Value Chain Analysis Of Vegetables: The Case Of Yayu And Hurumu Districts Of Iluababor Zone, Ethiopia

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Abstract
Ethiopia has a diverse climate and altitude conditions which are conducive to the production of different horticultural crops. Despite a favorable condition in the country, small-scale vegetable producer farmers are not benefiting from the available opportunities due to low market participation. This study was aimed at analyzing the vegetable value chain in Yayu and Hurumu districts of Ilubabor zone focusing on kale and tomato crops. The specific objectives of the study were to identify actors and their roles in the value chain, to estimate marketing margins of each actor and identifying determinants of market participation decision and level of participation of farm households in the vegetable market. The study used both primary and secondary data. The primary data were collected through personal interviews from a total of 161 respondents (120 producers, 25 traders and, 16 consumers) using questionnaires. Value chain analysis approach was used to identify major value chain actors and their roles. The major vegetable value chain actors in the study area are input suppliers, producers, collectors, wholesalers, retailers and consumers. Five and four marketing channels were identified for tomato and kale, respectively. Market margin analysis was carried out to estimate value captured by each actor. The highest total gross margin was about 25% in channel III for kale and 33.33% in channel IV for tomato. The highest producers share in kale and tomato marketing channels are 85% and 80% both in channel II. Producer received the maximum profit when they sell directly to consumers. From traders, collectors received the highest (21.05%) marketing margin in channel IV for kale and wholesalers received the highest (28.57%) in channel V for tomato. The Heckman first stage model result showed that four variables such as education level of household head, irrigation access, participation in non-farm activity and quantity produced significantly affect the probability of kale market participation decision while family size, production experience, participation in non-farm activity and quantity produced significantly affect the tomato market participation decision. Heckman second stage model indicated that age of household head, family size and quantity produced significantly influence the kale level of market participation of producers while extension contact, quantity produced and perception of lagged price were among determinants which affect significantly tomato producer's level of market participation. Policy implications drawn from the study findings include the need to strengthen the provision of extension service, strengthen education level of household heads, arranging experience sharing program for producers, improving farmer's knowledge and experience on vegetable production and improving productivity, providing irrigation facility.

Keywords: Actors, Heckman model, Market participation, Value chain, Vegetables

Introduction
Background of the Study
Agriculture is the most important sector in Ethiopia that has given an overriding focus in the government plan for the growth of the economy. In 2014/15 fiscal year, it represents 41% of the country's Growth Domestic Product (GDP), over 90% of export earnings and directly supports 80% of the population's livelihoods (MoFED, 2015).

The horticulture sub-sector is one of the fastest growing food sectors in the world. The sector plays a significant role in developing countries like Ethiopia both in income and social spheres in improving income and nutritional status. Further, the sector is considered as income-boosting alternatives to basic grains for smallholder farmers and they contribute to increasing employment opportunities. Ethiopia has a diverse climate and altitude conditions which are conducive to the production of different horticultural crops. Vegetable production is becoming an increasingly important activity in the agricultural sector of the country following the development of irrigation and increased emphases given by the government to small scale commercial farmers (Afari-Sefa *et al.*, 2015). In 2016/17 production year, vegetables took up about 1.69% of the area under all crops at the national level and 2.17% of the total crop production. From total estimated area under vegetables, the lion's share which is about 75.41% and 15.06% was under red peppers and kale, respectively (CSA, 2017).

The major vegetable types grown in the study area include kale, tomato and head cabbage. The emphasis of this research lies on the tomato and kale since those are

the most cultivated species in Yayu and Hurumu district, where the research was conducted.

During the 2016/2017 cropping season, the total annual kale production was estimated to be 3,528,964.26 quintals of which 977,717.32 quintals (27.71%) is from the Oromia region and 80,853.28 quintals (2.29%) is from Amhara region. The total area under kale is 36,090.31 hectares, whereas the total area under this crop in Oromia regional state is 9,636.73 hectares (CSA, 2017). In Ilubabor zone, the total area under this crop in the year 2016/17 was estimated to be 337.87 hectares with the total annual production of 33,598.12 quintals. The average productivity of this crop in the zone was estimated to be 99.44 quintals per hectare, which were less than the regional yield of 101.46 quintals per hectare (CSA, 2017). However, there is still huge potential for yield improvement. Thus, the present study was conducted to analyse the value chain of vegetables emphasizing on the tomato and kale to identify the major value chain actors and their roles, to understand value share of actors and factors affecting market participation and level of participation in the market as to exploit the available opportunity of the current growing demand for vegetables and to use the available potentials.

Statement of the Problem

Increased market participation among smallholder producers has emerged to be a key strategy in agricultural transformation because of its ability to unlock the smallholder's productivity, thereby increasing their incomes and reducing poverty (Jaleta *et al*., 2009). However, for most smallholder vegetable producers, vegetable production is considered as supplementary to the production of main crops and cultivation is on a very small plot of land (Tekleab, 2009). Due to this, they are not participating in the markets and not benefit from increasing demand for the product in both domestic and international markets.
Value chain analysis is a vital and flexible methodology to improve the value to producers and end consumers (Van Hoang, 2014). It is also important in determining the relationships and linkages between buyer and suppliers and a range of market actors in between (Wenz and Bokelmann, 2011). Thus value chain analysis of Vegetable is required to identify key players in the chain and to provide an understanding of their interactions and linkages within the chain to improve return on investment for value chain actors in the vegetable sub-sector.

Understanding this importance, different studies (Giziew *et al*., 2014; Tegegn, 2013; Emana and Nigussie, 2011 and Akalu, 2007) were conducted in different regions of the country in relation to the vegetable value chain and identified different constraints that hinder the development of the value chain system. For instance, study conducted by Tegegn (2013) identified the major constraints hindering the development of vegetable value chain as lack of modern input supply, high post-harvest losses, the limited power of price setting, the problem of supply shortage, lack of storage facility, problem in information flow, low product quality, lack of support from concerned bodies, high monopolistic power of wholesalers, high travel distance of export to Somalia, lack of processing and long chain condition of the market. Similarly, a study conducted by Afari-Sefa *et al*. (2015) identified the major production and marketing constraints as lack or limited access to improved seeds, diseases and insect pests, high post-harvest losses, lack of market information systems, poor marketing system and linkages, low institutional support and lack of value chain development to ensure participation and benefit to the smallholders.

Market distortions are the common activities of middlemen in price setting. They used the perishability nature of vegetables to cut price which further reduces producers bargaining power to sell their produce at a price convenient for them. A study conducted by Legesse *et al*. (2014) showed that the wholesalers are the ones who make the highest net margin as they charge a relatively higher price using their market power.

Even though a number of studies were carried out in different regions of the country by different scholars in relation to the vegetable value chain, vegetable value chain has not studied and documented in the particular study area. Therefore, there was strong need to conduct value chain analysis of vegetables to reduce the information gap on the subject and to better understand improved strategies for reorienting value chain system for the benefit of value chain actors. To this effect, the present study focused on providing an in depth analysis of the value chain of vegetables focusing on kale and tomato crops.

Objectives of the Study

The general objective of this study was to analyze the vegetable value chain in the study area. The specific objectives of the study were:

1. To identify the major vegetables value chain actors and their roles in the study area.
2. To analyze marketing margins of value chain actors in the vegetable value chain.
3. To identify determinants of market participation decision and level of participation of farm households in the vegetable market.

Significance of the Study

The study generated valuable information on the major vegetables value chain actors and their roles, estimation of marketing margins and identifying determinants of market participation decision and the level of participa-

tion of farm households in the vegetable market that might assist development practitioners and policy makers to make relevant decisions in the development of vegetable value chain and marketing to improve the livelihood of vegetable value chain actors. Also it may serve as a reference material for further research on similar topics and other related subjects.

Scope and Limitations of the Study

This study was conducted in two districts and concentrated on tomato and kale value chain analysis at four *kebeles* with sample size of 120 vegetable producer farm households, 25 traders and 16 consumers. The study focused mainly on the major vegetable value chain actors that include producers, collectors, wholesalers, retailers and consumers in the study areas.

The study mainly relied on the farmer's memory in the collection of the data due to lack of farm records among farmers. Another limitation of the study was that the empirical analysis was done based on cross-sectional data. Since Ethiopia has a wide range of diverse agro ecologies, institutional capacities, organizations and environmental conditions, the result of the study may have limitations to make generalizations and make them applicable to a country level. However, it may be useful for areas with similar context as the study area.

