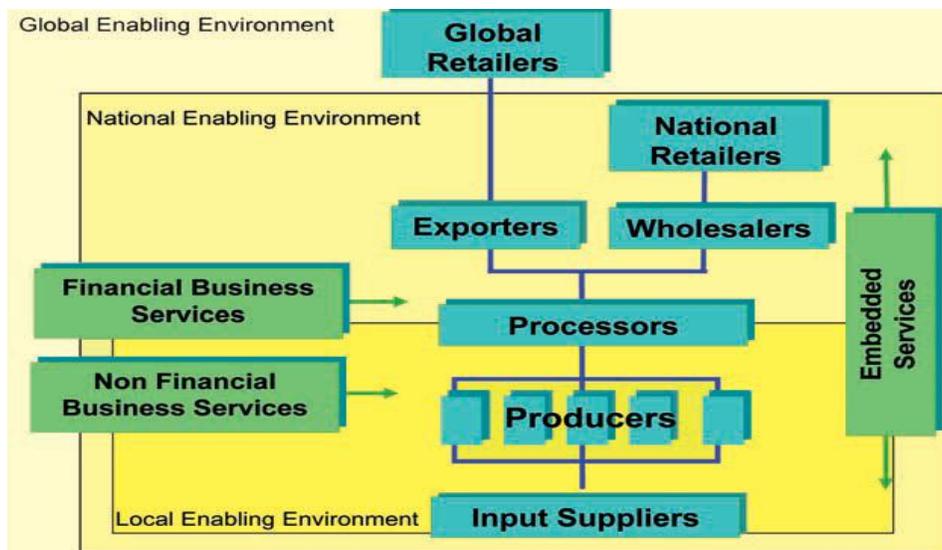


Figure 1. Diagrammatic representation of a value chain,
Source: (Turner, 2011, USAID, 2007)

of increasingly dynamic (and complex) markets and to examine the inter-relationships between diverse actors involved in all stages of the marketing channel in developing countries (Kaplinsky, 2000; Pietrobelli and Saliola, 2008; Bolwig et al., 2010). A value chain refers to the full range of activities that are required to bring a product (or a service) from conception, through the different phases of production, to delivery to the final consumer and disposal after final use (Kaplinsky and Morris, 2001). Agricultural value chains cover all activities from input supply, production, processing, wholesale and retailing to the final consumer (Haggblade et al., 2012). KIT et al. (2006) classified value chain actors as direct and indirect. Direct actors are commercially involved in the chain (input suppliers, producers, processors, traders, retailers, consumers) and indirect actors provide financial or non-financial services or support the functioning of value chain (bankers and credit agencies, business service providers, government, researchers and extension agents) (Figure 1).

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 product that is tailored to that segment. They may also try to process their produce to add value to it: they may dry chillies rather than selling them fresh, or they may make cheese rather than selling the unprocessed milk or cook rather than selling row potato. This means in simple words “from seed to feed” or “from forceps to fork”. 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 (Bezabih and Mengistu, 2011).

Value chain analysis

In the value chain literature, three main streams are distinguished: the French *filière* approach (Raikes et al., 2000), the business strategy approach (Porter, 1985) and the global approach (Gereffi et al., 2005). In a *filière* approach, the main idea is to highlight and map out specific physical commodity flows within a sector, though usually confining the analysis to domestic markets and ignoring dynamic adjustments to sector characteristics and relationships (Raikes et al., 2000; Kaplinsky and Morris, 2001). In the mid-1980s, Porter defined the “value chain” as a representation of a firm’s value-adding activities, based on its pricing strategy and cost structure and highlighting the interdependences and linkages between vertically-arrayed actors in the creation of value for a firm. He identified (1) primary activities, which directly contribute to add value to the production of goods and service and (2) support activities, which have an indirect effect on the final value of the product (van den Berg et al., 2009). In the development literature, these ideas were later expanded to incorporate governance relationships between actors in the value chain (Gereffi et al., 2005) and more broadly applied to emphasize the

linkages and relationships both between and within actors at each stage of production (Gibbon et al., 2008; Kaplinsky, 2000; Kaplinsky and Morris, 2001; Pietrobelli and Saliola, 2008; Gereffi et al., 2005).

The value chain analysis in the agriculture sector apply the following six sets of tools and steps (Kaplinsky and Morris, 2001; van den Berg et al., 2009): (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. This research intends to follow these steps as a framework of analysis.

Value chain in potato

The application of value chain analysis in agriculture is growing due to market failure and non-competitive setting of small scale agricultural production (Anandajayasekera and Gebremedhin, 2009). According to KIT et al. (2006), farmers who are involved in agricultural value chain 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. 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. However, this finding was mainly focused on agricultural products like rubber, cotton, coffee and cocoa but the value chain research related to potato is scanty in the context of developing countries.

Potato production in Ethiopia

Potato has been cited by the Ethiopian government as a strategic crop aiming at enhancing food security and economic benefits to the country. It ranks first among the vegetable crops grown and is a rapidly expanding crop in Ethiopia (Mulatu et al., 2005). It is one of the most economically important crops as a source of food and cash (Gildemacher et al., 2009b). Potato yields high productivity per unit of area and time (Gebremedhin et al., 2008); and hence is one of the key crops for food security in the country. Ethiopia is endowed with good agro-ecological zone suitable for the production of high

quality seed potato and ware potato. About 70% available agricultural land is located at an altitude of 1800-2500 mm which is suitable for potato production (Bezabih and Mengistu, 2011). The regional distribution of the potato production in Ethiopia constitute 46%, 34%, 19% and 1% of the national potato production, in Oromia, Amhara, SNNPR and Tigray respectively (CSA, 2008). Amhara region is the 2nd major potato growing area in the country, counting about 34% of the potato farmers, of which this study is conducted specifically in East Gojjam Zone of the region.

Potato is top in calorie, and contains high dry matter and protein content among major food crops worldwide. Potato has the potential to grow in the 70% of the 10M ha of arable land in Ethiopia (FAO, 2007). Several varieties of potato are grown by farmers some of which are local and others are improved varieties. According to Gildemacher et al. (2009b), 98.7% of the seed tubers required in Ethiopia are supplied from the local varieties. The seed tubers supplied by this system have poor sanitary, physiological, physical and genetic qualities (Endale et al., 2008; Gildemacher et al., 2009b; Hirpa et al., 2010). There are improved varieties that yield 19–38 t/ha on farmers' fields (Gebremedhin et al., 2008). However, the current area cropped with potato (about 0.16 Mha) is small and the average yield (less than 10 t/ha) is far below the potential. The low acreage and yield are attributed to many factors, but lack of high-quality seed potatoes is a major factor (Gildemacher et al., 2009a).

