Food Science and Quality Management
ISSN 2224-6088 (Paper) ISSN 2225-0557 (Online)
Vol.52, 2016

Determinants of Dairy Farmers' Market Participation in the Major Dairy Producing Towns of Jimma Zone of Southwest Ethiopia

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Abstract
The study was initiated with the objectives of analyzing factors affecting dairy farmers' market participation in major milk producing towns of southwest Ethiopia. Milk and butter were the two most important dairy products marketed in the areas. Data came from 238 dairy producing households, 17 traders, and 50 consumers. Heckman two stages procedures were used to analyze factors affecting milk market participation and level of participation in the study area. The first step of the Heckman two stages procedures results showed that dairy household milk market entry decision was strongly and significantly affected by family size, number of cross breed and local breed milking cows owned, access to credit and distance from milk market center. In addition, the second stage estimation result revealed that marketable milk volume was found to be strongly and significantly affected by the number of cross breed and local breed milking cows owned, family size, and monthly non-dairy income source of sampled dairy household. 69.7% were market participants as they were found to sell raw milk at the time of the survey, while the rest (30.3%) did not sell at the time of survey.
Keywords: Milk, market participation, Heckman model, southwest Ethiopia

INTRODUCTION

In Ethiopia, dairying is a means of providing an additional source of employment and income to small and marginal producers. The smallholders produce about 93% of dairy product, but it is only small quantity of this production that is marketed in the form of liquid milk; the larger volume is processed into different dairy products for home consumption and sales. Large scale marketing and processing of milk is limited to the area around Addis Ababa, which is the Addis Ababa milk shed. It appears that butter dominates dairy marketing, and the transaction in the form of raw milk is limited around major urban centers. The low marketable milk output in Ethiopia poses limitations on the possibilities of exploring distant but rewarding markets due to high transaction costs arising from transportation and high opportunity cost of labor involved. Again, dependable marketing system is not yet developed to market milk and milk products. Producers and consumers are spatially separated; most producers are found in the rural areas while consumers or profitable market is found in urban areas. Most of the milk supply is distributed from producer to consumer through informal marketing channels in both rural and urban areas. Market infrastructures and marketing facilities are not well developed in the country. This, in turn, reduces incentives to participate in economic transactions and results in subsistence rather than market-oriented production systems. Therefore, improving the position of smallholders to actively engage in the dairy market is one of the most important development challenges of the country (Holloway et al., 2002).

In Ethiopia, fresh milk sales by smallholder producers are important only when they are close to formal milk marketing facilities, such as government enterprise or milk groups. Producers far from formal marketing outlets prefer to produce other dairy products instead, such as cooking butter and cottage cheese. The vast majority of milk produced outside urban centers in Ethiopia is processed into dairy products by the households, and sold to traders or other households in local markets (Muriuki et al., 2001).The existing excess demand for dairy products in the country is expected to induce rapid growth in the dairy sector. Factors contributing to this excess demand include the rapid population growth (estimated at 3 percent annually), increased urbanization and expected growth in incomes. While the response of the private sector to the increased demand for dairy is expected to be significant, the small-scale household farms in the highlands hold most of the potential for dairy development (Mohammed et al., 2004).

METHODOLOGY

Description of the study area

The study conducted in Jimma town, and Serbo, Yabu, and Seka local towns of Jimma zone of Oromiya Regional State. Jimma is located 352 km south-western of Addis Ababa. The area lies between a latitude of a latitude of 7°41'N and longitude of 36°50'E and has an elevation of 1704 meters above sea level. The area is characterized by a humid tropical climate of heavy annual rainfall that ranges from 1200-2000 mm per year. About 70% of the total

annual rainfall is received during rainy season, which lasts from the end of May to early September. The area has a relatively higher temperature of about 25°C-30°C from January to April and having a minimum temperature of 7°C-12°C during the months of October to December (OPEDJZ. 2002). Serbo, Yabu, and Seka local towns are the direct supplier of the city salesmen/women and consumers in Jimma town.

