



Research Article

Analysis of market participation of small dairy farmers in gubre town, snnpr, ethiopia

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Abstract

With a descriptive as well as econometric 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's below the age of five year, 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.

Introduction

In today's world, food insecurity, poverty and unemployment are the main problems, especially in developing countries. In order to solve these 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 live 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 all the finished goods and services produced, 85% of income obtained from foreign countries 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 shortage of food and to get continues domestic economic growth and development and for improving the capacity of the country (Deres, 2010). The livestock segment also have an energetic part as a source

of diet, earnings and external currency to domestic economy and donates around 12 and 33% of the over-all and agricultural output, respectively (Deres, 2010) and it contributes 30% of agricultural employment (SNV, 2008).

Ethiopia has a vast capacity for dairy making and supplying due to its ample livestock resource availability for dairy production and high local demand for dairy outputs, so boosting supplying of dairy outputs 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, 2,940, and 4,058 million liters of cattle milk in 2008/09, 2009/10, 2010/11 respectively (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 especially



the dairy industry does not offer probable aid to the domestic economy because of various factors. Technical, institutional and socio-economic problems are the main constraints of the development of this sector in a country (MoARD, 2007).

In Ethiopia, dairy products are supplied to the market in different ways (formally or informally). Most of the producer's especially rural producers supply their products by using the informal way they sell directly to consumers or illegitimate traders and they decide the price through negotiation. A small number of producers especially urban producers they use formal ways to supply their products. Producers supply to cooperatives and milk collecting groups. The number of cooperatives and milk collecting groups is few and they have low performance (Woldemichael, 2008). There are many contributions that small scale dairy farming brings to a family, but the most quantifiable is its contribution to the household income (Urassa and Raphael 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 fundamental 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) was conducting research with the objective of market access and value chain analysis of dairy products in the Wolaita zone. In the study area around 59.4%, of the milk produced per day was supplied to the market. The econometric results have shown that the age of household head, experience, milk yield, number of milking cows owned and land size affect the household's milk market participation. And also, family size, milk yield, and experience significantly affected the volume of milk supply. Meryem (2013) conducted a research on the objective of Analysis of cow milk market chain. The estimation result showed that dairy product market participation decision was significantly and positively affected by age, education level, land ownership, adopting dairy technology, and access to market information of households. Research conducted by Woldemichael (2008), with the objective of analyzing dairy marketing chains in the Hawassa, Shashemane and Yergalem. The result shows that dairy household's market participation decision was affected by age of the household head, family size, education level, experience in dairy production, number of crossbreed milking cows owned, and distance from the milk markets center.

Sosina (2016) was conducting research on the objective of assessing the value chain of dairy products in Meta district, Eastern Ethiopia. The empirical findings propose that distance, off-farm income, income obtain from the crop, age of household head, and land size was found to be negatively and significantly affecting milk market participation decision. Supplementary feed, crossbreed dairy cows and the number of livestock were positively and significantly influenced the amount of milk marketed.

However, most of these studies were done on the milk market participation alone that means they exclude other dairy products in their study. And also they are not studies factors that affect the rate of dairy market participation of the dairy households. This study is initiated with the purpose of analyzing dairy market participation of small dairy producers that could be used as points of entrance for research, policy, and development interventions to revive 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 socio-economic characteristics of small dairy farmers in Gubre town
- To assess determinants of dairy market participation and rate of participation in Gubre town

Significance of the Study: The result of this study would be useful to provide valuable information on market participation of small dairy farmers; it helps policymakers in designing appropriate policies for intervention and for other responsible body's. All peoples that are engaged in the development of this sector would be benefited from the findings of this study. The outcome of this study also believes to be useful for dairy producers to make better decisions. The work also helps as a reference document for other studies.

Methodology

Study Area: The present study was conducted at Gubre town in the Southern Nations Nationalities and Peoples Region (SNNPR), Gurage zone, positioned at 178 km southwest of Addis Ababa and 20 km east of Wolkite town. Wolkite is an administration and trading center of Gurage zone. It is found southwest of Addis Ababa along the main Addis Ababa - Jimma road at a distance of 158 km. Topography of the town is characterized by flat areas. Gubre is bordered on the south, west and east both by Cheha woreda and on the north by the Wabe River which separates it from Abeshge and Kebena woreda.

