Journal of Biology, Agriculture and Healthcare
ISSN 2224-3208 (Paper) ISSN 2225-093X (Online)
Vol.8, No.19, 2018

Dairy Value Chain Analysis in Meta District, Eastern Ethiopia

Sosina Bezie[1]* Mengisitu Ketema[2]
1.Debre Markos University, College of Agriculture and Natural Resources,
P.O Box 269, Debre Markos, Ethiopia
2.Haramaya University College of Agricultural Department of Agricultural Economics,
P.O Box 138, Dire Dawa, Ethiopia

Abstract
Identifying dairy value chain map, examining performance of actors in the chain and analyzing the determinants of milk market participation decision and level of milk marketed in the study area was the those specific objectives . The primary data for this study were collected by three stage sampling technique. In the first stage from 55 kebeles, eleven kebeles were selected purposively based on production potential. In the second stage out of those selected kebeles 4 of them were selected randomly and third stage 121 producers were randomly selected from list of dairy producer kebeles. Meanwhile, 46 traders from different markets and 28 consumers in Dire Dawa, Harar and Meta towns were selected and interviewed. Heckman two stage models were applied to identify determinants of milk market participation and volume of milk supply to the market. The cost margin indicates that the highest share profit margin profit was obtained by cafes 6.57 Birr/litre and the lowest profit goes to retailers(1.85 Birr/litre) next to producers (1.86 Birr/litre). Results of Heckman two stage selection model shows among those 14 explanatory variables hypothesized to affect milk market participation decision, distance to the nearest market, nonfarm income, crop income, land size and age of household were found negatively and significantly affecting participation decision. Supplementary feed, hybrid dairy cows, livestock size (TLU) were significantly and positively influencing the value of milk marketed. Mill's ratio was significant at outcome equation and it indicates that there were selectivity bias between those sample dairy producer households and heckman two-stage model was appropriate for the collected data. The value chain analysis revealed that the major value chain actors are input suppliers, producers, collectors, rural wholesalers, urban wholesalers, retailers, cafes and consumers. Value chain supporters are Meta Agricultural Office and Haramaya University. It is also found that milk passes through several intermediaries with value added products (boiled milk and yoghurt) before reaching the ultimate users. Therefore, policies aiming at increasing producer's provision of modern inputs, number of dairy cows and improving livestock production of dairy cows and change of their attitudes towards dairy production and participating to dairy market were recommended to accelerate diary value chains development in the study area.
Keywords: Dairy value chain, Heckman two-stage, market participation, value chain actors.

1 INTRODUCTION

1.1 Background

The roles livestock play in developing countries, especially to rural livelihood improvement and augmenting livelihood of poor, are well recognized (Upton, 2004). The estimate of cattle for the rural sedentary areas at country level is about 53.4 million. About 64% or 34 million of these are aged 3 years or above and play a number of economic roles in the livelihood of smallholder farmers.

Ethiopia holds large potential for dairy development due to its large livestock population and the favorable climate for improved, high-yielding animal breeds. Milk represents an important livestock product and makes a significant contribution to the nutrition as well as income of the livestock owner (Mohammed *et al*, 2004).

The country has about 27 breeds of cattle (DAGRIS, 2007). On the other hand, the results obtained indicated that 98.9 percent of the total cattle in the country are local breeds. The remaining are hybrid and exotic breeds that accounted for 0.94 percent and 0.11 percent, respectively (CSA, 2014). The national average milk yield per cow per day is 1.54 liters for indigenous cows. In Ethiopia, milk production is predominantly the domain of small and marginal farmers keeping 1-3 milch animals under mixed farming system (CSA, 2008).

The majority of milking cows are indigenous animals which have low production performance with the average age at first calving is 53 months and average calving intervals is 25 months. Cows had three to four calves before leaving the herd at 11-13 years of age, the average caw lactation yield is 524 litres for 239 days of which 238 litres is off take for human use while 286 litres is suckled by the calf. In addition, a very small number of crossbred animals are milked to provide the family with fresh milk butter and cheese. Women, who use the regular cash income to buy household necessities or to save for festival occasions, sell surpluses, usually. Both the pastoralist and smallholder farmers produce 98% of the country milk production (MOA, 1985 E.C).

Dairy products in Ethiopia were channeled to consumers through formal and informal marketing systems (Tsehay, 2001). The formal marketing system appeared to be expanding during the last decade with private farms entering the dairy processing. The informal market directly delivers dairy products by producers to

consumer (immediate neighborhood or sales to itinerant traders or individuals in nearby towns). In Ethiopia, the share of milk sold in formal market is less than 2% compared to 15% in Kenya and 5% in Uganda (Muriuki and Thorpe, 2001). As an option, dairy farmers processed 93% of milk produced into milk products. Generally, the low marketability of milk and milk products pose limitations on possibilities of exploring distant but rewarding markets. Therefore, improving position of dairy farmers to actively engage in markets and improve traditional processing techniques are important dairy value chain challenges of the country (Holloway and Ehui 2002).

1.2 Statements of the Problem

A properly functioning market (such as pricing system) for agricultural products is generally perceived as the best organizational structure to achieve more efficient production, in terms of type, quantity and quality, and consumption decisions (Bradhan, 1990).

