Determinants of Market Outlet Choices by Smallholder Tomato Producers in Mecha District Amhara National Regional State, Ethiopia

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Abstract

Tomato plays a significant role in increasing food security and income for the poor farmers of Ethiopia in general and Mecha district in particular. Tomato is a perishable vegetable product; market channel choice is a must to distribute the product in its freshness. To determine the sampling techniques used in the study, multi-stage sampling technique was applied. A simple random sampling technique was employed, to select 125 tomato producers in the study area. A multivariate probit model was employed to identify the factor affecting tomato market channel choices. The result of the multivariate probit model indicates that farming experience, total land size, distance to local markets, education level, land allocated for tomato, farm-gate price, non-farm activities, and market information have a significant impact on market outlet choices. The study findings highlight important development and policy implications include the need to improve farmers experience with tomato production and marketing, encourage adult education, expand the accessibility of market infrastructure and strengthen supportive institutions for credit access.

Key words: Tomato, Market outlet choice, multivariate probit model.
JEL Classification: Q1, Q2, Q3, Q4, Q5

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1. Introduction

Tomato (Lycopersicon esculuntum Mill) is one of the most popular vegetables in the tropics and sub-tropics have been grown all over the world (Geetha, 2011). The weather condition of Ethiopia is very important for tomato production and other vegetable crops, both during the rainy and dry seasons, by smallholder farmers, commercial state and private farms. It offers better economic returns to many farmers in Ethiopia, especially when it is grown during the wet season. It is mainly produced under irrigation during the off-season because, under rainy conditions, it is susceptible to a disease complex and perishable in nature. Successful cultivation of tomato is based essentially upon the choice of suitable varieties for a particular location (Desalegn et al., 2016). Smallholder farmers produce tomato for long time for their livelihood needs and consumption since the start of its commercialization. But the average yield of tomato in Ethiopia is low, ranging from 6.5-24.0 Mg ha-1 compared with the average yields in most developed countries such as America, Europe, Asia, and the entire world; ranging from 51, 41, 36 and 34 Mg ha-respectively (FAOSTAT, 2010).

Tomato producers have also been challenged by inconsistent production and low yields due to seed type, lack of irrigation, biocide use, diseases, drought, and cold effects (Ambecha et al., 2015).

Mecha district is identified as one of the potential fruit and vegetable production areas in the West Gojjam zone due to its proximity to the Koga Irrigation and Watershed Management Project. Despite the huge production of tomatoes in the district, the value chain is not well developed. Given the perishable nature of the product and the absence of producers' organizations and a lack of corrective actions, the current marketing system might put smallholder producers in a disadvantaged position. The marketing linkage between actors is also not well developed. Huge post-harvest losses of the harvested tomato occur due to inadequate storage facilities, which bring substantial losses to the growers and hence to the national economy (Melaku and Getachew, 2016).

Various factors affect households' decisions to select market outlets for delivering their products to the market. Identifying these factors is very important in terms of identifying possible areas of intervention that may help farmers to maximize the benefits of their tomato marketing activities. Therefore, this study attempts to identify factors affecting market outlet choice decisions by tomato producers in the Mecha districts of West Gojjam zone Ethiopia.

2. Research Methodology

2.1. Description of the Study Area

The study was conducted in Mecha District, Amhara Regional State, due to the potential it has for tomato production. The district is known for its flat topography, which accounts for about 75% of the total area of the district. 13% of the area is characterized as undulating topography, and the remaining 8% and 4% of the area are covered by mountainous and valley topographies, respectively (Mola Tafere et al., 2011).

The total area of the study area (Mecha district) is about 156,027 hectares. From the total area, nearly 50% of this (72,178ha of land) is used for cultivation. Forest land and grazing land cover 18,547ha and 15,591ha, respectively. The land covered by water bodies' accounts for about 1,386 hectares. The soil type of the Mecha district is characterized as 93% red soil, 3% black soil, and 4% gray soil. The average land holding at the district level is 1.5ha per household and ranges from 0 to 3ha among the farmers in the district (Mecha district office of agriculture, 2018).

In the crop sub-sector, the main crops grown include maize, teff, finger millet, wheat, chickpeas, beans, and Niger seed. In the livestock subsector, cattle are dominant, and large numbers of poultry, sheep, and goats are also kept. Oxen, cows, heifers, bulls, calves, chickens, goats, and sheep are found in numbers in most households. Mecha has a production potential for vegetables because of the presence of irrigation water. The vegetables produced in this district are tomato, onion, pepper, shallot, potato, and cabbage (Fanos, 2014).

2.2. Source Methods of Data Collection, and Sampling Techniques

Both quantitative and qualitative types of data were collected from both primary and secondary sources. A cross-sectional survey was conducted using structured and semi-structured questionnaires. Key informant interviews and focus-group discussions were conducted with different stakeholders and organizations.