According to Gubre town health office (2017) the total population of the town was 5113 of which 2662 were male and the rest 2451 were female. The largest ethnic group reported in Gubre, who were almost the only one in this town, were the Sebat Bet Gurage (99.23%); all other ethnic groups made up 0.77% of the population. Sebat Bet Gurage



was spoken as a first language by 97.91% of the population, and 1.65% spoke Amharic; the remaining 0.44% spoke all other primary languages reported. The number of the populations were Muslim, with 44.17% of the population, while 41.71% practiced Ethiopian Orthodox Christianity, 8.31% were Catholic, and 5.42% were Protestants. Concerning education, 29.33% of the population were considered literate, which is more than the Zone average of 20.62%; 20.47% of children aged 7–12 were in primary school, 5.28% of the children aged 13–14 were in junior secondary school, and 6.67% of the populations aged 15–18 were in senior secondary school.

The main economic activities of the town are farming and trade. Trade is the main livelihood strategy for the study area. Many of the population depend on trade as the livelihood strategy. Most of the peoples found in the area engaged in peddler (Suq bederete), petty market, kiosk & shop and service providing types of business (like shoeshine, tea shop). They also participate in the trading of chat and fruits. 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 same 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 like butter and cheese have been sold through informal markets.

Data Type and Method of Data Collection: This study used primary and secondary types of data. Regarding sources of data, data obtained from 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 papers/literatures that are significant for the study. Moreover, secondary data were collected from reports of different organizations, including government institutions like agricultural offices, 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 dairy production potential and the existence of a dairy market participation problem. The area selected for this study was Gubre town. Gubre town was selected because of the availability of large number of cattle's and good weather condition for dairy production. And also the availability of dairy market participation problems. Prior to dairy household sampling, initially the total number of dairy farm households (complete listing of all the dairy farms) in the town was obtained. At the second stage, a simple random sampling procedure was used to select sample households from the area. To select sample respondents from the area, first the household heads in the study area were identified (obtained). Then the sample respondents from the area were selected randomly using simple random sampling technique. The farmers in the

area were selected randomly from the list of household heads. After the random sampling was made unfortunately some farmers were found to be that they had no milking cows at the survey time. As a result, there was additional random selection to replace those farmers who had no milking cows. In these way a total of 140 sample households were selected randomly and each was interviewed for the purpose.

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 had relatively homogeneous characteristics (their socio-economic characters had relatively similar). The formula was given as;

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

$$N=1042,$$

$$e=0.08$$

$$n = \frac{1042}{1 + 1042 * 0.08^2} = \frac{1042}{1 + 1042 * 0.0064} = \frac{1042}{7.6688}$$

$$n \approx 140$$

Where:

n = sample size

N = the number population 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 were 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. In this study descriptive statistics was used to explain the different socio-economic characteristics of the sample households. These include mean, percentage, standard deviations and frequency of occurrence for the participant and non-participant dairy producers. The statistical significance of the variables were tested for dummy variables by using chi-square (χ^2) and for continuous variables by using t-tests.

Econometric analysis

In this thesis Logit model was used to recognize the determinants of market involvement of small dairy farmers;

$$Pi[y = 1 | Xj] = \frac{1}{1 + e^{-Zi}} = \frac{e^{Zi}}{1 + e^{Zi}}$$



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 $x_1, 2, 3 \dots \dots \dots x_n$ 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.

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:

$$y^* = \beta \times i + \varepsilon_i$$

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

Denoting Y_i as the observed dependent (censored) variable

$$y_i = \begin{cases} L \text{ if } Y^* \leq L \\ Y^* = \beta \times i + \varepsilon_i \text{ if } L < U \\ U \text{ if } Y^* \geq U \end{cases}$$

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).

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

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:

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

Hypothesis and Variable Definition: In order to explain market participation of small dairy farmer's continuous and dummy variables were identified based on economic theories and the findings of different empirical studies. The following variables were constructed:

Dependent variables

Dairy market participation decision: is a dummy variable that represents the probability of dairy market participation of the household. For the household who participate in dairy market the variable takes the value of one other ways it takes the value of zero.

Dairy market Participation rate: is continues variable measured as the ratio of amount of dairy supplied to the total amount of milk produced. It is the percentage of dairy supplied to the market for the total production. Aggregating over multiple dairy products has made it impossible to work with quantities for different dairy products produced and sold cannot be aggregated directly. So use of values instead of quantities was made to solve this problem. Village level market prices for each dairy product during the respective survey period were used.

