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ANALYSIS OF MARKET PARTICIPATION OF SMALL DAIRY FARMERS IN GUBRE TOWN, SNNPR, ETHIOPIA

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ABSTRACT: With a descriptive as well as econometrics analysis method, this study investigated 140 arbitrarily selected dairy producer households, focusing on analyzing dairy market participation of small dairy farmers in Gubre town south nation nationality and people region of Ethiopia. The purpose of this paper is to provide information regarding the determinants of dairy market participation and rate of participation in Gubre town. Based on the findings, Out of a total of 140 dairy producing sample respondents, 65 (46.43%) were they participate in the dairy market, while the rest 75 (53.57%) were nonparticipants. The mean production of milk per day for the sample, participant, and non-participant respondents was 1.94, 2.42 and 1.51 liter respectively. The number of children less than the age of five years, the volume of milk produced, distance to the closest dairy market and information access considerably affects both the dairy market participation and rate of participation decision of the households. But the size of milking cows kept and credit use only affects the dairy market participation decision of the households. Hence, policies aiming at increasing producer's provision of modern inputs, increasing the number and productivity of dairy cows and change of smallholder farmer's attitudes towards dairy production and joining the dairy market were recommended to accelerate the dairy market contribution in the study area of Gubre town.

Keywords: dairy, Gubre town, non-participant, participant

INTRODUCTION

In today's world, Food insecurity, poverty and unemployment are the main problems, especially in developing countries. In order to solve this problems and bringing economic growth the role of agricultural sector is greater. Furthermore, it is a means of generating income for many peoples live in third world countries (FAO, 2003). The life of those people's lives in third world countries in one and another way depends on agriculture, mainly on livestock. They sustain their lives through agricultural activities (Nguyen, and Cheng, 1997).

Agriculture is contributing about 43% of gross domestic product (GDP), 85% of the foreign earnings and 85% of employment opportunities and it is the most important people's livelihood activity in Ethiopia. Hence, development of agriculture is important for addressing food insecurity, to alleviate poverty and to bring sustainable national economic growth and development and for improving the capacity of the country (Deres, 2010). The livestock sector also plays an energetic role as a source of food, income and foreign currency to Ethiopian economy and donates about 12 and 33% of the total and agricultural GDP, respectively (Deres, 2010) and it contributes 30% of agricultural employment (SNV, 2008).

In Ethiopia there is a huge potential for dairy production and marketing due to its ample livestock resource availability for dairy production and high local demand for dairy products, so boosting marketing of dairy products is believed to be useful for poverty

reduction through generating income and creating employment opportunities for the rural poor. Dairy market participation was important for minimizing losses and diversification for dairy farmers.

Over the past few years milk production in Ethiopia is improved. Central Statistical Agency estimation shows that the country produced 2,765 million liters of cow milk in 2008/09, 2,940 million liters of cow milk in 2009/10, 4,058 million liters of cow milk in 2010/11 (CSA, 2011) and 3,044,977 tons in 2014/15 (Zijlstra et al., 2015). The total number of cattle in Ethiopian was 56.7 million (Zijlstra et al., 2015). Due to their large number, the livestock sector in general and the dairy industry in particular does not provide the expected aid to the national economy due to several factors. The development of the dairy sector in the country is affected by a number of technical, institutional and socioeconomic constraints (MoARD, 2007).

Milk and milk products are supplied to market through both informal and formal marketing systems in Ethiopia. In the informal marketing system, producers sell to consumers directly or to unlicensed traders. Price is usually set through negotiation between the seller and the buyer, this system is dominant in the rural dairy production system. In the formal marketing system, there are cooperatives and private milk collecting and processing groups that receive milk from producers and distribute to consumers, supermarkets and retailers; this system most of the time exist in urban and pre-urban dairy systems, although the number of cooperatives and groups are few and their performance is low (Woldemichael, 2008). There are many contributions that small scale dairy farming brings to a household, but the most quantifiable is its contribution on the household income (Urassa and Raphael 2002).

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).

