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Market Value Chain Analysis of Potato: Evidence from Southern Ethiopia

Kumala Deksisa[1*] Meaza Biset[2]
1. Department of Agricultural economics and Agribusiness Management, College of Agriculture and Veterinary medicine, Jimma University, Ethiopia
2. BSc Student Department of Agricultural economics and Agribusiness Management, College of Agriculture and Veterinary medicine, Jimma University, Ethiopia

Abstract
For Debub-Bench Woreda smallholder potato producers, potato has significant contribution for consumption at home and in generating cash income. Therefore, enhancing potato farmers' access to market and linking them to most beneficial outlets is a key issue needed. Data were collected from both primary and secondary sources. Primary data was collected from randomly selected 94 farm households and 22 traders. Potato market chain actors in the study area include input suppliers, producers, retailers, wholesalers, processors and consumers. Five potato marketing channels were identified in the study area with major share of volume of potato marketed going through producers to retailers and to consumers channel. Lack of irrigation facility, disease and pests, high input cost, weak extension services, delay of fertilizer distributions, poor quality seed and adverse weather condition are production constraints identified in the study area. Low output price, poor road infrastructure, limited credit services, shortage of capital, lack of continuous supply throughout the year, and high transportation costs are marketing constraints hindering potato value chain development in the study area. Based on the findings government and other stakeholders need to focus on strengthening improved seed access, strengthening rural urban infrastructure, expanding accessibility of market, improving land management practices and improving productivity through strengthening extension service in order to accelerate market chain development.
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1. INTRODUCTION

1.1. Background of the Study

Agriculture plays an important role as the primary source of food and income for the poorer sections of the population (Tassew, 2014). In Ethiopia, agriculture is the most important sector which accounts 46% of GDP, 80% of export value and about 73% of employment(Aklilu, 2015).But according to NPC (2016), agriculture accounts 38% GDP, 80%of export value and 72% employment opportunity.

Vegetable production plays important role in poverty alleviation through employment generation, improving the feeding behavior of the people, creating new opportunities for poor farmers. Since the labor to land ratio of vegetable cultivation is high,its production and marketing allows high productive employment. Due to the nature, bulkiness and perishable of the product, the marketing demand of potato in day to day operation becomes raise. Increasing horticultural production and marketing thus contribute to commercialization of the rural economy and create many off-farm jobs (Weignberger and Lumpkin, 2005).

Potato *(Solanumtuberosum L.)* popularly known as 'The king of vegetables', which is the fourth most important food crop after maize, wheat and rice in worldwide (Ayalew, 2014). The percentage of vegetables consumed at home at country level is more than that of cereals and pulses and at least for once the consumers can eat potato. The reason for increasing consumption level of potato is due to increasing demand of the consumer, increase population growth, growth in fast food restaurants and consumers perceive potato as a healthy food (Gildemacher *et al.*, 2009). According to CSA (2012) report about 79 percent, 18 percent and nearly 1 per cent of the vegetables produced were used for household consumption, sale and seed respectively. From this potato cover about 64%, 20% and 14% were used for consumption, sale and seed respectively. The average composition of potato is about 80% water, 2% protein, and 18% starch(Tadele *et al*., 2015).

As compared to cereal crops the mean price received by farmers for their crop sales becomes low which is 2.1(birr/kg). The total revenue from sales among growers by crop was 154.0(birr/year) and most of the cereals, pulses, oilseeds, vegetables, and root crops, over 90% of the sales were at local markets. Potato was sales at 16% of their produce is sale at on farm and 83% was sale at local market and the remaining 1% was sale at others (Minot and Sawyer, 2013).

In Ethiopia, root crops covered nearly 13.12% of the area which is the third in terms of the area of land for crop cultivation next to cereal which cover 61.51% and pulse of 20.67%. As compared to other root crops, potato accounted for 81.74% and 83.66% of area cultivated and production respectively (CSA, 2015). Potato is

regarded as a high potential food security crop due to its generating more employment in the farm economy, its ability to provide high yield of high-quality product per unit input with a shorter crop cycle (mostly less than 120 days) than major cereal crops(Ephrem, 2015). Potatos are a carbohydrate-rich, high source vitamin C, vitamins B_1, B_2 and B_6 and minerals such as potassium, phosphorous and magnesium and energy-providing food with little fat (Haverkort *et al*., 2012).