Independent variables

Age of the household head: It is a continuous variable and measured in years. Old household heads are supposed to



be wise in resource use, and it is estimated to have positively affected the probability and rate of dairy market participation of households.

Sex of the household head: This is a dummy variable that takes a value of one if the household head is male and zero otherwise. Women contribute more labour input in the areas of feeding, cleaning of sheds, milking, butter and cheese making and sale of milk and other products. So if the sex of household head is female, the variable is expected to have a positive relation with dairy market participation.

Education status of the household head: It is dummy variable and gives one if they are literate and zero other ways. Education plays an essential part in the acceptance of new innovations and technologies. The adoption of new technology increases productivity, which causes market participation increase.

Number of Children below the age of five years: this is continues variable. Most of the time milk is a major food for children and it is important for children health and growth. So, an increase in the number of children in this age category which increase the consumption of milk in the house and decreases the marketable surplus. Therefore, this factor is expected to be a negative effect on the probability and rate of dairy market participation of small farmers.

Family size: It is a continuous variable and measured in adult equivalent. Large number of household members has positively affected dairy market participation. Families with more household members tend to have more labour. As dairying was labor intensive activity families with more household members tend to have more labor, which in turn increases dairy production. And also if there are large members in the household, there financial need is increased for satisfying this need they participate in the dairy market and rate of participation also increases.

Grain production: is continues variable measured in income obtained from grain production per year. When they have produced more grain they use milk and milk products as an additional food and they do not supply to the market. So, it is expected to have a negative effect on the probability and rate of dairy market participation.

Number of milking cows: This variable is continuous and is measured in number of milking cows owned. As the number of dairy cows increases, milk production also increases and percentage share of consumption declines and milk sales increases. The probability and rate of dairy market participation of dairy producers were supposed to be positively affected by the number of milking cows owned.

Number of livestock holding: This refers to the total number of livestock owned by the household measured in tropical livestock unit (TLU). Livestock is an important source of income and food. More livestock holding is expected to decrease the probability of market participation because, if they have many livestock they have not time to give more

attention for milking cows and they satisfy their financial need by sealing livestock's.

The amount of milk produced: is a continuous variable measured in liters. When the amount of dairy products was increased, the surplus amount of dairy in the household also increases. So, the amount of supply also increases. The variable is expected to have a positive relation with the probability and rate of dairy market participation.

Distance to the nearest dairy market: It is distance of the dairy household from the nearest dairy market and is measured in kilometer. Dairy market participation should thus be inversely related to distance to the market. When the market is far from dairy producers the higher would be the transportation charges, increase transaction costs, walking time and loss due to damage. This reduces returns to dairy and the motivations to participate in the market and rate of dairy supplied was reduced.

Access to market information: It is a dummy variable taking a value of zero if the households have not dairy market information access and one if the household have access of dairy market information. It is supposed that dairy market information is positively associated with the probability and rate of dairy market participation of households.

Credit use: credit use is a dummy variable taking a value of one if the household have used credit and zero otherwise. If they use credit this creates opportunities for getting money to perches important materials used in dairy production. Credit use is supposed to affect the probability and rate of dairy market participation of dairy households positively.

Results and Discussions

Descriptive results

This part deals with the outcome 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 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. All sample household's produce milk by using local breed's cattle (only local breeds of cattle kept in the sample households).

Number of livestock holding: Different kinds of livestock were kept by the sample households (Cattle, Sheep, Goat, Poultry, and Donkey). 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).

