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Smallholder Vegetable Farmers' Choice of Agricultural Marketing Channels in *Maekel* Region, Eritrea

Ghirmai Tesfamariam Teame (Corresponding author)

Department of Economics and Finance

College of Business and Social Sciences, Adi-Keih, Eritrea

E-mail: santarosaye@gmail.com

Medhanie Petros Yacob

Warsay Yikealo Secondary School, Sawa, Eritrea

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Abstract

One of the major problems of agricultural development, in developing and transition economies, is the lack market and marketing channels for agricultural produce. Market channel choice makes important contributions to the incomes and other livelihood attributes among smallholder farmers in developing countries. However, smallholder farmers in developing countries do not use output markets effectively due to a number of factors. The objective of the study was to assess the technical, institutional and demographic factors that determine marketing channel choices of small scale vegetable farmers in *Maekel* region, Eritrea. Data were collected from 206 randomly selected vegetable farming households from 13 villages. Three marketing channels were identified in the study area. These are farm-gate sales, private traders and a combination of both. The result of the study revealed that almost half of the farmers (52%) use farm-gate, while 24% and 23% of the farmers choose private traders and both marketing channels for the sale of their vegetable produce, respectively. Moreover, result of the multinomial regression reveals that education, gender of household head, household size, age of household head, distance from the market, availability of road infrastructure and social network of farmers significantly influence marketing channel selection of smallholder farmers. The results of the study are used to draw policy recommendations that improve marketing channel selection of smallholder vegetable farmers.

Keywords: Marketing channels, Multinomial logit, Random Utility Model, Smallholder farmer, Developing countries, Eritrea

1. Introduction

The importance of agriculture in an economy's growth and development is undeniable and unquestionable. In developing economies, the subsistence agriculture, which is characterized by smallholder farmers, low marginal productivity of labor, underdeveloped agricultural marketing facilities, informal markets, asymmetric information and so on; employs about 70% of the total labor force and accounts for large percentage of household income.

Smallholder farming has long been the dominant economic activity and main source of livelihood, amongst the rural poor, in developing and transition economies. According to Gollin (2004), it is expected to remain enormously important source of income and livelihoods, contributor to the production of global agricultural output for the foreseeable future. According to the World Bank Rural Development Strategy (2003) smallholdings are those farms "with a low asset base and operating in less than 2 hectares of cropland". About two-thirds of the developing world's 3 billion rural people live in about 475 million small farm households, working on land plots smaller than 2 hectares (Rapsomanikis, 2015). Even though smallholder production is important for household food security, the productivity of this sub-sector in developing countries is quite low.

One of the main activities of the smallholder farms and also an essential part of their livelihood strategy is the interaction with agricultural markets. Agricultural marketing channel involves a group of people or organizations that direct the flow of agricultural commodities from producers to consumers. It includes all market levels and actors that have a role in the distribution of a given commodity from farmer to consumer (Kabeto, 2017). The length of the channel varies from commodity to commodity, depending on the quantity to be moved, the form of consumer demand and degree of regional specialization in production. Generally speaking, there are many constraints that limit marketing of agricultural produce by smallholder farmers including supply-side constraints (especially those at the farm level that limit sufficient and reliable flow of products); demand-side constraints that limit the growth of local consumption of agricultural products; and markets and marketing institutions that are not well linked to serve farmers, especially in rural areas; lack of transportation infrastructure, distance from the market place (Poole, 2017). There are also technical, demographic and institutional challenges like availability of market information, contract agreement, cooperative societies, and extension service and so on.

According to World Bank (2021), 63.12% of the total work force is employed in agriculture in Eritrea. Agriculture, which is a fundamental element of livelihood of the rural population, is dominated by smallholder farming, and makes up 11% of the GDP. The agricultural sector's contribution to GDP is much smaller than the proportion of the population employed in agriculture, which shows that agriculture is still at its primitive stage (Osman and Groenewald, 2003). Despite this fact, there is still lack of empirical studies about smallholder's agricultural markets, agricultural market participation and choice of marketing channels in Eritrea. The objectives of this study, is therefore, to identify the institutional, technical and demographic factors that determine the choice of marketing channels of smallholder vegetable farmers in *Maekel* region (Central region), Eritrea. By identifying such

factors, the paper seeks to recommend policy options that would improve the marketing of agricultural products and improve the livelihoods of the farmers.