Research Methodology

Description of the Study Areas

The study was conducted in two districts (Yayu and Hurumu) of Illu Ababor zone of Oromia regional state. The district is one of the biodiversity rich and densely forested regions in the Illu Ababor zone of the Oromia regional state. The district has a humid and warm tropical rainy climate with mean minimum and maximum temperatures of 13.5 and 27.3 ºC, respectively. The rainfall pattern is unimodal with a mean annual rainfall ranging between 1243 and 3445 mm (Wakjira, 2006). The population of the district was about 78,611 of which 40,281 were male and 38,330 were female. Out of the total population, 10,587 were urban dwellers in Yayu (YDOA, 2017).

Hurumu district is located in Oromia regional state. The district is neighbor to Yayu district where forest coffee is registered by United Nations Educational, Scientific and Cultural Organization as one of the country's heritage and identified as one of the potential areas for coal mine. The altitude of the district ranges between 1400m and 2580m. The average annual rainfall of the district ranges 1191mm to 1960mm and the annual average temperature is 23^0c. The total area of the district is 48,615.14 hectares (486.15km^2) from the total area of the district 86% of the area has the Woinadega type of climate, 9% Kolla type of climate and the remaining 5% Dega type of climate (Zewde, 2011). In 2017 the total population of the district is about 51,880 of which 27,181 were male and 24,699 were female. Out of the total population of the district, 6920 were urban dwellers (HDOA, 2017).

Data Type, Source and Methods of Data Collection

Primary data were collected through both participatory research approach (key informant interview, focus group discussion and observation) and formal survey. A preliminary assessment was conducted to collect basic information about the study area and select four representative *kebeles*.

Sampling Procedure and Sample Size determination

The two districts were selected purposively based on their potential they have for vegetable production and it was also the target areas of NutriHAF (a research and capacity building) project. A two-stage sampling technique was used to select sample respondents. In the first stage, 4 potential vegetables producer kebeles (namely BondoMegela, Geci from Yayu district and Gaba and Wangegne from Hurumu district) were selected purposively with the help of district irrigation and development authority experts from 18 and 15 kebeles of Yayu and Hurumu districts, respectively. In the second stage, a total of 120 vegetable producers, farm households were selected randomly from the selected rural sample kebeles by using a simple random sampling technique (Table 1). The sample size of respondents was determined by using a simplified formula provided by Yamane (1967) at 95% confidence interval with 9% precision levels.

$$n = \frac{N}{1 + N(e)^2} = \frac{3848}{1 + 3848\,(0.09)^2} \approx 120 \qquad (1)$$

Where; n is the sample size, N is the population size and e is a level of precision

Table 1: Sample size distribution of vegetable producers

No.	Kebeles	Total number of vegetable producers	Number of sampled households
1	BondoMegela	930	29
2	Geci	1090	34
3	Gaba	898	28
4	Wangegne	930	29
Total		3848	120

Source: Respective District Irrigation and Development Authority, 2017

Further, data from traders (collectors, wholesalers and retailers) and consumers were also collected. A purposive sampling method was used to select them from the market on the market day in order to get the overall picture of the vegetable value chain. As a result, 18 retailers and 16 consumers of kale and tomato were selected for the purpose of the study.

Table 2: Sample size distribution of traders and consumers

Traders	Total number	Sample
Collectors	3	3
Wholesalers	4	4
Retailers	-	18
Consumers	-	16

Source: Respective District Trade and Industry office, 2017

Methods of Data Analysis
Three types of data analysis methods, namely descriptive analysis, value chain analysis and econometric analysis were used for analyzing the data collected from producers, traders and consumers.

Descriptive analysis
Descriptive statistical tools such as mean, percentages and frequency were used in the process of examining and describing socio-economic and demographic characteristics of sample farmers, traders and consumers. Moreover, t-test and chi-square test were used to make comparisons between different groups of households with respect to the characteristics under consideration. The t-test was used for a continuous variable, while dummy variable was tested using the chi-square test.

Value chain analysis
Value chain analysis is the process of breaking a chain into its constituent parts in order to better understand its structure and functioning. The analysis consists of identifying chain actors at each stage and discerning their functions and relationships, determining the chain governance, or leadership, to facilitate chain formation and strengthening and identifying value adding activities in the chain and assigning costs and added value to each of those activities (UNIDO, 2009).

The study has employed value chain analysis showing flow of product along the chain with identified major actors and their relationships with other actors in the chain. This could be captured through mapping the value chain. Mapping the chain facilitates understanding of sequence of activities, key actors and relationship involved in the value chain. This analysis was undertaken in qualitative terms.

Marketing margin
After having developed the general conceptual map of the value chain, the next step is to analyze the chain's economic performance. Marketing margins, production costs and price markups, are among the possible measures of chain performance. Marketing margins were calculated by taking the difference between producers and retail prices. The producers share is the commonly employed ratio calculated mathematically as, the ratio of producer's price to consumer's price. Mathematically, producers share can be expressed as:

$$Ps = \frac{Pp}{Cp} = 1 - \frac{MM}{CP} \quad (2)$$

Where; Ps is producer's share, Pp is producer's price, Cp is consumer price and MM is marketing margin.

Computing the Total Gross Marketing Margin (TGMM) is always related to the final price paid by the end buyer and is expressed as a percentage (Scott, 1995). The formula to calculate TGMM is given as:

$$TGMM = \frac{\text{Final consumer price} - \text{Producer price}}{\text{Final consumer price}} X\ 100 \quad (3)$$

Where; TGMM is total gross marketing margin

The marketing margin at a given stage 'i' (GMM_i) was computed as:

$$GMM_i = \frac{\text{Selling price at } i^{th} \text{ link} - \text{Purchase price at } i^{th} \text{link}}{TGMM} X\ 100 \quad (4)$$

Econometric analysis
This study used the Heckman two-step model. Heckman two-stage model was the relatively simple procedure for correcting sample selection bias arising from sample selection. The Heckman model provides consistent and asymptotically efficient estimates for all the parameters (Amemiya, 1985; Maddala, 1983; Heckman, 1979). The model consisted of two steps. The first step was estimated using probit model. Then the inverse mills ratio, computed from the probit regression, is used with other explanatory variables in a second step to determine an outcome equation using OLS regression.

Model specification
Heckman (1979) proposed a two-step procedure which involves the estimation of probit and a linear regression model. The probit model predicts the probability of whether an individual household participated in the market or not. The OLS involves a decision on the level of market participation. The two equations for the two steps are specified as follows.

Step 1: The selection equation:

$$P_{(0,1)} = \beta_0 X_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots \beta_n X_n + e \quad (5)$$

Where; participation is denoted by 1 and not- participation is denoted by 0, β_0 is a constant, β_1…n are parameters to be estimated and X_{is} are a vector of explanatory variables.

Step 2: Outcome equation

$$Y = \beta_0 X_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots \beta_n X_n + e \quad (6)$$

Where; Y denotes the amount of vegetable sales, β_0 is a constant, β1…..n are parameters to be estimated and X_{is} are a vector of explanatory variables.

Variables and Hypotheses

Dependent variables :

a. Market participation decision of vegetable producers (Y)
b. The level of market participation (y):

Independent variables :

a. Age of household head (Age)
b. Sex of the household head (Sex)
c. Household head education (Education)
d. Family size (Family)
e. Total land size (Land)
f. Vegetable farming experience (Experience)
g. Access to irrigation (Irrigation)
h. Extension contact (Extension)
i. Access to credit (Credit)
j. Livestock ownership (Livestock)
k. Participation in non-farm activities (Non-farm)
l. Quantity produced (Quantity)
m. Distance to the nearest market (Distance)
n. Perception of lagged price (Price)

RESULTS AND DISCUSSION

Characteristics of Sample Producers, Traders and Consumers

Characteristics of sample Farmers

Kale

The total sample size of farm respondents handled during the survey was 120. Of the total sample respondents, 83.33% were kale market participants during the survey year. The study showed that 66.67% of the sample households were male-headed households and 33.37% were female-headed. The average age of the sampled respondents was 40 years. Sample households had on average 8 years of experience in producing kale. Regarding family size the household heads interviewed had a family size ranging from 1 to 9 and the average family size was found to be 4 persons (Table 4). About 70% of the sample respondents reported that they had access to agricultural extension services. Those sample farmers who had access to extension services, on average one times visited by developmental agents per month. The mean production of kale producer is 137.33 kilograms per annum. As expected, farm households with larger quantity of kale produced had higher marketed surplus than households with small quantity of kale produced. The study also showed that the average number of livestock owned in TLU was 2.05 while 2.02 TLU and 2.22 TLU had owned by participant and non-participant, respectively (Table 4). In the study area, livestock is important major assets for the households and considered as a measure of wealth. They used as a source of income, food and draft power for small holder farmers. In addition to these, they serve as providing manure for production and a means of transportation of farm products from place to place.

