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Determinants of Dairy Products Marketing Participation and Supply: In Case of Chomen Guduru District, Horo Guduru Wollega Zone, Oromia Regional State, Ethiopia

Gizaw Zeleke[1], Shibeshi Tolesa[2]

[1]Department of Agricultural Economics, Faculty of Resource and Management and Economics, Wollega University, Shambu Campus, Shambu, Ethiopia

[2]Department of Agricultural Economics, College of Natural Resource Management, Mattu University Bedele Campus, Bedele, Ethiopia

Email address:
keeyeroo@gmail.com (Gizaw Zeleke), shibeshi2015@gmail.com (Shibeshi Tolesa)

Abstract: Market participation of smallholder agriculture is an indispensable pathway to increase income of rural peoples. Hence, this study was aimed at analyzing Determinants Of Dairy Products Marketing Participation And Supply: In Case Of Chomen Guduru District, Horo Guduru Wollega Zone with specific objectives of identifying the factors affecting smallholder farmers' milk market participation decision, to identify the determinants level of market participation among smallholder milk market participant farmer's and identify the challenges and opportunities of milk marketing. The data were obtained from both primary and secondary sources. The primary data for this study were collected from 150 producers. Using structured questionnaires', key informants, and focus group discussion where used for data collection. To analyze the factors affecting the producers' market participation decision and level of market participation, double hurdle model was applied. First stage double hurdle model results showed that sex of household head, dairy farming experience, members of cooperative and extension service had positive and significant effect on milk market participation decision. The second stage double hurdle model results showed that age of household head, dairy farming experience and volume of milk produced had positive significance over level of milk participation whereas non frame income activity and distance to the nearest market had negative significant effect on level of milk market participation. The results also revealed that Absence of farmer's milk cooperative, Seasonal Fluctuation in milk demand and Low bargaining power of farmers were the most pressing milk production and marketing constraints, respectively. Based on the findings, the study recommends that government should give emphasize on rural education system, family planning program, construction of different infrastructure and establish, collective organizations across rural areas like dairy cooperatives are assumed to play important role to faster delivery of farm produces, and Policy makers should provide market price information to smallholder's.

Keywords: Marketing, Smallholder's, Dairy

1. Introduction

1.1. Background of the Study

Ethiopia has one of the largest livestock populations in Africa and ninth in the world. The sector is an integral part of agriculture accounting for about 45 percent of the total value of agricultural production and supporting the livelihoods of a large share of the population [16].

The economic development of African countries is highly dependent on agricultural growth as a large proportion of the population relies on agriculture directly or indirectly for their livelihoods [8]. Agriculture still, continued to be a strategic sector for Ethiopia and overall performance of economy is correlated to performance of agriculture sector. Agriculture contributes about 36.2% of Gross domestic product (GDP) and 72.7% of employment [3]. Within agriculture, livestock sector directly contributes about 17% of the national GDP

and 39% of the agricultural GDP [13].

CSA reports that Ethiopia is endowed with the largest livestock population in Africa and estimated cattle population was 60.39 million [7]. From the total cattle population about 12.39 million are milking cows and about 98.24% of milking cows are local breeds and remaining about 1.54% and 0.22% are hybrid and exotic breeds respectively. From the same source total milk production from milking cows was about 3.32 billion litres with an average national milk yield is 1.37 liters per cow per day. Also, Shapiro explain that large proportion dairy cattle about 95% are kept by smallholder farmers with fewer than five head of cattle per households and 5% are held by peri-urban and commercial farms with 10 or more dairy cows and only 5% of raw milk reaches formal market[13].

Dairy production is an important component of livestock farming in Ethiopia both in pre urban and rural areas. Ethiopian dairy sector is growing and receiving new investment and consists of multiple actors and channels. Ranges of actor's are smallholder and commercial producers, small and large processors, service and inputs providers, farmers 'organizations, and cooperatives [1]. Dairy production and marketing became the means of livelihood for millions of households in Ethiopia. The smallholder farmer's income earned from daily milk production is used to purchase agriculture inputs or hire labour and land, effectively increasing a household's food production potential and resiliency [2]. Market-oriented production systems are emerging as important components of the dairy production systems and contributing immensely towards filling the gap between demand and supply for dairy products in urban centres [10].

