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Determinants of Producers' Participation Decision and Level of Participation on Milk Value Addition at Farm Level:In Case of Esssera Woreda Dawuro Zone, Southern Ethiopia

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Abstract
Producersers play great role along dairy value chain in study area. Dairy sector has crucial role in improving the livelihoods of farmers through family income, employment generation, achieving food security, poverty alleviation as well as to improve nutritional status of the family in Essera Woreda. Even if there is potential of dairy production, processing, marketing and consumption, there is insufficient information about socio economic factors that hinder farmers' participation decision and level of participation on milk value addition at farm gate. But determinants of farmers' participation decision and level of participation decision on milk value addition were not identified and analyzed to take intervention area to improve the dairy sector. This study aimed at identifying determinants of the farmers' participation decision and extent of participation on milk value addition. The primary data for this study were collected from 133 producers and analyzed using application of appropriate statistical tools. The result of probit (Heckman first stage) model indicated that farmers' participation decision on milk value addition is significantly affected by gender, quantity of milk yield produced per day, family size, access to extension service, types of dairy cows' breed and access to credit. While farmers' participation decision on volume of milk value addition is significantly affected by gender, family size, education level of household, distance nearest to market, farmers cooperative, types of breed owned by household, access to extension service, access to credit, quantity of milk produced per day and consumers' quality preference on value added dairy products. Therefore, policy aiming at improving producers' and traders' access to improved inputs such as improved breed of dairy cows, credit, extension service.
Keywords: - Heckman, Probit, value addition, level of participation, Lambda

1. INTRODUCTION

Ethiopia has a complex dairy value chain, with both formal and informal channels. In Ethiopia the farm-level value of the milk was estimated to be 1.16 billion USD In view of such a large number of dairy cows and the important number of producers engaged in the dairy sector, the development efforts so far made have not brought a significant impact on the growth of the sector (FAO, 2011). Only 5% of the milk produced in Ethiopia is sold in commercial markets (LMD, 2012). In Ethiopia, fresh milk sales by smallholder producers are important only when they are close to formal milk marketing facilities, such as government enterprise or milk groups. Producers far from formal marketing outlets prefer to produce other dairy products instead, such as cooking butter and cottage cheese. The vast majority of milk produced outside urban centers in Ethiopia is processed into dairy products by the households, and sold to traders or other households in local markets (Muriuki *et al*., 2001). Participation decision and level of participation in-farm level milk value addition is hypothesized to be affected by socio-economic and demographic characteristics of farm households.

The SNNPR has 23.5% of Ethiopia's milking cows and produces 27 of the percentage share of Milk Production. The processing and trade of dairy products, especially soured butter, dominates the dairy sector. Some of the butter is used for home consumption, and the surplus is for sale to small traders who transport it to urban areas for distribution by wholesalers and retailer butter traders. Ayib, a soft cottage cheese, is produced on the farm from sour buttermilk, for home use and for sale (LMD, 2013). Dawuro zone is one of SNNPR with the livestock resource of 411.54 thousand cattle, 168.02 thousand sheep's 125.08 thousand goats, 39.08 thousand equines and 219.87 thousand poultry. Essera Woreda is the areas in which the research will be done with livestock species of 71460 cattle, 34857 shoat, 4508 equines and 40,081 poultry. Dairy sector has significant contribution in supporting household income and used as source of food in Essera Woreda. The most known dairy products are butter, cheese and raw milk. Therefore, this study was focused on assessing determinants of the farmers' participation decision and extent of participation on milk value addition at farm level.

2. METHODOLOGY OF THE STUDY

2.1. Description of Study Areas

This study was conducted in Essera Woreda of Dawuro Zone Southern Ethiopia. The Dawuro Zone covers total

area of 4436.7 sq.km^2 and lies between 6.59-7.34 degree north latitude and 36.68 to 37.52 degree east longitudes, with an elevation ranging 501-3000m. The Zone has a five Woredas and one urban administration which are Mareka, Loma, Gena, Tocha and Essera. It has atotal population of 398,796. Regarding the Agro-Ecology, 55.6% is *Kolla*, 41.4% is *Weyna-Dega* and 3% is *Dega*. The average annual rainfall ranges from 1201 to 1800mm. According to the land utilization data of the region, 38.4% is cultivated land, 13.39% grazing land, 16.81% forest bushes and shrub land, 17.09 % cultivable and 14.31 is covered by others. The livestock resource of the Zone was estimated to be 313,094 cattle, 113,554 sheep, 45,703 goats, 7,081 horses, 1,934 mules, 5,064 donkey, and 157,996 chicken and 28,557 traditional hives (CSA, 2006).

