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Potato Value Chain Analysis: The Case of Chencha Woreda, Gamo Gofa Zone, Southern Ethiopia

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Abstract
This research was carried out with an aim to conduct and explore the study on analysis of potato value chain at Chencha Woreda of Gamo Gofa Zone SNNPR southern Ethiopia. It entails the specific objectives of Identify the key players for each step of production and marketing using the value chain approach, analyze the roles and relationships of actors in the sector for implementation of the interventions and identify the constraints faced by potato value chain actors. Primary data have been be collected from 124 selected respondent /farmers/ this supplemented by information from two focus group, and 10 key informants and also retrieved from relevant report and documents. The result of the study shows that production and productivity of potato got the highest yield and benefit to producer but potato producer couldn't achieve these result and benefit so all necessary potato technology should disseminate extensively in the study area. From the individual producers' perspective, the survey results show that the production characteristic in the study area is characterized by traditional rain-fed agriculture. The average potato productivity (yield) in the study area is 80 quintals per hectare which is below the potential. The data on sub sector selection showed that potato has higher profitability per hectare compared to other crops cultivated in the same season and this is the factor that influenced producers most to prefer potato production to other crops. The result of the study revealed that there are different actors on potato value chain in study area. Potato growers are the major actors who perform most of the value chain functions right from input supply up to post harvest handling and marketing. The major value chain functions that potato grower perform include ploughing, planting, fertilization, weeding, disease and pest control and harvesting. The study result also indicates that input costs like fertilizer cost and seed cost as well as labor cost comprise large share of the total variable costs involved in potato production. Family labor also plays significant role in the production of potato in the study area. Therefore, improving yield should be given more attention in the area. This can be achieved through improving the supply and accessibility of modern agricultural inputs like chemical fertilizer to the producers, improved and certified seed. In addition the current use of high yielding varieties must be duly examined as the use of these varieties seems to affect potato production and yield negatively. Although, the real cause for this negative return from the use of high yielding varieties is not clearly known, possible reasons include lack of proper training given to producers on the use of these varieties or disease vulnerability. Therefore, it might be wise to train the producers on the proper use of these varieties on field. The other reason could be soil mining effect but this cannot be proved from the available data as well. Therefore, the current use of high yielding varieties in the study area needs further research. Further more effective soil and water conservation mechanism will be implemented in the near future to compact the serious soil erosion problems of the Woreda in order to boost quality potato for market.
Keywords: Potato value chain, subsector selection

1. Introduction

1.1 Background

Ethiopia's economy is largely dominated by agriculture, which provides a means of living for more than 83 percent of the population and employs 70.4 percent of the economically active population (CSA 2009). The contribution of agriculture to the GDP, at constant factor cost, is estimated to be 44.5% in 2007/08 fiscal year (NBE 2008). The livestock sub-sector is an important component in the agricultural activity and has been contributing considerable portion to the economy of the country, and still promising to rally round the economic development of the country (CSA, 2007). Livestock account for about 40.0% of the agricultural GDP, 18.0% of the total GDP and 19.0% of the export earnings. Similarly, contributions of livestock to cash income of the smallholders accounts for up to 87% (BDI, 2008)

The potato (Solanum tuberosum) has its origin in South America, around Lake Titicaca which is near the present border of Peru and Bolivia (Horton, 1987). It is one of major food crops grown in most of the developing countries. Developing countries currently produce about 30% of the world's potatoes. Moreover, the production of potatoes is increasing more than the production of most other crops. Consequently, potato growing is increasingly becoming one of the major sources of income, rural employment and food for growing populations. Potatoes are currently rank fourth in terms of importance among the food crops of developing countries. Its production has also more than doubled in these countries since 1965. However, the relevance of potato is not only limited to the developing world, it is also an important crop in the industrialized parts of the world like Europe due to its use as a cheap food, livestock feed, source of starch and alcohol(Hourton, 1987).

Potatoes are source of both food and income in many of the densely populated highlands of Sub-Saharan Africa. Due to its high significance as a source of both food and income, potato remains to be an important crop for the livelihood of the rural population in these countries. Taking into consideration the prospect for growth of market for fresh potatoes and the current international market conditions characterized by high prices for cereals, potato can be taken as a good benchmark for rural development in sub-Saharan Africa (Gildemacher et al., 2009). In Sub- Saharan Africa, Kenya, Uganda and Ethiopia are among the ten African countries with the largest area allotted to potato production (FAOSTAT,2006) as cited by (Gildemacher *et al*.,2009). Root crops like potatoes, sweet potatoes and taro/'Godere' are among the major food crops consumed across the country. According to the survey results of CSA (Central Statistical Agency) for the year 2009/2010, root crops covered more than 1.65% of the total area under all crops cultivated in the country. From this total area allocated to root crops, 32.88% of it is covered by potato while Sweet potatoes and taro ('Godere') cover 25.19% and 24.6% respectively.

In Ethiopia, potato is produced in two season's i.e. in 'belg' season (March- August) and in 'meher' season (September-February). However, most of the production takes place in 'meher' season. Therefore, the season from September to February (i.e. 'Meher' season) is considered as the main season for which most of the information regarding potato production is available. According to (CSA, 2010), the total potato production by private peasant holdings for the year 2009/10 was 5,723,325 quintals with an average yield of 82 quintals per hectare. As it can be seen from table 1, potato production is the highest of all other root crops cultivated in the country. In terms of area coverage as well, potato is the largest of all root crops with a total area of 69,784 hectares.