In Ethiopia, the main production season for potato, at altitudes higher than about 2500 m.a.s.l. is June to September (Meher in Amharic). The off-season production slot for Ethiopia at higher elevations is April to August (Belg in Amharic). However, one should bear in mind that nowadays the main production season for ware potato represents only 22% (34,000 ha), while the off-season production is around 128,000 ha. The reason for a gradual shift from Meher to Belg is the fact that the late blight pressure is increasing and farmers experience less risk with cultivation during the small rains combined with irrigation. During the main season, risks are high.

The average potato production throughout Ethiopia is 8 - 10 t/ha (Gildemacher et al., 2009a; Abay and Tesfaye, 2011). This is relatively low average, especially when considering the potential of Ethiopia, with its favorable climate at higher elevations, soils and irrigation potential. The main production constraints are related to the narrow genetic basis of the varieties and the poor seed quality. In addition, the disease pressure/susceptibility is increasing and management capacity of the farmers is poor. Indeed the average yield reported for improved seed is between 19 and 46 t/ha for different varieties at different locations (Haverkort et al., 2012). However, this study on cooperative initiated value chain in comparison with privately promoted value chain is the first in its nature.



Figure 2. Geographic location of the study sites (Cases).

METHODOLOGY

Description of study sites

The cooperative case is conducted in Sinan district which is located in Amhara region. Robe Gebeya is the administrative town of the district and is located 327 km away from the capital. The district consists of 17 Kebeles (the lowest administrative organ in the Ethiopian government structure which is equivalent to villages) and total population of 103,870 (Figure 2). In Sinan, there are seven primary multipurpose cooperatives and one cooperative union serving more than 15,000 poor farmers. The altitude of Sinan district varies from 2600 - 4088 mm above sea level which is suitable for potato production. The major crops cultivated in the district are potato and barley. Although the district has irrigation potential, the major farming system is rain-fed agriculture and livestock rearing. However, due to recurring natural problems [such as flood, storm, variable rainfall, drought] and socio-economic problems [such as poor access to health and education facilities, veterinary services and safe drinking water, poor road infrastructure and technology, shortage of grazing land, crop and livestock diseases, overpopulation, etc farmers live in precarious situations.

SolaGrow PLC is conducted in Debre Zeit area, Oromia region. The head quarter of the PLC is located at Hidi, 50 kilometers far from Addis. The company comes from a Dutch investor, Jan van de Haar. The founder of the company was motivated by the good experiences he had on potato cultivation in desert areas of Israel, Egypt and

Mali as a research manager at HZPC Holland BV, one of the leading seed potato companies in the Netherlands. He decided to resign his job in 2006 and continue as an entrepreneur in seed potato production in Ethiopia. The vision of the company is “to contribute to food production and food security of Ethiopia by providing seeds, expertise and technology to the farmers on a commercial basis, reinvesting its dividends into ongoing development of agro-economic sector”. The company started its business with potato seed production and marketing but now it targeted the entire value chain. The company works in Partnership with HZPC and other four sister companies working in Ethiopia. These four companies are Cropgrow PLC for Vegetable production, Seedgrow PLC for seed production, Cowgrow Breeding PLC for breeding and selection of dairy cows and Investgrow PLC for Machinery rental and medical health care.

The main compound Hidi contains the offices, the grading & storage facilities, breeding center, the plant and molecular laboratory and an 8 hectare experimental field. The company has invested a lot in the acquisition of nucleus farms in the main vegetable growing areas of Ethiopia since 2007, as well as in the import of advanced mechanization technology and the registration of improved varieties. The company has 23 ha irrigated land used as demonstration field at Filtino, the area located between Hidi and Debre Zeit. The company leased about 500 ha of land for its large scale production in its working sites such as Doba, Wenchi, Koga, Mahoney, Hosanna and Welkite. The company has more than 450 permanent and temporary employees working in these sites. The

company has 200 contract farmers and targets to reach 12,000 framers for the next 5 years from 2013.

Research design

This research applied mixed method descriptive research design that combines both quantitative and qualitative approaches.

Sampling techniques

The population of this study is aimed to be all potato producing kebeles and cooperatives in Sinan, Amhara region and SolaGrow contract farmers in Oromia region. However, due to resource constraints selected samples were taken in both research areas. In the Sinan case, one primary cooperative, one cooperative union, 60 farmers, 20 traders, and 20 consumers were included. In addition, five support provider officials from Microfinance Institutions, Ministry of Agriculture, and Non-Governmental Organizations /NGOs/were interviewed. The district was chosen because of its potential for potato production and the current food security status of the population. For the SolaGrow case, in-depth interviews were conducted with the company manager, one agronomist, 20 contract farmers, five retailers, and five farmers' group leaders.

Data source and instruments

In this study, both quantitative and qualitative data were collected from secondary and primary sources. First, the researcher reviewed the relevant literature on potato and its value chain in and outside the country. For this purpose, policy documents, reports, published and unpublished documents, website data, CSA data and MoA data were reviewed as a secondary data source. Moreover, concepts of value chain and value chain study tools are reviewed and used as a data collection and analysis tool.

Second, the researcher conducted a survey of main value chain actors such as farmers, traders (local collectors/traders, wholesalers and retailers), processors, and consumers (household and institutions) in the two selected research areas to solicit a wide variety of information on potato value chain. For this purpose structured questionnaire was prepared based on value chain analysis framework. The questionnaire has both closed-ended and open-ended questions. It is prepared in English and translated in to local language for clarity. The questionnaire has been tested before final use.

Third, unstructured interview was made with experts in the MFI, Agriculture, NGOs and cooperative sectors. For this purpose Key Informants Interview guide was

prepared in line with value chain analysis framework. This kind of interview gives a chance for the researcher to obtain rich, detailed information in a flexible way. Moreover, market site observation has been made by the researcher.

Data analysis

The tools of value chain analysis were applied to guide the study. Progress out of Poverty Index/PPI/developed by the Grameen foundation was used to measure the poverty status of producer farmers in the selected sites. PPI is a poverty measurement tool for organizations and businesses with a mission to serve the poor. In PPI for Ethiopia, the answers to 11 questions about a household's characteristics and asset ownership are scored to compute the likelihood that the household is living below or above the poverty line. The data collected from different sources has been analyzed using descriptive statistics like tables, graphs, and percentages. The quantitative data collected through questionnaire has been prepared by cleaning, coding, and entering them in to a computer and analyzed by the help of Statistical Package for Social Science. The qualitative data collected from key informants' interview and survey through open-ended questions and observation were coded by categorical system and analyzed thematically together with the quantitative survey.

