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Ware Potato Value Chain Analysis in West Showa Zone, Central Ethiopia

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Abstract
Ware potato plays a multiple and important roles in local food systems and for food security; however due to the prevalence of production and marketing constraints, the crop haven't supply majority of its advantages. Thus, the study was conducted in order to link the farmers to the needs of consumers, working closely with suppliers and processors to produce the specific goods required by consumers. This research attempted to analyze the value chain of ware potato in Ambo and Dendi districts, Ethiopia in the cropping year of 2014/15. Data were collected both from primary and secondary sources. Primary data were collected from a total of 227 sampled respondents and were interviewed randomly from both districts. Descriptive, inferential and value chain map was used as a means of data analysis. The study result revealed that there were actors involved from input supply to end markets, who were participated directly or indirectly in the value chain. Direct actors were owners of the product taking risk in the chain: basically buying from other actors, processing and selling the product to the next actors; indirect actors are those that provide financial or non-financial support services to direct actors. From the study results it is possible to conclude that, there were potential conditions for ware potato production in the study areas and many actors involving in the value chain; however, the sector need integrated supports as the value chain was constrained by different production and marketing problems.
Keywords: - Ware potato, Actors, Value chain analysis

INTRODUCTION

Ware potato plays a multiple and important roles in local food systems and for food security in that ware potato is a tuber crop that well suited for the cultivation in environmental conditions where other crops may fail; and it's short and flexible vegetative cycle makes it well suited for rotation with other major crops, such as wheat, rice, maize or soybeans (FAO, 2008). Ware potato also represents an important source of energy, with a high delivery of energy per unit land, water and time and as a source of minerals and vitamins for the diet (Anderson *et al.,* 2010). Nutritionally, the crop is considered to be a well-balanced major plant food with a good ratio between protein and calories.

Ethiopia has the highest potential for ware potato production of any country in Africa, with 70 percent of its 13.5 million hectares of arable land is suitable to its cultivation (International Potato Institute, 2014).Ethiopia has good climatic and edaphic conditions for higher ware potato production and productivity. Compared to cereals, ware potato is a short duration crop that can yield up to 30-35 t/ha in 3-4 months in Ethiopia (Endale *et al.,* 2008). In Bhutan, it is reported that the potential yield of ware potato can reach up to 50 t/ha (Joshi *et al*., 2009). However, the ware potato sub-sector in Ethiopia is relatively underdeveloped and is faced low productivity of less than 10 t/ha. Also, CSA (2012/13) revealed that in Ethiopia average tuber yield of ware potato was almost constant between 6-8 t/ha in the last 20-30 years while the area planted with ware potato increased from 30,000 ha to about 74,934.57 ha in 2012during the main rainy season.

In Ethiopia, ware potato is produced in the rainy and dry seasons using rain and irrigation, respectively. For example, by using irrigation and rain fed, in the Ambo district, 2,036.37 hectares of land and in Dendi district, 2,310 hectares of land were covered by ware potato during 2014 (AWAO, 2014; DWAO, 2014). Even though there is huge demand and potential for ware potato production in both districts, the production of ware potato carried out in this particular study areas is low and below its potential. Still now, farmers are facing different problems such as the use of local inputs, spread of pests and diseases, inadequate logistical facilities (storage, transport and handling) and low production and productivity. Therefore, this indicates a need for more generalized study which carefully examines ware potato value chain in the study areas. This study, therefore, investigates the creation of value addition in the production of ware potato by applying the concept of value chain analysis, to increase the production and productivity of ware potato and to identify the major constraints and opportunities faced by the value chain actors in the selected study areas. To this end, this research was initiated with the specific objectives of analyzing and developing value chain map of the ware potato in the study areas.

METHEDOLOGY

Description of the Study Areas

The study was conducted in two major ware potato producing districts, West showa zone located in the Oromia National Regional State. These include: Ambo and Dendi districts (locally known as Woreda) and Kebele (the lowest administrative organ in the Ethiopian government structure which is equivalent to villages) in each of the selected zones. Together, 74 kebeles in Ambo and 82 kebeles in Dendi district were purposefully selected based on potentiality of ware potato production.