Essera Woreda is located at 522, 575 and 584 kms from Addis Ababa through Hosanna, Shashemene and Jimma roads respectively; and 350 kms from Hawassa, the regional capital. The area is topographically undulating and rugged. The Woreda covers a total area of 1043.1 km^2 and lies between 6.7-7.02^0 latitude and 36.7 to 37.1^0 longitudes, with an elevation ranging from 501 to 2500 m.a.s.l. The Woreda lies in three agro-ecological regions: *Kolla* region, which is within 500-1500 m.a.s.l; *Woyna-dega* within 1501-2500 m.a.s.l; and *Dega* at above 2500 m.a.s.l. The annual mean temperature varies from 17.6 to 27.5^{o}C. The rainfall is a bimodal type: the short rainy season is between February and March and the long between May and September. The average annual rainfall varies between 1401-1800 mm (EWARDO, 2008). According to the land use plan of the area, 38.4% is cultivated land, 13.39% grazing land 16.81% forest bushes and shrub land, 17.09% cultivable, and 14.31% is covered by others. The Woreda has 29 *kebeles* (27 rural and 2 urban) with a total population of 82,218 (EWFEDO, 2014). Out of this 41,762 are male and 40,456 are female and total households in the Woreda are 17021.

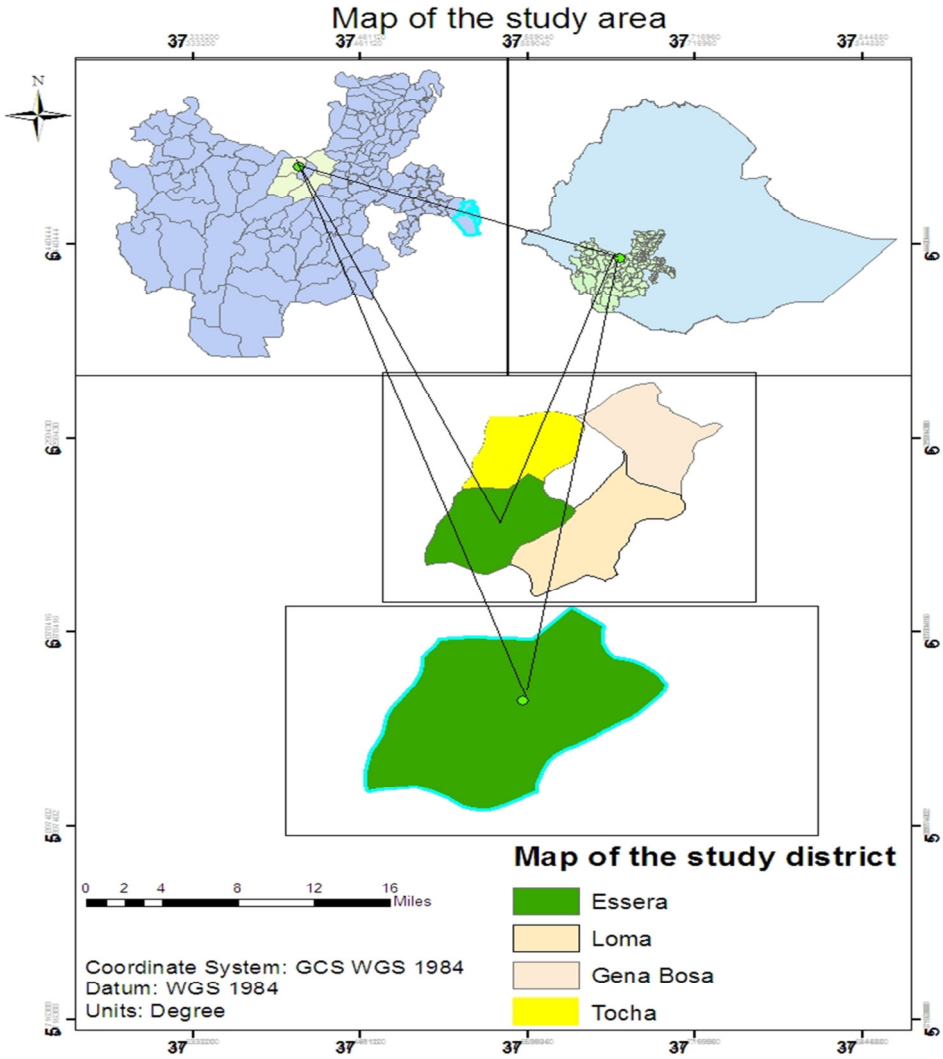

Figure 1: Map of Essera Woreda in Dawuro Zone
Source: EWAO (2015)