Gubre town is found in Gurage zone of south nation nationality people regional state. In Gubre town there is great potential of dairy production because of the ample availability of labour force, water and large number of milking cows, but there is a market participation problem of small dairy farmers. Many dairy producer households cannot supply their product to the market due to many factors. And those suppliers can only supply a small amount of their total production of dairy. However, the underlying factors affecting the dairy market participation are not well addressed. Because of this, most smallholder dairy farmers could not get appropriate income from dairy through sustainable milk and milk products marketing.

So, it requires understanding of those factors that affect dairy farmers' participation in the dairy market. Empirical findings show that some studies were conducted on farm household dairy market participation in Ethiopia (Berhanu, 2012; Meryem, 2013; Hirut, 2016 and Sosina, 2016 in recent time and some other earlier studs). Most of these studies were done on the milk market participation alone that means they exclude other dairy products in their study. This study is initiated with the purpose to analysis dairy market participation of small dairy producers that could be used as points of entry for research, policy and development interventions to revitalize the dairy sector of the study area.

The general Objective of the study was to analyses market participation of small dairy farmers in Gubre town, Ethiopia.

The specific objectives of this study are:

- To describe the socioeconomic characteristics of small dairy farmers in Gubre town
- To assess determinants of dairy market participation and rate of participation in Gubre town

METHODOLOGY

Study Area: The study was conducted at Gubre town in the Southern Nations Nationalities and Peoples Region (SNNPR), about 178 km southwest of Addis Ababa at 7.30°N and 36.20°E. The average annual temperature and rainfall of the area is 20.6°C and 164 mm respectively. The altitude of the area is 1885 meters above sea. The main economic activities of the town are farming and trade. Seasonal rainfall pattern determined the farming activities of the area. The subsistence agriculture in Gubre is primarily based on enset and chat, together with maize, teff as well as some annual root crops and important cash crops including coffee. There are a number of home based private livestock holding in the study area. The majority of milk produced is consumed at household level in the form of fluid milk, butter and cheese. Parts of dairy products have been sold.

Data Type and Method of Data Collection: This study used primary and secondary types of data. Regarding sources of data, both primary and secondary sources were used in collecting valuable and relevant data. Primary data were collected through field survey. Information on the position of dairy producers and other data were collected from the sample respondents and other participants in the study area. Interview, questionnaire and personal observation were used to collect primary data. Before collecting the primary data, reviews were made on different published and unpublished documents/literatures that are significant for the study. Moreover, secondary data were collected from reports of different organizations, including government institutions like agricultural offices (regional, zonal and district), individuals and from different researches.

Sampling Procedure: Two stage sampling procedure was used. At the first stage, the study area was selected purposively on the basis of milk production potential and the presence of a dairy market participation problem. The area selected for this study was Gubre town. Prior to dairy household sampling, initially the total number of dairy farm households in the town was obtained. At the second stage, a simple random sampling procedure was used to select specific households from the area. This study applies a simplified formula provided by (Yamane, 1967). And 92% confidence level with 8% level of precision was used in order to reduce sample size because the households in the area are homogeneous characteristics. The formula was given as:

$$n = \frac{N}{1 + N * e^2} \quad N = 1042, e = 0.08$$

$$= \frac{1042}{7.6688} \quad n \approx 140$$

$$n = \frac{1042}{1 + 1042 * 0.08^2} = \frac{1042}{1 + 1042 * 0.0064}$$

Where:

n = sample size

N = the population size and

„e“ = the level of precision (i.e. 0.08)

According to the above formula, the sample size was approximately 140

Data Analysis Methods: Two types of data analysis methods were used to analyze the data collected from dairy producers, which is a descriptive and econometric analysis. The survey responses summarized into groups and given codes before entering into the computer. The data collected from the study area were entered into SPSS 16 for managing the data and analyzed by using STATA 13.

Descriptive analysis: Refers to the use of percentages, means, frequencies, and standard deviations for comparing socioeconomic and institutional characteristics of dairy producer households in the study area.