The t-test result indicated that there is a significant mean difference between market participants and non-participants in terms of family size at 5% and quantity produced at less than 1% probability level. Kale market participants had more family size, experience of kale production, quantity produced, located near to the market and older than their counterpart (Table 4).

Table 3: Characteristics of kale market participants and non participants

Continuous variable		Mean		Total (120)	t-test
		Participant (97)	Non-participant (23)		
Age		40.99	37.70	40.36	1.32
Education		3.77	3.78	3.78	-0.01
Family		5	4	4	2.07**
Land		1.57	1.66	1.59	-0.41
Experience		7.79	7.17	7.68	0.85
Extension		1.09	0.96	1.07	0.68
Livestock		2.02	2.22	2.05	-0.52
Quantity		158.04	50	137.33	6.30***
Distance		55.31	58.04	55.83	-0.74
Dummy variables		Percentage	Percentage	Percentage	X^2-test
Sex	Male	68.04	60.87	66.67	0.4303
	Female	31.96	39.13	33.33	
Price	Attractive	62.89	52.17	60.83	0.8955
	Not attractive	31.11	47.83	39.17	
Non-farm	Yes	53.61	69.57	56.67	1.9278
	No	46.39	30.43	43.33	
Credit	Yes	42.27	39.13	41.67	0.0753
	No	57.73	60.87	58.33	
Irrigation	Yes	55.67	52.17	55	0.0918
	No	44.33	47.83	45	

*** and ** represents a significance level at 1% and 5% level
Source: Own survey, 2017

Tomato

From the total sampled tomato producers, 69.17% were tomato market participants during the survey year. Average age of the sampled respondents was 40.87 years ranging from 21 to 72 years. The average family size of sample respondents was 4 for tomato market participant and 5 for non-participants. The t-test result revealed that quantity of tomato produced by the market participants and non-participants was found to be significant at less than 1% probability level (Table 5). As expected, farm households with larger quantity of tomato produced had higher marketed surplus than farm households with small quantity of tomato produced. This indicates that quantity of tomato produced can directly influence farmer's market participation decision. Table 5 also shows that tomato market participant households had more extension contact with extension agent than non-participant tomato producer. The t-test indicated that there is a significant mean difference between tomato market participants and non-participants at less than 5% probability level in terms of extension contact.

The mean number of years that had been spent in formal school by tomato market participant was 4.35 and 4.49 years for non-participants. This indicates that non-participants were relatively more educated than their counterparts. For the sample households, the average time to the nearest market in hours of walking time was 58.5 minutes. As shown in Table 5 for the tomato market participants the distance to the nearest market takes an average of 58.01 minutes while for the non-participants it took 59.59 minutes.

The land holding size of the sample households ranges from 0.25 to 5ha with a mean of 1.58 ha. The average land owned by tomato market participants and non-participant was 1.60ha and 1.55ha per household, respectively (Table 5). In the study area, land is one of the major constraints that limit farmer's production potential. During Focus Group Discussion (FGD) sessions, it was stressed that there was no option for newly formed households to have their own farmland. The only chance for such households was to share and rent what the household had in the past. The farming experience of tomato producer sample households ranges from 2 to 17 years with a mean of 7.68 years. The mean of the tomato farming experience of market participants was 7.96 years while that of non-participants was 7.03 years. The statistical analysis showed that absence of significant mean difference between farming experiences of market participant household heads and their counterparts.

Table 4: Characteristics of tomato market participants and non participants

Continuous Variable		Mean		Total (120)	t-test
		Participant (83)	Non-participant (37)		
Age		41.83	38.70	40.87	1.56
Education		4.35	4.49	4.39	-0.20
Family		4	5	5	-0.87
Land		1.60	1.55	1.58	0.19
Experience		7.96	7.03	7.68	1.52
Extension		1.18	0.76	1.05	2.32**
Livestock		2.12	2.05	2.10	0.23
Quantity		377.10	53.11	277.2	5.04***
Distance		58.01	59.59	58.5	-0.41
Dummy variables		Percentage	Percentage	Percentage	X^2-test
Sex	Male	79.52	67.57	75.83	1.9943
	Female	20.48	32.43	24.17	
Price	Attractive	51.81	40.54	48.33	1.3009
	Not attractive	48.19	59.46	51.67	
Non-farm	Yes	46.99	40.54	45	0.4298
	No	53.01	59.46	55	
Credit	Yes	57.83	54.05	56.67	0.1487
	No	42.17	45.95	43.33	

Irrigation	Yes	60.24	51.35	57.5	0.8276
	No	39.76	48.65	42.5	

*** and ** represents a significance level at 1% and 5% level
Source: Own survey, 2017

Characteristics of Sample traders
The demographic characteristics of traders (collectors, wholesalers and retailers) has been depicted in Table 6.

Table 5: Characteristics of sample traders

Characteristics		Mean	Minimum	Maximum
Age		32.76	21	60
Family size		4	1	7
Trading experience		4.8	2	12
Initial capital		2796	500	10000
Current working capital		5492	1100	20000
		Frequency		Percentage
Sex	Male	10		40
	Female	15		60

Source: Own survey, 2017

Characteristics of sample consumers
The survey result indicates that sampled consumers (the buyer of the product for consumption purpose) were dominated by females; i.e., 81.2% and the remaining 18.8% were males. This implies that female's involvement in the purchase and preparation of vegetables was high. The respondent's age ranges from 23 to 35 years with an average of 34 years. The average family size of the consumers was four persons and ranges from one to seven. The result shows that on average about 573.75 Birr per month is spent for consumption of vegetables and ranges from 250 to 1500 Birr (Table 7).

Table 6: Characteristics of sample consumers

Characteristics		Mean	Minimum	Maximum
Age		34	23	35
Family size		4	1	7
Monthly expenditure		573.75	250	1500
		Frequency		Percentage
Sex	Male	3		18.8
	Female	13		81.2

Source: Own survey, 2017

1.1. Value Chain Analysis
Value chain analysis is a strategic tool that used to analyse the value chain activities identified by the respondents. This can be divided into the primary and support activities. The primary activities relate directly to the physical creation, sale, maintenance and support of a product or service.

Major vegetable value chain actors and their functions
The value chain is a concept which can be described as the entire range of activities required to bring a product from the initial input-supply stage, through various phases of production, to its final market destination. It is clear that along with the farmers, a number of actors participated in the value chain of vegetables from the production point to the consumer point. The major actors involved in the vegetable value chain, their roles and interrelationships are discussed below.

Input Suppliers
Agriculture value chain analysis begins at the input supply level. In the study area, inputs such as seeds, fertilizer, pesticides and farm implements are supplied by the office of agriculture, the office of irrigation, primary

cooperatives, traders and informal farmers to farmer's exchange. In the study area, sampled producers were complaining about the quality and adequacy of vegetable seeds.

Regarding fertilizers, the sampled producers who used fertilizer procured it from primary cooperatives and office of agriculture while the source of organic fertilizer is producers themselves. There is no private market for fertilizer.

The majority of the sampled producers used seed by purchasing from the market. For kale they used their own seed from the previous production and do occasionally exchange with other farmers. The seed for other vegetables is supplied by private suppliers. However, farmers consider them as very expensive. There is no specialized seed supplier in the study area.

Input traders often buy from distributors in bigger cities such as Mettu and Jimma. They buy seeds in cans and re-sell them in small size packages. Expired seed is a common problem in the area, leading to very low germination rates. In vegetable production, no pesticides are used, because they are not available, but for other cereal crops pesticides are supplied mostly by private suppliers.
Labour is an important factor of agricultural production. The labor is employed in vegetable production from land preparation to harvest. The respondents used family and hired labor for the production of vegetables. Sometimes they also used *Debo*[1] as a source of labor for vegetable production.

