

Tomato Value Chain Analysis in Yayo And Hurumu Districts of Ilu Aba Bor Zone, Ethiopia

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Research Article

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Abstract

Background: Tomato is one of the most important and widely grown vegetable in Ethiopia. This study was aimed at analyzing tomato value chain in Yayu and Hurumu districts of Ilubabor zone. 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 tomato market.

Methodology: The study used both primary and secondary data. Descriptive statistics, value chain analysis and Heckman two-stage selection model were used to analyze the data.

Results: The major tomato value chain actors in the study area are input suppliers, producers, collectors, wholesalers, retailers and consumers. Producer received the maximum profit when they sell directly to consumers. The Heckman first stage model result showed that four variables such as 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 extension contact, quantity produced and perception of lagged price significantly influence the tomato level of market participation.

Conclusion: in the study area Tomato is produced mainly as a source of food and income and it is one of the most important and widely grown vegetable. The market participation decision of the farmers is influenced significantly by family size, production experience, participation in non-farm activity and quantity produced. Similarly, 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 tomato value chain in the study area.

Introduction

The horticulture 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. Ethiopia has a diverse climate and altitude conditions which are conducive to the production of different vegetable crops [1].

Varieties of vegetable crops are grown in different agro-ecological zones by smallholder farmers, mainly as a source of income as well as food. The types of vegetables grown vary with agro-ecology and consumption preferences [2].

Tomato (*Lycopersicon esculentum* Mill) is one of the most important and widely grown vegetable in Ethiopia. It is produced mainly in the country as a source of food and income both under rain-fed as well as irrigation. It is also a source of basic raw material required for fresh consumption and local processing industry for the production of processed tomato like tomato paste and tomato juice [3]. Recently the total

production of tomato in Ethiopia has shown a marked increase and it became the most profitable crop providing a higher income to small scale farmers. During the 2016/2017 cropping season, the total annual tomato production was estimated to be 283,648.27 quintals of which 117,728.85 quintals (41.51%) is from the Oromia region and 141,341.21 quintals (49.83%) is from Amhara and Tigray regions. The total area under tomato in Ethiopia is 6,298.63 hectares, whereas the total area under this crop in Oromia regional state is 1,703.03, Amhara 1,074.46 and Tigray 888.98 hectares [4]. However, the average productivity of this crop was still less than the potential.

Many development interventions now use a value chain approach as an entry point to engage smallholders, individually or collectively, in local and high value export markets [5]. Value chain analysis offers the opportunity to assess the efficiency of value-added operations/services as well as systemic competitiveness along the supply chain to increase production, trade and the income-generating potential of farmers and other actors. Understanding this importance of value chain analysis, different studies were conducted in different regions of the country in relation to tomato value chain and identified different constraints that hinder the development of the value chain system. For instance, study conducted by [6] 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 [1] 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.

Even though a number of studies were carried out in different regions of the country by different scholars in relation to tomato value chain, there is no empirical evidence to inform policy makers and agricultural practitioners on tomato value chain in the study area despite the enormous merits and potentials. Therefore, there was strong need to conduct tomato value chain analysis. This will help to reduce the information gap on the subject and help both research and development initiative to improve the value chain. The objective of this study is therefore, to identify the major tomato value chain actors and their roles in the value chain, to estimate the marketing margins of each actor and to identify the determinants of market participation decision and level of participation in the market in the study area.

Methodology

Description of the Study Areas

The study was conducted in *Yayu and Hurumu districts*, Ethiopia (Figure 1). The two districts were located in the southwest part of the country at a distance of 560 km and 578 km from Addis Ababa, respectively. As in many other rural parts of Ethiopia, agriculture, which is often typically characterized by