To draw the sampling units for the study, a multi-stage sampling technique was used. Mecha district has 33 kebeles, of which 7 kebeles are major growers of tomato. In the first stage, with the consultation of the district agricultural office experts, seven kebeles were selected based on the scope and gaps of research In the first stage, out of the seven major tomato growers, three

kebeles in the district were randomly selected. In the second stage, from 4,100 tomato producers in the Mecha district (Mecha district office of agriculture, 2018), about 125 samples of household heads were randomly selected by using a simple random sampling technique.

A sample frame was developed by taking into account tomato collectors, retailers, and wholesalers in the main market sites: Merawi, Bahir Dar, and Bikolo. As a result, 50 tomato traders at different levels of the value chain nodes; 13 traders from Merawi, 29 from Bahir Dar, 8 from Bikolo were selected for this study according to the amount of tomato they have handled.

2.3. Method of Data analysis

Different studies used different empirical methods to analyze the determinants of the choice of marketing channels. Analytical approaches used to analyze the market outlet choice include discrete choice regression models such as the binary probit or logit (Bongiwe and Micah, 2013), multinomial probit or logit (Mamo and Degnet, 2012; Berhanu et al., 2013; Tewodros Tefera, 2014; Mukiama et al., 2014; Mekonen, 2017), and other empirical studies utilized Tobit (Anteneh et al., 2011).

In the study area, a multivariate probit model was applied for households choices of more than two market outlets and to jointly estimate several correlated binary outcomes also in this study. (Cappellari and Jenkins, 2003; Gujarati, 2004) on the choice of market outlets, while allowing for the potential correlations between unobserved disturbances as well as the relationships between the choices of different market outlets (Hailemariam et al., 2012).

Abay (2007) noted that in a multivariate model, where the choice of several market outlets is possible, the error terms jointly follow a multivariate normal distribution (MVN) with zero conditional mean and variance normalized to unity (for identification of the parameters) where (μy1, μy2, μy3) MVN~(0, Ω) and the symmetric covariance matrix Ω is given by:

$$\Omega = \begin{Bmatrix} 1 & \rho y1y2 & \rho y1y3 \\ \rho y2y1 & 1 & \rho y2y3 \\ Py3y1 & \rho y3y2 & 1 \end{Bmatrix} \qquad (1)$$

Consider the i^{th} farm household (i=1, 2….. N), making decisions on the choices of available market channels. Let U0 represents the farmer who directly

sells for wholesalers, and let Uk represents the farmer who sells the tomato the Kth market outlet: where K represents a choice of wholesalers (Y1), retailers (Y2), and rural collectors (Y3). Producers who decide on choosing the Kth market outlet (maybe wholesalers, retailers, collectors, or consumers or all) if Y*ik = U*k-U0>0. The net benefit Y*ik that the farmer receives from choosing a market channel is an invisible (dependent) variable determined by the observed independent variable (Xi) and the error term (∈i):

$$Y * ik = X'i\beta + \epsilon i \quad (K = Y1, Y2, Y3) \qquad \textbf{(2)}$$

Using the indicator function above, the unobserved preferences in equation (2) translates into the observed binary outcome equation for each channel choice of farmers as follows:

$$Yik = \begin{cases} 1, \text{ if } Y*ik>0 \\ 0, \text{ otherwise} \end{cases} (K = Y1, Y2, Y3$$

2.4. Definition and Hypothetical Variables

Market outlet choices (MktC): It was measured by the probability of selling tomato to either of the markets involving different alternative outlets. It is represented in the model as Y0 for households who do not choose to sell tomato mainly to the base category, Y1 to that of tomato wholesalers, Y2 to that for retailers, Y3 to rural collectors.

Sex of the Household Head (SHH): Sex is a dummy variable that takes a value of 1 if the household head is male and 0 female. The variable is expected to have either a positive or negative relationship with market outlet choice. Both men and women participate in selling tomato using different market outlets to generate income. Bebe et al. (2012) indicated that the majority of female households in any farming area are resource constrained given that they do not own critical resources in vegetable marketing to obtain additional income. As a result, male household heads have more chances to choose the best market channel than female household heads.

Age of the household head (AGE): Age of the household, a continuous variable, is taken as one of the explanatory variables. The expected sign could be positive or negative; as age is one of the parameters of human capital. Households that are longer farmers in tomato production are believed to be wise

in resource use, and it is expected to have a positive effect on the selection of the best marketing channel. On the other hand, older households may also be tradition-bound in taking up new technologies; in this sense, age may also negatively affect horticultural production and productivity.

Education level of the household head (EDUHH): **C**ategorical variable referring to the formal and informal education the household head attended. Educated people make better use of their time and available resources. Anteneh et al. (2011) studied whether the level of education of the household head significantly influenced the choice of coffee market outlet.