The study area of Meta has high milk production marketed without further processing to other products. This implies that producers at farm level not get appropriate profit share than other intermediary. Even if, there were high production of milk there were no studies in the study area related to dairy value chain analysis. Dairy value chain studies become essential to provide vital and valid information on the operation and efficiency of dairy product marketing system, for effective research, planning and policy formulation. Knowing the behaviour of each actor from input suppliers to the ultimate consumers would be give information to solve problems and give ultimate solution. Therefore, in line with the market-orientated production strategy of the country's policy, the study is intended at bridging the information gap with regard to dairy value chains, factors affecting milk supply and to participate in the milk market in Meta district of East Hararegie Zone, Oromia national Regional state.

Besides it is intended to narrow the information gap on the area of interest by drawing attention in answering the following questions:

1.3 Objectives of the Study

The overall objective of the study is to assess value chain of dairy products in Meta district, Eastern Ethiopia. Specific objectives were:

1. To map the dairy value chain in the study area;
2. To identify dairy marketing costs and margins of the dairy value chain actors and to map the dairy value chain.
3. To identify determinants of participation decision and level of participation in-farm level milk marketing.

2 RESEARCH METHODOLOGY

2.1 Description of the Study Area

The study was conducted in Meta district, found in East Hararghe zone, Oromia National Regional State of Ethiopia and located about 435 km east of the capital city of Addis Ababa.

The district is characterized by crop-livestock mixed farming system where livestock in general and dairy production in particular contribute significantly to farmer livelihoods used as cash income generating purpose. Local cattle are the predominant breeds in the study area of Meta district. The area has high production of milk potential and selling to the district areas and other markets of Harar and Drie Dawa markets. The average temperature and rainfall of the district are 20^0c and 750 mm, respectively. The 2007 national census reported a total population for this district of 252,269, of whom 127,371 were men and 124,898 were women.

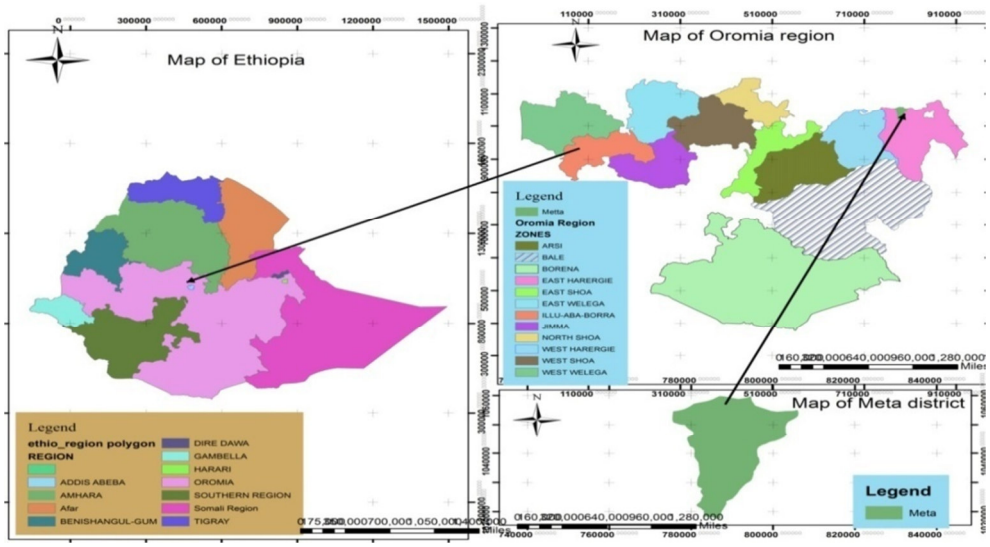

Figure 1. Geographical location map of Meta district.

Source: GIS map

2.2 Sample Size and Sampling technique

A three-stage sampling technique was implemented to select milk producer kebeles and sample milk producer households. In the first stage, out of 55 kebeles 11 milk producer kebeles were selected with consultation district agricultural experts and development agents, purposively based on their level of production and milk sales potential. In the second stage, from the identified 11 selected kebeles 4 kebeles were selected randomly. In the third stage, sample frame of the kebeles were updated and sample size of dairy producers were determined using a simplified formula provided by Yamane (1967) as follows.

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

Where: n= sample size=121

N =Population size=4000 e=sampling error/ level of precision = 9 % were used

Acertain proportions of traders at different levels were selected by simple random sampling method in the case of rural and urban wholesalers, collectors, retailers, and cafes. Furthermore, 9, 12 and 7 dairy product consumers were interviewed from Meta, Harar, and Dire Dawa cites, respectively.

2.3 Data Type and Methods of Collection

Both primary and secondary data types were used in the study under investigation. In order to generate these data types, both secondary and primary data sources were employed. Primary data were collected using two types of structured questionnaire, one for dairy producer farmers and the other for dairy product traders. A preliminary survey was also conducted through focus group discussions .Primary data collected from households were focused on factors affecting milk market participation decisions, volume of marketed milk supply and general behavior of different value chain actors. Secondary data were also collected from journals, books, CSA, internet browsing, district reports.