2. Literature Review

The available marketing channels of agricultural products under different categories are classified as a choice between formal or informal market channels, a direct or indirect sale to various intermediaries and users, channels through exploring the various value-chain actors and structures, or others compared the institutional and technical factors involved. For example, Thamthanakoon (2018) has classified the marketing channels as direct and indirect marketing channels. The direct marketing channels include farmers' market; consumers, other farmers, friends, relatives, end users, road side; and farm-gates. On the other hand, the indirect marketing channels include middlemen, intermediaries, brokers; wholesalers; local traders; cooperatives; processing, agro-industrial companies, businesses; export agents; supermarkets; food services (restaurants/ hotels); auction and specific channels of marketing (e.g. development authority, government agents).

Smallholder farmers have to choose market outlets which are more relevant and convenient to them based on proven utility maximization from existing alternatives. This depends on clear comparative advantages in bargaining and easy accessibility of the market channels for their farm products (Nwafor, 2020). According to Jari and Fraser (2009), if the costs that are associated with using a particular marketing channel are greater than the benefits, households will be discouraged from using it, shifting to the option that maximizes their utility. Institutional, technical and demographic factors affect decision of farmers to select a proper channel from the available alternatives. This section summarized key findings of several empirical studies that have investigated the determinants of agricultural marketing channel choice of smallholder farmers.

Studies have shown that farmer characteristics such as age, education level, gender, and farming experience significantly influence the choice of marketing channels. For example, Ahmed et al. (2018) reported that younger and more educated farmers are more likely to use modern marketing channels such as supermarkets and processors, while those with lower education levels were more likely to use traditional channels such as intermediaries and brokers. Similarly, applying binary logit models Raza et al. (2019) for wheat farmers in Pakistan and Li et al. (2017) among smallholder dairy farmers in China showed that farmers' age, gender, education level, farming experience, trust in intermediaries, and frequency of contact with them were significant factors affecting farmers' choice of marketing channels. Moreover, Kibrom et al. (2019) in Ethiopia, Asante et al. (2018) in Ghana, Rahman et al. (2019) in Bangladesh and Ma et al. (2019) in China found that smallholder farmers with higher education levels, larger household size and larger farm size were more likely to use modern marketing channels such as supermarkets, cooperatives and processors. Finally, farming experience which serves as a direct indicator of production knowledge and individual expertise to some extent, significantly influences the choice of the market channel (Nxumalo et al., 2019; Nwafor, 2020 and Harrizon et al., 2016). With regard to gender of household head, there is an increasing evidence in recent studies that the difference in gender influences

the choice of marketing channels in agriculture (Harrizon et al., 2016; Nxumalo et al., 2019; Adu, 2018; Riziki et al., 2015). But there are also many researchers that challenged this argument (Musara et al., 2018; Nwafor, 2020; Liu, 2018 and Chirwa, 2009).

Farm-level factors such as farm size, crop type, and yield also play significant role in marketing channel choice. For instance, using a survey of 384 farmers and a multinomial logit model Tadesse and Baheta (2014) reported that farmers with larger farm sizes are more likely to use modern marketing channels such as supermarkets, cooperatives, processors and exporters, while those with smaller farms were more likely to use traditional channels such as intermediaries and brokers among smallholder coffee farmers in Ethiopia. This is due to the fact that farmers with larger farm size have the ability to meet the volume requirements. Similarly, using different techniques and in different countries and for different agricultural products, Ojehomon et al. (2020), Kibrom et al. (2019), Asante et al. (2018), Ma et al. (2019, Gebremedhin et al. (2018), Tadesse et al. (2019), Birungi et al. (2018) and Njoroge et al. (2019) reported similar findings on the issue of farm size. Moreover, Kibrom et al. (2019) found that crop type were significant determinants of marketing channel choice. Specifically, those who grew perishable crops such as vegetables were more likely to use traditional marketing channels such as local markets and brokers.