Econometric analysis: Smallholder farmers who produce dairy products may or may not participate in dairy products marketing (May sale or not sale). This dependent variable is discrete consisting of two outcomes yes or no. Discrete choice models dealing with such kind of binary responses (yes or no choice) are called dichotomous or dummy variable regression models (binary choice models). They are linear probability model, logistic distribution function (logit) model and normal distribution function (probit) model. In which determinants of an event happening or not happening was identified. These functions are used to approximate the mathematical relationship between dependent and independent variables (Gujarati 1988).

The linear probability model is simple to estimate and use, but it has some drawbacks. The two most important drawbacks are that the fitted probabilities can be less than zero or greater than one and the partial effect of any explanatory variables are constant. These limitations of the LPM can be overcome by using more sophisticated binary response models namely logit and probit models (Wooldridge 2002).

But for all practical purposes, both logit and probit models give similar results. Probit model is mathematically a bit difficult as it involves integrals. In practice, the choice therefore depends on the ease of computation, which is not a serious problem with sophisticated statistical packages that are now readily available (Gujarati 2004). Logit model was used to identify factors affecting market participation of small dairy farmers;

$$P_i[y = 1|X_i] = \frac{1}{1+e^{-Z_i}} = \frac{e^{Z_i}}{1+e^{Z_i}}$$

Where P_i - is the probability of participating in the market for the i^{th} dairy producer and it ranges from 0 to 1.

Z_i - is a function of a number of explanatory variables (x) which is also expressed as:-

$$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \dots \dots \dots + \beta_n X_n$$

Where β_0 is an intercept, $\beta_1, \beta_2, \beta_3 \dots \dots \dots \beta_n$ Are parameters (slopes) of the equation in the model and $X_1, X_2, X_3 \dots \dots \dots X_n$ are explanatory variables

$\frac{P_i}{1-P_i} = e^{Z_i} = e^{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \dots \dots \dots + \beta_n X_n}$ This is the odds ratio: is the ratio of the probability that dairy producer would participate in the market to the ratio he/she would not.

$\ln\left[\frac{P_i}{1-P_i}\right] = Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \dots \dots \dots + \beta_n X_n$ This is the log odds ratio. The logistic regression slope coefficient is interpreted as the change in the natural log of the odds ratio associated with a unit change in the independent variable.

There are several cases where the variable to be modeled was limited in its range. Because of the limitations put on the values taken by the dependent variables, such models known as limited dependent variable regression models. When information on the regressand is available for some observations, for such kind of dependent variables it is possible to use OLS and Tobit models for analyzing them. Using OLS may result in a biased and inconsistent parameter estimates even asymptotically. The use of Tobit models to study censored and limited dependent variables has become increasingly common in applied social science research for the past two decades (Smith and Brame, 2003). Tobit is an extension of the probit model and it is one approach to dealing with the problem of censored data (Johnston and Dinardo, 1997).

In this study the value of the dependent variable was rate of participation that was computed as the ratio of amount of dairy supplied to the total amount of dairy produced by small dairy farmers. Thus, the value of the dependent variable ranges between 0 and 1 (zero (0) for those producers who are not participate in the market at all and one (1) for those producers they supply there total product) and Tobit model was chosen as a more appropriate econometric model. In this study Tobit model was used to identify factors affecting the rate of dairy market participation of small dairy farmers. The model derives from an underlying classical normal linear regression and can be represented as:

$$Y^* = \beta X_i + \varepsilon_i$$

$$\varepsilon \sim N(0, \delta^2)$$

Denoting Y_i as the observed dependent (censored) variable

$$Y_i = \begin{cases} L & \text{if } Y^* \leq L \\ Y^* = \beta X_i + \varepsilon_i & \text{if } L < Y^* < U \\ U & \text{if } Y^* \geq U \end{cases}$$

Where

Y_i = the observed dependent variable, in our case participation rate (ratio of amount supplied to the total amount produced)

Y_i^* = the latent variable (unobserved for values smaller than 0 and greater than 1).

