Determinants of Market Outlet Choice of the Smallholder Mango Producers: The Case of Boloso Bombe Woreda, Wolaita Zone, Southern Ethiopia: A Multivariate Probit Approach

By Takele Honja, Endrias Geta & Amsalu Mitiku

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Abstract- This study aimed at identifying of factors affecting market outlet choice of the smallholder mango producers in Boloso Bombe District, Southern Ethiopia. The survey was conducted in four randomly selected kebele administrations in the district. About 120 smallholder mango producers have been selected randomly from the four kebele administrations proportionally. Both qualitative and quantitative types of data were used. Sample households were used as source of the primary data used for the study. Both close ended and open ended (semi-structured) questionnaire was prepared to collect the data. Personal interview, focus group discussion and group discussions was used to capture adequate data. Both descriptive and inferential statistics were used to analyze the data. Multivariate probit model was used to identify factors affecting market outlet choices of the smallholder mango producers.

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Abstract- This study aimed at identifying of factors affecting market outlet choice of the smallholder mango producers in Boloso Bombe District, Southern Ethiopia. The survey was conducted in four randomly selected kebele administrations in the district. About 120 smallholder mango producers have been selected randomly from the four kebele administrations proportionally. Both qualitative and quantitative types of data were used. Sample households were used as source of the primary data used for the study. Both close ended and open ended (semi-structured) questionnaire was prepared to collect the data. Personal interview, focus group discussion and group discussions was used to capture adequate data. Both descriptive and inferential statistics were used to analyze the data. Multivariate probit model was used to identify factors affecting market outlet choices of the smallholder mango producers. The result obtained from multivariate probit model indicated that variables such as family size, distance to the market, quantity of mango produced, price offered, access to market information and access to non- farm income determined the decision of choice of wholesaler, collector, retailer and consumer market outlets at different significance level. Therefore, variables affecting the choice of wholesaler and consumer market outlet should be promoted and farm gate and retail price intervention is quite important to maximize the economic benefit of farmers. Quantity of mango produced and price should be promoted and get special attention to increase the contribution of mango to the household livelihood.

Keywords: mango, market outlet choice, multivariate probit model.

I. Introduction

Mango fruit crop has significant importance with a potential for domestic and export markets and industrial processing (James *et al*., 2008). However, a review of literature in agro-industry value chain in Ethiopia indicated that the sector faces many challenges due to limited market outlets, limited efforts in market linkage activities and poor market information among actors (Dereje, 2007; Kaleb, 2008; Dendena *et al*., 2009). It is common in Ethiopia that majority of mango producers sell their products at nearby local market. Most of the time mango producers sell their produce to consumers and sometimes to retailers because of the market fluctuation and lack of marketing infrastructures. The other reason is maturity stage and harvesting time of mango fruit is similar. This condition increase the supply at that time and the demand is less compare to that of the supply. In this situation the price of the fruit become less and less and as result of this farmers are obliged to sale their produce at local market (Seid and Zeru, 2013). In addition to this, farm gate sale of mango is also common in Ethiopia. The main sales channels of mango in Ethiopia include direct sale to consumer, hotels, large retailers and supermarkets, wholesalers and small retailers and kiosks (James *et al*., 2008). Marketing system of mango in Ethiopia is characterized by use of traditional transportation means and marketing is mainly oriented on local market. The main constraints of mango marketing are mentioned as lack of markets to absorb the production, low price for the products, poor product handling and packaging, imperfect pricing system and lack of transparency in market information system mainly in the export market.

Marketing channel choice decisions are among the most complex and challenging decisions facing farmers and chosen channels intimately affect all other marketing decisions (Berry, 2010). Giuliani and Padulosi (2005) indicated that systematic identification of factors faced by households in market outlet choice decision along agricultural value chain is increasingly seen by agricultural research as important component of any strategy for reaching the millennium development goals especially eradication of poverty and hunger. But, studies conducted earlier on mango sector in Ethiopia (James *et al*., 2008, Tigist *et al*., 2009, Timoteos, 2009, Tiruneh, 2009, Bezabih, 2010, Ayelech, 2011, Seid and Zeru, 2013) did not touch factors affecting market outlet choice decision of small scale mango producers in spite of the fact that it is indispensable for the agricultural development programs. Mango is one of potential fruit crop produced in Boloso Bombe Woreda in Wolaita Zone which has a significant contribution to the livelihood of small scale farmers in the area thereby

