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Factors affecting market outlet choices of pepper producers in Wonberma district, Northwest Ethiopia: multivariate probit approach

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Abstract: Pepper is an important cash crop for its contribution to income-generating, employment opportunity and improvement of food security to the majority of the rural households. However, enhancing pepper producers to reach the market is a key issue needed in Wonberma district. This study sought to analyze determinants of market outlet choices among smallholder pepper producers in Wonberma district of West Gojjam Zone of Amhara Region, Ethiopia. Both primary and secondary source of data were used to collect qualitative and quantitative data. Two-stage sampling method was used and data were collected from 130 pepper producers. Multivariate probit (MVP) model was used to analyze factors affecting market outlet choices of smallholder pepper producers. The MVP model results indicated that quantity of pepper produced, pepper farming experience, extension contact, year of schooling, bargaining power of the producer; post-harvest value addition, market distance, and livestock ownership had a statistically significant influence on choices of the market outlet. Therefore, this study underscores increasing productivity of pepper; enhancing post harvest value addition practices, improve farmers bargaining power through cooperative; strengthen institutional services and infrastructure development like road and transportation facility for policy implication.

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PUBLIC INTEREST STATEMENT

The spice sub-sector has an immense potential for economic development and poverty reduction through the creation and expansion of employment opportunities and distribution of income and foreign exchange earnings. Despite Ethiopia's long history in the spice trade and its conducive agroecology which supports the production of a variety of them, the contribution of spice trade remained minimal and low. Among the spices, pepper is used as flavoring material, source of essential oil, source of color, and cash crop of many smallholders. In spite of its significance, pepper producers in Wonberma district were affected by a low price on the one hand and skyrocketed consumer price on the other hand. Pepper producers in Wonberma district have a range of market outlets so as to maximize the share of the consumer price. Therefore, this study was conducted to analyze factors affecting market outlet choices of pepper producers in Wonberma District using a multivariate probit model approach.

Subjects: Agriculture & Environmental Sciences; Environment & Business; Environment & Economics; African Studies

Keywords: Wonberma; pepper; multivariate probit model

1. Introduction

Pepper is the world's most important vegetable next to tomato and by virtue of its versatile use in the modern world earned a reputation as the king of spices (Spice, 2003). This crop is a vital cash crop for farmers in many developing countries such as Ethiopia, Nigeria, Ghana, India, Pakistan, Bhutan, Indonesia, Cambodia, and Thailand (Lin et al., 2013). Mohammed, Abdulsalam, and Ahmed (2015) indicated that investment in chili pepper production is a viable enterprise for income generation, poverty alleviation, job creation, and improvement of food security to every household. Pepper has various purposes in food, feed, and cosmetic industries. For instance, the color and flavor extracted from pepper are used in both food and feed industries like poultry feed, sauces, and ginger beer (Rubatzky and Yomaguch, 1997). In addition, it also plays a crucial role in cosmetic production, condiment, food preservation, and medical and ornamental purposes in the garden (Food and Agricultural Organization Statistical Division [FAOSTAT], 2013).

Currently, Vietnam is by far the world largest producer and exporter of pepper, producing 34% of the world's pepper crop in 2008. Indonesia is in second position in pepper production followed by India, Brazil, China, Malaysia, Sri Lanka, Thailand, and other countries which have recorded less production in pepper (Yogesh and Mokshapathy, 2013). Likewise, the major world exporter of pepper is Vietnam, Indonesia, Brazil, India, Malaysia, and Sri Lanka, followed by Thailand, China, Madagascar, and other countries.

Green pepper sauce, ground pepper, pepper oil, and pepper oleoresins are the major products of pepper. Ethiopia is the one among the few countries producing paprika and capsicum oleoresins from red pepper for export purpose and considers as the home of many spices (Minster of Agriculture and Rural Development [MoARD], 2007). Pepper grows under various environmental and climate conditions. Ethiopia has good climatic and soil conditions for growing pepper. The most commonly grown type is the MarekoFana variety, a pungent long chili of dark-red appearance (pungency is at least twice as high as required for Western food processors) (Herms, 2015).