2.2. Sampling Procedure and Sample Size Determination

A multi stage sampling technique was used to select representative sample for this study. Before selection of Kebeles and sample farm households, consultation with Woreda agricultural experts and development agents was made. Dawuro Zone has a total of five Woredas and one urban administration. In first stage, Essera Woreda was selected purposively based on the volume of dairy production and involvement of actors along dairy value chain. Second stage, 6 *Kebele* administrations were selected from 29 kebele administrations on the basis of dairy production and marketing potential. These are Bale, Gudumu, Duzi, Dalli, Arusibala and Ofa. The total number of dairy producers in each kebele administrations is 603, 568, 540, 504, 448 and 517 in Bale, Gudumu, Duzi, Dalli, Arusibala and Ofa, respectively. Finally, 133 sample households were selected randomly by applying probability proportional to size sampling technique. For populations that are large, Cochran (1963) developed the Equation (1) given below to yield a representative sample for proportions.

$$n_o = \frac{z^2 pq}{e^2} \quad \text{---------- (1)}$$

Where n_o is the sample size, z^2 is equals the desired confidence level at 95% which is 1.96, e is the desired level of precision, p is the estimated proportion of an attribute which indicate homogeneity of the study population that present in the dairy producers which is at 10% because of similar socio-economic factors and q is 1-p. The value for Z is found in statistical tables which contain the area under the normal curve. Therefore, the sample size (n_o), was calculated as follows.

$$n_o = \frac{1.96^2 0.1(1-0.1)}{0.05^2} = 138$$

According to Cochran (1977) sample size readjustment formula was used if the population was less than 10,000 and the target population is finite. In this study the population was less than 10,000 which was 3,180 and target population is finite. Therefore, finite population correction formula was used and the sample size was reduced slightly. In addition to this, there was less variability in population (dairy producers); sample size adjustment formula was needed to determine small numbers of sample size because it provides proportionately more information for a small population than for a large population. Therefore, the sample size ($\mathbf{n_o}$) can be adjusted using equation 2 as follows.

$$n = \frac{n_o}{1+\left(\frac{n_o-1}{N}\right)} \quad \text{---------- (2)}$$

Where n is the required sample size and N is the population size.

$$n = \frac{138}{1+\frac{(138-1)}{3180}} = 133$$

Table 3: Sample size determination for producers

Kebele	Total Households	Dairy producer households	Proportion	Sample households
Duzi	778	540	0.17	28
Gudumu	792	568	0.18	29
Dalli	620	504	0.160	26
Ofa	628	517	0.16	26
Arusibala	548	448	0.14	24
Bale	1053	603	0.19	30
Total	4419	3180		133

2.3. Types, Sources and Method of Data Collection

Dairy value chain analysis was conducted through a combination of qualitative and quantitative methods. Thus, both quantitative and qualitative data were used to find out necessary results from this study. Quantitative data permit a more objective assessment and facilitate an assessment of larger-scale patterns, trends and relationships among different value chain actors. Questionnaires focused on what value chain actors are doing. The qualitative research tool was used to check the reliability of data collected by questionnaire. The secondary sources of data were journals, books, internets browsing, reports of national policy, regional, zonal and Woreda. While primary data sources includes agricultural office, Marketing and cooperative office, trade and industry office, agriculture department, trade and industry department, key informants, Development Agents (DA) and dairy producers. Finally, participatory rapid appraisal tools were conducted.

Before data collection, discussion with the administrative bodies to get well-organized data from representative Kebeles administrations that represents the Woreda administrations. This was done through group discussion. Based on structured questionnaire, short time training was given for the stakeholders who are necessary in order to give full data about dairy value chain for the investigation. Next group discussion interview and household interview was taken place on data related with factors affecting farmers' decision of milk value addition at farmers' level. Generally, well-developed structured questionnaire and checklists were prepared and

socio-economic, demographic data were fulfilled by dairy households and from development agents.

2.4. Methods of Data Analysis

2.4.1. Descriptive statistics

Data collected through structured and semi-structured questionnaire survey was coded, entered, edited and analyzed by using both SPSS version16 and STATA. Descriptive statistics such as frequency, percentage, mean and standard deviation were used to analyze the survey data collected from smallholder dairy farmers.

2.4.2. Econometrics analysis

To analyze producers' participation decision in milk value addition and the extent of value addition of milk two step procedures was used. Heckman (1979) developed Heckman model which has important role in solving a selectivity bias to analyze factors affecting producers' participation decision in first step and the extent of participation in second step. The selectivity term inverse mill's ratio which is added to the second step outcome equation that explains factors affecting the extent of milk value addition is constructed from first equation. This ratio is a variable used for controlling bias due to sample selection (Heckman, 1979). In the first-stage, we used the standard probit model, which follows random utility model and specified as Wooldridge (2002). In the first stage, the decision to add or not to add value on milk was assessed using a probit model. The choice of this model is based on the fact that the decision to add value on milk is discreet; it is either one participates on milk value addition or not. Furthermore, the study assumes a normal distribution and hence the choice of the probit model. Therefore, Heckman two step procedure specifications can be written as:

$$Y* = Z'\alpha + \Sigma 1$$

$$Y = 1 \text{ If } Y* > 0$$

$Y = 0$ If $Y* \leq 0$---------- (3)