Ethiopia is potentially conducive for potato production due to its favorable weather conditions and good strategic location (CoQA, 2009). However, although the country is endowed with huge arable land that can be allotted to potato cultivation, the current area cropped with potato is very small and yield is quite low (Hirpa et al., 2010). There has been efforts made by the government to improve productivity and market performance of potato but the results are not that much promising. This can be attributed to many factors like inadequate technical and managerial production skills, poor contract enforcement (weak institutional framework), imperfections in the marketing chain and very few market related institutions and weak infrastructure (CoQA, 2009). In order to analyze outcomes in agriculture in general, the starting point is the individual farm household unit. This is because outcomes in agriculture fundamentally depend on choices made by producers in allocating their land, labor, capital and other inputs they apply; in selecting crop mixes; and in the technology they select. From the results achieved by farm households, it is possible to scale up the outcome to community level, to the agricultural sector and even to national level (Gabre-Madhin and Haggblade, 2003).

Apart from the production problems, there seem to be institutional problems. Potatoes are sold unpacked, unlabeled which makes identification of quality very difficult. Instead, consumers simply pick those potatoes which are free from any physical damage. Consequently, the system does not reward quality production and value addition and price is almost the same for all types of potatoes. The only difference in price is mainly due to distance between markets or information asymmetry on prices (CoQA, 2009). Therefore, this paper devoted to the value chain analysis of potatoes from the perspective of individual farm households or producer units with the aim of identifying major stakeholders and constraints contributing to low level of potato yield, value chain analysis and come up with possible recommendations for further improvement of potato value chain analysis and yield in the study area.

2. METHODOLOGY

2.1Area description

Chencha Woreda is situated between 1300 m and 3.250m above sea level. It forms the upper rectangular landmass of the highland. The Woreda is bordered by Kucha and Boreda- Abbaya Woredas in the North, Arba Minch Zuria Woreda in the South, Boreda Woreda in the East and Dita Dera Malo in the West. Due to a high altitudinal range, the area is characterized by diverse agro-climatic distribution and vegetation cover. The Woreda is divided into two agro-ecological zones, namely, Dega and Woina Dega, which account for about 82 and 18% of the total area respectively. Due to its rugged topography the highland area is very vulnerable to soil eroding forces. The rainfall regime in the Woreda is bimodal. The first round of rain occurs between March to April. The second round of rain occurs from June to august. The rainfall distribution in Chencha varies from year to year and across seasons. The annual rainfall distribution in the Woreda varies between 900 mm to 1200mm. The minimum temperature in the Woreda varies between 11 to 13 degree centigrade, while the maximum temperature is in the range 18 to 23 degree centigrade. The soils of the Woreda are primarily clay or clay loams which have evolved from volcanic rocks (basalt) and volcanic tuff in the higher altitudes of the study area. The dominant soil color is reddish brown to dark brown. The principal soil types are Cambi sols and Nitosols. Litho sols are specially confined to severely eroded steeper parts of the Woreda. These soils are very shallow and generally agriculturally unproductive (MoA/FAO, 1990). Many small rivers and streams originate from Chencha

highland. However, the main rivers of the highland are Cullufo. Zute, Hare, Gina, Shaye, Basso and Kulano. These rivers are not providing any economic value in the highlands, except eroding away the vulnerable highland soils. But in their lower courses some of the rivers like Cullufo, Hare and Basso provide the life line for irrigation forms of the low land area around Arba Minch.

2.2. Data Types and Sources

In order to address the objectives of the study, qualitative and quantitative data was collected from both primary and secondary sources. The primary data were collected using three types of interview schedule (one for producers and one for traders) other for support organization. A checklist was also used to guide the informal discussion conducted to generate data that cannot be collected from individual interviews. The primary data collected from producers focused on factors affecting potato market supply, size of output, market information, credit access, access to market, extension service, and demographic characteristics of the household, *woreda* Agricultural and Rural Development Offices, zonal and *woreda* Agricultural Marketing Offices, Veterinary Service Center, Agricultural Training and Vocational College, zonal cooperative office, cooperative management, nongovernmental organizations, enterprises, cooperatives and consumers. Moreover, the interview schedule for traders included: types of traders (wholesalers, retailers, local collectors, etc.), buying and selling strategies, source of market information, demographic characteristics. Interview schedule for support organizations was focused on the service they delivered for farmer and trader of potato.

2.3. Methods of Data Collection

The developed questionnaire was first pre-tested before starting the real or actual data collection system then the questionnaire was modified to capture basic data left. This method was used to reduce the unwanted questions from the questionnaire and include some variables, which were not included in the questionnaire, to fit with the existing situation of the study area. Good value chain analysis begins with good data collection, from the initial to the targeted interviews. Both qualitative and quantitative data are required for the VCA. The qualitative data was collected using, questionnaire, PRA tools such as: focused group discussions, Key Informant interview and personal observations.

Subsector Selection Process

Determined and prioritized selection criteria, short-listed subsectors, ranked subsectors using selection criteria and finally selected subsectors was considered for further analysis

Sub Sector Selection Criteria: - Through team discussion, review of other best practices programs, and discussions with different experts. These criteria were assessed based on the desk research, the value chain interviews, and on a more concise basis for a quantitative benchmarking of each value chain in comparison with the others. The criteria were fall under three broad categories: 1) Economic Potential or production potential of the sector, 2) market demand of the sector 3) Feasibility of working with the sector.