RESULTS AND DISCUSSION

Characteristics of respondents

Some basic demographic characteristics of respondents in both cases are presented in Table 1. The majority of respondents were males in both research sites. This is mainly because most of the time males have the tendency to be organized and form cooperatives as well as do contract farming than females; the later spend most of their time by conducting household activities rather than conducting business activities outside their home.

The majority of farmers in both cases fall under the productive age range of 31 - 50. Education plays pivotal role in potato production and productivity. However, in the case of Sinan, 45% of sample farmers are illiterate and only 3% have attained grade 9-12. In SolaGrow contract farmers, 15% are illiterate and 30 % of them attended grade 9 - 12. It shows that SolaGrow farmers are relatively educated than Sinan. In both cases, the majority of sample potato producers are married and their livelihood depends largely on farming and with the family size of 4 - 6.

Progress out of poverty

The Sinan PPI result in Table 2 shows that producers interviewed have 18.4% likelihood of falling below the

Table 1. Demographic characteristics of respondents.

Attributes	Categories	Sinan Farmers (n=60)	SolaGrow Farmers (n=20)
Sex	Male	48	17
	Female	12	3
Age	10-30	10	3
	31-50	44	16
	>50	6	1
Education	Illiterate	27	3
	Grade 1-8	18	7
	Grade 9-12	2	6
	Adult education	13	4
Marital Status	Single	3	1
	Married	45	17
	Widowed	8	2
	Divorced	4	-
Livelihood Sources	Farming	58	20
	Petty trading	14	3
	Government job	10	4
Family size	1-3	4	2
	4-6	43	12
	>6	13	6

Table 2. PPI category likelihoods of sample farmers.

	PPI Score	\$1/Day/2005 PPP Poverty Line		\$1.25/Day/PPP 2005 Poverty Line		
		Total Below the \$1/Day/2005 PPP Line	Total Above the \$1/Day/2005 PPP Line	Total Below the \$1.25/Day/2005 PPP Line	Total Above the \$1.25/Day/2005 PPP Line	
Sinan Farmers [10 yrs ago]	0-4	38.3%	61.7%	87.6%	12.4%	28.4% likelihood of falling below and 71.6% above the \$1.25/day PPP line
	5-9	59.6%	40.4%	82.9%	17.1%	
	10-14	38.3%	61.7%	63.6%	36.4%	
	15-19	29.2%	70.8%	58.3%	41.7%	
	20-24	24.0%	76.0%	47.7%	52.3%	
Solagrow Farmers [5 yrs ago]	25-29	17.5%	82.5%	38.5%	61.5%	18.5% likelihood of falling below and 81.5% above the \$1.25/day PPP line
	30-34	13.4%	86.6%	28.4%	71.6%	
Sinan Farmers [Now]	35-39	8.0%	92.0%	18.5%	81.5%	18.4% likelihood of falling below and 81.6% above the \$1.25/day PPP line
	40-44	8.3%	91.7%	18.4%	81.6%	
Solagrow Farmers [Now]	45-49	4.9%	95.1%	18.6%	81.4%	7.4% likelihood of falling below and 92.6% above the \$1.25/day PPP line
	50-54	1.9%	98.1%	7.4%	92.6%	
	55-59	3.0%	97.0%	5.0%	95.0%	
	60-64	0.8%	99.2%	3.0%	97.0%	
	65-69	0.7%	99.3%	2.2%	97.8%	
	70-74	0.0%	100.0%	0.5%	99.5%	
	75-79	0.3%	99.7%	1.1%	98.9%	
	80-84	0.0%	100.0%	3.4%	96.6%	
	85-89	0.0%	100.0%	9.3%	90.7%	
	90-94	0.0%	100.0%	0.0%	100.0%	
95-100	0.0%	100.0%	0.0%	100.0%		

\$1.25/day poverty line now as compared to 28.4% likelihood of falling below the \$1.25/day poverty line 10 years ago. This shows that the farmers' poverty status has improved by 10%. If we use the \$2.50/day poverty line, 80% of farmers live below it today. In the case of SolaGrow, 7.4% contract farmers have the likelihood of falling below the \$1.25/day poverty line now as compared to 18.5% likelihood of falling below the \$1.25/day poverty

line 5 years ago. The conclusion is that farmers' poverty status has improved by 11.1% for the last 5 years. But based on the \$2.50/day poverty line, 66.1% of them are living below the \$2.50/day poverty line. Overall, the poverty status of SolaGrow farmers is relatively better than the Sinan case. Sinan farmers are mostly subsidized by the government and GIZ. More than 15% of the price of fertilizer is subsidized by the regional government. They

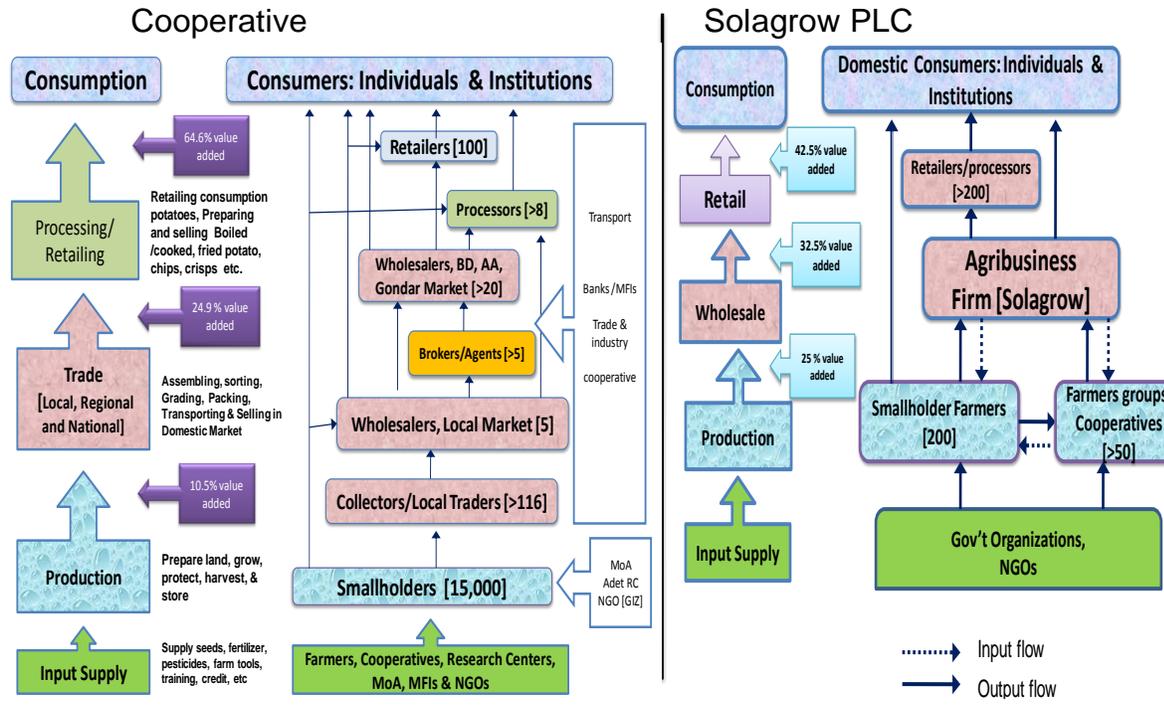


Figure 3. Consumption Potatoes Value Chain at Sinan & Debre Ziet.