X_i = is a vector of independent variables (factors affecting the rate of dairy market participation)

β_i = Vector of unknown parameters

ε_i = Residuals that are independently and normally distributed with mean zero and a common variance σ^2 ,

$i = 1, 2, \dots, n$ (n is the number of observations). And L = lower limit, U = upper limit

By using Tobit model, the rate of participation was regressed on the various factors hypothesized to influence rate of market participation of smallholder farmers in the study area. The model parameters are estimated by maximizing the Tobit likelihood function of the following form (Maddala, 1997; Amemiya, 1985).

$$L = \prod_{Y_i^* > 0} \frac{1}{\sigma} f\left[\frac{Y_i - \beta_i X_i}{\sigma}\right] \prod_{Y_i^* \leq 0} F\left[\frac{-\beta_i X_i}{\sigma}\right]$$

Where: f and F are respectively, the density function and cumulative distribution function of Y_i^* . $\prod_{Y_i^* > 0}$ Implied the product over those observations (i) for which $Y_i^* > 0$, and $\prod_{Y_i^* \leq 0}$ implied the product over those observations (i) for which $Y_i^* \leq 0$.

The Tobit coefficients do not directly give the marginal effects of the associated independent variables on the dependent variable. But their sign shows the direction of change in marginal rate of dairy market participation as the respective explanatory variable change (Maddala, 1985).

The change in the rate of dairy market participation with respect to a change in an explanatory variable among the participating households is:

$$\frac{\partial E\left(\frac{Y_i}{Y_i^*} > 0\right)}{\partial X_i} = \beta_i \left[1 - z \frac{f(z)}{F(z)} - \left(\frac{f(z)}{F(z)}\right)^2 \right]$$

Where, $F(z)$ is the cumulative normal distribution of Z , $f(z)$ is the value of the derivative of the normal curve at a given point (i.e., unit normal density), Z is the z-score for the area under normal curve, b is a vector of Tobit maximum likelihood estimates and s is the standard error of the error term.

RESULTS AND DISCUSSIONS

This part deals with the results of descriptive statistics and econometric analysis of the study. The analysis was made on the bases of the objectives of the study. For describing the general characteristics of sample dairy farm household's descriptive analysis, such as mean, percentage, frequency and standard deviation were used. The econometric analysis was done to identify factors that affect dairy farm household's market participation in the dairy market. For this study milk, butter and cheese were chosen because they were the three most important produced dairy products in the area. Milk and cheese were used for consumption only, while butter was used for household consumption and cosmetics.

Socioeconomic characteristics of sample respondents (households)

Age of the household head: The average age of the sample household heads was 42.25 years where the minimum is 23 and the maximum is 80. The average household head age of market participant was 42.91 and the corresponding figure for non-participant was 41.68. From the statistical analysis performed, it is found out that the mean age difference between participant and non-participant is not statistically significant.

Children below the age of five years: The average number of children below the age of five years of sample respondents was 0.59. The maximum and minimum number of children less than five years of age of the sample households was 4 and 0 respectively. The mean number of children below the age of five years for market participant and non-participant dairy households were 0.45 and 0.71 respectively. The mean age of children less than the age of five years was lower for participant households as compared with nonparticipant households. The t-statistic value shows that the number of children less than the age of five years is statistically significant.

Family Size: Total family size of the sample respondent households was 717. The average family size of the sample households was 5.12 where the minimum is 1 and the maximum is 10. From a total of 140 dairy producing sample households, 65 (46.43%) were market participants as they supply dairy products to the market, while the rest 75 (53.57%) did not participate in the dairy market in the study area. The market participating households were lower number of family size than non-participants. Farm households with larger family size, they consume more dairy products which reduce their market participation. But the t-test showed that there is no a significant relationship between family size and dairy market participation decision.

