

This item is the archived peer-reviewed author-version of:

How participation in vegetables market affects livelihoods : empirical evidence from Northern Ethiopia

Reference:

Gebrehiwot Nahusenay Teamer, Azadi Hossein, Taheri Fatemeh, Van Passel Steven.- How participation in vegetables market affects livelihoods : empirical evidence from Northern Ethiopia

Journal of international food and agribusiness marketing - ISSN 0897-4438 - 30:2(2018), p. 107-131

Full text (Publisher's DOI): <https://doi.org/10.1080/08974438.2017.1402725>

To cite this reference: <https://hdl.handle.net/10067/1541410151162165141>

How Participation in Vegetables Market Affects Livelihoods: Empirical Evidence from Northern Ethiopia

Abstract

Vegetable farmers face a number of challenges in marketing. Having first-hand information about vegetable marketing is essential in order to devise appropriate strategies aimed at enhancing the value of the vegetable chain. It was in line with this view that the study was conducted to characterize vegetable markets in Northern Ethiopia. In an effort to identify the factors influencing vegetable marketing among farmers, data were collected from 283 farm households who were selected using stratified random sampling. Furthermore, the data were triangulated through focus group discussion (FGD) and key informant interviews. Descriptive statistics and the binary logistic regression model were used to identify the variables and test the probability of their influence in regards to farmers' decisions in vegetable marketing. From the 13 explanatory variables included in the binary logistic regression model, six predictors were found to be statistically significant in determining the effects of participation decision on vegetable market. These variables are: household family size, total land holding of the household, amount of vegetable produced and marketed, use of irrigation technologies, contact with extension agents and access to market information. Relying on a survey result and observations, the findings of the study indicated that vegetable marketing is significantly improving the livelihood of small holder producers.

Keywords: small-scale producers, cooperative, marketing, revenue, Tigray.

1. Introduction

There is no universally accepted definition of marketing. Kotler (2003) defines marketing as a societal process, by which individuals and groups obtain what they need and want through creating, offering, and freely exchanging products and services and value with others. Kohls and Uhl (1985) define agricultural marketing as the performance of all business activities relating to the flow of goods and services from the point of initial agricultural production until they are in the hands of the ultimate consumers. Smallholder farmers in developing countries find it difficult to participate in the market decisions due to a range of constraints and barriers reducing the incentive for their participation. It is considered that modern agricultural inputs enable resource poor smallholder farmers to produce marketable surplus and quality products. In developing countries, promoting farmers market participation is an important effort necessary to bring agricultural transformation (Melesse, 2017). Improving the productivity, profitability, and sustainability of agriculture is the main pathway out of poverty for the rural farm households using agriculture for development (World Bank, 2008). African markets are typically undercapitalized and inefficient (GabreMadhin, 2003; Fafchamps, 2004). Jaleta (2007) also revealed that limited marketing outlets and lack of price information were the major factors that hindered the move from subsistence farming to cash crop production. The majority of smallholder farmers in developing countries are located in remote areas with poor infrastructure and they often fail to participate in markets due to the high transaction costs involved (Key et al., 2000; Makhura, 2001; Omamo, 1998). Makhura and Mokoena (2003) also identified infrastructure, distance to the market, lack of assets (for example lack of own transport) and inadequate market information as the main constraints to marketing. Lack of bargaining power along with various credit bound relationships with the buyers has led to farmers being exploited during the transaction where most of

the farmers become price takers. According to Emanu and Gebremedhin (2007) factors such as inadequate markets, low prices, a lot of intermediaries and inadequate marketing institutions and interaction among farmers make it impossible for small-scale farmers to take part in formal markets. In this context, the marketing of agricultural commodities requires the existence of efficient marketing systems that can transfer the produced agricultural commodities from the point of production to the required market at the least possible cost.

The government of Ethiopia gave priority to agricultural development activities through its policy document entitled Agricultural Development Led Industrialization (ADLI, 1994). The policy focuses on the development of agriculture both as a source of production for direct consumption and as raw materials for industrial processing (Ethiopian Investment Agency, 2012). It also regards agricultural marketing as the key element for rural growth, poverty reduction, enhanced food security, and addressing the needs of a growing population in both rural and urban areas. Based on the report from the Ethiopian Investment Agency (EIA, 2012), Ethiopia has a comparative advantage for the development of horticultural commodities due to its favorable climate, proximity to European and Middle Eastern markets and cheap labour. According to the report of Central Statistics Authority (2012), the total area cultivated for fruits and vegetables was about 12,576 hectares in 2011. Of the total land area under cultivation in the country during the same year, the area under fruits and vegetables is less than one percent (i.e. 0.11%), which is insignificant as compared to food crops (EIA, 2012). The same report also indicated that tuber crops, tomato and onion production and marketing play an important role in improving household's income, nutrition and food security. Mathews (2009) noted that the growing demand for local foods is presenting new opportunities for smallholder agricultural producers, but understanding the relative costs and benefits of different local channels is important to maximize farm performance.

Since the adoption of the new economic policy in 1991, agricultural markets have been reformed and prices of commodities are determined through market mechanisms (Ethiopian Economics Association, 2004). As a result of such favorable conditions, a large number of small holder producers are growing a variety of vegetable products for the local market. However, according to Wolday (1994), the performance of agricultural marketing systems in Ethiopia is constrained by several factors such as poor quality of agricultural produce, absence of market facilities, weak extension services that ignore marketing development, poor linkage of research and extension service, lack of marketing information and intelligent services, excessive value and periodic fluctuation, restricted access to credit, and transportation problems. By supporting marketing issues raised by Wolday, Mulat (2000), also highlighted the factors affecting the Ethiopian agricultural output market such as price variations, high transaction costs, high risk factors, inadequate transportation networks, limited number of traders with inadequate capital and facilities, high handling costs, inadequate market information systems, weak bargaining power of farmers, and underdeveloped agro-industrial sectors. Furthermore, Emanu and Gebremedhin (2007) argued that poor product handling and packing, imperfect pricing systems, and lack of transparency in market information are among the impediments in the marketing of vegetable products in Ethiopia. In this regard, the report of Ethiopian Economics Association (EEA, 2005) revealed that due to the weak bargaining power of producers and harvest fluctuations, the *price free* notion of markets has been found to affect producers. Because of these constraints, smallholder farmers are not getting the right share of the consumer price and they are not producing and selling in an organized manner and as a result part of their benefit may transfer to the middle men (Coleman, 1999). All of these factors reduce their participation in economic transactions and results in subsistence agriculture rather than market oriented production systems.