Where,

Y *= latent (unobservable) variable representing farmers' discrete decision whether to add values to milk or not

Z' = vector of independent variables hypothesized to affect farmer's decision to add values to milk

α = vector of parameters to be estimated which measures the effects of explanatory variables on the farmer's decision

ε1 = normally distributed disturbance with mean (0) and standard deviation of δ1, and captures all unmeasured variables

Y = dependent variable which takes on the value of 1 if the farmers add values on milk and 0 otherwise. Probit parameter estimate does not show by how much a particular variable increases or decreases the likelihood of adding values to milk. Therefore, marginal effects of independent variables on the likelihood of farmers to add value on milk should be considered. Finally, the log likelihood function which is maximized to obtain parameter estimates and corresponding marginal effects is given as:

$$\text{Ln L} = \left(\frac{\alpha}{Y}, Z\right) = \sum_{y=1} \ln(\Phi(Z'\alpha) + \sum_{y=0} \ln(1 - \Phi(Z'\alpha)$$---------- (4)

Conditional on participation decisions, the variables determining level of participation are modeled using the second-stage Heckman selection model (Heckman, 1979). The Heckman selection equation is specified as:

$Z_i* = \text{Wi}'\alpha + \varepsilon 2$

$Z_i = Z_i*$ if $Z_i* \geq 0$

$Z_i = 0$ if $Z_i* \leq 0$---------- (5)

Where,

Zi * = latent variable representing the desired or optimal level of milk value added which is observed if *Zi** >0 and unobserved otherwise

Zi = observed level of milk value added

Wi = vector of covariates for unit i for selection equation which is a subset of *Z'*

α = vector of coefficients for selection equation

ε 2 = random disturbance for unit i for selection equation. One problem with the two equations (4 and 5) is that the two-stage decision making processes are not separable due to unmeasured farmer variables determining both the discrete and continuous decision thereby leading to the correlation between the errors of the equations. If the errors in equations 3 and 4 are correlated, the estimated variable values determining the level of milk value addition become biased. Therefore, it is important to specify a model that corrects for selectivity bias while estimating the determinants of the level of participation. Hence, Lambda (LBD) was included as one of the independent variables in the farmers' participation decision on milk value addition. The second stage involves including the Mills Ratio (MR) to the volume of milk value addition equation and estimating the equation using Ordinary Least Square (OLS). If the coefficient of the 'selectivity' term is significant then the hypothesis that an unobserved selection process governs the participation equation is confirmed. Therefore, the level of participation equation with correction for sample selection bias becomes:

$$V = X'\beta + \lambda\left(\frac{\phi(X'\beta)}{\Phi(X'\beta)}\right) + \varepsilon 2 \quad \text{---------- (6)}$$

Where,

$\frac{\phi(.)}{\Phi(.)}$ = Mills ratio

λ = Coefficient on the mills ratio

ϕ = standard normal probability density function

Φ = standard cumulative distribution function

ε 3 = not correlated with ε 1, ε 2 and other independent variables. Under the null hypothesis of no sample selection, bias λ is not significantly different from zero.

V = level of milk value addition in liter

3. RESULTS AND DISCUSSIONS

3.1. Demographic Characteristics of Sample Households of Producers

Table 2 presents the mean value and t-test of continues variables whereas Table 3 presents dummy variables and chi2 test of access to resources and infrastructure characteristics of the sample households. The total sample size of the producer households interviewed during the survey was 133. Out of 133 producer households, male and female households were 103 and 30 respectively. As the result of survey data, the education level of the households 53.3%, 29.3%,13.5%, 3.8% were illiterate, primary school and read and write, and high school respectively. This revealed that large percent of household were under illiterate with low perception for milk value addition. Average age of household head was 44.6 years; dominated by younger heads that encourage milk value addition participation decision of farmers. The maximum and minimum family size of the respondents was 10 and 3 respectively.

Thus, average family sizes of sample producers during survey were 6. In further, the result reveals that the major income source of the farmers are crop-livestock and crop production which accounts 99.2% and 0.8% respectively. An average land size of sample respondents is 1.1 ha per households in Essera Woreda. Thus, the average numbers of milking cows per household is 2 in study area. Only 1.04 liters of milk, out of average 2.03 liters yield per day was used for value addition. The major milk value added products produced are butter and cottage cheese. About 71.4% of respondents revealed that they added values to milk in the form of butter and cheese where as the remaining 28.6% respondents consume milk in liquid form at household level. Thus, 28.6% of respondents are producing but not participate in milk value addition. On average 14.28 kg of butter was produced per household per year per cow and 9.68 kg of butter supplied to market from sampled households while on average 4.6 kg of butter was consumed at household level per year. The reason might be that they consume at home level because they have large number family size with dependent age group and they earn income from non dairy sources.