Table 1: Household sample design, 2015

Study area (District)	Sample kebele	Total number of HHs			Sample HHs		
		Male	Female	Total	Male	Female	Total
	Ya'eChebo	224	44	268	21	4	25
	IlamuGoromti	230	50	280	21	5	26
Ambo district	Golja	215	36	251	19	4	23
	GalesakotaGashere	343	74	417	32	7	39
Dendi district	GalesaKoftu	384	84	468	35	8	43
Total		**1396**	**288**	**1684**	**128**	**28**	**156**

Source: Field survey by the author (2015)

Research design

The study applied both qualitative and quantitative approaches of mixed method descriptive research design.

Sampling techniques

Samples were taken from the total population in the study area. A total of 156 farmers, 8 input suppliers, 5 processors, 8 wholesalers, 9 retailers, 20 consumers, 13 support service providers and 8 local collectors. Together, 227 sampled respondents were selected and interviewed from both districts. The study area, Ambo and Dendi districts were chosen because of the potential for potato production.

Data analysis

Both qualitative and quantitative methods of data analysis were used. Key informant interview, interviewing different value chain stakeholders and secondary document analysis were used.

The data collected from different sources has been analyzed using descriptive statistics such as tables, graphs and percentages. In relation to the quantitative data analysis, the collected data through questionnaire has been prepared by coding and entering them into the computer and analyzed by the help of statistical package for social science (SPSS) version 20.0 and STATA version 11.2. Analysis results were presented using tables and figures. Inferential statistics were used to analyze the data collected from value chain producers.

RESULTS AND DISCUSSION

Demographic characteristics of sample households

The major variables used to describe the demographic characteristics of sample producers include gender of the household, age, marital status and education level and these factors significantly influenced the crop production. The results of the study (Table 2) indicated that from the total respondents, 82.4% were male headed households and only 17.6% were female headed households in Ambo district; and 81.7% were male headed households and 18.3% were female headed households in Dendi district. A chi square test has been made to test the influence of household type (Male or Female headed) on the market supply of ware potato. In case of marital status, 95.9% in Ambo and 90.2% of Dendi respondents were married.

Table 2: Demographic and socioeconomic characteristics of sample respondents (categorical variables)

Variables	Items	Number of respondents						X^2-test
		Ambo (N=74)		Dendi (N=82)		Total (N=156)		
		N	%	N	%	N	%	
Sex	Male	61	82	67	82	128	82	**0.0121**
	Female	13	18	15	18	28	18	
Education	Illiterate	11	15	4	5	15	9.6	**19.182***
	Literate	63	85	78	95	141	90	
	Read and write	12	19	14	19	26	19	
	Primary education	25	40	33	42	58	41	
	Secondary education	25	40	31	40	56	40	
	Certificate & above	1	1.6	-	-	1	1	
Marital status	Married	71	96	74	90	145	93	**3.1601**
	Unmarried	3	4.1	5	6	8	5.1	
	Divorced	-	-	2	2	2	1.3	
	Widowed	-	-	1	1	1	0.6	
Cooperatives	Yes	51	69	51	62	102	65	**0.5254**
	No	23	31	31	38	54	35	

* Significant at 10% probability level, N is number of respondents
Source: Own computation from survey result, 2015

The age of ware potato producing household showed variation; thus the age of ware potato producing household respondents ranged from 39 to 63 with a mean age of 47.2 years in Ambo and from 39 to 63 with a mean age of 44.4 in Dendi district (Table 2). The Chi-square test indicated that average household head age in the two districts had a significant difference at 5% significance level. The mean age of total sample of respondents was 45.7 years. This indicated that ware potato producing farmers in Ambo district have higher mean age as compared to Dendi ware potato producing farmers. The mean age of Dendi district helped the farmers to supply more ware potato product because the largest proportions of the household lie within a working age group (within 15 and 64 years). This is in line with Biruk Seifu (2013) which showed that if the majority of the household are under the active age group, there is perception to new technologies.

Education level of the household head in the two districts has significant variation at 10% significance level. About 85.1% and 95.12% were literate in Ambo and Dendi districts, respectively and the rest are illiterates. This result is in line with the findings of Astewel (2010) who found that if paddy producer gets educated, the market supply increases as well. The Dendi producers had relatively higher literacy rate and the literacy rate helped them to supply the crop product more.

