

Econometric Analysis of Factors Affecting Haricot Bean Market Outlet Choices in Misrak Badawacho District, Ethiopia

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Abstract: *This study was undertaken with the objective of identifying factors affecting haricot bean market outlet choices in Misrak Badawacho District, Ethiopia. Multivariate Probit model (MVP) were used to analyze the determinant factors that affect the choices of market outlet of smallholder haricot bean farmers. In the study area rural assemblers, direct consumers and urban traders marketing outlets were used by haricot bean producer farmers. MVP model result revealed that distance to all weather road and distance to the nearest district market had a positive association for the probability to choose the rural assemblers market outlet whereas, number of equine owned and use of credit had a negative association. The probability to choose direct consumers outlet number of equine owned had a positive association. Number of equine owned, use of credit, membership in cooperative and price information had positive association, where as distance to the nearest district market were negatively affected the probability to choose the urban traders outlet. Therefore, this implies that the need to invest on improving the present infrastructure like roads and transportation facilities, market information delivery system; strengthening the rural microfinance system to address the credit needs of farmers and promoting farmers group are vital area of intervention that would assist smallholder farmers to choose the more rewarding market outlet.*

Keywords: *Market outlet choices, Smallholder haricot bean farmers, Multivariate probit model.*

1. INTRODUCTION

Ethiopian agriculture is dominated by subsistence oriented, natural resource intensive, low input low output; rain-fed farming system [1]. The development of Ethiopian economy heavily depends upon the pace with which the agricultural growth achieved. The rate of agricultural growth also depends upon the pace with which the current subsistence oriented production system is transformed into market oriented production system [2]. In development policy planning, transformation of smallholder agriculture to market oriented production system is agreed to be a solution for the existing problems of poverty and food security in the rural Ethiopia [3].

Markets provide households the opportunity of welfare gains from trade through specialization according to comparative advantage [4]. Market participation has seen as a solution to increase the welfare of smallholders in developing countries and move them out from the poverty trap [5]. Integration of smallholders into markets is essential for sustainable development of the agricultural sector in agriculture-based economies [6]. Smallholder market participation depends on various factors including farm productivity, access to input supply and services, access to output markets.[7], transaction costs [8]and [9].

Choice of market outlets is a very important part in market participation decision. Farm households make a number of decisions in their daily activities. Marketing outlet choice is one of the most important farm household decisions to sell their produce in different marketing outlets and has a great impact on household income [10] and [11]. Market outlets choices are household specific decision and several drivers have to be considered as a basis for such decision. Various empirical studies pointed out that smallholder farmers decision to choose different market outlet can be affected by household characteristics, resource endowments and access to different market outlets [10]; prices and transportation cost.[12] and [13] and according to [11] lack of market knowledge or difficulties in accessing markets that are more rewarding makes smallholder farmers to transact their produce through outlet offering low price.

Thus, factors affecting market outlet choices of smallholder haricot bean farmers result become essential to provide imperative information for effective research planning and intervention. Therefore this study attempts to investigate how the characteristics of smallholder farmers, their resource endowment, transaction costs, institutional arrangements and service delivery jointly affects haricot bean market outlet choices.

2. METHODOLOGY

2.1. Study Area and Sampling Techniques and Sample Size

The study was conducted in Misrake Badawach district of Hadiya zone of Southern Nations Nationalities and Peoples Regional State (SNNPRS), Ethiopia. Cross sectional data were collected from 123 randomly selected haricot bean producer households in 2014 production season. A two stage random sampling technique was used to select sample respondents. In the first stage six *kebeles* were selected randomly. From the selected *kebeles*, haricot bean producer farm households were identified in collaboration with development agents. In the second stage a total of 123 haricot bean producer farm households were selected randomly from the selected sample *kebeles* by using simple random sampling technique. The sample size in each *kebele* was determined proportional to Size of the identified haricot bean producer households. Out of the total 123 sample households only 84 households that participated in market were included in this analysis.

2.2. Method of Data Analysis

Both descriptive statistics and econometric analysis were used to meet the specific objective of this study. In descriptive statistics mean, standard deviations, frequency and percentage were used to describe the hypothesized variables. Whilst for econometric analysis MVP model were used.

The econometric model were used to identify the household characteristics, resource endowment, transaction costs, institutional arrangements and service delivery factors that were hypothesized as determinants of haricot bean producers farmers market outlet choices. However, in market outlet choice one actor may involved in one or more than one type of market outlets due to these, MVP was preferred because it simultaneously capture the influence of the set of explanatory variables on each of the different outlets choices, while allowing the unobserved (error terms) to be freely correlated.