Institutional factors such as government policies, access to credit, access to market information and extension services also play significant role in marketing channel choice. For example, Ojehomon et al. (2020), Kibrom et al. (2019), Ali et al. (2017), Kassie et al. (2015), Asante et al. (2018), Ogunniyi et al. (2016) and Shiferaw (2014) found that farmers who have access to credit, market information, and extension services are more likely to use modern marketing channels while those who lacked access to credit, market information and extension services are more likely to use traditional marketing channels such as intermediaries and local markets. Moreover, access to market information, credit and extension services are important because they enable farmers to make more appropriate decisions regarding when and where to sell their commodity (Nahar et al., 2020 and Jari and Fraser, 2009). Similarly, using a survey of 150 farmers and the binary logit model, Adhikari et al. (2019) showed that market information and government policies significantly influenced rice farmers' choice of marketing channels.

Market factors such as distance to the market, market access, quality of produce, transport cost, type of intermediary, convenience and price stability also influence marketing channel choice. For example, using multinomial logit model, Asante et al. (2019) and Ma et al. (2019) investigated the determinants of smallholder farmers' choice of marketing channels for cocoa in Ghana and for maize in China, respectively. Their findings showed that price offered in different markets, quality, distance to market, transport cost, type of intermediary, and convenience significantly influenced smallholder farmers' choice of marketing channels. Similarly, using a survey of 250 farmers, Ojehomon et al. (2020) showed that prices offered in different markets, distance to market, and access to market information are significant determinants of marketing channels among smallholder cassava farmers in Nigeria. In similar studies, Olagunju et al. (2017) in Nigeria and Murendo et al. (2012) in Zimbabwe found that farmers who had access to market information were more likely to use modern marketing

channels, while those located further from the market were more likely to use traditional channels such as brokers and middlemen. Finally, using binary logit model, Ali et al. (2017) reported that prices offered in different markets, distance to market, transportation costs, quality of produce, and access to market information were significant determinants of marketing channel choice among smallholder vegetable farmers in Pakistan.

Social capital is defined both in quantitative and qualitative terms as the number of trustworthy trading contacts, which enables traders to carry out long-distance transactions, given the existing transaction costs (Gabre-madhin, 2001). Moreover, Gift, (2014) and Jari and Fraser (2009) identified it as one of the factors that determine the choice of marketing channel, and referred it as social networks and is through these networks that trust is developed, which in turn, encourages cooperation and regular exchanges. Studies by Alemayehu and Adugna (2019) and Tadesse et al. (2019) in Ethiopia, Heng et al. (2019) in Cambodia, Birungi et al. (2018) in Uganda, Njoroge et al. (2019) in Tanzania, and Mwangi et al. (2018) in Uganda found that farmers who trusted their buyers were more likely to use modern marketing channels such as supermarkets, cooperatives, and processors.

It is clear from the preceding discussion that various factors influence choice of marketing channel of rural farm households for their agricultural produce. However, the effect of these factors differ in their magnitude and sign in different countries in relation to different marketing channels. Thus, the study intends to identify and verify the effect of these factors in influencing rural households' choice of agricultural marketing channels from the Eritrean context.

3. Research Methodology

3.1 Data Type and Methods of Data Collection

Multistage sampling technique is used in the study. First, 13 villages were randomly selected from the 4 administrative regions of *Makel* region, Eritrea. These villages are: *Adi-Qe, Adi-Qountsi, Adi-Guadad, Adi-Nfas, Adi-Segdo, Beleza, Embaderho, Kushet, Merhano, Tsaeda krstyan, Tsazega, Tsolot, and Wekiduba,* where most of the region's irrigated lands are located. Then, simple random sampling was employed to collect primary data from a sample of 206 smallholder vegetable farming households from these villages. Face to face interview through a structured questionnaire with head of a household or his spouse were used to collect data at a household level. Depending on the population of smallholder vegetable farmers in each village, the distribution of the respondents range from is 6-21 farmers per village. The list of explanatory variables, their units of measurements and hypothesized relationships with the dependent variable are given in table 1.