The Ethiopian dairy cattle population is distributed across all regions in the country; the four main milk-shed regions that contribute more than 90% of total milk production are Oromia, SNNPR, Amhara and Tigray. Oromia is the largest contributor, producing almost 50% of the nation's milk. The main milk-shed areas within Oromia region are Adama-Asella, Addis Ababa, Ambo-Woliso, Selale and Jimma areas. Ambo-Woliso milk shed consists of West and South-West Shewa, Oromia region that have high market potential, as a result of access to feed and moderate artificial insemination services than other milk sheds [14].

In Chomen Guduru District, agriculture is the backbone of the economy. It contributes much to meet major objectives of farmers such as food supplies and cash needs. The District is characterized by mixed farming activities. The estimated cattle population of the district was about 113,019 and dairy cows 'accounts 30% of the total population of cattle. The District is one of the potential producers of dairy (milk and butter) in Horo Guduru Wollega Zone, due to suitable topography with immense grazing areas and rich fresh water supply from its many rivers [5]. So this study attempted to empirically analyze analysis of the dairy products marketing Participation in the Chomen Guduru district, Horo Guduru Wollega Zone.

1.2. Statements of the Problem

Agricultural marketing is the key thrust for economic development and has a guiding and motivating impact on production and distribution of agricultural product. The expanding of population live in urban and rising in level of income require more sorted out marketing channels for processing, distributing products; value-addition and institutional development of marketing channel actors.Ethiopia suffers from weak market linkages on both the input and output side. The constraints like, poor market access, lack of infrastructure, shortage supply channels, packaging, storing inability, weak marketing channel connection agricultural outputs to processors are prevent quality products from reaching end users [16]. In terms participation Getachew explained that smallholder dairy producer have interest [11].

Dairy products(fluid milk and butter) marketing and value chains of producers to identify the actors participate in the chain, factors which determine participation and volume supply, factor influencing channel outlet choice, structure conduct and performance, constraints and opportunities in other parts of the world and in some part of Ethiopia [10, 11]. This study designed to analyze dairy market participation in Chomen, Guduru, and district of Horo Guduru Wollega zone.

1.3. Objective of the Study

1.3.1. General Objective

The general objective of the study is to analyze dairy marketing participation decision and level of participation of dairy farm households in Chomen Guduru.

1.3.2. Specific Objective

The specific objectives of the study are:
1) To explore factors affecting smallholder farmers' milk market participation decision in the study area.
2) To identify the determinants of level market participation among smallholder milk market participant farmer's in the study area.
3) To identify the challenges and opportunities of milk marketing in the study area.

1.4. Research Questions

The study was attempted to answer these research questions:
1) What are the factors affecting smallholder farmer's milk market participation decisions in the study area?
2) What are the determinants of level of market participation for smallholder farmer's milk market participants in the study area?
3) What are the challenges and opportunities during the milk market participation by smallholder farmer in the case of the study area?

1.5. Significance of the Study

The determinants of dairy market participation and constraints of a small dairy farm for participating in the dairy

market is very essential for policymakers, government actors, NGOs, and other stakeholders to support, encourage, and promote the sector through minimizing the factors obstructing the growth of dairy market participation. This finding will be helpful for a better understanding of the determinate factor associated with the market participation of small dairy farmers.

The findings of this study are also believed to be useful to dairy producers, investors and marketing agents to make informed decisions. The work also serves as a reference document for researchers to embark on studies of the same or related kinds in other parts of the country. Since, the results and recommendations will be availed at district level, development agent, extension services and technical assistants can use for their day to day activity to increase farm productivity and hence, the target people in the district those engaged in subsistence agricultural activity will be the primarily beneficiaries. The information from the study also contributes to smallholder farmers' knowledge in their livelihood improvement efforts. Finally it will be used as reference point for further investigation in similar and/or related area over a period of time in different part of the country.