2.4. Sampling Techniques

Formal survey was conducted with value chain actors such as input supplier, producer, traders and consumers. To conduct formal survey with producers, two stages sampling method was conducted. In the first stage, four PAs (kebeles) found in the study Woreda Dorze Ayira, Mafuna Zolo, Gedeno and Boyena Tuba were selected randomly. In the second stage using probability proportional to size technique, producers of potato were selected from each selected PA. A total of 124 sample potato producers were selected from the four PAs. In addition to producers, sample respondents were also selected from the other value chain actors on the basis of their size and availability and interviewed based on their respective functions in the chain. By preparing checklist six retailers, four wholesaler and supporting actors were interviewed in the study area. A checklist was also used to guide the informal discussions conducted at different places with wholesaler and retailers out of study area.

2.5 Data analysis

Descriptive analysis employed to analyzed data, use of percentages and means in the process of examining and describing socio economic profile of the smallholder, marketing functions, facilities and services, role of intermediaries, market and traders characteristics. The collected data were analyzed using the value chain framework to reveal constraints within the chain that prevent or limit the exploitation of end market opportunities.

2.5.1. Sub sector selection and analysis

The study started with sub sector selection from the potential commodities produced in the area, to conduct selection the study demand priority index as a criterion to identify potential product. The sub sectors selected primarily on the basis of productivity potential and market potential choosing those that show the most promise for increased growth in the economy. Others may have institutional priorities that mandate a particular focus, such as women or environmental conservation. The scoring was done after analyzing questionnaires collected

from the producers. Informants or available primary and secondary data of the sub sectors were used for further consideration of the sector. Other tools and theories were incorporated into the sub sector selection step as well. By using Priority index (PI) potato selected as the best from other by smallholder than other crops and livestock found in the Woreda.

Priority index (PI) = $\frac{(F1X3) + (F2 X 2) + (F3 X1)}{F \text{ total}}$

F1= Frequency of the first selection
F2= Frequency of second selection
F3 = Frequency of third selection
FT= Frequency of total respondents
Sub sector analysis considered the productivity of the product and its market value in the study area.

3. Rseults

3.1. Household and Farm characteristics

This section discusses the socio-economic characteristics of the sample households in the study area. These socio economic variables include sex, age, religion, marital status, education level, and family size.

3.1.1. Demographic and Socio-Economic characteristics of sample households

The numbers of sample respondents handled during the survey were 124. The age of the sample respondents ranges from 24 to 130 years and the average age of sample respondents were 45.5 years. The working age groups accounts for 61.3%. Majority of the total sample farm households 75% were male-headed and the remaining 25 % were female-headed implying that more of the sample households were male. Regarding their marital status, majority of them were married (92.7%) and few were single (1.6%) and widowed (5.6%). Referring Table 1, around 36.3% of the sample households were illiterate. During the survey, only2.4% of the sample households was educational background above secondary level. With respect to land holding of the respondents, an average size of land holding per household is 0.5ha

3.1.2. Household income and its sources

Rural income generating activities encompass agricultural production (mainly crops and animal husbandry), agricultural and non-agricultural wage employment, non-farm enterprises, transfers and non-labor income sources. The people of the study area practice various livelihood and income generating activities mainly crop production in addition to animal husbandry, handicraft, petty trading and daily labor. Crop production plays a major role in income generation in the area and cereals such as barley and wheat, maize, pulse crops such as bean and pea are the major crops grown. Especially, the area is known for its apple production nationally. The study on focus group discussion revealed that greater number of women engaged in petty trade. This petty trade involves short distance migration to different markets, which take place on different day on the highland and neighboring low lands. Petty trade in the study area is the most laborious but less rewarding activity. It is worth to note that almost all women in focus group discussion involved in cotton spinning for sale for local weavers besides the above off-farm activities. Cotton spinning is almost a tradition and girls begin learning spinning early in their childhood.

3.1.3. Resource ownership

Resource ownership is characterized in terms of livestock, bee colony, land, the types of house owned and plowing tools. The livestock species found in the study area are cattle, sheep, donkey, mule, horse, poultry, and bee colony. About 98.4% of the total sample households had grass roofed houses and that 1.6% of the total sample households had iron sheet roofed house. The average total cattle owned in the Woreda were 2.3. More than 82.1 % of respondents have cow next to oxen 57.3%. Majority of the respondents' livelihood is based on agriculture which is about 69.4 %. However, the remaining 30.6 % of the respondents were engaged in other small business like weaving in addition to agriculture. Land is one of the necessary constraints of the households in the study area. The newly formed households have no option to get their own farmlands elsewhere except sharing from their parents. The study revealed that there is a serious shortage of farm land in the area and the average farm size was 0.51 hectares per household.

3.2. Producers' Access to Business Support Services

Access to services like credit, agricultural extension and market information has vital importance to promote agricultural households' production and productivity which thereby increase marketable surplus and ultimately farm income. For producers, knowing where and when to sell their output is one of the most difficult challenges. If they have no knowledge of current market prices, they can easily be exploited. But gathering current information about markets may not be easy, especially for people living in very remote areas (CTA, 2008). Addressing new challenges requires extension to play an expanded role with a diversity of objectives, which include linking producers more effectively and responsively to domestic and international markets; enhancing crop diversification; coupling technology transfer with other services relating to input and output markets;

poverty reduction and environmental conservation; viewing agriculture as part of a wider set of rural development process that includes enterprise development and non-farm employment; and capacity development in terms of strengthening innovation process, building linkages between producers and other agencies, and institutional development to support the bargaining position of producers (Sulaiman *et al*, 2006). Access to business support services for all actors in the value chain is pivotal to make the chain actors and the market chain as a system competitive so that producers, intermediaries and end users of goods and services can make the best use out of it. In this section support services of extension, credit, input supply and marketing in potato production have been assessed and evaluated by producers.