In 2015/16 production year, the total cultivated land and production of pepper at the national level were 147,216.20 ha and 2,696,053 quintals (Central Statistical Agency [CSA], 2016). This means that 18.31 qt/ha was harvested. In addition, in 2016/17 production year, Ethiopia's pepper production was 3,298,042.9 quintals harvested on 180,701.46 ha (Central Statistical Agency [CSA], 2017). In Amhara region, the total cultivated land and productions were 69,020.08 ha and 1,116,185.52 quintals (CSA, 2017). Therefore, the contribution of the Amhara region for the country production was 35.21%.

Wenberma which is located in North West part of Ethiopia is one of the potential districts in pepper production due to its favorable agro-ecology in West Gojjam zone. As district office of agriculture reported, in 2015/16 production season total production of pepper in Wenberma district was estimated to be 215,280 quintals on 8970 ha of land while in 2016/17 production season it was about 200,658 quintals on 8143 ha of land (Office of Wenberma District Agriculture and Rural Development [OWDRAD], 2017).

Pepper makes a significant contribution to the Ethiopian households and national economy. However, production and marketing of pepper are constrained by different factors. The main constraints that contributed for low productivity of pepper in Ethiopia include lack of proper and

adequate inputs, traditional production methods, and lack of research outputs on production techniques (Mekdes et al., 2017). As a result, the variation in market outlet choice will be expected. Likewise, marketing problem like storage facilities, transportation, linkages with traders, quality-controlling mechanisms, market information, and price settings are weak in the region and need to be further investigated (BoA, 2004, cited in Abay, 2013). Such constraints are aggravated by underdeveloped infrastructure and weak transport facilities.

Farmers in Ethiopia in general and in Amhara region in particular are affected by low producer's price, on the one hand, and high consumer's price, on the other hand (Abay, 2013). Therefore, to solve production and marketing problems and to increase the contribution of pepper to generate additional income for producers and traders, it was important to undertake this study. In addition, factor affecting market outlet choices were not done in Wenberma district. Since there is no research conducted so far to address existing problems in the study area, the motivation behind this study was to provide information for intervention that would be useful to pepper producer, traders, Governmental Organization (GO), Non Governmental Organizations (NGOs) Agriculture Gross Plans (AGPs), researchers,and other stakeholders. Therefore, this study was conducted to analyze factors affecting market outlet choices of pepper producers in Wonberma District using a multivariate probit (MVP) model.

2. Materials and methods

2.1. Description of the study area

The study was conducted in Wenberma District, North West Ethiopia, approximately mid-way between Debre Markos and Bahir Dar. It is located at about 165 km Southwest of Bahir Dar and 426 km from Addis Ababa.

Wonberma district is one of the potential areas in pepper production from the west part of Ethiopia due to its suitable agroecological zone. Based on altitude, it is divided into two Agro-ecological zones as midland ("*Woynadega*") 47% and lowland ("*Kola*") 53%, respectively. The area has a rainy season (from June to September) and a longer dry season (from October to May) with mean annual rainfall of 1115 mm (OWDARD, 2017). Fgure 1 indicate the location where this study is consucted.

