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REGULAR ARTICLE

DETERMINANTS OF SMALLHOLDER FRUIT COMMERCIALIZATION: EVIDENCE FROM SOUTHWEST ETHIOPIA

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ABSTRACT

The aim of the study was to identify determinants of smallholder fruit commercialization in southwest Ethiopia. To get the sampled respondents multi-stage sampling techniques were used and in view of that, three districts were selected purposively from Jimma zone by selecting eight kebeles randomly. At the end, total of 240 sample households were randomly selected from these kebeles. To answer the research questions and objective of the study both qualitative and quantitative data were collected from primary and secondary sources. The primary data were collected from fruit producers as sampled households, agricultural experts, local leaders and other subject matter specialists on various aspects of commercializing fruits. Primary data were collected from the respondents using a pre-testing questionnaires, structured interview schedule and closed and open-ended questionnaires by well-trained enumerators closely supervised by the researchers. Secondary data were previous research findings and reports collected from kebeles, districts, agricultural offices, ministry of trade, trade and revenue offices. Moreover, qualitative data were collected through discussions with different agents by using focus group discussion and key informant interviews. The collected data were analysed using descriptive statistics (frequency, percentage, average mean, standard deviation, chi square and t-test) and econometric model (Probit model) to analyse determinant factors affecting smallholder's participation decision in marketing of fruits. From the result, age of household heads, household family size, access to transport services, off-farm activities, access to extension services, distance to market, improved fruit seeds and perishability of fruit were significantly affecting smallholder farmer's participation decision in commercialization of fruits. Therefore, to overcome the investigated problems strong commitment and reformation should be done by stakeholders including farmers, extension agents, researchers, policy makers.

Keywords: Fruit producers, Commercialization, Probit Model, Ethiopia
JEL: D13, Q02, Q12, Q13

INTRODUCTION

Agriculture is the mainstay of the Ethiopia and more than 85% of the rural populations are engaged in agriculture. The livelihood of the smallholder farmers is also determined by this sector. This sector also plays a substantial role in the life and livelihood of most Ethiopians. It accounts for over 40% of GDP, over 80% of employment and 90% of foreign exchange earnings (**Diao, 2010; Demese *et al.*, 2010**). This indicates that agriculture is the basis for every economic activity of the country. Agriculture determines the economic, social, and political system of the society in developing countries like Ethiopia (**Leykun and Haji, 2014**). Ethiopian smallholder farmers are dependent on the cultivation of cereals (**Salami *et al.*, 2010; CSA, 2011**). However, agricultural production system of the rural people is featured by poor access to land, poor access to inputs, poor irrigation system, inadequate market orientation, inadequate infrastructures, poor technology, inadequate extension advisory services and low output (**Tilaye, 2010**). Besides, majority of smallholder farmers in Ethiopia are subsistence based farming system and the linkage between production and consumption decision is very low (**Muller, 2014; Tabe-Ojong *et al.*, 2018**). Their participation in subsistence farming does not ensure their food security and household welfare.

Ethiopian government has formulated a series of policies, strategies and programs to promote agricultural development to achieve food security and build resilience. The government has also developed the second Growth and Transformation Plan for the period 2016-2020 to become a middle income country by 2025 by improving the agricultural productivity and its commercialization. Among the strategies market-oriented agricultural production policies is the central one (**Shifera and Teklewold, 2007; Mekonnen, 2015**) and the government tries to promote production and marketing of high value agricultural products to increase the competitiveness of farmers in national and international markets (**Tufa *et al.*, 2013**). However, smallholder farmers are unable to benefit from such policy interventions due to unimproved varieties, high transaction costs, lack of infrastructures and inadequate extension services (**Gebremedhin and Hoekstra, 2007**). Thus, commercializing subsistence farming is very decisive and important pathway to ensure household food security and nation economic growth of the country (**Abafita *et al.*, 2016; Mitiku, 2014**).