Table 3: Demographic and socioeconomic characteristics of sample respondents (continuous variables)

Variables	Ambo (N=74)		Dendi (N =82)		Total (N=156)		**t-test**
	Mean	SD	Mean	SD	Mean	SD	
Age	47.2	8.4	44.4	7	45.7	7.8	**2.2****
Experience	8.3	4.2	6.9	3.2	7.5	3.8	**2.28****
Family size	9.03	3	7.92	2.7	8.44	2.9	**2.43****

** Significant at 5% probability level, N is number of respondents
Source: Own computation from survey result, 2015

There was significant difference in ware potato production experience within the households in the two districts at 5% significance level. The average year of farming experience in ware potato production was 8.3 and 6.9 years in Ambo and Dendi districts, respectively. Availability of cooperative membership of the ware potato producing household head was also affecting the total crop supply. Thus, majority of the respondents, 68.9% and 62.2%, have been a member of cooperatives from Ambo and Dendi districts, respectively. This indicated that larger numbers of the households were accompanied under the cooperative member in Ambo district as compared to Dendi district.

The available data indicated that the average family size of the respondents were 9.03 and 7.92 in Ambo and Dendi districts, respectively. T-test was also conducted to observe the significance difference between family size groups in the two selected districts. The result showed that there was a significance difference in ware potato production family size in the two districts at 5% significance level. Biruhalem (2010) and Dessalegn (2008) indicated that larger families with their greater supply of labor are expected to adopt a technology than the smaller family size; hence better access to input such as labor, seed and information .Ware potato production and selling to the market requires higher labor with households having larger family size were likely to produce

and sell more of ware potato than those who have lower family size.

1.1.1. Production overview

1.1.1.1. Land holding size and area allocated for ware potato production

The average land holding size of the respondents showed significant variation between the two districts. The average land holding size of the respondents were 3.59 and 3.5 ha in Ambo and Dendi districts, respectively which is higher than the average national land holding size per households (1.77 ha) (CSA and World Bank, 2013). In all regions of Ethiopia, more than 90% of farm households own the land they cultivate (CSA and World Bank, 2013). The whole sampled farmers, (100%) have their own arable land and the cultivated land used for the production of ware potato has a mean of 2.9 ha and 2.7 ha at Ambo and Dendi districts, respectively. The remaining land was allocated for grazing and irrigable purposes.

According to Desta (2004) report the availability of land enabled farmers to earn more agricultural output, which in turn increased market supply. Also, as Biruk (2013) revealed that more land size means more cultivation and more possibility of production which in turn increases farm income and improves food security. This indicated that farmers in both districts have their own land in which they produce and supply the crop to the nearby market.

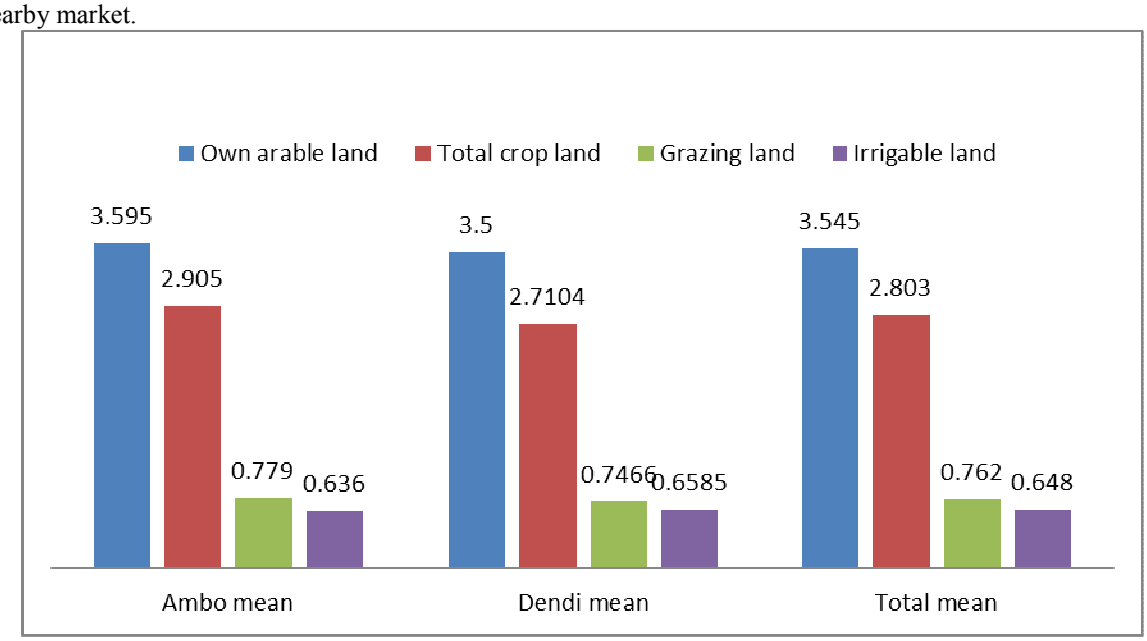

Figure 1: Land ownership and allocation of the land per household (Average hectare)
Source: Own computation from survey result, 2015