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contributing to the income of the majority of smallholder producers as well as ensuring of food security. Farmers in the study area can sale their mango via multiple outlets in order to maximize expected utility thereby making a joint decision. Although farmers sale mango through different market outlets, no empirical evidences has been done on factors affecting market outlet choice of smallholder mango producers in the area. Therefore, this study was conducted with the main objective of identifying factors affecting market outlet choice of smallholder mango producers in the area.

II. Methodology of the Study

a) Sample Size Determination and Sampling Techniques

Boloso Bombe Woreda was selected purposively as the study area based on the extent of mango production and participation of farmers in mango marketing. There are 18 rural kebele administrations in the Boloso Bombe Woreda. From the se rural kebele administrations, 4 kebele administrations were selected randomly. Accordingly, Adila, Bombe, M ehal Ambe and Para wocha kebele administrations were selected randomly. There are about 1150, 1210, 1220, a nd 1360 mango producers in Adila, Mehal Ambe, Bomb e and Para Wocha kebele administration, respectively. S ample frame was drawn for the study population of sele cted kebele administration and by employing Probability Proportional to Size (PPS), the number of farmers taken from each kebele was determined. Finally, based on the sampling frame drawn from each kebele administration, simple random sampling technique was applied to select the sample mango producing households. Accordingly, about 120 households have been selected randomly from the four kebele administrations proportionally.

b) Types, Sources and Methods of Data Collection

To conduct this study, both qualitative and quantitative types of data were used. Qualitative data collected may include demographic, socio-economic and institutional characteristics of mango producers and market outlet choices available for in the area. In addition to this, farmers' access to non-farm income and owning of on farm transport means were also collected. Quantitative data like age of the farmer, volume of mango produced, quantity of mango sold through each outlet, selling price of the mango in unit of measurement, marketing experience and distance to the nearest market were collected. Sample households were used as source of the primary data used for the study. To capture adequate data for the study, first both close ended and open ended (semi- structured) questionnaire was prepared. To collect the data, personal interview and Participatory Rural Appraisal (PRA) tools such as focus group discussion group discussions were used.

c) Method of Data Analysis

To change the raw data of the study into fact, both descriptive and inferential statistics were used. Descriptive statistics such as frequency, mean and percentage were used in the process of comparing socio-economic, demographic and institutional characteristics of households across market outlets choices. In addition to this, descriptive tools such as tables were used to present the results. Inferential statistics such as F-test (log-likelihood ratio test), Wald test, and pseudo R^2 were used to test adequacy of the model and hypothesis for the statistical significance of parameters.

d) Econometric approach

Determinants of the market outlet choices were identified by using multivariate probit model. Some recent empirical studies of market outlet choices assume that farmers consider a set (or bundle) of possible outlets and choose the particular marketing outlet that maximizes expected utility. They also assume that the addition or deletion of alternative outcome categories does not affect the odds among the remaining outcomes and the odds of choosing a particular market outlet over the other do not depend on which other outcomes are possibly chosen. However, in the present study more than one marketing outlet is available in the study area and farmers are more likely to simultaneously choose more than one market outlet in order to address their multiple needs. In this case, the dependent variables are the dichotomous variables indicating whether sales are made through the relevant marketing chain. The market outlets have been categorized into four groups: wholesaler, collector, retailer and consumer market outlets. Each farmer can use one or more marketing outlets or several combinations of different outlets which maximize the expected utility and due to this there is some overlapping and many farmers sell on more than one market outlet. This is to mean that farmers do not sell mango permanently to the particular market outlet and use the available market outlets alternatively in the absence or presence of the possible choices. Since farmers may market their mango via multiple outlets, the multinomial logit model would be infeasible due to the resultant very large number of possible choices. The relative risk of selecting one outlet can be affected by the relative risk of the selecting the other and violate the Hausman assumption of Independence of Irrelevant Alternatives (IIA) in multinomial logit model. If simultaneity in decision-making exists, this approach yields biased, inefficient and inconsistent estimates (Maddala, 1983; Greene, 2003). Thus, the decision of choosing market outlets is inherently multivariate and attempting univariate modeling excludes useful economic information contained in interdependent and simultaneous choice decisions. Failure to capture

unobserved factors and inter-relationships among choice decisions regarding different market outlets will lead to bias and inefficient estimates (Menale *et al.*, 2012).