Ethiopia is one of among the ten African countries with the largest area allocated for potato production (Gildemacher *et al.,* 2009). The production of potato in Ethiopia was increase from time to time (year to year). From a total area of 67,356.84 hectare covered by potato 7,849,934 quintals was produced, with average yield 117.61Qt/ha in Meher season in 2013/14 (CSA, 2014) and from a total area of 67,356.84 hectare covered by potato, 9,218,320.70 quintals was produced, yielding 136.85 Qt/ha in main cropping season in 2014/15 (CSA, 2015).

Transforming the subsistence-oriented production system into a market-oriented production system is a way to increase the smallholder farmer's income and reduce rural poverty in developing countries including Ethiopia (Aman*et al*., 2014). The Ethiopian agricultural output markets are characterized by inadequate transport network, inadequate capital facilities, lack of access to market, high handling costs, inadequate market information system, weak bargaining power of farmers, lack of procurement of credit and lack of awareness about marketing trend(Kinde, 2007 and Arneja*et al.,*2009).

According to Bezabih and Hadera (2007), production of horticultural crops is seasonal and price is inversely related to supply. During the peak supply period, prices decline and vice versa. Due to perishability of the products and poor storage facilities, the price of potato becomes low price, unstable price and unreliable market. The marketing aspect of vegetables are characterized by seasonal surpluses and shortages which in turn affect the marketing behavior of producers, traders and consumers. That is it cannot attain the wasingness of both producers, traders and consumers without use of efficient marketing system even if there is an increase in supply (Jemma, 2008).A good marketing system is not limited to stimulation of consumption, but it also increased production by seeking additional output (Schulte, 2013).

The increasing production and productivity is nothing for profitability unless reasonable market price exist for potato yield.Majority of smallholders potato growers have no market access. Even though smallholder potato growers could obtaine high yield from their farm but their yield is influenced by market price and brokers (Basha, 2016). The supply of potato is neither sufficient nor constant to satisfy the demand of the market at both market outlets (Mahlet*et al.,* 2015and Kumilachew, 2016).The market performance of the potato crop is still low due to lack of improved varieties, poor seed supply systems and all most all seeds and outputs are exchange in informal seed market (Gumatw*et al*., 2016).

Lack of well integrated market system, failure of farmers to get information on the markets through long distances and lack of access to village market arrangements seemed to lock out many of them from making decisions to enter the potato market to sell. The nature of the product on the one hand (bulky product, costly to transport, low dry matter concentration, difficult to store potato tubers, very sensitive to many pests and diseases) and lack of properly functioning marketing system on the other, often resulted in lower producers' price (Christopher et al. 2014).

A number of studies carried out in different regions of the country on potato value chain regarding mapping of actors, marketing margins, gender role, opportunities and constraints, factors affecting participation, and extent of participation of farmers in the value chain, and the likes (for example, Bezabih, 2008; Addisu, 2016; Habtamu, 2015; Getachew, 2015; Abraham, 2013; Bezabih and Mengistu, 2011). In this regard, potato market chain analysis has become an interesting process that has not been undertaken as well in the study area. Therefore, this study aims to bridge the prevailing knowledge gap in the study area through understand and resolve the problem of potato market; to identify market chain actors and their roles and factors that affect the production and marketing activity of potato in the study area.

3. RESEARCH METHODOLOGY

3.1. Description of the Study Area

Debub Bench district is located at southern part of Ethiopia in Bench Sheko zone of south nations nationalities regional states (SNNRS). The capital town of this district is Debrework town, which is located at 592.5km from Addis Ababa and 867.5 km from Hawassa. The district is bordered with Aman-Mizan to north, Gurafarda district to the South, Shewa bench district to the east and Sheko district to the west. The district has a total of 25 rural and 2 urban kebeles of the total district population of 132,535 about 66,037 were males and 66,498 were females. Among the total 121,357 rural agricultural households were 58,634,62,723 male and female's population respectively, and 11 honey where urban households were, 7403 male population and the remained 3775 were female's population (CSA, 2013).