Table 1. Variables definitions, units of measurement and expected signs

Variable	Description	Type	Value	Expected Sign
Age_HoH	Age of head of household	Continuous	Years	-/+
Gender_HoH	Gender of head of household	Dummy	Male=1, Female=0	-/+
HH_Size	Household size	Continuous	Number of family members	+
Edu_HoH	Level of Education of head of household	Continuous	Completed years	+
Farm_Exp	Years of farming experience	Continuous	Number of Years of farming	+
Soc_Netw	Availability of extensive Social capital	Dummy	Yes = 1, No = 0	+
Transport	Ownership of Market transport	Dummy	Yes = 1, No = 0	+
Dist_Mkt	Distance to the market	Continuous	Kilometers	-
Road_Infr	Road infrastructure	Dummy	Bad=0, Fine=1	+

3.2 Econometric Model Specification

A farmer's marketing outlet choice was conceptualized using the Random Utility Model (RUM), which is appropriate for modeling discrete choice decisions. It is an indirect utility function where an individual with specific characteristics associates an average utility level with each alternative marketing outlet in a choice set (Harrizon et al., 2016). The Econometric model, which is used in the study, is adopted from Greene (2012). In this study, a smallholder farmer is exposed to three marketing alternatives, which are: sales to private traders, farm-gate sales and both private traders and farm-gate sales. A farmer chooses from a set of alternatives (j = 0, 1, 2) which maximizes his/her utility (Uij), subject to demographic, institutional and technical and other factors. However, it is not possible to directly observe the utilities; rather the choice made by the farmer which maximizes the utility. Hence, for the i^{th} farmer faced with J choices, the utility of choice j is decomposed into deterministic ($Z'_{ij}\theta$) and random (ε_{ij}) part:

$$U_{ij} = Z'_{ij}\,\theta + \varepsilon_{ij} \tag{1}$$

If the farmer makes choice j in particular, then we assume that U_{ij} is the maximum among the J utilities. Hence, the statistical model is driven by the probability that choice j is made, which is

$$\text{Prob}\,(U_{ij} > U_{ik}) \qquad \text{for all other } k \neq j. \tag{2}$$

Let Ai be a random variable representing a set of discrete, mutually exclusive choices of market channels avaialble to a smallholder farmer, that indicates the choice made. If the J disturbances are independent and identically distributed with Gumbel (type 1 extreme value) distributions,

$$F(\varepsilon_{ij}) = \exp(-\exp(-\varepsilon_{ij})), \tag{3}$$

then

$$\text{Prob}\ (A_i = j) = \frac{\exp(Z'_{ij}\,\theta)}{\sum_{j=0}^{J}\exp(Z'_{ij}\,\theta)} \tag{4}$$

Which leads to what is called the multinomial logit model, where the Z' represents a vector of explanatory variables, while θ is a vector of coefficients, which obviously differ from choice to choice. Multinomial logit models, which were widely used in studies exploring the market channel choices among smallholder farmers, are applicable when the dependent variable is qualitative and has more than two categories (attributes).