mixed farming, is the main source of cash income and food for the majority of forest-dependent communities in the study area. Crop production and livestock rearing form the key components of the rural livelihood strategies. The cultivation of staple or cash crops that are annual or perennial in their nature is a key land-based livelihood activity performed by villagers [7]. Some of the widely cultivated staple crops include Maize, Sorghum, Teff, Finger millet, Field pea and Faba bean. Meanwhile, the perennial crops include wild coffee, Enset and *Khat* (a shrub that has a stimulating effect when the fresh young leaves and tender shoots are chewed.) Moreover, vegetables and root crops produced in the area include kale, tomato, head cabbage, onions, potato and sweet potato. The collection of non-timber forest product is another form of local economic activity. These products include woods for house construction, thatching grass, climbers, ropes, timber, charcoal, wild fruits, wild spices, and woods for agricultural tools. There are also medicinal plants that are vital to local communities and their livestock. Wild coffee is also another essential crop, contributing to both cash income source and subsistence needs of the local community [8].

Data Type, Source and Methods of Data Collection

In this study, both qualitative and quantitative data types were collected. Both primary and secondary data sources were also used. 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*. This information was generated through discussion with an expert at district irrigation and development authority. In order to conduct the formal survey, survey questionnaires were prepared and pre-tested for each value chain actors operating in the study area. Primary data were also supplemented with secondary data collected from the literature of published and unpublished sources.

Sampling Procedure and Sample Size determination

Producer survey was conducted in Yayu and Hurumu district, Ethiopia. The two districts were selected purposively. Two-stage sampling technique was used to draw the sampling units of the study. In the first stage, four kebeles from tomato growers in the districts were selected randomly. Second, the number of respondents was determined by using probability proportional to size sampling procedure. Then the predetermined size of the sample farmers from each kebele was randomly selected using systematic random sampling technique. This study applied sample size determination formula developed by [9] at 95% confidence interval with 9% precision levels.

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

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

Table 1: Sample size distribution of tomato producers

No.	Kebeles	Total number of tomato 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, 2018

Further, data from traders (collectors wholesalers and retailers) and consumers were also collected. The sites for the trader surveys were district market in which a good sample of tomato traders exists. The traders sampling were very tricky because of the absence of heir population list and specific sampling frame that was used as a benchmark for the sample selection. Hence 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 tomato value chain. As a result, 3 collectors, 4 wholesalers, 18 retailers and 16 consumers were selected.

Methods of Data Analysis

To analyze data, descriptive statistics, value chain analysis and Heckman two-stage selection model were used. The main descriptive statistical tools employed to characterize households were means, frequencies, percentages, t-test and Chi-square test. The Heckman two-stage selection model was used to determine factors affecting the market participation decision and level of market participation. Heckman has developed a two-step estimation procedures model that corrects for sample selectivity bias and participation and level of participation might be affected by different factors. If two decisions are involved, such as participation and value of tomato sales, [10] two-step estimation procedure is appropriate. The first stage of the Heckman model a 'participation equation', attempts to capture factors affecting market participation decision. This equation is used to construct a selectivity term known as the 'inverse Mills ratio' which is added to the second stage 'outcome equation' that explains factors affecting level of market participation. The inverse Mill's ratio is a variable for controlling bias due to sample selection [10]. The second stage involves including the Inverse Mills ratio to the outcome equation and estimating it using Ordinary Least Squares. The specifications of Heckman two-step procedure for the two steps are specified as follows.

Step 1: The selection equation:

$$P_{(0,1)} = \beta_0 X_0 + \beta_1 X_1 + \beta_2 X_2 + \dots \beta_n X_n + e \quad (2)$$

Where; participation is denoted by 1 and not- participation is denoted by 0, β_0 is a constant, $\beta_1 \dots n$ are parameters to be estimated and X_{is} are a vector of explanatory variables.

Step 2: Outcome equation

$$Y = \beta_0 X_0 + \beta_1 X_1 + \beta_2 X_2 + \dots \beta_n X_n + e \quad (3)$$

Where; Y denotes the amount of tomato sales, β_0 is a constant, $\beta_1 \dots n$ are parameters to be estimated and X_{is} are a vector of explanatory variables.