Data Types and Sources

Both quantitative and qualitative data types are used for the study. In order to generate these data types, both secondary and primary data sources used. Secondary sources include reports of line ministries, journals, books, CSA and internet browsing, national policies, zonal and woreda reports, among others. Primary data sources include zonal and woreda Agricultural and Rural Development Offices, zonal and Woredas Agricultural Marketing Offices, zonal cooperative office, cooperative management, nongovernmental organizations, dairy farmers, traders, hotels/restaurants, cooperatives and consumers.

Methods of Data Collection

The major data collection methods is used include discussions with individual, groups and key informant and focus groups, rapid market appraisal, observation, formal survey and visual aids. A preliminary assessment is conducted to collect basic information about the study area. This information is generated through discussions and individual expert contact at zonal Agricultural and Rural Development Office. In addition, using secondary data sources of the zone and woreda and guided visits to already proposed study area, visualization of dairy value chain activities is done. Following participatory research, formal survey is performed to quantify the qualitative data. Survey questionnaires are prepared for each value chain actors operating within the study area. Using the questionnaire, interviews are conducted to gather data on household characteristics, socioeconomic and demographic characteristics, farm information, income sources, milk and milk products production, labor availability and utilization, marketing and market access, processing, value addition and technology use, credit, extension and information services, consumption patterns, attitudes and preference towards milk, attitudes and perceptions towards price, capital (financial, social), purchase practices, selling practices, transportation, linkages among and between value chain actors, power relationships, among others. Moreover, gender disaggregated data is collected across production to consumption.

Sampling technique

Based on volume of production Jimma, Seka, Serbo and Yabu local towns were selected purposively. From total producers in the study area, representative farmers are selected by random sampling techniques for data collection. The total population in dairy production is very large; therefore sampling is necessary for the sake of study. By using the formula of Yamane (1967:886), and the 90% confidence level and P= 0 .1% assumed, the sample size is determined as:

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

Where n is the sample size, N is the population size of dairy producers, traders and consumers, and e is the level of precision.

Table 9Sample size distribution

Chain actors	Jimma town		Seka		Serbo		Yabu		Total sample
	Population	sample	Population	sample	population	sample	population	Sample	
producers	61	38	245	71	300	75	118	54	238

Methods of Data Analysis

Two types of data analysis, namely descriptive statistics and econometric analysis were used for analyzing the data collected from respondents. Heckman two stages procedures were used to analyze factors affecting milk market participation and level of participation.

Descriptive statistics

This method of data analysis refers to the use of ratios, percentages, means, and standard deviations in the process of comparing socio-economic and institutional characteristics of the dairy household.

Econometric analysis

Heckman has developed a two-step estimation procedures model that corrects for sample selectivity bias. If two decisions are involved, such as participation and volume of supply, Heckman (1979) two step estimation procedures is appropriate. The first stage of the Heckman two-stage model is a 'participation equation', attempts to capture factors affecting participation decision. This equation is used to construct a selectivity term known as the 'inverse Mills ratio' (which is added to the second stage 'outcome' equation' that explains factors affecting

volume of milk supply. The inverse Mill's ratio is a variable for controlling bias due to sample selection (Heckman, 1979). The second stage involves including the Mills ratio to the milk supply equation and estimating the equation using Ordinary Least Square (OLS). If the coefficient of the 'selectivity' term is significant then the hypothesis that an unobserved selection process governs the participation equation is confirmed. Moreover, with the inclusion of extra term, the coefficient in the second stage 'selectivity corrected' equation is unbiased (Zaman, 2001). Specification of the Heckman two-step procedure, which is written in terms of the probability of milk market participation, DMP, and marketed milk volume, YIELDM is:

The participation Equation/the binary probit equation

$Y_{1i} = \beta_1 x_{1i} + \upsilon_{1i}$ $\upsilon_{1i} \sim N(0,1)$

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

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

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

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

β_1 is vectors of unknown parameter in participation equation

μ_{1i} are residential that are independently and normally distributed with zero mean and constant variance

The observation equation/the supply equation

YIELDM = $\mathbf{Y}_{2i} = X_{2i}\beta_2 + \mu_2$ $\mu_{2i} \sim N(0, \delta^2)$

Y_{2i} is observed if and only if DMP = 1. The variance of μ_{1i} is normalized to one because only *DMP*, not Y_{1i} is observed. The error terms, μ_{1i} and μ_{2i}, are assumed to be bivariat, normally distributed with correlation coefficient, ρ, β_1 and β_2 are the parameter vectors.