3.2.1. Producers access to credit

Competitive financial market is a fundamental in undertaking each and every economic activity in order to get the maximum benefit out of the activity undertaken. Formal financial market in most developing countries is not competitive and even nonexistent in the rural areas. About 46.8% of respondents replied that they had access to credit while 53.2% said that they had no access to credit. Formal credit access and sources of the credit for the potato production and marketing in study areas as described were trader, and local money lender. They borrowed money from trader during slack seasons and this situation affected farm gate prices since producers are forced to sell their produce at lower prices for their borrowers which ultimately triggered to lower returns. Even though one micro-finance and one governmental bank are available in the study area no credit is reported by the respondents from formal banks; lack of definite credit service is reputed in the study area. Thus the lack for the delivery has deterred the financial capacity of producers to purchase the necessary input for potato productions. For this reason informal credit system has come up as prevailing feature where producers borrow money from HAB project and trader.

Table 1. Farmers' access and source of credit for potato production and marketing

Variable	Response	Total	Percent
Access to credit service	Yes	58	46.8
	No	66	53.2
Do you take credit in 2011	Yes	39	31.5
	No	85	68.5
Source of credit	Wisdom MFI	4	10.2
	Private lender	10	25.6
	NGO	25	64.1

Source: *Survey result, 2012*

3.2.2. Access to extension service

Agricultural development office provides agricultural extension services to producers 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 producers get extension service on general agricultural activities. Extension service in Chencha Woreda is fully provided by Woreda agricultural departments. Even though three development agents institutionally assigned to work in crop production, animal science and natural resources, the service is hardly imparted on potato to impact on production-consumption task. The failure is also accompanied by lack of technical expertise of the agents which ultimately resulted into death to the right of entry of the service on the theme. The result further highlighted that, learning and knowledge imparting has failed to support households to participate in the value chain. About 96% of respondents replied that they had got extension service while 4 percent's said that they do not receive any advisory from agents.

Table 2 Farmers' access to extension service for potato production and marketing

Description	Percent
Totally no	4
Weekly	42.7
Biweekly	16.1
Monthly	7.3
Once in three month	1.6
Any time	28.2
Total	100

Source: *Survey result, 2012*

According to the assessment, the frequency of extension advising on potato is also considerably lower than other crop. Thus, from all respondents about 42 percent of them are visited once in a week, while 16.1, 7.3 and 28.2 percent's of the respondents are entitled to get extension access only once in two weeks, monthly and any time, respectively while percent's of the respondents reported that they had totally no extension visit. The

assessment has therefore indicated the extension service is largely in favor of other crop production and is delivered unintentionally**.**

3.2.3. Access to market information

Ideally, current market information should be the starting point for any decision regarding next production, post-harvest handling, processing and marketing. Market information is mostly said to be more perishable than the commodity itself. Access to timely and accurate market information is the basic element not only in potato but also other commodity marketing. Tschirley et.al (1995) argued that the existence of information barriers makes unexploited market opportunities, seasonal gluts and producers with inadequate quality specification and control, inequitable returns to producers, pre-harvest losses and fundamentally poor returns to production and marketing system as a whole. The distribution of market information refers to the availability of relevant market information to producers, about demand, supply and price of the crops. The survey result indicates that 79.2% of the households had price information before they sale potato to the nearby market but 20.3% of the interviewed producers do not have access to any information. Most of the producers in the study area access price information through informal means like neighbors/friends, personal observation of market, traders, and other producers and so on. The study found that 46.8% of the respondents get market information from friends/neighbors, 32.3% gets from development agent, 13.7% through personal observation at market and the rest through radio.

3.2.4. Farmer's price setting strategy

The method of price formation is critical importance. Regarding price setting, 31.5 % of them responded that the price is fixed by the market demand and supply of potato and 28.2% and 25.8% of them replied that it is set by the buyer and by negotiation of buyer and seller respectively.13.7% of the respondent set the price themselves. This indicates that the potato traders had fewer roles in price setting. The study revealed that the average selling price of potato in Chencha Woreda is 183 Ethiopian Birr.

Table3. Price setting of producer

Description	Total	Percent
My self	17	13.7
broker	1	0.8
Buyer	35	28.2
Negotiations	32	25;8
Supply and demand	39	31.5
Total	124	100

Source: *Own survey 2012*

With regard to place of selling potato the majority of the producers (50.8%) sell their product in the local market (*Gulit*) and 40.3% of them sell in the Woreda market and the rest (8.9%) sell in both market.