Farmers make two interrelated decisions i.e. decision to sell or not to sell (market participation) and to whom to sell (market channel choice). Both decisions are key ingredients for successful marketing and

determine the well-being and income to be obtained. This is so because different channels are characterized by different benefits (profitability) and costs.

In Malawi, a wide range of indigenous vegetables are grown that play a critical role in the nutrition of the people by providing essential minerals and vitamins that generate some income for small-holders (Mkamanga, 1990). A study made by Bathi (1993) indicated that their returns from vegetable farming was quite high and could be much higher if the package practices were adopted. Increased consumer incomes and year-round demand for fresh vegetable produce force retailers or their representatives to establish buying points both in different growing areas. Several factors must be considered when choosing a marketing channel for vegetable products. Location can have a major impact on farmer's profitability because location affects the marketing channel used as well as the ability to attract customers. Furthermore, bringing vegetables to market requires special handling. To preserve quality and maintain marketability, each crop must be harvested, prepared for market, packaged, and shipped. Small-scale vegetable growers generally have more difficulties finding established markets.

Though vegetable marketing was practiced for decades in the study area, it is not well supported by comprehensive research and thus there remains a knowledge gap. To see the positive impacts of vegetable marketing on livelihood improvements and identifying the factors that are affecting the market, it is important to understand how farmers are operating vegetable marketing activities and what factors impede them from achieving the optimum level of efficiency required for marketing. Identifying and understanding factors affecting smallholder farmers' market participation decisions and identifying the way to avert the bottlenecks associated with these factors is fundamental in improving vegetable products marketing system and the well-being of smallholder livelihood. Accordingly, this article attempts to analyze the determinants of smallholder farmers' market participation decisions (to sell or not to sell) and channel choices (to whom to sell) and associated revenue generated from the sale of vegetable products among smallholder farmers in the study area. More specifically, the study aims at: Developing a comprehensive overview of vegetable marketing.

Identifying and analyzing the main factors influencing vegetable marketing among small holder farmers. Analyzing the revenue generated from the sale of vegetable products and its impact on livelihood improvement.

Approaching strategies for promoting efficient vegetable marketing systems for smallholder farmers.

2. Methodology

2.1. Study area

Tigray regional state is found the Northern Ethiopia which extends from 12°15' to 14°50'N latitude and from 36°27' to 39°59'E longitude. As per the projection of the Central Statistical Agency, (2013), the population of Tigray Regional State is estimated to be 4,960,003 and 75.8% of the population live in rural area. Based on the statistical report of Bureau of Finance and Economic Development (BoFED, 2013) agriculture is the main economic activity employed by the majority of farmers and the sources of income for the rural people. In most *Woredas* (Districts of Ethiopia) of the region, farmers produce vegetables for their own consumption and market them by themselves, produce is grown by diverting the available rivers also by traditional means and using small-scale irrigation schemes.

Kilte-Awlaelo *Woreda* has been purposively selected for the study as it is one of the major vegetable growing areas in the region and nearest to the major market areas such as the town of Wukro and Mekelle. It is found in the Eastern zone of Tigray region. It is located at a distance of 44 km from the regional capital city, Mekelle and 73 km from the zonal city Adigrat (WoFED, 2014). Administratively the *Woreda* covers 19 *Tabias* (*Tabia* is the lower administrative hierarchy below *Woreda*/district) and 59 *Kushets* (*Kushet* is the least administrative hierarchy below *Tabia*). The total population living in the

Kilte-Awlaelo *Woreda* is estimated to be around 109,583 of which 53,061 are male (CSA, 2013). The total household size is about 23,200 heads of household out of which the male headed is about 79 percent and the remaining 21 percent is female headed (Kilte Awlaelo *Woreda* Office of Agriculture and Rural Development, 2013). The majority of households depend on agricultural production as a source of household food and income.

Though Kilte Awlaelo *Woreda* has enormous potential for vegetable production, the marketing system used by farms, the households and their characteristics have not yet been sufficiently studied and analyzed. To fill the knowledge gap in the area this research tries to rigorously examine the problems of vegetable marketing with a focus on small holder vegetable producers.

Based on the information collected from the *Woreda* Office of Agriculture and Rural Development, a total of 10,499 ha was cultivated during 2015/16 harvesting period. From the total cultivated area, about 3848.14 ha is cultivated by using small-scale irrigation schemes. The major vegetables grown in the area include onion, tomato, potato, pepper, lettuce, cabbage, carrot, garlic, bed root, shallot and others.

[insert Figure 1]

2.2. Model specification

Market participation is a dummy variable representing whether a farmer was involved in vegetable marketing or not in the last production season. For the respondents who participate in market, it is = 1, and = 0 for the respondents who did not participate in market. Given that dependent variable (market participation) is a binary variable and has two outcome categories, econometric models namely binary logistic regression models were used to estimate the determinants of household vegetable market participation decisions. In this regard, the necessary precautions were made on the quality and usability of the data. To this end, multicollinearity problems were checked using Variance Inflation Factor (VIF) for each independent variable.

The amount of money generated from the sale of vegetable products has a direct and positive relationship with the livelihood improvement of the producers. Accordingly, to estimate the impact of market participation on livelihoods the econometric model specification of supply function in matrix notation was applied as described hereunder.

$$Y = \beta 'X + U$$

Where:

Y = Revenue generated from the sale of vegetable products

X = a vector of explanatory variables

β' = a vector of estimated coefficient of the explanatory variables

u = disturbance term

2.3. Population and sample

This study was conducted based on the survey undertaken in May 2016 in Kilte-Awlaelo *woreda* of Tigray region, Northern Ethiopia. The sample *Woreda* was purposely selected based on its potential for the development of vegetable products and its close proximity to the major towns of the region (Wukro and Mekelle).