2.3.1 Descriptive Statistics Analysis

The data collected was analyzed using descriptive statistics. Econometric model was also being applied with the help of statistical software packages such as STATA and SPSS.

This method of data analysis refers to the use of percentage, means, and standard deviations. To compare and test the mean or proportion difference between selected characteristics appropriate tests of x^2 (chi-square) test for discrete variables was be used. Market Performance Analysis

Market performance refers to how well the market fulfills certain social and private objectives, includes price levels and price stability in long and short term, profit levels, cost, efficiency and qualities and quantity of food commodities' other scholars defines market performance as to the impact of output, by canalizing its level of marketing margin.

The total Gross Marketing Margin (TGMM) is required to be calculated (Scott, 1995).

$$TGMM = \frac{End\ buyer\ price - first\ seller\ price}{\text{End buyer price}} x100 \qquad (2)$$

Where, TGMM=Total Gross Marketing Margin

The producer's margin is calculated as a difference:

$$GMMp = \frac{End\ buyer\ price - marketing\ gross\ margin}{\text{End buyer price}} x100 \quad (3)$$

Where GMMp= the producer's share in consumer price or

PS= $\frac{pp}{cp}$=1-$\frac{MM}{cp}$

Where: PS=producers share
Pp=producers price
Cp=consumer price
MM=marketing margin

2.3.2 Econometric Analysis

Econometric analysis was used to estimate the causal relationship between the dependent variable and the explanatory variables.

Tobit model which assumes all producers are potential suppliers of a good and that volume of supply and market participation are influenced by the same variables in the same way (Blaylock and Blisard, 1993). But two dependent variables of milk participation decision and level of participation not affected by the same explanatory variables. Hence, Tobit model was not appropriate for the two dependent variables.

Heckman has developed a two-stage estimation procedures model that corrects for sample selectivity bias. If two decisions are involved, such as participation and volume of supply, Heckman (1979) two stage estimation procedures was appropriate. Technological desimnation, price information and distance to the nearest dairy market were biases in the study area. Hence, the first stage of the Heckman two-stage models a 'participation equation, attempts to capture factors affecting participation decision. This first equation is used to construct a selectivity term known as the 'inverse Mills ratio which is added to the second stage 'outcome' equation' that explains the common factors affecting both volume of milk supply and milk market participation. Hence, inverse Mill's ratio is a variable for controlling bias due to sample selection which is included in the supply equation (Heckman, 1979).

The second stage involves including the Mills ratio to the milk supply equation and estimating the equation using Ordinary Least Square (OLS). If the coefficient of the 'selectivity' term is significant then the hypothesis that an unobserved selection process governs the participation equation is confirmed. Moreover, with the inclusion of extra term, the coefficient in the second stage 'selectivity corrected' equation is significant and biased was there hence the Heckman two-step procedure, which is written in terms of the probability of milk market participation (MMP) and marketed milk volume (MMV) was:

Market participation equation

It identifies whether milk producing smallholder farmers participate in the market or not participate. In such circumstances, the probit model estimation is employed.

The Probit model is specified as:

$Y_{1i} = X_{1i}\beta_1 + u_{1i}$ $\quad u_{1i} \sim N(0,1)$ (4)

MMP = 1, if $Y_{1i} > 0$ or (Participated)

MMP = 0, if $Y_{1i} \leq 0$ (Not participated)

Where Y_{1i} is the latent dependent variable which is not observed, Participated or not participated

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

β_1 - is vectors of unknown parameter in participation equation

u_{1i} - are residuals that are independently and normally distributed with zero mean and constant variance.

The observation equation/the supply equation

Heckman selection model estimates volume of milk supplied to the market by smallholder milk market participants.

The model is specified as:

MMV = $Y_{2i} = X_{2i}\beta_2 + u_{2i}$ $\quad u_{2i} \sim N(0, \delta^2)$ (5)

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

Y_{2i} is regressed on the explanatory variables, X_{1i}, and the vector of inverse Mills ratios (λi) from the selection equation by ordinary least squares.

where: Y_{2i} is the observed dependent variable, it is the volume of supply in the second-step

X_{2i} is factors assumed to affect sale volume

β_2 is vector of unknown parameter in the supply equation

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

$\lambda = \frac{f(x\beta)}{1-F(x\beta)}$ (6)

$f(x\beta)$ is density function and $1 - F(x\beta)$ is distribution function

Table 1Summary of explanatory variables used in Heckman selection model

Variable	Description	Types	Values
MMV	Marketed Milk Volume	Continuous	Amount of milk sold in litre
MMP	Milk Market Participation	Dummy	1=yes, 0= no
AGE	Age of household head	Continuous	Number of years
SEX	Sex of household head	Dummy	1=Male, 0=Female
EDU	Education of household head	Continuous	Years of schooling
MANEQ	Family size	Continuous	Man equivalent
HYBR	Hybrid dairy cows	dummy	1=yes, 0= no
ACEXT	Extension service	Dummy	1=yes, 0= no
DNMM	Distance to the nearest milk market	Continuous	Distance in kilometer
NMC	Number of milking cows	Continuous	Number of local and hybrid milk cows
INFO	Access to market information	Dummy	1=yes, 0= no
NFARMI	Nonfarm income	Continuous	Nonfarm income in Birr
CROPI	crop income	Continuous	In Birr
LAND	Size of land holding	Continuous	Hectares
SFD	Usage of supplementary feed	Dummy	1=yes, 0= no
TLU	Number of livestock	Continuous	Tropical livestock unit (TLU)