Table 2: The mean values and t-test results of independent continuous variables

Variables	Participants		Non participants		Total		
	Mean	Stad	Mean	Stad error	Mean	Stad error	t-value
Age	44.2	1.1	45.7	1.9	44.6	0.96	0.66
Education level	1.92	0.11	1.6	0.12	1.83	0.08	0.099*
Family size	5.7	0.17	5.4	0.26	5.6	0.14	-1.02
Land size	1.1	0.037	1.03	0.06	1.08	0.03	0.42
Distance nearest to market	11.7	0.6	10.98	1.13	11.54	0.54	-0.62
Milk yield produced per day	2.14	0.082	1.72	0.05	1.93	0.07	0.00***
Number of dairy cows	2	0.9	1.5	0.35	1.75	0.6	0.05**
Dairy farming experience the household	10	6	7	3	8.5	4.5	0.82

Source: Own survey result (2015)

Table 3: Access to service and infrastructure to sampled households of producers (N=133)

Variables	Participants		Non participants		
	N (Yes)	%	N (Yes)	%	Chi2
Access to extension service	52	39	12	9	0.01
Access to credit	28	21	4	3	0.02
Access to market information	50	37.6	21	15.8	0.07
Access to market center	66	49.6	24	18	0.48
VA extends shelf life of the product	65	48.9	24	18	0.56
Membership of farmers cooperative	43	32	15	11	0.37
Access to milk collection center	10	8	2	1.5	0.34

Source: Own survey result (2015)

According to the survey result, producers' participation decision and level of participation on milk value addition was low because of shortage of extension service, limited access to credit, and limited access to market center and market information. In addition to these, milk value addition was not performed based on consumers' demand in study area. Out of sample households, 36% revealed that value added dairy products in market not meet the consumers' preference. Thus, in study area most of dairy producers add value on milk traditionally through indigenous knowledge. Still there is extension service gap on milk value addition in study area. Out of total sampled households, 51.9% revealed that there was a lack of extension service on milk value addition. According to the result obtained by the respondents' survey from the study area, the famers' participation decision on milk value addition constrained by accessing credit problem. As the result of survey of the sampled households, 66.2% and 33.8% are due to limited supply of credit and bureaucracy of the credit financing institute specially OMF respectively.

Majority of the farmers in study area add value on milk for the purpose of income generation and consumption. Mainly milk is processed and marketed by women and girls in study area. Respondents from the study area revealed that the reason they process milk is to fetch good price, both to fetch good price and to extend the shelf life of the products and to increase shelf life of the products which accounts 56.4%, 39.8% and 3.8% respectively. Dairy production is labor intensive and the result of respondent survey shows that 86.5% and 13.5% of labor source of the producers from dairy production to marketing performed by family labor and labor exchange respectively. In study area farmers have faced with the problem of infrastructure such as access to main road for market center and transport facility. Most of the time they use man power during marketing dairy products. Thus, 67.7% and 32.3% of transporting facility of the farmers are man power and vehicle respectively.

3.2. Econometrics Results

Producers' participation decision and level of participation on milk value addition affected by different factors. These are internal and external factors. James Heckman has proposed Heckman two-step estimating procedure. In step 1, probability of producers' participation decision on milk value addition was estimated and which is done on the basis of the probit model. In step 2, we estimate the model by adding to it a variable (called the inverse Mills ratio or the hazard rate) that is derived from the probit estimate. Depending on mean value chi-square test and t-test used to identify the significance difference between frequency of dependent variable and independent dummy variable; and dependent variable and continuous variable respectively. To analyze determinants of participation decision and level of participation, data from 133 households were used. However, only 95 households added values to milk indicating that milk production is not necessarily for value addition, given a household demand for fluid milk consumption.

Table 4: The estimated results of binary probit model (first stage).

Variables	Coefficient	Standard error	P>/z/	Marginal effect
AGEHH	-0.004	0.010	0.770	0.001
GNDER	0.600	0.310	0.050	0.053
EDULHH	0.100	0.160	0.690	0.023
FMSIZE	-0.020	0.090	0.020	0.014
TPSBRED	-0.600	0.091	0.000	0.340
ACCREDIT	0.810	0.380	0.030	0.160
ACEXSRVCE	0.570	0.280	0.040	0.140
MLKYLDd	0.580	0.330	0.080	0.530
Constant	-1.300	1.120	0.270	-

Number of observations = 133, LR chi2 (14) = 38.34, Probability > chi2 = 0.0000, Log likelihood = -60; Pseudo R^2 = 0.24

Source: Own survey result (2015)

As the result indicated in Table 4 above, the probit estimations (Heckman first stage analysis results)

are significantly influencing the farmers' participation decision on milk value addition. The probit model overall goodness of fit for parameters is predicted the observations at 95% of confidence interval. The model chi-square tests indicate that the overall goodness of fit of the probit model which is 38.34 and statistically significant at a probability of less than 1%. This shows that jointly the independent variables included in the probit model regression explain the variations in the farmers' probability to add values to milk. The pseudo-R2 values indicate that the independent variables included in the regression explain significant proportion of the variations in the dairy farmers" likelihood to add values to milk. Thus, pseudo-R2 =0.24 indicates that about 24% of the variation in the dependent variable is due to the explanatory variables included in the model.