Considering the production potential of the 2015/16 harvest period, the 19 *tabias* were stratified into high, medium and low potential areas for vegetable production.

Accordingly, two *tabias* were randomly selected from each stratum. Mesanu and Genfel *tabias* were selected from high potential areas, Debre Birhan and Debre Tsion from medium potential areas and Gemad and Hadnet from low potential areas.

From the total of 23,200 households living in the *Woreda*, about 80% (about 18,560 households) of the residents is assumed to be involved directly in agriculture. For populations that are large, Cochran, (1977) developed a mathematical equation which yields a representative sample for proportions. The equation is:

$$n = \left(\frac{t}{d} \right)^2 p(1 - p)$$

Where:

n =sample size

t =values of standard variant at 95% confidence interval ($t=1.96$)

p = the estimated proportion of an attribute that is present in the population (e.g., 25%).

d = acceptable margin of error for proportion being estimated =0.05

Determining proper sample size for a survey mainly hinges on factors like the level of precision required, the level of risk allowed and the degree of variability in the attributes being measured. Furthermore, customary to a social science survey, a 95% confidence level and $\pm 5\%$ precision was applied in determining the size of the sample. This is considered as the most conservative estimate because it is associated with the largest sample size. In addition, factors such as purpose of the study, budget and time considerations are taken into account. To this end, by applying a sample size determination equation of Cochran (1977), a sample of 288 households was chosen using stratified random sampling based on proportional allocation.

Proportionate to the number of farmers involved in production and marketing of vegetable products, about 288 farmers were selected at random from the list of farmers of each *tabia* obtained at *tabia* level administration. However, 5 questionnaires from *tabia* Hadinet were discarded because the answers provided were inconsistent and unreliable reducing the final sample size to 283 households.

A visit to physical facilities of the marketing of vegetable products during the study period (e.g. production fields, packing equipment, transport and storage facilities) and direct observations of the performance of marketing functions was made by the researcher. This was done to observe post-harvest handling, grading, packaging, storage facilities, transport and transaction activities related to vegetable marketing. This helps to cross-check the data collected through various methods. Interviews and focus group discussions were also held with relevant *Woreda* level experts on the challenges and government interventions in vegetable marketing.

2.4. Data collection

Data were collected from both primary and secondary sources. Primary data sources incorporated the entire situation of the vegetable marketing system all the way from the producing farmers up to the retailers and consumers through structured questionnaires. The primary data was gathered using interview schedules from the respondent farmers (sampled household heads). The interview

schedule was designed in a way that enabled us to collect both qualitative and quantitative data which was administered by data enumerators who were recruited, trained and supervised by the researcher. The interview schedule was translated in to the local language (Tigrigna) and pre-tested at *Tabia* Deбри (Enderat Woreda) before its actual use.

The data types collected consisted of demographic characteristics of the respondents, land size, use of technology and inputs, contact with extension workers, type and volume of vegetable production, choice of marketing channel, transportation, pricing, determinants of market supply, market information, marketing problem, and other data relevant to the study.

On the other hand, the key informant interviews and focus group discussions were used to collect comprehensive data from the *Woreda* extension workers, heads of Agriculture and Rural Development Office, *Woreda* Cooperative Promotion and Marketing Office heads. In addition to these, secondary data pertinent to the study such as reports and statistical reports from the *Woreda* Office of Agriculture and Rural Development and Office of Trade and Industry were reviewed.

Since the data collected through interview schedule was limited in number, the findings should be interpreted with caution. Nevertheless, the data and information from the interviews is important in creating better understanding in relation to the recent vegetable marketing situations in the study area.

3.Results and discussion

3.1. Descriptive analysis

Vegetable marketing is influenced by various socio-economic attributes. Of these attributes, demographic and socio-economic characteristics are the ones. Hence, this section will discuss household characteristics like sex, age, family size, education status, etc. which influence the involvement of sample respondents in vegetable marketing. The survey also includes other independent variables that determine vegetable marketing participation such as land size, use of inputs and technologies, contact with extension workers, volume of vegetable production, access to market information, distance to the market, and market price for vegetable products, choice of marketing channel, transportation, marketing problems and other related activities. The descriptive analysis and the overall relationship of the dependent and independent variables are discussed as follows.

3.1.1. Gender

From the total male-headed households, about 76.68% of the respondents were involved in production and marketing of vegetable products in 2015/16. On the other hand, about 62.86% of the female respondents were involved in vegetable marketing during a similar period (Table 1). On the other side, the average revenue generated from the sale of vegetables by male respondents is Br. 21,936.29 with the standard deviation of 31,034.94 while that of female respondents is Br. 12,529.14 with the standard deviation of 16,925.93. This clearly shows male respondents are getting more revenue from the sale of vegetable products as compared to female counterparts. When we measure the strength of the linear association between gender and revenue generated from the sale of vegetable products through Pearson correlation, it is negatively related with p-value of 0.08. Hence, the relation between gender and revenues from the sale of vegetable products is not very significant and hence female headed households are likely to participate in the sale of vegetable products like that of males.

[insert Table 1]

3.1.2. Access to extension services:

During the survey, there were about 64 extension agents in the study area and each *Tabia* had at least three extension agents. From the total households, about 82.69% of the respondents reported that they had contact with extension agents at least once in the 2015/16 production season (Table 1). The average contact of households with extension agents was 4.55 times with a minimum of 0 and maximum of 16 times. The t-test result also showed that there were significant differences in the frequency of contact among households who are involved in vegetable marketing and those who were not.