Productivity: In Ambo district, average land allocated for the ware potato production was 0.37 ha per a household and 0.38 ha in Dendi districts under both rain and irrigation production in the year 2015. Moreover, the average ware potato yield in Ambo district was higher (7.4 t/ha) as compared to that of Dendi district (5.8 t/ha) (Table 4). The production in both district was below the average national ware potato production during the main rainy season, which was 11.61 t/ha during 2013/14 (CSA, 2013/14). There was also statistically significant relationship between yield and market supply of ware potato product. This low yield production might be due to availability of several factors such as farmers` usage of local seed variety, occurrence of diseases and others. The yield gap also exists among the household members. The results showed a clear yield variation; Ambo district have better ware potato productivity than Dendi district.

Table 4: Average productivity of ware potato in 2015 production year (t/ha)

Districts	Production system	N	Minimum	Maximum	Mean	Std. Deviation
Ambo	Rain fed	56	2	20	7	4.84
	Irrigation	18	2.5	32	8.8	4.73
Dendi	Rain fed	59	2	16	5.1	5.6
	Irrigation	23	2	24	5.9	3.4

Source: Own computation from survey result, 2015

The study results showed that farmers in both districts have been produced more yield by irrigation than by rain-fed. The low yield was attributed to the type of variety farmers are growing which was local, poor seed quality, disease, unpredictable weather condition and weed. The mean productivity of ware potato produced

under rain-fed was 7 t/ha in Ambo district and 5.1 t/ha in Dendi district. Production using irrigation in Ambo district was also higher than that of Dendi district with an average yield of 8.8 t/ha during the study time.

1.2. Value Chain Analysis

1.2.1. Value chain map of ware potato in the study areas

Value chain can be mapped and analyzed using value chain analysis which can include qualitative and/or quantitative tools (Jon Helin and Madelon, 2006). According to McCormick and Schmitz (2002), value chain mapping enables to visualize the flow of the product from conception to end consumer through various actors. It's merely a flow diagram that helps to identify constraints and opportunities in the chain. It also helps to identify different actors involved in ware potato value chain, and to understand their roles and linkages. A value chain map illustrated the way the product flows from raw material to end markets and presented how the industry functioning. The value chain map of ware potato in both Ambo and Dendi districts are indicated in diagram below (Figure 2).