Land Size Allocated (AREATOM): This variable is assumed to have a positive relationship with the dependent variable and is a continuous variable measured in hectares. Solomon Asefa et al. (2016) found that total coffee land size is expected to have a positive effect on cooperatives and the formal market as compared to the informal market, which is also true for total land holding.

Improved seed (IMSED): It is a dummy variable that has a value of 1 if the HH uses an improved tomato seed variety and zero if not. The use of improved seed have a positive effect on the dependent variable in that if the farmer uses improved seed, the productivity is increased, and if the productivity is high, the farmer can produce more product and distribute it on the right channel. As noted by Arega (2006), almost all of the sampled farmers responded that, at present, new maize varieties are being used in the study area, which increases the productivity of their product. But if varieties with a low level of disease resistance give low yields per unit of area.

Chemical fertilizer (CHEMF): It is a dummy variable that has a value of 1 if a farmer uses chemical fertilizer and 0 if not. It has a positive relationship with the distributors in the selection of the best market outlet. Addisu (2016) found that the majority of producers used inorganic (chemical) fertilizer (DAP and Urea) depending on the land size allocated to vegetables and the soil fertility status as perceived by the producers, while some producers used organic fertilizer (manure and compost). The productivity status of both types of fertilizer is equal, but when we look at the cost-benefit analysis and the factor of fertilizer on soil fertility, organic fertilizer is chosen.

Distance to nearest market (DIS-MK): It is a continuous variable that is measured in kilometers, or the amount of time farmers waste selling their product to the market. Different studies (Adugna, 2009; Abay, 2007; and Rehima, 2006) indicated particularly, that rural communities in remote areas suffer from a lack of transportation facilities. If the producers are close to the market places, they

would have minimized transportation costs and the time they spent selling the product. Therefore, it is hypothesized that this variable is negatively related to a marketable surplus of tomato and the best alternative market. Taye et al. (2017) stated that; farmers nearer to urban centers are more likely to be informed about the best destination and are willing to participate in the market and affect market outlets.

Farming experience (EXP): This is a continuous variable measured over a number of years. A household with a more experience in tomato production is assumed to produce more tomatoes and, as a result, to supply more tomatoes to the market. A study by Berhanu et al. (2013) explained that there is a positive relationship between experience in dairy farming and the choice of a more profitable milk marketing outlet. In this sense, farming experience affects the market outlet choice of producers.

Access to credit (CREDIT): This is a dummy variable that takes a value of one if farmers take the loan and zero otherwise, which indicates credit taken for tomato production and marketing. Access to credit would enhance the financial capacity of the farmer to purchase the inputs, thereby increasing tomato production and market share. Therefore, it is hypothesized that access to credit will have a positive influence on the level of production and sales. In this sense, farmers who could gain credit from different financial institutions can produce more. Adugna (2009) reported that credit is important to facilitate the introduction of innovative technologies and for input and output marketing arrangements.

Access to market information (MINFO): This is a variable proposed to influence the market supply of tomato positively. The variable is considered dummy. Assigning one if a farmer got information, and zero if not. A farmer who has better market information about the product market will make a better outlet choice. Mekonen (2017) found that access to market price information positively and significantly influenced the choices of both end consumers and cooperative outlets. This implies that a farmer who can gain coffee market price information increases the chance of choosing the best outlet.

Access to extension service (EXTENSTION): **T**his is a dummy variable that has a 1 value if a farmer had a contact with an extension agent for agricultural work supervision in production time and a 0 value otherwise. Mekonin (2017) stated that access to extension services negatively and significantly affected the choice of end consumer outlet.

Tomato lagged price (PRICETOM): This is also the variable measured in the log normalized price of tomato per quintal and is expected to affect the market outlet choice of tomato positively and significantly. Berhanu et al. (2013) found that milk prices affect accessing individual consumer milk market outlets positively as compared with accessing cooperative milk market outlets and negatively as compared with accessing hotel or restaurant milk market outlets.

Non/off Farm income (OFFARM): It is a dummy variable measured in terms of whether the household obtained income from farming and non-farming activities. It has the value of one if the household is involved in nonfarm activities and zero if not. The study hypothesized that earning from non-farm income is higher than vegetable production, primarily because farmers are shifting towards non-farm income activities. Farmers who gain more income from farming activities other than vegetables who would rather supply their vegetables to the nearest market outlet with low prices than go far. Hence, off/non-farm income is hypothesized to influence the farmers' decision in the choice of marketing channel. This is explained by the fact that as producers participate in non-farm activities, the time they have to spare for marketing agricultural activities and producing marketable surplus is less. This decreases the probability of participating in the whole sale market channel, which is a larger market compared to the retailer and assembler market outlet (Taye et al., 2017).

3. Results and Discussion

3.1. Characteristics of sampled households by market outlet choices

Sample households choose three alternative markets with different residents. About 109, 79, and 68 households have sold their products to rural collectors, wholesalers, and retailers alternative outlets, respectively. Out of those, about 32% select all three outlets to sell the product and to receive a better price from the alternative markets. Furthermore, 25% of the household chooses rural collectors due to proximity to the selling place (they purchase the product on the farm).