Commercialization also enhances the links between the input and output sides of agricultural markets and farmers' participation (**Jaleta *et al.*, 2009**). Some evidence shows that the average crop output and input market participation are 25% and 20%, respectively in 2009 and this indicates that market participation in rural areas is not above average (**Leykun and Haji, 2014**). Even if, the efforts made by the government to transform smallholder farmers from subsistence to commercial farming system, the performance has been considered expectations (**NPC, 2016**). This poor performance is because of lack of modern inputs and inefficient use of resources (**Kindie, 2005**) and following traditional way of farming system, poor production technology, rain-fed dependent agriculture, and low output mode of production (**FAO, 2011**). Some literatures indicate that commercial orientation of smallholder farmers for crop production in Ethiopia is very low (**Bekele, 2010; Adane, 2009; Bedaso *et al.*, 2012**).

Vegetable production is another subsistence farming practiced by smallholder farmers in Ethiopia and its cultivation is considered as the supplementary to the production of main crops. Now days, these crops are the main sources of income for smallholder farmers and their demand is also growing in both national and international markets (**Bezabih and Hadera, 2007; Yilma, 2009**) and as the result, the participation of horticulture producers is increasing. Though farmers have an interest in participating in production and marketing of horticultural products, their participation is very limited because of different factors especially for those farmers who are living in rural areas. Among these factors poor transport, inadequate infrastructure, high transaction costs, lack of market information, and lack of feasible partners (**Abafita, *et al.*, 2016**). **Mitiku (2014)** argued that market participation of smallholder farmers is very limited and agricultural markets are also fragmented which increases the transaction costs and reduces farmer's interest to produce products for the market. To tackle these problems increasing the participation of smallholder farmers in marketing of horticultural crops is very crucial (**Olwande *et al.*, 2015**). Commercialization of smallholder farmers is the way to bring their commodities to the market and becoming beneficiary as inclusive development (**Arias *et al.*, 2013**). Market oriented patterns of crop production can be effective and productive through intensification and commercialization of agriculture (**Gebreslassie *et al.*, 2015).**

In Ethiopia, many research investigations have been carrying out on the production of vegetables and their determinant factors that influence their production activities but the research done on the market participation of smallholder vegetable producers is very limited. Moreover, other literatures are mainly focusing on smallholder commercialization of other horticultural crops and livestock products. In Ethiopia, vegetable production is not available in all parts of the country but southern parts particular to Jimma zone have a good potential in vegetable production which are mainly utilizing them for stable food subsistence, with less market oriented activities. Despite the production potential and importance of horticultural crops, there has been limited study with regard to commercialization of horticultural crops mainly focusing on vegetable crops. However, vegetables are commodities which have higher value at market turning by more on consumption purpose than commercializing, and this is due to lack of information and other related factors. Vegetable commercialization by smallholder farmers are determined by household characteristics, household resource endowments, institutional factors, infrastructural factors and market related factors (**Goitom, 2009; Bekele *et al.*, 2010**). Although Ethiopian farmers are producing more of surplus vegetables, they are not much linked with markets and thus why their opportunity to diversify their livelihoods from vegetable production is very much limited. Thus, getting access to markets for vegetable marketing is a great important to diversify the livelihoods of smallholder farmers and reduces the rural poverty (**World Bank, 2008**). As long as my knowledge concerns and reports from government offices, there is little empirical evidence on smallholder vegetable commercialization and its associated factors in Ethiopia. Other studies carried out in Ethiopia focused on the commercialization of horticultural crops without particular investigation of vegetables. Moreover, those studies who worked out have been focusing on the proportion of output sold in market. In this study, we address such gabs in the literature.

Therefore, this research aims at linking smallholder fruit producers with markets to enhance the demand of the products and increase means of generating their income. Therefore, this study was conducted with the objective of examining smallholder fruit commercialization and their associated factors in the study context. This may be valuable input for smallholder farmers, policy makers and other stakeholders in revealing the gab in the performance of the current fruit production system to realize the nation development policy.

