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Analyzing Determinants of Milk Market Participation and Volume of Milk Supply in Urban and Peri – Urban Areas of Ambo and Dendi Districts, West Shewa Zone of Oromia Regional State, Ethiopia

Kemer Tura[1]*, Lemma Fita[2]

[1]*Madda Walabu University, College of Agriculture and Natural Resources, Department of Agricultural Economics, Robe Ethiopia.

[2]Ambo University, college of Agriculture and Veterinary Science, Departmet of Animal Scienc, Ambo- Ethiopia.

ABSTRACT

This study was undertaken with the objective of analyzing factors affecting milk market participation and volume of milk supply in urban and peri – urban areas of Ambo and Dendi Districts, West Shewa Zone. The study made use of primary data collected from 146 smallholder milk producers who selected randomly out of 2235 total households.The data were collected through application of individual interview schedules.The analysis was made by using both descriptive statistics and Heckman two-stage econometric model.From all dairy producing sample households, about three fourth of the households (74.7%) were market participants during the survey period.The first step of the Heckman two stages procedures results showed that dairy household milk market participation was significantly and positively affected by age of the household head, number of cross breed milking cows, access to extension services, access to milk market information and access to credit services while it was affected negatively and significantly by sex of the household head and distance to the nearest market. In addition, the second stage heckman estimation result point out thatnumber of cross breed milking cows, access to extension service, access to information and financial income from non -dairy sources are an important factors affecting sale volume of milk significantly and positively while Landholding size was found to affect volume of milk supply negatively.The finding implies that policy aiming at improving extension access through training farmers, Awareness creation on credit service terms and conditions,price information dispersion through public sector such as extension agentshould be facilitated in order to enhance producer's milk market participation and level of participation. Moreover, integration of cross breed cows to the smallholder's dairy sector through improving their access to improved cattle breeds is an important issue to increase milk yield per day per household which in turn increase milk market participation and sale volume of milk.

KEYWORDS: *Milk market, Participation, Deteminants, Heckman two-step model.*

INTRODUCTION

The roles of livestock in enhancing the livelihoods of the poor in developing countries are well recognized. Livestock and their products are estimated to make up about a third of the total value of agricultural gross output in the developing countries, and this share is rising from time to time (ILRI, 2005). Livestock production in developing countries is increasing rapidly in response to the fast growing demand for livestock products resulting from increasing population especially that of urban areas, and rising consumer income and the sector is found to play an increasing role in peri–urban systems (Woldemichael, 2008).

Ethiopia has the tenth largest livestock inventory in the world and first in Africa. The country has 56.71 million cattle population including 11.4 million dairy cattle and 58.44 million shoats (CSA, 2014). Livestock production is an integral part of Ethiopian agricultural system. The sub-sector is estimated to contribute about 16.5% of the total GDP, 35.6% of total agricultural GDP, and 60-70% livelihoods of the Ethiopia population (MoFED, 2011). The estimated annual growth rates are 1.2% for cattle, 1% for sheep and 0.5% for goats (CSA, 2006). The percentage of total livestock population found in highlands of Ethiopia including peri-urban and urban areas are 70-80% of the cattle, 48%-75% of sheep and 27%-55% of goats (Halderman, 2004).

In Ethiopia 3.3 billion liters of milk was produced in 2011/12,

worth $1.2billion and imported an additional $10.6 million of dairy products (FAOSTAT, 2011). At 19 liters per annum, per capita, annual milk consumption is well below the world average of 105 liters and the African average of about 40 liters (FAOSTAT, 2007). Households that produce milk typically produce such a small amount that it is consumed entirely by the households. Ethiopian families are very conscious of the nutritional importance of milk, particularly for children (Land O'Lakes, 2010).

Milk marketing is an incentive for farmers to improve production. It stimulates production, raise milk farmers' income and living standards and create employment in rural areas (Asaminew, 2007). Provision of improved and sustainable milk marketing arrangements in villages is therefore important in the aspiration for advancement of the sector. The Ethiopian milk marketing system is not well developed. This can be reflected from the fact that only 5% of milk produced in rural areas is marketed as liquid milk (Livestock and Livestock Characteristics, 2012). This has resulted in difficulties of marketing of fresh milk where infrastructure especially transportation facilities are extremely limited and market channels have not been developed. In the absence of an organized rural fresh milk market, marketing in any volume is restricted to the urban and peri-urban areas (Getachew, 2003).

Empirical studies from Ethiopia indicated that there are little studied conducted on farm household market participation and level of participation. However, among a few findings, Berhanu*et al.* (2013) studied milk market participation of smallholder farmers by using probit model which was followed by a second stage regression model to analyze intensity of participation in Ethiopia. In addition study conducted by Woldemichael (2008) on dairy marketing chains analysis: in Shashemane, Hawassa and Dale district's milk shed, souhern Ethiopia was identified factors affecting milk supply by using heckman model. On the other hand, Holloway *etal*. (2005) conducted studies on expanding market participation among smallholder livestock producers in the Ethiopia high lands using double –hurdle model. Some other studies on livestock and livestock products marketing in some parts of Ethiopia were conducted by Holloway *et al* .(2002), Abonesh (2005), Rehima (2006), Gizachew (2005). None of this studies identified determinants of Milk Market Participation and Volume of milk Supply in Ambo and Dendi Districts in West Shewa.

West Shewa zone is one of the potential milk production and marketing areas in Ethiopia. There are about 380,659 milking cows in West Shewa zone which produces 99,640,495liters of milk per year (CSA, 2014). In the zone, it is common to see household milk supply to the market. Given West Shewazone's potential for milk production, marketing and consumption, it is assumed that the results of the study become essential to provide vital and valid information for effective research, planning and policy formulation. In doing so, the study would also contribute to filling the knowledge gap by identifying the major factors that determines milk market participation and sales volume of milk in the study areas.