3.1.3. Education

The survey result shows that about 32.3% of the sample respondents are illiterate and do not have formal education while 8.13% attended religious education and thus they can read and write. About 49.12% attended elementary school, 9.19% attended high school and about 1.4% of the sample respondents attended college level education. As clearly depicted in table 1 above, there is a significant difference amongst sellers and non-sellers of vegetable products with regard to market participation (i.e. decision to sell vegetable products or not). The research result also shows that farmers who sold vegetable products in the last production season are better educated than their counterparts. When we measure the strength of linear association between age and total revenue from the sale of vegetables through Pearson correlation, it is positive with p-value of 0.294. This indicates that literacy enhances the marketing skills of vegetable growers which may in turn lead to higher revenue from the sale of vegetable products and as a result bring better livelihood status for vegetable produces.

3.1.4. Access to market information

Out of the total sampled households, the majority (i.e. 89.05%) reported that they had access to market information. From farmers who had access to market information (i.e.252 households), 82.94% of them participated in vegetable markets, while the rest 17.06% did not. On the other side, only about 25.81% of the respondents who do not have access to market information are involved in marketing of vegetable products (Table 1). The result also confirmed that there is a difference in access to market information among sellers and non-sellers of vegetable products. When we measure the strength of the linear association between access to market information and total revenue from the sale of vegetables through Pearson correlation, it is positive with p-value of 0.506. This indicates that the influence of access to market information in generating revenue from the sale of vegetable products is moderate.

3.1.5. Age of the head of the household

The average age for all sampled household heads was observed to be 46.30 years with minimum and maximum 21 and 75 years of age respectively and the standard deviation of 11.95. When we assess the average revenue generated from the sale of vegetables considering age as a variable, the respondents within the age group of 18 to 35 are getting Br. 30,311.81 with standard deviation of 43,323.18 while the respondents above 65 years of age are getting Br. 16,530.52 with standard deviation of 25,816.13. If we measure the strength of the linear association between age and total revenue from the sale of

vegetable products through Pearson correlation, it is negatively correlated with p-value of 0.015. This indicates that there is a significant difference between the age of the household head and revenue generated from the sale of vegetable products within the study area. This means, as age increases, the revenue generated from the sale of vegetable products decreases and this could be attributed as a result of better access to education and market information of the young respondents as compared to older respondents.

3.1.6. Family size

For all sampled households, the average household size was about 5.25 persons with minimum and maximum family members of 1 and 12 persons respectively. For those who are involved in vegetable markets, the average family size was 5.07 persons per household while for those who aren't involved in vegetable marketing was around 5.84 persons. When we measure the strength of the linear association between household family size and total revenue from the sale of vegetables through Pearson correlation, it is negatively correlated with p-value of 0.238. This indicates that there is an inverse relationship between household family size and involvement in vegetable marketing.

3.1.7. Ownership of farm land:

As per the survey result, the average land owned by the sample households is 0.54 hectare with a minimum land holding of zero and maximum of 2.2 hectares. The average production for the period of 2015/16 is 65.56 quintal per household. From the total production, on average about 41.79 quintals of vegetables is supplied to the market which generates average revenue of Birr 20,772.86 per year. The remaining 23.77 quintal of vegetables is consumed by households. When we measure the strength of the linear association between size of land and total revenue from the sale of vegetable products through Pearson correlation, it is significant and positively correlated with a p-value of 0.244** (correlation is significant at the 0.01 level (2-tailed)). This shows that as the size of the land increases, agriculture production increases and similarly the revenue generated from the sale of vegetable products increases which will have a positive impact in the livelihood improvement of vegetable producers.

3.1.8. Agricultural inputs used

As indicated in table 8, most farmers use fertilizer in 2015/16 production season. Of the total sampled households, about 83.75% use fertilizer for vegetable production. From the total respondents who used fertilizer to vegetable production (i.e. 237 farm households), a significant majority of households (73%) used DAP while 13.5% used UREA. The remaining 13.5% of households reported that they use both DAP and UREA. The application of improved seed is also one of the most important inputs which determines the amount of vegetables produced by the households. The average cost incurred for the purchase of inputs is Birr 995.5 per respondent with standard deviation of 1125.

As Table 2 shows, as the use of agricultural inputs increases, the revenue from sales of vegetable products increases. When we measure the strength of the linear association between total cost of inputs used and total revenue generated from the sale of vegetables through Pearson correlation, it is significant and positively correlated with a p-value of 0.382** (correlation is significant at the 0.01 level

(2-tailed)). As a result, it can be argued that the use of agricultural inputs lead to increased surplus production and involvement in vegetable marketing which is directly linked to improving the livelihood status of producers. However, during the survey, the respondents reported that there is a problem of accessing up-to-date seed variety and fertilizers. The increasing trend of raising prices of fertilizers is also another problem mentioned by respondents.

[insert Table 2]

3.1.9. Ownership and use of irrigation technologies

When we see the ownership and use of water pumps, about 47.35% of the respondents own and use pumps for agricultural activities with average revenue from the sale of vegetable products amounting Birr 25,247.98, and about 15.55% of the respondents use rented pumps with average revenue of Birr 19,957.27 and the remaining 37.10% are not using pumps and generate an average revenue amounting to Birr 15,403.52. This clearly indicates that those respondents who own and use water and treadle pumps are generating more revenue as compared to those who are not owning or using motor pumps. When we measure the linear association between ownership and use of pumps and revenue generated from the sale of vegetable products through Pearson correlation, it is positive and significant with p-value of 0.151* (correlation is significant at the 0.05 level (2-tailed)). Also when we measure the linear association between investment for the purchase of motor pumps and revenue generated from the sale of vegetable products through Pearson correlation, it is positive and significant with p-value of 0.288** (correlation is significant at the 0.01 level (2-tailed)). Hence, more investment in motor pumps will result in more agricultural production and revenue which has a direct link to livelihood improvement.