3 RESULTS AND DISCUSSIONS

3.1 Demographic characteristics of sample producers (households)

Total sample size of dairy producer household respondents handled during the survey was 121. Of the total sample respondents, 90.08% were male-headed households and 9.92% were female-headed households. Of this percentage, from male-headed dairy households 69.72%, 30.28% were participants and non-participants in dairy marketing, respectively and from female-headed households 91.7% and 8.3% were participants and non-participants, respectively. Illiterate are 47.14%, adults education 20.69%, (1-4) grade 20.69%, (5-8) grade 11.48% and those non participants were, illiterate 44.12%, adults education 32.35%, (1-4) grade 8.82%, (5-8) grade 11.76% , (9-12) grade 2.95% educational level respectively.

Table 2. Demographic and socioeconomic characteristics of sample households

Variables	Description	Participation decision				
		No(34)	Yes(87)	Total(121)	%	t/x^2
Sex	Male	33(30.28)	76(69.72)	109	90.08	2.58
	Female	1(8.3)	11(91.7)	12	9.92	
Education	Illiterate	15(44.12)	41(47.14)	56	46.28	
	Adults education	11(32.35)	18(20.69)	29	23.97	
	(1-4) grade	3(8.82)	18(20.69)	21	17.36	
	(5-8) grade	4(11.76)	10(11.49)	14	11.57	
	(9-12) grade	1(2.95)	0	1	0.83	5.98
Marital Status	Married	32(94.12)	74(85.05)	107	87.60	2.5
	Divorce	0	5(5.75)	5	4.13	
	Widowed	2(5.88)	8(9.2)	10	8.26	
Nonfarm	No	25(73.53)	62(71.26)	87	71.9	0.06
income	Yes	9(26.47)	25(28.74)	34	28.1	

Source; survey result 2015

Table 3. Age, family size and dairy experience of the respondents

Variables	Description	Participation decision		x^2
		Yes(87)	No (34)	
Age	Mean	44.03	57.5	60.9*
	Std.D	10.46	14.07	
Family size	Mean	2.70	2.98	45.67
	Std.D	1.04	0.83	

Source: Own survey result (2015)

3.2 Dairy product movement

In Table 4. Were indicated sample dairy households produced 672.38 liters of milk per year. Most of the milk produced sold to the market as raw milk, of 320.04 litres or as 47.6% per households. Out of produced dairy milk 325.64 liters (48.43%) was used as home consumption. The remaining 3.97% of milk was processed to butter for cosmetic purpose of household members.

Table 4. Types of dairy products produced and utilized by sample farm households per household/year

Dairy products	**Litres**	**Percent**
Amount of row milk consumed at home	325.64	48.43
Amount of row milk supplied to the market	320.04	47.6
Amount of milk processed to butter	26.7	3.97
Total milk produced by sample households	672.38	100

Source: survey result, 2015

3.3 Access to extension services

Institutional support services such as extension are important prerequisite for enhanced dairy value chain. However, 51% and 17% of participants and non participants farmer respondents did not have Access to extension services. Moreover, this in adequate extension services shows that 100% of milk participants were selling row milk to the market without processing or value addition. About 36% and 17% of market participant and non participant dairy farmers were received extension services.

Table 5. Access to extension services

Extension contact	Non participants(N=34)	Participants(N=87)	Total	%	X^2
No	17	51	68	56.2	3.4
Yes	17	36	53	43.8	

Source: survey result, 2014/2015

There was no significance difference between participants and non-participants in contact of extension services.

3.4 Access to road and transport

Availability and adequacy of good road, commercial vehicles and telecommunication infrastructure were important prerequisite to link producers with markets in reduced transaction costs. Milk was mainly transported from rural *kebeles* to district market of Meta and Kulbi of different markets.

The survey result revealed that 63.2% and 11.77% of dairy market participants and non-participants had access to market, respectively. From total sample households, 59% of them do have access to market and the remaining 62% do not have access to market.

Average distance needed by milk market participants to travel to the nearest market was about 2.47 km whereas it was 4.23km for non-participants' households per kilometers. Thus, there was statistically highly significant difference between the two groups with regards to distance to nearest market.

Table 6. Access to market

Indicators	Item	Participants (87)	Non participants (34)	Total 121	t/X^2
Access to market	Yes	55 (63.2)	4 (11.77)	59	25.9***
	No	32 (36.8)	30 (88.23)	62	
Distance to market in km	Mean	2	4	6	

Note: The parenthesis indicate percentage, Source: survey result, 2015,

In addition to accessibility and adequacy, the sampled dairy households were asked about the effectiveness or the quality of the service provided by government. Accordingly, the survey result indicated that about 39.08% and 67.65% of milk participants and non-participants respectively confirmed the service they received is of good quality.