The model for a marketing channel choice is

$$\text{Prob}\ (A_i = j \mid Z_i) = \frac{\exp(Z'_i\,\theta_j)}{\sum_{j=0}^{2}\exp(Z'_j\,\theta_j)}, \quad j = 0,1,2 \tag{5}$$

However, all the three probabilities cannot be estimated independently. A convenient normalization that solves the problem is to choose one category as the base or reference or comparison category, and set its coefficient values as zero ($\alpha_0 = 0$). This arises because the probabilities sum to one, so only J parameter vectors are needed to determine the J + 1 probabilities. Therefore, the probabilities are

$$\text{Prob}\ (A_i = j \mid Z_i) = P_{ij} = \frac{\exp(Z'_i\,\theta_j)}{1+\sum_{j=1}^{2}\exp(Z'_j\,\theta_k)}, \quad j = 0,1,2 \tag{6}$$

The above probability expressions are nonlinear. However, the model implies that we can compute J log-odds, i.e., logits that are linear functions of the explanatory variables, and the parameters can be estimated by maximum likelihood estimation as follows:

$$\ln\left[\frac{P_{ij}}{P_{ik}}\right] = Z'_i(\alpha_j - \alpha_k) = Z'_j\,\alpha_j \qquad if\ \ k = 0 \tag{7}$$

The coefficients in this model are difficult to interpret. It is tempting to associate $\boldsymbol{\alpha}_j$ with the j^{th} outcome, but that would be misleading. Thus by differentiating equation (6), we find that the partial (marginal) effects of the variables on the probabilities as

$$\delta_{ij} = \frac{\partial P_{ij}}{\partial Z_i} = P_{ij}\left[\alpha_j - \sum_{k=0}^{J} P_{ik}\alpha_k\right] = P_{ij}\left[\alpha_j - \bar{\alpha}\right] \tag{8}$$

In our empirical model, the outcome variable, marketing channel, captured three agricultural produce marketing channels (Farm-gate sales, sales to Private Traders and Both (combined),

where the combined market channel is serving as the reference channel in the model.

4. Research Findings and Discussion

4.1 Descriptive Analysis

Table 2 shows summary statistics of some the variables under study. The table shows that almost half of the farmers (52%) used farm-gate, while 24% and 23% of the farmers used private traders and both marketing channels, respectively for the sale of their vegetable produce. The mean age of household heads in the sample was 42.45 years with an average schooling of 4.64 completed years, which generally shows there is low level of education among the vegetable farmers. Furthermore, the mean household size of the sampled households was approximately 8 individuals, and 96% of the sampled households are male headed, showing that there is low level participation of female headed households in irrigated vegetable farming in the study area. The land area is very small, which is also a reflection of the issue of land fragmentation in Eritrea. Regarding the farming experience, majority of the sampled farmers (53.88%) have more than 15 years of farming experience and 41.87% of the farmers have farming experience ranging from 6 to 15 years, while 4.85% of them have less than 5 years of farming experience.

Table 2. Summary statistics of variables

Variables	No. of obs.	Mean	Standard deviation	Min.	Max.
Age_HoH	206	42.45	15.8223	19	79
HH_Size	206	7.95	2.48352	1	16
Dist_Mkt	206	10.84	3.72107	3	16.6
Edu_HoH	206	4.64	4.21462	0	12

Source: Survey data

The average distance of the farm from the market was 10 KMs with 16.6 KMs being the longest and 4.5 KMs the shortest distance. All of the farmers reported that they don't have any storage room that would provide with time leverage in the market. Similarly, all of the sampled farmers reported that they do not have market stall (or any specialized market infrastructure); seldom contacted by extension officers regarding markets and prices, availability of updated market information. Majority of them (76.56%) get their market information from their friends in the market and 24.44% of them from other farmers. With respect to the availability of social network of the farmer in the market, only 53.40% of them reported that they have some connection in the market or loyal customers that help them to market their produce. Finally, regarding the modes used to transport their vegetables to the market, 50.49% of the farmers use family sumpter (mainly horses and donkeys), while 38.83% and 10.68 of the farmers use family vehicle and hired people, respectively.