Table 1 depicts the proportion of smallholder farmers' characteristics by tomato market outlet choice. 52%, 44.8%, and 73.6% of male-headed households choose wholesalers, retailers, and rural collectors' outlets, respectively. Moreover, education level also affects the market outlet choice of the sample households. Also, education level and market information have a significant effect on the market outlet choice of the household head at a 5% and 1%

significant level, respectively. This indicates that most educated households (about 62.4% of them) choose rural farmers because most educated households produce different vegetables than tomato alone. Due to this reason, they have no time or effort to sell their products by transporting in long-distance markets.

Furthermore, a household with market information selects a wholesaler's market outlet over a household without market information because wholesalers purchase tomato in bulk and at a better price than traders and collectors.

Table 1: Proportion d household characteristics by tomato market channel choice

Variables	Category	Wholesalers (%)	Retailers (%)	Rural collectors (%)	$\chi 2$
Sex of the HHH	Female	11.2	9.6	13.6	
	Male	52.0	44.8	73.6	(1.40)
Education level	Illiterate	16.8	11.2	24.8	
	Read and write	33.6	33.6	45.6	
	Elementary	4.8	4.0	10.4	
	High school	4.0	3.2	4.0	
	College/university	2.4	1.6	1.6	(11.55)**
	Others/Religious	1.6	0.8	0.8	
Non/off farm activity	Yes	40.0	33.6	54.4	
	No	23.2	20.8	32.8	(1.00)
Market information	Yes	70.0	50.4	56.4	
	No	7.2	4.0	16.8	(10.80)***
Extension service	Yes	35.2	35.2	52.00	
	No	28.0	19.2	35.2	(1.26)

Note: ***, **, and* implies significant level at 1%, 5% and 10% respectively.

Table 2 also indicates that land allocated for tomato, distance to the nearest market, tomato lagged price, and farming experience affects the selection of market outlet choice statistically and significantly at a 10% significant level. It shows that a household with a large plot of land (about 0.87ha) selects the outlet that buys in bulk on the farm to reduce post-harvest losses during transportation. Also, households that produce tomato far from local markets (about 3.65km) select rural collectors rather than wholesalers and retailers (which are 3.53km and 3.49km away from the local market, respectively) to reduce transportation costs and the Perishability of the product.

The average lagged tomato market price offered by rural collectors market outlet was ETB 634.76ETB per quintal which is lower than the price

offered by wholesalers and retailers lagged price of tomato which was 720.40ETB and 650.50ETB respectively. In terms of farming experience of household more experienced households in tomato production (about 7.63 years) select wholesaler market outlet chick offers a better price than other outlets.

Table 2: Mean household characteristics by tomato market channel choice

Variables	Mean (SD) of market outlet			
	Wholesalers	**Retailers**	**Rural collectors**	**t-value**
Land allocated for tomato	0.63(0.48)	0.54(0.50)	0.87(0.34)	9.88***
Distance to a local market	3.53(3.13)	3.49(3.28)	3.65(3.13)	31.85***
Tomato lagged price	720.40(305)	650.50(280)	634.76(205.98)	34.42***
Farming experience	7.63(1.48)	5.99(1.56)	4.54(1.51)	14.09***

Note: ***indicates at 1%, ** indicates at 5% and *implies at 10% significant level.

3.2. Marketing channels

Seven main alternative marketing channels were identified through which the tomato production in the study areas flows to the end users. These marketing channels were identified from the start of tomato production until the product reaches the end user of the product (the final consumer) through different intermediaries with a proportion of tomato marketed.

Channel I and Channel III were the dominant channels with the largest flows, where about 48.42% and 42.68% of the production flows to the end users, respectively. The smallest proportion of tomato (8.9%) was received by retailers (channel VII).

I. Producer → rural collector → wholesaler retailer → consumer
II. Producer → rural → collector → retailer → consumer
III. Producer → wholesaler → retailer → consumer
IV. Producer → rural collector → consumer
V. Producer → wholesaler → consumer
VI. Producer → retailer → processor consumer
VII. Producer → retailer → consumer

3.3. Determinants of market outlet choices

Empirical results of the multivariate probit models showed that the correlation coefficients of the error terms in the models had positive as well as negative signs, indicating that different market outlet choices are interdependent for the farmers. In other words, these opposite signs of the correlation coefficients revealed that there are complementarities (positive correlation) and competitive (negative correlation) between different market outlets option being used by the farmers.

Table 3 shows that the model fits the data and the Wald test was used to test the model fits, which was chi2 (27) =37.55, Prob > chi2= 0.0853 is significant at the 10% level, which indicates that the subset of coefficients of the model is jointly significant and that the explanatory power of the factors included in the model is satisfactory.