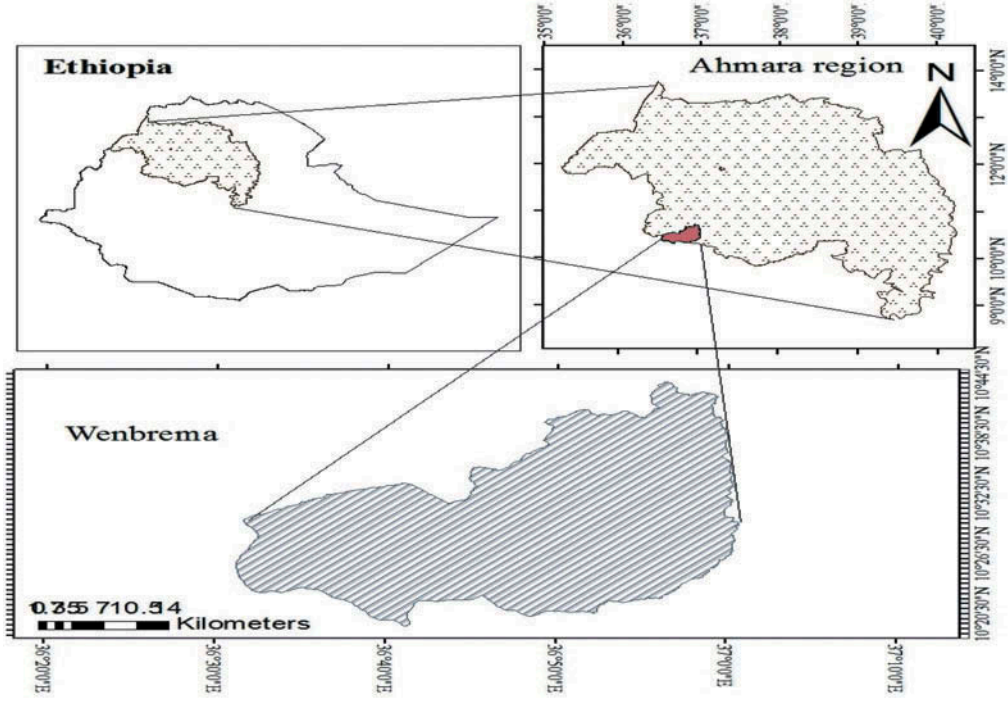

Figure 1. Location of Wenberma district.

Source: Wenberma District Office of Agriculture (2017).

According to Population and Housing Census of Ethiopian Central Statistic Authority projection, the total population of Wenberma District is about 182,212 in which the total male population comprises 91,540 and remaining 90,672 are females (CSA, 2017) with an area of 1356.75 square kilometers. This district has an estimated population density of 134.3 people per square kilometer, which is the Zone average of 174.47 (OWDRAD, 2017).

2.2. Sampling procedure and method of data collection

Cross-sectional data were collected from 130 pepper-producing farmers in the study area. A two-stage sampling procedure was applied to select sample respondent. In the first stage, four *kebeles* were selected from 19 potential pepper producing rural *kebeles* randomly. In the second stage, 130 sample respondents were selected randomly from the list of households who produce pepper in the sample *kebeles* and the sample households were drawn randomly from each *kebele* based on probability proportional to size sampling techniques.

Both quantitative and qualitative data were collected from the primary and secondary data source. Primary data was collected directly from sampled households through structured and semi-structured questionnaire. Focus group discussion and field observation were also undertaken during primary data collection in the study area. Farmers and experts (i.e. extension agents and district and zone experts) were interviewed through focus group discussion using a checklist. Secondary data were collected from office of agriculture, input suppliers, Woreda trade office, survey report, bulletins, annual report, CSA, and websites. Both published and unpublished documents were comprehensively reviewed to support the interpretation of the primary data.

2.3. Methods of data analysis

Descriptive statistics and econometric analysis were used to analyze the data obtained from sample households. Descriptive tools like frequency, percentage, mean, and standard deviation were used to analyze the data gained from sample households. Econometric analysis was used to estimate the causal relationship between the dependent variable and regressors. It is pertinent to understand the effect of different regressors on market outlet choice by smallholder pepper producers. The goal of market outlet choice decision is to explain the effects of the independent variables on the probability of choosing between different market outlets in the pepper market.

Multinomial logistic model is the most appropriate model to estimate nominal outcomes of unordered categories (Wooldridge, 2008). This model is appropriate when individuals can choose only one outcome from among the set of mutually exclusive, collectively exhaustive alternatives. It also assumes independence across the choices. That means it does not allow correlation or substitution between them.

However, sample households might choose more than one market outlets simultaneously, and then the decision to supply to market 'j" affects the amount of pepper to be supplied to other market outlets. In addition to that, the interdependence of irrelevant alternative assumption in a mutually inclusive market outlet choice is violated. Therefore, market outlets choice is not mutually exclusive, considering the possibility of simultaneous choices of outlets and the potential correlations among these market outlets choice decisions. MVP model was applied for the household's variation in the choice of a market outlet and to estimate several correlated binary outcomes jointly.

The simulated maximum likelihood test (LR χ^2 (6) = 12.46(Prob > χ^2 = 0.05) of the null hypothesis of independence between the market outlets decision (ρ_{21} = ρ31 = ρ_{41} = ρ_{32} = ρ_{42} = ρ_{43} = 0) is significant at 5% significant level (Table 1). Therefore, the null hypothesis that all the ρ (Rho) values are jointly equal to 0 is rejected, indicating the goodness of fit model and supporting the use of multivariate probit (MVP) model over multinomial logit model.