Y_{2i}, is regressed on the explanatory variables, X_{1i} and the vector of inverse Mills ratios (λ_i) 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

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

$\lambda_i = \frac{f(X^{\beta})}{1-F(X^{\beta})}$

Hypothesis and Variable Definition

Both continuous and discrete variables are included and discussed as follows:

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 stage of two stages estimation procedure. For the household who participate in dairy market the variable takes the value of one where as it take the value of zero for the household who did not participate in milk market.

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

Independent (Explanatory) Variables

Milk yield per day: is a continuous variable which is measured in liters. A marginal increase in dairy production has obvious and significant effect in volume of dairy supply. The volume production of dairy is expected to have positive relation to market participation and marketable surplus. A marginal increase in dairy production has obvious and significant effect in motivating market participation. Production beyond consumption has two fates based on various reasons; either sold as fluid milk or processed into different dairy derivatives. The processed part of the product may be used for home consumption or sales. Production in turn varies directly with the number of lactating dairy cows. As the number of dairy cow increases, production also increases and the percentage share of consumption declines and sales increases (Holloway et al., 2002).Singh and Rai (1998) identified factors affecting marketed surplus of buffalo milk in Haryana. They observed that milk production and price significantly affected marketed surplus positively. Also Wolday (1994) observed that output of food grains (wheat *teff* and maize) have positive effect on quantity supplied to the market. Rehima (2006) identified that the volume production of pepper

is expected to have positive relation to market participation and marketable surplus.

Number of milking cows (NCB1 for cross breed, NLB for local breed): This variable is continuous and is measured in number of milking cow owned. The entry to milk market and marketed milk volume are assumed to be positively influenced by the number of milking cows owned. The study conducted by Holloway et al. (2002) in the Ethiopian high lands on expanding market participation among smallholder livestock producers indicated positive and significant relation between milking cow numbers and market participation and marketable milk volume. Further study conducted by Gizachew (2005) confirmed positive and significant relation between market participation decision by dairy household and marketable milk volume.

Education Level of the Household Head (ELHH): It is continuous variable and is measured in years of formal schooling of the household head. Education plays an important role in the adoption of innovations/new technologies. Further, education is believed to improve the readiness of the household to accept new idea and innovations, and get updated demand and supply price information which in turn enhances producers' willingness to produce more and increase milk market entry decision and volume of sale. Study conducted by Holloway et al. (1999) indicated positive relationship between education and dairy household milk entry decision and marketed milk volume. Similarly, study conducted by Gizachew (2005) and Rehima (2006) showed that formal education was positively related to household market participation and marketed volume. Therefore, in this specific study, formal education is hypothesized to affect milk market participation decision and sale volume of milk.

Age of the household head (AGE): It is a continuous variable and measured in years. Age is a proxy measure of farming experience of household. Aged households are believed to be wise in resource use, and it is expected to have a positive effect on market participation and marketable surplus. Tshiunza, et al. 2001 used age as the major farmers' characteristics that significantly affected the proportion of cooking banana planted for market. He found that younger farmers tended to produce and sale more cooking banana for market than older farmers.

Family size (FSHH): It is a continuous variable and measured in adult equivalent i.e. the availability of active labour force in the household, which affects farmer's decisions to participate in market. As dairying is labour intensive activities, dairy production in general and marketable surplus of dairy products in particular is a function of labour. However, family size is expected to have positive impact on market participation and volume of sales, but larger family size requires larger amounts for consumption, reducing marketable surplus. A study by Singh and Rai (1998) found marketed surplus of buffalo milk to be negatively affected by family size. However, a study conducted by Wolday (1994) showed that household size had significant positive effect on quantity of *teff* marketed and negative effect on quantity of maize marketed. In this context family size is expected to have positive or negative impact on market participation and volume of sale.