also have access to credit on the basis of 50% down payment arrangements by the government through cooperatives. Poor farmers in Sinan get farm tools and improved seeds for free from GIZ through its Climate Change and Adaptation project. They also get agricultural extension services by government paid workers. With this combined effort, the improvement in poverty status is only 10% for the last 10 years. However, SolaGrow framers improved their poverty status by 11% for the last 5 years [shorter period as compared to Sinan] with commercial model. They buy fertilizer from the market without subsidy. They get farm tools from the company but with rent. They get improved seeds and fertilizer on loan not for free. They are expected to pay the loan from their produce. With this model, they are productive; they are able to repay their loans. The company is also profitable. It expanded its business from one region to four regions and from two working sites to 8 working sites. It has created more job opportunities for large number of people. It has diversified its businesses with more than 2.4 million euro expansion project. As confirmed by the company manager and other employees working for the company, there is no subsidy to the company except the PSOM06/ET/22 subsidy from the Dutch government to establish nucleus farm, laboratory and other related facilities at the beginning of the company establishment. Therefore, it is fair to conclude that Solagrow farmers are more productive than Sinan farmers. This could be due to the positive effect of SolaGrow in supporting farmers in potato production and

marketing and enable them to pay their costs from their profit.

Potato value chain mapping

The value chain map (Figure 3) depicts the flow of potatoes for consumption in the market, activities carried out at each stage of the value chain, the structure of actors, the value added and the support involved in the value adding process. As indicated in the chain, first the core functions/processes has been identified. These are: input supply, production, trading [local, regional. national], processing, retailing and consumption. After mapping the core processes, the main actors and support providers have been identified.

More than five channels have been identified for consumption potatoes in Sinan case. The shortest channel occurs when producers directly sell their produce to the consumers and the longest is when the producers sell their products to local traders and local traders to wholesalers in the local market and wholesalers in the local market to other wholesalers in regional and national market and then to retailers and the retailers to final consumers. There are many value chain actors at each stage with diverse roles. However, the value added to producers is very small showing that the value chain is not benefiting the producers rather it benefits the retailers and wholesalers.

In the case of SolaGrow, there are three channels

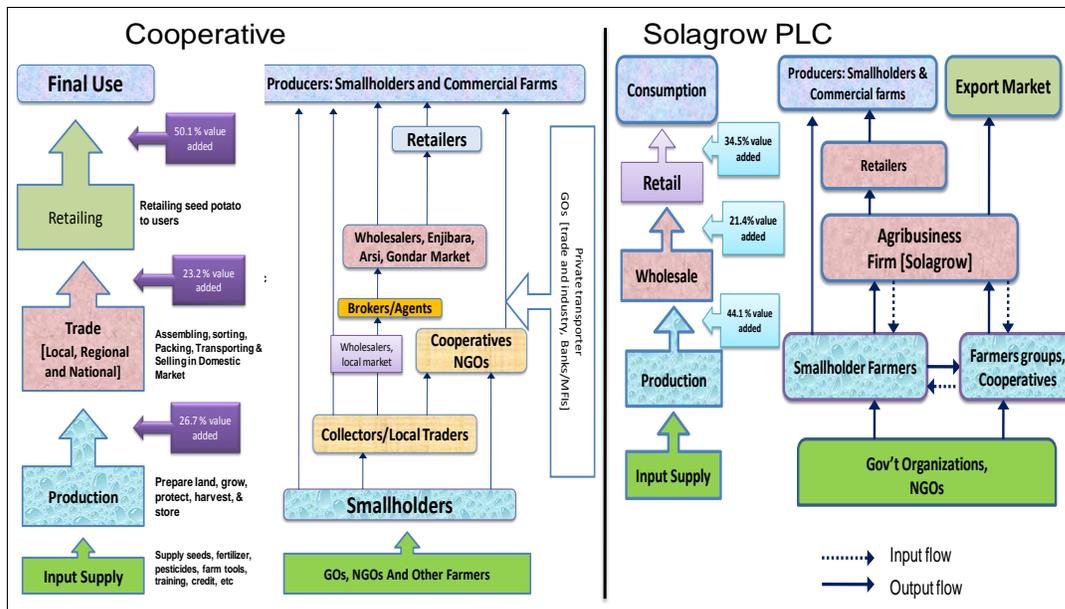


Figure 4. Seed Potato Value chain at Sinan and Debre Ziet.

identified in the value chain. The value chain is innovative and clearly shows the contribution of SolaGrow PLC as a source of input, and market chain for the product. It is also evident that the value added to Solagrow contract farmers is better than the Sinan case. SolaGrow established strong relationships with the stakeholders of the potato chain up and down to the chain. It has good cooperation with research institutions and universities. The PLC works closely with individual farmers, farmers groups and cooperatives. It provides inputs to farmers and buys their produce. Originally SolaGrow took the production and marketing of potato seed as core business. Since 2010 the company focused on two sides: 1) to take the whole potato chain into consideration, from seed to consumption potatoes to market, and 2) to include the seeds and markets of the rotational crops such as linseed, vegetables, and malting barley. The company realized that farmers tend to move to mono cropping when they once get good profit from a specific crop and wants to prevent this negative trend by creating awareness on this topic of rotation and by offering other alternative crops to the farmers. The major advantage of this approach is the continuous collaboration with the farmers and the spreading of risks by growing complementary crops.