1.6. Scope and Limitations of the Study

Geographically the study was be conducted in Chomen Guduru district of Horro Guduru Wollega Zone in four kebeles. The primary data needed for the research will be collected for 2022 Dairy production year. However, there are spatial as well as temporal limitations to make the study more representatives in terms of wider range of area coverage and time horizon. Furthermore, since Ethiopia has wide range of institutional capacities and organizations, the result of the study may have limitations to make generalizations and make them applicable to the country as a whole.
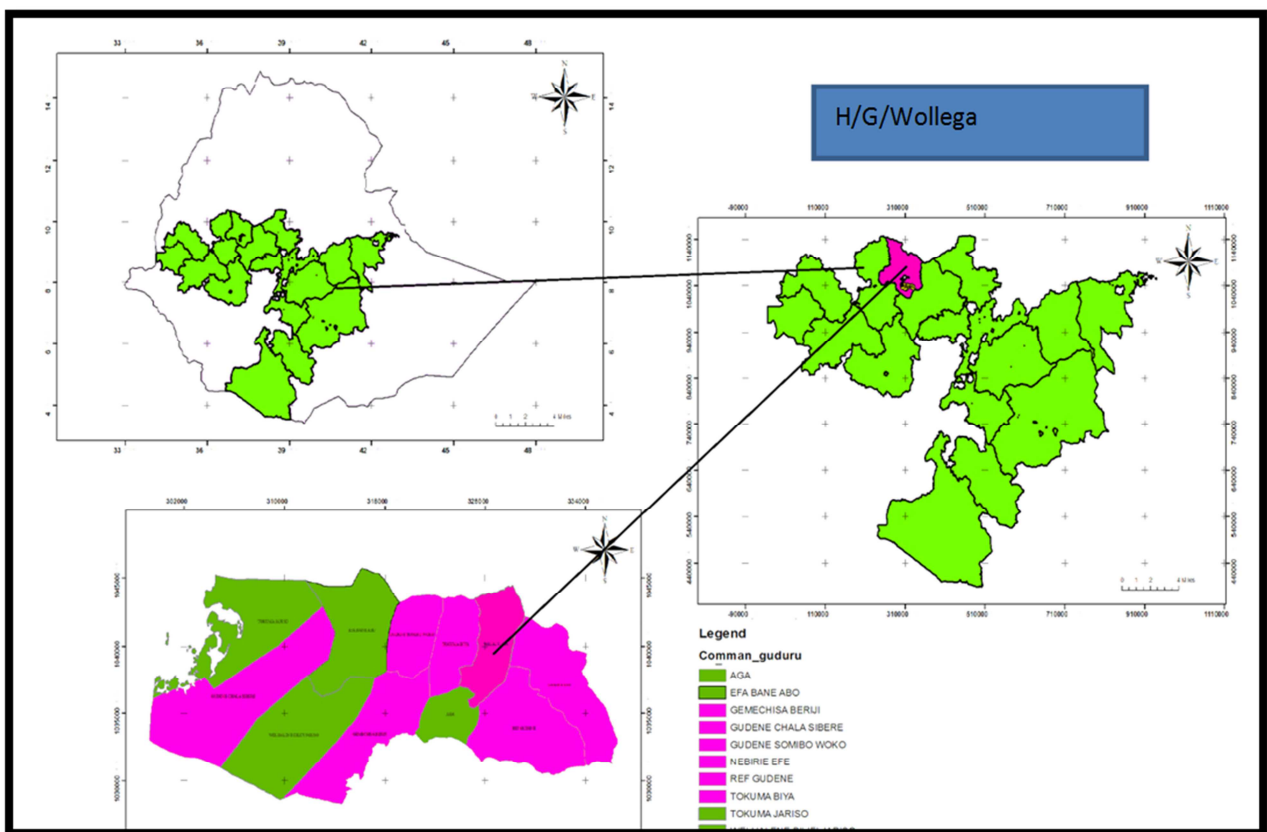
Source: Adopted and manipulated from Ethiopian map

Figure 1. Map of study area.