3.1.10. Total production, consumption and marketing of vegetable products

When we see the types of vegetables produced by the farmer's, tomato is taking up the highest portion (54.23%) followed by other vegetables such as carrot, pepper, lettuce, cabbage, carrot, garlic, bed root and shallot (42%). The remaining share of production is taken by onion (3.24%) and potato (0.5%). The survey result also revealed that the average vegetable supplied to the market per household is 63.74% of the total production which is about 41.79 quintals (41,790 kilograms) which generates an average revenue of Birr 20,772.86 from the sale of vegetable products with standard deviation of 29,795.83. (1USD= Birr 21.5 as of June 2016). When we measure the strength of the linear association between amount of vegetable supplied to the market and total revenue from the sale of vegetable products through the Pearson correlation, it is positive and strongly correlated with a p-value of 0.000 (Figure 2). This indicates that supply of vegetable products to the market has a direct and positive relationship to revenue from the sale of vegetable products which has a positive contribution to the livelihood improvement of producers.

[insert Figure 2]

3.1.11. Cooperative membership

Farmers usually participate in cooperatives to solve their common social and economic problems through common efforts and collective actions. Farmers' cooperatives increase efficiency of marketing by reducing the channel of marketing and hence promote agricultural development. From the total sampled households (i.e. 283 households), about 87.63% are members of one or more cooperatives. The result of the research also indicated that there are statistically significant differences between

households who are members and those who are non-members of cooperatives in terms of market participation. For instance, out of the 248 respondents who are members of farmers' cooperatives, 234 (94.35%) reported that they have been involved in the sale of vegetable products during 2015/16. Conversely, from households who are not members of any cooperatives, only 6 respondents (42.3%) participated in vegetable marketing. Comparatively, members of cooperatives have been involved in vegetable marketing than non-members. The chi-square result showed the difference is statistically significant ($\chi^2 = 1.168$, $df = 1$, $p < 0.05$).

3.1.12. Distance to market and main services

Distance from market and main services affects market participation and channel choice decisions of farm households. In relation to the time spent to travel from farmers' villages to the main market place (Mekelle and Wukro towns), the households reported that they have to travel about 88.12 minutes on average with a minimum of 25 and maximum 165 minutes. The average distance to nearby markets is about 16.113 km. On the other hand, on average farmers walk for about 29.33 minutes to reach the extension office (Table 3).

[insert Table 3]

3.1.13. Choice of market channel:

A market channel is defined as a structure of inter-reliant organizations that reach from the point of product origin to the consumer with the purpose of moving products to their final consumption. Smallholder farmers have the opportunities of choosing from different market channel options once they already decide to sell their products. The principal market outlets identified in this study are farmer cooperatives, traders and consumers. The possible market channels used by farm households of the district were analyzed with the intention of identifying the alternative routes of vegetable produce as it passes from farm households to its end users. As per the discussion with *Woreda* experts, about seven major channel options are identified for vegetable marketing. The main marketing channels identified from the point of production until the product reaches the final consumer through different intermediaries were:

Channel 1: Vegetable producers → consumers

Channel 2: Vegetable producers → retailers → consumers

Channel 3: Vegetable producers → wholesalers → consumers

Channel 4: Vegetable producers → wholesalers → retailers → consumers

Channel 5: Vegetable producers → rural assemblers → retailers → consumers

Channel 6: Vegetable producers → rural assemblers → wholesalers → consumers

Channel 7: Vegetable producers → primary cooperatives → cooperative union → consumers

The above channels used by farmers of the district were grouped in to three major categories for the sake of convenience so as to enable a smooth analysis and interpretation. Thus, retailers, wholesalers and rural assemblers of vegetables were categorized in to one group as traders, while cooperatives and consumers make up the other two categories of vegetable buyers.

3.1.14. Market channels used by farm households

To further support the analysis, households who sold to the three groups of channels (traders, consumers and cooperatives) were assessed. Accordingly, about 27.19% of the sample respondents sell their vegetable products to cooperatives, about 19.35% to consumers and 32.72% to traders. The remaining 20.74% of the sample respondents use a combination of market channels to sell their vegetable products.

Further analysis was made in relation to market channels used by farm households. In terms of literacy, there is a significant difference in choosing market outlets. A large majority of the literate households sell to traders, while most of the illiterates sell directly to consumers (40.2%). The majority of farmers who are members of a cooperative used the trader and cooperative channel to sell their vegetable products. The majority of the households who have access to extension contact (42.4%) sells to traders, while the majority (63.6%) of farmers with no contact sells directly to consumers.

3.1.15. Means of transportation

Transport services link farm households with potential buyers. It influences timely delivery of vegetable products to the markets. In addition, the type of transportation used by farmers determines how fast and in what conditions vegetable products reach the intended market. Farmers in the study area use different ways to transport their produce to the main market, mainly Mekelle and Wukro towns. The results obtained show that most respondents (71.89%) use pack animals to transport their vegetable products, about 14.75% of the respondents use animal carts, 9.68% use back loading and the remaining 3.69% use vehicles. It is worth considering that in the case of an absence of public transportation from farmers' the villages to Mekelle and Wukro towns, pack animals and animal carts are the dominantly used means of transportation. Results from the focus group discussion and key informant interviews also confirmed that though efforts are currently being made to connect villages to Wukro town, there is no regular public transport service to and from most peasant associations. In some of the villages; however, the participants of the focus group discussion mentioned that some wheel mini cars (*Bajaj*) are available for transportation services. However, such transportation services are not suitable for transporting vegetables, though farmers may use them to travel to towns to scan market situation.

3.1.16. Market price

Better price offering provides an incentive to farmers to participate in a market. It was expected that the selling price would incentivize farmers to participate in a vegetable market that offered better prices. According to the result, there is a statistically significant relation between prices and choosing cooperative means as a channel for selling vegetable products. The likelihood of farmers in choosing cooperative as their outlet increases by 1.065 as the price of vegetable products increase by one birr. This suggests that farmers choose cooperatives as a channel when appreciable price difference exists from that of traders. This result highlights the argument that a better price provides an important incentive for market channel choice by farmers.

3.1.17. Results of correlation analysis

Efforts were made to see the correlation results of the independent variables in relation to total market supply and total revenue generated from the sale of vegetable products as depicted in Table 4.