Sex of the household head (SEX): This is dummy variable that takes a value of one if the household head is male and zero otherwise. The variable is expected to have a positive relation with milk market entry decision and milk sale volume. In mixed farming system, both men and women take part in livestock management. However, obstacles such as lack of capital, and access to institutional credit and extension service, may affect women's participation and efficiency in ruminant livestock production (Tanga et al., 2000). Generally, women contribute more labour input in area of feeding, cleaning of barns, milking, butter and cheese making and sale of milk and other dairy products. Tshiunza et al. (2000) discussed the determinants of market production of cooking banana in Nigeria. In their study the male farmers tended to produce more cooking banana for market than female farmers. Further, study conducted by Gizachew (2005) indicated negative relation between sale volume of milk and male-headed household. Study conducted by Rehima (2006) confirmed the same result. However, in this specific study, being male household head is expected to affect milk market participation decision and sale volume positively.

Financial income from the 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, spouse and other household members. Through improving liquidity, this income makes the household to expand production and or/ purchase from market. It also strengthens the household position in coping with different forms of risks. Thus, income from non-dairy source is hypothesized to affect milk market entry decision by household and sale volume of milk positively.

Access to credit (ACCR): Access to credit is measured as a dummy variable taking a value of one if the household has access to credit and zero otherwise. This variable is expected to influence the marketable supply of milk and milk market entry decision by dairy household positively on the assumption that access to credit improves the financial capacity of dairy households to buy more improved dairy cows, thereby increasing milk production and milk market participation.

Access to Dairy production Extension service (ATDPES): This variable is measured as a dummy variable taking a value of one if the dairy household has access to dairy production extension service and zero otherwise. It is expected that extension service widens the household's knowledge with regard to the use of improved dairy production technologies and has positive impact on milk market participation decision and sale volume of milk. Number of extension visits improves the household's intellectual capitals, which improves dairy production and divert dairy production resources. Different studies conducted by different scholars revealed that extension visit

has direct relationship with market entry decision and marketable output. In this line, study conducted by Holloway (2002) identified that extension visit was directly related to dairy household milk market entry decision and marketed milk volume. Furthermore, Rehima (2006) identified that extension visit was positively related to pepper market entry decision and marketed pepper volume. Therefore, number of extension visits is hypothesized to impact dairy household milk market entry decision and marketed volume.

Access to Market information (ATMI): Farmers marketing decisions are based on market price information, and poorly integrated markets may convey inaccurate price information, leading to inefficient product movement. Therefore, it is hypothesized that market information is positively related to market participation and marketable surplus.

Distance to nearest milk market (DONM): Is location of the dairy household from the nearest milk market and is measured in kilometer**.** The closer the dairy market to dairy household, the lesser would be the transportation charges, loss due to spoilage and better access to market information and facilities. This improves return to labour and capital; increases farm gate price and the incentives to participate in economic transaction. A study conducted by Holloway et al (2002) on expanding market participation among smallholder livestock producers in the Ethiopia high lands revealed that distance to milk market was negatively related to milk market participation decision of dairy households. Similarly, study conducted by Wolday (1994) on food grain market in Alaba Siraro indicated negative relationship between distance from household residence to grain market and volume of marketed food grain. Furthermore, study conducted by Abonesh (2005) and Rehima (2006) indicated similar results. In his study of household food marketing behavior, Goetz (1992) found that better information, significantly raises the probability of market participation for potential selling households. Therefore, in this study, distance from nearest milk market is hypothesized to be negatively related to market participation decision and marketable milk surplus.

Experience in dairy production (**EXHH):** is a continuous variable which is expressed in years. As the farmers experience increase the number of cows owned increase and market participation decision and level of participation increase. Therefore, it is expected that this variable affects market participation decision and level of participation positively.