Gender (GNDER): It is a dummy variable which take 1 for men households and 0 for women households. Gender has positive relationship with farmers' participation decision on milk value addition and statistically significant at probability of 5%. Gender aggregated data collected from male households from male and female as well as female households. Thus, understanding of the role of gender particularly women in dairy value chain at farm level and taking the issue of gender under consideration increases the farmers' participation decision on milk value addition by 5.3%.

Family size of household age greater than 6 years (FMSIZE): Family size of a respondent is a continuous variable measured in terms of number of family members in the household. Average number of family size in study area was 6 and most of sampled dairy households are under dependent age group. Thus, they consume milk in the form of liquid. The result of survey revealed that family size had negative impact on milk value addition participation decision of farmers and statistically significant at probability less than 5%. It implies that a unit increase on family size greater than 6 but dependent age group declines farmers' participation decision on milk value addition by 1%. The result agreed with Berem *et al*. (2010) asserts that household with adult has a positive influence on the both farmers likelihood to add and extent of value addition, implying that higher the number of adults in a household, the higher the value addition done by the household. This might be related to the decisions being made.

Types of dairy cows owned (TPSBRED): Dummy variable which take 0 for local breed and 1 for exotic. Types of breed of dairy cows had negative effect and statistically significant at the probability less than 1%. This implies most of sampled households in study area have local breed of dairy cows. These local breed of dairy cows were low in milk production. Thus, little amount of milk left for value addition purpose. The marginal effect realizes that households only owning of local dairy cows decline farmers participation decision on milk value addition by 34%.

Access to credit (ACCREDIT): It is a dummy variable which take value 1 if farmers have access to credit service and 0 otherwise. Access to credit had positive impact on milk value addition decision of producers and statistically significant at probability less than 5%. Access to credit encourages probability of farmers' decision on milk value addition by 16%. The reason may be farmers could purchase dairy cows, milking equipment, packaging materials and others easily if and only if they get access to credit.

Access to extension service (ACEXSRVCE): It is a dummy variable which take value 1 if farmers have access to extension service and 0 otherwise. Access to extension service had positive impact and statistically significant at probability less than 5%. This implies that access to extension service of dairy households create awareness on milk value addition and improves producers participation decision by 14%. The result agreed with Holloway and Ehui (2002) found that extension visits directly related with dairy household production, milk value addition and marketing of dairy products.

Milk yield produced at household (MLKYLDd): It is a continuous variable which measures the quantity of milk produced in liter. Quantity of milk yield produce at household had positive effect and statistically significant at probability less than 10%. The marginal effect revealed that a liter increase in milk yield from local breed at household level increases milk value addition decision by 53%. The reason may be farmers in study area adopted with local breed of dairy cows and thus local breed had low production of milk but better in fat content of butter. Respondents reported that farmers' who have low milk yield could not participate in value addition because they viewed it as a waste of time and finances. Therefore, to get more butter more milk yield production from local breed was expected from *Essera Woreda*. This study is in line with Tadele *et al*. (2013) studied that keeping of more local breed and producing more milk yield enhances both milk value addition decision and level of participation decision on milk value addition. The result also agreed with Borem *et al*. (2010) asserts that farmers with larger quantities of honey are more likely to engage in value addition as they see it as profitable unlike their colleagues who harvest smaller quantities of honey.

Table 5: Determinants of intensity of quantity of milk processed by producers

Variables	Coefficient	Standard error	P>/z/
AGEHH	0.001	0.002	0.630
GNDER	0.710	0.330	0.030
EDULHH	0.053	0.030	0.090
FMSIZE	-0.040	0.090	0.620
TPSBRED	0.340	0.150	0.030
ACCREDIT	0.165	0.080	0.030
ACEXSRVCE	0.140	0.070	0.000
ACSMCCETR	0.520	0.320	0.870
DCEMKT	-0.010	0.010	0.040
MLKYLDd	0.500	0.700	0.000
FCOOPERTV	0.120	0.700	0.090
LABOR	0.280	0.290	0.340
ACCSMKTINF	0.100	0.280	0.720
CSMRSPNCE	1.100	0.280	0.000
Constant	-1.300	1.100	0.270
Mills ratio	0.200	0.100	0.080

Number of observation = 133, Censored observation= 38, Uncensored observation = 95, Wald chi2 (13) = 1272.82 (0.0000), Prob > chi2 = 0.0000, Rho= 0.7, Sigma= 0.3.
Source: Own survey result (2015)

The second stage Heckman selection estimates for volume of milk value addition depicted in Table 5. Wald Chi-Square test employing an appropriate degree of freedom which implies that the overall goodness of fit for the Heckman selection model is statistically significant at less than 10%. Sigma indicates the adjusted standard error for the farmers' participation decision on level of milk value addition regression while Rho indicates that the correlation coefficient between the unobservable that determine selection into farmers' participation decision and the unobservable that determine the level of participation decision on milk value addition. Rho positive indicates the unobservable in the selection of participation decision of milk value addition are also affecting the stage 2 model (level of milk value addition) and is positively correlated. Thus, Wald chi2 (13) is strongly significant reveals that Heckman two stage model is applicable for this study.