2. Methodology

2.1. Description of the Study Area

Chomen Guduru is one of the twelve Horo Guduru Wollega Zones. It is located at a distance of 78 km from zonal capital called Shambu and 260 km from capital city of the country Addis Abeba and bordered by Guduru district to the north, the Guder River/Abuna Gindeberat District to the east, the Jima Geneti district in the West and Midakegn and Jima Rare district to south.

The district has a total population of 64,124 of which 31914 are male and 32210 are female. From this population 49644 live in rural area, and 14480 live in urban area. Total number of females who are living in rural area is 25123 and 24521 are total number of males who are living in rural area. From the population living in urban areas, male constitutes

7136 and female constitutes 7344. The district level of literacy is >83%, indicating that most of districts' population has been involved in education [4]. The total Land area of the district is 41,364.5 hek (413,645,00m^2). From this area 15,298.205 (37%) hectare is used for crop production, 1057.5 hectare (29%) is used for grazing, 217.5 (6%) hectare is covered with forest and133.5 (2) hectare area is covered with stone, and Settlement land &the other [5].

The livestock populations of the district are 244281 cattle; 145,664 goat, 13863 sheep, 18,981 Horse, 15437 Donkey, 18,837Mule 695& poultry 57,372 [9].

The district has a mean annual Rainfall of 1200mm-1350mm, which is bimodal and erratic in distribution. This is because it is affected by season and agro-ecologic zone. The district receives a maximum amount of rainfall during summer season and a minimum amount of rainfall during spring season. The altitude of the areas ranges from 1,500-2,350 m.a.s.l and temperature the district's mean annual temperature is 18°C minimum and 24°C maximum and its monthly mean Temperature ranging from 18°C -24°C which makes it to have favorable climate for production. The soil type is mainly the sandy loam soil 98% and clay soil loam 2% generally soil type of this district is sandy loam soil red to brown in color and with high water holding capacity. Geographically, the woreda, the falls between 09°13'48.5"N latitude and 037 ° 21'32.3''E longitude the woreda receives an average annual rain fall ranging from about 1200mm-1350mm &and temperature 18 up to 26 centigrade and the agro ecological zone,woina degas 98% and 2% is dega. Infrastructures like telecommunication, electric power and schools are on expansion in the district. Rural roads that branched to different PAs and villages have played significant role of the supply of inputs and output of agricultural production.

2.2. Sampling Method and Sample Size

A two stage sampling procedure will be employed to select potential dairy producer households. First, four potential dairy producer kebeles from the District will be selected through purposive sampling method. During the selection, the kebele's potential for dairy production and the accessibility of the areas to travel will be taken into consideration. In the second stage, using the population list of dairy producer farmers from sample kebeles, the intended sample size will be determined proportionally to population size of dairy producer farmers. Then 150 representative households will be randomly selected using simple random sampling technique of the sample size will be determined based on the formula given by Yamane at 92% confidence level and error term 8% [15].

$$n = \frac{N}{1+N(e)^2} = \frac{3930}{1+3930(0.08)^2} \approx 150 \qquad (1)$$

Where:
n= is the sample size (150)
N= is total smallholder dairy producer households of the district (3930)

e= Level of precision or margin of error 8% (0.08).)
1-designates the probability of the event occurring

Table 1. Number of sample respondents.

Name of sampled kebeles	Total dairy farm rairing households (number)	Sample Size
Waljalane Bilif Jarso	350	37
Tokuma Jarso	410	43
Gamachisa Barji	352	37
Ifa Bane Abo	320	33
Total	1,432	150

Source: CGDAO and Own computation, 2023

2.3. Methods of Data Analysis

Two types of data analysis, namely descriptive statistics and econometric models will be used to analyzing the data that was be collected from dairy producers of the study areas.