Definition of Variables and Hypotheses

Dependent variables

1. **Market participation decision of tomato producers (Y):** It was a dummy variable that is regressed in the first stage of the Heckman two-stage model estimation procedure. It takes a value of one for the sample households who participate in the tomato market and zero for non-participant sample households.
2. **The level of market participation (y):** It was a continuous variable and measured in a kilogram. It represents the level of the marketed surplus of vegetables by measuring the actual volume of vegetables sold by farm households annually in the market.

Independent Variables

In this study, independent variables are derived from reconnaissance survey research conducted in the other area, evidence from past research, from published literature, as well as from discussion with experts. The description of explanatory variables, their measurement, and expected effect are shown in Table 2.

Table 2: Description of independent variables

Variables	Description	Measurement	Expected effect
Age	Age of the household head	Number of years	Indeterminate
Sex	Sex of the household head	1= male, 0 = female	Indeterminate
Education	Educational level of household head	Years of schooling	Positive
Family	Number of family size in household	Adult equivalent	Indeterminate
Land	Total land size of the household head	Hectare	Positive
Experience	Tomato production experience	Number of years	Positive
Irrigation	Access to irrigation	1= yes, 0 = no	Positive
Extension	Extension contact	Number of contacts	Positive
Credit	Access to credit services	1= yes, 0 = no	Positive
Livestock	Livestock ownership	Tropical livestock unit	Positive
Non-farm	Participation in non-farm activities	1= yes, 0 = no	Positive
Quantity	Total quantity produced	Kilogram	Positive
Distance	Distance from the nearest market	Walking hours	Negative
Price	Last year price perception	1=attractive, 0 = otherwise	Positive

Results And Discussion

Characteristics of sample producers

From the total sampled tomato producers, 69.17% were tomato market participants during the survey year. Average age of the sampled respondents was 40 years ranging from 21 to 72 years. The average family size of sample respondents was found to be 4 and 5 persons for participants and non-participants, respectively. The mean number of years that had been spent in formal school was 4.39 years. For the sample households, the average time to the nearest market in hours of walking time was 58.5 minutes. The survey result with respect to land holding of the respondents reveals that the land holding size of the sample households ranges from 0.25 to 5ha with a mean of 1.58 ha. The farming experience of tomato producer sample households ranges from 2 to 17 years with a mean of 7.68 years. The t-test result revealed that quantity of tomato produced by the market participants and non-participants showed variation at less than 1% probability level (Table 3). A farm household 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. The result 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 survey results show that of the total sample households, 75.83% were male headed and 24.17% were female-headed households. The result also shows that from the sample households 48.33% of them replied that the price of tomato in the previous year was attractive. In terms of non-farm activity, the survey result shows that 45% of sample respondents were participating in non-farm income generating activity while 55% were not participating in the non-farm activity as their source of income. In study area petty trade, daily labor, a local brewery, firewood and charcoal sale, consumer good retailing, transportation of produces (from and to the market/farm) and temporary employment on others' farm was found to be some of the non-farm income generating activities in which sampled farmers were participating. The chi-square test shows that there was no significant difference between those who participate in the market and those who didn't participate regarding the sex of household head, perception of the previous year price of tomato, participation in non-farming activity, access to credit and irrigation.

Table 3: Characteristics of tomato market participants and non-participants

Continuous Variable	Mean		Total (120)	t-test	
	Participant (83)	Non-participant (37)			
Age	41	38	40	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		
Price	Attractive	51.81	40.54	48.33	1.3009
	Not attractive	48.19	59.46		
Non-farm	Yes	46.99	40.54	45	0.4298
	No	53.01	59.46		
Credit	Yes	57.83	54.05	56.67	0.1487
	No	42.17	45.95		
Irrigation	Yes	60.24	51.35	57.5	0.8276
	No	39.76	48.65		

*** and ** represents a significance level at 1% and 5% level

Source: Own survey, 2018

Value Chain Analysis

Major 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. Along with the farmers, a number of actors participated in the value chain of tomato from the production point to the consumer point. The major actors involved in tomato value chain, their roles and interrelationships are discussed in Table 4 below.