Objectives of the Study

To analyze determinants of milk market participation and volume of milk supply in the study areas.

RESEARCH METHODOLOGY

Description of the Study Areas

The study was conducted in two districts of Western Shewa Zone; Ambo and Dendi districts. Ambo district is located in Western Shewa Administrative Zone of Oromia Regional state at about 114 km West of Addis Ababa. The District shares boundary with Dendi District in the East, Wanchi District of South west Shewa Zone in the South, Ilfeta District in the North and Tokekutaye District in the West. Ambo district is characterized mostly by flat and to some extent by undulating land features. The district has a mean annual temperature ranging between 23-25°C and a mean annual rainfall of 1300-1700mm. Topography of the district covers 17% lowlands, 60% midlands and 23% highlands. The altitudinal ranges of the agro-climatic zones in the Ambo district fall between 500 and 3,200 meters above sea level (AWARDO, 2014). According to CSA (2007), the population of Ambo district is 108,406 of which 54,186 were male and 54,220 were female. Dendi district is located in Western Shewa Administrative Zone of Oromia Regional state at about 78 km West of Addis Ababa. The District shares boundary with Ejere District in the East, Wanchi, Waliso district of South west Shewa Zone, and Dawo districts in the South, Jeldu and Ilfeta Districts in the North and Ambo district in the west. Dendi district has a mean annual temperature ranging between 9.3-23.8°C and a mean annual rainfall of 750-1170mm. Topography of the district covers 29% highlands, and 71% midlands. The altitudinal ranges of the agro-climatic zones in the Dendi district fall between 2000 and 3288 meters above sea level (DWARDO, 2015). According to CSA (2007), the population of Dendi district is about 209,545 of which 106,050 are male and 103504 are female.

Sampling Techniques

A multistage sampling procedure was used to select representative households from the study areas. In the first stage, Ambo and Dendi districts were selected purposively as they are one of the potential milk production areas of the west Shewa zone. In the second stage all peri – urban kebeles were taken from each district, which means: 3 and 5 potential peri – urban kebeles were selected from Ambo and Dendi districts, respectively. In the third stage, out of potential peri-urban kebeles; 2 peri-urban kebeles were selected randomly from each district namely; Kisose and Awarokebeles from Ambo district and DanoEjersa Gibe and GareArera from

Dendi district. In addition to this, Ambo town from Ambo district and Ginchi town from Dendi district were selected purposively on the basis of milk production potential. Sample size was determined using a simplified formula provided by Yemane (1967). The sample size for collecting quantitative data for this research was determined by using Yamane (1967) simplified formula:

$$n = \frac{N}{1 + N(e^2)}$$

Where;

n =designates the sample size the researcher uses;

N= designates total number of households

e =designates maximum variability or margin of error 8 %(0.08);

1=designates the probability of the event occurring.

Using the household list of the sample peri – urban and urban kebeles, Proportional sampling technique was employed to sample 146 households from the two districts

In order to select household respondents, simple random sampling technique was used to select 146 sample households.

Table 1. Sample size distribution of households in urban and peri - urban areas.

Name of Districts	Name of kebeles/towns	Total number of households	Number of sample households
Ambo	Kisose	293	20
	Awaro	286	19
	Ambo town	519	33
Dandi	DanoEjersa Gibe	515	33
	GareArero	420	27
	Ginchi town	202	14
Total households		2235	146

Source: Own computation from AWARDO and DWARDO data

Sources of Data and Method of Data Collection

Both primary and secondary data from different sources were used. Primary data were collected by the formal survey through interviews with selected farmers using semi-structured questionnaires in July 2015. Before data collection, the questionnaire was pre-tested to evaluate the appropriateness of the design, clarity, interpretation and relevance of the questions and time taken for an interview, hence, appropriate modifications and corrections were made on the questionnaire. Data were collected by enumerators under continuous supervision of the researcher. Secondary data were collected from review of relevant published and unpublished documents, reports of CSA, different organizations including government institutions such as districts agricultural offices.

Methods of Data Analysis

Two types of data analysis: descriptive statistics and econometric analysis were used to analyze the data collected from milk producer households.Descriptive statistics such as ratios, percentages, means, x^2– test and t – test were used to compare socio-economic and institutional characteristics of the dairy household.Heckman (1979) two step estimation, model used to analyze determinants of milk market participation and volume of milk supply. The first stage of Heckman two-stage model 'participation equation' was used to capture factors affecting participation decision which used to construct a selectivity term known as the 'inverse Mills ratio. The inverse Mill's ratio is a variable for controlling bias due to sample selection. In the second stage, the Mills ratio was included to the milk supply equation and the equation was estimated using Ordinary Least Square (OLS). Specification of the Heckman two-step procedure, which was written in terms of the probability of milk market participation (MMP) and volume milk Sale (VMS) is:

The participation Equation/the binary probit equation

$$Y_{1i} = X_{1i}\beta_1 + U_{1i}U_{1i} \sim N(1,0) \quad (1)$$

MMP = 1 if $Y_{1i} > 0$

MMP = 0 if $Y_{1i} \leq 0$

Where: Y_{1i} is the latent dependent variable which is not observed

X_{1i} is vectors that are assumed to affect the probability of sample milk household milk market participation

β_1 is vectors of unknown parameter in participation equation

U_{1i} is residual that is independently and normally distributed with zero mean and constant variance.

The observation equation/the supply equation

$$VMS = Y_{2i} + X_{2i}\beta_2 + U_{2i} \qquad U_{2i} \sim N(0, \delta^2) \quad (2)$$

$Y_{2i}$is observed if and only if MMP = 1. The variance of u_{1i} is normalized to one because

Only MMP, not Y_{1i} is observed. The error terms, U_{1i} and U_{2i}, are assumed to be bivariate, normally distributed with correlation coefficient, ρ.β_1 and $\beta_2$are the parameter vectors.