DATA AND METHODS

Sampling methods and procedures

The study was conducted in southwest part of Ethiopia by selecting sampled respondents as sample size based on determining factors and levels of accuracy required. In this regard, this survey was conducted in three districts in southwest part of Ethiopia and these districts were selected purposively on the basis of better production potential of fruits. From these selected districts again eight kebeles were also selected purposefully where the production potential of fruits is very high. Finally, 240 sampled households were selected using simple random sampling method assisted by probability proportion to size. Then, a total of respondents were used for personal interview by using well trained and qualified enumerators (Table 1).

Data types, sources and methods of collection

To answer the research questions and objective of the study both qualitative and quantitative data were collected from primary and secondary sources. The primary data were collected from fruit producers as sampled households, agricultural experts, local leaders and other subject matter specialists on various aspects of commercializing fruits. Primary data were collected from

the respondents using a pre-testing questionnaires, structured interview schedule and closed and open-ended questionnaires by well-trained enumerators closely supervised by the researchers. Moreover, restructuring had been done using sufficient number of non-sampled respondents through pilot study in order to suitably modify the questionnaire and facilitate smooth administration. Secondary data were previous research findings and reports collected from kebeles, districts, agricultural offices, ministry of trade, trade and revenue offices. Moreover, qualitative data were collected through discussions with different agents by using focus group discussion and key informant interviews, and this served as a supplementary to quantitative data. Focus group discussions were done on specific topics with small groups of [people that consist of 10-15 farmers who are fruit-producers. Checklist was also employed to spark out the discussion to obtain the primary data from group discussion members, key informant interviews and other officials during field survey.

Methods

The unit of analysis in this study was fruit producers. To analyse the collected data both descriptive statistics and econometric models were used. The descriptive methods like mean, percentage, t-test and chi square test were used. Probit model were also used based on the nature of dependent variable. Collinearity can increase estimates of parameter variance; yield models in which no variable is statistically significant even though R^2y or $Pseudo - R^2y$ is large; produce parameter estimates of the "incorrect sign" and of non-reasonable magnitude; create situations in which small changes in the data produce wide swings in parameter estimates; and, in truly extreme cases, prevent the numerical solution of a model (**O'Brien, 2007**).

R^2 is used to represent the proportion of variance in the i^{th} independent variable that is associated with the other independent variables in the model. It is an excellent measure of the Collinearity of the i^{th} independent variable with the other independent variables in the model. Tolerance is the percentage of variance in a dependent variable that is not accounted for by other independent variable(s). This represents the proportion of variance in the i^{th} independent variable that is not related to the other independent variables in the model. Its value for the i^{th} independent variable is one minus the proportion of variance it shares with the other independent variable in the analysis $(1 - R_i^2)$. The Variance Inflation Factor (VIF) is the reciprocal of tolerance (Eq. 1).

$$\mathrm{VIF_i} = \frac{1}{(1-\mathrm{R_i^2})} \quad (1)$$

Where: R^2-is multiple correlation coefficients between X_i and other explanatory variables. Note: VIF is the measure of multicollinearity between continuous independent variables. As a rule of thumb, if the VIF of a variable exceeds 10, which will happen if R_i^2 exceeds 0.90, that variable is said be highly collinear (**Kleinbaum *et al.*, 1988).**

Between dummy independent variables the presence of multicollinearity problem is detected from determination of contingency coefficient. Contingency coefficients can be used to estimate the extent of the relationship between two variables, or to show the strength of a relationship. The Collinearity between dummy variables was tested using contingency coefficient. This is another chi-square based on measure of association that can be used to show if there is a correlation (Eq. 2).

$$\mathrm{CC} = \sqrt[2]{\frac{\chi^2}{\chi^2+\mathrm{n}}} \quad (2)$$

Where: χ^2 chi-square statistic, n sample size

It is a symmetric measure which indicates the strength and significance of the relation between the row and column variables of a cross tabulation. When there is no relationship between the two dummy variables, each of these measures has a value of 0. As common characteristics (relationship) between the variables increases, each of these measures also increases, although by different amounts. When CC exceeds 0.75 it is an indication of serious multicollinearity relationship between variables (**Gujarati, 1995**). To analyse determinants of smallholder farmers' participation in marketing of fruits Probit model was used. Participation in marketing decision of the respondents was taken as the dependent variable with value of 1 if the farmer participated and 0 otherwise. In this model the probability that Y=1 (the probability that the household participates in fruit marketing) was estimated using the cumulative standard normal distribution function. Assume that Y can be represented by market participation and the regression equation is representing market participation (dependent variable, Y) and the independent variables are given by Eq. 3.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k + U_{1xki} = x\beta + u \quad (3)$$