The likelihood ratio test of the null hypothesis of independence between the market channel decision ($\rho21 = \rho31 = \rho32=0$) is significant at 1%. This shows that the goodness-of-fit of the model is hypothesized in that all the ρ (Rho) values are jointly equal to 0 is rejected, which implies that the decisions to choose these market channels are interdependent.

Table 3: Multivariate probit estimation for determinants of tomato market outlet choice

Variables	Wholesalers			Retailers			Rural collectors		
	Coef.	Z	P>|z|	Coef.	Z	P>|z|	Coef.	Z	P>|z|
Sex of the HHH (Male)	0.387**			0.095			0.152		
Education level	0.128			0.108			-0.362**		
Land allocated for tomato	0.134			0.679***			2.759*		
Farming experience	0.133*			0.066			-0.077		
Distance to local markets	-0.007			-0.185*			-0.085		
Extension service	-0.131			-0.129			-0.388		
Lagged price	0.001			0.001			0.004**		
Non/off-farm activities	0.216			0.117			0.749**		
Market information	-0.834**	-1.97	0.020	-0.806**	-2.18	0.034	0.727***	2.66	0.000
Constant	1.359	0.73	0.980	-0.288	-0.15	0.034	-3.128	-1.22	0.997
Predicted probability		0.632		0.544				0.872	
ρ 21									(0.510)***
ρ 31									(-0.395)**
ρ 32									(-0.730)***
Wald chi2(27)	37.55*								
Likelihood ratio test of independence	ρ21 = ρ31 = ρ32 =0, chi2(3) = 33.80 ***								
Joint probability (success)	0.331								
Joint probability (failure)	0.109								

Note: ***, **, and * significant at 1%, ** at 5% and * at 10% probability level respectively.

Therefore, the use of the multivariate probit model is justified to determine factors affecting the choice of market outlets. In addition, there are also differences in the decision-making behavior of marlet channel choice among farmers, which are reflected in the likelihood ratio statistics. The ρ values (ρij) indicate the degree of correlation between market outlet choice decisions.

The simulated maximum likelihood estimation results suggested that there was positive and significant interdependence between farmers selection of market outlet for wholesaler and retailers which implied that ρ21 (correlation between the choice of wholesaler and retailer market outlet) was positively significant at the 1% significant level. This indicates that farmers delivering to wholesalers are more likely to deliver to retailers than processors and consumers. The ρ31 (correlation between the choice for wholesaler and rural collector market outlet) and ρ32 (correlation between retailer and rural collector) are both negative and statistically significant at 5% and 1% significance levels respectively (Table 3). The study revealed that farmers who deliver to rural collectors are less likely to deliver to wholesalers (ρ31). Equally, farmers who are involved in the rural market outlet are less likely to send their tomato to the retailers (ρ32).

The simulation results indicate that the probability that tomato producers choose wholesalers, retailers, and rural collector market outlets was 63.2%, 54.4%, and 87.2%, respectively. The likelihood of choosing a retailer is relatively low (54.4%) as compared to the probability of selecting a rural collectors' market channel (87.2%) and wholesaler market channel (63.2%). This indicated that farmers were not interested in selling their products to the retailer market channel even if they got a better price than other market channels due to marketing costs such as transportation and to keep the product from damage (which may reduce post-harvest losses for producers).

The joint probabilities of success or failure in choosing the three market outlets suggest that households are more likely to jointly choose the three market outlets. The likelihood of households jointly choosing the three outlets is only 33.1%, but it's above the failure rate (10.9%). As depicted in Table 3 above, some of the variables used in the model were significant at more than one market outlet, while others were significant in one market outlet but not in the other outlet. This result indicates that choosing the right mix of market outlets is determined by different factors for each market channel. The finding was also consistent with Addisu Hailu's (2016) study on vegetable value chain analysis. He found that the joint probabilities of success and failure of the four variables also suggest that it

would be unlikely for households to choose all four market outlets simultaneously.

Out of nine explanatory variables included in the multivariate probit model, three variables (sex, farming experience, and market information) significantly affected wholesaler market outlet; three variables (total land size, distance to local market, and market information) significantly affected retailer outlet; and five variables (education level, land allocated for tomato, tomato lag price, non-farm income, and market information) significantly affected collector market outlet choices at 1, 5, and 10 percent significant levels.

Sex of the households has a positive and significant value on choosing of wholesalers' market outlet at a 5% significant level. This indicates that as the number of male-headed households increased, the probability of smallholder farmers selling their product to wholesale market outlets would also increase by 0.387 percentage points. This is due to the fact that male-headed households have a large land size and near to information that brings them to produce much amount of tomato and selects best market channel than female-headed households. Mahilet et al. (2015) stated that male-headed households have better financial capability, better land size, better extension contacts, and better access to market information. Therefore, male-headed household heads supply more potato to the market as compared to female household heads.