Y_{2i}, is regressed on the explanatory variables, X_{1i}, and the vector of inverse Mills ratios (λi) from the selection equation by ordinary least squares. Where, $Y_{2i}$is the observed dependent variable, X_{2i} is factors assumed to affect sale volume

β_2 is vector of unknown parameter in the supply equation

U_{2i} is residuals in the supply equation that are independently and normally distrusted with zero mean and constant variance.

$$\lambda i = \frac{f(x\beta)}{1-F(x\beta)} \quad (3)$$

$f(x\beta)$ is density function and $1 - F(x\beta)$ is distribution function.

Hypothesis and Variables Definition

Dependent Variables

Milk Market Participation decision (MMP): Is a dummy variable that represents the probability of market participation of the household in the milk market that is regressed in the first stages of two stage estimation procedure. For the household who participate in milk market the variable takes the value of 1 where as it take the value of 0 for the household who did not participate in milk market.

Volume of milk sales (VMS): It is continuous dependent variable in the second step of the Heckman selection equation. It is measured in liters and represents the actual milk supply per day by dairy farm household to the market which is selected for regression analysis that takes positive values.

Independent variables

Age of household head (AGE): - This is a continuous independent variable that measured in years. Aged households are believed to be wise in resource use, and it is expected to have a positive effect on market participation and marketed supply. Study conducted by Woldemichael (2008) showed that age of the household head had a positive and significant impact on market participation decision of the dairy households.

Sex of household head (SEX): - This is a dummy independent variable that takes the value 1 if the head of a household is male and 0 other wise. Study conducted by Rehima (2006) indicated that there was negative relationship between sale volume of milk and male-headed household. In this specific study, being male household head is expected to affect milk marketing sale volume negatively.

Education of household head (EDHH):- This is dummy variable measured as: =0, if the farmer is Illiterate, = 1 if the farmer attends are educated. Education broadens farmers' intelligence and enables them to perform the farming activities intelligently, accurately and efficiently. In this specific study, formal education is hypothesized to affect sale volume of milk positively. Study conducted by Gizachew (2005) showed that formal education was positively related to household market participation and marketed volume.

Milking cow ownership (NCB for cross and NLB for local breed):- This is a continuous independent variable measured in the number of milking cows owned by a household. The entry to milk market and marketed milk volume are assumed to be positively influenced by the number of milking cows owned. Study conducted by Berhanu*et al. (*2013) and Tadele*et al.* (2014) also resulted in positive relationship between milk market participation and cross breed milking cow ownership.

Household size (HSIZE): - This is a continuous independent variable that is measured in the number of members in a household. Families with more household members tend to consume more milk which in turn decreases milk market participation and marketed milk volume. Berhanu*et al.* (2013) found out negative relationship between household size and market participation of households. Therefore, this variable is hypothesized to have negative impact on sales volume of milk.

Access to dairy extension services (EXS): - This is a continuous independent variable measured in the number of visits of households to extension services. This variable was expected to have positive impact on sales volume of milk. Holloway (2002) also identified that extension visit was directly related to marketed milk volume.

Distance to the nearest market (DIST): - is a continuous independent variable measured in kilometer. A study conducted by Holloway *et al.* (2002) on expanding market participation among smallholder livestock producers in the Ethiopian high lands showed that distance to milk market was negatively related to milk market participation decision of dairy households. Therefore, in this study, this variable is hypothesized to be negatively related to the likely hood of milk market participation decision.

Access to market information (INFM):-This is a dummy independent variable taking the value of 1 if a household had access to market information services and 0 otherwise. It was assumed that market information is positively related to milk market participation and marketed supply.

Membership to milk cooperative (MCOP): -It is dummy variable and takes the value of 1 if the household is member of milk cooperatives and 0 otherwise. It was expected to affect milk market participation and marketed milk supply positively.

Landholding size (LAND): - This is a continuous independent variable measured in hectare which refers to the total area of land that a farm household owned in hectares. The availability of land enables the owner to earn more agricultural output which in turn increases the marketed supply (Desta, 2004). In this study, this variable was expected to have positive relationship with marketed milk supply.

Access to credit (ACCR): Access to credit is measured as a dummy variable taking a value of 1 if the household has access to credit and 0 otherwise. This variable was expected to influence the marketed supply of milk by dairy household positively on the assumption that access to credit improves the financial capacity of dairy households to buy more improved dairy cows and improved feeds thereby increasing milk production and milk marketed supply.

Financial income from non-dairy sources (FINDS): It is continuous variable measured in Ethiopian Birr (ETB). The variable represents income originating from different sources other than dairy, obtained by household head and it is hypothesized to affect sale volume of milk sale positively. Weldemichael (2008) also identified that financial income from non-dairy sources was positively related to volume of milk supplied to the market.

Districts: This variable is a dummy variable taking the value zero if the district is Dendi and one if the district is Ambo, which consists of a number of characteristics of the districts. This is related to the difference between districts in access to information, access to market, production potential etc. This variable hypothesized to influence the likelihood of milk market participation and level of participation either positively or negatively.

Residence: This variable is a dummy variable taking the value zero if the residence is Peri – urban and one if the residence is Urban, which consists of different characteristics of the study location. This is also related to the difference between the locations in access to information, access to market, production potential etc. This variable hypothesized to influence the likelihood of milk market participation and level of participation either positively or negatively.