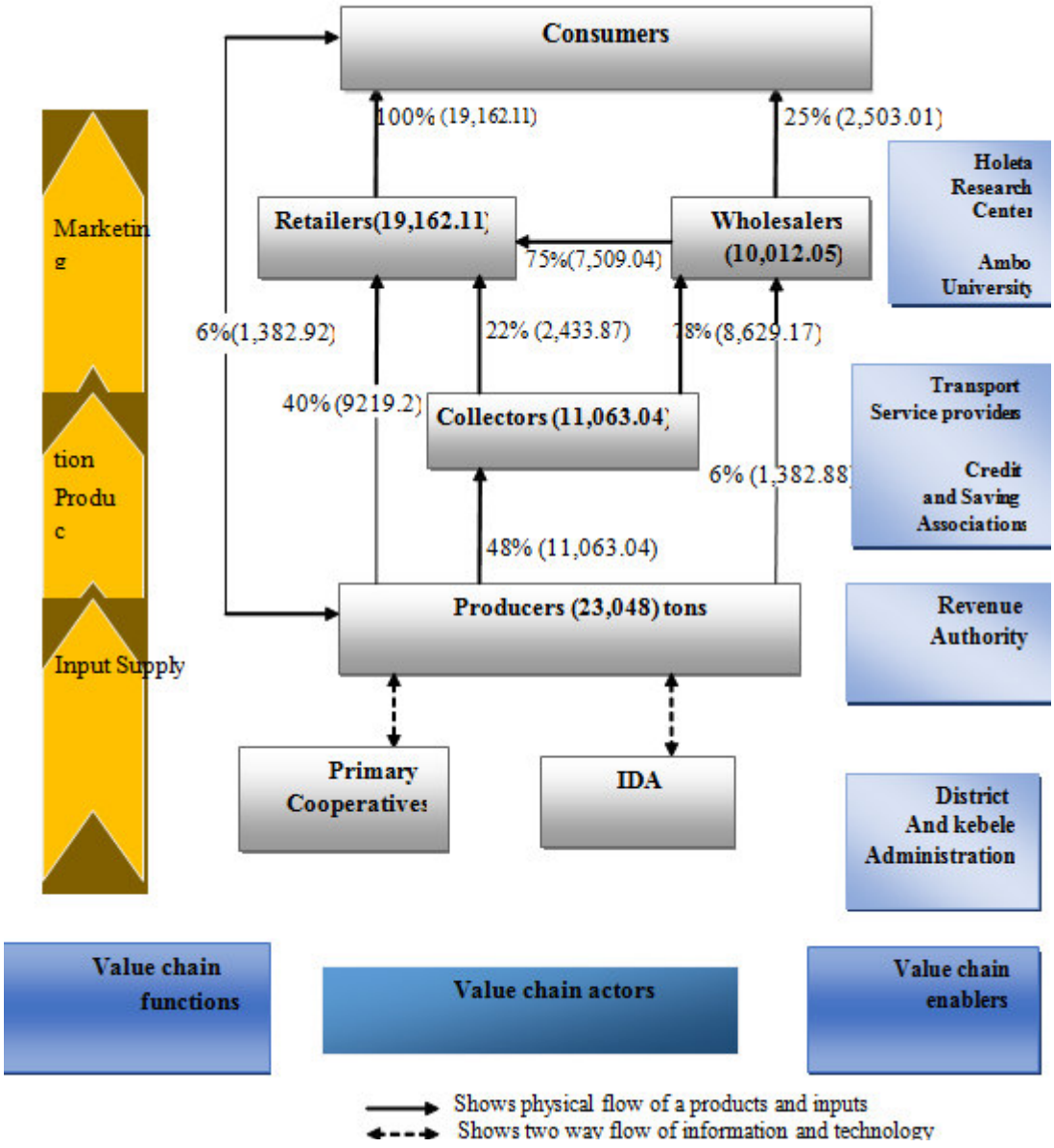

Figure 2: Value chain map of ware potato
Source: Own sketch from survey result, 2015

1.2.2. Value chain actors and their function in the study areas

Value chain map illustrated that interaction of different actors who participates directly or indirectly in the value chain. Direct actors are owners of the product taking risk in the chain: basically buying from other actors, processing (in which ever form) the product and selling the product to the next actors. These are (input suppliers,

producers, traders, consumers). Indirect actors are those that provide financial or non-financial support services to direct actors. They can be value chain supporters such as financial institutions, transporters, brokers, etc and value chain influencers that include government.

1.2.2.1. Input supply stage

A. Input suppliers

The main sources of input supply in the study areas were: primary cooperatives, IDA and private input suppliers. Out of 74 sample respondents in Ambo district, 71 (95.95%) households used improved varieties of ware potato and 76 (92.68%) in Dendi district (Table 8). The most widely used type of improved ware potato variety is "Holland" in both districts. This improved input includes inorganic fertilizers, pesticides and farm implements. About 35% and 41% of the farmers obtained improved input from primary cooperatives in Ambo and Dendi districts, respectively. Out of 71 respondents who used improved input, 22 of them obtained the modern input from IDA in Ambo district and 20 respondents were obtained modern inputs from IDA in Dendi district (Table 9). Also Biruhalem (2011) revealed that primary cooperatives are the most important source of rice seed. The farmers also used improved input ware potato varieties named "Gudane", "Jalene" and "Chimdi" in both districts. Some farmers are also using organic fertilizers such as manure and compost.

Table 2: Source of inputs used in ware potato production in Ambo and Dendi districts

Did you use improved agricultural inputs?		**Ambo (N=74)**		**Dendi (N=82)**		
		N	**%**	**N**	**%**	**X^2 test**
	Yes	71	95.95	76	92.7	0.705
	No	3	4.05	6	7.32	
Total (N)		74		82		
Source of modern input						
Primary cooperatives		25	35	31	41	
Local market		5	7	6	8	
IDA		22	31	20	26	
Private suppliers		19	27	19	25	
Total (N)		71	100	76	100	

Source: Own computation from survey result, 2015.