The district has a total area of 255,099 hectare and is situated 6.73'to 7.01' latitude and 35.37 to 36.7' longitude. From the total area, cultivated land, grazing land, forest area, water body, bushes and shrubs, artificial

forest, and others account 77,698, 9,375, 15,243, 576, 2,475, and 583.31, 73,874.16 hectares, respectively. The district's altitude ranges from 501 to 2500m. The district has three ecological zones; 5% lowland (kola), 80% medium altitude (Woynadega) and 15% highland (dega). The annual rainfall of the district ranges from 1801-2000mm.the temperature varies as of the agro-ecological zones from 15°c -25°c.

3.2. Data Types, Sources and Method of Data Collection

The study was conducted based on both primary as well as secondary data. The primary data was collected by using formal survey from one for from four rural potato producing *kebles* the other from potato traders and consumers at different level and informal survey through Rapid Market Appraisal (RMA) technique like focus group discussion and key informant interview was used with checklists. Relevant data was collected from different market actors to meet the objective of the study.

Independent questionnaires was designed for both potato producers, traders and consumers. Semi-structured questionnaires and personal interviews was used to collect the data. Before the data collection, the questionnaire was pre-tested on four or five farmers to evaluate the appropriateness of the design, clarity and interpretation of the questions, relevance of the questions and to estimate time required for an interview. Enumerators who have college diploma working in the district rural area as development agents was hired and trained about the objective of the study and on the techniques of data collection. The questionnaire was covered different topics in order to capture relevant information related to the study objectives.

Secondary data was also be collected from different sources, such as: government institutions, the district agricultural office, zone and district marketing and cooperative office, of small scale trade and industry, reports, bulletins and websites. Published and unpublished documents was extensively reviewed to secure relevant secondary information.

3.3. Sampling Procedure and Sample Size Determination

Two stage sampling procedure was used for the selection of sample household heads. Debub-Bench District was purposively selected from Bench-Sheko Zone. At the first stage, with the help of district agricultural experts and development agents four potato producing Kebeles was selected from twenty five rural kebeles in the district through random sampling method. In the second stage, from the list of households who are potato producers in the two kebeles, 94 sample respondents from potato producers was selected randomly using probability proportionate size. The sample size was determined following a simplified formula provided by Yamane (1967). Accordingly, the required sample size at 95% confidence level with degree of variability of 5% and level of precision equal to 10% was used to determine a sample size required to represent the population.

Based on the number of potato traders in the district; if their number is small, i was use all traders but if the number of traders is large, sample respondents was selected randomly during the survey period.

3.4. Methods of Data Analysis

3.4.1. Descriptive statistical analysis

This method of data analysis refers to the use of ratio, means, percentages, variances and standard deviations in the process of examining and describing marketing functions, farm household characteristics, role of intermediaries, market and trader's characteristics.

4. RESULTS AND DISCUSSION

This chapter presents the findings of both descriptive and econometric analyses. Descriptive statistics was employed to describe and discuss the socio-demographic characteristics of sampled farm households, traders and consumers, marketing channels, and the role of the actors in the marketing chain in the study area.

4.1. Descriptive Statistical Analysis

4.1.1 Socio-demographic characteristics of potato producers

Out of the 94 sample respondents 123 (94.6%) were male headed and the rest 7 (5.4%) were female headed. The distribution of marital status 117(90%), 9(6.9%) and 4(3.1%) were married, divorced and widowed respectively. According to the survey result, about 101(77.6%) of households have their own transport facility and about 29(22.4%) have no transport facility. Moreover, the result shown that the main means of transport were pack animal and animal cart. Due to lack of accessibility of road there is no vehicles to transport potato either to the district market or to other markets. So, availability of well-functioning transport network to the district is very essential because it creates place utilities of the product.

Table 1: Characteristics of sampled producers (dummy and categorical variables)

Variables	Response	Frequency	Percent
Sex	Female	7	5.4
	Male	83	94.6
Ownership of transport	Yes	80	77.6
	Pack animal	77	59.2
	Animal cart	18	13.8
	Both pack animal and animal cart	6	4.6
	No	14	22.4
Marital status	Married	72	90.0
	Widow	4	3.1
	Divorce	9	6.9

Source: Own survey result, 2022

Regarding family size the mean family size of sample households was 3.78 with the minimum and maximum family size of 1 and 7.2 respectively. With respect to the educational level, the mean educational level of households was 0.46. This implies that all most all of the producers are illiterate. The level of potato production experience is taken to be the number of years that an individual was continuously engaged in potato production. The average years of experience for potato production for the entire sample households was about 32.92 years with a standard deviation of 9.62, the minimum and maximum years of experience was 10 and 50 years respectively. This may show that potato production started in the district about many years ago.