Table 2. Description of the dependent and independent variables used in the model

Variables	Description	Types	Values
MMP	Milk Market Participation	Dummy	0 = no, 1 = yes
VMS	Volume of milk sales	Continuous	Liters
AGE	Age of household head	Continuous	Number of Years
SEX	Sex of household head	Dummy	0 = female, 1 = male
EDHH	Education level of household head	Dummy	0 = illiterate, 1 = educated
NCB	Cross breed	Continuous	Number of crss breed cows
NLB	Local breed	Continuous	Number of local cows
HSIZE	Household size	Continuous	number of members in a household
EXS	Access to dairy extension	Continuous	Number of visits per month
DIST	Distance to the nearest market	Continuous	Kilometer
INFM	Access to market information	Dummy	0 = no, 1 = yes
MCOP	Membership to milk cooperative	Dummy	0 = no, 1 = yes
LAND	Landholding size	Continuous	Hectares
ACCR	Access to credit	Dummy	0 = no, 1 = yes
FINDS	Financial income from the non-dairy sources	Continuous	ETB
District	Districts of respondents	Dummy	0 = Dendi, 1= Ambo
Residence	Residence of households	Dummy	0 = peri-urban, 1= urban

RESULTS AND DISCUSIONS

Socio-Economic Characteristics of the Sample Households

The mean value of socio economic characteristics of milk market participants and non-participants are given in (Table 3).From 146 dairy producing sample households, 74.7% were market participants as they were found to sell raw milk at the time of survey, while the rest (25.3%) did not sell milk at the time of survey.

The mean landholding of milk market participant household was 0.97hectare, which was smaller than that of non-participant households (1.37hectare). The t-test statistics for the landholding of the market participants and non-participants was found to be significant at 5% probability level. Contrary to prior expectation, this result shows that farm households who participated in milk market had smaller mean hectares of lands, indicating that market oriented dairy production does not necessarily require huge land which showed that efficient and intensive feed management on small land enables farmers to produce surplus milk than using grazing system on huge land. This result is consistent with the findings of Berhanu*et al*. (2013) who reported that milk market participants households had smaller land size than non- participants.

Table 3. Socio-economic characteristics of milk market participants and non-participants

Variables	Mean values of variables		t – value
	Non Participants	Participants	
Age of household head (years)	44.16	45.33	-0.6285
Household size (number of person)	.036	5.63	1.059
Landholding size (hectares)	1.37	0.97	1.977**
Quantity of milk produced per day (liters)	5.86	17.15	-6.881***
Number of cross breed milking cows (number of cows)	0.30	1.50	-6.923***
Number of local breed milking cows (number of cows)	1.30	0.87	2.286**
Access to extension services (number of visit /month)	0.96	1.86	-4.675***
Dairy farming experience (years)	8.32	10.35	-2.521**
Distance to the nearest market (kilometer)	3.76	2.77	3.4337***
Financial income from the non-dairy sources (ETB)	31108.11	30706.42	0.145

Source: Own survey result, 2015; ***, **, and * indicate significance difference at 1%, 5% and 10%, respectively.

The average daily milk yield per household significantly varied at less than 1% probability level between participants and non-participants sample households of the study areas. The mean milk yield per day in market participants and non- participants was 17.15 and 5.86 liters, respectively. The mean value of milk produced per day per participant household was almost 3 times higher than that of non-participant households. This result is in line with the findings of Berhanu*et al.* (2013) and Weldemichael (2008) who indicated that production volume was the most important factor that affects the level of milk market participation.

With regard to milking cow ownership, the mean numbers of cross breed milking cows owned by milk market participants and non-participants sample dairy household were 1.50 and 0.30, respectively and is found to be significant at less than 1% probability level. Whereas, the mean number of local breed milking cow owned by market participants and non-participants dairy household was found to be 0.87 and 1.30 milking cow per dairy household, respectively. The average difference of local milking cows between milk market participants and non - participants was statistically significant at 5% significance level. This result indicates that dairy households with larger number of local cow produces less amount of milk and as a result they were less accessed to milk market when compared with those who have cross breed milking cows. This result is in line with the finding of Gizachew (2005), Getaneh (2005) and Weldemichael (2008).

The mean experience years in dairy production of milk market participants and non-participants was 10.35 and 8.32, respectively. The t- statistic value depicted that mean difference in dairy farming experience among milk market participants and non-participants was statistically significant at 5% probability level. This indicates that experience can directly influence dairy household milk market participation which shows that households who have been in dairy production for many years are better to participate in milk market. This result is contradicted with the findings of Berhanu*et al.* (2013) and Weldemichael (2008) who reported that households who have longer dairy production experience were less participated in milk markets because they perceived as traditional owning local cows.

The average number of extension visits per month in dairy production of milk market participants and non-participants was 1.86 and 0.96, respectively. The t- statistic value revealed that mean difference in dairy extension visit among milk market participants and non- participants was statistically significant at 1% probability level showing that, the frequency of extension visit to milk market participants is considerably higher than non - participants. This is because, learning and knowledge imparting widens the household's mind towards the use of improved technologies thereby supporting households to participate in the market chain. Prior study conducted by Holloway and Ehui (2002) and Rehima (2006) also indicated that extension visit had direct relationship with market entry decision.

The mean distance of the household from the nearest market of milk market participants and non- participants was 2.77 km and 3.76km, respectively. This result shows that compared to participants, non - participants are situated at significantly further distance from market indicating that distance from the market have negative impact on producers milk market participation. This implied that, the further a household from the milk market, the more difficult and costly it would be to get involved in the milk market. The t- value confirmed that mean difference in distance to the nearest market among milk market participant and non- participants was statistically significant at 1% probability level. This result is in line with the findings of Tadele*et al.* (2014).

Socio-economic characteristics of milk market participants and non- participants of categorical variables like educational level, access to information, access to credit, membership to cooperatives and residence of the household were found to

be significantly varied among milk market participants and non- participants.