[insert Table 4]

3.2. Binary logistic regression

A binary logistic regression model was applied to estimate the determinants of household vegetable market participation decisions. The selected independent variables were checked for potential multicollinearity problems by using Variance Inflation Factor (VIF) tests. The result showed that the VIF for all predictors is less than 10 indicating that there were no multicollinearity problems (Table 5). The distance from market was found to be statistically significant in determining the market participation decision of vegetable producers in the study area. This might be because of good transportation facilities in rural communities in remote areas. Because of such transportation facilities the farmers in remote areas can become involved in vegetable markets as closer households to the market.”

[insert Table 5]

From the 13 explanatory variables included in the binary model, about six (6) predictors were found to be statistically significant in determining market participation decisions of vegetable producers in the study area. These variables are: size of the household, total land holding of the household, amount of vegetable produced and supplied to the market, use of irrigation technologies, contact with extension agents and access to market information. Table 13 below shows the regression estimates of market participation decision by the respondents.

The result of the model indicates that household family size is negatively related with farmers' market participation decision. The result was found to be statistically significant at $P=0.004^{**}$. This clearly underscores that as the number of family members of the respondents increases, the potential to sell vegetable products decreases. The likelihood ratio depicts that the probability of selling vegetable products decreases by 0.546, as the number of persons in the household increases by one unit (one person). This is due to the fact that as the number of family members increases, large amounts of the vegetables produced would be consumed by family members. This probably means that households with large family sizes tend to fail to produce marketable surplus beyond their consumption. This is in line with the result of Lapar et al. (2003) which underscores a decline in propensity to participate in the market with the rise in the numbers of household members.

Prior studies have shown that as the land holding of farmers' increases, their chance of producing marketable surplus also increases. This is because productive assets such as land holding are central in stimulating market participation by farm households (Barrett, 1997). This could be due to the role of land size in boosting total production levels and thus sales of surplus produce. Farmers with large acreage have a potential to produce more and supply more to the market. As the result from table 13 above, landholding of the farmer positively affects his/her decision to participate in vegetable marketing. As the amount of total land owned by the farmer increases by one unit, the probability of market participation increases by a factor of 5.93. The result is statistically significant at $P=0.017^{*}$. The results of the model in table 13 indicate that the probability of farmer's decision to sell vegetable products is positively influenced by contact with extension agents and it was statistically significant ($P=0.046^{*}$). Farmers who had contact with extension agents are more likely to participate in vegetable marketing than farmers who had no contact with extension agents. This is because access to extension service provides farmers with information about new technologies which boosts vegetable production and market information which in turn enhances the productivity of marketable surplus. The result is similar with the finding of Siziba et al. (2011) who identified that the volume of cereal products sold increases as the farmer makes contact with extension agents.

The use of irrigation technologies positively increases vegetable production and thereby market participation in the sale of vegetable products. The probability of selling vegetable products by households increases by 0.117 when the farmer tends to use irrigation technologies. The result was statistically significant at $P=0.047^{*}$. This is apparent because farmers who have access to irrigation technologies exhaustively work on their farm with the intention of commercializing their produce.

Confirming the hypothesis, the amount of vegetables produced and supplied to the market positively influenced farmers' decision to sell their products. As depicted in the model (table 13), as the amount of vegetable production by the household increases by one unit, the likelihood of selling vegetable increases by 1.16. This result is statistically significant at $P=0.003^{**}$. This suggests that farmers who obtain a high yield of vegetables can supply more to the market and generate revenue than farmers who produce in small quantities.

Improved market information empowers farmers to plan their production more in accordance with the market demand and schedule their harvests at the most profitable times. It also helps them to decide to which markets to send their produce to and also to negotiate with buyers on better terms. Small holders require up to date information on consumers' needs and market trends. The dynamic needs of the market require the farmers to be informed about market information, which in turn affects the decision with regard to what and how much to produce, among other things. Confirming the hypothesis, the results in the binary logistic regression model shows that market information positively influencing the farmers' decision to participate in vegetable markets with a statistically significant result at $P=0.009^{**}$. The model also depicted that the likelihood of participating in vegetable market increases by 11 when a farmer has access to market information.

The Cox & Snell R Square and the Nagelkerke R square value (table 13), provides an indication of the amount of variation in the dependent variable. These are described as pseudo R square. The result revealed that the values for Cox & Snell=0.609 and Nagelkerke=0.924, respectively. This suggests that between 60.9% and 92.4% of the variability in the outcome variable (i.e involved in vegetable marketing) is explained by the set of independent variables used in the model.

3.3. Livelihood indicators resulting from vegetable marketing

A question was raised to the sample respondents about whether vegetable production and marketing activities improved the livelihood of the respondents or not. About 83% (180 respondents) of the of sample respondents who are involved in marketing of vegetable products argue that there is change in livelihood due to the involvement in vegetable production and marketing activities while the remaining 17% respondents said that there is no change in livelihood brought about by their involvement in vegetable farming. In addition to the source of income from the sale of vegetable products, the families are consuming vegetables at home with average monthly consumption rates of around 7 kg per household with standard deviation of 5.79. This was further justified by its nutritional values and improvement in the health status of the family members. The survey result also depicted some contributions from vegetable production and marketing such as getting additional income, access to improved nutritional values (vegetable consumption by the family members which directly resulted in improved feeding habit), improved access livestock development (purchase of oxen and cows), pay loans and save money, purchase of household goods, the construction of houses in towns, and the likes. These all indicate that the production and marketing of vegetable products are promoting the livelihood of the farmers.

The propensity score matching (PSM) involves constructing a statistical comparison group based on a probability model of vegetable market participation and non participation. This method allows us to analyze the likelihood of market participation, the impact of participation on income and livelihood across farmers in a comprehensive way. The impact of market participation is then calculated as the mean difference in revenue across these two groups.