MVP model was used to analyze the determinants of farmers' decisions on market outlet choices; because farmers more likely choose a different outlet simultaneously. The household decision of whether or not to choose is considered under the general frame work of utility or profit maximization. In this context, the utility of the economic agents is not observable, but the actions of the economic agents could be observed through the choices they made. Following [14] the functional form of multivariate probit model is specified as follows, econometric approach for this study is characterized by a set of binary dependent variables y_{it} such that

$$y_{it}^* = x'_{it}\beta + \varepsilon_{it}, \quad i=1,\dots,n \quad t=1,\dots,T \quad (1)$$

$$y_{it} = \begin{cases} 1 & \text{if } y_{it}^* > 0, \\ 0, & \text{otherwise} \end{cases} \quad (2)$$

Where $t=1,2,\dots,T$ denotes the market outlet choices available;

x'_{it} is a vector of explanatory variables,

B denotes the vector of parameters to be estimated, and

$\varepsilon_{it,}$ are random error terms distributed as multivariate normal distribution with zero means and variance–covariance matrix V .

Where V has values of 1 on the leading diagonal and correlations $tT = Tt$ as off-diagonal elements. It is assumed that a rational i^{th} farmer has a latent variable, y_{it}^* which captures the unobserved preferences or demand association with the t^{th} choice of market outlet choice. This latent variable is assumed to be a linear combination of observed households and other characteristics that affect the market outlet choice, as well as unobserved characteristics captured by the stochastic error term.

Given the latent nature of the variable, y_{it}^* , the estimation is based on the observed variable y_{it} which indicates whether or not a household choose a particular market outlet. Since choosing of several market outlet choices is possible, the error terms in equation (1) are assumed to jointly follow a multivariate normal distribution, with zero conditional mean and variance normalized to unity. The off-diagonal elements in the covariance matrix represent the unobservable correlation between the

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stochastic components of the type of choice outlets. This assumption means that Equation (2) gives a MVP model that jointly represents decisions to choose a particular market outlet. This specification with non-zero off-diagonal elements allows for correlation across the error terms of several latent equations which represent unobserved characteristics that affect the choice of alternative outlets choices.

2.3. Hypothesized Variables

In the case of identifying factors influencing haricot bean market outlet choice decisions, the main task were exploring which factors potentially influence and how these factors are related with the dependent variables. Therefore, the following dependent and independent variables were hypothesized in the study.

2.4. Dependent Variable

Haricot bean Market outlet choice (HMOC): The outlet choice is farmers' decision involving different alternative market outlets. It is measured by the probability of farmers 'selling haricot bean to either of marketing outlets.

Table 1 indicates the summary of hypothesized independent variables which was used in the econometric analysis .

Table 1. Summary of hypothesized independent variables.

Variable	Variable definition	Value
SEX	Sex of the Household Head	0=male,1=female
AGE	Age of the household head	Years
EDUCATION	Education of the Household Head	0=illiterate, 1=literate
NEQUINE	Number of equine owned	Number
MCOOP	Membership in cooperative	1 =member, 0= otherwise
UCREDIT	Use of credit	1= used, 0= No
DISTNM	Distance to the nearest market	Kilometer
DISTAWR	Distance to all weather road	kilometer
API	Access to price information	1=access, 0= otherwise

3. RESULT AND DISCUSSION

Descriptive statistics result, the mean and standard deviation of continuous variables by haricot bean market outlets are provided in Table 2. The mean age of household heads that had access to rural assemblers, direct consumers and urban traders' market outlets were about 42 years. Households that sell to urban traders on average owned 2.28 equines than those who supplied to rural assemblers (equine1.07) & direct consumers (equine1.22).This implies that households who supplied to urban traders have access to more equine to transport their produce to farther markets. Distance travelled to the nearest district market and all weather roads were the highest for households who had access to rural assemblers i.e. 9.78 km and 7.71 km, respectively and were the lowest for households who had access to urban traders and direct consumer i.e. on average about 5 km and 3km, respectively.