RESULTS AND DISCUSSIONS

Socio-Economic Characteristics of the Sampled Dairy Households

Milk market participants and non-participants

From 238 dairy producing sampled households, 69.7% were market participants as they were found to sell raw milk at the time of the survey, while the rest (30.3%) did not sell at the time of survey. The average age of the milk market participants is lower than that of non participants is which is smaller than that of the finding of *(*Belay et al., 2011). Age structure determines the composition of goods and services thus has direct influence on dairy management practices and other economic and social activities necessary for improved livelihoods. The mean family size of milk market participating household was less than the non-participating households and smaller than that of (Asaminew and Eyasu, 2009). Table 2 shows that the t-test statistics for the family size of the market participants and non-participants was found to be significant at less than 5% probability level. As expected, farm households with larger family size in adult equivalent had lower marketable milk surplus than dairy household with smaller family size. This indicates that when family size increases milk consumption increase and milk market participation decreases. The mean education level of milk market participants was higher than that of non participating dairy producers statistically significant at less than 5% significance level. This implies that education had positive influence in the milk market participation. The mean experience years in dairy production of milk market participants was higher than that of non-participants and the mean difference was estimated to be significant at 10% probability level. This shows that when the year of experience in dairy production increases dairy producers participate more in milk market. With regard to milking cow ownership, the mean numbers of cross breed milking cows owned by participating households is higher than that of non-participating sampled dairy household and were found to be significant at less than 1% probability level. Whereas, the mean number of local breed milking cow owned by participating households is lower than that of non participating dairy household and the their mean difference was estimated to be statistically significant at less than 1% significance level. This result is consistent with the finding of Gizachew (2005) and Woldemichael, (2008). The reason for mean number of local milking cow owned by non-participating dairy household was larger than participating household seems to be that dairy households with larger number of local cow reside at periphery of the town in need of more land for their larger number of cattle and as a result they were less accessed to milk market. With regard to milk yield, mean milk yield per day of participating households is higher than that of non-participating sampled dairy household and was found to be significantly different at less than 10% probability level. The result of this study is lower than that of Woldemichael, (2008) was found to be the highest (27.12 litters) in cross medium and lowest (6.9 litters) in local small dairy farms. This result suggests that production volume was found to be the most important variable in determining the level of milk market participation.

Table 10 Socio-economic characteristics of milk market participants and non-participants

Variables	Mean value of variables for		t-value (P-value)
	Participants	Non participants	
Age	44.4639	49.667	-0.6517(0.012)
Family size	4.3976	5.4306	-6.086(0.012)
Education level	6.3795	0.6253	15.751(0.000)
Experience in dairy production	8.0422	5.1389	5.794(0.000)
Number of cross breed milking cows	1.02	0.00	6.835(0.000)
Number of local breed milking cows	0.6928	1.1944	-4.181(0.000)
Quantity of milk produced per month	90.6370	213.1262	-6.197(0.000)
Income from non dairy sources/month	4992.8916	621.6667	5.145(0.000)

Source: - own survey 2015

The independent sample t- test also revealed that there is statistically significant difference in mean value of financial income from non-dairy source between participating and non participating sampled dairy households and was estimated to be significant at less than 1% significance level. Participating sampled dairy households were higher than non-dairy financial income than non-participating sampled dairy household. This result is consistent with the finding of Woldemichael, (2008).This indicates that source of income from other activity is very important variable in determining milk market participation of dairy producers.

The survey result in Table 3 depicts that there was statistically significant difference between milk market participants and non-participant sampled dairy household's religion. The majority of sampled milk market participant household were found to belong to Muslim, where as the majority of the non-participant sampled dairy household was found to belong to Protestant Christianity. This has a direct implication with level of milk market participation. The informal survey conformed that Orthodox Christianity followers usually do not consume diet of animal origin for more than 208 days annum. During fasting days and periods, they were found to sale most of their dairy products which raise the level of milk market participation. However, the survey result highlighted that other religion had no direct impact on milk market participation level.

Table 11 Socio-economic characteristics of milk market participants and non-participants (%)

Variables		**Participant %**	**Non participant %**	**Chi square value (P-value)**
Sex	Male	48.2 %	61.1 %	3.358 (0.067)
	Female	51.8 %	31.9 %	
Religion	Muslim	66.9 %	25 %	77.834 (0.000)
	Orthodox	29.5 %	25 %	
	Protestant	3.6 %	50%	
Marital status	Married	85.5 %	88.9 %	8.928 (0.012)
	Divorced	9 %	2.8 %	
	Widowed	5.5 %	2.4 %	

The chi-square test revealed that sex, religion and marital status difference in market participating and nonparticipating was estimated to be significant at less than 1% significance level.