Producers
The major value chain functions that vegetable producers perform include land preparation, growing/planting/, fertilizing, irrigating, weeding, controlling pest/disease, harvesting and post-harvest handling and marketing.
In the study area, vegetables are produced based on both irrigation and rain-fed system. Except for tomato, all vegetables can be produced by the rain-fed system. Sampled respondents were producing vegetables by sole cropping and intercropping with other crops. Kale is hardly intercropped with maize in the on-farm area. The trend of vegetable production is reported to be growing. However, the productivity of vegetable production is low due to different reason like pest and diseases, land shortage, lack of extension services and inputs and wild animal damage. According to FGDs, farmers had the desire to increase land allocation if they were certain about pest and diseases.

[1] *Debo* is an informal institutional system whereby the local people organize themselves into a group to assist and support each other on different village level agricultural activities, house construction and so on.

Right after harvesting producers perform different activities like sorting, grading and packing to handle the product and extend the shelf life of the product. Vegetable producers in study area produce and consume some of their produce at home, give some as a gift for their relatives and neighbors, some preserved as a seed for next season, some lost due to the post-harvest problem and supply the rest to the traders in the market. They sell to different types of actors such as collectors, wholesalers, retailers and consumers with the varying volume of sell. The major means of transports of vegetables to the market are vehicles, pack animals and carrying by human beings. In the study area, there are high post-harvest losses due to improper harvesting, handling and poor infrastructure facilities in the market.

Collectors
Collectors in the study area are traders who collect produce from farmers in the village markets and from farms for the purpose of reselling it to wholesalers and retailers. They purchase vegetables directly from farmers and did not involve brokers. They know the area of surplus well and use their financial resources to collect vegetables from the surrounding area. The major trading functions they perform include buying and assembling, repacking, sorting, transporting and reselling. They mainly used pack animals and small truck for transportation of vegetables.

Brokers
Brokers are agents who work for a commission on behalf of other participants. They facilitate transactions by bringing the buyers and sellers together. In the study area, only the wholesalers use brokers for buying and selling.

Wholesalers
Wholesalers are traders that buy large quantities of vegetables from collectors and also directly from farmers and resell to other traders both in cash and credit. They also sell to consumers. Relative to other traders, they have better storage, transport and communication access than others. They mainly used trucks for transportation. They had some informal contractual agreements with their buyers when sold their output to other traders on credit. The cost incurred by the wholesalers was on transportation, loading and unloading, rent of the store, sorting, grading and cleaning. Storage problems and default of credits are mentioned as the major problems of wholesalers in the study area.

Retailers
Retailers are key actors in the vegetable value chain in the study area. They are the last link between producers and consumers. In the study area, the main vegetable retailers were women, who sold vegetables in a small

amount. Mostly, they buy vegetables from wholesalers in credit and return the money after selling the vegetables to consumers. They offer the product according to the requirement and purchasing power of the buyers. The major vegetables sold by retailers are onion, tomato, kale, garlic, cabbage, beetroot and green pepper. The major problem raised by retailers during the survey was limited financial capacity that hinders them from being involved in the larger trade, product quality and lack of information.

Consumers

Consumers are a final buyer of the product for consumption purpose. Consumers in the study area include households/private consumers and hotel and restaurants. The private consumers in the study area are urban and rural dwellers. Private consumers purchase vegetables directly from producers, collectors, retailers and wholesalers while hotels and restaurant buy mainly vegetables from the wholesalers. The consumers have their own quality criteria to purchase vegetables such as color, shape, weight, smell, size and etc.

Consumers have a long time experience in consumption of vegetables. Vegetable consumption depends on income from coffee, so that bad harvests or low coffee prices can indirectly influence the consumption of vegetables. The consumption is relatively high during the fasting period. The major constraints that hindering consumption of vegetables is a low volume supply of vegetables, high price of vegetables and low awareness about the benefit of vegetables.

Value Chain Enablers And Facilitators

In the study areas, there are many institutions supporting the vegetable value chain in one way or another. The most common support providers are the office of agriculture, district irrigation and development authority, district trade and market development office, primary cooperatives, micro-finance institutions and NGO's. They provide supportive services including training and extension, information, financial and research services. Some service providers extend services beyond one function and others are limited to a specific function.

District irrigation and development authority and agricultural development office provide agricultural extension services to producers through experts and development agents. The office provides advisory services, facilitate access to inputs and provide technical support in seedbed preparation, fertilizer application, crop protection and post-harvest handling. The key informant interview points out that the producers get extension service on general agriculture and it is not sufficient to improve the technical skill of the producers.

Value chain map of vegetables in the study area

Value chain maps are the core of any value chain analysis. A value chain map illustrates the way the product flows from raw material to end markets and indicates how the industry functions. The overall objective of chain map is to get an overview of the actors and their functions in the value chain and the flow of products through the chain. Chain maps can also provide information on the supporting functions in the value chain (UNIDO, 2011). Mapping of the value chain was carried out after principal actor identification. This mapping included all activities, starting from farm input supply through product delivery to final consumers. The functions involved along the value chains of various vegetables in the study area are more or less similar. Differences appear mainly in the channels produce pass through in the trading functions and actors assuming different roles. Major value chain functions include input supply, production, trading and consumption. Figure 4 and 5 displays the actors and their functions in kale and tomato value chain in the study area, respectively.

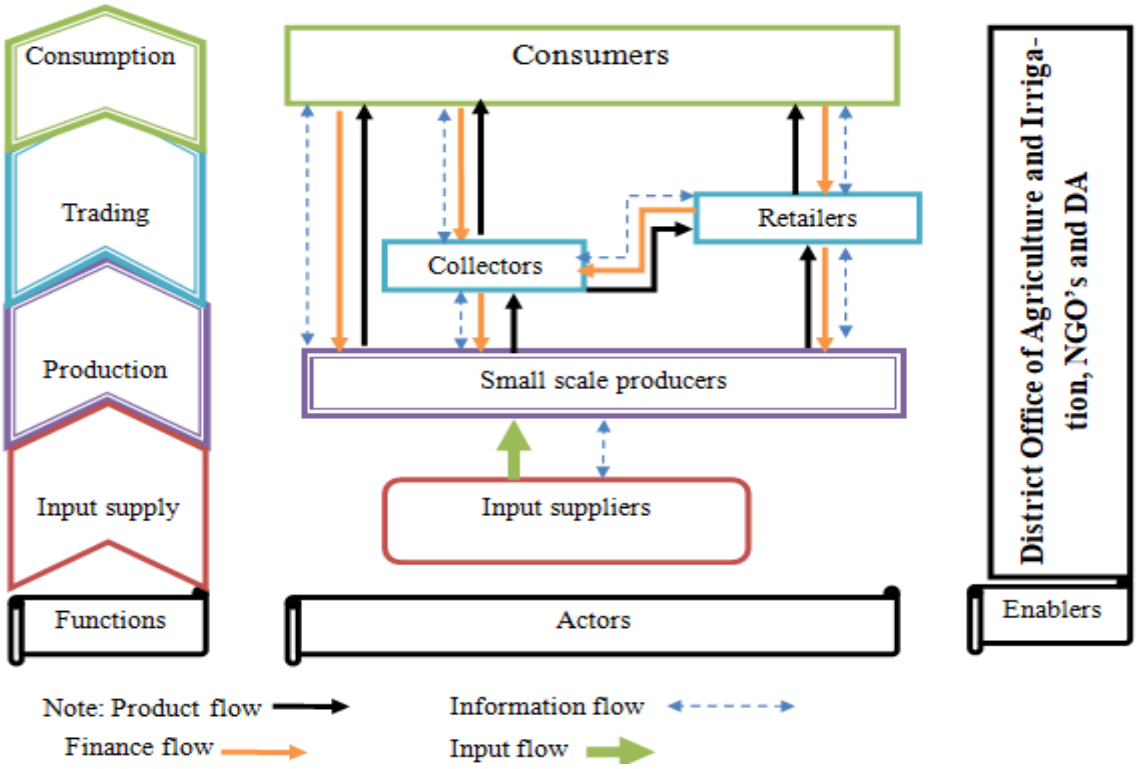

Figure 1: Value chain map of kale in study areas
Source: Own sketch from survey result, 2017