Table 2. Mean and standard deviation of continuous variables that affects market outlets choice

Explanatory Variables	Mean and standard deviation of market outlets					
	Rural assemblers N=43		Direct consumers N=48		Urban traders N=58	
	mean	Std.dev.	mean	Std.dev.	mean	Std.dev.
Age	41.67	7.64	41.71	8.57	41.94	8.74
Ownership of transport equine	1.07	0.93	1.22	1.11	2.28	1.15
Dist. to the nearest district market	9.78	6.66	5.38	5.38	5.07	5.36
Distance to all weather road	7.71	2.68	3.08	2.61	3.16	2.45

Source: own survey data, 2014

In the study area three market outlets were used by haricot bean producing farmers. Out of these, large numbers of haricot bean producer farmers were chosen urban traders, followed by direct consumers and rural assemblers outlets. Moreover, the proportion of haricot bean supplied by sample households

to rural assemblers, direct consumers and urban traders marketing outlets were 26%, 14% and 60%, respectively. On average terms the volume of haricot bean supplied to rural assemblers, direct consumers and urban traders were 354 kg, 473kg and 507 kg, respectively (Table 3).

Table 3. Producer market outlet, choices and volume of haricot bean supply to each outlets

Market outlets	Producers choice		Volume supplied in kg		
	Frequency	Mean	Std.	Total	%age
Rural assemblers	43	354	2.18	19,825	26
Direct consumers	48	473	3.75	10,400	14
Urban traders	58	507	2.93	45,160	60
Total				75,385	100

Source: own survey data, 2014

Factors affecting smallholder haricot bean producers market outlet choices

The model results in Table 4 reveals the choice set in the MVP model includes three outlet choices; which were rural assemblers’, urban traders’, and direct consumers outlet. The samples were drawn 100 times. The matrix rho, rho were represented the correlation coefficient matrix between rural assemblers, and direct consumers, rural assemblers and urban traders and direct consumers and urban traders, respectively. The likelihood ratio test result indicated that, the correlation coefficients are statistically different from zero in one of the three cases, verifying the goodness of fit of the multivariate probit model and outlet choices are mutually interdependent. The Wald χ^2 test value of 79.25 which is significant at 1% significance level reveals separate estimation of choice of these outlets is biased and the decisions to choose the three outlets were interdependent.

Table 4. Factors affecting market outlet choices of smallholder haricot bean producers

Explanatory variables	Rural assemblers		Direct consumers		Urban traders	
	Coef.	Robust std.	Coef.	Robust std.	Coef.	Robust std.
Age	0.011	0.019	0.005	0.019	0.006	0.020
Sex	-0.313	0.394	0.673	0.461	0.259	0.413
Education	0.052	0.331	0.170	0.388	0.412	0.386
Number of equine owned	-0.371	0.167**	0.416	0.183**	0.426	0.167**
Access to price information	-0.341	0.372	-0.240	0.421	1.017	0.386***
Membership in Cooperatives	-0.467	0.413	-0.264	0.462	1.039	0.397***
Use of Credit	-0.615	-0.359*	0.390	0.369	0.937	0.373**
Dist. to the nearest district market	0.104	0.034***	-0.044	0.030	-0.068	0.025***
Distance to all weather road	0.153	0.061**	-0.001	0.056	-0.008	0.067
Constant	-0.367	0.043	0.599	1.327	-3.036	1.193
Rho21	-0.835***					
Rho31	-0.385**					
Rho32	0.277					
Predicted probability	0.506		0.572		0.686	
Joint probability(success)	0.150					
Joint probability(failure)	0.039					
N	84					
Number of simulation(draws)	100					
Log pseudo likelihood	-119.81					
Wald chi2(30)	79.25***					
Likelihood ratio test of rho21-rho31=rho32=0: chi2(3)	21.629					
Prob > chi2 =0.0001						

Dependent variable is market outlet choices, ***, ** and * are statistically significant at 1%, 5% and 10%, respectively.

Source: own survey data, 2014.

The Simulated Maximum Likelihood(SML) estimation results suggested that p-values (degree of correlation between each pair of the dependant variable) statistically significant levels. These were a negative and significant interdependence between household decisions to choose rural assemblers outlet choice with direct consumers’ at 1% significance level, and rural assemblers with urban traders’ outlet choice were also negatively and significantly interdependent at 5% Significance level,

but not between direct consumers outlet and urban traders. This indicates the choice of rural assemblers' outlet was significantly decrease the choice of direct consumers' and urban traders' outlets, as the households' decision to choose one type of outlet reduces choice of the other outlets.