The multivariate probit model takes into account the potential interdependence in market outlet choices and the possible correlation in the choice of alternative outlets. The probability of preferring of any particular market outlet is estimated conditional on the choice of any other related outlet. The multivariate probit model assumes that each subject has distinct binary responses, and a matrix of covariates that can be any mixture of discrete and continuous variables. Generally speaking, the multivariate probit model assumes that given a set of explanatory variables the multivariate response is an indicator of the event that some unobserved latent variable falls within a certain interval. The multivariate probit is an extension of the probit model (Greene, 2003) and is used to estimate several correlated binary dependent variables jointly. The model is specified as follows:

$$Y_{im} = \beta_m x_{im} + \varepsilon_{im} \quad\text{............................... (2)}$$

Where Y^*_{im} (m = 1... k) represent the unobserved latent variable of market outlets chosen by the ith farmer

(i=1…n). Therefore, in this case k = wholesaler, collector, retailer and consumer outlets, X_{im} is a $1 \times k$ vector of observed variables that affect the market outlets choice, β_m is a $k \times 1$ vector of unknown parameters to be estimated, Σ_{im}, m = 1,…, M are the error terms distributed as multivariate normal, each with a mean of zero, and variance-covariance matrix V, where V has values of 1 on the leading diagonal and correlations (Cappellari and Jenkins, 2003). Equation (9) is a system of m equations that as shown in Equation 10 below;

$$Y_1^* = x_1\beta_1 + \varepsilon_1 \quad Y_1 = 1 \text{ if } Y_1^* \text{ is} > 0, Y_1 = 0 \text{ otherwise}$$
$$Y_2^* = x_2\beta_2 + \varepsilon_2 \quad Y_2 = 1 \text{ if } Y_2^* \text{ is} > 0, Y_2 = 0 \text{ otherwise}$$
$$Y_3^* = x_3\beta_3 + \varepsilon_3 \quad Y_3 = 1 \text{ if } Y_3^* \text{ is} > 0, Y_3 = 0 \text{ otherwise}$$
$$Y_4^* = x_4\beta_4 + \varepsilon_4 \quad Y_4 = 1 \text{ if } Y_4^* \text{ is} > 0, Y_4 = 0 \text{ otherwise}....(3)$$

This system of equations is jointly estimated using maximum likelihood method. There are six joint probabilities corresponding to the six possible combinations of preferring and not preferring each of the four market outlets. The probability that all four market outlets have been preferred by household 'i' is given as:

$$Pr(y_{1i} = 1, y_{2i} = 1, y_{3i} = 1, y_{4i} = 1) =$$

$$Pr(\varepsilon_{1i} \leq \beta_1 x_{1i}, \varepsilon_{2i} \leq \beta_2 x_{2i}, \varepsilon_{3i} \leq \beta_3 x_{3i}, \varepsilon_{4i} \leq \beta_4 x_{4i}) = Pr(\varepsilon_{4i} \leq \beta_4 x_{4i} / \varepsilon_{3i} \leq \beta_3 x_{3i} / \varepsilon_{2i} \leq \beta_2 x_{2i}, \varepsilon_{1i} \leq \beta_1 x_{1i} \times Pr(\varepsilon_{3i} \leq \beta_3 x_{3i} / \varepsilon_{2i} < \beta_2 x_{2i} / \varepsilon_{1i} < \beta_1 x_{1i} \times Pr(\varepsilon_{1i} \beta_1 x_{1i}) \quad\text{.. (4)}$$