GNDER (Gender): It is a dummy variable which take 1 for men households and 0 for women households. Gender has positive relationship with farmers' participation decision on level of milk value addition and statistically significant at probability less than 5%. Gender aggregated data collected from male households from male and female as well as female households. Thus, realize of the role of gender in dairy value chain at farm level and taking the issue of gender under consideration increase the level of milk value addition by 0.71 liter. The result of sampled respondents confirmed that most of the activities like feeding, watering, processing, barn cleaning, packaging and marketing dairy products were performed by women. The result of this study agreed with that of Tadele *et al.* (2014) reported that males are more mobile and have a chance to collect information on different value added dairy products than selling raw milk.

Educational level of household (EDULHH): It is the continuous variable measured as illiterate, read and write, primary, secondary and certificate. It has positive relation with farmers' participation decision on level of milk value addition and statistically significant at the probability less than 10%. Improving the education level of the households by keeping other independents constant increases the level of milk value addition participation of farmers by 0.053 liter. The reason might be education enhances the skills of farmers on milk value addition.

Distance nearest to market (DCEMKT):It is continuous variable and measured by km. As expected, distance to the nearest market center is statistically significant at the probability less than 5% and negatively associated with farmers' participation decision on level of milk value addition. A unit nearest to market center declines the level of milk value addition by 0.01. The reason might be milk can be consumed in the form of liquid.

Access to extension service (ACEXSRVCE): It is a dummy variable which takes 1 if farmers have access to extension service and 0 otherwise. Access to extension service has positive relation with farmers' participation decision on level of milk value addition and statistically significant at the probability less than 5%. The result of sampled households' survey realizes that improving of access to extension service increases the level of milk value addition by 0.1 liter while keeping other independent variables constant. Access to extension service enhances the level of milk value addition of farmers. The result agreed with Tadele *et al*. (2014) asserts that access to extension service widens the actors' knowledge and enhances the farmers' participation decision on milk value addition and level of milk value addition.

Types of dairy cows owned (TPSBRED): Dummy variable which take 0 for local breed and 1 for exotic. Types of breed of dairy cows had negative effect and statistically significant at the probability less than 5%. This implies most of sampled households in study area have local breed of dairy cows. These local breed of dairy

cows were low in milk production. Thus, little amount of milk left for value addition purpose. By keeping other variables constant additional owning of local breed of dairy cows increases the level of milk value addition by 0.34 liter.

Access to credit (ACCREDIT): It is a dummy variable which takes 1 if farmers who access to credit and 0 other wise. Access to credit has positive impact on level of milk value addition and significant at probability less than 5%. Keeping other independent variables constant, access to credit raises the level of milk value addition by 0.165 liter. This finding coincides with that of Owuor & Bebe (2009) that participation in credit has been found to cause a rise in household income in the long-run this rise in income is likely to have a positive effect on the probability to add value and level of value addition.

Membership in farmers cooperative (FCOOPERTV): It is a dummy variable which take 1 for household head who are in farmers group and 0 for others. It is positively associated and statistically significant at probability less than 10%. Keeping other independent variables constant household head being in farmers group enhances the farmers' participation decision on the volume of milk value addition by 0.12 liter. This is because of farmers' in group have access to training on easy access to skills, credit and information which in turn enable them to improve milk value addition in farm level to get better price did single farmers.

Quantity of milk yield (MLKYLDd): This is a continuous independent variable which is measured in litter and has positive impact and statistically significant at probability less than 1%. This implies that by keeping other independent variables constant one additional liter of milk increases the level of milk value addition by 0.5 liter. The result revealed that in study area sampled households owned with local breed dairy cows which have low milk production capacity. Thus, a little amount of milk left for value addition purpose. By keeping other independent variables constant additional liter of milk necessary to enhance the extent of milk value addition to get more value added dairy products. The result of this study agreed with Borem *et al*. (2010), asserts that farmers with larger quantities of honey are more likely to engage in value addition as they see it as profitable unlike their colleagues who harvest smaller quantities of honey. This factor was reported as a major constraint to value addition with those who harvested little amounts reporting that they could not participate in value addition majorly because they viewed it as a waste of time and finances.