About 24.66% of the sample household heads did not attend any education, whereas 35.62%, 25.34% and 14.38% households attended primary school, secondary school and college and above, respectively. Table 9 above depicts that about 79.82% and 62.16% of milk market participants and non-participants sample dairy households, respectively had different level of educational background. The chi-square test showed that the difference in education level of market participants and non-participants was found to be significantly different at less than 5% significance level. The market participant households had higher educational level than non-participant sample dairy households. This indicated that education is a significant factor for skill development and enhancing marketing decisions. This concept is fully supported by the study conducted by Fakoya*et al.* (2007) who stated that formal education enhances the information acquisition and adjustment abilities of the farmer, thereby improving the quality of decision making to participate in agricultural market.

Table 4. Proportion of socio-economic and institutional characteristics of milk market participants and non-participants

Variables	Items	Non-Participants (N=37)		Participants (N=109)		x^2- Value
		N	(%)	N	(%)	
SEX	Male	21	56.76	69	63.3	0.50
	Female	16	43.24	40	36.70	
Religion	Orthodox	23	62.16	65	59.63	0.413
	Protestant	11	29.73	31	28.44	
	Catholic	3	8.11	13	11.93	
Education	Illiterate	14	37.84	22	20.18	8.24**
	Primary	15	40.54	37	33.94	
	Secondary	6	16.22	31	28.44	
	Higher education	2	5.41	19	17.43	
Access to information	YES	5	13.51	92	84.40	62.26***
	NO	32	86.49	17	15.60	
Access to credit	YES	1	2.70	39	35.78	15.19***
	NO	36	97.30	70	64.22	
Membership to milk cooperatives	YES	1	2.70	46	42.20	19.74***
	NO	36	97.30	63	57.80	
Residence	Urban	7	18.92	40	36.70	3.99**
	Peri– Urban	30	81.08	69	63.3	

Source: Own survey result, 2015; ***, **, and * represents 1%, 5% and 10 % significance level, respectively.

About 66.44% of the sample household heads had easy access to market information while 33.56% were not getting market information easily. From all sample dairy households, 84.40% and 13.51% of milk market participants and non-participants households, respectively had access to market information, whereas 15.60% and 84.49% of milk market participants and non- participants were not getting market information at the time of survey, respectively. The chi-square test confirmed that the difference in access to information by the market participant and non-participant households was statistically different at less than 1% significance level.

According to the survey results, 35.78%, and 2.70% of sample milk market participants and non- participants, respectively had access to credit while, 64.22% of milk market participants and 97.30% of non – participants were in need of credit. The difference in access to credit across the milk market participants and non - participants was found to be significant at 1% probability level. This result indicated that access to credit has direct impact on households' milk market participation as it facilitates the introduction of innovative technologies, input and output marketing arrangements and promote milk production thereby increasing marketable surplus. Weldemichael (2008) has also stated that access to credit service is important factors that promote dairy production and productivities thereby increasing milk marketable surplus and ultimately household's income.

With regard to households' membership to cooperatives; there was a significance difference at 1% probability level among sample milk market participants and non-participants. From all milk market participants, 42.20% of dairy households were members of milk cooperatives, whereas 57.80% of households were not the members of milk cooperatives. Majority of non- participant households (97.30%) were not member of the milk cooperatives, while only 2.7% of non- participating households were members of milk cooperatives. This indicated that membership to cooperative can directly affect households participation to milk market. This is because cooperatives assures sales guarantee to producers which in turn enhances farmer s' willingness to produce more and increase volume of sales.

The study also indicated that farmers in urban areas participate in milk market better than those in peri-urban areas. Chi-square test result also showed that there was significant differences between milk market participants and non- participants across location at less than 5% significant level. The reason for the differences may be due to the difference in type of milking cow ownership and market access of the milk producers.

Determinants of Milk Market Participation and Sale Volume of Milk Supply

Milk is produced for both market and household consumption in the two districts. Various variables are assumed to determine the sell volume of milk and of milk market participation by sample dairy households. The study used the variance inflation factor to check multicollinearity among continuous variables and contingency coefficient to check multicollinearity among discrete variables. According to the test results, multicollinearity was not a serious problem both among the continuous and discrete variables (appendix table 1). Heckman two-step estimation model was employed to identify the factors determining milk market participation and volume of milk sell.

Regression output of the Heckman two stage analyses: The econometric analysis for the Heckman two-step estimation procedures was performed using STATA version 11 software. The Heckman two-step procedure was employed in order to control the selectivity bias, endogenity problem and obtain consistent and unbiased parameter estimates. The model in the first stage predicts the probability of participating of each household in the milk market; in the second stage, it analyses the determinants of volume of milk supply to market. Maddala (1983; cited by Daniel, 2001) suggested using selection variable that is assumed to affect the participation decision largely, but not level of participation in the selection equation which enables the inverse Millis' ratio to predict correctly. Accordingly, this study used distance to milk market center as selection variable in probit model or participation equation which was hypothesized to affect the milk market participation decision by dairy household, but has no significant impact on level of milk market participation in order to predict inverse Mill's ratio correctly.

The binary probit equation: The model output reports result of estimation of variables that are expected to determine milk market participation of an individual household. From all sample dairy households, 91.10% were correctly predicted into market participant and nonparticipant categories by the model. The correctly predicted participants and correctly predicted non participants of the model were 94.44% and 81.58%, respectively. Out of 16 explanatory variables, 10 variables were found to determine the probability of milk market participation.