Number of livestock holding and Number of milking cows: The result revealed that the average number of milking cows owned by the total sample households was 1.64. The average milking cows owned by the dairy market participant and non-participant was 1.86 and 1.44 cows, respectively. The maximum and minimum number of milking cows' kept by the sample households was 3 and 1 respectively. The mean difference between dairy market participants and non-participants in terms of milking cows owning were statistically significant. The mean livestock holding in Tropical Livestock Unit (TLU) for the sample households was 3.72, where the maximum was 8.85 and the minimum was 1.2. The mean livestock holding for participant households was 3.95 TLU and 3.51 TLU for the non-participants. Dairy market participant households have better mean livestock holding than non-participant households. The mean difference in the two groups with regard to livestock holding was statistically insignificant.

The amount of milk produced: The mean production of milk per day for the sample households was 1.94 liter, and the range varies between 0.5 liter and 7 liter. The average daily production of milk for dairy market participant households was 2.42 liter while the daily average production for non-participants was 1.51 liter. The mean comparison between dairy market participants and non-participants in relation to milk production showed that the difference between the two groups was statistically significant.

Distance to the nearest dairy market: The average distance moved by the sample respondents to reach the nearest dairy market was 2.93 Km. The maximum and minimum kilometer moved by the sample respondents to reach the nearest dairy market or milk collection center was 6.6 Km and 0.1 Km respectively. Average distance moved by dairy market participants to reach the nearest dairy market was about 1.94 km, whereas non-participant households on average traveled 3.78 kilometers. Thus, there was a statistically significant difference between dairy market participants and non-participants regarding distance to the nearest dairy market.

Total Grain production: The major crops grown in the study area are teff, maize and coffee. The mean annual income obtained from grain production of the sample households was 9991 Birr, though the range varies between 0 Birr and 32841 Birr. The average annual income obtained from grain production for dairy market participants was 8223 Birr while the annual average income obtained from grain production for non-participant was 11523 Birr. The mean comparison between the participants and non-participants showed that the difference between the two groups is statistically significant.

Table 1: Summary of descriptive statistics of sample households by dairy market participation decision (continuous variables)

Variables	Description	Participation decision			t-test
		Yes	No	Total	
Age	Mean	42.91	41.68	42.25	-0.63
	Std.D	10.81	12.06	11.47	
Number of children <5 year	Mean	0.45	0.71	0.59	1.93*
	Std.D	0.64	0.91	0.80	
Family Size	Mean	5.26	5	5.12	-0.91
	Std.D	1.74	1.64	1.69	
Number of Livestock	Mean	3.95	3.51	3.72	-1.34
	Std.D	1.78	2.10	1.95	
Number of milking Cows owned	Mean	1.86	1.44	1.64	-4.30***
	Std.D	0.58	0.58	0.61	
Total milk produced per day	Mean	2.42	1.51	1.94	-5.54***
	Std.D	1.28	0.58	1.07	
Distance to the nearest Dairy market	Mean	1.94	3.78	2.93	7.91***
	Std.D	1.33	1.41	1.65	
Total income obtained from Grain produced last year	Mean	8223	11523	9991	2.69***
	Std.D	7155	7301	7395	

Source: Survey data, (2018)

Sex of the household head: A total of 140 dairy producing sample households were investigated during the survey. According to the survey result, out of the total sample respondents 37 (26.43%) of the sample households were headed by females and 103 (73.57 %) were male-headed households. From dairy market participants 49 (75.4%) were male-headed dairy producer households and the rest 16 (24.6%) of sample households were headed by females. Out of the non-participants in dairy market, 54 (72%) of sample respondents were male headed households and 21 (28%) of the households were headed by females. It indicates that male-headed households participate in the dairy market than female headed. But the chi square test showed that there is no significant relationship between sex of the household head and dairy market participation.

Education status of the household head: It was seen that 71 (50.71 %) of the sample household heads are found to be literate and 69 (49.29 %) of the sample household heads were illiterate. The comparison of dairy market participation reveals that 28 (43%) of participants and 41 (54.67%) of non-participants are found to be illiterate. The chi square test shows that there is an insignificant relationship between dairy market participation and education status of the household head.