The producers' selection of market outlet depends on the amount of utility obtained from alternative market outlets. The possible outcome of market outlet choice can be modeled

following random utility formulation. A market outlet which has a greater level of expected utility as compared to other market outlet is supposed to be chosen by the farmer (Masten and Saussier, 2002). Consider the i^{th} farm households (i = 1, 2..... N), facing a decision problem on whether or not to choose available market outlets. Let V_0 represent the utility expected to obtain by the farmer who chooses K^{th} market outlet and V_k represent the actual utility of farmer to choose the K^{th} market outlet: where K denotes choice of wholesalers (Y1), district retailers (Y2), consumers (Y3) and local collectors (Y4) of market outlet. The farmer decides to choose the K^{th} market outlet if $Y^*_{ik} = V^*_{ik}—V_0 > 0$. The net benefit that the farmer derives from choosing a market outlet is a latent variable determined by observed explanatory variable (Xi) and the error term which represent an observed utility (e_i):

$$Y^*_{ik} = B_k X_{ik+} \boldsymbol{e_i} \ (\mathrm{K} = \mathrm{Y1},\ \mathrm{Y2},\ \mathrm{Y3},\ \mathrm{Y4}) \tag{7}$$

where B_k is vector of parameter. K represents a different level of utility from a different market outlet (Yi). Using the indicator function, the unobserved preferences in Equation (7) translates into the observed binary outcome equation for each choice as follows:

$$\mathrm{Y_{ik}} = \begin{cases} 1 \ \ if\ y_{ik} * > 0 \\ 0 \ otherwise \end{cases} \quad (K = Y1, Y2, Y3, Y4) \tag{8}$$

where Y_{i1} = 1, if farmers choose wholesale, 0 otherwise), Y_{i2} = 1, if farmers choose retailer, 0 otherwise), Y_{i3} = 1, if farmers choose consumer, 0 otherwise) and Y_{i4} = 1, if farmers choose local trader, 0 otherwise).

In multivariate model, where the choice of several market outlets is possible, the error terms jointly follow a multivariate normal distribution (MVN) with a mean of zero and variance–covariance matrix V has values of 1 on the leading diagonal and correlation $\boldsymbol{\rho}_{jk} = \boldsymbol{\rho}_{kj}$ as off-diagonal element where ($\mu_{y1}, \mu_{y2}, \mu_{y3}, \mu_{y4}$) MVN ~ (0, Ω) (Belderbos, Carree, Diederen, & Veugelers, 2004). The symmetric variance-covariance matrix Ω is given by

$$\Omega = \begin{bmatrix} 1 & \rho_{y1y2} & \rho_{y1y3} & \rho_{y1y4} \\ \rho_{y2y1} & 1 & \rho_{y2y3} & \rho_{y2y4} \\ \rho_{y3y1} & \rho_{y3y2} & 1 & \rho_{y3y4} \\ \rho_{y4y1} & \rho_{y4y2} & \rho_{y4y3} & 1 \end{bmatrix} \tag{9}$$

Off-diagonal elements in the variance–covariance matrix represent the unobserved correlation between the stochastic components of the different types of outlets. This assumption means that Equation (9) will generate MVP models that jointly represent a decision to choose a particular market outlet. This specification with non-zero off-diagonal elements allows for correlation across error terms of several latent equations, which represents unobserved characteristics that affect the choice of alternative outlets.

Following the form used by Cappellari and Jenkins (2003), the log-likelihood function associated with a sample outcome is then given by

$$\mathrm{L} = \ \sum_{i=0}^{n} \omega ln \Phi_i(\mu i, \Omega) \tag{10}$$

where ω is an optional weight for observation i... N and Φ is the multivariate standard normal distribution with arguments μ_i and Ω, where μ_i can be denoted as

$$\mu_i = (\mathrm{K_{i1}}\beta_1 \mathrm{X_{i1,}} \mathrm{K_{i2}}\beta_2 \mathrm{X_{i2,}} \mathrm{K_{i3}}\beta_3 \mathrm{X_{i3,}} \mathrm{K_{i4}}\beta_4 \mathrm{X_{i4}}), \text{while } \Omega_{ik} = 1 \text{ for } J = K \text{ and} \tag{11}$$

$$\Omega_{jk} = \ \Omega_{kj} = \ \mathrm{K_{ij}K_{ik}}\rho_{jk} \text{ for } J = K,\ K = 1,\ 2,\ 3 \ldots \text{with } k_{ik} = \ 2y_{ik} - 1 \text{ for each i},\ k = 1, \ldots,\ 4 \tag{12}$$

Matrix Ω has constituent elements Ωjk. Therefore, we can use a MVP model to study farmer joint-decision to market outlet choice.