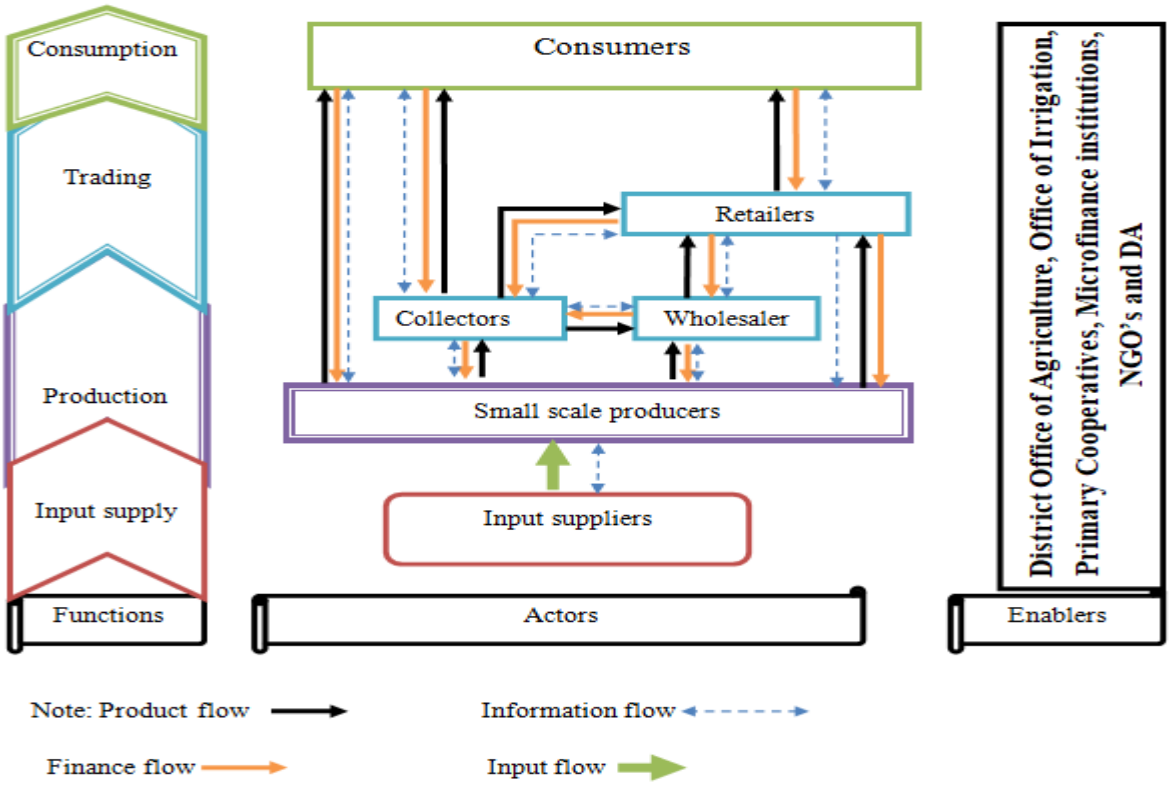

Figure 2: Value chain map of tomato in study areas
Source: Own sketch from survey result, 2017

Marketing Channels And Margin Analysis

Marketing channels

A marketing channel is a business structure of interdependent organizations that reach from the point of product origin to the consumer with the purpose of moving products to their final consumption destination (Kotler and Armstrong, 2003). 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). Since the marketing channels for different vegetables were different, the analysis was carried out for kale and tomato separately.

Kale marketing channels

In this study, four marketing channels were identified in kale marketing. The main marketing channels identified from the point of production until the product reaches the final consumer were depicted in Figure 6. The marketing actors along the marketing channel were producers, collectors, retailers and consumers. Wholesalers are not interested to buy kale because of the perishability nature of the product. Due to this marketing channel of kale are very short in the study area.

During the survey year, a total of 8014 kilograms of kale was marketed by sampled households. From the total volume sold by sample producers the largest share 46% (3686.44 kilograms) passes through channel II (Producers ⇒ Retailers ⇒ Consumers). Moreover, the producers sold kale of about 32% and 13% to consumers and collectors markets, respectively. The least volume of kale, 9% (721.26 kilograms) passes through a channel IV (Producers ⇒ Collectors ⇒ Consumers).

Channel I: Producers ⇒ Consumers (2564.48 kilograms)
Channel II: Producers ⇒ Retailers ⇒ Consumers (3686.44 kilograms)
Channel III: Producers ⇒ Collectors ⇒ Retailers ⇒ Consumers (1041.82 kilograms)
Channel IV: Producers ⇒ Collectors ⇒ Consumers (721.26 kilograms)

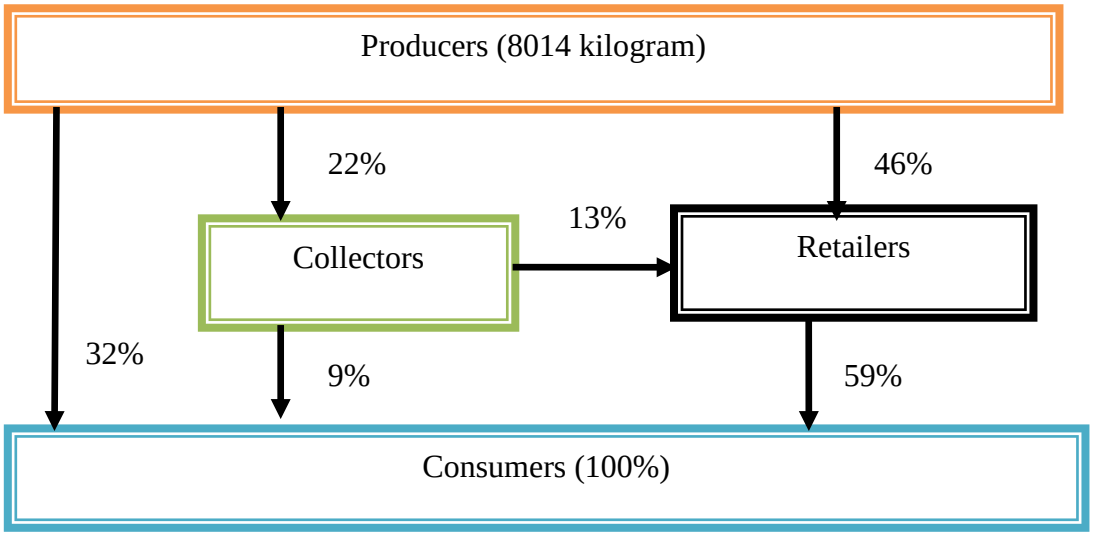

Figure 3: Kale market channel
Source: Own sketch from survey result, 2017

Tomato marketing channel

Five main alternative marketing channels were identified in tomato marketing. In the survey year, it was estimated that 25,488 kilograms of tomato were supplied to the market by sample farmers. The main marketing channels identified from the point of production until the product reaches the final consumer are presented in Figure 7.

As can be understood from Figure 7, the main buyers of tomato from producers were collectors, wholesalers, retailers and consumers with an estimated percentage share of 8%, 50%, 24% and 18%, respectively. Channel comparison was made based on the quantity of tomato that passed through each channel. Accordingly, channel IV (Producers ⇒ Wholesaler ⇒ Retailer ⇒ Consumer) accounted for the largest share 36% (9175.88 kilograms) than other channels. The least share 8% (2039.04 kilograms) goes to channel III (Producers ⇒ Collector ⇒ Retailer ⇒ Consumer).