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
	SD	10.81	12.06	11.47	
	Min	23	23	23	
	Max	80	70	80	
Number of children <5 year	Mean	0.45	0.71	0.59	1.93*
	SD	0.64	0.91	0.80	
	Min	0	0	0	
	Max	2	4	4	
Family Size	Mean	5.26	5	5.12	-0.91
	SD	1.74	1.64	1.69	
	Min	2	1	1	
	Max	8	10	10	
Number of Livestock	Mean	3.95	3.51	3.72	-1.34
	SD	1.78	2.10	1.95	
	Min	1.20	1.20	1.20	
	Max	8.85	8.59	8.85	
Number of milking Cows owned	Mean	1.86	1.44	1.64	-4.30***
	SD	0.58	0.58	0.61	
	Min	1	1	1	
	Max	3	3	3	
Total milk produced per day	Mean	2.42	1.51	1.94	-5.54***
	SD	1.28	0.58	1.07	
	Min	1	0.5	0.5	
	Max	7	3	7	
Distance to the nearest Dairy market	Mean	1.94	3.78	2.93	7.91***
	SD	1.33	1.41	1.65	
	Min	0.10	0.25	0.10	
	Max	5.5	6.60	6.60	
Total income obtained from Grain produced last year	Mean	8223	11523	9991	2.69***
	SD	7155	7301	7395	
	Min	0	0	0	
	Max	32841	28481	32841	

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

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).

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

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	Frequency Percent (%)	49 75.4	54 72	103 73.57	0.21
	Female	Frequency Percent	16 24.6	21 28	37 26.43	
Education	Literate	Frequency Percent (%)	37 57	34 45.33	71 50.71	1.87
	Illiterate	Frequency Percent	28 43	41 54.67	69 49.29	
Information Access	Yes	Frequency Percent (%)	59 90.77	19 25.33	78 55.7	60.43***
	No	Frequency Percent	6 9.23	56 74.67	62 44.29	
Use of credit service	Yes	Frequency Percent (%)	18 27.70	5 6.67	23 16.43	11.21***
	No	Frequency Percent	47 72.30	70 93.33	117 83.57	

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

Source: Survey data, (2018).

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 independent variables were tested for presence of multicollinearity problem. For continuous variables Variance Inflation Factor (VIF) and for dummy variables contingency coefficients (CC) were work out to recognize the presence of a multicollinearity problem among 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, number of milking cows owned, the amount of milk produced, distance to the nearest dairy market, access to the market information and use of 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, the amount of milk produced, distance to the nearest dairy market and access to the market information. 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: 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: As expected, this variable was positively and significantly affected the rate of household dairy market participation at 1% significance level. 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 rate of dairy market participation in the household 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 rate of household dairy market participation to rise by 2.41%. 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 rate of market participation increase in response to the increase in the amount of milk produced.

Distance to the nearest dairy market: 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: 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 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.

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% (Tables 3,4).

Conclusion and recommendation

The study was undertaken with the objective of analyzing dairy market participation of small dairy farmers in Gubre town, SNNPR, Ethiopia. In the study both primary and secondary sources of data were used. The primary data was collected from 140 randomly selected dairy producer households. From a total of 140 dairy producing sample households, 65 (46.43%) were market participants, while the rest 75 (53.57%) did not participate in the dairy market in the area. The mean production of milk per day for the sample households was 1.94 liter. Most of the milk produced, 4792.5 liters (59%) per month

**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
CHILDLESS5	-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	

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

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).

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
CHILDLESS5	-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	

***, ** 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)

the result of shortage of feed; most of dairy cows in the area are indigenous. Health access for animals tends to be deficient. The major opportunities of dairy production and marketing in the study area where there is an increased demand for dairy products, political stability, good weather condition, low cost of labor and availability of large cattle population.

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

Number of Children below the age of five years negatively determines probability and rate of dairy market participation. Most of the time milk is a major food for children and it is important for children health and growth. So, an increase in the number of children in this age category which increases the amount of milk consumption in the house and reduces the amount of milk available for sell. Thus, 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.

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.

was processed into butter, cheese and other dairy products. But only butter and cheese were supplied to the market in the town. Dairy used as a source of income for about 46.43% of the dairy producing households in the area. The income obtained from selling of dairy products is used to cover expenditures like students' school material, purchasing grains, health expenses, etc. The main problem in dairy production and marketing in the study area were low volume of production. Low production was



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 (i.e. through television, radios, newspapers, magazines etc.).

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.

Small-scale dairy farming in Gubre town contributes to the household income; it covers some of their home expenses. But they are not getting appropriate income from dairy, because of low productivity, it needs improvement. Many dairy products are used for household consumption, because many of the households in the study area are not market oriented. The policy implication is that smallholder dairy farmers in the area should adopt market-oriented dairy production system by using crossbred cows and improved dairy technologies. The government and other responsible bodes should solve the constraints available in the area like shortage of feed, low access of health service etc.

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