Table 4 market place for selling potato

Market for sale potato	Total	Percent
Village market	63	50.8
Woreda market	50	40.3
village and Woreda market	11	8.9
Total	124	100.0

Source*: Own survey 2012*

3.2.5 Access to road and transport

It is evident that the availability of well-functioning good roads, transport network and commercial vehicles and telecommunication infrastructures are very important. Transport facilities used to create place utilities of the product. As Clemens (1994) stated, transport is an important factor in the marketing channel linked surplus regions to deficit areas. It there by allows producers in surplus areas to profit from better prices on other markets and consumers in deficit areas also to benefit from lower prices from surplus markets. The survey result indicates that 62.9% of the households had access to all weather road but 37.1 % of the interviewed producers do not have access to all weather road. About 44.4 % of respondents use pack animals, 55.6% carry on their back to transport their products to the local market. Transport limitation, no transport service and shortage were reported as a major problem by 54.8% and 24.2 and 21.2 % of respondents, respectively. Majority of the respondents are not member of cooperative association (90.3%).To sell their product 53.3% of the producers used organized market but 27.5 % sell to unorganized market and the reaming 19.4 % do not sell.

3.2.6 Access and use of input

Improved seed is one of the major inputs that affect the productivity and production of crops. The table indicates that the majority of the sample household do not use improved potato seed. Producers respond that the major problem, which affects the productivity and production of their potato, is related to fertility. The study revealed that, about58.9% do not used improved potato seed only 41.1 % of the total sampled household used improved potato seed. The survey result indicated that about 89.5% of the household have an access to agricultural input

where as 10.5% have no accesses at all. The respondents know that using inputs help to improve the productivity of potato and leads to the increase of production and supply. According to the result from the survey, 85.5% of the total sample producers used Urea for potato production while about 87.1% of the total sample households used DAP. During the survey period respondents were asked when they sell. The respondents replied that 89.2% them sold immediately after harvest and 5.9 % sold after few months of storage (maximum 3 months). This indicates that producers have no storage for their product and preferred to sell with prevailing market price immediately after harvest.

Table 5 time of selling potato in the area

Description	Total	Percent
Not sale	22	17.7
Immediately after harvest	92	74.2
One month after harvest	6	4.8
Three month after harvest	4	3.2
Total		

Source*: Own survey 2012*

3.3. Demographic characteristics of traders

The survey result indicates that the sampled traders were on average 42.1 years old. Traders had 8 years of experience on the average. Wholesalers are more experienced, and had much exposure to trade. The survey indicates that 80% of the sample traders were males while 20% of them are females. About 70% of traders were protestant while the remaining was Orthodox Christian. From sample traders 90% were married, and 50% and 30% of the sample traders are within the level of primary and secondary school education, respectively.

3.3.1 Resource ownership of traders

Physical assets: Physical assets related to their business are summarized in Table 9. The survey indicates that 80% of the sample traders reported that they had a separate place of storage while 10% of them indicate that they had store with residence. Traders' average storage holding capacity for such separate store was 33.5 quintal of potato whereas the residence store was 15 quintals. About 74% of the traders store their potato for 4.5 days on average before sale. Only 20 % the total sample traders had land line telephone but 90 %the sampled trader's had mobile phone. On the other hand 80% of the sampled traders have weighing scale in their store.

Financial capital: The study reveals that sampled traders had average working capital of Birr 38,300 in. The working capital of this year varies from 5000 to 125,000. Wholesalers had the highest average capital of Birr 78,750. The finding of the study shows that working capital comes from internal sources and the external finance is extremely limited. About 30% of the sample traders used their own fund. 70% pointed out that they were used personal loan, bank and micro finance. The study also revealed that the interest rate of micro finance institution was very high 12.5% as compared with commercial bank of Ethiopia 6%.

3.4 Potato market channel

According to Mendoza (1995), marketing channel is the sequence of intermediaries through which whole avocado and mango passes from producers to consumers. The analysis of marketing channels is intended to provide a systematic knowledge of the flow of the goods and services from their origin (producer) to the final destination (consumer). Three marketing channels are exhibited in the study areas where all channels remained in the region. According to the survey, Producer-wholesaler-Retailer-consumer channel procured largest volume of products (62.4 percent) followed by Producer-Retailer-Consumer channel which accounted for 40.8 percent of the total potato marketed from the market. The volume that passed through, Producer-Wholesaler-Retailer-Consumer channel has the most important since it accounted the largest marketed volume (62.4%)

I. **Producer----consumer**: This channel represented 7% of total potato (30.75 quintal) marketed during the survey period. This channel was found to be the least important marketing channel in terms of volume.
II. **Producer--- Wholesaler--- Retailer-Consumer**: This channel represented 62.4% of total potato (272.5 quintal) marketed during the survey period. The channel was found to be the first important marketing channel in terms of volume.
III. **Producer--- Retailer----Consumer**: This channel represented 40.8% of total potato (178 quintal) marketed during the survey period. The channel was found to be the second important marketing channel in volume.