Access to market information: Information is important for enhancing dairy market participation. However, only 55.7 percent of sample households were access to dairy market information and 44.3 percent of sample households did not have access to dairy market information. According to the survey result 59 (90.77%) of dairy market participant households and 19 (25.33%) of non-participant households get dairy market information. They were getting market information from different sources, mainly from neighbors and personal observations. The chi-square result revealed that there is a significant relationship between dairy market participation and access to information. Dairy producers who have market information were better to decide how to produce and supply dairy products to the market.

Use of credit service: The main sources of credit in the study area were micro finance institutions. From the sample respondents only 16.43% of the households take credit while 83.57 % of the households did not take credit due to various reasons. The comparison of dairy market participation released that 18 participants and 5 non-participants take credit. From dairy market participants, 27.70 percent of the sample respondents and from the non-participants, 6.67 percent of households take credit. The chi square test result shows that the relationship between use of credit and dairy market participation was statistically significant.

Table 2: Summary of descriptive statistics of sample households by dairy market participation decision (dummy variables)

Variables	Description	Participation decision			X ²
		Yes	No	Total	
Sex	Male	49 75.4	54 72	103 73.57	0.21
	Female	16 24.6	21 28	37 26.43	
Education	Literate	37 57	34 45.33	71 50.71	1.87
	Illiterate	28 43	41 54.67	69 49.29	
Information Access	Yes	59 90.77	19 25.33	78 55.7	60.43***

	No	Frequency	6	56	62	
		Percent	9.23	74.67	44.29	
Use of credit service	Yes	Frequency	18	5	23	11.21***
		Percent (%)	27.70	6.67	16.43	
	No	Frequency	47	70	117	
		Percent	72.30	93.33	83.57	

Source: Survey data, (2018)

Econometric Results

The dependent variable dairy market participation was defined as a dichotomous variable taking the value of one (1) for market participants and zero (0) for non-participants. Dairy Market participation means the supply of any kind of dairy products to the market from small holder dairy farmers own production. The rate of dairy market participation (ratio of the total amount of dairy products supplied to the market to the total amount produced) was the dependent variable. It is censored at zero (lower limit) and one (upper limit), that is, some households did not supply any dairy product to the market the value of zero for the dependent variable and some households supply all of their dairy products to the market the value of one for the dependent variable. Hence, Logit model was used to investigate the factors that determine dairy market participation and Tobit model was used to analyses the determinants of the rate of dairy market participation by small dairy producers. And STATA version 13 was used to analysis the data.

Before running the models explanatory variables were checked for existence of multicollinearity problem. Variance Inflation Factor (VIF) for continuous variables and contingency coefficients (CC) for dummy variables were computed to realize the existence of a multicollinearity problem between explanatory variables. There was no multicollinearity problem among the explanatory variables those used in the models.

Estimation outcomes show that: The result of the Logit model shows that out of twelve (12) explanatory variables, six (6) variables were found to determine the probability of market participation. These are a number of Children below the age of five years (CHILDLESS5), number of milking cows owned (NOMKCOWS), the amount of milk produced (MILKPRODU), distance to the nearest dairy market (DISTANCE), access to the market information (INFO) and use of credit (CREDIT). And the output of the Tobit model shows that out of twelve (12) explanatory variables, four (4) variables were found to determine the rate of dairy market participation. These are number of children below the age of five years (CHILDLESS5), the amount of milk produced (MILKPRODU), distance to the nearest dairy market (DISTANCE) and access to the market information (INFO). The effect of the marginal changes in the significant explanatory variables on the rate of dairy market participation is discussed below.

Number of Children below the age of five years (CHILDLESS5): As hypothesized, the number of children below the age of five years was found to be negatively and significantly related to the household dairy market participation decision and rate of participation at 1% and 5% significance level respectively. The negative relationship tells us that households with the number of children under the age of five years usually reduces the marketed surplus and have decreased the capacity to participate in the dairy market. Because milk is a major food for children and it is important for children's health and growth. So, if there are many children's in the household, the higher home consumption of milk by those children, which reduces the probability of dairy market participation and rate of participation of the household. The result of this study matches the findings of Meryem (2013).