Channel I: Producer ⇒ Consumer (18%)
Channel II: Producers ⇒ Retailer ⇒ Consumer (24%)

Channel III: Producers ⇒ Collector ⇒ Retailer ⇒ Consumer (8%)
Channel IV: Producers ⇒ Wholesaler ⇒ Retailer ⇒ Consumer (36%)
Channel V: Producers ⇒ Wholesaler ⇒ Consumer (14%)

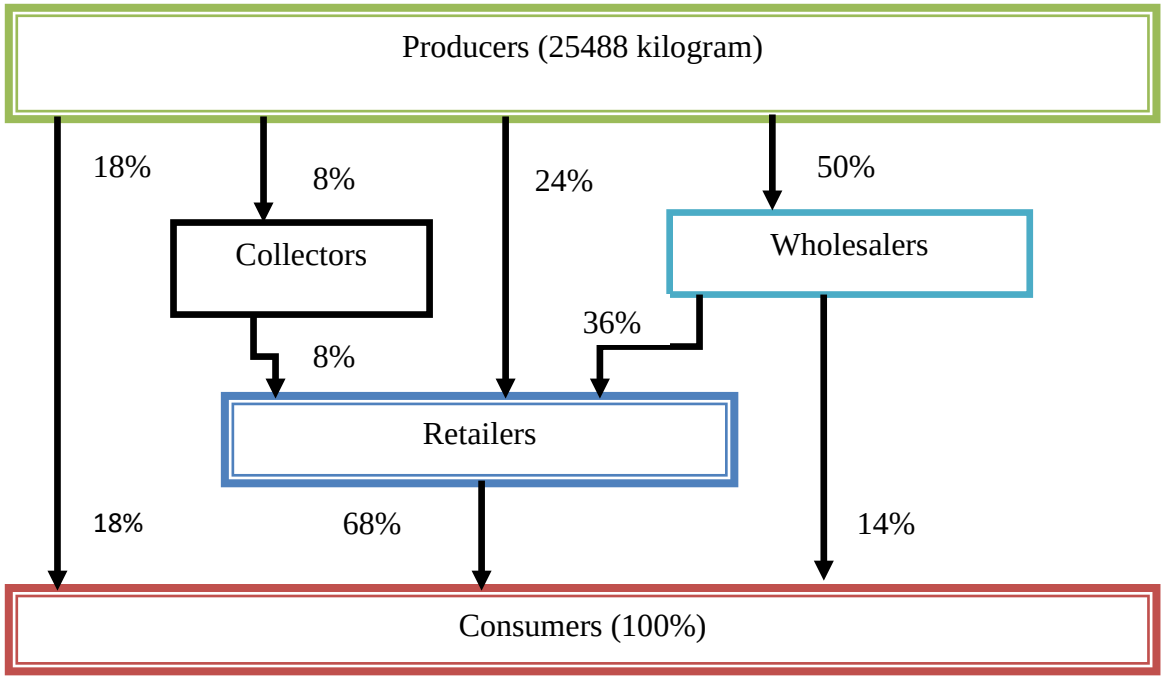

Figure 4: Tomato market channel
Source: Own sketch from survey result, 2017

Marketing margin analysis
Margin analysis can be conducted parallel to channel surveys and helps to determine how pro-poor a value chain is. It is determined based on the price received or selling price. A systematically recording of prices at different levels of the marketing chain during a two to three week period is sufficient to calculate quite accurately the relevant marketing margins (Scott, 1995).

Kale margin analysis
Table 8 indicates the benefit share of major marketing actors under various marketing channels of kale. Accordingly, producers' profit was high in the channel I which was 8.4 Birr per kilogram. In this channel, producers sell directly to consumers and receive the price paid by consumers. Producers marketing cost was also high in this channel which was 0.6 Birr per kilogram. Producers receive the lowest profit 6.1 Birr per kilogram in channel III and IV when they sell to collectors. From traders, retailers shared the highest profit 1.2 Birr per kilogram in channel II and collectors received a profit of 1 Birr per kilogram when they purchase from producers.
The result also indicated that TGMM was highest in channel III which was 25% and the lowest in channel II which was 15%, respectively, excluding channel I. High TGMM reduces the producers share (GMMp), which is the percentage share of producers from the total consumer price. Accordingly, producers share (GMMp) was high in channel II which was 85% of the total consumer price and lower in channel III which was 75%, excluding channel I. The result also showed that the maximum gross marketing margin from traders was taken by collectors, which accounts 21.05% of consumer prices in channel IV. The minimum gross marketing margin is taken by retailers which accounted for 10% in channel III.

Table 7: Estimated marketing margin of kale value chain actors per kilogram

Actors	Item	Marketing channel			
		I	II	III	IV
Producers	**Production cost**	1	1	1	1
	Marketing cost	0.6	0.5	0.4	0.4
	Selling price	10	8.5	7.5	7.5
	Gross profit	8.4	7	6.1	6.1
	GMMp (%)	100	85	75	78.95
Collectors	**Purchase price**			7.5	7.5
	Marketing cost			0.5	1
	Selling price			9	9.5
	Gross profit			1	1
	GMMc (%)			15	21.05
Retailers	**Purchase price**		8.5	9	
	Marketing cost		0.3	0.4	
	Selling price		10	10	
	Gross profit		1.2	0.6	
	GMMr (%)		15	10	
TGMM (%)		0	15	25	21.05

Where; TGMM, GMMp, GMMc and GMMr represents Total Growth Marketing Margin, Growth Marketing Margin of producer, Growth Marketing Margin of collector and Growth Marketing Margin of retailers, respectively.

Source: Own computation of survey result, 2017

Tomato margin analysis

Table 9 indicates the benefit share of major marketing actors under various marketing channels of tomato. Accordingly, producers' profit was high in channel I which was 10.7 Birr per kilogram. In this channel, producers sell directly to consumers and receive the price paid by consumers. Producers marketing cost was also high in this channel. Producers receive the lowest profit 8 Birr per kilogram in channel IV and V when they sell to wholesalers. From traders, collectors shared the lowest profit 1 Birr per kilogram in channel III when they sell to retailers.

The result also indicated that TGMM was highest in channel IV which was 33.33% and the lowest in channel II which was 20%, respectively, excluding channel I. High TGMM reduces the producers share. Accordingly, producers share was highest in channel II, which was 80% of the total consumer price and lower in channel IV which was 66.67%, excluding channel I. The result also showed that the maximum gross marketing margin from traders was taken by wholesalers, which account 28.57% of consumer prices in channel V. The minimum gross marketing margin is taken by retailers and collectors which accounted for 13.33% in channel III and IV. It was clearly observed that as the number of market agents increases, the producers share decreases. The reason was the higher the numbers of middlemen in a commodity market, the more profit they retained from their services, whether they added value to the traded item or not.

Table 8: Estimated marketing margin of tomato value chain actors per kilogram

Actors	Item	Marketing channel				
		I	II	III	IV	V
Producer	**Production cost**	1.6	1.6	1.6	1.6	1.6
	Marketing cost	0.7	0.6	0.5	0.4	0.4
	Selling price	13	12	11	10	10
	Gross profit	10.7	9.8	8.9	8	8
	GMMp (%)	100	80	73.34	66.67	71.43
Collectors	**Purchase price**			11		
	Marketing cost			1		
	Selling price			13		

	Gross profit			1		
	GMMc (%)			13.33		
Wholesaler	**Purchase price**				10	10
	Marketing cost				1.5	2
	Selling price				13	14
	Gross profit				1.5	2
	GMMw (%)				20	28.57
Retailer	**Purchase price**		12	13	13	
	Marketing cost		1	0.5	0.5	
	Selling price		15	15	15	
	Gross profit		2	1.5	1.5	
	GMMr (%)		20	13.33	13.33	
TGMM (%)		0	20	21.43	33.33	28.57

Where; TGMM, GMMp, GMMc, GMMw and GMMr represents Total Growth Marketing Margin, Growth Marketing Margin of producer, Growth Marketing Margin of collectors, Growth Marketing Margin of wholesalers and Growth Marketing Margin of retailers, respectively.

Source: Own computation of survey result, 2017

Econometric Results

Determinants of kale market participation decision and level of participation

The Heckman two-step procedure was used to determine the determinants of kale market participation decision of sample households and level of participation. The first step of the model predicted the probability of sample households to participate in the kale market and in the second step, it analyses the determinants of the level of market participation.

The model result showed that out of fourteen explanatory variables hypothesized to affect the kale market participation decision of households, four variables were found to determine the probability of kale market participation. These were education, irrigation access, non-farm income and quantity produced which were found to affect producers' decision to sell kale significantly. In the second step of Heckman's estimation, the significant factors that affect level of market participation were identified by using the OLS model. The model result showed that four variables including inverse mills ratio were found to be significantly affects the level of kale market participation. These variables were age, family size, quantity produced and inverse mills ratio. The results of the model are depicted in (Table 10).

Household education: As expected, education of household head had been associated positively with farmers likelihood to participate in kale market participation and statistically significant at 10% level of significance. As the sample household head education status increases by one, the probability of participating in the kale market increases by 1.4%, all other factors held constant.

Participation in non-farm activities (Non-farm): Participation in non-farm activities was found to be significantly and positively associated with the decision of kale market participation. The result of the model depicts that participation in non-farming activities had a positive effect on decision to participate in the kale market at 5% level of significance.