Where: Y represents market participation, X represents the factors that determine market participation ßo and ß1-k are estimable parameters, U is the error term. The researchers opted to use the Probit regression model to identify the determinant factors that affect the decision of smallholders to participate in the market output. The reason why the Probit model used is the dependent variable is a dichotomous. Accordingly, the dependent variable assumes only two values; 1 if the household participates in output market and 0 if he/she doesn't. Thus, the Probit model is given by the Eq. 4. Y= 1 if a household participates in the market, and Y= 0 otherwise.

$$P\left(Y = \frac{1}{X}\right) = F(X\beta) = \frac{1}{\sqrt{2\pi}\int_{-\infty}^{x\beta} e^{-\left(\frac{x\beta}{2}\right)^2} dx} \quad (4)$$

Where:

$X = (x_1 i, x_2 i, \ldots x_k i)$

$\beta' = (\beta_0, \beta_1 - \beta_k)$

In the course of identifying factors influencing the participation decision in marketing of fruits the main task

is to analyse which factors influence the participation of fruit products. Therefore, potential explanatory variables, which are hypothesized to influence the market participation and fruit products (Table 2). Market participation is the dummy variable that represents the market participation of the household that is regressed in the Probit model. The dependent variable was smallholder fruit commercialization (market participation). It was determined by different factors such as socio-economic, demographic and institutional factors. So, for the households who participate in market it takes the value of 1 where as it takes the value of 0 for otherwise. The explanatory variables were hypothesized to influence the market participation decision of fruit producers. These variables and their influence are described in Table 2.

RESULTS AND DISCUSSION

Descriptive statistics

Age of household heads is a continuous variable measured in terms of years. The results (Table 3) indicate that the mean age of fruit producers participating in the market was 39.53 years where as 57.86 years was for non-market participants. The mean age of non-market participants was greater than that of market participants. This implies that young households were more participating in selling of fruits than old people households. The result of the t-test indicates that the mean age difference between the market participants and non-market participants was statistically significant at 1% probability level.

Family Size is a continuous variable referring the number of total family members in the household. The mean family size of market participants (3.78 members) was less than non-market participants (7.15 members) (Table 3). This implies that the number of consumers were larger in non-participants than market participants hence the size of the family does not go along with the consumption level of the households. Thus why, a few of households were limiting themselves in commercializing of fruits due to lack of sufficient fruits for selling purpose, rather for consumption. The result of the t-test shows that the mean household family size difference between the market participants and non-market participants was statistically significant at 1% probability level.

Distance to market place is a continuous variable measured in terms of kilometres. It was found that the mean distance of the non-market participants (8.15km) was greater than market participants (4.26km). This indicates that majority of non-market participants were far from the market place as compared to market participants provided that their participation in marketing of fruits is becoming tapered. The result of the t-test shows that the mean difference between distance of household residence to the nearest market for the market participants and non-market participants was statistically significant at 1% probability level.

Table 1: The name of districts, kebeles and the final sampled respondents

Name of Districts	Name of kebeles	Total pop. in each selected kebeles	Proportion of sampled households (%)	Total sampled households
Dedo	Waro kolobo	4322	12.08	29
	Ganjo Abbe	4026	11.25	27
	Ofole korti	4531	12.92	31
Kersa	Marawwa	3502	10.00	24
	Siba	4846	13.75	33
	Girma	4123	11.67	28
Seka	Shane kochi	5268	15.00	36
Chokorssa	Buyo kachama	4737	13.33	32
Total		35355	100.00	240

Source: Authors computation (2018)