Table 4: Major value chain actors and their functions

Actors	Functions
Input Suppliers	Supplying inputs such as seeds, fertilizer, pesticides and farm implements. They include office of agriculture and irrigation, primary cooperatives, traders and informal farmers to farmer's exchange.
Producers	They perform most of the value chain functions right from farm inputs preparation on their farms or procurement of the inputs from other sources to post-harvest handling and marketing.
Collectors	buying and assembling, repacking, sorting, transporting and reselling
Brokers	Facilitating transactions by bringing the buyers and sellers together.
Wholesalers	Purchasing and reselling to other traders and consumers.
Retailers	They are the last link between producers and consumers. They resell the produce to consumers
Consumers	Consumers are a final buyer of the product for consumption purpose.
Enablers and facilitators	They provide support services. They include office of agriculture, district irrigation and development authority, district trade and market development office, primary cooperatives, micro-finance institutions and NGO's.

Source: Own survey, 2018

Value chain map of tomato 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 [11]. 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.

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 [12]. 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). Five main alternative marketing channels were identified tomato marketing in the study area. The main marketing channels identified from the point of production until the product reaches the final consumer are presented in Table below.

Table 5: Main alternative marketing channels of tomato marketing in the study area

Channel	Actors
I	Producer → Consumer
II	Producers → Retailer → Consumer
III	Producers → Collector → Retailer → Consumer
IV	Producers → Wholesaler → Retailer → Consumer
V	Producers → Wholesaler → Consumer

Source: survey result, 2018

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 [13]. The results of the study showed that tomato producer's share is highest about 80% of the total consumer price in channel II and lowest in channel IV which was about 66.67% because of the involvement of the intermediaries in this channel. As the number of intermediaries increases, the producer's share in consumer's price decreases. Table 6 indicates the estimated marketing margin under various marketing channels of tomato.

Table 6: 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

Source: Own computation of survey result, 2018

Econometric Results

The Heckman two-step procedure was used to determine the determinants of tomato 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 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 and level of participation, four variables were found to determine the probability of market participation and four variables including inverse mills ratio were found to be significantly affects the level of tomato market participation. The results of the model are depicted in (Table 7).

Table 7: 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, 2018

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. The implication is that households' participation decision in tomato market could depend on family size or the per capita consumption requirement that could be satisfied from own production. Thus, the likelihood of being a seller in tomato market decreases for households with larger family size. The result is consistent with the result of [14] who found that household with large family sizes need to feed their family first and take the remaining small portion surplus to the market, especially if the crop is consumed at home.

Production experience: The result shows that tomato 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 increases by 2.4%, keeping other factors constant. This means that farmers with more experience in tomato production and marketing have higher ability to produce more and participate in the market.

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. 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 able to encouraged earning income 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 [15] who found that households who earn income from non-farm activity participate less than those who did not have access.

Quantity produced: the result showed that 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. The result also implied that a unit increase in the quantity of tomato produced would lead to increase the market participation decision and level of participation by 0.6% and 0.806 kilograms, respectively. The reason behind is that farmers can sell more from extra production/harvests which can meet and satisfy the demand of households. Unlike the other cereal crops, farmers cannot store tomato for a long time; since it is relatively perishable. So, they are forced to sell. Hence, as more is produced more will be supplied to the market. This is in line with that of [16] who found that the amount produced had a positive relationship with household market participation decision and level of market participation.

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. The result indicated that an extra extension visit would increase the level of market participation by 13.37 kilograms, keeping other factors constant. This could be attributed to the fact that an increase in the number of extension visits

would avail up to date information and knowledge regarding agricultural technologies that might improve productivity and therefore increase the level of participation.

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 [14] 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 [17] 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

Conclusion

Tomato is one of the most important and widely grown vegetable in Ethiopia. It is produced mainly in the country as a source of food and income. The market participation decision of tomato farmers is influenced significantly by family size, production experience, participation in non-farm activity and quantity produced. Similarly, 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 tomato value chain 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 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.