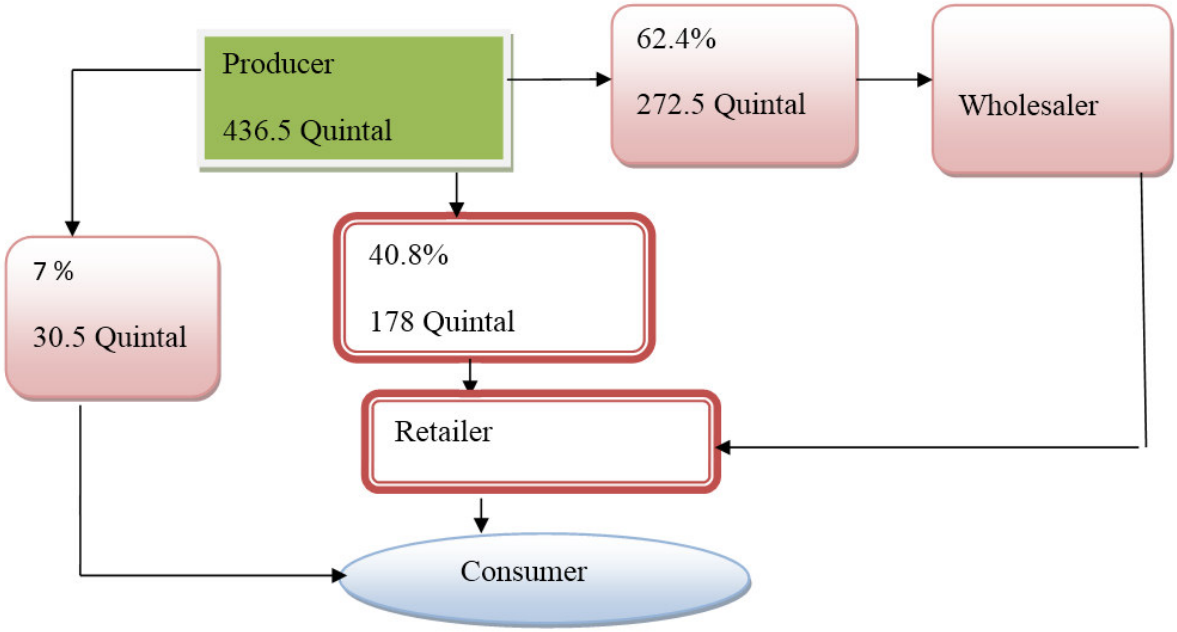

Fig. 1 potato market channel
Source: ***Survey result, 2012***

3.5. Actors in potato value chain and their marketing functions

The focus of value chain framework is developing an effective way of coordinating the hierarchical stages in the value chain to meet consumer demand in an efficient manner. Effective vertical coordination of value chain stages requires partnership, actor interactions, information flow along the chain and coordination of the activities of chain actors. Hence, the competitiveness of a value chain is greatly influenced by the partnership and collaboration for innovation that can be realized by chain actors. Moreover, the development and operation of enabling and supportive business development services (e.g. market information, transport, credit) play critical role in how well the value chain responds to consumer demands. (Anandajayasekeram and Berhanu, 2009). The actors participating in the potato value chain include producer (small scale producers), wholesalers, retailers, input suppliers and exporters. On the Woreda (study area) level the main actors participating in potato value chain are small scale farmer, wholesaler, retailers and supportive actors.

3.5.1 Input suppliers

Producers in the study areas, get improved seed from different sources. For instance, from VITA an international NGO, World vision Ethiopia, office of agriculture and rural development, southern Ethiopian research center. Regarding fertilizers, some producers used only organic fertilizer (manure and compost) while some producers used both inorganic and organic fertilizers depending on the land size allocated to potato and the soil fertility status as perceived by the producers. Potato growers obtained fertilizer from either cooperatives or private traders. Pesticides are supplied mostly by private vendors.

3.5.2 Potato Producers

The next major potato value chain actors next to input supplier are seed and ware potato growers. Most of them in the study area are smallholder farmers having an average potato land size 0.2 hectares. The total number of potato growing farmers in Chencha district according to the information found from MOA, in the year 2012 was 8500. This implies that 40 % of the household in the study area produce potato product for food and cash. Potato growers are the major actors who perform most of the value chain functions right from input supply up to post harvest handling and marketing. The major value chain functions that potato grower perform include ploughing, planting, fertilization, weeding, disease and pest control and harvesting.

3.5.3 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 4 to 18 years with an average of 9.3 years. In the study area potato retailers are very few since most of the time the producers themselves sale their potato to final users like consumer or sometimes to restaurants.

3.5.4 Supportive actor:

Value chain supporters provide support services and represent the common interests of the value chain operators. They remain outsiders to the regular business process and restrict themselves to temporarily facilitating a chain upgrading strategy. Typical facilitation tasks include creating awareness, facilitating joint strategy building and

action and the coordination of support activities (like training, credit, input supply, etc). The main supporters of the potato value chain in the study area are Woreda's Office of Agricultural and Rural Development (OoARD), SARI, MFI, Bank and NGO (world vision Ethiopia and Vita).

3.6 Potato 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. Figure2 shows the potato value chain map in the study area.