III. Results and Discussion

a) Market Outlet Choices of the Households

Market outlet choices available for sale of mango in the study area include wholesaler, collector, retailer and consumer outlets. As indicated in the Appendix Table1, about 89.1%, 76.8%, 76%, and 74.6% of sample households sell their mango via wholesaler, consumer collector, and retailer outlets, respectively. Conversely, about 25.4%, 24%, 23.2% and 10.9% of sample households do not sell their mango via the retailer, collector, consumer and wholesaler market outlet, respectively. The survey has further indicated that no farmer has used cooperative as a market outlet in the study area except those who have been organized in mango processing unit.

b) Households' characteristics by market outlet choices

The effect of continuous variables over market outlet choice is examined by using mean comparison as Berhanu *et al.* (2013) and Geoffrey *et al.* (2014) have used. As shown in the Appendix Table 2, the mean age of sample households who sale mango to the retailer, consumer, collector and wholesaler, market outlet is 44, 43.34, 43.3 and 42.8, years old, respectively. This indicates that households who sale mango to the wholesalers are younger than households

who sale to other market outlets. And conversely, households who do not sale mango to the wholesalers are older than households who not sale to other market outlets.

The mean family size of sample households who sale mango to wholesaler, retailer, consumer and collector market outlet is 7.53, 6.59, 6.53 and 6.38, respectively. Accordingly, households who sale and do not sale mango to the collectors have smaller and larger mean family size, respectively in comparison to households who sale and do not to other outlets. This indicates that inadequacy of labor at household level obliges to sale mango at farm gate and labor endowment promotes involvement in formal marketing. The mean distance to the nearest market for households who sale their mango to the collectors (30.1 minutes walk) is greater than those who sale to another market outlets. This indicates that when distance to market is large, farmers prefer to sale their mango at farm gate. The mean quantity of mango produced for households who sale to wholesaler (9.45 quintal) is greater than households who sale to other market outlets. This implies that households who produce more prefer wholesale market since wholesalers purchase bulk quantity of mango. The mean price paid for a unit kg of mango in birr is lowest for households who sale mango to the collectors in comparison to the households who

sale to other outlets. This is due to the fact that farmers sale immature mango to the collectors at farm gate with a minimum price. This is in line with Montshwe (2006) stated that the farm gate sale tends to reduce farmers" revenue since the prices are relatively low.

c) *Socio-economic characteristics of households by market outlet*

The effect of dummy variables over market outlet choice is examined by the frequency of households selling to each market outlets as Berhanu *et al.* (2013) and Geoffrey *et al.* (2014) have used. Proportion of household characteristics by mango market outlets is given in Appendix Table3. About 53.9%, 42.9%, 33.3%, and 30.4% of the male headed households used wholesaler, consumer, collector, retailer, and market outlet choices, respectively as a choice of marketing outlets. On the other hand, 69.6%, 66.7%, 57.1% and 46.1%, of the female headed households used retailer, collector, consumer and wholesaler, respectively as the choice of mango marketing outlets. This shows that the male headed households who used wholesale as the choice of marketing outlets were more than their counterparts. About 92.9%, 91%, 87% and 80.7% of households who have access to extension service used consumer, wholesaler, retailer and collector, respectively as market outlet choices. Households who have access to extension service have a minimum probability of selling mango to the collector market outlet. This is because extension service discourages selling of unripe mango as it increases postharvest loss and retards benefit derived from selling of it. About 87%, 84.3%, 72%, and 66.7% of households who have access to credit sell their mango to the retailer, wholesaler, consumer and collector, respectively as the market outlet. The proportion of households who have access to credit that sell mango to the collector market outlet (66.7%) is less than proportion of households who sell mango to the other market outlets. This indicates that access to credit enables farmers to endow economic resources in order to involve in formal marketing.

About 74.2%, 71.4%, 69.6% and 41.7%, of households who have access to market information sell mango to the wholesalers, consumers, retailers and collectors, respectively as market outlet choice. This indicates that about 41.7% of households who have access to market information sell mango to the collector which is less than proportion of households selling to the other market outlets. This implies that when farmers are getting informed about opportunities in final market, their tendency of selling to collector at farm gate decreases. About 100%, 100%, 97.8%, and 91.7% of households who have access to market sell mango to retailer, consumer, wholesaler and collector, respectively, as market outlet choice. The proportion of households who have access to market that sell mango

to the collector (91.7%) is less than proportion of households selling to the other market outlets. About 42.9%, 19.1%, 13% and 8.3% of households who own transport means sell their mango to the consumer, wholesaler, retailer and collector, respectively, as market outlet choice as shown in the Appendix Table3. The proportion of households who own transport means that sell their mango to the consumer outlet (42.9%) is greater than proportion of households selling mango to other market outlets. This implies that owning transport means facilitate efficient delivery of mango to the terminal market thereby reducing cost of transaction.