4.2 Econometric Analysis and Discussions

The result of the estimated multinomial logit model (equations 7 and 8) is reported in table 3. The values of the categorical variable (marketing channel choice) are assumed to have no

natural ordering. Thus, the combined marketing channel is selected as the reference category and the results of the study are interpreted relative to this marketing channel. Multicollinearity tests were first carried out, using variance inflating factor (VIF) test, to check for the existence of serious multicollinearity among the explanatory variables. The result shows that the VIF for each of the explanatory variables was less than 10, implying no serious multicollinearity among the explanatory variables. The Pseudo R^2 of 0.6387 of the estimated model indicates that the multinomial logit model predicts about 63.87% of farmers' choice of marketing channel. Moreover, the Wald Chi-square statistic result, which is used to test the overall significance of variables, is statistically significant at 1% level, implying that the explanatory power of the factors included in the model is satisfactory.

Table 3. Results from multinomial logit regression

Variables	Private traders			Farm-gate sales		
	Coefficient	Marginal effect	P- value	Coefficient	Marginal effect	P- value
Gender_HoH	19.89523	1.664971	0.000***	1.817273	-0.0096313	0.217
Farm_Exp	-0.018096	-0.0015851	0.614	0.0158666	0.0006895	0.755
HH_Size	-0.389	-0.0364878	0.017**	0.9397348	0.0380858	0.000***
Dist_Mkt	-0.158346	-0.0138979	0.027**	0.1457789	0.0063034	0.236
Transport	-0.386333	-0.0298098	0.295	-0.660387	-0.0241034	0.326
Road_Infr	7.561192	0.6006261	0.000***	8.661071	0.3060582	0.000***
Soc_Netw	0.0871452	-0.0169885	0.861	6.028215	0.2338961	0.000***
Age_HoH	0.0894428	0.0073069	0.007***	0.0523793	0.0016746	0.17
Edu_HoH	0.225229	0.0227984	0.000***	-0.958685	-0.0381616	0.000***
Constant	-0.858014		0.548	-14.99897		0.000
Number of observations	206					
Pseudo R^2	0.6194					
Prob > chi^2	0					
Wald chi2 (18)	1068.79					
Log pseudo likelihood	-80.098236					

Source: Survey data

*Note: *** , ** indicate p-values significant at 1% and 5% level of significances, respectively*

The result of the study shows that level of education of head of household has positive and statistically significant effect on vegetable farmers' choice for private traders' channel of vegetable marketing at 1 percent level of significance, keeping the effect of other variables in the model constant. This implies that an increase by one year of education of head of household increases the probability of a vegetable farming household choosing private traders marketing channel by 2.25%, compared to the reference category. The positive relationship between education level and selling to private traders can be explained by the fact that these outlets have a higher marketing margin for the vegetable produce and since education level comes with knowledge; farmers are able to make informed decision based on the marketing margin. On the other hand, an increase in level of education of head of household by one completed year decreases the probability of choosing farm-gate channel by 3.8%. Because as farmers get enlightened, they seek more lucrative marketing outlets. This shows that education plays an important role in the adoption of new skills and tends to convince household heads to accept new ideas, obtain updated information about their

produce demand, supply and prices which would result in making informed decisions in selection of marketing channels.

Household size has a positive and statistically significant effect on the choice of sales at the farm-gate at 1% level of significance, keeping the effect of other variables constant. An increase in the number of household size by one individual, increases the probability of vegetable farmer choosing farm-gate marketing channel by 3.8%, compared to the reference category. This could be due to the fact that the larger the family size, increases domestic consumption requirements and may render households to be more risk averse, and as a result, the volume of marketable surplus of vegetables supplied to the market decreases. Thus, smallholder farmers are more likely to choose farm-gate marketing channel, as private traders do not have interest in dealing with small quantity of sales. Moreover, there is negative and significant relationship between household size and sales to private traders. An increase in household size by one individual decreases the likelihood of a vegetable farming household selling to private traders by 3.65%, relative to the reference category.

Regarding the distance from the farm to the market, which is measured in kilometers, the likelihood of choosing private traders marketing channel decreases by 1.39% and it is statistically significant at 5% level of significance. The longer the distance between farm and nearest market results in higher transportation expenses, higher chances of vegetable spoilage and have less potential vegetable market alternatives, and creates obstacles in having access to the latest market information. This implies that the longer the distance from farm to the market, the less likely are the farmers to sell their produce to private traders or the private traders may not be interested or don't have information about to dealing with these farms.