The average land size of respondents was 0.89 hectares (Table 3). The minimum and maximum size of landholding of the producers was 0.5 and 1.5 hectares respectively. Out of the total land, the respondents allocated most of their plots for potato production as their cash crop which was an average of 0.47 hectare. The minimum and maximum size of land allocated for potato production was 0.25 and 1 hectares respectively.

Table 2: Characteristics of sampled potato producers (Continuous variables)

Variables	Mean	Std. Dev.	Minimum	Maximum
Family size	3.78	1.43	1	7.2
Education (years of schooling)	0.46	1.39	0	8
Experience in potato farming (years)	32.92	9.62	10	50
Farm size (ha)	0.89	0.25	0.5	1.5
Land allocated for potato (ha)	0.47	0.18	0.31	1

Source: Own survey result, 2022

Input utilization:

Inputs used by farmers of the study area was fertilizer (urea, DAP and compost), seed and pesticides. These inputs are supplied to farmers either by the market or agricultural experts. During the survey period, 88(67.7%), 9(6.9%) and 33(25.4%) of producers were used local varieties, improved varieties and both local and improved varieties respectively. Due to high incidences of bacterial wilt traditionally known as *aselel* and potato late blight the production of both varieties in general and improved one in particular becomes decrease in the study area. Since most producers used seeds either own production or from market, the level of production becomes decrease. This result is in line with Emana and Nigussie (2011) and Gildemacher *et al*. (2009) when producers were taken seeds from either own stock or bought from other farmers, the accumulation of seed through disease become higher and resulting low yield and quality. So, if this disease is not controlled can cause 100% crop loss in the rain season (FAO, 2007). So efficacy use of fungicides/pesticides and use only healthy seed can reduce the problem of late blight and bacterial wilt respectively.

Table 3: Use of inputs and its sources by sample potato producers

Variables	Response	Frequency	Percent
Seed used	Local	88	66.7
	Improved	9	6.9
	Both	33	25.4
Source of it	Own seed	32	24.6
	BoA	9	6.9
	Market	3	2.3
	Fellow farmers	15	11.5
	Both own and BoA	29	22.3
	Both own and market	42	32.4

Source: Own survey result, 2022

Table 5 illustrates that about 16.2% of sample respondents don't apply chemical fertilizers in potato production due to lack of money. However, 83.8% of the sample respondent use chemical fertilizer at a varying

rate. About 45.8% of the respondents used pesticide for potato production from private vendors while 54.2% did not use it. Even if 195kg DAP/ha and 165kg urea/ha are recommended to increase the production of potato in rainfed type of agriculture as stated in AADO (2017) and Admasu *et al.* (2016), farmers in the district who used fertilizer on average use 135.78kg DAP/ha and 115.53kg urea/ha which is less than the requirement rate. Since a proper application of recommended farm input is important to obtain more amount of production and marketable supply, producers in the study area did not use the required amount at right time due to lack of money to purchase, absence of input at a right time and lack of credit.

Table 4: Amount of inputs used by sample potato producers

Variables	Observation	Mean	Std. Dev.	Min.	Max.
Amount of DAP used in kg	109	63.82	27.62	25	125
Amount of urea used in kg	98	54.63	21.09	25	100
Amount of compost used in qt	122	14.77	4.73	7	25
Amount of pesticide used in liter	59	3.76	2.23	1	6

Source: Own survey result, 2022

Farm households cash income and its sources

Potato producers in the study area practice various income generating activities like animal husbandry and animal fattening in addition to crop production. From the total sample households, the average annual cash income generated from selling of other crops, livestock, non/off-farm activity and potato were 4119.62, 3980.77, 633.85 and 6838.66 birr respectively. From this we can see that potato production in the study area becomes the main means of income generating activity to district producers.