Seed and consumption potatoes are distinct commodities that need to be treated differently from planting to harvesting and then storage as well as marketing. However, in Ethiopia value chains for these two commodities are largely identical. In the absence of a labeling system, it is difficult to distinguish seed tubers from consumption potatoes in the market. This was evident in the case of Sinan. Seed value chain is almost

similar to consumption potatoes value chain except the involvement of cooperatives and NGOs in the marketing of seed potato. The value chain is also similar in the case of SolaGrow except the possibility of exporting seed potatoes to international market such as Middle East, Sudan and Somali. However, seed and consumption potatoes are separately treated by Solagrow than Sinan (Figure 4).

Input supply

In Sinan, most potato growers (80%) plant local seed. Growers select small sized potato from their own consumption potatoes or from neighboring farmers and use them as seed. This has affected their productivity. Some farmers use improved varieties supplied from German Technical Cooperation /GIZ/ in collaboration with cooperatives and Adet Agricultural Research Center. GIZ, through its Sustainable Land Management/SLM/ and Global Climate Change Adaptation/GCCA/ projects, provide training and agricultural inputs for farmers to be productive in climate friendly crops such as potatoes. However, the scope of the project is very limited and need expansion to reach large number of farmers. Adet Agricultural Research Institute is involved in developing potato variety for wider adaptation and high yielding. Varieties released from Adet have been introduced and being adopted but not widely used by the growers at Sinan because farmers prefer the local variety for consumption and they grow improved variety for seed for sale.

Regarding fertilizers, three quarters of the farmers used

only organic fertilizer such as manure and compost, while others used inorganic fertilizer; the decision depends on the land size allocated to potato and their perception on soil fertility. Farmers use organic fertilizer from their own source and inorganic fertilizer from cooperatives. Pesticides and herbicides are supplied mostly by cooperatives, agriculture office and individual private suppliers. Farm tools are supplied mainly by GIZ, agriculture office, cooperatives and research centers. However, farmers do not use improved varieties of potato seed and they do not use modern agricultural inputs due to lack of awareness and inadequate supply.

Agriculture office supply inputs and provide agricultural extension services to farmers through development agents. The office provides advisory service, facilitate access to inputs and provide technical support in crop protection. However, there are no specialized extension services for potato growers except that potato is considered as just one of the vegetables. Development agents get extension service on general agriculture and it is not sufficient to improve the technical skill of the farmers.

The cooperative society play a role in the supply of input required for potato and other crops production. Fertilizer, herbicide, pesticide, and improved seeds are the main inputs delivered. These inputs are supplied either for cash or on credit. Members can take inputs on credit but non-members are expected to pay in cash. However, they do not play their roles as expected due to the lack of adequate capital to supply inputs, the shortage of modern agricultural inputs such as fertilizer and improved seed, inadequate participation in seed and consumption potatoes marketing; lack of transport and storage facilities, and lack of infrastructural facilities. Furthermore, the low educational level and managerial skill of the primary cooperative committee members and their preference for their own businesses as opposed to that of the membership as a whole also prevent such cooperatives for providing efficient services. Most of the management staff and committee members are not paid for this work and this makes it difficult for them to spend enough time on their society's business.

Some farmers and traders in Sinan get credit from government banks and microfinance institutions. But this service is very much limited. Private transporters give transport service to mainly traders but in a very limited way.

In the case of SolaGrow, the company follows four core values in its business operation. The first core value is providing improved varieties of seeds and sharing production tools [tractors, digging machines, shovels and hand tools. The second value is sharing the seed and tools on a commercial basis, or by loan. The third value is focusing on the basic needs: food, water and medical care. The last value is 'be there and stay there'. Inline with its core values, the company supplied improved varieties of seed potatoes, fertilizer, farm tools and

technical advice. As opposed to the Sinan case, the majority of SolaGrow farmers used improved varieties of potato seed (90%) and fertilizers (80%). The company provides seed and fertilizer to out growers on credit and gives periodic training and technical assistance on site. The company owner lives very close to farmers to share their life and cooperate with them in its businesses. It constructed water wells; provide health care and other community services for employees and the neighboring villages and this has created trust among contract farmers to work with the company.

The company has its own nucleus farms for seed production, demonstration and experimental field. In these nucleus farms, the company is aiming to get farmers and out growers involved in quality production for local and international market. The contract farmers and other interested potato growers are invited during visit day to see the potato production in practice, they share experience on how to use improved seeds, fertilizer, herbicides, etc and farmers do not pay anything for this. The company leased the land from the government and rented or contracted out from farmers. In Ethiopia, land is public property. Individuals, companies and other organizations have only use right of land. There are two broad classifications of land for rent or lease purposes: rural land and urban land. Application for land acquisition can be made during a field visit of an investor and after taking out an investment license. The Ethiopian Investment Agency (EIA) has the mandate to facilitate the allocation of land for FDI projects throughout the country. Urban land for other activities is available on an auction basis. The auction prices vary, depending on demand. The lease and rental prices of urban and rural land vary according to location, type of investment and class of land. The land cannot be mortgaged or sold, but the lease or rental value of land and the fixed assets thereon may be mortgaged or transferred to a third party. According to the lease policy, if the farm is located 700 kms away from Addis Ababa, the investor is expected to pay 111 birr (around \$6.89) / hectare per annum for rain-fed agriculture. As the area gets nearer to the central market Addis Ababa, the price will increase by 4.05 birr (\$0.251) per kilometer and as it goes far from 700 kms from Addis Ababa, the price declines by 4.05 birr (\$0.251) per kilometer. When it comes to irrigation farming the lease price will be 158 birr (\$9.8) per hectare per annum and it will increase or decrease per every kilometer by 4.17 birr (\$0.252). This lease price is subject to revision in every 10 year. And the investors lease the land for 25 years for annual crops and 45 years for perennial crops. SolaGrow farms around Debre Ziet are close to Addis Ababa and the price is around 3000 birr (\$186.2) per hectare per annum.

Production

The smallholder farmers with various amount of land are

Table 3. Average land size, production, consumption, sale and price

Variables	Sinan Farmers (N=60)	SolaGrow Farmers (N=20)
Land size of sample farmers (hectare)	1.35	1.75
land allocated for potato production (hectare)	0.74	0.56
Potato produced (kg)	5096	8288
Production per hectare (kg)	6900	14,800
Potato consumed (kg)	1737	1492
Potato used for seed (kg)	860	1160
Potato sold (kg)	2000	4973
Potato damaged (kg)	499	663
Consumption potatoes selling price [\$/kg]	8.8	11.66
Seed potatoes selling price [\$/kg]	13.79	23.86

\$1=18.8 Ethiopian Birr as of August 2013.

the key actors who are directly involved in potato production. In Sinan, smallholder farmers produce potatoes with the support of mainly government organizations and some NGOs and sell their products to cooperatives or other traders. In SolaGrow contract farming, the company is responsible to supply inputs and technical advice while farmers are responsible to produce and supply the product with acceptable quality standard of the company. The average sampled farmers land holding is 1.35 ha per household in Sinan and 1.75 ha per household for SolaGrow contract farmers (Table 3). The land allocated for potato production is higher in Sinan (0.74ha/household) than Solagrow farmers (0.56 ha per household) in 2012/2013. This finding in both cases is higher than the average estimated by Bizuneh and Mengistu (2011) for Tigray (0.28ha) and SNNPR (0.45 ha) per household. This difference could be due to the dominant potato production system in the study areas.