A positive and significant relationship is found between availability of social networks and selection of farm-gate marketing channel of smallholder vegetable farmers at 1 % level of significance, holding the effect of other variables constant. The existence of loyal customers and their people in the market increases the likelihood of farmer choosing a farm-gate marketing channel by 23.4%, compared to the reference category. Because if they have loyal customers who take their produce just after harvesting and they may not need to deal with whoever comes as a private trader.

Age of household head has positive and significant effect on the choice of private traders marketing channel, at 1% significance level. As the age of household head increases by a year, the probability that a vegetable farming household will choose a private traders marketing channel increases by 0.73%, compared to the reference category. Older farmers are more inclined to sell their agricultural produce to private traders, as they might have market advantage over young farmers due to accumulated capital, long-term relationship with their customers. Moreover, gender of head of household has positive and significant effect on the choice of private traders marketing channel, at 1% level of significance. Being a male headed household increases the likelihood of choosing private traders marketing channel by 166.5% compared to female headed households. The reason behind this might be male headed households have good market networks due to their interaction ability with one or more buyers than females who are in most cases restricted to home chores.

Finally, the availability of road infrastructure was found to have positive and significant relationship with the choice of private traders and farm-gate marketing channels at 1% level of significance. The availability of good road infrastructure increases the likelihood of a farmer choosing a private traders and a farm-gate marketing channels by 60.06% and 30.6%, respectively. This shows that farmers with access to good roads are more likely to use different marketing channels than farmers who face poor road networks.

5. Summary and Policy Implications

5.1 Summary

Using a cross-sectional data from 206 smallholder vegetable farmers, the study tried to identify the demographic, institutional and technical factors that affect marketing channel selection by smallholder vegetable farming households in *Maekel* region, Eritrea. Sales in the farm-gate, sales to private traders and a combination of the two are the three distinct marketing channel options that were observed in the study area. The low number of marketing channels is an indicator of the extent of market thinness in the smallholder farming sector of Eritrea. Moreover, farm-gate marketing channel is the most widely used option by the smallholder vegetable farmers in the study area.

All the respondents reported that they don't have storage facilities and market infrastructure for their produce in their localities. This implies that they don't retail their products, rather forced to deliver it to traders or sell it in their farm and don't see local markets as alternative marketing channel. Moreover, it is reported that due to problems of management and governance, the previously active agricultural cooperatives are no longer operational. Therefore, selling products through agricultural cooperatives, which has the potential to enhance marketing options and thus smallholder farmers' income, is nonexistent. In addition to this, they have reported that they don't usually get adequate visits, information and advice regarding markets and prices from extension workers.

Based on the multinomial logistic regression result, the main factors that influence choice of marketing outlet of the smallholder vegetable farmers in *Maekel* region are level of education of head of household, gender of household head, farming experience of household, household size, distance from the market, availability of road infrastructure and social network of farmers.

5.2 Policy Implications

- Based on the finding of this study, rural development policies should be aimed at enhancing households' asset base which are critical for their choice of marketing channels.
- Women headed households and youth should be encouraged to participate in marketing networks, which would contribute to their empowerment and improve their livelihoods.
- Policies should focus on mainstreaming gender equality and empowering female-headed households and the youth to enhance their knowledge and decision making regarding the choice of market channels.

- Farmers' access to reliable market information on direct markets, prices at semi-urban and urban marketing centers and current prices offered by other market channels and agents should be promoted. This could be achieved with the assistance of the extension officers in their localities.
- Agricultural cooperatives should be enhanced in terms of their outreach, governance and management to serve the farmers as marketing channels.
- Finally, there is lack of scholarly articles in the field of agricultural markets in Eritrea. Thus, future researches should focus on welfare effects of marketing channels, determinants of choice of marketing channels in relation with transaction cost, formal and informal markets and exploring the various value-chain actors and structures.

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