Indictors	Items	Participants (87)	Non participants(34)	Total (121)	X^2
Access to veterinary services	Yes	53(60.12)	18(52.94)	71	0.64
	No	34(30.08)	16(47.06)	50	
Quality	High	34(39.08)	23(67.65)	57	8.00*
	Low	53(60.92)	11(32.35)	64	
Adequacy	Adequate	34	24	58	9.7*
	Inadequate	53	10	63	
Indictors	Items	Participants (87)	Non participants(34)	Total (121)	X^2
Access to veterinary services	Yes	53(60.12)	18(52.94)	71	0.64
	No	34(30.08)	16(47.06)	50	
Quality	High	34(39.08)	23(67.65)	57	8.00*
	Low	53(60.92)	11(32.35)	64	
Adequacy	Adequate	34	24	58	9.7*
	Inadequate	53	10	63	
Indictors	Items	Participants (87)	Non participants(34)	Total (121)	X^2
Access to veterinary services	Yes	53(60.12)	18(52.94)	71	0.64
	No	34(30.08)	16(47.06)	50	
Quality	High	34(39.08)	23(67.65)	57	8.00*
	Low	53(60.92)	11(32.35)	64	
Adequacy	Adequate	34	24	58	9.7*
	Inadequate	53	10	63	

Access to grazing land

Respondents used different feeds for their dairy cows such as natural pasture in front and backyard of their house, cut and carry system, crop residues (mainly maize, barely straw, maize fur process, wheat straw, sorghum, maize leaves, sorghum leaves), concentrates and improved feeds introduced by NGO, research centre and office of agriculture such as elephant grasses on their garden areas. The survey result shows that in comparatively 33% of their feeding of dairy cows was crop residues and straw for participants and non participants feeding share were of the highest portion was 50% as the same of participants. Some of the respondents because of drought is becomes series problem receive and government organization supports through provision of grass hay and straw. Even if there were supports from government the respondents reported that no fair distribution of this supports by different problems of kebele agents.

Table 7. Feed shortage coping mechanisms

Variable	Participants (87)	Non participants (34)	Total (121)	X^2
Crop residue	18(20.69)	3(8.82)	21	
Crop residue, concentrates, straw elephant grass	4(4.61)	1(2.94)	5	
crop residue and straw	29(33.33)	17(50)	46	
crop residue and concentrate	13(14.94)	1(2.94)	14	
crop residue, concentrate and straw	19(21.84)	7(20.59)	26	10.35**
crop residue, concentrate and elephant grass	4(4.5)	5(14.7)	9	

Note: The parenthesis indicate percentage, Source: own survey result, 2014/2015

3.5 Demographic Characteristics of Milk Traders

3.5.1 Sex, religion and marital status of sample traders

Table 8 depicted that around 78.26% of sample traders were female and only 21.74% of them were male traders. Moreover, 73.91% of sample milk traders were Muslim, 15.2% Orthodox Christians and 10.87% was protestant Christians. Survey on their marital status depicted that 73.91% were married, 15.22% were divorce, 8.7% were

single and 2.17%, them were widowed.

Table 8. Sex, religion and marital status of sample traders

Indicators		Collectors (20)	Rural Wholesalers (3)	Urban wholesalers (6)	Retailers (12)	Cafes(5)	Total (46)	%
Sex	Female	15(75)	3(100)	6(100)	11(91.7)	1(20)	36	78.26
	Male	5(25)	-	-	1(8.3)	4(80)	10	21.74
religion	Muslim	19(95)	0	2(33.3)	10(83.3)	3(60)	34	73.91
	Orthodox	-	3(100)	1(16.7)	1(8.3)	2(40)	7	15.21
	protestant	1(5)	0	3(50)	1(8.4)		5	10.87
Marital	single	3	-	-	1	-	4	8.7
status	married	12	3	4	10	5	34	73.91
	widowed	-	-	-	1	-	1	2.17
	divorce	5	-	2	-	-	7	15.22

Note: The parenthesis indicate percentage, Sources: survey result, 2015

3.5.2 Age, initial working capital and experience of traders

Age is one of the demographic factors that are useful to describe traders experience and networking. The age of sample traders ranged from 24 to 60 years. The average age for each sample traders (Rural wholesalers, Urban wholesaler, collectors, retailers, Cafés) were 42, 39.8, 37.55, 37.25, and 41.8 years respectively and its standard deviation was 11.5, 6.49, 8.43, 10.72, 10.72 and 6.98 years, respectively. It shows that as the age of those traders were on active labour age it is good for doing different value chain activities.

Experience plays an important role in improving trading activities and marketing efficiency and system of handling of their products. Traders had a minimum of 4 years and a maximum of 24 years of experience of milk trading activity. The average trading experience for each sampled traders' respondents (Rural wholesalers, Urban wholesalers, collectors, retailers and cafés) was 8.3, 18.8, 8.5, 8.75 and 10.8 years with standard deviation of 1.5, 3.06, 5.2, 4.03, and 5.17 years respectively.

The traders' survey showed that a mean of 72, 79.2, 63.05, 63.5 and 278 of birr for Wholesalers, collectors, Retailers, and Café, respectively is necessary. This result shows that milk-trading activity requires low initial working capital to enter the market.