Table 3: Type of modern input usage per household per ha

District	**Type of modern inputs used per ha**		
	Mean		
	DAP(kg/ha)	UREA(kg/ha)	Pesticide(L/ha)
Ambo	91.5	44.89	0.67
Dendi	105.6	45.7	0.6
Total	98.99	45.33	0.67

Source: Own computation from survey result, 2015

The amounts of improved inputs used by farmers were showed variations; about 45.5% of the farmers in Ambo used 91.5kg/ha of DAP, where as 48.75% of the farmers in Dendi used about 105.6 kg/ha DAP (Tables 9). The rate of UREA usage in Dendi district was higher than in Ambo district; this might be due to the farmers in Ambo used additional organic fertilizer to minimize the inorganic fertilizers cost. The mean use of pesticide in both districts were almost proportionately equal (0.67L/ha) (Table 9).

1.2.2.2. Production stage

A. Ware potato producers

Ware potato growers are the major value chain actors who are directly involved in ware potato production activities and perform most of the value chain functions such as ploughing, ridging, fertilization, weeding, pest/disease control, harvesting, post-harvest handling and marketing as well. They are generally small holder farmers having different land size. The present study result indicated that about 6.76% (1,211.18 tons) and 9.76% (1,330.19 tons) of ware potato produced were damaged before it reached to the market in Ambo and Dendi districts, respectively (Figure 3). The survey result showed that 8.7% and 8.11% of the respondents undertake cleaning activity in Ambo and Dendi districts, respectively. Consequently, about 43.5% of farmers in Ambo and 48.7% in Dendi district conducted cleaning, transporting and storing activities to reduce damage from

their yields before selling their produces.

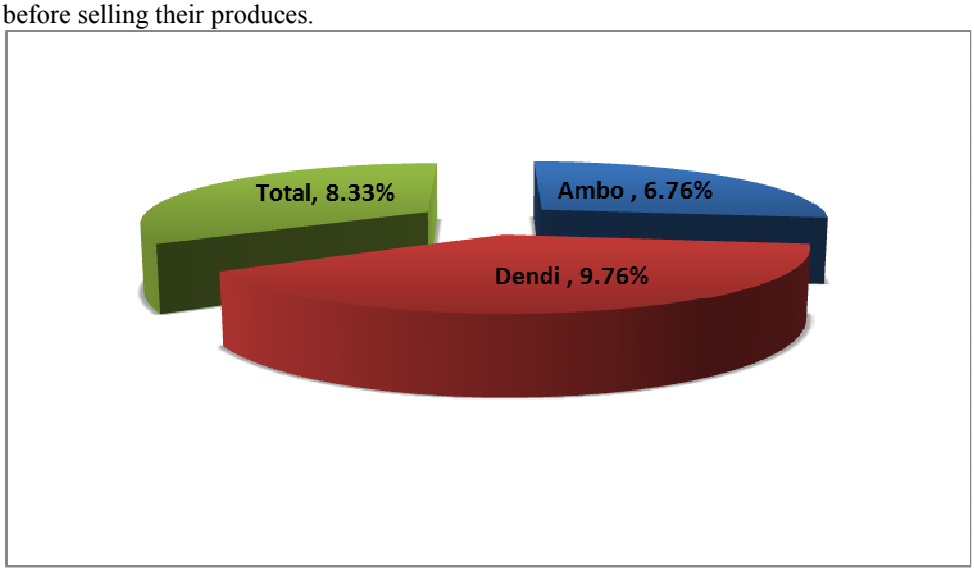

Figure 3: Post harvest loss of ware potato in percentage of production
Source: Own computation from survey result, 2015

Means of transportation also affects the quality of ware potato product supplied to the market. Hence, about 46.27% of producers in Ambo and 45% in Dendi district have used back animals to transport their produce from the area production to the area of marketing.

1.2.2.3. Marketing stage

A. Collectors/Assemblers

Are traders who usually collects ware potato product from producers` farms and from the village market and resell it to other value chain actors such as wholesalers and retailers. They account 48% of trading of ware potato where they move the product from the area it was produced to the area where wholesalers and retailers exists. Usually, traders add a value to the product which includes assembling, cleaning, sorting, grading, transporting and selling to the markets.