About 46.2%, 26.9%, 15.4% and 11.5% of sample households who have membership in group sell mango to the wholesalers, retailers, consumers and collectors, respectively, as market outlet as indicated in Table3. The proportion of households who have membership in group that sell mango to the collector market outlet (11.5%) is less than the proportion of households selling to other market outlets. This implies that farmers who are member in group do not want to sell mango to the collectors at their village.

d) *Factors affecting market outlet choice of the mango producers*

The multivariate probit model was estimated jointly for four binary dependent variables namely wholesaler, collector, retailer and consumer market outlets. The P-value of the Wald test statistics for the overall significance of the regression is low (0.0268) indicating that the multivariate regression is significant. Further, the likelihood ratio test of rho is significant (P-value = 0.0133) indicating that a multivariate probit specification fits the data. The significance of the off-diagonal elements of the covariance matrix shows that there are unobserved heterogeneities that influence the choice decisions on the different market outlets. The correlation coefficients among the error terms are significant indicating that the decision to choose one market outlet affects the decision of choosing the other. The correlation coefficients between the wholesaler and consumer and collector and consumer market outlets is negative and significant at the 5% level indicating that farmers who choose one market outlet are less likely to choose another (Appendix: Table5).

According to the result obtained from the multivariate probit model, the probability of choosing wholesaler market outlet was influenced by family size, distance to the nearest market centre, quantity of mango produced and price as indicated in Appendix Table 4. Family size is positively correlated with the choice of wholesaler outlet at less than 1% level of significance, respectively. This is due to the fact that households with the larger family size have plenty of labor force to deliver mango to final market. This is in line with the Tewodros (2014) who indicated that large family size implies better labour endowment so that

households are in a position to travel to get wholesalers in the district or nearby town markets. Distance to the nearest market centre is negatively correlated with the choice of wholesaler market outlet at 5% level of significance. This indicates that when distance to the nearest market is increasing, the likelihood of selling mango to the wholesale market outlet is decreasing because of the transaction costs related with the delivering of mango.

Quantity of mango produced also determined the choice of wholesaler market outlet positively at less than 1% level of significance. This indicates that when quantity of mango produced increases, probability of selling to the wholesalers is increasing because wholesalers purchase high quantity of mango at once without selection. The price paid for a unit kg of mango determined the choice of wholesaler market outlet positively at less than 1% level of significance. This is due to the fact that wholesalers purchase mango without any selection and overestimate the price paid for a unit kg of mango in relative to other market outlets.

The probability of choosing collector market outlet was determined by the family size, distance to the nearest market, quantity of mango produced, price and access to non-farm income as indicated in the Appendix Table4. Family size determined the probability of choosing collector outlet negatively at 10% level of significance. This implies that large family size has a plenty of labor force for delivering of mango to the final market and plenty of labor force disfavor selling of mango to the collector market which pays low price at farm gate. Distance to the nearest market centre is also negatively correlated with the probability of choosing collector outlet at 5% level of significance. When distance to the nearest market increases, transaction cost of delivering mango to the final market also increases and because of this farmers choose to sell at farm gate with few transaction cost. Quantity of mango produced determined the choice of collector market outlet positively at 10% level of significance. This implies that collector can purchase a significant volume of mango at farm gate which in further sell to other traders like wholesalers. The probability of selling mango to the collector market outlet choice is negatively correlated with the price paid for a unit kg of mango at farm gate at 5% level of significance. This indicates that a low price worth to unripe mango by collectors at farm gate discourages farmers from selling their mango to the collectors. This is in line with Montshwe (2006) who stated that farm gate sale tends to reduce farmers' revenue since the prices are relatively low. Access to non-farm income determined the probability of choosing collector outlet negatively at 5% level of significance. This is due to the fact that farmers who have access to non-farm income are not quick enough to harvest immature mango for temporary cash need because they can derive income needed for the households' basic

needs from other activities like trading. In addition to this, farmers who have been engaged in non-farm activities like trading have more knowledge in economic value of selling mango in formal market and they know as farm gate price diminishes their benefit from selling of mango. In other case, they can derive income from non-farm activities which enable them to sell mango at formal market.