Table 2: Description of explanatory variables for Probit estimation

Variable	Type of variable	Measurement	Expected Effect
Age of households	Continuous	Number of years	+
Family size of household	Continuous	Number of children per household head	-
Education of household heads	Categorical	Education status of the household head	+
Household labour size	Continuous	Number of labour force participating in marketing	+
Access to market information	Dummy	1=Yes, 0 otherwise	+
Access to transport services	Dummy	1=Yes, 0 otherwise	+
Off-farm income	Dummy	1=Yes, 0 otherwise	+
Access to extension service	Dummy	1=Yes, 0 otherwise	+
Distance to market place	Continuous	Kilometer	-
Using improved seeds	Dummy	1=Yes, 0 otherwise	+
Perishability of fruit products	Dummy	1=Yes, 0 otherwise	_

Source: Authors computation (2018)

Labour market refers to the availability of labour in terms of both supply and demand for producing as well as marketing of fruits. During discussion with the respondents marketing of fruits was very difficult task for one person rather in cooperation. Table 3 reveals that 40.48% of market participants had no enough labour while 59.52% of them had enough labour for both production and marketing of fruits. In the case of non-market participants 55.26% of them had no enough labour but 44.74% of them had no labour problem. On another hand, market participants had more enough labour force than non-market participants for fruit marketing. The result of chi square test showed that the difference between market participants and non-market participants was statistically significant at 5% probability level based on the labour market.

Access to market information indicates that farmers need to be able to get their products to market and receive equitable price treatment. Farmers need information pertaining output prices so as to make the right decision, ahead of the production season, regarding which type of crops to produce and sell and which crops to purchase from the market. 49.21% of market participants and 35.09% of non-market participants had access to market information but 50.79%of market participants and 64.91% of non-market participants had no access to market information (Table 4). Similarly, majority of the respondents from both market participants and non-participants were unable to getting market information timely and hence they were exposed to selling their fruits with low price at farm gate. During the survey time the respondents reported that they were facing inadequate access to get the system of gathering, analysing and interpreting information about a market, a product or service to be offered for sale in that market. Result of chi square test the difference between market participants and non-market participants was statistically significant at 5% probability level based on access to market information.

Access to transport refers to out taking fruit products from one place to the market place for the purpose of selling by means transportation in the study area. Table 4 presents those farmers who had the problem of getting means of transportation or not. 53.97% of market participants and 52.63% of non-market participants had no access to transport but 46.03% of market participants and 47.37% of non-market participants were getting access to transport service (Table 4). This indicates that majority of the smallholder farmers were located in remote areas with poor transport services so that failure of smallholder farmers' participating in the marketing of fruits happened. However, the chi-square test reflects that there is no statistically significant difference between market participants and non-market participants based on access to transport.

Participation in off-farm activities like sales of butter, cheese, coffee, crops, chat and other livestock products are the major off-farm activities and cash income sources. 48.41% of market participants and 18.42% of non-market participants were taking part in off-farm activities but 51.59% market participants and 81.58% of non-market participants didn't participate in it (Table 4). This shows that fruit market participants were more participating in off-farm activities than non-market participants. The result of chi square shows that the difference between market participants and non-market participants was statistically significant at 1% probability level based on participation of off-farm activities.

Access to extension services are essential factors that enable farmers to improve their practices and help them respond to emerging challenges. Knowledge, ideas, attitudes and skills gained through extension programmes can help farmers increase their productivity, reduce losses, and gain better access to markets. Table (4) reflects majority of the non-market participants were getting less access to extension services than market participants especially on market price, costs, benefits, transactions, and time of selling. Moreover, from the total of sampled respondents 47.92% had got access to extension services while 52.08% didn't get it. This shows that there was the problem of inadequate extension services delivered to smallholder fruit producers in the study area. The result of chi square test showed that the difference between market participants and non-market participants was statistically significant at 5% probability level based on access to extension service.