Education level of households has a negative and significant effect at a 5% probability level on choosing rural collectors. This implies that, other things being equal, the probability of selling tomato to rural collectors' market channels would be decreased by 0.362 percentage points compared to the probability of selling to wholesalers and retailers market channels. The more educated a farmer is the less likely to sell their tomato through village traders because more educated farmers are close to market information on doing marketing activities. Rural collectors mostly purchase tomato on the farm at a cheap price to reduce other marketing costs like transportation. The negative relationship between education level and selling to rural collectors' outlets can be explained by the fact that being educated enhances the ability of farmers to make decisions with regard to the choice of marketing channel to sell their farm products based on the marketing margin and marketing cost. This is supported by Chala and Chalchisa (2017). Literacy decreases the probability of choosing the retailer channel for vegetable marketing and increases the probability of choosing the wholesaler market channel. This may be due to literate households being more aware of the market channel and able to get market information for their products and helps to

choose the best market channel that expected to give better price for their produce.

Land holding for tomato production also affects the probability of choosing retailers and rural collectors' market outlets by 1% and 10% at significant levels, keeping other factors constant. An increase in land holding for tomato production by 1 hectar, increases the probability of choosing retailers and village traders' outlets by 0.679 and 2.759 percentage points, respectively. The positive sign on the land allocated for tomato variable showed that a farmer with large land allocated for tomato, compared to farmers with small tomato land sizes, would be more likely to sell to retailers and rural collectors. Retailers are large in number, and rural collectors purchase the product in bulk from farms. This is in line with Meron (2015) as the land holdings increase the farmers' plant more vegetables, yield increases, market participation also increases, and then the producers choose the best market channel. Solomon et al. (2016) found that the total coffee consumption of the household has a negative and significant effect on the preference for formal markets relative to informal markets.

The likelihood of choosing a wholesaler outlet was also positively and significantly affected by farming experience at 10% levels of significance. This result indicates that more experienced households in tomato production were more likely to deliver tomato to wholesaler outlets by 0.133 percentage points than the less experienced farmers. The more number of years engaged in tomato production and marketing gives the farmers a desire to adjust their market links; trying alternative marketing outlets to increase sales volume or better prices to maximize profits. Addisu (2016) found a similar result that experienced farmers had better knowledge on the cost and benefits associated with various potato marketing outlets; consequently, they are likely to increase the quantities supplied through the wholesalers' to benefit from economies of scale.

The likelihood of choosing a retailer's market outlet is statistically and negatively affected by distance to the local market at a 10% level of significance. This result shows that when the distance to the local market increased by one kilometer; the probability of choosing a retailer's market outlet would decrease by 0.185 percentage points while keeping other variables in the model constant. This is due to the fact that most producers prefer to sell their products at the farm gate without incurring transaction costs. They want to sell to wholesalers and rural collectors at the farm gate at fewer prices without marketing costs. But if they sold to retailers in the local market by incurring marketing costs, they would receive a large profit. As supported by Taye et al. (2017), the likelihood of

choosing retailers and assemblers market outlets is statistically and negatively affected by distance to the nearest urban market at 10% and 1% levels of significance, respectively. This is due to the fact that most producers prefer to sell their products at the farm gate without incurring transactory costs. Delivering onion products to retailers requires transporting the product to urban markets to meet retailers. As a result, producers prefer to select other markets to deliver their products.

Lagged Price is associated positively and significantly at a 5% level of probability with choosing rural collectors outlet. A positive sign on its coefficient indicates that as last year's price of tomato increased by one birr, farmers were more likely to sell tomato to rural collectors by 0.004 percentage point while keeping other factors constant. This may be because producers choose to sell tomato to rural collectors on farm-gate to reduce marketing costs/transaction incurred on other outlets (wholesalers and retailers outlets). This is in line with Sigei et al. (2015): an increase in price by one birr increases the probability of selling the pineapple yield at the local market by 29.73%. This shows that farmers who sell their product at local market incur neither higher transaction costs nor poor prices such as urban traders and rural assemblers (farm-gate marketers).

Availability of off/non-farm income has a positive and significant relationship with the likelihood of choosing a rural collector outlet at 5% significant level. Farmers who have access to off/non-farm income have more probability (0.749 percentage points) to choose a rural collector outlet compared to those who have no access to off/non-farm income. The result may imply that producers with the availability of off/non-farm income have no time to sell their product to the nearest markets and sold to alternative outlets because of performing other off/non-farm activities instead of selling tomato on local market by taking full-time. Taye et al. (2017) found that an increase in cash resources will make the households invest more in onion production and marketing activities resulting to more surpluses driving them to sell to assemblers and retailers which is a larger market compared to a retailer.