The average revenue from the sale of vegetable products for all the respondents is 20,772.86ETB (Ethiopian Birr) per respondent. However, considering the market participation as a variable, 76.68% of the respondents are involved in vegetable production and marketing and their average income is 22,375.00ETB while for the non participants, the average revenue is 15504.00ETB. This clearly shows

that participation in vegetable marketing increases farm income by 44.3% which is directly linked to livelihood improvements. The result showed that participation in the market in general has a strong positive effect on farm income. In this paper, we found that participation improves market orientation resulting in an increase in the share of sold farm products. When analyzing the impact of the market participation on farm performance, it becomes clear that positive findings are mainly driven by those vegetable market participants explained by commercialization and farm income.

3.4. Major problems of vegetable marketing

Farmers' vegetable production and marketing is influenced by a number of factors that can be attributed to production and market characteristics. Based on the discussion with the experts at Woreda level, the following issues were identified as major problems in the vegetable marketing of the study area.

High costs of production: This is due to high cost of seeds, fertilizers, equipment, chemicals and plagues in the vegetable sector of the *Woreda*.

Perishability: As vegetables are highly perishable, they start to lose their quality right after harvest and continue to do so until they are consumed.

Price fluctuations: The perishability of vegetables means the commodity cannot be held for long periods of time and fresh produce from one area is often sent to distant markets without a firm buyer or price. Prices may be negotiated while the commodities are enroute. Sellers might have little market power in determining its price. In this regard, producers are normally price takers and are frequently exposed to the risk of being cheated into under pricing by any intermediaries within the marketing channel. These exact challenging circumstances were faced by the vegetable producers of farmers surrounding Kilte-Awlaelo *Woreda*.

Inadequate market place: This problem particularly affects smallholder collectors who are informally involved in vegetable marketing around streets of major towns.

Price/Quantity risks: Due to the perishable nature and biological nature of the production process, there is a difficulty in scheduling the supply of vegetables to meet market demand. The crops are subjected to high prices and quantity risks with changing consumer demands and production conditions.

Seasonality: Vegetables have seasonal production directly influencing their marketing. Normally, they have limited periods of harvest and more or less a year round demand. In fact, in some cases, the cultural and religious set up of the society also renders demand to be seasonal. This seasonality is also worsened by lack of storage facilities.

Lack of standards: Repeated weight cheating and price discrimination are the common problems practiced by wholesalers and brokers. As a result there is no clear and well known quality and grading standard in the *Woreda* area.

Packaging: There is no uniform size or standard for the packages to be used in the local markets.

Lack of strong cooperatives: Although there are many multipurpose irrigation cooperatives and one union cooperative in the study area which was established to safeguard farmers' rights over their marketable produces, farmers were exposed to baseless traders, who ultimately sell their produce at low price. On top of this, local traders and elite farmers went to weaken the limited activities undertaken by cooperatives.

In conclusion, the major vegetable marketing constraints in the study area include high postharvest losses, poor marketing and value chain development, weak linkages and integration among value chain actors. The postharvest losses of vegetables are high primarily because of poor postharvest handling,

poor storage infrastructure and transportation facilities as well as poor market information and support systems in rural areas.

4. Conclusions and Recommendations

The study covers the demographic and socio-economic factors influencing vegetable marketing. In particular, it targets Kilde-Awlaelo *Woreda* whereby there is high potential for vegetable production and marketing. In the target *Tabias*, farmers produce vegetables and other agricultural products by the use of micro dams, shallow wells, private ponds, community bond, check dams and diversions for the cultivation of marketable vegetables.

A total of 283 sample respondents were randomly selected for the survey from six *Tabias*. From the survey, it was found that the average family size was around 5.25 persons and the average land holding of the sample respondents to be 0.54 ha with standard deviation of 0.48. Considering sex of the head of the household as a variable, the survey result revealed that female headed households produce less and their participation in vegetable marketing is limited as compared to men. About 76.68% of the sample respondents are involved in vegetable production and marketing. The average production is 65.56 quintal per household in which tomato takes the lead followed by other vegetables (such as carrot, pepper, lettuce, cabbage, carrot, garlic, bed root, onion and potato). The survey result also revealed that the average weight of vegetables supplied to the market per household is 63.74% (41.79 quintals) which generates average revenue of Birr 20,772.86 per respondent.

From the 13 explanatory variables included in the binary logistic regression model, about six (6) predictors were found to be statistically significant in determining vegetable market participation decision in the study area. These variables are: household family size, total land holding of the household, amount of vegetables produced and marketed, use of irrigation technologies, contact with extension agents and access to market information. From the respondents involved in marketing, about 83% believe that there is change in their livelihood due to their involvement in vegetable production and marketing activities.

The major vegetable marketing constraints are high postharvest losses, poor marketing and value chain development and weak linkages and integration among value chain actors. The postharvest losses of vegetables are high primarily because of poor postharvest handling, poor storage infrastructure and transportation facilities as well as poor market information.

Relying on a survey result and observations, it is concluded that vegetable marketing schemes could significantly improve agricultural production and revenue of vegetable producers which has a direct relationship livelihood improvement of producers. In order to improve the vegetable marketing, it is necessary to solve the above mentioned problems through the involvement and joint effort of all stakeholders in the value chain including producers, cooperative societies, traders and wholesalers, government, non-government organizations, and also designing well-structured short-term and long-term plans and development programs to fill the capacity gaps. Moreover, attention should be given for the capacity of cooperatives so that farmers can join-hands in dealing with marketing activities based on cooperative principles and values and solve their common problems through members' participation. Based on the findings of the study, the following recommendations are suggested.

1. Develop improved and affordable postharvest handling and storage structures and facilities at a household level to prolong the shelf life of vegetable products and minimize postharvest losses.

2. Build the capacity of farmer's cooperatives/unions and producers so as to create better opportunities for integrating smallholders into vegetable value chains so that the profit margin of the farmers can be improved.
3. Engage policy makers in frequent dialogues and forums with vegetable producers and all stakeholders in the value chain to timely solve the common problems in the vegetable market.