Table 5: Source of cash income by sample producers in 2021/22(birr)

Source of income	Mean	Std. Dev.	Min	Max
Other crops	4119.62	2089.61	500	9000
Livestock	3980.77	2201.17	300	15200
Non/off-farm activity	633.85	1460.94	0	6000
Potato	6838.66	3406.51	1500	14500

Source: Own survey result, 2022

4.1.2. Access to institutional services for farm households

The frequent use of institutional services like credit, agricultural extension and market information has vital importance to promote agricultural production and productivity which thereby increase marketable surplus and ultimately increase farm income.

Frequency of extension contact and amount of credit received:

Table 7 illustrates that out of a total potato producers sample households, the mean extension contact frequency provided for potato producing farmers was found to be 2.17 day/month with standard deviation of 1.27 in the year 2016/17 production year. The extension services provided about potato production, input use (fertilizer, compost), product storage, seedling raising, and product marketing.

Table 6: Frequency of extension contact and amount of credit received

Variable	Mean	Std. Dev.	Min	Max
Extension contact per month (days)	2.17	1.27	0	4
Amount of credit received (birr)	458.08	1004.08	0	4500

Source: Own survey result, 2022

Since potato production requires high cost, farmers in the study area are wasingness to take credit but due to lack of credit access they did not take in the area and 80.2% of the respondents reported access to credit as a problem in 2021/22 production year. About 19.8% of the respondents reported that they took credit from their relative, friends and traders (wholesalers) in the form of cash. The mean credit received was found to be 458.08 birr with standard deviation of 1004.08. The main reason on which producers could not take credit was due to limited supply of credit (71.5%), short payback period (13.1%) and high interest rate (13.8%). Catherine (2008) said that, access to financial services in particular to funds for crop production is a limiting factor that slows down input use and output marketing.

Table 7: Purpose for taking credit and reasons for not taking credit for potato production

Variable	Response	Frequency	Percent
Credit taken	Yes	26	19.8
	No	104	80.2
Purpose for take credit	To purchase fertilizer	11	42.4
	To rent land	3	11.5
	To purchase seeds	5	19.2
	To purchase transport animals	1	3.8
	To hire labour	6	23.1
Reason do not take credit	No service nearby	93	71.5
	Short payback period	17	13.1
	High interest rate	18	13.8

Source: Own survey result, 2022

Distance to the nearest market and development center:

Distance from producer's house to nearest market also the factor which may determines producer's potato supply to the market. As observed from Table 9, potato producing farmers travel from 30 to 200 walking minutes with an average walking minutes of 109.23 to reach the nearest market center. The sample producers in the study area travels average walking minutes of 45.31 ranging from 20 to 90 walking minutes to reach development center.

Table 8: Distance to nearest market and development center (in walking minutes)

Variables	Mean	Std. Dev.	Min	Max
Distance from nearest market	109.23	46.13	30	200
Distance from development agent	45.31	16.05	20	90

Source: Own survey result, 2022

Access of market information:

Access to agricultural marketing information are essential factor in encouraging competitive markets. A reliable market information help farmers to sell their potato produce freely by interacting with traders and can choose a profitable mode of transaction or channels to get better benefit. As indicated in Table 10, about 51.5% of sampled producers had no access to market information and 48.5% had access to market information from different sources. There is no adequate and organized flow of information about potato market to potato producers of the study area. The major source of market information for those producers were personal observation, other farmers, traders and combinations of these sources. The type of information provided were about output price information for 74.6% of respondents, about market channel option obtained by 9.5% of respondents and about time of sell obtained by 15.9% of respondents. Generally, sample producers reported that due to lack market access and linkage in the district as well as lack of reliable market information, the power on deciding the price of potato becoming low and as a result the income getting from sale of potato being low as compared to the effort they made in production of potato.

Table 9: Access and sources of market information for respondents

Variables	Response	Frequency	Percent
Access to information	Yes	63	48.5
	No	67	51.5
Types of information	Price information	47	74.6
	Market channel option	6	9.5
	Time of year to sell	10	15.9
Where you get information	Through personal observation	67	51.5
	From other farmers	40	30.8
	From potato traders	10	7.7
	From both farmers and traders	13	10

Source: Own survey result, 2022

4.2. Potato market chain actors and their roles

The actors participated in potato market chain in the study area were input suppliers, smallholder farmers, retailers, wholesalers, processors/hotels and consumers.