Econometric Model

Econometric analysis was used to estimate the causal relationship between the dependent variable and the explanatory variables. It is crucial to understand the effects of different factors on Milk market participation decision and intensity of participation of producers.

To identify factors that influence smallholder Milk farmers` participation decision and intensity of milk sales in the study area, double hurdle estimation procedure was employed. The first stage of the double hurdle models a 'participation equation, attempts to capture factors affecting participation decision.

Models that include yes or no type dependent variable are called dichotomous or dummy variable regression models in which determinants of an event happening and not happening is identified. It identifies whether maize producing smallholder farmers participate in the market or not participate. In such circumstances, the probit model estimation is employed.

The general form of double hurdle model for farmer's market participation and level of participation are explained as follows separately.

$$d^* = wi`\beta + vi, vi \sim N(0, \sigma 2) \qquad (2)$$

$$di = \begin{bmatrix} 1 if d^*i > 0 \\ 0 if d^*i < 0 \end{bmatrix}$$

$$y^* = xi`\delta ui, ui \sim N(0, \sigma 2) \qquad (3)$$

$$yi = \begin{bmatrix} 1 if y^* > o and d^* > o \\ 0 if y^* < 0 \end{bmatrix}$$

Where, $d^*_i$is a unobservable variable describing i^{th} households' decision to participate in the milk output market as seller (d_i), $y^*_i$is a latent (unobservable) variable describing i^{th} household level of participation in the milk output market, $y_i$is the observed variable (actual quantity of maize sold by household i), W'_i and X'_i are vector of variables explaining the participation decision and level of participation decision

respectively, β and δ are vectors of parameters to be estimated, v_i and u_i are respective error terms assumed to be independent and normally distributed. According to Cragg (1971), log likelihood function for the double hurdle model that nests a univariate probit model and a truncated regression model specified as follows.

Where, Φ and ϕ represent standard normal probability and density functions respectively, W_i and X_i represent independent variables for the probit model and truncated regression model respectively, β, σ, and δ are parameters estimated from each model.

Multi collinearity is a situation whereby there exist strong linear relationships among independent variables is more than 75 percent [12]. If two variables are highly collinear, then this will result in inefficient estimates. In this study, before running multiple linear regression analysis, Multicollinearity will be tested by using a variance inflation factor for continuous variable and contingency coefficient for dummy variable.

Variance Inflation Factors (VIF) is used to assess the degree of association among continuous explanatory variables. As a rule of thumb, if the VIF is greater than 10 the variable is said to be highly collinear. According to (Gujarati, 2004).

Contingency coefficient (CC) was used to detect the degree of association among dummy explanatory variables (Healy, 1984). It measures the relationship between the raw and column variables of a cross tabulation. The value ranges between 0-1, with 0 indicating no association between the raw and column variables and value close to 1 indicating a high degree of association between variables. The decision criterion, if the contingency coefficient value is (CC >0.75) the dummy variables are said to be collinear and is computed as follow.

Heteroscedasticity is one of the problems that lead to violate assumption of CLRM. It mostly occurs in cross sectional data due to misspecification of the model. When we say there is heteroskedasticity problem, it means the variance of the population vary along the variables.

In this study, to detect heteroskedasticity problem, Breusch-Pagan / Cook-Weisberg test were used to identify the existence of the heteroskedasticity problem. So, the robust standard errors were used to overcome the examined problem.

2.4. Hypothesis test and Variable Definition

To identifying the determinants of market participation of dairy product in the study area, the main task is exploring which factors significantly influence and how (the direction of the relationship) these factors are related with the dependent variable is required. Hence, the following dependent and independent variables were hypothesized.

Dependent Variables

Dairy product market participation: is a dummy dependent variable that represents the probability of dairy product market participation of the household. The variable takes a value of 1 if a household that participate in dairy product market and takes 0 values if a household is not a participant in dairy product marketing.