Descriptive Results of access to services between Market Participants and non participants

Table 4 compares access to different services between milk market participants and non-participants.

Table 12 Access to services of milk market participants and non participants

Variables	Participants (N= 79)	Non participants (159)	Total (238)	Chi2(p-value)
Access to credit				
No	54.68%	45.32%(63)	100%	69.5465
Yes	3.03%	96.97%	100%	(0.000)
Total	33.19%	66.81%	100 %	
Access to extension				Chi2 (P-value)
No	63.33 %	36.67%	100 %	59.2892
Yes	14.86 %	85.14 %	100 %	(0.000)
Total	33.19 %	66.81 %	100 %	
Access to market information				Chi2 (P-value)
No	62.92 %	37.08 %	100 %	56.6557
Yes	15.44 %	84.56 %	100 %	(0.000)
Total	33.19 %	66.81 %	100 %	
Distance of nearest milk market				Chi2 (P-value)
< 1 km	12.36 %	87.64%	100 %	95.7632
1-2 km	14.47 %	85.53 %	100 %	(0.000)
>2km	78.08 %	21.92 %	100 %	
Total	33.19 %	66.81 %	100 %	

45.32% of non-participants and 96.97% of participants have access to credit while 54.68% of non-participants and 3.03% of participants reported to have no access to credit. The result is in agreement with the finding of Woldemichael, (2008).This indicates that access to credit had a direct impact on milk market participation. The difference in access to credit across the milk market participant and non participant was found to be significant at 1% probability level. The study results revealed 63.33 % of non participants do not have access to extension and 14.86 % received extension services. 36.67 % of Participants do not have access to extension service and the rest 85.14 % had access. The result is in agreement with the finding of Woldemichael, (2008).The difference in access to extension service across the milk market participants and non participants was found to be significant at less than 1% significance level. 84.56 % of participants had access to current milk market price information and the rest 37.08 % of respondents had no access to market information. 15.44 % of non participant had access to market information and 62.92 % of respondents do not have access to market information. The result is in agreement with the finding of Woldemichael, (2008). The Chi-square test statistics revealed that there was statistical difference in access to milk market information among milk market participants and non participants. The survey result revealed that milk market participants had access to a variety of market information sources. The information on average distance to milk market centers was analyzed as an indicator of access to market. The survey result revealed that 12.36 % of non participants had easy access to milk market centers that means 1km far from market center, 14.47 % of them are 1-2km far from market center and the rest 78.08% of them are >2km far from market center. From participants 87.64 % of respondents of them are 1 km far from market center, 85.53 % of them are 1-2km far from market center and 21.92 % of them are >2km far from market centers. The chi-square test statistics confirmed that the difference in access to milk market center among the milk market participation was found to be significant at less than 1% significance level. Performance of dairy household also depends on access to infrastructure. Milk being a perishable commodity, good access to market is of paramount importance.

Econometric Analysis of Factors Affecting Milk Market Supply and Level of Supply

Out of 11 hypothesized variables, five variables were found to determine the probability of milk market participation. These are family size of household (FSHH), distance to the nearest market (DNMM), number of cross breed milking cows (NCB1), number of local breed (NLB) and access to credit (ROC) (Table 5).