Inputs suppliers:

Agriculture market chain analysis begins from the input supply level. The availability of input at the right time and at the right place is crucial for farmers to increase production and market supply. The main source of input suppliers to farmer in the district were woreda agricultural office, traders and informally from farmer to farmer exchange. They provide seeds, fertilizers, pesticides and farm implements. Majority of sampled producers used seed from own produce and market (wholesalers). Traders (wholesalers) buy seed from other traders from other

district and sell to district producers. There is no specialized seed supplier in the study area. Regarding fertilizers, potato growers obtained either from market or development agent. Due to lack of input (fertilizer, seed and pesticide) credit from extension office, majority of the sample producers obtained the inputs through purchase even if the amount is small. Since the annual income of the producer depend mainly on potato production, the purchasing power was reported as low even if there is wasingness for using inputs if supplied at right time.

Producers:

Potato growers are the major actors who perform most of the market chain functions right from land preparation, application of inputs, disease controlling, produce and store and deliver the product to the market. Since the product is highly perishable in nature, some producers were sell immediately after harvest. Due to lack of transportation facility and road accessibility, farmers mostly sold potato on the woreda market and sometimes on village market by themselves using pack animals and animal cart.

The producer produce potato product for both consumption and market by means of rainfed system only. They sell their product to wholesalers, retailers, processors and final consumers in woreda market but they sell only to retailers and consumers in village market. Sole cropping is the most popularly practiced production system in district potato producers. Only 38.5% of sample respondents were produced potato by inter cropping with other crops when farmers have less than or equal to 0.25 hectare. Producers used basket '*Kirchat'* and grass boxes (*kuna*) for collection and used polythene sacks and sisal sacks to deliver the product to the market. There is no scientific measurement unit for price setting mechanism between farmers, traders and consumers rather they use only visually observing size of the sack.

Wholesalers:

These were those participants of the marketing system who buy seeds from other traders those who live in other district and sell to the district producers. Wholesalers are one of the major actors who supply seeds to farmers even though the distance of the market center from producer is relatively far. Sometimes, wholesalers give seeds on credit basis for some farmers in order to obtain the produce from them latter. They also buy the potato produce directly from farmers, especially in time of surplus market like on Friday (the main market day in the district) and resale to retailers in deficit time (in other market days on which the incident of farmer becomes low). As compared to other traders wholesalers have a better financial, information and storage facility. All wholesalers have a warehouse to store potato either self-owned or on rental basis. They are four in number who are licensed to perform wholesaling activities in Debub-Bench district.

Retailers:

Retailers buy potato most of the time from producers and sometimes from wholesalers to sell the product to processors and consumers. Since in the study area potato retailers are large in number (both licensed and unlicensed) and most of the time retailers purchase the product directly from producers. Village retailers only buy from producers and only sell directly to consumers but woreda retailers buy from both wholesalers and producers and sell to consumers and processors. When they purchase potato product from wholesalers some retailers get on credit base due to limited working capital. In this regards retailers have the opportunity to take the amount they demand and were expected to pay back at the end of one or two market days depending up on the speed they sell. Beside buying and selling potato product they often sell fertilizers to potato producers. They perform numerous marketing functions including buying, repacking, sorting and selling.

Processors:

They buy potato mostly from farmers and retailers in their surrounding and sell processed potato to consumers. They perform several value addition activities such as buying, processing and selling to end consumers through converting the fresh product to cooked one. Mostly in the district area potato is commonly consumed in the form of boiled potato and in sauce form. Mainly daily laborers and students consume potato from processors.

Consumers:

Consumers are the last link for potato market chain. Consumers for this particular study mean those households who directly buy, process and consume potato at their home and also those who consume from processors. They buy most of the time directly from farmers and retailers and also cooked one from processors. That is they bought the product for their own consumption purpose only. They have their own quality criteria to purchase potato product.