The average potato yield of sampled farmers is estimated to be 6900 kg/ha or (6.9 tones per hectare) in Sinan and 14,800 kg/ha (14.8 tones per hectare) in Debre Ziet. The productivity per hectare in Sinan is lower than the national average [8-10 tones per hectare) and this is due to the use of local potato variety, poor seed quality, lack of agricultural inputs and poor management practices. But the yield per hectare in SolaGrow contract farmers is higher than the national average. This is due to SolaGrow's support in input supply and technical advice. However, the productivity per hectare in Ethiopia in general and in the two cases in particular is far below the international experiences. For instance, in USA the national average productivity is 44.2 tones per hectare. In South Africa, it is 34 tones per hectare. In China and India it is 14.7 and 19.9 tones per hectare respectively. The world's average is 17.4 tones per hectare and the African average, excluding South Africa, is of course close to the Ethiopian average productivity which is 10.8 tones per hectare.

Table 3 shows that of the average quantity of potato produced by sampled farmers in Sinan, 34% was consumed, 39% was sold, 17.5% was used for seed and 9.8% was damaged due to poor storage and transportation whereas in SolaGrow contract farmers 18% was consumed 60% was sold, 14% was used for seed and 8% was damaged due to crop disease and improper handling. In both cases, large volume of the product is sold though higher in SolaGrow than Sinan. There is also significant variation in selling prices for both seed and consumption potatoes. This is due to high quality product with proper follow-up and control as well as market access created by SolaGrow.

In the case of Sinan, the main production season is the Meher -main rainy season (74%). However, Belg-short rainy season (63%) and off-season (25%) are also the common production seasons. What is unique in Sinan case is that farmers produce potato throughout the year without irrigation because of the ago-ecological suitability and the rainfall which makes the land suitable for potato production. In the case of SolaGrow, farmers use both irrigation and rain-fed agriculture. The main production season however, is Belg as opposed to Sinan which is Meher.

Farmers in Sinan managed to sale 60% of their products for local traders, 12 % for cooperatives, 10% for wholesalers and 18% for local farmers. Despite the expectation, the share of cooperatives is very minimal. 100 percent of farmers in Sinan transported potato to the market by donkeys/horses and very few farmers used cars/trucks for transportation of potato to the local market in addition to donkeys and horses.

Assefa is one of the smallholder farmers at Sinan district. He is 49 years old and married with a family size of six children. He has 2.25 hectare of land and about 1.5 hectare of this is used for potato production. He managed to produce 8000 kg per hectare, before he changed to growing improved varieties, but now he grows the improved varieties and managed to get 14,000 kg per

hectare. He usually sells his product at the farm gate since his farm land is close to the gravel road. In 2012, Assefa sold 4000 kg improved variety for cooperatives at \$29.3 per 100kg of potatoes and 3000 kg local variety consumption potatoes at \$16 per 100kg of potatoes. For him that was a great success because he has purchased new house in the nearby town of Sinan. He managed to send his children to school. However, high cost of inputs, lower price of potatoes, lack of a good market for his product, lack of storage and transportation facilities, shortage of agricultural inputs such as improved seed, fertilizer and fungicides affected his profit.

SolaGrow used a combination of market and resource specification contracts with potato growers. Through market specification contracts, potato growers were allowed for greater exchange of information on quality, market demand and price. Similarly, with resource specification contracts, SolaGrow helped potato growers to access improved seeds, fertilizer and periodic technical advices. Before harvest, growers bring a sample of their potatoes for grading. When the farmers conform to the quality standard, SolaGrow pays them local market price plus \$0.04 – 0.11 per kg after deducting the input costs it provided at the beginning of the season. Hence, SolaGrow helped smallholder potato farmers reduce the problem of transaction costs related to high credit costs, specialized inputs, high marketing risks, and at the same time stabilizing their income from potato sales. Farmers sell all of their produce to SolaGrow based on their contract agreement. However, the potato that is not meet the quantity standard of the company will be either consumed by the household or sold in the local market.

Gashaw is a contract farmer for SolaGrow PLC. He farms 2.5 hectare of land in Oromia region. He has seven family members and he farms potato, enset [known locally as false banana], barley, maize and wheat. He saw his neighbors benefiting from farming with SolaGrow PLC and decided to join the company in 2009. He started producing potatoes and other rotational crops with irrigation. Before SolaGrow, he had no irrigation and improved varieties of seeds. However, following the contract agreement, the company gave him loan to establish irrigation facilities and he got improved varieties from the company. This opportunity completely changed his cultivation practices. He grows potatoes for both consumption and seed in 1.5 hectare of land. He gets all the inputs from the company in advance and the cost of these is taken off the selling price at harvest. He managed to produce 18,500kg/ha for one season and sold the product with attractive price to SolaGrow. He also grows four rotational crops such as barley, linseed, maize and wheat. This provides him with year round employment and guaranteed good returns. This created confidence to him to work with the company. In the unlikely event of loss or crop failure due to natural calamities the cost of inputs is waived, which mitigates

his loss. He now has a bank balance of \$2000. Gashaw sales his product to SolaGrow at the farm gate and this saves the cost of transport and helps him to avoid the risk of being exploited by traders. He sends his children to schools, and hopes that his children will have a good future. More than 60 farmers in the village do contract farming for SolaGrow in the same way.

Local trade/collection

There are more than 116 potato collectors and local traders in the Sinan and Robe Gebeya area who are involved in the local potato trade. They purchase potatoes from the local growers, assemble them in one place and then sell them to wholesalers or transport them to other towns. These local traders also collect potatoes on behalf of wholesalers, who pay them a small fee ranging from \$0.02-0.08 per kg for the service. However, all their costs are also covered by the wholesalers themselves. Local traders can also purchase potatoes by themselves and store them for some time, negotiate the price with wholesalers and sell them when necessary. But this form of business is highly risky according to them because they do not have any guarantee of a market and they lose money if the market price goes down. In some cases, the farmers themselves have to bring the potatoes to the wholesalers but this is not common. But in the case of SolaGrow, contract farmers supply their product directly to the company. The role of local traders is not significant.