Table 5. First-stage probit estimation results of determinants of probability of milk Market participation

Variable	Coefficient	Robust Std. Err.	Marginal effect	P>|z|
Constant	-0.311	1.569		0.843
AGE	0.048	0.023	0.001	0.043**
SEX	-1.557	0.571	-0.036	0.006***
EDHH	0.352	0.219	0.008	0.109
HSIZE	-0.130	0.101	-0.003	0.199
LHS	-0.021	0.195	0.009	0.914
NLB	0.144	0.183	0.003	0.432
NCB	0.978	0.421	0.022	0.020**
Epr	0.105	0.041	0.002	0.011**
MCOP	0.648	0.616	0.012	0.293
EXS	0.928	0.260	0.021	0.000***
INFM	0.921	0.408	0.034	0.024**
ACCR	2.679	0.543	0.049	0.000***
DIST	-0.400	0.163	-0.009	0.014**
FINDS	-0.0003	0.0001	-7.46e-07	0.136
Disrt	0.984	0.4684	0.023	0.036**
Residence	0.260	0.548	0.063	0.067*

Dependent variable=household Milk Market Participation (MMP), number of observation (N) =146, Log likelihood function = -28.468, Restricted log likelihood = -82.645, LR chi^2 (15) = 48.49, Pseudo R^2 = 0.6555, Prob> chi^2 = 0.0000, positive prediction value=94.44%, ***, **, and * represents significance level at 1%, 5% and 10% probability level, respectively.

Age of the household head (AGE): The model result depicts that age of the household head has a positive and significant impact on market participation decision of the sample dairy households. The positive and significant relationship between the two variables indicates that older dairy household head could have more milking cows increasing the probability of the household milk market entry decision. The marginal effect also indicated that when the household age increases by one year, the probability of participating in the milk market increases by 0.1%. The results of this study coincides with the findings of Weldemichael (2008) but disagree with the findings of Tshiunza *et al.* (2001) who reported that age of the household head negatively affected milk market participation .

Sex of the household head (SEX): Sex of the household head has negative and significant impact on market participation decision of the sample dairy households at less than 1% probability level. The negative and significant relationship between the two variables indicates that there is negative relationship between milk market participation decision and male headed households. This is because; female contributes more labor in the area of feeding, cleaning of bans, milking and sell of dairy products. The finding of this study coincides with the findings of Getaneh (2004). The marginal effect also confirmed that keeping other things constant, the probability of participation in milk market of male headed household is lowered by 3.6% compared with female headed households.

Number of cross breed milking cows: As it was expected, this variable has positive relationship with household milk market participation decision and was statistically significant at 5% probability level. The positive and significant relation between the variables indicates that as the number of milking cow increases, milk production per dairy household also increases which in turn increases percentage share of sell volume of milk per day per household. The marginal effect of the variable confirms that increase in one head of cross breed dairy milking cow leads the probability of dairy household milk market participation to rise by 2.2%. The results of this study coincide with the findings of Weldemichael (2008).

Experience in dairy production (Epr): As prior expectation, this variable has a positive impact on dairy household milkmarket participation decision and was significant at 5% probability level. The dairy householdshaving longer experience in dairy production have accumulated dairy knowledge so that they are better to participate in milk market. The marginal effect of the variable showed that everyone-year experience rise in dairy production causes milk market participation decision to increase by0.2%. This result is contradicted with the findings of Berhanu*et al*. (2013) and Weldemichael (2008) who reported negative relationship between dairy farming experience and milk market participation decision.

Extension services (EXS): The model result depicts that access to dairy production extension service has a positive and significant impact on market participation decision of the sample households. The variable was statistically significant at 1% probability level. The positive and significant relation between the variables indicates that as the number of extension visits increases, the likelihood of milk market participation by the dairy household also increases. This is because; extension service expected to widen the household's knowledge with regard to the use of improved dairy production technologies and has positive impact on milk market participation decision. The marginal effect of the variable indicated that increase in one visit of dairy production extension services leads the probability of dairy household milk market participation to rise by 2.1%. Holloway (2002) and Rehima (2006) reported the same result with this finding.

Access to market information (INFM): As it was expected, access to market information has positive relationship with household milk market participation decision and was statistically significant at 5% probability level. This is because; farmers marketing decisions are based on market price information, and poorly integrated markets may convey inaccurate price information, leading to inefficient product movement. The marginal effect of the variable confirmed that keeping other factors constant, getting market information leads likelihood of dairy household milk market participation to increase by 3.4%.

Access to credit (ACCR): As it was expected, access to credit has positive relationship with household milk market participation decision and was statistically significant at 1% probability level. The positive relation between the variables indicated that availability of credit service enables the dairy household to purchase more improved dairy cows and more feed for dairy cows, which can contribute to increased milk production and then contribute to increased milk market participation decision by dairy household. The marginal effect of the variable showed that keeping other factors constant, getting credit services leads the probability of dairy household milk market participation to increase by 4.9%.

Distance to the nearest market (DIST): This variable had a negative effect on milk market participation and found to be statistically significant at 5 % significance probability level. The negative relationship indicates that the further is a household from the milk market, the more difficult and costly it would be to get involved in the milk market. The marginal effect implies that a one-kilometer increase in a milk market distance from the dairy household residence reduces the probability of participation in milk market by 0.9%. In other words, as the dairy household becomes closer to milk market center by one kilometer, the probability of his or her participation in milk market rises by 0.9%. This result coincides with findings of Holloway (2002), Gizachew (2005) and Weldemichael (2008).

District Dummy (District): As the districts become Ambo, it influences the likelihood of milk market participation decision significantly and positively at less than 5%

significance level. The marginal effect showed that in Ambo district as compared to Dendi district, the likelihood of milk market participation increases by 2.3%, being other variables held constant. This is may be due to the differences in access to markets, access to information access to infrastructures and difference in socio-economic characteristics of the two districts.