Table 9. Age, initial working capital and experience of traders

Variables	Rural Wholesalers(3)		Urban Wholesaler(6)		Collectors (20)		Retailers (12)		Cafes (5)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age s	42	11.5	39.8	6.49	37.6	8.43	37.5	10.2	41.8	6.98
Experience	8.3	1.5	18.8	3.06	8.5	5.2	8.75	4.03	10.8	5.17
Initial capital	72	18	79.2	28.3	63.1	45.2	63.5	29.53	278	186.1

Sources: own survey result, 2014/2015

3.6 Dairy value chain mapping

According to McCormick and Schmitz (2002), value chain mapping enables to visualize the flow of the product from conception to end consumer through various actors. The major actors in milk and value added products value chain are input suppliers, producers, collectors, rural wholesalers, urban wholesalers, retailers ,cafés and consumers.

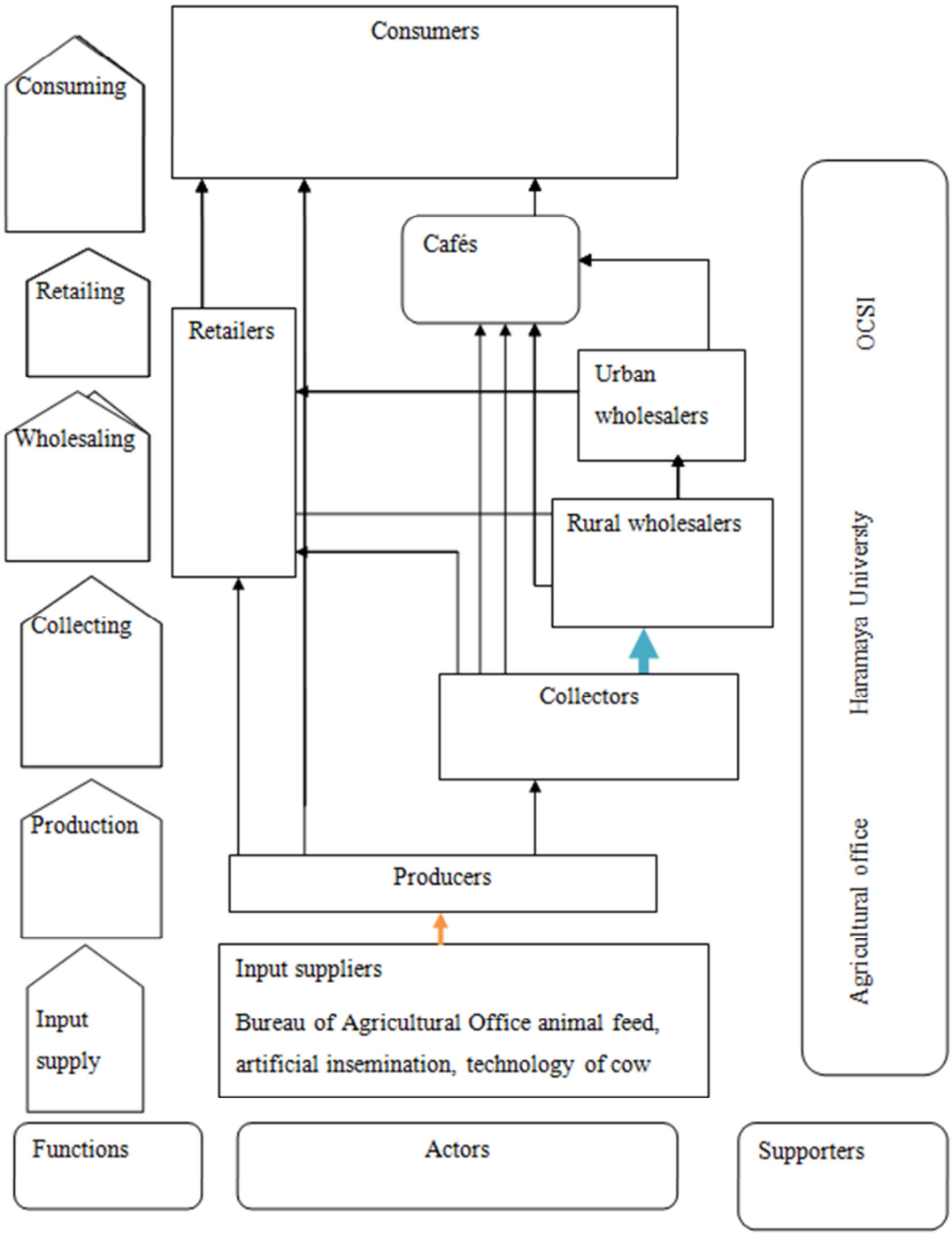

Figure 2. Map of milk Value chain
Source: Survey result, 2015

Represents the flow of much of products

Input flow

3.7 Actors, their roles, and relationships in dairy value chain

Input suppliers: Accordingly, inputs such as AI (Artificial Insemination), veterinary services, hybrid Borena cows, improved forage and pasture seeds, among others have been obtained from Agricultural office of Meta district. Even if, there was AI in agricultural support, supply of this input is not enough and available for rural *kebeles* which is long distance at the district town of Meta

Producers: The major value chain functions that dairy producers perform include feeding of their dairy cows, cleaning of their dairy cow barn, controlling and taking to veterinary services, harvesting or milking and transporting to purchasers of the product of different value chain actors. Majority of producers were selling their row milk to collectors and others of were also selling directly to consumers and retailers. In summer season, even if production of dairy cows milk and milk products increased, but the price were low.