Farmers' closeness to market information influences the likelihood of choosing wholesalers' outlet and retailers' outlet negatively at a 5% significant level, and influence likelihood of choosing rural collectors at 1% significant level positively. Households who are close to market information are less likely to sell their product to retailer (by 0.806 percentage point) and wholesaler (by 0.834 percentage point) outlets and are more likely to choose rural collectors market outlets (increased by 0.727 percentage point), keeping other factors constant. This

shows that farmers close to price information, marketplace information, and information about customers want to sell their product to traders who buy in bulk and at a good price. Rural collectors buy a large amount of tomato on the farm without incurring marketing costs for producers. Contrary to this result, Kasa et al. (2017) found that access to current market information improves producers' selling prices, because market information helps producers to analyze the price difference between the local market and the nearby main market increases the probability of choosing outlets (retailers and consumers) which gives a relatively higher price to producers.

Alemayehu et al. (2016) found that access to market information has positively and significantly (at 5% level of significance) affected the amount of onion supplied to the market. This implies that if farmers get adequate, consistent, and timely price information, they will adjust their production accordingly and supply a sufficient amount of onion to the market.

4. Conclusions and Recommendations

The study focused on determining factors affecting tomato producers' market channel choices based on data collected from the smallholder producers in Mecha district, Amhara regional state, Ethiopia. Tomato market channel choice is the best way that the product gets to the consumers/end users through alternative outlets; and is also known as a distribution channel. A marketing channel is a useful tool for managing especially perishable farm products such as tomato, and is crucial to creating an effective and well-planned marketing strategy and marketing linkages in all areas. The main objective of the study is to investigate the factors that determine small-scale producers' marketing channel choices in the study area. Multivariate Probit Model (MVP) was employed to analyze the factors that determine the choice of tomato market channels. Tomato producers distribute their product through three alternative market channels according to their outlet choice decision but are correlated: the simulation results indicate that the probability that tomato producers choose wholesalers were (63.2%), a retailer (54.4%), and for rural collector market outlet (87.2%). The multivariate probit model results confirmed that sex, farming experience, distance to a local market, market information, education level, land allocated for tomato, tomato lagged price, non-farm income significantly affected the channel choices of tomato producers in the study area.

Based on the findings of the study, the following policy implications should be undertaken: establishment of farmers' cooperative organizations for marketing vegetables produced such as tomato in the study area and creating the linkage among the farmers and different financial institutions in the country to enable the access of raw materials used for tomato production and marketing of tomato where the demand for the product exists. Appropriate strategies and governmental and NGO policies should strengthen the existing provision of formal and informal education to the rural farming households in general and to the study area in particular; to improve the marketing alternatives among farmers the local government should facilitate rural infrastructures such as road, electricity, and health centers. Finally, improving the supply and demand of inputs and the end product is the most important element in strengthening the best alternative channels for distribution.

References

Abay Akalu. (2007). Vegetable market chain analysis in Amhara national regional state: the case of Fogera woreda, south Gondar zone; MSc thesis, Haramaya University, Ethiopia.

Addisu Hailu. (2016). Value chain analysis of vegetables: the case of Ejere district, west Shoa Zone, Oromia national regional state; MSc thesis, Haramaya University, Ethiopia.

Adugna Gessess. (2009). Analysis of fruit and vegetable market chains in Alamata, southern zone of Tigray: the case of onion, tomato and papaya. MSc thesis, Haramaya University, Ethiopia.

Alemayehu Asale, Derib W/Yohanes, Taye Buke. (2016). Onion Market Chain Analysis in Humbo District of Wolaita Zone, Southern Ethiopia. *International Journal of Scientific Research & Engineering Trends* 2(1):6-16.

Ambecha O. Gemechis, and Bezabih Emana. (2015). Tomato production in Ethiopia: constraints and opportunities: MSC thesis, Jimma University College of Agriculture and Veterinary Medicine, Jimma, Ethiopia.

Anteneh. A., Muradian, R. and Ruben, R. (2011). Factors Affecting Coffee Farmers Market Outlet Choice in Ethiopia. Centre for International Development Issues Nijmegen, Radboud University, the Netherlands.

Arega Bazezew. (2006). An assessment in the use of agricultural inputs with particular reference to Mecha woreda: west Gojjam zone, Ethiopia. *Ethiopian Journal Science & Technology*, 3(2):31–49.

Bebe B. O. Lagat J. K. and Magembe E. M. (2012). Evaluation of the factors associated with shift from pastoral to agro-pastoral farming systems in Trans-Mara West district of Narok County, Kenya. *Asian journal of agricultural sciences*, 4(6):403-410.

Berhanu Kuma, Derek Baker, Kindie Getnet and Belay Kassa. (2013). Factors Affecting Milk Market Outlet Choices in Wolaita Zone, Ethiopia. Holota Agricultural Research Center; EIAR, Addis Ababa, Ethiopia. *African Journal of Agricultural Marketing*.