The probability of choosing retailer market outlet was determined by the quantity of mango produced and price as indicated in the Appendix Table 4. The two variables determined the probability of choosing retailer market outlet negatively at less than 1% level of significance. The negative correlation in the case of quantity of mango produced implies that famers who produce a large volume of mango prefer wholesale market than retailer as retailers purchase a small quantity of mango. In the case of price, retailers often underestimate the price paid for a unit kg of mango and try to deceive farmers thereby reflecting their bargaining ability.

The probability of choosing consumer market outlet was determined by quantity of mango produced, access to market information and price as indicated in Appendix Table 4. Quantity of mango produced is negatively correlated with the probability of choosing consumer outlet at less than 1%. This implies that farmers who produce a high quantity of mango do not prefer selling of mango to the consumers because consumer demands a small quantity of mango for spot consumption. Access to market information determined the probability of the choosing consumer outlet positively at 10%. Price information about local market informs the farmer on prevailing pricing condition. This implies that accessibility of market information related with price condition in local market fosters choice of consumer in local market. This is in line with the Geoffrey *et al*. (2014) who indicated that market price information had a positive influence on the choice of the local market. Price paid for the unit kg of mango also determined the probability of choosing consumer outlet positively at less than 1% level of significance. This implies that end user of the product pays a better price for ripe mango in local market and indicates that farmers who sell ripe mango can drive better income.

IV. Conclusion and Recommendation

The result obtained from the MVP model revealed that about six variables were found to be statistically significant at different significance level by determining the choice of wholesaler, collector, retailer and consumer market outlets. The result has indicated that variables such as family size, distance to the market, quantity of mango produced and price offered are the significant determinants of the choice of wholesale market outlet. Farmers' choice of collector

market outlet is determined by the family size, distance to the nearest market, quantity of mango produced, price offered and access to non-farm income. The choice of retailer market outlet is determined by the variables such as quantity of mango produced and price offered. Consumer market outlet choice is determined by the variables such as quantity of mango produced, price offered and access to market information. Based on the result obtained from the model variables affecting the choice of wholesaler and consumer market outlet should be promoted and farm gate and retail price intervention is quite important to maximize the economic benefit of farmers. Quantity of mango produced and price are the key determinants of households' market outlet choice. Therefore, these variables should be promoted and get special attention. Establishment of cooperative and small scale mango processing industry diversifies marketing alternatives of the farmers, efficient use of the resources and better for the bargaining ability. Therefore, attention should be payed on these issues for the further improvement of mango marketing in the study area.

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Appendix

Table 1: Proportion of market outlet choice of the households

Market outlets	Category	Frequency (n)	Percentage (%)
Wholesaler	Yes	107	89.1
	No	13	10.9
Collector	Yes	91	76
	No	29	24
Retailer	Yes	90	74.6
	No	30	25.4
Consumer	Yes	92	76.8
	No	28	23.2

Source: Survey result (2015)

Table 2: Mean household characteristic by market outlet choices

Variables	Category	Market outlet choices			
		Wholesaler	Collector	Retailer	Consumer
Age in year	Yes	42.80	43.29	43.88	43.34
	No	43.67	41.67	40.00	41.44
Family size in number	Yes	7.53	6.38	6.59	6.53
	No	6.39	6.94	6.29	6.47
Distance to the market in minutes of walk	Yes	29.15	30.1	25.72	24.65
	No	14.87	19.64	33.14	27.81
Quantity of mango produced in quintal	Yes	9.45	6.89	6.3	4.8
	No	5.83	6.93	12.1	9.9
Price in birr	Yes	3.2	2.01	2.18	2.5
	No	2.22	2.77	3.24	1.8

Source: Survey result (2015)