Residence Dummy (Residence): As the residences become Urban, it influences the likelihood of milk market participation decision significantly and positively at less than 10% significance level. The marginal effect showed that in urban residence as compared to peri – urban, the likelihood of milk market participation increases by 6.3%, being other variables held constant. This is may be due to the differences in access to markets, access to information access to infrastructures and difference in type of milking cow ownership as the majority of urban milk producers own cross breed milking cows.

Estimation results of second stage Heckman selection model

The results of second stage Heckman selection estimation for volume of milk supply are given in table 22.The overall joint goodness of fit for second stage Heckman selection model parameter estimates is assessed based on wald chi- square test. The null hypothesis for the test is that all coefficients are jointly zero. The model chi square test applying appropriate degrees of freedom indicates that the overall goodness of fit for second stage Heckman selection model is statistically significant at 1% probability level. This shows that jointly independent variables included in selection model regression explained volume of milk supply. In the second stage Heckman selection model; 6 independent variables: Landholding size, number of cross breed milking cows, access to extension services, access to information, financial income from non -dairy sources and districts of households are found to be significant.

Table 6. Results of second-stage Heckman selection estimation of determinants of volume of milk supply to the market.

Variables	Coefficient	Std. Err.	P>|t|
Constant	1.547	4.007	0.604
AGE	-0.012	0.044	0.697
SEX	0.280	0.840	0.721
EDHH	0.339	0.483	0.478
HSIZE	-0.323	0.245	0.194
LHS	-0.468	0.462	0.037**
NLB	-0.410	0.385	0.264
NCB	5.904	0.465	0.000***
Epr	-0.034	0.087	0.673
MCOP	0.099	0.842	0.849
EXS	1.177	0.342	0.000***
INFM	2.527	1.417	0.036***
ACCR	0.441	0.819	0.529
FINDS	0.0001	0.0003	0.001***
Disrt	2.085	0.897	0.004***
Residence	1.231	0.643	0.120
lambda	3.324	1.602	0.038**

Dependent variable=Volume of milk supplied to market, number of observation (N) =146), Censored observations = 37, Uncensored observations = 109, Wald chi2 (14) = 412.56(0.000) ***, R-squared=0.8415, Adjusted R squared=0.8159, Rho = 0.83098, Sigma = 3.4477761, ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

Landholding size (LAND): In contrary to prior expectation, landholding size negatively and significantly affected volume of milk supply at 5% probability level. The finding coincides with the findings of Staal*et al*. (2006), but dis agree with the findings of Desta (2004). The negative relationship between volume of milk sell and landholding size indicates that market oriented dairy production does not necessarily require land. This further suggests growing demand for production and marketing of milk in context of efficient dairy feed management. The model output further confirmed that volume of milk supply to the market decreases by -0.46liters as land holding size of household increases by 1 hectare.

Number of cross breed milking cows: This variable is significant at 1% probability level and has a positive effect on marketable milk volume. The model output predicts that the addition of one cross breed milking cow to the dairy household leads to an increase in the volume of milk supply to the market by 5.90liters. This result is believable and suggests that marketable milk surplus of the household in the study areas are more responsive to number of cross

breed milking cows. Furthermore, this result elaborated that marketable milk surplus per day increases in response to the increase in milking cow number.

Access to dairy extension services (EXS): Access to dairy production extension services as expected has a positive and significant impact on volume of milk supply to the market by dairy households and was statistically significant at 1% probability level. This result shows that; extension service expected to widen the household's knowledge with regard to the use of improved dairy production technologies and has positive impact on volume of milk selling. Study conducted by Holloway (2002) also showed that extension visit was directly related to marketed milk volume. The coefficient of the variable confirmed that an increase in one visit of dairy production extension services leads the probability of volume of milk sell to rise by 1.17liters.

Access to market information (INFM): It affected volume of milk supply positively and significantly at 5% significance level. If milk producer gets market information, the amount of milk supplied to the market increases by 2.52liters. This suggests that access to market information reduces farmers risk aversion behavior of getting a market and decreases marketing costs of farmers that affects the marketable surplus. The implication is that obtaining and verifying information helps to supply more quantity of milk.

Financial income from the non-dairy sources (FINDS): Financial income from non-dairy sources has a positive effect on sell volume of milk and found to be significant at 1% probability level. The positive relation between the variables indicates that any additional financial income from non- dairy sources enables the dairy household to purchase more improved dairy cows and more feed for dairy cows, which can contribute to increased milk production and then contribute to increased volume of milk supply to the market by dairy household. The result showed that if milk producers additional income from non-dairy sources increases by 1ETB, the volume of milk supply raised by .0001liters. This is in line with the findings of Weldemichael (2008) who reported that financial income from non- dairy sources had positive impact on volume of milk supply.

District Dummy (District): As the districts become Ambo, it influences the volume of milk supply to the market significantly and positively at less than 1% significance level. The coefficient showed that in Ambo district as compared to Dendi district, the volume of milk market supply increases by 2.08liters, being other variables held constant. This is may be due to the differences in access to markets, access to information access to infrastructures, difference in type of milking cow ownership and difference in socio-economic characteristics of the two districts.

LAMBDA: The coefficient of mills ratio (Lamda) in Heckman two stage estimation was statistically significant at 5% probability level. This indicated sample selection bias existence of some unobservable household characteristics affecting likelihood to participate in milk market and thereby affecting volume of milk supply.

CONCLUSIONS

From all dairy producing sample households, about three fourth of the households (74.7%) were market participants. The maximum likelihood probit model analysis revealed that age of the house hold head, sex of the household head, number of cross breed milking cows, dairy farming experience, access to extension services, access to milk market information, access to credit services, distance to the nearest market, districts of respondents and residence of households are found to exert significant impact on probability of the households milk market participation whereas, Landholding size, number of cross breed milking cows, access to extension services, access to information, financial income from non -dairy sources and residence of households are an important factors affecting sell volume of milk.