Improved seed variety is another factor that determines both the production of fruits and the chance of participating in the output markets. Table 4 presents that 48.41% of market participants and 41.23% of non-market participants used improved fruit seeds but 51.59% of market participants and 58.77% of non-market participants didn't get it. Smallholder fruit producers who were getting access to improved fruit seeds were market participants as compared to non-market participants. Even though seeds were available on the market their quality was very low so that fruit producers wouldn't have increased the level of their production and brought for marketing. However, the chi square result shows that the difference between market participants and non-market participants was not statistically significant.

Perishability of fruits is used in marketing to describe the way in which service capacity cannot be stored for fruit sale in the future. Fruits are usually soft, fleshy, edible plant products because of their high moisture content they are relatively perishable. The results in Table 4 shows that among the market participants of fruit producers 59.52% of them wouldn't have access to storage facilities but 40.48% of them had. In the case of non-market participants 57.89% of them had storage facilities but 42.11% didn't have this service. However, the chi square test result shows that the difference between market participants and non-market participants was not statistically significant.

Educational level is a categorical variable that is measured in terms of educational level or schooling. The results (Table 5) indicate that 57.14% of market participants were illiterate, 21.43% attained primary education, 11.90% attained secondary education and 9.52% attained tertiary education where as 63.16%, 12.28% and 2.63%2.63% of them were attained illiterate, primary education, secondary education and tertiary education for non-market participants, respectively. This indicates that majority of sampled respondents were fallen under the illiterate and primary education in both market

participants and non-market participants. However, the result of the chi-square test shows that education level was not statistically significant.

Determinants of smallholder's participation decision in commercialization of fruits

This sub-section presents the results of Probit regression model. If households sold fruits any value above zero, they were considered as participants and if not they are non-participants. The decision of smallholder farmers to participate in the marketing of fruits is determined by the maximum likelihood estimation. To obtain the marginal effects the post estimation of the selection equation results was done to analyse the data. The marginal effects were used for interpretation and it has also a direct interpretation (Table 6).

Age of household heads was statistically significant and negatively influenced farmers' likelihood to participate in fruit marketing at 1% probability level. The marginal effect shows that all other factors constant, the probability of households to participate in fruit marketing decreases by 1.8% as the age of household head increases by one year. This implies that younger people are more attached with technology and update their business mind with marketing issues so that youths were more participating in fruit marketing than elders in the study area. The older people are fewer participants in pineapple market than the younger people **(Geoffrey *et al*., 2014)**. **Barret (2007)** also indicated that young people are more active in marketing of commodities than the older once because young people are more amenable to accept new ideas than the older, and the older people are also more risk averter than the younger once.

Table 3: Summary statistics for continuous variables

Variables	Market Participants (N=126)				Non-market Participants (N=114)				t	μ
	Min	Max	Mean	Std dev.	Min	Max	Mean	Std dev.		
Age	20	88	39.53	12.74	17	92	57.86	19.97	8.56	0.0000***
Family size	1	11	3.78	1.85	1	14	7.15	2.33	12.46	0.0000***
Distance	1	15	4.26	2.76	1	20	8.15	3.65	9.36	0.0000***

Source: Authors computation (2018); *** indicates significant at the probability level of 1%.

Table 4: Summary statistics for dummy variables

Variables	Market-participant		Non-market participant		Total		χ^2	μ
	N	%	N	%	N	%		
Labour market								
No	51	40.48	63	55.26	114	47.50	5.2477	0.022**
Yes	75	59.52	51	44.74	126	52.50		
Market information								
No	64	50.79	74	64.91	138	57.50	4.8819	0.027**
Yes	62	49.21	40	35.09	102	42.50		
Access to transport								
No	68	53.97	60	52.63	128	53.33	0.0430	0.836
Yes	58	46.03	54	47.37	112	46.67		
Off-farm activities								
No	65	51.59	93	81.58	158	65.83	23.9341	0.000***
Yes	61	48.41	21	18.42	82	34.17		
Extension contact								
No	54	42.86	71	62.28	125	52.08	9.0477	0.003***
Yes	72	57.14	43	37.72	115	47.92		
Improved seeds								
No	65	51.59	67	58.77	132	55.00	1.2482	0.264
Yes	61	48.41	47	41.23	108	45.00		
Perishability								
No	75	59.52	66	57.89	141	58.75	0.0655	0.798
Yes	51	40.48	48	42.11	99	41.25		