B. Ware potato processing

Processors are actors who involved in the transformation of a product from one form to other. Ware potato is mostly consumed in the form of boiled and cooked meals and served for consumption for the consumers in the form of `Wot`. In major cities of the country, consumption of ware potato chips, crisps and roasted ware potato are common. Large scale ware potato processing was not common in the study areas. A very few ware potato processors were willing to give information on the amount they process. Hence, it's difficult to report on the amount the crop which was processed. In the interview, some respondents said that they prefer large size ware potato for processing such as `Jalene variety`.

C. Wholesalers

Are value chain actors who purchases ware potato product from itinerant collectors (small and mobile traders who visit villages and rural markets) and assembly traders or primary wholesalers with larger volumes than collectors and assemblers and supplying them to retailers and consumers. Wholesalers perform important storage, transport and communication functions. Majorities of wholesalers have a storage facilities either owned or rented. The average ware potato retained per week was 25 quintal by the wholesalers.

D. Retailers

Retailers are key actors in ware potato value chain in the study areas. They are the final link between producers and consumers. They buy ware potato product from wholesalers mostly and sell to urban consumers. Also, they play key role in meeting numerous marketing functions such as buying, storing and selling. This retailers purchase different kinds of vegetable products and sell to final users of the product. Retailers purchase ware potato product mainly from producers, collectors and wholesalers and sell to consumers and they account trading of 40% of the ware potato product and the average ware potato retained by the retailer was 5 quintal per week. According to Ayelech (2011), retailers are the ultimate actors in the market chain that purchases and delivers avocado and mango to consumers.

1.2.2.4. Consumption stage

A. Consumers

These are other value chain actors who buy the product for final consumption. In type, households, restaurants, cafes and institutions such as higher education institutions, hospitals and others are some. Most of the consumers purchase ware potato product from retailers. Producers were also producing ware potato product for home

consumption.

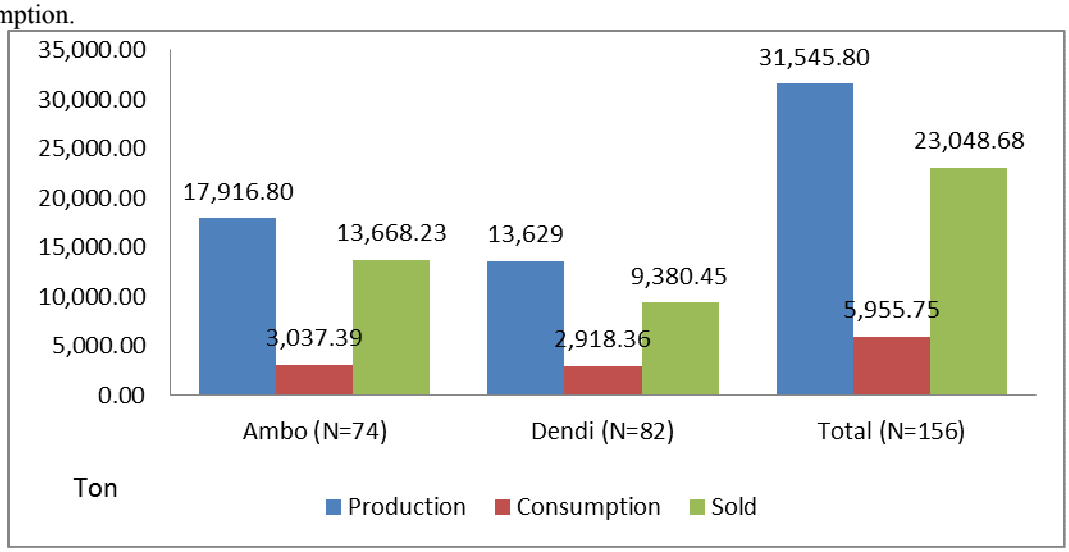

Figure 4: Average amount of ware potato produced, consumed and sold at a household level
Source: Own computation from survey result, 2015

The survey results showed that from the total sampled producer respondents, on average, 1.6 t/ha and 1.4 t/ha of ware potato produced were used for consumption by the farm households in 2015 in Ambo and Dendi districts, respectively. From the total produced ware potato crop, about 16.95% and 21.41% were used for home consumption in Ambo and Dendi districts, respectively. Even if the farmers are producing the crop for the market, significant proportion of ware potato crop were used for home consumption as well.