Irrigation access: Irrigation access was found to be significantly and positively associated with the decision of kale market participation at 5% level of significance. Marginal effect of the variable also confirms that the households market participation decision increase by 12.6% when they access irrigation facilities.

Quantity produced: This variable had a positive relationship with both household market participation decision and level of participation at 1% probability level. The model output predicts a unit increase in the amount of kale produced leads to the rise of the probability of kale farm household market participation by 0.6% and level of participation by 0.478 kilograms, keeping all other factors constant. This can be explained by the fact that the higher the produce the higher the farmer's motivation to sell more to generate more income.

Age of the household head: The model result depicts that age of the household head had a positive impact on level of market participation of the sampled kale households and it was significant at 10% significance level.

Family size: The model result clearly depicts that family size had a positive impact on level of market participation and it was significant at 10% significance level. The positive and significant relationship indicates that households with more number of family members is assumed to supply more amount of kale to the market than those households with relatively less number of family members. The coefficient confirms that when the family size increases by one, the level of market participation in-

creases by 2.91 kilograms keeping other factors constant. The possible reason is that vegetable production and marketing is a labor intensive activity and require large labor. To this effect large family size is more important.

Lambda (IMR): According to the model output, Lambda or selectivity bias correction factor has negative impact on level of market participation and statistically significant at a 5% significance level. This discloses the fact that there is sample selection bias which shows the existence of some unobservable farming household characteristics negatively affecting the farmers' likelihood to participate in kale market and thereby the level of market participation (Table 10).

Table 9: Determinants of kale market participation decision and level of participation

Variables	Probit regression				OLS regression		
	dy/dx	Coef.	Robust Std. Err.	P>z	Coef.	Std. Err.	P>t
Constant	------	-6.535	2.216	0.003	-39.703	25.072	0.116
Age	0.001	0.015	0.022	0.497	0.535*	0.286	0.064
Sex	-0.022	-0.227	0.557	0.683	7.094	5.360	0.189
Education	0.014	0.147*	0.089	0.099	-0.034	0.806	0.967
Family	-0.007	-0.068	0.151	0.651	2.910*	1.656	0.082
Land	-0.013	-0.134	0.242	0.580	1.568	2.747	0.569
Experience	0.008	0.080	0.060	0.182	0.189	0.892	0.832
Irrigation	0.126	1.310**	0.561	0.019	-7.601	5.176	0.145
Extension	0.037	0.389	0.196	0.047	2.598	2.889	0.371
Credit	-0.011	-0.109	0.333	0.742	-0.048	4.783	0.992
Livestock	-0.010	-0.107	0.138	0.437	-1.933	1.493	0.198
Non-farm	0.084	0.870**	0.405	0.032	7.269	4.998	0.149
Quantity	0.006	0.064***	0.021	0.002	0.478***	0.036	0.000
Distance	0.000	-0.001	0.009	0.874	-0.077	0.152	0.614
Price	-0.057	-0.595	0.438	0.174	1.776	5.147	0.731
IMR					-7.821**	3.812	0.043
Model summary	Number of obs= 120, Wald chi2 (14) = 32.79, Prob > chi2 = 0.0031, Pseudo R2 = 0.6781 and Log pseudo likelihood = -18.875225				Number of obs = 120, F(15, 104) = 29.71, Prob > F = 0.0000, R-squared = 0.8108, Adj R-squared = 0.7835 and Root MSE = 24.88		

***, ** and * represents a significance level at 1%, 5% and 10%, respectively

Source: Own survey result, 2017

Determinants of tomato market participation decision and level of participation

The Heckman two-step procedure was used to determine the determinants of tomato market participation decision and level of participation of sample households. The first step of the model predicted the probability of sample households to participate in the tomato market and in the second step, it analyses the determinants of the level of market participation.

The model result showed that out of fourteen explanatory variables hypothesized to affect the tomato market participation decision of households, four variables were found to determine the probability of tomato market participation. These were family size, production experience, participation in non-farm income generating activities and quantity produced which were found to affect producers' decision to sell tomato significantly. In the second step of Heckman's estimation, the significant factors that affect level of market participation were identified by using the OLS model. The model result showed that four variables including Inverse Mills ratio were found to be significantly affects the level of tomato market participation. These variables were extension contact, quantity produced, lagged price and inverse mills ratio. The results of the model are depicted in (Table 11).

Family size: It was significant and negatively associated with the market participation decision at 1% level of significance. The marginal effect result also indicates that a unit increase in family size decreases the probability of participation in tomato market by 6.4%, keeping other factors constant.

Production experience: The result shows that vegetable farming experience of households has positive and significant effect at the 1% level on the tomato market participation decision. Thus, the result implied that as farmer's experience increase by one year, the probability of

market participation increase by 2.4%, keeping other factors constant.

Participation in non-farm activities (Non-farm): The result of the model depicts that participation in non-farming activities had a negative effect on decision to participate in the tomato market at 10% level of significance. The result also showed that if tomato producers participate in non-farm income generating activity, tomato market participation decision would decrease by 8.2%, keeping other factors constant. This implies that farmers who had non-farm income sources were not encouraged earning from sale of tomato and also the income earned from this sector is not invested in farm improvement activities. The finding is consistent with the findings of Omiti *et al*. (2009) who found that households who earn income from non-farm activity participate less than those who did not have access.

Quantity produced: The total amount of tomato produced in a year had a positive and significant impact both on the tomato market participation decision and level of participation at 1% significance level.

Extension contact: As expected, an increase in the number of extensions visits significantly and positively affected the level of market participation at less than 5% significance level.

Perception of lagged price: The model result depicts that this variable had a negative relationship with the tomato level of market participation and it was found to be statistically significant at 10% probability level. The negative and significant relationship between the variables indicates as household's perception on lagged market price of tomato goes from attractive to not-attractive (low), decreases the level of market participation of tomato by 16.815 kilograms, keeping other factors constant. This implies that when the perception of lagged market price of farmers is attractive, it motivates the farmers to produce more, they have surpluses to supply to the market and lagged price can act as a motivation to produce towards market participation. This is in line with the finding of Musah *et al.* (2014) who found that output price is an incentive for farm households to participate more in the supply market. The study also confirms the study conducted by Abera (2015) who found that lagged market price affects the household's decision to participate in the market.

Lambda (IMR): It was significantly and negatively related to the level of market participation at the 10% level of significance which implies that the error term in the selection and outcome equation is negatively correlated. It also indicates that there was a sample selection bias or the existence of unobserved factors that determine farmers' likelihood to participate in the tomato market and thereby affecting the level of participation.

Table 10: Determinants of tomato market participation decision and level of participation

Variables	Probit regression				OLS regression		
	dy/dx	Coef.	Robust Std. Err.	P>z	Coef.	Std. Err.	P>t
Constant	-------	-1.350	2.280	0.554	51.059	48.931	0.299
Age	-0.002	-0.020	0.026	0.440	0.032	0.583	0.957
Sex	-0.016	-0.136	0.518	0.793	-0.539	11.244	0.962
Education	-0.001	-0.008	0.071	0.907	-0.019	1.580	0.990
Family	-0.064	-0.534***	0.171	0.002	-1.846	3.001	0.540
Land	-0.035	-0.293	0.232	0.206	1.076	5.307	0.840
Experience	0.024	0.201***	0.077	0.009	-0.785	1.761	0.657
Irrigation	0.039	0.324	0.417	0.438	-13.983	9.704	0.153
Extension	-0.057	-0.475	0.349	0.173	13.371**	6.615	0.046
Credit	0.073	0.614	0.494	0.214	3.325	9.838	0.736
Livestock	0.019	0.160	0.105	0.129	3.021	3.136	0.338
Non-farm	-0.082	-0.685*	0.409	0.094	-7.858	9.803	0.425
Quantity	0.006	0.054***	0.013	0.000	0.806***	0.019	0.000
Distance	0.000	0.001	0.009	0.884	-0.183	0.246	0.460
Price	-0.039	-0.326	0.467	0.485	-16.815*	9.455	0.078
IMR					-10.272*	5.634	0.071
Model summary	Number of obs = 120, Wald chi2 (14) = 27.07, Prob > chi2 = 0.0189, Pseudo R2 = 0.6571 and Log pseudo likelihood = -25.421832				Number of obs = 120, F (15, 104) = 293.99, Prob > F = 0.0000, R-squared = 0.9770, Adj R-squared = 0.9736 and Root MSE = 49.72		