Bongiwe G. X., Micah B. M. (2013). Factors affecting the choice of marketing channel by vegetable farmers in Swaziland. Sustainable Agriculture Research, 2(1):112–123

Chala Hailu and Chalchisa Fana. (2017). Determinants of Market outlet Choice for Major Vegetables Crop: Evidence from Smallholder Farmers' of Ambo and Toke-Kutaye Districts, West Shewa, Ethiopia; *Journal of Economics and Sustainable Development*, 8(19):16-24

Damondar N. Gujarati. (2004). *Basic Econometrics.* 4th edition New York, USA.

Desalegn Regassa, Wakene Tigre and Addis Shiferaw. (2016). Tomato (Lycopersicon esculentum Mill.) varieties evaluation in Borana zone, Yabello district, southern Ethiopia; *Journal of Plant Breeding and Crop Science*, 8(10):206-210

Fanos Mekonnen. (2014). Vegetable seedlings; an emerging business and alternative input supply system in Ethiopia. A report on livestock and irrigation value chains for Ethiopian smallholders.

Geetha K. S. (2011). Value chain analysis of tomato; A Study in Karnataka, department of agricultural marketing, co-operation and business management; university of agricultural sciences g. k. v. k., Bengaluru.

Hailemaryam, Efa Gobena Tura, and Tura Kaso Hamo. (2018). Determinants of Tomato Smallholder Farmers Market Outlet Choices in West Shewa, *Ethiopia. Journal of Agricultural Economics and Rural Development*, Vol. 4(2):454-460.

Kassa Tarekegn, Jema Haji, and Bosena Tegegne. (2017). Determinants of honey producer market outlet choice in Chena District, southern Ethiopia: Agricultural and Food Economics, DOI 10.1186/s40100-017-0090-0

L. Cappelari and S. P. Jenkins. (2003). Multivariate probit regression using stimulated likelihood. *STATA journal*, 3(3):278-294.

Mahlet Abitew, Bezabih Emana, Mengistu Ketema, Jeffreyson K. Mutimba and Jemal Yousuf. (2015). Gender role in market supply of potato in Eastern Hararghe Zone, Ethiopia. *African Journal of Agricultural Marketing*, 3 (8):241-251.

Mamo Girma and Degnet Abebaw. (2012). Patterns and Determinants of Livestock Farmers' Choice of Marketing Channels: Micro-level Evidence. Working Paper No 1:Ethiopian Economics Policy Research Institute, Addis Ababa, Ethiopia

Mekonin Abera. (2017). Determinants of Market Outlet Choice of Coffee Producing Farmers in Lalo Assabi District, West Wollege Zone, Ethiopia. *Journal of Economics and Development*, 19(2):48-67.

Melaku Alemayehu and Getachew Alemayehu. (2016). Annual Conference Paper of: Performance evaluation of tomato varieties for irrigation production system in Mecha District of west Gojjam Zone, June 2016. Amhara Region, Ethiopia.

Meron Yohanes. (2015). Performance and challenges of vegetable market: The case of Kombolcha district, East Hararghe zone, Oromia national regional state, Ethiopia. MSc. Thesis, Haramaya University, Haramaya, Ethiopia

Molla Tafere, Asresie Hassen, Biruhalem Kassa, Baye Berihun, Mekonen Tolla, Yihalem Denekew, Yihenew G. Selassie and Firew Tegegne. (2011). BDU-CASCAPE working paper 5; PRA report: Mecha district, Ethiopia.

Mukiama, B. K., Suphanchaimatand, N. & Sriwaranun, Y. (2014). Factors Influencing Vegetable Farmers Choice of Marketing Channel in Khon Kaen, Thailand. *Khon Kaen Agricultural Journal*, 42(4): 595-604.

Rehima Musema. (2006). Analysis of Red Pepper Marketing: The Case of Alaba and Siltie in SNNPRS of Ethiopia. MSc Thesis, Haramaya University, Haramaya, Ethiopia.

Sigei K. Geoffrey, Bett, K. Hillary, Kiprop, K. Jonah, and Odipo, O. Timothy. (2015). Factors Influencing the Choice of Marketing Outlets among Small-Scale Pineapple Farmers in Kericho County, Kenya. *International Journal of Regional Development*. 2(2).

Solomon Asefa, Wondaferahu Mulugeta, and Jibril Hadji. (2016). Determinants of Farmers' Preference to Coffee Market Outlet in Jimma Zone: The Case of Coffee Potential Districts. Developing Country Studies, 6(6):9-19

Taye Melese, Degye Goshu and Assefa Tilahun. (2017). Determinants of outlet choices by smallholder onion farmers in Fogera district Amhara Region, Northwestern Ethiopia. MSc thesis, Gondar University, Gondar, Ethiopia.

Tewodros Tefera. (2014). Analysis of Chickpea Value Chain and Determinants of Market Options Choice in Selected Districts of Southern Ethiopia; School of Environment, Gender and Development Studies, *Ethiopia*. *Journal of Agricultural Science*; 6(10):1916-9752.