2.4. Hypothesis and definition of working variables

2.4.1. Dependent variables

Market outlet choice: This is a categorical dependent variable which represents the market outlet preference of the farmers to sell their pepper. Four main pepper market outlets (consumer market, local collector market, wholesale market, and district retail market) were selected in the study area.

Table 2 indicates the summary of hypothesized independent variables which were used in the econometric analysis.

Table 1. Description of independent variables used in the multivariate probit model

		Expected outcome on market outlet choices			
Variables	**Measurement**	**Consumer**	**Local collectors**	**District retailers**	
Wholesalers	Farming experience	Continuous (in years)	Positive	Negative	Negative
Positive					
Market distance	Continuous (in walking hours)	Negative	Positive	Negative	Negative
Lagged year price	Continuous (in Birr/qt)	Positive	Positive	Positive	Positive
Year of schooling	Continuous (in grade)	Positive	Negative	Positive	Positive
Frequency of extension contact	Continuous (in number)	Positive	Negative	Negative	Positive
Sex of the households	Dummy, 1 if male, 0 otherwise	Negative	Negative	Positive	Positive
Livestock ownership	Continuous (in number)	Negative	Negative	Positive	Positive
Quantity of pepper produced	Continuous (in quintal)	Positive	Positive	Negative	Positive
Post-harvest value addition	Dummy, 1 if added, 0 otherwise	Positive	Positive	Positive	Positive
Bargaining power	Dummy, 1 if farmers influence price, 0 otherwise	Positive	Negative	Negative	Positive
Trust in buyer	Dummy, 1 if trust, 0 otherwise	Negative	Positive	Positive	Positive

3. Results and discussion

3.1. Demographic and socioeconomic characteristics of sampled respondents

Demographic characteristics of sample households (such as sex, family size, year of schooling, farming experience, livestock ownership, distance from farmer training centers, and distance from the market) play a crucial role in either promoting or impeding lucrative market outlet choices.

As shown in Table 3, 90% of the respondents were male-headed households and 10% were female-headed households. On average, sampled household's year of schooling were 5 years in the study area. Educational backgrounds of the sampled households are believed to be important features that determine the readiness of household heads to accept new innovations and improve their market participation and choice of better market outlets.

The average livestock holding of pepper producers was 9.85 Tropical Livestock Unit (TLU). It is the farmers' one of sources of income, food, and traction power for the cultivation of land.

Table 2. Characteristics of pepper producers (continuous and dummy variables)

	Mean	Standard deviation	Minimum	Maximum
Year of schooling	5.00	2.59	0	12
Farming experience	16.88	6.81	5	35
Livestock owned	9.85	4.20	4	28
Frequency of extension contact	6.92	3.74	3	15
Quantity of pepper produced	12.47	6.17	7.20	18
Distance from market	1.35	0.69	0.54	3.84
Item	**Frequency**	**Percent**		
Male	117	90.00		
Female	13	10.00		

Parenthesis in the disturbance term correlation matrix showed the robust standard error (RSE).
Source: Own computation from survey result, 2017.

Hence, households with larger livestock holding have better access to draft power than those with less. Livestock holding is also one of the main cash sources to purchase agricultural inputs. It means that the one with large livestock ownership would be able to purchase input for pepper production so as to increase the market surplus of pepper. The mean farming experience of the sample respondents were 16.88 years in Wenberma district which implied that sampled households had good experience in the production of pepper. Extension service also contributes to the development of the skill and knowledge of farmers to adopt new and improved technologies like seed varieties and animal breeds, implements, chemicals, and practices (Dereje, 2012). According to Table 3, the mean frequency of extension contact of sample household was about 7 times in a year ranging from 3 to 15 times in a year.

Another important factor which affects market outlet choices of sample households was the distance to the nearest market. The average distance needed for producers to travel to the nearest marketplace was 1.35 walking hours. The major market farmer had been using to supply pepper were Shindi, Wogedad, and Gommer Dond.

Farmers who produce pepper in Wenberma district have four alternative market outlet choices for selling pepper. These are wholesales, district retails, local collectors, and consumers. MVP was used to analyze the pepper producers' market outlet choices among four different outlets included in the model. In this section, significance of the determinants influencing producers' decision in market outlet choice is discussed based on results of the MVP model in Table 4.