***, ** and * represents a significance level at 1%, 5% and 10%, respectively

Source: Own survey result, 2017

Summary, Conclusion And Recommendations

Summary

In many parts of the world, agriculture continues to play a crucial role in economic development and poverty reduction. The horticulture sub-sector is one of the fastest growing food sectors in the world. The sector plays a significant role in developing countries like Ethiopia both in income and social spheres in improving income and nutritional status. Thus, the study has analyzed vegetable value chain by focusing on kale and tomato crops in Yayu and Hurumu districts. The specific objectives of the study were identifying the major vegetables value chain actors and their roles, analyzing marketing margins of value chain actors in the vegetable value chain and identifying determinants of market participation decision and level of participation of farm households in the vegetable market. To address the objective of the study, both quantitative and qualitative methodologies were used. The data were generated from both primary and secondary sources. The primary data were collected through personal interviews from a total of 161 respondents (120 producers, 25 traders and, 16 consumers) using questionnaires. Qualitative data were also collected through focus group discussions, key informant interviews and observations. The survey data were analyzed using descriptive statistics, value chain analysis and econometric tool. The main findings of this research are summarized as follows.

During the survey year, a total of 8014 kilograms of kale and 25488 kilograms of tomato were marketed by sampled households. The t-test and chi-square test were used to test the presence of significant statistical differences between market participants and non-participants in terms of continuous and dummy variables, respectively. Accordingly, the t-test result indicated that there is a significant mean difference between kale market participants and non-participant in terms of family size and quantity produced. Similarly, the t-test result for tomato indicates that there is a significant difference between market participants and non-participants in terms of extension contact and quantity produced. The chi-square test shows that there was no significant mean difference between those who participate in the market and those who didn't participate in the market for both commodities in terms of sex, perception of the previous year price, participation in non-farming activity, access to credit and irrigation.

Vegetable value chain analysis in the study areas revealed that the main value chain actors are input providers, producers, collectors, wholesalers, retailers and consumers. Input suppliers' function was 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 (collectors, wholesalers and retailers) perform activities such as assembling, retailing, transporting and selling to consumers. There are also governmental and non-governmental supportive actors who are involved in the vegetable value chain directly or indirectly. Value chain supporters or enablers provide facilitation tasks like creating awareness, financial services, research and development, infrastructures and information.

About four different kale market channels have been identified in the study area. Channel comparison was made based on the quantity of product that passed through each channel. Accordingly, channel II was found to be the most important channel in terms of its volume of transaction. The results also showed that kale producers' market profit was highest when they sell directly to consumers in the channel I which is about 8.4 Birr per kilogram while took lowest market profit when they sell to collectors in channel III which is about 6.1 Birr per kilogram. The total gross marketing margin was highest in channel III which was about 25% and lowest in channel II which was about 15%. The producer's share is highest about 85% of the total consumer price in channel II and lowest in channel III which was about 75% because of the involvement of the intermediaries in this channel. It is observed that high total gross marketing margin reduces the producer's share which is the percentage share of producers from the total consumer price.

About five different market channels of tomato are also identified with each channel having different volume of quantity and marketing margin. Channel IV was found to be the most important channel in terms of its volume of transaction. Producers marketing profit share was highest when they sell directly to consumers in the channel I which was about 10.7 Birr per kilogram and the lowest profit 8 Birr per kilogram in channel IV and V when they sell to wholesalers. From traders, collectors shared the lowest profit 1 Birr per kilogram in channel III when they sell to retailers. The producer share of the consumer price was maximum 80% in channel II and the minimum 66.67% in channel II. The total gross marketing margin was highest in channel IV which accounts 33% and lowest in channel II which was about 20%. As the number of intermediaries increases, the producer's share in consumer's price decreases.

The econometric result of the Heckman first stage (probit regression) model indicated that education level of household head, irrigation access, participation in non-farm activity and quantity produced are significantly determining the market participation decision of kale. Moreover, market participation decision of tomato was

significantly affected by family size, production experience, participation in non-farm activity and quantity produced.

The results of the Heckman second stage (OLS regression) model indicated that kale level of market participation of the sample households were influenced by age of household head, family size and quantity produced. On the other hand, extension contact, quantity produced and perception of lagged price affected the second decision concerning the farm household's level of market participation. Inverse Mills ratio (lambda) was also significant factor affecting the level of participation of both commodities.

Conclusion

The significant mean differences were recorded between market participant and non-participants of kale regarding family size and quantity produced. Similarly, there is significant mean difference between tomato market participants and non-participants in terms of extension contact and quantity produced shows that those factors need an intervention; so as to increase possible gain particularly in the study area from vegetable value chain.

In the study area, there are many actors involved in vegetable value chain playing different roles. They were input suppliers, producers, collectors, wholesalers, retailers and consumers. Vegetable produced in the study area passes through several intermediaries, like collectors, wholesalers and retailers before reaching the consumers. The intermediate buyers purchase vegetables from farmers at a lower price and sale to the end users at a higher price. The higher difference prevailed in prices between producers and intermediaries shows that there was little assistance of farmers. The lower percentage share of producers from vegetable value chain needs intervention to improve the gain of farmers by accessing them to higher markets. Further, the higher price changes exhibited between producers and consumers' shows that there was lower access that consumers to purchase directly from farmers; hence consumers were directly purchasing from retailers paying higher prices.

The important factors which were found to be significantly affecting kale market participation decision of small holder farmers to participate in the kale market were education level of household head, irrigation access, participation in non-farm activity and quantity produced. Similarly, variables such as family size, production experience, participation in non-farm activity and quantity produced significantly affect the tomato market participation decision. In addition to this, age of household head, family size and quantity produced are among significant factors influencing the kale level of market participation of producers while extension contact, quantity produced and perception of lagged price were among determinants which affect significantly tomato producer's level of market participation. Hence, these significant factors need to be intervening so as to enhance the possible gain that could be drawn from vegetable value chain particularly in the study area.

Recommendations

The findings of the study stresses the need for appropriate policy formulation and implementation on factors that enable farmer's market participation as this is expected to have multiplier effects ranging from farm income growth to economic growth and poverty reduction at macro level. This leads development programs should act upon these variables. Therefore, the following recommendations are forwarded based on the results of the study.

The quantity produced has significant and positive effect on both kale and tomato market participation decision and level of participation. Therefore, policies that would improve farmers' production capacity such as the supply of improved seeds and credit to farmers should be explored. In addition to that, for boosting production continuous training and follow up should be provided on factors that further increase the productivity of land by responsible stakeholders.

The age of household head has a significant and positive effect on level of kale market participation. Even though it is difficult to increase the age of respondents it is possible to share knowledge from older farmers to young and inexperienced farmers. Hence, the local government should arrange experience sharing and provision of short-term training programs so as to share the rich knowledge of old farmers to young and inexperienced farmers.

Education has positive and significant effect on kale market participation decision. Hence, appropriate policies should be designed to provide adequate and effective basic educational opportunities to the rural farming households in general and to the study area in particular. In this regard, the regional and local government should strengthen education level of household heads through facilitating all necessary materials that is required for education.

Extension contact has significant and positive effect on level of tomato market participation. Therefore, the policies and strategies should place more emphasis on strengthening the existing agricultural extension service provision through providing incentives, short and long-term training and upgrading educational level, providing non-overlapping and congruent responsibilities to extension workers.

Irrigation access has significant and positive effect on kale market participation decision. Therefore, it is recommended that smallholder farmers need to be provided technical and financial support that enable them to have irrigation facility. It is also recommended that government should give attention to scaled up underground water and other water sources to expand vegetables production and productivity.

The result also showed that when the farmers' perception of lagged market price was not attractive, the level of tomato market participation will decrease. Therefore, creating an environment where the attractive price of tomato would be offered to farmers is an important policy issue for the concerned bodies so that farmers' perception about price would improve.

Participation in non-farm activities has positive and significant effect on kale market participation decision. However, it has negative effect on tomato market participation decision. Thus, the further analysis must be needed to recommend for the farmers to participate in a non-farming activity or not. Similarly, family size has positive and significant effect on level of kale market participation. However, it had a negative effect on the market participation decision of tomato. Thus, the further analysis must be needed.

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