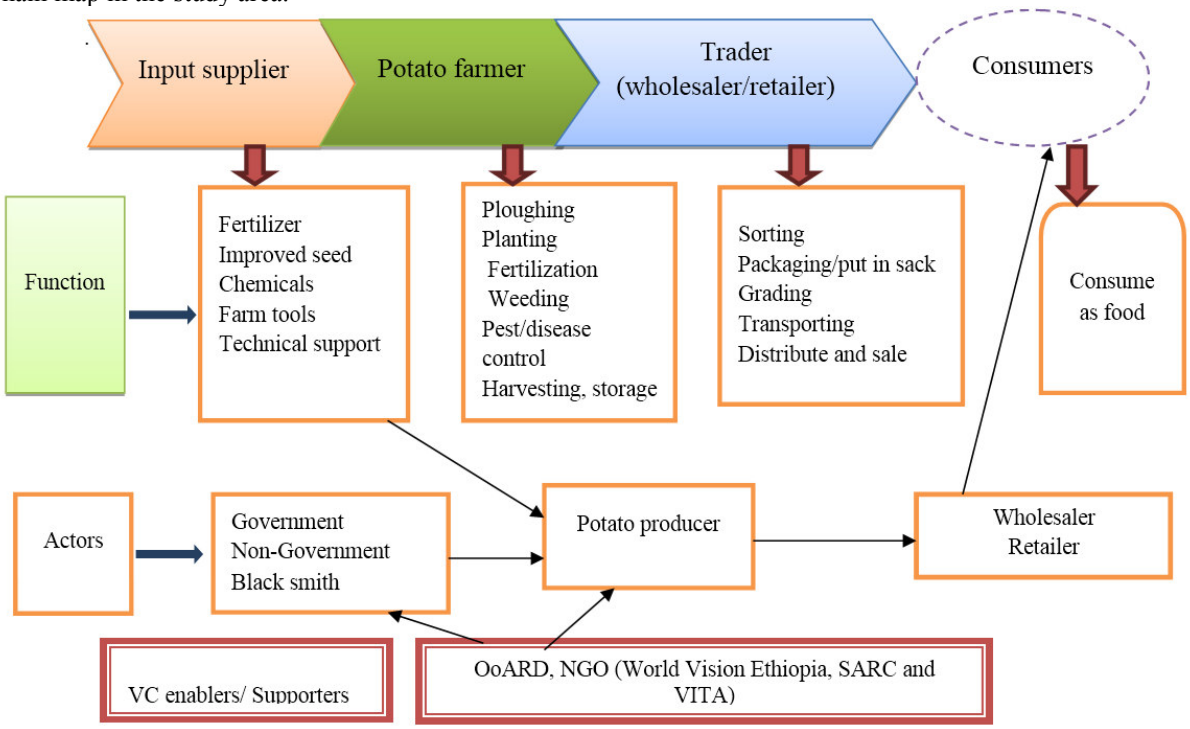

Figure 2 shows the potato value chain map

3.7 Estimating Cost of Potato Production

The major cost items involved in potato production in the study area include: labor cost, seed cost, fertilizer cost, cost of fungicides, oxen rent, and land rent. These costs vary across households depending on the total land size allocated to potatoes and the number of days assigned for pre-harvest practices. Since the production methods used by the households are mainly traditional, most of the pre-harvest and post-harvest practices are done using manual labor and oxen are used for land preparation. The major pre-harvest costs include land preparation, planting, and weeding while the main post-harvest cost comprises cost of harvesting.

3.7.1 Calculation of Gross Margin for actors

Analyzing the economic results from potato production was one of the main research questions of this study. Accordingly, it was found to be reasonable to determine gross margin realized by potato producers as gross margin is a good estimator of economic returns from crop production. Gross margin is determined by subtracting variable costs from the gross revenue. It is not however a measure of farm profit as it doesn't take into account fixed costs.

Table 6. Estimated cost and marketing margin of potato market in channels

Producer	**Birr/quintal**	**Percentage of operating cost**
Operating cost	ETB/Q	
Seed	5	10.9
Fertilizer	20.44	44.5
Chemicals	3.75	8.2
Depreciation cost	2.5	5.4
Labor cost	3.75	8.2
Oxen rent	3.5	8.2
Transportation cost	4	8.7
Marketing cost	2	4.4
Miscellaneous	1	2.2
Total operating cost	**45.94**	
Selling price	80.7	
Producers profit	34.76	
Wholesaler	**Birr/Q**	Percent
Price purchase	**80.7**	
Operating cost		
Transportation cost	20	40
Cost of bags	3	12
Loading and unloading cost	10	40
Miscellaneous expenses	2	8
Total Operating Cost	35	
Total Cost of production	115.7	
Selling Price	237	
Gross Profit	121.3	
Net Profit	96.3	
Retailer	**Birr/Q**	Percent
Purchase price	**237**	
Operating cost		
Cost of bags	3	25
Unloading cost	5	41.7
Labor cost for day to day activity	2	16.7
Miscellaneous expenses	2	16.7
Total Operating Cost	12	
Total Cost of production	249	
Selling Price	325	
Gross Profit	88	
Net Profit	76	

Source: *own survey 2012*

For the purpose of this study, gross margin was calculated as;

Value of Production= Total amount of potato produced* Unit price of potato

Value added= Value of production - Input costs without labor

Gross margin= Value added - Cost of hired labor

Producers incur Birr 45.94/quintal as an operating cost and sale their product with ETB 80.7 /quintal to the wholesaler. As compared with other actors in the Woreda's potato value chain, the cost of potato producers' is much higher and the major share of the operating cost goes to fertilizer (44.5%) followed by seed(10.9%). The result of the study shows that potato wholesaler earn a profit of Birr 106.3/1quintal of potato. This indicates that the performance of marketing of potato wholesaler for the specified year 2011 was showing positive figure and the highest profit per quintal basis. Table 1 also shows transportation, loading and unloading costs take the major proportion both (40%) of the operating costs followed by bag for storage of potato (12%).

3.8 Constraints of potato production

Major constraints of the potato production sub-sector in the study area were identified through review of literature and thorough discussions with key informants such as representatives of concerned government and non-government institutions, wholesaler, retailers, and professionals. Accordingly, some of the principal constraints and problems are discussed below. During focus group discussion the majority of the respondent answered that input supply includes improved seed and fertilizer, storage facility, incidence of diseases that damage their potatoes, climatic variations, and problem of market for their harvested potato and lack of all-

weather road are the major constraints of potato production.