Recommendations

Awareness should be created on credit service terms and conditions in order to improve credit accessibility by the smallholder producers. In addition government should create conducive environment for micro-finance institutions in order to link them with smallholder dairy producers.

Dairy market price information has to be dispersed through public sector such as extension agent as the model output identified it is exerting positive and great impact on milk market participation and volume of marketable surplus.

Government and other concerned partners of the study areas are required to give due attention for integrating cross breed cows to the smallholders dairy sector through improving their access to improved cattle breeds.

Active exchange of experiences should be encouraged among smallholder farmers, private farms and existing interest groups to improve milk quantity production which in turn increase household's milk market participation and level of participation.

The dairy farmers should be encouraged to improve their financial capacity to improve the herd quality and quantity for further development.

REFERENCES

1. Abonesh, T. 2005. Imperfect Competition in Agricultural Markets: Evidence from Ethiopia. *Journal of Development Economics,* 76 (2): 405-425.
2. Ahmed, M. M., S. Ehui and Yemesrach, A. 2004.Milk development in Ethiopia.
3. Asaminew, T. 2007. Production, handling, traditional processing practices and quality of milk in Bahir Dar milk shed Area, Ethiopia. M.Sc. Thesis. Alemaya University, Ethiopia.
4. Berhanu, K., Derek, B., Kinde G. and Belay, K. 2013. Factors affecting milk market outlet choices in Wolaita

zone, Ethiopia. *African Journal of Agricultural Marketing,* 1 (2): 024-031.

5. Berhanu, K., Derek, B., Kinde, G. and Belay, K. 2013. Factors Affecting Milk Market Participation and Volume of Supply in Ethiopia.*AsianJournal of Rural Development,* 4: 1-15.
6. Cooking Banana in Nigeria.*African Crop Science Journal 9 (3): 537-547.*
7. CSA (Central Statistical Agency). 2014.Agricultural Sample Survey Report.
8. Desta, B. 2004. Impact of community managed irrigation on farm production efficiency and household income. The case of Weliso and Wenchi districts of Oromiya Regional State. M.Sc. Thesis Presented to the School of Graduate Studies, Haramaya University. 46p.
9. Fakoya, O., M. Agbonlahor and Dipeolu, A. 2007. Attitude of women farmers towards sustainable land management practices in South-Western Nigeria*. World Journal of Agricultural Sciences,* 3(4): 536-542.
10. FAOSTAT, 2007.Food and Agriculture Organization of the United Nations.<http://faostat.fao.org/>.
11. Getachew, B. 2002.Cattle Marketing in Western Shewa.M.Sc Thesis Presented to the School of Graduate Studies of Alemaya University, Ethiopia.
12. Getachew, F. 2003. A Review of the small scale milk sector in Ethiopia.FAO prevention of food losses programme. Milk and milk products, post-harvest losses and food safety in Sub-saharan Africa and the Near East. Available on: http://www.fao.org/ag/againfo/projects/en/pf1/docs/P1assessmentcoverethiopia. pdf.
13. Gizachew, G. 2005. Dairy Marketing Patterns and Efficiency: The Case of Ada' Liben
14. Halderman, M.N. 2004. The political economy of pro-poor livestock policy making in Ethiopia. FAO working paper No. 19, Rome.
15. Heckman, J.J. 1979. Sample selection bias as a specification error, Econometrica.153-161pp.
16. Holloway, G. and Ehui, S. 2002. Expanding market participation among smallholder livestock producers: A collection of studies employing gibbs sampling and data from the Ethiopian highlands. Socio-economic and Policy Research Working Paper 48.ILRI, Nairobi, Kenya. 85p.
17. ILRI (International Livestock Research Institute). 2007. Medium-Term Plan. Livestock: A pathway out of poverty.
18. Land O'Lakes, 2010. The Next Stage in Dairy Development for Ethiopia.Rep. Addis Ababa.
19. Livestockand Livestock Characteristics. 2012. Rep. Vol. II. Addis Ababa: Federal Democratic Republic of Ethiopia. livestock and livestock characteristics. Volume II, Livestock Center for Africa, Addis Ababa, Ethiopia.123-130PP.
20. Madalla, G.S. 1983. Limited Dependent and Qualitative Variables in Econometrics.Cambridge University Press. United Kingdom. 260-261pp.
21. MoFED (Ministry of Finance and Economic Development).2011. A review to Improve Estimation of Livestock Contribution to The National GDP. 33p.
22. Rehima, M. 2006. Analysis of red pepper marketing: The case of Alaba and Siltie in SNNPRS of Ethiopia. M.Sc thesis presented to the School of Graduate Studies, Haramaya University. 105p.
23. Staal, S. J., Baltenweck, I., Njoroge, L., Patil, B. R., Ibrahim M and Kariuki, E. 2006. Smallholder dairy farmer access to alternative milk market channels in Gujarat. IAAE Conference, Brisbane, Australia.
24. Tadele, M., Tewodros, T.and Noreen, B. 2014. Factors influencing urban and peri- urban dairy producers' participation in milk value addition in Welmeraworeda, West Shewa Zone of Oromia Regional state, Ethiopia. *International Journal of Livestock Production,* 5(9):165-172.
25. Tshiunza, M., Lemchi, J., Tenkouano, A., 2001. Determinants of Market Production of
26. Woldemichael, S. 2008. Dairy marketing chains analysis: The case of Shashaname, Hawassa and Dale District's milk shed, Southern Ethiopia. M.Sc. Thesis, Haramaya University, Ethiopia.51P.
27. Yamane, T. 1967. Statistics*:* An Introductory Analysis, 2nd Ed., New York: Harper.

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