The Wald test (44) (χ^2 = 111.52, ρ = 0.00) is strongly significant at 1% significant level, which indicates that the subset of coefficients of the model is jointly significant and that the explanatory power of the factors included in the model is satisfactory; thus, the MVP model fits the data reasonably well. The simulated maximum likelihood test (LR χ^2 (6) = 12.46(Prob > χ^2 = 0.05) of the null hypothesis of independence between the market outlets decision ($\rho_{21} = \rho_{31} = \rho_{41} = \rho_{32} = \rho_{42} = \rho_{43} = 0$) is significant at 5% significant level. Therefore, the null hypothesis that all the ρ (Rho) values are jointly equal to 0 is rejected, indicating the goodness of fit of the model and supporting the use of MVP model over individual probit model. This verifies that separate estimation of choice decision of these outlets is biased, and the decisions to choose the four pepper marketing outlets are interdependent household decisions.

The simulation maximum likelihood estimation result indicates the marginal success probability of each market outlets. The likelihood of choosing wholesale market outlet (64%) was relatively high as compared to the probability of choosing district retail (54%), local collectors (51%), and consumer outlet (48%). With regard to the joint probabilities of success and failure of market outlet, choice decisions suggest that those households are more likely to jointly choose four market outlets. The likelihood of households to jointly choose the four market outlets is 6% compared to their failure of 4% to jointly choose the four market outlets.

The $\boldsymbol{\rho}$ values ($\boldsymbol{\rho}_{ij}$) indicate the degree of correlation between each pair of dependent variables. The $\boldsymbol{\rho}_{31}$ (correlation between the choice for local collector and wholesaler) and $\boldsymbol{\rho}_{42}$ (correlation between consumers and district retail) are negatively interdependent and significant at 1% and 5% probability levels, respectively. $\boldsymbol{\rho}_{41}$ (correlation between the choice for consumer and wholesale) is positively interdependent and significant at 1% significant level. From this finding, it is possible to conclude that those pepper producers delivering to local collectors are less likely to deliver to wholesalers and vice versa. Likewise, those pepper producers delivering to district retailers are less likely to deliver to consumers and vice versa. This indicates the competitive relationship of the wholesale market outlet with local collectors' market outlet.

Table 3. Overall fitness, probabilities and correlation matrix of the market outlets from the MVP model

		Market outlets		
Variables	**Wholesalers**	**D. retailers**	**L. collectors**	**Consumers**
Predicted probability	0.63	0.54	0.51	0.48
Joint probability (success)				0.06
Joint probability (failure)				0.04
Number of draws				100
Observation				130
Log likelihood				−301.73
Wald $\chi^2(44)$				111.52
Prob > χ^2				0.00***
	$\boldsymbol{\rho}_1$	$\boldsymbol{\rho}_2$	$\boldsymbol{\rho}_3$	$\boldsymbol{\rho}_4$
$\boldsymbol{\rho}_1$	1.00			
$\boldsymbol{\rho}_2$	−0.067 (0.153)	1.00		
$\boldsymbol{\rho}_3$	−0.483***(0.136)	−0.003(0.146)	1.00	
$\boldsymbol{\rho}_4$	0.320***(0.123)	−0.134**(0.0598)	−0.038(0.146)	1.00
Likelihood ratio test of	$\boldsymbol{\rho}_{21} = \boldsymbol{\rho}_{31} = \boldsymbol{\rho}_{41} =$	$\boldsymbol{\rho}_{32} = \boldsymbol{\rho}_{42} = \boldsymbol{\rho}_{43} = 0$:		
		$\chi^2 = 12.4629$		
		Prob > $\chi^2 = 0.05$		

Note: *** and ** indicate statistical significance at 1 and 5, respectively. ρ_1 = wholesalers, ρ_2 = district retailers, ρ_3 = local collectors and ρ_4 = consumers.