1.2.2.5. Supporting actors

They are actors who never directly deal with the product, but whose services can add values to the product. These are service providers that play supporting roles to enhance the operation of the different stages of the value chain and the chain as a whole. Service providers have better marketing skills and have a better understanding of the markets. Some of the supportive factors include: conducive environments (laws), training, advisory and information service on ware potato production, marketing, management and credit service.

Table 4: Access to services by sample respondents

Variables	Items	Ambo (N=74)		Dendi (N =82)		x^2-test
		N	%	N	%	
Credit access	Yes	22	29.73	25	30.49	0.01
	No	52	70.27	57	69.51	
Advisory service	Yes	67	90.54	70	85.37	0.97
	No	7	9.46	12	14.63	
Training Access	Yes	67	90.54	61	74.4	0.97
	No	7	9.46	21	25.6	

Source: Own computation from survey result, 2015

A. Credit Access

Finance is the most important element in agriculture, specifically in ware potato production which is used to cover the production expenses ranging from land cleaning to threshing. The study showed that from the total respondents, 22 (29.73%) and 25 (30.49%) have the credit access in Ambo and Dendi districts, respectively. BirukSeifu (2013) revealed that access to credit service helps the farmers to purchase agricultural inputs such as fertilizers, improved seeds and oxen, and which in turn increases production and contributes to food security. Also, according to Kefyalew (2010), credit access has been promoting to encourage the use of fertilizer and improved seeds.

B. Training access and advisory services

The main sources of ware potato training were DA and AWAO, DWAO worker experts in both districts. Agriculture development office in both districts provides agricultural extension services to the respective farmers through DA workers. From the total sampled ware potato producers, 67% and 74.4% have been taken training services in Ambo and Dendi districts, respectively. Farmers responded that they are getting advisory service and market information on seed production, crop management and marketing in both districts.

Problem faced on advisory service is that there was no specialized advisory service designed only for

ware potato producers. The advisory services were offered for different kinds of vegetable product. More importantly, the study results indicated that 90.54% and 74.4% of the respondents participated in vegetable training in general that were organized by districts, respectively (Table 10). Regarding to advisory service, among the total sampled respondents, 90.54% and 85.37% of the respondents have been getting advisory service in ware potato production in Ambo and Dendi districts, respectively.

C. Financial services

In both study areas, micro finance, cooperatives and traders have been identified as a potential source for credit both in material and on cash basis. About 29.73% and 30.49% of the respondents have credit access from different sources in Ambo and Dendi districts, respectively (Table 10).

With regard to credit source, out of 47 respondents who took credit in both districts, 50% and 32% of the farmers obtained credit from micro financial institutions, 31.8% and 60% obtained credit from cooperatives and 18.2% and 8% were obtained from traders in Ambo and Dendi districts, respectively. From a sample of 47 credit users who took credit in both districts, about 40.9% and 56% used the credit for purchasing farm implements, 54.5% and 24% to pay for inorganic fertilizers and 4.6% and 20% of the credit were used to pay for hired labor in Ambo and Dendi districts, respectively. According to Kindie (2007), credit access improves the financial capacity of farmers to buy modern inputs, thereby increasing production and market supply of sesame.

Table 5: Source and purpose of credit used by sample of respondents

Variables	**Ambo (N=74)**		**Dendi (N =82)**	
	N	%	N	%
Credit sources				
Micro finance	11	50	8	32
Cooperatives	7	31.8	15	60
Traders	4	18.2	2	8
Credit purpose				
To purchase farm implements	9	40.9	14	56
To pay for Inorganic fertilizers	10	45.5	6	24
To pay for hired labor	2	4.6	5	20

Source: Own computation from survey result, 2015

Conclusion

The major findings of the study are summarized as follows. The most commonly produced crops in the study areas include: Ware potato, onion, maize and barley. From the listed crop items, ware potato production is dominant in terms of total area covered by ware potato product.

From the study results it is possible to conclude that, even though there were potential conditions for ware potato production in the study areas; the sector was constrained by different production and marketing problems like diseases, drought, insects (pests) problems, lack of sufficient irrigation water, limited access to supply of agricultural inputs, lack of adequate extension services, poor linkage with value chain actors, loss of produce, low produce quality and price fluctuation.

Ware potato value chain was affected by several problems at each stage of the main value chain functions those influenced the efficiency and competitiveness of the whole chain in the study areas. Therefore, interventions are required to improve the efficiency of ware potato value chain in the study areas and the following main issues are forwarded as recommendations for the interventions.

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