4.3. Potato market channels

The analysis of marketing channels is intended to provide information on a flow of the goods and services from their producer to the final consumer. The total quantity of potato produced by sample producers was about 5145 quintal from this 2655 quintal was supplied to the market. The main potato marketing channels identified from production to end consumption were:

Channel I: Producers ⇒ Consumers = 718qt (27.04%)

Channel II: Producers ⇒ Processors ⇨ Consumers = 234qt (8.82%)

Channel III: Producers ⇒ Retailers ⇒ Consumers = 939.75qt (35.40%)
Channel IV: Producers ⇒ Retailers ⇒ Processors ⇒ Consumers = 313.25qt (11.79%)
Channel V: Producers ⇒ Wholesalers ⇒ Retailers ⇒ Consumers = 450qt (16.95%)

As can be observed from figure 3 below, the main receivers from producers were retailers, consumers, wholesalers and processors with percentage share of 47.19%, 27.04%, 16.95% and 8.82% respectively. Therefore, channel comparison was made based on volume that passed through each channel. Accordingly, from a total amount of potato supplied to the market the largest and the lowest volume of potato passed through channel III and IV respectively. In the district the flow of potato was more concentrated mostly on retailers and consumers and less on other actors (wholesalers and processors).

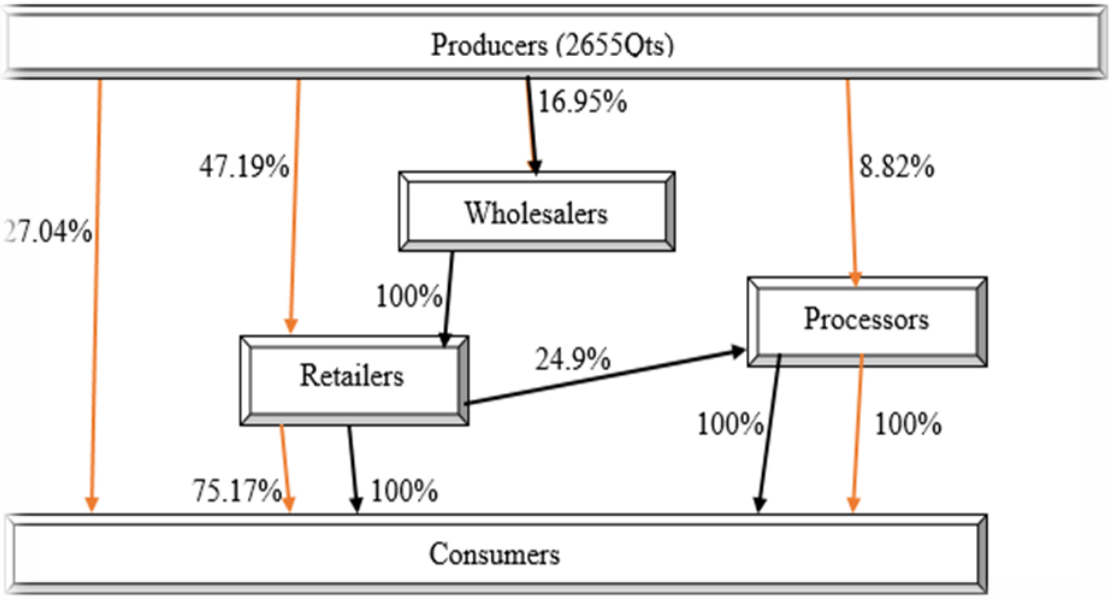

Figure 1. Potato market channel
Source: Own sketch from survey result 2022

4.3. Problems Faced by Market Chain Actors

During the survey period, the presence of disease and pest like bacterial wilt (BW), late blight or snow (*aselel*), lack of new disease resistant seed variety, lack of credit and lack of insecticide/pesticides are considered as the major problems which hinder the production of potato by sample potato growers. A rise in price of fertilizer together with limited access to credit resulted low productivity and marketed surplus. Furthermore lack of market access, high market distance, lack of transportation and perishability is the major factors which affect farmers for deliver their product to the market.