The marginal effect of the variable also shows that other things being held constant, the number of children below the age of five years in the household increase by one unit, the probability of dairy market participation and the rate of participation of the household decreased by 38% and 3.03 % respectively.

Number of Milking cows owned: The size of milking cows owned was a positive and significant relationship with household dairy market participation and significant at 5% probability level. The positive and significant association tells us that as the number of milking cows owned by the household increases, milk production per household also rises, which in turn increases the probability of participating in the dairy market. A study conducted by Berhanu (2012) also found that the number of milking cows kept positively and significantly affects the milk market participation of households. The marginal effect also indicates that when the number of milking cows owned by the household increase by one unit the probability of participating in the dairy market increase by 34.6%.

The amount of milk produced (MILKPRODU): As expected, this variable was positively and significantly affected the probability and rate of household market participation at 10%, and 1% significance level respectively. The positive and significant relationship among the two variables indicates that as the volume of milk produced per day in the household increases, the percentage share of milk remain from home utilization and supplied to the market in the household increases. As a result, the probability and rate of dairy market participation in the household also increase. The marginal effect of the variable also confirmed that an increase in the volume of milk produced per day per household by one liter leads to the probability and rate of household market participation to rise by 20.6 % and 2.41% respectively. This result suggests that the marketable dairy surplus of the households in the study area is more responsive to the volume of milk produced. Furthermore, this result explains that the probability and rate of market participation increase in response to the increase in the amount of milk produced.

Distance to the nearest dairy market (DISTANCE): distance to the nearest dairy market was a negative and significant effect on dairy market participation and rate of participation at a 1% significance level. The negative relationship among distance to the nearest dairy market and dairy market participation decision and rate of participation indicates that as the distance of a household from the dairy market is higher, the higher would be the transportation charges, increase transaction costs, walking time and loss due to damage, and also increase other marketing costs, low access to market information and facilities. This reduces returns to dairy and the motivations to participate in the market. It also decreases the market participation rate of dairy producers. A study conducted by Woldemichael (2008) and Sosina (2016) also found that distance to the nearest dairy market negatively and significantly affects dairy market participation. The marginal effect also confirms that a one-kilometer increase in distance from the dairy producers to the dairy market the probability and rate of dairy producer participation in the dairy market reduced by 25 % and 1.83% respectively.

Access to market information (INFO): It was hypothesized that access to market information affects the probability and rate of dairy market participation positively and found to be statistically significant at a 1% significance level. The positive relationship indicates that farmers' market participation decision was based on the availability of market information. The availability of good information leads farmers to prepare a good decision regarding dairy production and marketing which encourages dairy producers' participation in the dairy market. On the other hand, wrong price information may obtain from poorly integrated marketing; it may create inefficient product movement. A study conducted by Meryem (2013) also found that access to market information positively and significantly affects milk market participation. The marginal effect shows that as dairy producers get

19 access to market information the probability and rate of households dairy market participation decision increases by 73.9 % and 12.03% respectively, other factors being kept constant. 66

Credit use: this variable positively influences the probability of dairy market participation by households. It is significant at 5% probability level. The positive relationship indicates that additional financial income obtained from credit enables the dairy households to purchase additional dairy cows and different inputs (like feed and dairying materials), which can contribute to increase milk production per household per day and then contribute to increasing the probability of dairy market participation by dairy households. A study conducted by Meryem (2013) also found that credit use positively and significantly affects milk market participation. The marginal effect shows that when households used to credit the probability of participation in the dairy market increase by 50.2%. 4 2 2 17 33 65