Input supply- Shortage of improved and quality seed potato, which is more serious in the area. 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. Currently the problem is more significant as the rate of fertilizer adoption is the country in general is high. However, with the strengthening of the extension system which aims to double yield to transform the economy, the Potato Value Chain Analysis and Development in Ethiopia fertilizer adoption rate is expected to increase.

• *Production*- Low yield due to inadequate agronomic practices and untimely supply of agricultural inputs such as fertilizer. Farmers cited unavailability of certified seed when it is needed as well as the high cost of seed.

• *Marketing*- Marketing problems cited by producers include high seed potato price, lack of all-weather road in most of the peasant associations, and traders suppressing of potato price. As largest proportion of the producers stress that low price of 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. Producers are generally price takers

Storage facilities

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

- It is recommended to expand DLS in high potato producing areas as per standard DLS design and construction. Through technical support to the producers, cost effective mechanism of expanding DLS should be considered.
- 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 producers can invest in storage facilities if they are well aware of the benefits and could increase their productivity. This requires capacitating producers' entrepreneurship.

Transportation

The road network is not good having a natural hill and mountainous and muddy. Product transportation took different forms, head load to vehicles. Potato was transported from field to market places with head load, animal back, equine and Isuzu. Isuzu was the prominent transporter of both. Isuzu and FSR took potato from many places with limited transport of cart and donkey load minibuses and large buses participated in product transport per each day at peak production seasons. The problem is some peasant associations are far away from all-weather road and not on the position to sale their product with fair price.

Lack of organized marketing channel: There is no well-organized market channel for potato in the Woreda and these results in lack of grading and standardizing of the product, poor quality control, and inadequate and inconsistent supply to the next users in the chain. Distant markets, unreliable transport and inadequate joint efforts in marketing make it difficult for timely delivery of the required volume.

Lack of knowledge and skill on potato production and management: During the survey, it was noticed that the average years of farming experience per house hold is 23.9 years. Though they have been engaged in the sector for long, their knowledge of how to manage potato or post-harvest management is very low.

3.9 Opportunities of potato production in the Woreda

Based on the survey conducted on the status of the Chencha Woreda potato production, it was inspected that it has lots of opportunities and constraints. The opportunities refer to the external favorable conditions that are in favor of potato production and marketing in the Woreda. This includes favorable weather conditions and good strategic location for production of potato. An altitude above 1500 m.a.s is a conducive place for potato production. Regarding the altitude Chencha Woreda has an altitude between 1300 and 3250 m.a.s which is an ideal place for potato production

3.10 Intervention required

- Construct feeder roads by responsible bodies(government , non-government and private investors
- Support community through training to construct cost effective all weather feeder roads
- Train producers on appropriate time of potato planting and varieties used resistance to disease in different part of the study area
- Train producers on appropriate potato management practice
- Creating awareness about seed potato production, sorting, grading, quality control,
- Support Construction of Affordable DLS; establish and introduce potato seed certification and

distribution mechanisms

- Establish seed potato producing producers groups, cooperatives like other crop seed groups.
- Strengthen capacity of research centers engaged in Potato variety development
- Set-up suitable potato seed supply system involving relevant stakeholders;
- Create market linkage between potato seed producers and farmer
- Create linkage between credit institution and farmer
- Teach producers on merits and demerits of using small size potato;
- Advise producers on proper potato seed size to use and demonstrate on producers plot
- 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. This initiated producer to produce more an maximize their income
- Involving the private sector in the enhancement of the processing of potato can result in sustainability of the intervention.

4. Conclusions and Policy Implications

Potato plays a significant role in the country's economy. It is a crop with the highest volume of production among all other root crops and it also covers the largest area allotted to root crops in the country. In Ethiopia, potato is produced by both private peasant holdings and commercial farms. Though the total production by peasant holdings is much greater than that of commercial farms, the yield in commercial farms is greater than the yield in private peasant holdings. This better yield among commercial farms might be attributed to higher level of input use like fertilizer by commercial farms as compared to private peasant holdings.

From the individual producers' perspective, the survey results show that the production characteristic in the study area is characterized by traditional rain-fed agriculture. The average potato productivity (yield) in the study area is 80 quintals per hectare which is below the potential. The producers' data on sub sector selection showed that potato has higher profitability per hectare compared to other crops cultivated in the same season and this is the factor that influenced producers most prefer potato production to production of other crops.

The study result also indicates that input costs like fertilizer cost and seed cost as well as labor cost comprise large share of the total variable costs involved in potato production and value addition. Family labor also plays significant role in the production of potato in the study area.

Therefore, improving yield should be given more attention in the area. This can be achieved through improving the supply and accessibility of modern agricultural inputs like chemical fertilizer to the producers. In addition the current use of high yielding varieties must be duly examined as the use of these varieties seems to affect potato production and yield negatively. Although, the real cause for this negative return from the use of high yielding varieties is not clearly known, possible reasons include lack of proper training of producers on the use of these varieties or disease vulnerability. Therefore, it might be wise to train the producers on the proper use of these varieties on field. The other reason could be soil mining effect but this cannot be proved from the available data as well. Therefore, the current use of high yielding varieties in the study area needs further research. Further more effective soil and water conservation mechanism will be implemented in the near future to compact the serious soil erosion problems of the Woreda.

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