- 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.
- 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

Declarations

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Availability of data and materials

The data sets are used and/or analyzed during the current study available from the corresponding author on request.

Ethics approval and consent to participate

Not applicable.

Consent for publication

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Competing interests

I declare that the author does not have any competing interests.

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Figures

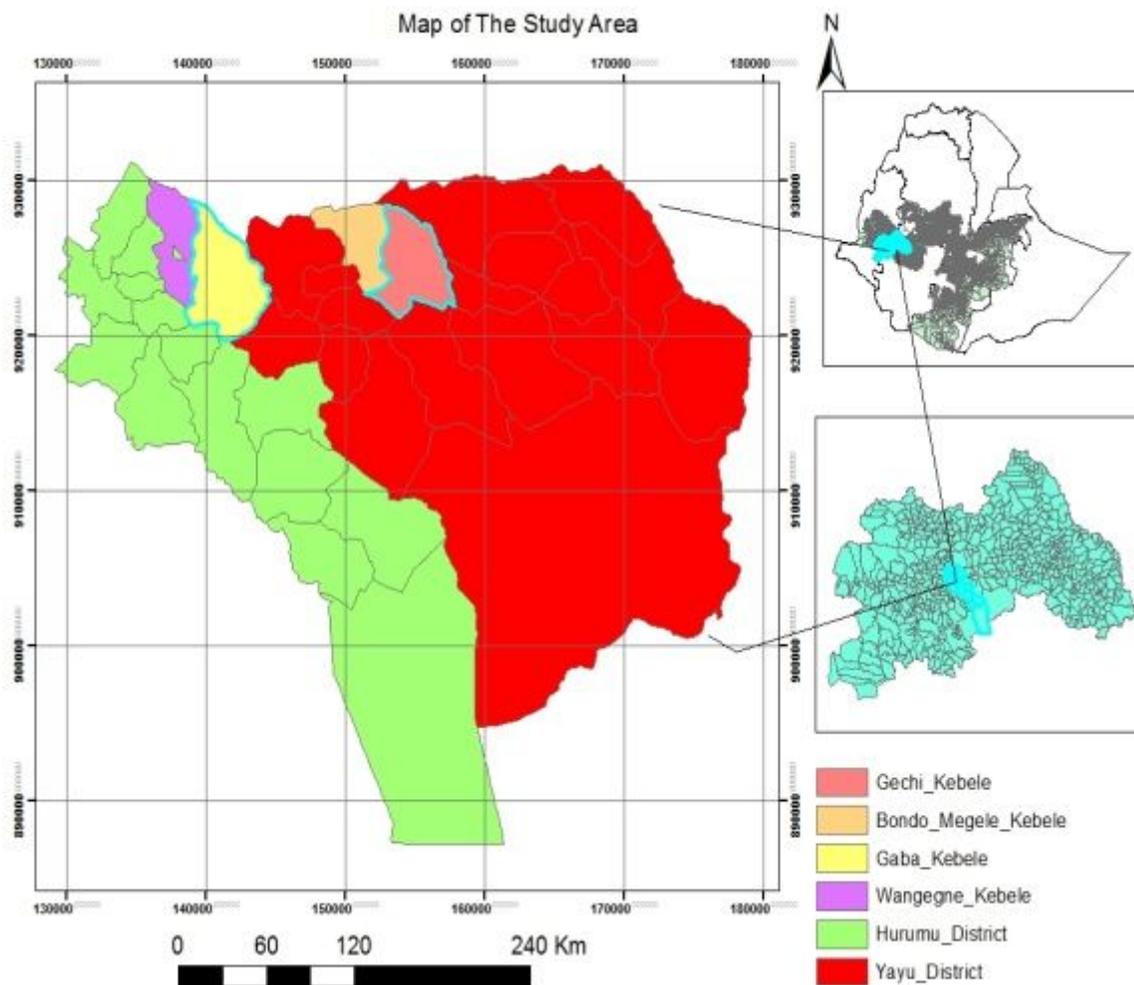


Figure 1

Map of the study areas

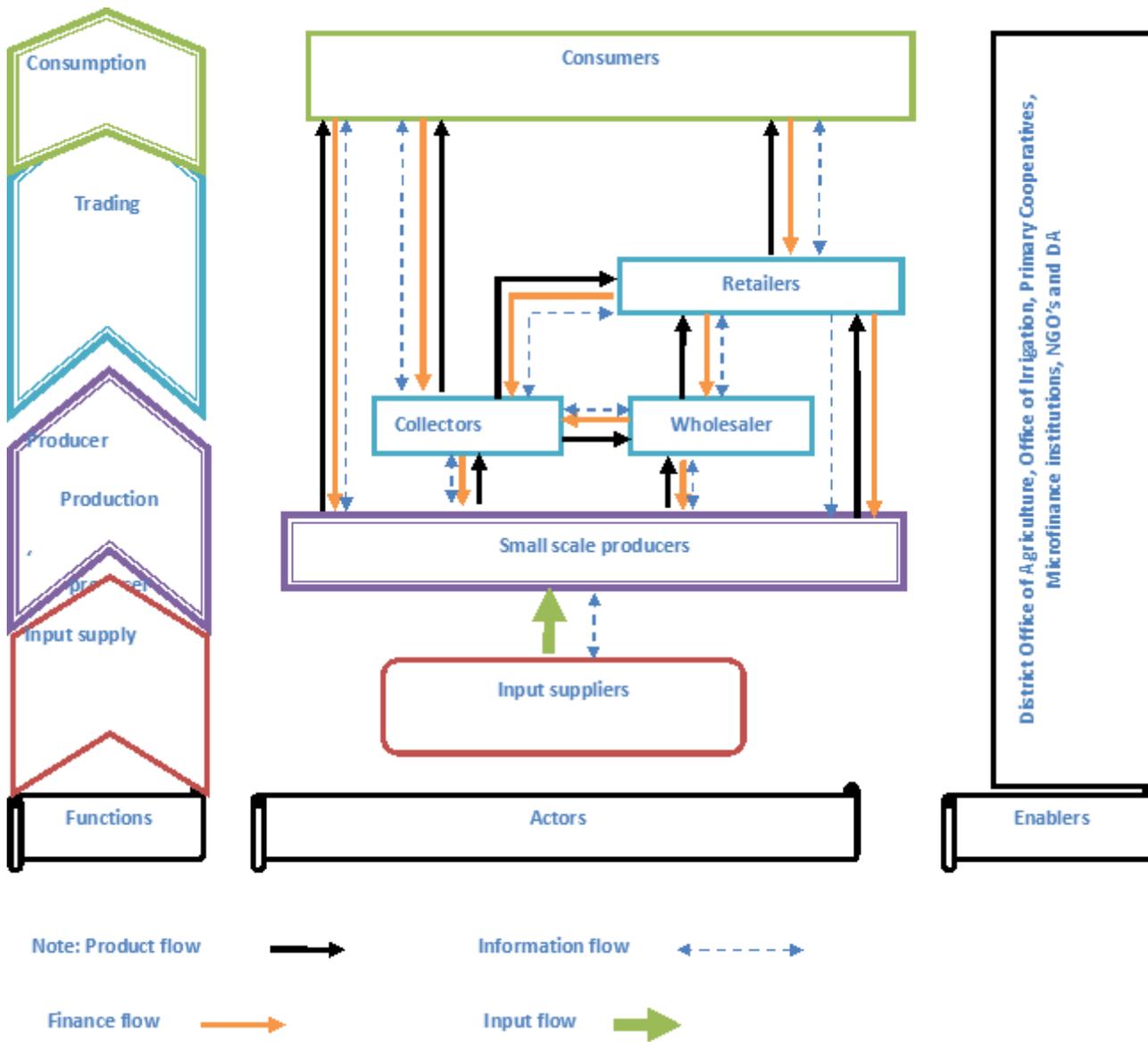


Figure 2

Value chain map of tomato in study areas

Source: Own sketch from survey result, 2018