50 Table 3: Estimation result of the binary logit model and its marginal effect

Variable	Coef.	Std. Err.	dy/dx
AGEHHH	0.013	0.035	0.003
SEXHHH	-0.361	0.727	-0.090
EDUHHH	1.003	0.810	0.243
CHILDLLESS5	-1.538***	0.562	-0.380
FASIZE	0.113	0.217	0.028
GRPRODU	0.00003	0.00006	6.29e-06
NOMKCOWS	1.400**	0.696	0.346
TOTLIVSTO	-0.188	0.217	-0.046
MILKPRODU	0.835*	0.446	0.206
DISTANCE	-1.013***	0.262	-0.250
INFO	3.936***	0.893	0.7390
CREDIT	2.383**	1.071	0.502
cons	-3.775	2.077	

44, ** and * are level of significant at 1%, 5% and 10% respectively. 14

Number of obs = 140

LR chi2 (12) = 124.84

Prob > chi2 = 0.0000

Log likelihood = -34.265304

Pseudo R2 = 0.6456

Source: Survey data, (2018)

1 Table 4: Estimation result of Tobit model and effects of changes in the significant explanatory variables on the rate of dairy market participation

variables	Coef.	Std. Err.	dy/dx
AGEHHH	0.004	0.002	0.001
SEXHHH	-0.035	0.062	-0.012
EDUHHH	0.077	0.056	0.026
CHILDLLESS5	-0.092**	0.038	-0.030
FASIZE	-0.006	0.016	-0.002

GRPRODU	6.45e-06	3.92e-06	2.13e-06
NOMKCOWS	0.058	0.050	0.019
TOTLIVSTO	-0.024	0.018	-0.008
MILKPRODU	0.073***	0.022	0.024
DISTANCE	-0.055***	0.018	-0.018
INFO	0.371***	0.070	0.120
CREDIT	0.095	0.061	0.034
cons	-0.393	0.154	

27, ** and * are level of significant at 1%, 5% and 10% respectively.

Number of obs = 140

LR chi2 (12) = 112.60

Prob > chi2 = 0.0000

Pseudo R2 = 0.7448

75 left-censored observations

65 uncensored observations

0 right-censored observation

Source: Survey data, (2018)

1

CONCLUSION AND RECOMMENDATION

From the outcomes of the study, the following conclusions and policy suggestions are mentioned for policy makers, researchers and other responsible bodies who are involved in helping the dairy sector.

Based on the outcomes of the study, the amount of milk produced, number of children below the age of five years, distance to the nearest dairy market and access to market information where significantly influenced the probability and rate of dairy market participation of households. In addition, use of credit and Number of milking cows owned were significantly affects the probability of dairy market participation

15

Number of Children below the age of five years negatively determines probability and rate of dairy market participation. Households with number of children under the age of five years usually reduce the marketed surplus and have decreased the capacity to participate in the dairy market. Therefore, family planning training would be given to the households in order to reduce the number of children below the age of five years in a household.

3

Number of milking cows owned positively and significantly affected probability of dairy market participation. This suggests that the probability of dairy market participation increase as the number of milking cows' increase, through increasing milk produce per day per household. So governments and other responsible bodies should integrate crossbred cows into smallholder production and upgrading milk production capacity of local cows.

The amount of milk produced also positively determines the probability and rate of dairy market participation of the household. The amount of milk produced can be increased through adoption of crossbred cows, but which is not kept mostly by rural households who are far away from urban centers, as they have low access to markets. The policy implication is that in order to increase the amount of milk produced per day per household producers would adopt crossbred cows. Government and other responsible bodies support those dairy producers by giving training and other services in the area.

The probability and rate of dairy market participation of the household were negatively affected by distance to the nearest dairy market. As distance from the nearest dairy market increases household probability and rate of dairy market participation decreases. The policy implication is that Governments and those responsible bodies requires to improved infrastructure and transportation facilities through repairing roads.

19

Access to market information affects the probability and rate of dairy market participation of the household positively. Thus, the dairy producers should try to get access to market information. Distribution of market information can be done through different Medias.

Use of credit positively affected the probability of dairy market participation. Credit enables the dairy households to purchase additional dairy cows and different inputs like feed and dairying materials, which contribute to increase milk production and dairy market participation. The policy implication is that the government, NGOs and other responsible bodes should create easy ways of getting credit for farmers.

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