The volume of dairy products sold (sale value): is a continuous dependent variable that is measured in Littre. It represents the actual monetary value of dairy products sold.

3. Result and Discussion

3.1. Descriptive and Inferential Analysis Result

3.1.1. Characteristics of Surveyed Households over Discrete Explanatory Variables

Sex of household: As indicated in table 3 male headed household constitute 53.3% among 56.23% were milk market participant while 43.75% were non-participants and the remaining 46.7% were female headed households among 71.74% were participants and 28.5% were non participants. The chi-square test of variability between the two groups is significant indicating there was variability at 5% significance level between market participant and non-participants.

Access to market information: Information is important for enhancing dairy market participation. However only 60.67% of sample household were access to milk market information and 39.33% of sample household did not have access to milk market information. According to result 66.3% of milk market participant and 50.9% of non-participants household get milk 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 milk market participation and access to information. Dairy producers who have market information were better to decide how to produce and sale their products to the market.

Credit Service: In table 3 the result indicates that 74% of market participants had gets credit access, while 26% were not get credit. On the other hand 16.9% of non-market participants had gets credit access, while 83.1% had not get credit access. The chi square test shows that credit access of sample households was statistically insignificant meaning that credit access was not affect the market participation of sample households.

Table 2. Summary statistics for dummy variables.

Variable	Category	Participants (N=95)		Non participant (N=55)		Total (N=150)		Chi2 value
		N	%	N	%	N	%	
Sex	Male	45	47.3	20	36.3	65	43.3	3.7039**
	female	50	52.6	35	63.6	85	56.7	
Credit service	Yes	79	83.1	32	58.1	111	74	11.2938***
	No	16	16.9	23	41.9	39	26	

Variable	Category	Participants (N=95)		Non participant (N=55)		Total (N=150)		Chi2 value
Access to market information	Yes	63	66.3	28	50.9	88	58.7	3.4650*
	No	32	33.7	27	49.1	59	39.3	

Notes: ***,**,and * shows significant at 1%, 5%, and 10% significance level, respectively.
Source: Computed from household survey data, 2023

3.1.2. Characteristics of Respondents over Continuous Explanatory Variables

Table 3. *Summary statistics for continuous variables.*

Variable	Participant			Non participant			Total				tvalue
	Mean	mix	Max	Mean	mix	Max	Mean	Std. Dev	min	max	
Fsize	6.8	1	13	5.9	1	12	6.5	2.962223	1	13	-1.7039*
Educ	7.1	1	12	5.4	1	12	6.54	3.172089	1	12	-3.413***
VMP	8	1	16	7.4	1	16	7.68	0.299012	1	16	-0.7283**
DisMI	20.3	14	29	21.9	12	29	20.9	0.2936565	12	29	2.5756**
NDC	2.29	1	5	2.1	1	4	2.25	0.080372	1	5	-0.6758*

Notes: ***,**,and * shows significant at 1%, 5%, and 10% significance level,
Source: Computed from household survey data, 2023

3.2. Econometric Result

Factors affecting the decision to participate in Milk market in the study area

The results for the factors affecting market participation decisions (First hurdle) are displayed in Table 3. Out of the fifteen variables fitted into first hurdle of double hurdle model, six variables affected market participation decisions of households in the study area (Table 3). These variables are; Sex, farming experience, distance to the nearest market, Family size, land holding size, and volume of milk produced. The Wald chi-square value of 44.96 for market participation decision model is statistically significant at 1% indicating that at least one of the explanatory variables included in the model jointly explain the probability of participating in milk output market.