Equally, there was a competitive relationship of district retail market outlet with consumer market outlet. However, those pepper producers delivering to wholesalers are more likely to deliver to the consumer. This indicates a complementary relationship of the wholesale market outlet with consumer outlet.Out of 11 explanatory variables included in MVP model, four variables significantly

Table 4. Multivariate probit estimations for determinants of producers' market outlets choice

	Market outlet							
Variables	**Wholesalers**		**District retailers**		**Local collectors**		**Consumers**	
	Coef	**RSE**	**Coef**	**RSE**	**Coef**	**RSE**	**Coef**	**RSE**
Quantity produced of pepper	0.798**	0.321	0.501	0.356	0.233	0.321	0.230	0.336
Market distance	0.103	0.103	0.058	0.093	−0.007	0.094	−0.706**	0.246
Farming experience	−0.016	0.024	−0.045**	0.021	0.013	0.021	0.022	0.023
Frequency of extension contact	−0.048	0.096	0.034	0.084	−0.158*	0.086	−0.015	0.086
Year of schooling	0.176***	0.053	0.025	0.048	−0.051	0.049	0.025	0.049
Bargaining power	0.246	0.233	−0.735***	0.245	-−0.486**	0.237	0.035	0.234
Sex of household	−0.016	0.296	0.353	0.249	−0.422	0.259	0.318	0.265
Post-harvest value addition	0.672**	0.298	0.039	0.250	0.397	0.267	0.242	0.277
Trust in buyer	0.281	0.254	0.077	0.242	0.004	0.246	−0.034	0.096
Livestock owned	0.075**	0.030	.0025	0.026	−0.077**	0.032	−0.037	0.027
Lagged year price	0.011	0.007	−0.002	0.006	−0.002	0.007	−0.003	0.007
Constant	−4.078	1.288	−2.256	1.031	0.621	1.073	−.436	1.114

1. Note: ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.
2. RSE is the robust standard error.
3. Source: Own computation from survey result, 2017.

affected wholesaler market outlet, two variables significantly affected district retailer outlet, three variables significantly affected collectors' outlet, and one variable significantly affected consumer outlet choices at 1%, 5%, and 10% probability levels.

3.1.1. Quantity produced

The probability of choosing wholesaler market outlet was positively and significantly affected by quantity produced at 5% significant level. The positive sign indicates that those households producing a large quantity of pepper mostly prefer to use wholesaler market outlet than other market outlets. On the other hand, households who produce a large output of pepper accessed wholesaler market outlets compared to households who supply less because of wholesaler capacity to purchase a large amount of pepper with a fair price. The implication is that if the quantity of pepper to be produced is large, farmers prefer a market outlet which buys large volume with a fair price. But, if the quantity to be produced is low, farmers are not forced to search price and market information. This finding agrees with Xaba and Masuku's (2013) quantity of baby corn produced significantly affected market channel choice.

3.1.2. Market distance

The result showed that the variable negatively and significantly related with consumer market outlet at 5% significant level. The negative and significant effect showed that households whose residences are far from the nearest market are less likely to sell to consumer market outlet and more likely to sell to other market outlets like a wholesaler and local collector market outlet. Selling pepper to the consumer requires labor and transportation facility to get the final consumer which exposes producer for additional marketing cost. As a result, the pepper producers prefer the nearby market outlet to sell their produce at the farm gate so as to decrease the transaction cost.

3.1.3. Farming experience

The likelihood of choosing district retailer outlet was negatively and significantly affected by farming experience at 5% significance level. This result indicated that more experienced households in pepper production were less likely to deliver pepper to district retailer market outlet than less experienced farmers. This is because more experienced farmers in pepper production and marketing help the farmer to adjust their marketing link, trying to search other alternative market outlets other than district retailer market outlet to increase market supply of pepper. In addition to that, experienced farmers had better knowledge of cost and benefits associated with various pepper marketing outlets; consequently, they are more likely to decrease the quantities supplied through the district retailer market outlet and increase the quantity supplied to other lucrative market outlets.

3.1.4. Frequency of extension contact

The likelihood of choosing local collect outlet was negatively and significantly affected by the frequency of extension contact at 10% significance level. This is because farmers having frequent contact with Development Agents (DAs) is more likely to know about market outlet which offer a better price for their produces. In addition, extension service increases the ability of farmers to acquire important market information as well as enable pepper producers to improve production method, hence leading to more output which in turn increase producer's ability to choose the best market outlet for their product. Thus, households that were visited more by extension agent were less likely to deliver pepper via local collectors and more likely to deliver via other existing market outlets. This result is in line with the result obtained by Tegegn (2013) who found a negative impact of agricultural extension service on the probability of choosing collector and retailer outlets.