Table 11: Constraints faced by potato producers during production and marketing

Production constraints	Freq.	%	Marketing constraints	Freq.	%
Disease and pest	87	83.84	Lack of transport	68	74.61
Lack of seed	86	79.23	Lack of market	86	86.15
Lack of pesticide	78	65.38	Market distance	83	81.53
Lack of credit	65	75.38	Perishability	76	68.46
Fertilizer shortage	61	63.07	Low price	71	63.07
Lack of market access	54	60.76	Low consumer demand	62	39.23
Lack of storage	51	54.61	Product bulkiness	68	56.15

Source: Own survey results, 2022 Where Freq. = frequency and % = percent

The survey result in table 12 showed that lack of: market infrastructure, storage facility, government support, credit and working capital and competition of unlicensed traders were the major factor which affect potato traders. Due to lack of road and transportation facility traders' sale potato even at a lower price in the district market. Moreover, supply shortage, perishability and high price of the product were considered as main problems by consumers.

Table 12: Constraints reported by potato traders and consumers

Constraints of traders	Freq.	%	Constraints of consumers	Freq.	%
Problem of credit	17	77.3	Supply shortage	18	90
Inadequate market infrastructure	21	95.5	Income shortage	3	15
Problem of price setting	10	45.5	Lack of storage	8	40
Competition of unlicensed traders	16	72.7	High price	12	60
Problem of storage	21	95.5	Perishability	15	75
Lack of demand	6	31.8	Lack of information	10	50
Problem of information	16	72.7			
Lack of gov't support	20	90.9			
Lack of capital	18	81.8			
Problem of seasonal supply	18	81.8			
Farmer reluctance to sell when price is low	5	22.7			

Source: Own survey results, 2022 Where Freq. = frequency and % = percent

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary and Conclusion

Debub-Bench is a potential for potato production and the crop is used as a source of household consumption and cash income for Debub-Bench district rural households. Even though potato has significant contribution for home consumption and cash income crops in the study area, their production is experienced by lack of properly functioning marketing system. Due to this fact, this study was aimed at analyzing market chain of potato in Debub-Bench woreda with a specific objectives of identifying the existing potato marketing chain actors and their roles.

The major actors of potato market chain in the study area were input suppliers, producers, collectors, wholesalers, retailers, consumers and supportive actors. Input suppliers' function were supplying seed, fertilizers, herbicides/pesticides and farm implements. Producers perform all activities right from land preparation and acquiring inputs to the harvesting and marketing of the product. Traders (local collectors, wholesalers, and retailers) perform activities such as assembling, retailing, transporting and selling to regional markets.

The major actors involved in marketing of potato include input suppliers, producers, wholesalers, retailers, processors and consumers. From a 5145qt of potato produced by sample producers about 2655qt (51.6%) was supplied to the market through five channels. Mostly producers sell more of their produce to retailers and consumers and less of them to wholesalers and processors. Moreover from five channels, major share of potato was goes in channel III (producers-retailers-consumers).

The major production and marketing constraints were also identified in the district. At households' level, the major production constraint were: disease, lack of credit access, shortage of insecticide/pesticide, fertilizer shortage, lack of storage and shortage of good quality seed. In addition to production constraint there are a number of marketing constraints farmers faced. These are: lack of market access, high market distance, perishability, lack of transport, low price and bulkiness of product. At trader level, lack of market infrastructure, competition of unlicensed traders, problem of storage, lack of government support, lack of capital, seasonality in supply and lack of credit are the major problems identified. At consumer level; supply shortage, perishability, high price and lack of information are the major factors which hinder the consumption level of the consumers.

5.2. Recommendation

Based the findings of this study, appropriate recommendations which would benefit producers and other market chain actors to design appropriate approaches to develop potato market chain are made. The recommendations would also equivalently help government or all interested to develop appropriate interventions to realize equitable benefit among the market chain actors.

To start with, Even though potato is significant contributor in food security and source of cash income for study area potato producers, producers in the study area are small-scale and unorganized. So, it need government intervention through development of farmers' cooperatives as well as developing linkage among market chain actors to improve production, access to information and to minimize low price received by producers. Not only does it require but also application of recommended chemical fertilizer rate, controlling disease and pest practice, development of improved varieties and improve credit access in the district should be promoted by extension service to increase both in production and market supply of potato.

The survey also revealed high inputs cost and delay in distribution. To increase quantity supplied to the market both production and productivity should improve. To enhance production and productivity of potato,

producers should get right types of inputs at the right time and at reasonable prices. Hence, efforts should be made to distribute quality inputs, fertilizers and chemicals timely at affordable prices.

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