Table 4. *First-stage (probit estimation) results of the determinants of Milk market participation decision.*

MPD	Coef.	Std. Err.	P>z	Marginal effect
Sex	-.9035	.432	0.037	-0.1636
Age	.0097	.018	0.591	0.0018
NDC	-.1860	.225	0.410	-0.0343
FXE	.3393	.054	0.000	0.0626
ASC	.1503	.575	0.794	0.0290
ASMI	-.5206	.7281	0.475	-0.0902
LDCO	.0217	.237	0.927	0.0039
Fsize	.0718	.099	0.472	0.0132
NFPAPart	.3671	.393	0.351	0.0698
EDU	-.0489	.114	0.668	0-.0090
EXSERVICE	.5520	.239	0.021	0.1018
DisMI	-.0041	.097	0.967	-0.0008
MC	.8751	.484	0.070	0.2099
VMp	-.0258	.056	0.642	-0.005
LH	.1534	.099	0.122	0.0283
_cons	-3.601	3.202	0.261	
Number of Ob.	150			
LR chi2(15)	138.98			
Prob>ch2	0.0000			
Loglikelihood	29.082396			
Pseudo R2 =	0.7050			

4. Conclusion and Recommendation

4.1. Conclusion

This study was undertaken with the aim of Determinants Of Dairy Products Marketing Participation And Supply: In Case Of Chomen Guduru District, Horo Guduru Wollega Zone with specific objectives of identifying the factors affecting smallholder farmers' milk market participation decision, to identify the determinants level of market participation among smallholder milk market participant farmer's and identify the challenges and opportunities of milk marketing.

The data were generated from both primary and secondary sources. The primary data were generated from individual interview using structured questionnaires', key informants interviews, and focus group discussion. The primary data for

this study were collected from 150 randomly selected milk producer households. The analysis was made using descriptive statistics and econometric model using STATA, SPSS software and excel. Duble hurdle models were applied to analyze determinants of milk commercialization in the study area. The findings of this study are summarized as follows.

The descriptive statistics indicated that about 63.3% of sampled respondents were participate in milk market households while the remaining about 36.7% were not participate households. Results from probit (first stage) of Double Hurdle Regression showed that participation decision of milk in study area was significantly influenced by sex of household head, dairy farming experience, members of cooperative and extension service. Distance to the nearest market that negatively influence participation decision while all other have positive influence. Factors non farming income and distance to the nearest market were found to affect level of milk market participation negatively and significantly, while Age of household head, dairy farming experience and volume of milk produced were those factors positively and significantly affecting level of milk market participation in study area. The result of the first stage and second stage double hurdle analysis revealed that dairy farming experience had positively and significantly influenced milk market participation decision and level of market participation. This implied that increase in the farming experience of the households had increased the production capacity and thereby it increased market participation decision and level of commercialized. This in turn led to sold more of milk to the market.

4.2. Recommendation

On households' decision to participate in milk output market and level of market participation.

Access to extension contact affects the milk market participation. Based on the result, encouraging farmers to contact the development agents increases the market participation. Thus, They have to hired the DA`s based on their academic professionals and updating their knowledge through training in all aspects of agricultural activities.

Membership to the cooperatives affects milk market participation. Households need motivation to be member of cooperatives. Education had also very important role in increasing the market participation and to identify the perfect information and select the appropriate channels.

Distance to nearest market affected milk producer's market participation decision and level of Level of market participation negatively. The office of transport authority and other concerned bodies need to strength construction of different infrastructure and establish, collective organizations across rural areas like dairy cooperatives are assumed to play important role to faster delivery of farm produces, especially perishable commodities of dairy, in improving the bargaining position of the dairy producers and creating employment opportunities, lowering transaction costs to enhance farmer's participation decision

to head milk production.

Land holding size has positively and significant effect on probability of milk market participation. The positive and significant coefficient of the variable depicts that the larger household land holding size, the more volume of milk produced and more is supplied to the market. Therefore, police proposed should focus on increasing milk production and productivity of the sector this result implies that intervention aimed at too aware farmers to allocate more lands for the production of milk.

Ethical

This study follows all ethical practices during writing.

Transparency

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study was reported; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained.

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Conflicts of Interest

The authors declare that they have no conflict of interests.

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