Some of the explanatory variables were significant to affect the decision made by farmers about a particular market outlet choice and it can be insignificant for the other outlets choices. Thus, the multivariate probit analysis result reveals the decision of each market outlet choices was influenced by the same or different factors at different or same level of significance.

Number of equine owned: the regression coefficient of number of equine owned was found to have a positive and significant influence on the probability of haricot bean producer farmers decision to choose direct consumers and urban traders outlets and negative and significant influence on rural assemblers' outlet. Equine ownership plays vital role in lowering transportation costs as well as farmers who have equine transport go distant market and choose more than one market to sell their produce and so be able to achieve higher price. This agrees with the findings of [15] that transport ownership allow farmers to sell their produce to marketing center located far off. The result reveals having equine increases the probability of choosing the farther and achieving the higher price market outlets.

Membership in cooperative: It had significant influence on market outlet choices. Household membership in cooperative could have better access to information that helps to production and marketing decisions. Membership in cooperative can also contribute towards reduced transaction costs and strengthen farmers bargaining power through networking and provision of up to date information to members. Therefore, the result reveals being a member in cooperatives increases the likelihood of choosing urban traders outlet. This agree with the findings of [16],[17]and [18].

Use of credit: Farmers who use credit may produce more output this might be due to use of credit provide for farm households a power to spend in input market that boost yield and thus leading to more marketable surplus. Likewise, use of credit eases liquidity constraints of households that contribute to market oriented production .Therefore, the result reveals using credit reduces the probability of choosing rural assemblers market outlet and increases the probability of choosing urban traders. This confirms the finding of [11].

Distance to the nearest district market: was an important variable that affect significantly the probability of haricot bean producer farmers decision to choose market outlets to sell their produce. The negative coefficient for urban trader outlet and positive sign for rural assemblers outlet reveals farmers who are located farther away from market face higher transaction costs and so may opt for rural assemblers in their villages or in nearby villages rather than selling to urban traders in more distant market that increase transaction costs. This confirm the findings of [16] and [17].

Distance to all weather roads: was found to have a significant and positive effect in the decision of choosing rural assemblers outlet. The assumption here is that the closer a household farm or house to all weather road, the more will be the transportation facilities access. Proximity of farmers to all weather roads is essential for output disposal. This implies that farm households located far from all-weather road facing high transportation costs and thereby leading to decide to choose the nearby market outlet i.e. the rural assembler's market outlet. This result confirms the finding of [19] that distance to the tarmac road impedes the choice of private traders.

Price information: was an important variable that affect significantly the probability of haricot bean producer farmer's decision to choose market outlets to sell their produce. The positive coefficient for urban trader outlet reveals having price information of different market outlets can create an opportunity to opt the best rewarding outlets. This agree with the findings [18] and [10] that price information can reduce transaction costs and improves the bargaining power of smallholder farmers.

The marginal success probability for each equation or market outlet choice decision result reveals the likelihood of choosing rural assemblers outlet was relatively low (51%) as compared to the probability of direct consumers outlet (57%) and urban traders (69%). This was due to the fact that rural assemblers outlet offered lower price as compare to other outlets. Hence, haricot bean producer constraint to choose rural assemblers outlet.

The joint probabilities of success or failure of choosing the three market outlets suggest that households were more likely to succeed to jointly choose the three market outlets. The likelihood of households' success to jointly choose the three market outlets were 15% compared to their failure to jointly choose the three market outlets of them were 3.9%.

4. CONCLUSION AND IMPLICATIONS

Factors affecting haricot bean market outlets choice were analyzed by Multivariate probit model. The result indicated that the outlet choice of rural assemblers was negatively and significantly influenced by number of equine owned and use of credit and positively influenced by distance to the nearest district market and distance to all weather road with 51 % predicted probability of marginal success. Whereas direct consumers outlet was positively and significantly affected by number of equine owned with 57% predicted probability of marginal success. Urban traders market outlet was positively and significantly affected by number of equine owned, membership in cooperative, access to price information and use of credit and also negatively and significantly affected by distance to the nearest district market with 69% predicted probability of marginal success.

Based on the findings of this study, some relevant implications can be drawn that can assist to design appropriate intervention mechanisms to improve market outlets choice of haricot bean farmers in the study area. Interventions intended at reducing transaction costs through rural infrastructure investment in the form of establishing all weather road, improving market information delivery system in order to avoid information asymmetry, improving smallholder farmers access to credit through strengthening rural micro finance and encouraging membership in cooperatives are vital area of intervention that would assist farmers to choose the more rewarding market outlets

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