References

- ADLI.(1994). Agricultural Development Led Industrialization. Economic Development policy of Ethiopia. Addis Ababa, Ethiopia.
- Bahta, ST. & Bauer S. (2007). Analysis of the Determinants of Market Participation within the South African Small-scale Livestock Sector, pp. 25-39 From <<http://www.tropentag.de/2007/abstracts/full/422.pdf>> (Retrieved on 16 May 2016).
- Bhati JP. and Singh R. 1993. Changes in population, labour force and land use in Himachal Pradesh: a strategy for sustainable agricultural development in hilly areas. Bihar -Journal of Agricultural Marketing. 1: 3, 329-338.
- Barker, J. (1989). Agricultural Marketing. Oxford University Press, New York.
- Barrett, C.B.(1997). "Food Marketing Liberalization and Trader Entry: Evidence from Madagascar," World Development 25, 5: 763-777.
- Bureau of Finance and Economic Development. (2013). Annual statistical report, Mekelle.
- Central Statistical Authority (CSA). (2013). Population and housing Census of Ethiopia', Analytical report, volume II, Addis Ababa.
- Central Statistical Authority (CSA). (2012). Agricultural sample survey report on area and production of crops (private peasant holdings, meher season). Volume I. CSA, Ababa, Ethiopia. 128 pp.
- Cochrom G. (1977) Sampling techniques. John Wiley & Sons, Ink. Third edition, USA.
- Coleman, (1999). The impact of group lending in Northeast Thailand. Journal of Development Economics, Vol. 60 Ž1999. 105–141 www.elsevier.com/locate/reconbase.
- Ethiopian Economic Association (EEA). (2004). Industrialization and industrial policy in Ethiopia: Report on the Ethiopian Economy, Vol. III 2003/04. Ethiopian Economic Association/Ethiopian Economic Policy Research Institute, Addis Ababa.

- Ethiopian Economic Association (EEA). (2005). Transformation of the Ethiopian agriculture: Potentials, constraints and suggested intervention measures. Report on the Ethiopian Economy, Vol. IV 2004/05. Ethiopian Economic Association/Ethiopian Economic Policy Research Institute, Addis Ababa.
- Ethiopian Horticulture Development Agency (EHDA). (2011). Exporting fruit and vegetable from Ethiopia. Assessment of development potentials and investment options in the export-oriented fruit and vegetable sector. Addis Ababa, Ethiopia. p51.
- Emana, B. & Gebremedhin, H. (2007). Constraints and opportunities of horticultural production and marketing in eastern Ethiopia. Drylands Coordination Group Report No. 46.
- Ethiopian Investment Agency (EIA). (2012). Investment Opportunity Profile for Production of Fruits and Vegetables in Ethiopia, Addis Ababa.
- Fafchamps, M. (2004). Market institutions in Sub-Saharan Africa: Theory and Evidence, Cambridge, MA: MIT Press.
- Gabre-Madhin, E. (2003). Institutions, contracts, and market exchange in developing economies. International Food Policy Research Institute, Washington, DC 20006.
- Jaleta, M. (2007). Econometric analysis of horticultural production and marketing in central and eastern Ethiopia. PhD Diss., Wageningen University. Wageningen, Netherlands.
- Key N., Sadoulet E. & De Janvry A. (2000). Transaction costs and agricultural household supply response. American journal of Agricultural Economics, 82, 245-259.
- Kilte-Awlaelo *Woreda* Office of Finance and Economic Development, (2016). Wukro, Tigray
- Kohls, R., & N. Uhl. (1985). Marketing of agricultural products. 5th Edition. McMillian Publishing Company, New York, USA.
- Kotler, P. (2003). Marketing Management. Delhi-India
- Lapar, M.L., G. Holloway, & S. Ehui. (2003). Policy Options Promoting Market Participation among Smallholder Livestock Producers: A Case Study from the Philippines. Food Policy 28:187-211.
- Makhura M. T. (2001). Overcoming transaction costs barriers to market participation of smallholder farmers in the north province of South Africa. (Unpublished PhD Dissertation). Department of Agricultural Economics, Extension and Rural Development, University of Pretoria.

- Makhura, M., & Mokoena, M. (2003). Market Access for Small-Scale Farmers in South Africa. In: L. Nieuwoudt & J. Groenewald (eds.). *The Challenge of Change*, Pietermaritzburg, University of Natal Press.
- Matthew, N. L. and M. S. Todd. (2009). *Choosing the Right Marketing Channels for Small-Scale Producers*, Department of Applied Economics and Management, Cornell University.
- Mkamanga, GY *et-al.* 1990. Country papers: Malawi. Vegetable research and development in SADCC countries. Proceedings of a workshop held at Arusha, Tanzania, 9-13 July. 97-106.
- Mulat, D. (2000). Ethiopian agriculture since 1991: Its performance and challenges faced. Paper presented at a symposium for reviewing Ethiopia's socio-economic performance 1991-1994, Debre Zeit, InterAfrican Group.
- Omamo S.W. (1998). Farm to market transaction costs and specialization in small scale agriculture. Explorations with a non-separable household model. *Journal of Development Studies*, 35 (2), 152-163.
- Siziba S, Nyikahadzoi K, Diagne A, Fatunbi AO & Adekunle AA. (2011). Determinants of cereal market participation by sub-Saharan Africa smallholder farmer. *Learning Publics Journal of Agriculture and Environmental Studies*, 2 (1):180-193.
- Wolday Amha. (1994). *Food grain Marketing Development in Ethiopia after the Market Reform 1990': A Case Study of Alaba Siraro District'*, PHD dissertation, Berlin, Verlag Koster
- Woreda Office of Finance and Economic Development. (2013). Annual report, Kilte Awlaelo, Tigray.
- Woreda Office of Finance and Economic Development. (2014). Annual report, Kilte Awlaelo, Tigray.
- Woreda Office of Agriculture and Rural Development. (2013). Annual report, Kilte Awlaelo, Tigray.
- Woreda Office of Agriculture and Rural Development. (2007). Annual report, Kilte Awlaelo, Tigray.