Source: Authors computation (2018); Notes: ***, **, represents statistically significant at the probability level of 1% and 5% respectively

Table 5: Summary statistics for categorical variables

Variable	Response	Market-participant		Non-market participant		Total		χ^2	μ
		N	%	N	%	N	%		
Educational level	Illiterate	72	57.14	72	63.16	144	60.00	4.9237	0.177
	Primary	27	21.43	14	12.28	52	21.67		
	Secondary	15	11.90	3	2.63	29	12.08		
	Tertiary	12	9.52	3	2.63	15	6.25		

Source: Authors computation (2018);

Table 6: Results of Marginal Effects of Probit Regression

Explanatory variables	Maximum Likelihood (Coeff)	Marginal Effects (dy/dx)	P>Z
Age of household heads	-.047	-.018	0.000***
Family size of the household	-.436	-.168	0.000***
Education of household heads	.170	.065	0.309
Household labour size	-.069	-.026	0.831
Access to market information	.166	.064	0.620
Access to transport services	1.384	.532	0.000***
Off-farm income	.960	.369	0.016**
Frequency of extension contact	.590	.226	0.066*
Distance to market place	-.260	-.100	0.000***
Using improved seeds	-.639	-.245	0.068*
Perishability of vegetables	-.859	-.330	0.017**

Source: Authors computation (2018); Notes: ***, ** and * implies statistically significance at 1, 5, and 10% probability level respectively, N =240, LR chi2 (12) = 242.56, Prob > chi^2=0.0000, Log likelihood=-44.775389. Pseudo R^2=0.7304

Household family size was negatively influenced household's market participation in fruit commercialization and its influence was statistically significant at 1% probability level. The marginal effect shows that keeping all other factors constant, the probability of household's market participation decreases by 16.8% as the size of the family size increases by one person. stated that as the number of household member increases more, the probability of household's market participation decreases more hence they consume fruit more **(Tufa *et al*., 2014)**. In other way round, the level of household market participation in selling of fruits decreases when the number of months to be feed increases, and disproportionate volume of production provided. Larger households are more expected to have lower market participation, controlling labour supply **(Berhanu *et al*., 2013)**.

Regarding access to transport service this variable was positively influenced farmers' likelihood to participate in fruit marketing and significantly at 1% probability level. All other factors keeping constant, improving access to transport services including its cost increases the probability of smallholder participation in fruit marketing by 53.2%. This implies that farmers prefer selling of fruits at urban market to local market and farm gate to get the right price so that the farmer is likely to choose the one which gives higher benefits. So, place of marketing determines farmers' choice to sell their fruit products at high price or low price. This further explains that most of the time rural farmers are facing the problem of lack of transportations so that their probability to sell fruit at urban market or at the right price would decrease. This brings them the opportunity to sell fruits at farm gate and their preference to select market is also limited. This result agrees with the argument of (**Matsane and Oyekale, 2014**).

Off-farm income was positively and significantly influenced market participation of smallholder fruit producers in the study area. Keeping all other factors constant, an increase in off-farm income increases the probability of participating in fruit market by 36.9%. This implies that those farmers who wouldn't have land for fruit production they ought to go for marketing of fruit by circulating from one market to another market to get extra income. On the other hand, most of the households who are lacking assets they probably have better options in off-farm jobs and/or they are better to migrate to the towns/cities as retailers/whole sellers of fruits to increase their income.

Frequency of extension contact was statistically significant and positively influenced the participation of the households in marketing of fruits at 1% probability level. This further indicates that, keeping all other factors constant, the probability of household's participation in marketing of fruits increase by 22.6%, when the rate of households' contact with extension agents increases by providing training and advisory services. This implies that the knowledge, skill, ideas and shaping attitudes gained through extension agents can improve household's productivity, access to market and also reduces losses. **Meron (2015)** noted that as the arte of extension agents visiting rural households increases more, the rate of household's in market participation also increases especially it can have a positive impact on improving vegetable and post-harvest management practices by improving the household's intellectual capacities. As frequency of extension visit should increase and not decrease the level of market participation (**Gani and Adeoti, 2011**).