Table 13 Determinants of market participation in Milk value chain in the study area

Variables	Coefficient.	Z	P>|z|	Marginal effect
AGE	.0362866	1.37	0.170	.0005139
SEX	-.1636869	-0.53	0.593	-.0023122
FSHH	1.008894	3.02	0.003	.0142877
ELHH1	-.0812903	-0.62	0.535	-.0011512
DONM	-.5122035	-1.83	0.067	-.0072537
NCB1	2.727608	3.50	0.000	.0386278
NLB	1.093932	2.22	0.027	.015492
INFDS	.00014	0.99	0.322	1.98e-06
ROC	.9420165	1.73	0.084	.0133258
ATDPES	-.1840326	-0.41	0.683	-.002484
YPIDP	-.0440252	-0.58	0.561	-.0006235
ATMI	-.1063027	-0.24	0.807	-.001458

Table 14 Determinants of level of participation in milk market

Variables	Coefficient.	Z	P>|z|	Marginal effect
AGE	.0150276	0.43	0.670	.0199854
SEX	-.130496	-0.34	0.731	-.0261677
FSHH	1.311071	3.54	0.000	1.327644
ELHH1	-.1706896	-1.07	0.286	-.1330025
NCB1	4.430374	10.84	0.000	4.264212
NLB	2.660743	6.09	0.000	2.360488
DONM	-.6247019	-1.94	0.052	-.6701386
INFDS	.0002501	5.24	0.000	.0002491
YPIDP	-.1204425	-1.26	0.207	-.0701504
ATMI	-.5622218	-1.08	0.279	-.3199413
_cons	-2.384925	-1.18	0.237	
LAMDA	2.409337	4.50	0.000	

Dependent variable = dairy market participation Censored obs = 79
Uncensored obs = 159 Wald chi2 (10) = 1236.17 Prob > chi2 = 0.0000

Family size of the dairy household (FSHH): The variable is statistically significant at less than 5% significance level. As expected, the variable has a positive effect on probability of dairy household milk market participation decision. This result is in contrast with the study conducted by Embaye (2010**)** in atsbiwenberta and alamata Woredas which confirmed the negative effect of the variable but in agreement with the study of Woldemichael (2008). The positive and significant relationship indicates that as dairying is labour intensive activity, larger family size provides higher labour force to undertake dairy production and management activities easily which in turn increases daily marketable milk volume leading to increased capacity of dairy household milk market participation. The marginal effect of the variable also emphasizes that for every increase in adult equivalent increases the probability of milk market participation decision of the household increases by 1.4%.

Distance to nearest milk market (DONM): This variable has negative effect on milk market participation and found to be statistically significant at less than 10% significance 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 also confirms that a one-kilometer increase in milk market distance from the dairy farm owner reduces the probability of participation decision in milk market by 0.7%. This result is in agreement with the work of Embaye (2010**).** Similarly, study conducted by Holloway et.al. (2002) and Gizachew (2005) found the negative relationship between distance to market and the probability of participation in milk market.

Number of cross breed milking cows (CB). As it was expected, this variable has positive relationship with household milk market participation decision and was statistically significant at 1% probability level. The marginal effect of the variable also confirms that a unit increase in cross breed dairy milking cow leads the probability of dairy household milk market participation to rise by 3.86%. This result is in agreement with the study of Woldemichael (2008).Moreover, this result designate that increasing number of quality crossbred dairy cows is an important policy relevant variable in stimulating the smallholder to market entry and benefit from economic transaction.

Number of local breed cows (NLB): As opposed to the hypothesis**,** this variable is significant at 5% probability level and has positive effect on milk market participation decision. 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 sale volume of milk per day per household. The marginal effect predicts that the addition of one local breed milking cow causes the marketable milk surplus of the dairy household to rise per dairy household by **1.5%.** Furthermore, this result elaborates that marketable milk surplus per day increases in response to the increase in milking cow number. Holloway et.al. (2002), found that household with larger dairy cows was positively associated with value of sale of dairy products.

Access to credit service (ROC): as hypothesized, this variable is significant at 10% probability level and has positive effect on milk market participation decision. The marginal effect predicts that access of credit service increases milk market participation decision by 1.3%.

Estimation Results of the Selection Equation: In the selection equation of the model, five variables are found to be significant determinants of level of milk market participation. These are family size (FSHH), number of crossbreed milking cows (CB), and number of local breed milking cows (NLB), distance from nearest milk market (DNMM) and income from non dairy source (INFDS).