Tekil is one of the local traders at Sinan. He collects potatoes from the farmers and sells them to wholesalers in Sinan or other major towns in Amhara region. In 2012, he sold about five truckloads of consumption and seed potatoes. In 2013, he managed to sell five truckloads of potatoes within six months. One truckload comprises 60-70 bags of potatoes. He purchases potatoes on a 'per bag basis'. The standard bag full of potatoes is considered to weigh 100 kg and in 2013 he paid around \$15.2 per bag for seed potatoes and \$13.3 per bag for consumption potatoes. After collecting potatoes, he stores them for few weeks and arranges to sell them when there is a call from wholesalers. He is interested in this business but the losses from damage to the potatoes due to poor storage, the limited supply of potato from farmers, and wholesalers' insistence on high quality discouraged him from doing this business but still continue doing it.

Wholesaling

There are very few wholesalers who have the license to do wholesale business in Sinan. The license is officially provided East Gojjam Zone Trade and Industry office in consultation with the district office of trade and industry.

The criteria to give license for potato whole trade are the working capital, experience and working place of the business owners among others. The cost of getting the license ranges from \$30 – 80 depending on the type and nature of business. Wholesalers at local market sell potatoes to other wholesalers out side the district through brokers. Brokers play crucial role in potato marketing since they link local wholesalers with regional and national wholesalers. However, according to Lalem, the brokers sometimes go beyond facilitation of transaction and tend to set prices and make extra benefits from the process. They do not have trade license, they manipulate prices and as a result they constrain the marketing system more than they facilitate. Wholesalers purchase in bulk from the district and sell the produce in the major towns such as Chagni, Enjibara, Bahirdar, Gonder, Metema, and Addis Ababa. These traders are also involved in the purchase of improved seeds which they sell to farmers in their local places.

Lalem is one of the three wholesalers at Sinan. He started his wholesaling business six years ago. He buys consumption and seed potatoes from the collectors and local traders as well as farmers, stores them for a few weeks and then sorts, grades and packs them into 100 kg sacks. Then he hires a truck and transports them to other towns. He purchases consumption potatoes for \$14.4 per 100 kg sack and seed potatoes for \$16. The transportation cost is around \$5 per bag and damage during storage and transportation is estimated to amount to between 5 and 10 kg per bag. It is not difficult to get a vehicle but the

SolaGrow PLC is a wholesaler and retailer. It purchases the product from out growers or produces in its farm and sells the product to users. Flexibility in its marketing strategy, for example, by making guarantee farmers to pay a premium of \$0.04-0.11 per kg more than the market price, helps the company to encourage farmers. It focuses on complete supply chain system: the company has tried to link all the potato supply chains. It has done this by searching final potato consumers and facilitated linkage between potato producer farmers with the ultimate consumers. According to Mr. van de Haar, the market is not a problem for the company. Sometimes small scale farmers comes to the company with \$260 [close to 5000 Ethiopian birr] to purchase seed potatoes. This shows that Ethiopian farmers are willing and able to pay good money for quality seed of highly productive varieties. According to the company manager, there are also losses, for example, in Doba (Bekoji) all the 25 hectare of potato plant got destroyed by frost in 2011. But still the company is profitable and interested in this business.

Retailing

In Sinan, retailers mostly buy from wholesalers and sell to urban consumers. Sometimes they could also directly

buy from the producers and sell to consumers through their grocery stores and open market. Retailers not only sell potato but also trade in other vegetables such as tomato, onions and cabbage. Consumers usually buy the product from retailers as they offer according to the requirement and purchasing power of the buyers. Since most of the institutional buyers (universities, hospitals, colleges, hotels, prisons, etc) purchase a bulk quantity of potatoes directly from farmers or wholesalers, the quantity of potatoes sold by the retailers in a day is generally less. However, the profit margin is on average from \$ 0.1 -0.18.

In the case of SolaGrow, apart from supplying seed potatoes to the export market and producer farmers and commercial farms, it established a new marketing chain for high quality consumption potatoes – by supplying to hotels, restaurants, supermarkets, institutions and other high end consumers via its established shopping centers around Debre-Zeit and the capital (Addis Ababa).

Processing

Large scale potato processing is non-existent in Ethiopia in general and in the study areas in particular. Potatoes are commonly boiled, or are cooked in different traditional dishes, known as 'Wat'. Potato chips, crisps, and roasted potatoes have in recent years become more popular, especially in the larger cities such as Addis Ababa, Bahirdar, Gonder and DebreMarkos. The supermarkets have also started to sell potato products such as chips and crisps. In urban areas potatoes are usually eaten with other vegetables as salad. In large cities such as Addis Ababa, it is common to see hotels, restaurants and cafes preparing French fries. Street vendors also prepare french fries and sell them in the evenings. In rural areas such as Sinan, however, potato consumption is limited because people generally know very little about making different dishes from potatoes. Household consumption is limited to potato stew, and boiled and sometimes fried potatoes.

Consumption

Potato consumers are individual households [rural and urban dwellers] and institutions. In Sinan, for example, institutions [Debre Markos University, Police College; prison, Teachers Training College, and Debre Markos Hospital] are the largest potato consumers, since they do have large number of individuals as a consumer. These institutions consume on average from 10,000-15,000 kg per week which counts about 45 % of the total consumption but this depends on the peak and slack seasons. The remaining percentage consumed by hotels, restaurants and individual households at rural and urban areas within and outside Sinan. The large market for

Table 4. Distribution of value addition for Consumption potatoes.

Cooperative	Producers	Wholesalers	Retailers	Consumers
Average sales price (\$/kg)	0.09	0.15	0.27	
Average cost of inputs	0.059	0.077	0.08	
Gross value added	0.031	0.073	0.19	
% of total value added	10.50	24.90	64.60	
Solagrow PLC				
Average sales price (\$/kg)	0.12	0.20	0.23	
Average cost of inputs	0.05	0.112	0.116	
Gross value added	0.067	0.088	0.114	
% of total value added	24.75	32.6	42.5	

Table 5. Distribution of value addition for seed potatoes.

Cooperative VC	Producers	Wholesaler	Retailer	Consumer
Average sales price (\$/kg)	0.14	0.20	0.33	
Average cost of inputs	0.076	0.145	0.21	
Gross value added	0.064	0.055	0.12	
% of total value added	26.72	23.16	50.11	
SolaGrow PLC VC				
Average sales price (\$/kg)	0.24	0.27	0.29	
Average cost of inputs	0.044	0.174	0.136	
Gross value added	0.196	0.096	0.154	
% of total value added	44.10	21.4	34.5	

seed potatoes for SolaGrow PLC is contract farmers, other individual farmers and commercial farms all over the country. Consumption potatoes are consumed largely by institutions and individuals at Debre Ziet, Adama, Woliso, Jima, Addis Ababa and other major cities of the country.