Local collectors: These traders in assembly markets collect raw milk from dairy producers in local *kebeles* milk markets for reselling it to rural wholesalers, café, retailers and consumers directly. They only buy from their local market from their / *mamila*/ in their common language name and other producers. Those collectors have also an opportunity because of high demand of milk products in Hararghe region.

Rural wholesalers: Survey result indicates that three of rural wholesalers were found in Kulbi market. Kulbi city is the main assembly center for milk from collectors in their surrounding rural kebeles. Because those two *kebeles* Welgeltie Belina and Biftu Genama are found far from the district town, there is no any town around them and their only opportunity is selling to Kulbi market.

Urban wholesalers: Urban wholesalers are those who reside in terminal market of Dire Dawa at specific place of "*M*egala" market and Harar and buy processed or value added and unprocessed milk from rural wholesalers of Kulbi and directly from other collectors. At present, urban wholesalers are major milk suppliers to retailers and cafes of Dire Dawa and Harar.

Retailers: mostly whom they have shops and refrjrators have selling by value adding to other product form of yoghurt. Others sell without further processing. Directly consumers by value adding of yoghurt and further processing of boiling milk again to control quality.

Cafes: Based on the survey result shows, that majority of cafes buy milk from collectors, rural wholesalers and urban wholesalers. Most of them were further process to yoghurt and boiling to drink and sell directly to consumers.

Consumers: The survey result showed that from dairy products most of consumers used was raw milk. Consumers mostly consumed by paying high price and because of passing different value chain actors they may also loss their purity of milk. Respondent consumers from Meta, Dire Dawa and Harar they indicated that lower quality, high price and shortage of supply in dry season were the most severe problem.

3.8 Value Chain Governance

The dominant value chain actors play facilitation role. They determine the flow of commodities and level of prices. The study result indicated that rural wholesalers govern the whole milk. Producers are not governing the value addition chain. Hence, they are price takers. Therefore, producers do not get maximum benefit from selling row milk

3.8.1 Marketing channels

The result revealed that there are 9 major marketing channels obtained in terms of quantity flow in 2015.

I. Producers ➔Consumer=3124 Lt (8.06%)
II. Producers➔Retailers➔Consumers=1268.51 Lt (3.28%)
III. Producers➔Collectors➔Consumers=768.65 Lt (1.98%)
IV. Producers➔Collectors➔Retailers➔Consumers=1899.65Lt (4.9%)
V. Producers➔Collectors➔Cafes➔Consumers=1153Lt (2.98%)
VI. Producers ➔Collectors➔Rural wholesalers➔Cafés➔Consumers=6513Lt (16.8%)
VII. Producers➔Collectors➔Rural wholesalers➔Urban wholesalers ➔Cafés ➔ Consumers =6318.81Lt (16.34%)
VIII. Producers➔ Collectors➔ Urban wholesalers➔ Retailers➔ Consumers=5762L (14.88%)
IX. Producers ➔Collectors➔Rural wholesalers➔Urban wholesalers➔Retailers Consumers =11918.89Lt (30.78%)