Family size of the household (FSHH): This variable has positive effect on marketable surplus of milk per day per dairy household and statistically significant at less than 1% probability level. The positive and significant coefficient of family size pictures that the lager the family size, the more volume of milk is supplied to market per day. The coefficient of the variable confirms that as the dairy household family size increases by one adult equivalent, volume of marketable milk surplus rises by 1.3 liters per day. This is because of the fact that household members represent labour resources for better management of dairy cows and, hence, are cited to be directly related to participation in production and marketing activities. The study conducted by Woldemichael, 2008 confirmed that the positive and significant effect in the level of participation.

Income from non-dairy source (INFDS): Financial income from non-dairy sources has positive effect on sale volume and found to be significant at 1% probability level. The positive relation between the variables indicates that any additional financial income enables the dairy household to purchase more number of improved dairy cows which can contribute to increased milk production per household per day and then contribute to increased milk market participation decision by dairy household. This result is in agreement with the study of Woldemichael, 2008.

Number of crossbred cows (CB): As hypothesized**,** this variable is significant at 1% probability level and has positive effect on marketable milk volume. The model output predicts that the addition of one crossbreed milking cow causes the marketable milk surplus of the dairy household to rise by 4.4 liters per day per dairy household. This result is plausible and suggests that marketable milk surplus of the household in the study areas are more responsive to number of cross breed milk cow. This result is in agreement with the study of Woldemichael, 2008.

Number of local breed cows (NLB): As opposed to the hypothesis**,** this variable is significant at 1% probability level and has positive effect on marketable milk volume. The model output predicts that the addition of one local breed milking cow causes the marketable milk surplus of the dairy household to rise by 2.6 liters per day per dairy household. Furthermore, this result elaborates that marketable milk surplus per day increases in response to the increase in milking cow number. Holloway et.al. (2002), found that household with larger dairy cows was positively associated with value of sale of dairy products.

Distance to the nearest milk market (DONM): This variable has negative effect on the level of milk market participation and found to be statistically significant at less than 5% significance level. The negative relationship indicates that the farther is a household from the milk market, the more difficult and costly it would be to supply milk to the market. The model output also confirms that a one-kilometer increase in milk market distance from the dairy farm owner reduces the level of milk supplied to the market by 0.6 liters. In other words, as the dairy households become closer to milk market center by one kilometer, the level of his/her milk supplied to the market rises. This result is in agreement with the work of Embaye, 2010**.**

LAMDA: The coefficient of Mills ratio (Lamda) in the Heckman two-stage estimation is significant at the probability of less than 1% and it indicates that in Heckman two-stage model, the correction for selectivity bias is significant.

CONCLUSION AND RECOMMENDATION

As it was seen from the model analysis, number of cross breed cow has strong positive and significant impact on both milk market participation decision and sale volume of milk per day, government and other existing and potential dairy sector development partners of the study area are required to give due attention for integrating cross breed cows to the smallholders dairy sector of the study areas in particular and of the country in general. This can be achieved in two ways: (1) through promotion of large private investment, which at the end will introduce new technology in the sector such as improved genotypes, feed and processing, and (2) as smallholders will likely continue dominating the sector, government should also promote integration of crossbred cattle into the smallholder sector through improving their access to improved cattle breeds, AI service, veterinary service, and credit.

The probit model analysis also shown that distance to milk market was negatively related to milk market

participation decision. This negative valued relation of the variable indicates that the closer the milk market, the lesser would be the transportation charges, reduced loss due to spoilage, and reduced other marketing costs, better access to market information and facilities which in turn increases the return to labor and capital of the dairy producer's household. Thus, the government should consider better means of coping with access problems to milk and other dairy products market through increasing dairy market out lets by forming market oriented dairy producer led-cooperative, and increasing and improving infrastructure facilities in order to reduce transaction cost associated with distance from milk market out lets. The selection equation of the Heckman two step procedure model analysis revealed that income from non-dairy source of dairy household was found to affect the sale volume of milk positively. The positively related value of the variable suggests that through improving liquidity, this income makes the household to improve sale volume of milk through expanding dairy production. Therefore, increasing the dimension of access to well functioning formal financial systems is critical in influencing sale volume of milk per day per dairy household.

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