Value added in potato value chain

Value addition is the difference in sales price and cost of inputs (raw materials) at each stage of the value chain. The survey in Sinan shows that the farmers' price for consumption potatoes is \$0.09 per kg; wholesalers sold it by \$0.15 per kg and retailers by \$0.25 per kg. The average Sales price of potatoes per kg for producers, wholesalers, and retailers in SolaGrow is \$0.12, \$0.20 and 0.23 respectively. The price change from producers to consumers is more than 200% in Sinan and less than 100% in SolaGrow. The average input cost for producers include costs of seed, fertilizer, pesticide, cost of transport, hired labor cost (including family labor- the opportunity cost of family labor is put equal to average estimated cost of hired labor) and other related costs.

The input cost of wholesalers and retailers include transportation cost, loading/unloading cost, cost of bags/sacks, and other costs (storage, tax, etc).

Potato producers in Sinan added 10.5% of the total value for consumption potato in the district. Retailers are responsible for 64.6% of the value and wholesalers added about 24%. The highest profit is earned by the retailers but the scale of operation is 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. The value added in SolaGrow value chain by producers, wholesalers and retailers is 24.75%, 32.6% and 42.5 % respectively and this is relatively better than the Sinan case in terms of the distribution of values added (Table 4).

The price of seed potatoes is about 20%-30% higher than the average price for consumption potatoes because seed potatoes have to be harvested later. This means that crop losses are higher, the quantity of seed potatoes supplied to the market is reduced and the price increases (Table 5).

The percentage share of value added to producers for seed potatoes is 27% in Sinan and 44% in Solagrow framers. The data clearly show that the value added to

farmers by SolaGrow PLC is better than the Sinan case. However, it is also good to note that traders and retailers underestimate their prices and profits as they associate the information with tax and other related issues.

Conclusion

A prospect for potato production and marketing in Ethiopia is promising due to the agro-ecological suitability of the land and irrigation potential. However, at present the value chain is not well developed. The case analysis compared potato value chain initiated by the private sector company and the cooperative society in Ethiopia and the findings show that cooperative society's approach is traditional and underdeveloped while the SolaGrow's approach is more promising and innovative.

The Sinan case tells us the fact that the potato value chain functions in a traditional way, there is no innovative way of integrating the chain actors. There is no quality control or grading of produce, there is no formal arrangement for input supply, production and marketing. Though the cooperatives involved in both input supply and in a limited way in potato market, their role is not as expected and they are not able to reduce the transaction cost. Farmers are not getting adequate advisory service from cooperatives and agriculture office to increase potato productivity. The value chain is constrained by lack of adequate storage and transportation facilities and poor post harvest handling. Potato processing is not well developed. Knowhow of different ways of utilizing potatoes is limited.

On the contrary Solagrow's approach is innovative. SolaGrow has set up complete farm to fork systems for production, quality control, grading, cold storages, packaging and transportation. The company has experimental and demonstration fields on its leased land and contracting farmers for large scale production of seed and consumption potatoes. The company supplies inputs such as seeds, fertilizers and pesticides. The farmers also receive technical guidance. Farmers take inputs on credit basis and they are guaranteed to sale their products to the company. The company has its own transportation facilities to collect the produce from the farms and to transport it to domestic markets like hotels, supermarkets, restaurants around Debre Ziet and Addis Ababa. The company invested in social services beyond production and marketing of potatoes and this enhanced the company's reputation in the community.

In both cases multiple actors involved in the potato value chain with diverse roles. In Sinan case, public actors play significant role mainly in input supply and production stages of the value chain. However, the cooperation among chain actors is very weak and informal. There is no any platform or responsible body who is working for effective and efficient linkage between value chain actors.

In Solagrow, the private sector plays significant role starting from input supply to output marketing. There is well established linkages and interaction among chain actors. The company interacts with producers and other actors effectively. SolaGrow imports improved potato varieties from the well-known international seed potato company HZPC Holland. This link with an international agribusiness firm can be considered as an important step towards the development of a sustainable marketing chain in Ethiopia.

The study shows that there are many intermediaries in between producers and consumers and there is a big difference between the price farmers receives and the price paid by the consumers in both ware and seed potato trade in Sinan than in Solagrow. This shows that traders in Sinan often exploit the poor farmers and of course local collectors by manipulating prices in their favor. Since wholesalers are the value chain regulators, they increase or decrease the price considering the supply situation and the role of producers in value chain management is minimal. However, in the case of Solagrow, agreement has been made in advance and both producers and Solagrow are governed by the agreement. The data shows that the benefit is fairly distributed By Solagrow as compared to Sinan.

The Sinan case shows that the potato value chain is constrained by the lack of support for producers and traders (technical, business or financial), the poor infrastructure facilities (storage and transportation), and the lack of market information and/or lack of integration among chain actors. Cooperatives do not play as expected due to lack of resources, poor leadership quality, and the low level of literacy coupled with high transaction costs in the potato market. In the case of SolaGrow, the majority of these problems are addressed by the company. Although the company is waiting other actors to ply a role in the area, it is a key player now and tried to solve the technical, financial and market problems of small holders.

The Solagrow PLC clearly shows that it is possible for private sector companies, to develop and maintain value chains which include small producers and are profitable for all parties. It is also evident that the value chain initiated by Solagrow grew much faster than the traditional value chain approach in Sinan. Sinan cooperative value chain has made use of assistance from the government in the form of subsidized credit and grants. The promoter of SolaGrow value chain has made no use of subsidy but share experiences and buys seeds from HZPC seed company, the Netherlands. The company controls the producers with its binding contract agreement. A contract of this kind is important because the company will supply seeds or other inputs on credit to the producers often accompanied by extension and other capacity building services and the producers will supply the product with reasonable quality standard.

In the development literature, there was an argument that

inclusive value chain should be initiated by government and NGO organizations because private businesses will inevitably exploit small farmers. However, this was not the case in Solagrow. One important lesson from the two cases is that the traditional approach to cooperative potato value chain supported by the government and NGOs in the form of direct and indirect subsidy didn't change the livelihoods of small farmers rather the new inclusive value chain promoted by SolaGrow PLC can build value chains which enable very poor farmers to improve their livelihoods.

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