Consumers' quality preference (CSMRSPNCE): It is a dummy variable which had positive impact and statistically significant at the probability of less than 1%. This implies that by keeping other explanatory variables constant an addition of sampled households add value on milk response to consumers' quality preference encourages the likelihood of farmers' extent to milk value addition by 1.1 liter. According to Colbon and Menapace (2011), it is important for agro-food distributors to understand the psychological construct underlying consumers' purchase decision process. The result coincides with that of Berhanu *et al*. (2011) asserts that while keeping other explanatory variables constant, an addition of a respondent household who add values to milk in response to consumer quality preference increases in the level of participation.

Lambda : According to Heckman two stage model output , the lambda (Inverse Mills Ratio) or selectivity bias correction factor has a positive impact and statistically significant at probability less than 10% . This result suggests that there appears to be unobserved factors that might affect both the probability of producers' participation decision and level of participation on milk value addition at the farm level in study area. The coefficient of Mills ratio in the Heckman two-stage estimation is **0.08** which is significant at the probability of less than 10% realizes that there is sample selection bias and the presence of unobservable behaviors of producers determining both producers' likelihood to milk value addition and level of participation on milk value addition in study area.

4. SUMMARY, CONCLUSSION AND RECOMMENDATIONS

4.1. SUMMARY AND CONCLUSSION

Farmers' participation decision on milk value addition positively associated with gender, quantity of milk yield produced per day, access to extension service, access to credit and statistically significant at probability 5%, less than 10%, 5%, and 5%, respectively. Households' only owning with local breed dairy cows and family size are negatively associated with milk value addition decision and statistically significant at probability less than 1% and 5% respectively. In further, gender, access to extension service, access to credit, types of breed of dairy cows, farmers cooperative, quantity of milk produced and consumers' quality preference in study area affects the volume of milk value addition positively and statistically significant at probability less than 5%, 1%, 5%, 5% , 10%, 1% and 1% respectively while family size and distance nearest to market negatively associated with volume of milk value addition and statistically significant at probability less than 10% and 5% respectively. Finally, According to Heckman two stage model output , the Lambda (Inverse Mills Ratio) or selectivity bias correction factor has a positive impact and statistically significant at probability less than 10%.

4.2. RECOMMENDATIONS

According to the result of probit estimation, gender, quantity of milk yield produced per day, access to extension

service and access to credit were statistically significant and positively associated with farmers' participation decision in milk value addition. On other hand, households only owning with local breed dairy cows and family size were negatively associated with farmers' participation decision on milk value addition. The result of Ordinary Linear Square estimation (OLS) reveals that gender, farmers cooperatives, types of breed of dairy cows, access to extension service, access to credit, quantity of milk produced per day and consumers' quality preference on value added dairy products were statistically significant and were positively associated with the volume of milk value addition. Therefore, stakeholders should improve farmers' participation decision and level of participation decision on milk value addition by providing appropriate extension service, empowering women, forming farmers cooperative, providing improved dairy cows, providing adult education, awareness creation on family planning and creating access to credit.

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6. APPENDICES

Appendices A: Tables

Table 1: The result of multi co linearity test (continuous variables)

Variable	VIF	1/VIF
MLKYLDd	1.09	0.92
AGEHH	1.14	0.88
DCEMKT	1.17	0.86
LNDSIZE	1.08	0.92
FMSIZE	1.02	0.98
Mean VIF	**1.10**	

Source: Own computational result (2015)

Table 2: The result of multi co linearity test (dummy variables)

	GNDER	TPSBRED	ACCREDIT	ACEXSRVCE	ACSMCCETR	FCOOPERTV	LABOR	CSMRSPNCE	ACCSMKTINF
GNDER	1.00	-	-	-	-	-	-	-	-
TPSBRED	-0.09	1.00	-	-	-	-	-	-	-
ACCREDIT	0.02	0.2	1.00	-	-	-	-	-	-
ACEXSRVCE	0.03	-0.12	0.06	1.00	-	-	-	-	-
ACSMCCETR	-0.08	-0.04	0.05	0.05	1.00	-	-	-	-
FCOOPERTV	-0.03	0.09	0.14	0.00	0.15	1.00	-	-	-
LABOR	0.03	0.08	0.08	-0.02	-0.06	0.3	1.00	-	-
CSMRSPNCE	-0.05	-0.04	0.05	0.05	-0.02	0.04	-0.03	1.00	-
ACCSMKTINF	0.04	-0.03	-0.11	0.12	-0.03	-0.03	0.01	-0.12	1.00

Source: Own computational result (2015)

Table 3: Heteroskedasticity test of the results

Source	Ch2	Df	p
Heteroskedasticity	128.52	126	0.4208
Skewness	41.51	15	0.0003
Kurtosis	0.00	1	0.9886
Total	170.03	142	0.0544

Source: Own computational result (2015)