3.1.5. Year of schooling

Years of schooling of the households was positively and significantly related with wholesaler outlet choice at 1% significant level. Education is believed to give individuals the necessary knowledge that can be used to collect information, interpret the information received, and make productive and marketing decision. The more educated the farmer is, the more likely to sell pepper through wholesalers

because more educated farmers spend less time on doing marketing activities. The positive relationship between years of schooling and selling to wholesaler outlet can be explained by the fact that being educated enhances the capability of farmers in making informed decisions with regard to the choice of marketing outlets to sell their farm produce based on the marketing margin and marketing cost.

3.1.6. Bargaining power

The likelihood of choosing district retailers and local collectors' market outlet was negatively affected by the bargaining power of the producers at 1% level of significance. The result indicates that those households having bargaining power were less likely to sell pepper to district retailers and local collectors' market outlet. This is because negotiation on price makes producers empowered on price decision-making and enable them to sell their produce with a better price using other market outlets. Similar findings explained by Emana, Ketema, Yousuf, and Jeffreyso (2015) found that bargaining power negatively and significantly affected choosing collectors and retailers' market outlets.

3.1.7. Value addition

Post-harvest value addition by the farmer was positively and significantly related with the wholesale market outlet at 5% significant level with the expected result. Farmers who have practiced post-harvest value addition (separating mixed colored from the normal one, cutting and cleaning) mostly prefer wholesaler market outlet to sell their produces with the fair market price. The probable reason might be related with quality of pepper which is mostly preferred by wholesaler market outlets; in turn, wholesalers sell it with abetter market price. This is in line with the finding by Emana et al. (2015) which revealed that post-harvest value addition of potato has a significant and positive relation with the likelihood of choosing collector and wholesaler only channel at 1% level of significance.

3.1.8. Livestock ownership

The model result showed that total livestock ownership of the household was positively and negatively associated with wholesaler market outlet and local collector outlet at 5% significant level, respectively. The positive relationships indicated that farmers having large total livestock are able to purchase more input for pepper production intern produce more quintals of pepper and supplied large quantity of pepper to the wholesale market outlet. In other cases, farmers with more livestock assets have better animal manure for input production which helps to increase productivity and production, and finally, farmers would supply more pepper to the wholesale market outlet. In addition, wholesale market outlet and local collectors' market outlet are competitive market outlets each other. Therefore, the one who supplies more pepper to wholesaler market affects negatively the local collectors' market outlet.

4. Conclusions and recommendations

The MVP model was applied to investigate factors influencing the pepper producer's choice of market outlets. The correlations between pepper producer's choice of collector and wholesaler outlet were negatively and statistically significant, and correlation between consumer and district retailer outlet was also negatively and statistically significant. This indicates the competitive relationship of the wholesale market outlet with local collector market outlet and district retail outlet with consumer market outlet. However, wholesale market outlets and consumers' market outlet had complimentary relationships. This study has also shown that the sampled households in the study area have made their choice of market outlets for their produce based on the quantity of pepper produced, farmers' experience, extension contact frequency, year of schooling, bargaining power of the producers, post-harvest value addition, market distance, and total livestock owned.

The following recommendations have been drawn to improve market outlet choice in the study area based on the findings of the study for future intervention.

The findings of this study indicated that farmers have been influenced by different factors to choose appropriate marketing outlets to sell their pepper. The results of this study suggest several ways in which smallholder farmers can actively market their produce.

The finding of this study pointed that the extension providers and Wonberma district education office need to increase the awareness of households about the importance of year of schooling and about the school age at which their children should join the school for better marketing of pepper and increase the quantity of pepper sold at the most profitable market outlet.

Additionally, there is a need to enhance value addition activities to improve the quality of pepper in order to fetch a higher price. Improving smallholder farmers bargaining power by strengthening formal institution would assist farmers to choose the more lucrative market outlet.

Distance to marketplace was significantly and negatively affecting consumer market outlet which hinders marketing of pepper. As a result, improving rural infrastructures would assist poor farmers for faster delivery of farm produces directly to the ultimate consumers.

Local collectors' market outlet was negatively and significantly affected by the frequency of extension service. Therefore, strengthening efficient and area-specific extension education through training would assist the farmers to choose the most profitable market outlets.

Wholesale and local collector market outlets were positively and negatively affected by the total livestock ownership, respectively. To do so, extension providers need to link livestock researchers with farmers to develop and disseminate high yielding, disease-resistant, and environmentally adaptable breeds to the smallholder farmers. As a result, production and productivity of pepper would increase and in turn volume of pepper supply to wholesale market outlet would also increase.

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