Distance of market place was found to be statically significant and negatively influenced on marketing of fruits at 1% probability level. As the marginal effects shows the probability of household participation in marketing of fruits decreases by 10.0%, the distance of farmers from market increases by 1km, keeping all other factors constant. This indicates that as farmers are more near to the market place their participation in fruit marketing becomes increasing hence fruits are easily putrefied from too far. The degree of commercializing fruits increases as the distance of market from farmer's residence is too small (**Tufa *et al.*, 2014)**. **Ogunleye and Oladeji (2007)** pointed out that the extent of farmer's market participations is hampered by a greater distance to the market.

Using improved fruit seeds was found to be statistically significant and negatively influenced the commercialization of fruits at 10% probability level. The marginal effects estimates indicate that keeping all other factors constant, an increase in using improved selected seeds decreases the probability of farmers' participation in

marketing of fruits by 24.5%. During survey time the respondents said that though seed was also available on the market, its quality was very low and its price was also very high. These two problems affected both the production of fruits and the chance of farmers' participation in the output markets.

Perishability of fruit products was found to be negatively related with farmer's participation in marketing of fruits and significantly influenced on marketing of fruits at 5% probability level. The marginal affects show that keeping all other factors constant, an increase in perishability of fruit products decreases the probability of farmers' participation in fruit marketing by 33%. This further entails that most of the time rural farmers don't have access to storage facilities to preserve fruit products until they get buyers so that they can't wait for marketing rather consumption. This decreases the participation of farmers in fruit marketing because of high fruit perishability. **Rais and Sheoran (2015)** stated that perishability of fruits is responsible for high market costs, market gluts, price fluctuations and other similar problems; and lack of cold storage and cold chain facilities are becoming bottle necks in tapping the marketing potential of fruits.

CONCLUSIONS AND RECOMMENDATIONS

The main objective of the research is to analyse determinants of commercializing fruits by smallholders in the southern part of Ethiopia. Accordingly, out of the twelve independent variables hypothesized to have influence on smallholder commercialization of fruits; eight variables (namely age of household heads, family size, extension contact, distance from settlement to market place**,** improved seeds, and perishability were negatively affected commercialization of fruits and also statistically significant; but place of selling and off/non-farm activities were affected commercialization of fruits positively and also statically significant. Based on the findings of the study, the following key recommendations might be forwarded to the concerned organizations to improve smallholder commercialization of fruits in Ethiopian context:

- Expanding village markets in the rural areas is very essential in consultation with government agencies to reduce transportation costs and also older farmers can easily use the markets without going long distance. Creating good environment for older farmers as they can sell their fruits at farm gate and village markets through brokers with fair price.
- For those producers who had the problem of lack of information, equipping them with training on how to sell, where to sell and when to sell their products might be provided. The problem of market price information was happened at farm-gate which was found to be inadequate because the farmers are forced to be price takers which result in lower prices. Therefore, the government and other policy makers should increase the marketing information and abilities of smallholder fruit farmers especially on disseminating price information through radio, TV, extension service, religious organizations, informal cooperative organizations (such as idir and equip) so that the farmers are encouraged to take their fruit products to competitive places where the prices are higher. Providing awareness for fruit producers on how much participation in off-farm activities links them with market issues.
- Training farmers how to use appropriate family planning to balance fruit production for both consumption and marketing. Encouraging extension agents to have frequent contacts with fruit producers to add their knowledge and skill with improved production, handling, storing and marketing for future consumer preferences. The government should provide enough improved fruit varieties timely by sustaining its quality and creating controlling system during delivering to farmers. Maintenance of transport, storage and other handling facilities are generally poor in the study area. Providing adequate storage facilities and involving proper regulation of temperature, humidity, air circulation, proper stacking pattern, regular inspection, and prompt produce disposal as soon as maximum storage life has been attained.
- Finally, there is need for further research to critically analyse other factors affecting the commercialization of smallholder fruit producers.

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