Table 3: Household characteristics by market outlet choices

Variables	Category	Proportion (%)			
		Wholesalers	Collectors	Retailers	Consumers
Sex	Female	46.1	66.7	69.6	57.1
	Male	53.9	33.3	30.4	42.9
Access to extension service	No	9	19.3	13	7.1
	Yes	91	80.7	87	92.9
Access to credit	No	15.7	33.3	13	28
	Yes	84.3	66.7	87	72
Access to market information	No	25.8	58.3	30.4	28.6
	Yes	74.2	41.7	69.6	71.4
Access to market	No	2.2	8.3	0	0
	Yes	97.8	91.7	100	100
Owning transportation means	No	80.9	91.7	87	57.1
	Yes	19.1	8.3	13	42.9
Membership in group	No	30.4	22.2	24.1	23.2
	Yes	46.2	11.5	26.9	15.4

Source: Survey result (2015)

Table 4: Result of multivariate probit regression

Variables	Market outlets							
	Wholesaler		Collector		Retailer		Consumer	
	Coef.	P>/Z/	Coef.	P>/Z/	Coef.	P>/Z/	Coef.	P>/Z/
AGE	-0.0053	0.726	0.0057	0.603	0.0084	0.510	0.0077	0.538
FMSZ	0.3420	0.002***	-0.1074	0.081*	0.0411	0.551	0.0716	0.225
SEX	-0.2493	0.608	-0.3862	0.215	-0.1434	0.640	0.2102	0.539
EDUC	-0.5835	0.168	0.2075	0.491	-0.1272	0.678	0.0714	0.815
DISNEAMKT	-0.0337	0.026**	-0.0160	0.025**	-0.0095	0.111	-0.0005	0.937

ACCEXSER	0.4320	0.389	-0.3965	0.330	-0.0229	0.956	0.1216	0.735
ACCCRE	-0.3907	0.442	0.1865	0.581	0.2131	0.535	-0.1674	0.620
QUNMAPR	0.1322	0.009***	0.0367	0.092*	-0.0698	0.005***	-0.0644	0.004***
ACCMKT	-4.1063	0.984	-0.0723	0.940	-3.494	0.989	1.4949	0.154
OWNTRAME	0.5915	0.428	-0.702	0860	0.2533	0.558	-0.1017	0.793
MEMBER	0.3413	0.557	-0.0940	0.822	-0.2826	0.568	0.2569	0.569
ACMKTINFO	0.1502	0.772	-0.1432	0.644	-0.3554	0.321	0.5238	0.070*
PRICE	0.4367	0.001***	-0.2287	0.014**	-0.3729	0.004***	0.6270	0.003***
ACNONFAIN	-0.0835	0.843	-0.6245	0.033**	-0.1250	0.683	0.3688	0.215
Constant	7.8076	0.970	1.4692	0.249	5.483	0.982	-2.874	0.045**

*N=120, Wald chi2 (56) = 78.18, Prob>chi2 = 0.02668, log likelihood = -204.49657, ***, ** and * are statistically significant at 1%, 5% and 10% level*

Source: Survey result (2015)

Table 5: Error covariance matrix and correlations of the MVP model

Correlation	Coef.	Std.err	Z	P>/Z/
/atrho21	.4940	.2165	2.28	0.023**
/atrho31	.2891	.2340	1.24	0.217
/atrho41	-.5951	.2529	-2.35	0.019**
/atrho32	-.1642	.1982	-0.83	0.408
/atrho42	-.5990	.2424	-2.47	0.013**
/atrho43	.3225	.1947	1.66	0.098*
Rho21	.4573	.1712	2.67	0.008***
Rho31	.2813	.2155	1.31	0.192
Rho41	-.5335	.1810	-2.95	0.003***
Rho32	-.1627	.1930	-0.84	0.399
Rho42	-5363	.1727	-3.11	0.002***
Rho43	.3117	.1758	1.77	0.076*

*Likelihood ration test of rho21 = rho31 = rho41 = rho32 = rho42 = rho43= 0 where 1, 2, 3 and 4 stands for wholesaler, collector, retailer and consumer, respectively, Chi2 (6) = 16.0803, Prob>chi2 = 0.013, ***, ** and * are statistically significant at 1%, 5% and 10% level, respectively.*

Source: Survey result (2015)