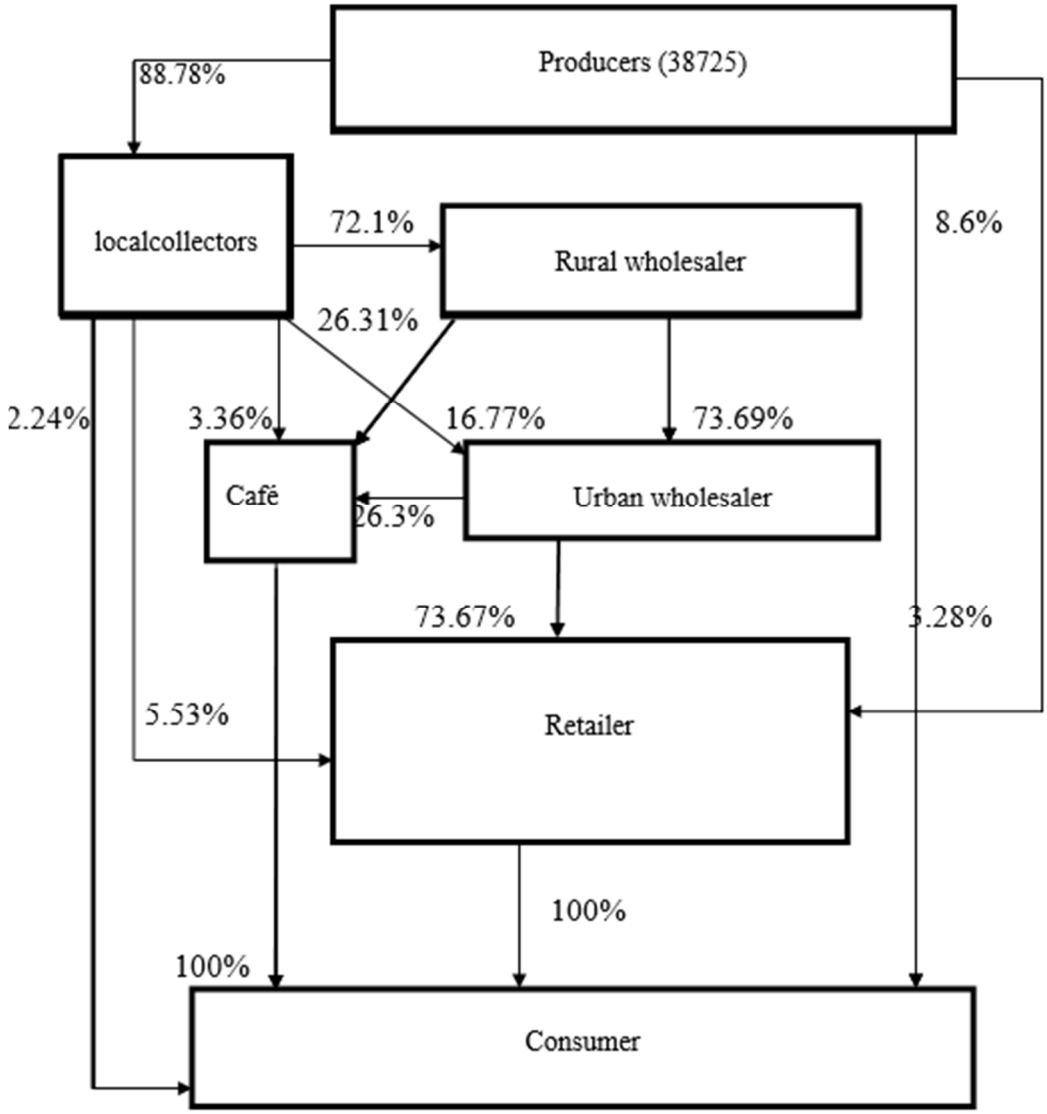

Figure 3. Dairy market channels
Source: survey result, 2014/2015

As can be seen from the Figure 3, sample respondents supply their product either through collectors, retailers or directly to consumers. Sample respondents selling their products to collectors 88.78%. The channel comparison was made based on volume that passed through each channel. Market channels IX and VI consisted the largest volume i.e. 30.78% and 16.8%, respectively.

Local collectors selling their milk products to rural wholesalers 72.1%. The remaining passes through 16.77%, 5.53%, 3.36%, and 2.24% to urban wholesalers, retailers, cafes and directly to consumers respectively. Rural wholesalers selling their boiled milk to urban wholesalers 73.69% of products and the remaining of 26.31%, to cafes. Urban wholesalers sells 73.67% to retailers and others to cafes. The remaining actors of cafes and retailers sells to consumer are directly.

3.9 Dairy market performance

In order to measure the market share of each agent, the marketing channel where all agents have participated was selected. Marketing margins, associated costs and benefit share of value chain actors and marketing margins through different main channels were presented bellow.

Table 10. Marketing costs and benefits of different dairy value chain actors (Birr/litre)

Cost items	Producers	Collectors	Rural Whole sellers	Urban wholesalers	Retailers	Cafes
Purchase price	-	11	12	17	16	19.3
Production cost	9	0	0	0		0
Transportation cost	0.05	0.5	0.65	0.25	-	-
Cleaning of containers	0.01	.025	0.025	0.028	0.005	.009
Spoilage and loss cost	-	0.03	0.06	0.04	.0009	-
Loading and un loading cost	-	-	-	0.1	-	-
Telephone	-	0.02	0.15	0.25	0.05	0.2
Processing/boiling/cost including wood of perfume		0.005	0.475	-	0.19	0.9
Labour cost	0.08	-	0.125	.06	0.17	0.35
Buying milk container	0.0015	0.0007	0.0013	0.001	-	-
Total cost per litre	9.1415	11.5807	13.49	17.729	16.4159	20.759
Selling price	11	14	17.7	20.7	18.25	27.33
Profit margin	1.86	2.42	4.21	2.97	1.85	6.57

Source: own survey result, 2014/2015

Producers profit margin was very low as because of production cost were higher. From all value chain actors cafes take the largest share of profit of 6.5 Birr per litre. Rural whole sellers of Birr 4.21 per litre also shared the second profit margin. Retailers were also the lowest profit margin share as compared other all value chain actors except producers.

Table 11. Marketing margins of actors in different marketing channel of milk products

Market margin(%)	I	II	III	IV	V	VI	VII	VIII	IX
TGMM	0	14.3	21.4	21.4	54.2	54.2	60.7	54.2	47.6
GMMp	100	85.7	78.6	78.6	45.8	45.8	39.3	45.8	52.4
GMMr		14.3		14.3				16.6	4.7
GMMco			21.4	7.1	25	4.2	3.6	25	4.7
GMMca					29.2	20.8	21.4		
GMMrw						29.2	17.9		23.8
GMMuw							17.9	12.5	14.4

Note: TGMM, GMMP, GMMr, GMMco, GMMca, GMMrw, GMMuw are total gross marketing margins, gross marketing margin of producers, retailers, collectors, cafes, rural wholesalers and urban wholesalers respectively.
Source: survey result, 2015

The total gross marketing margin (TGMM) was highest in channel VII and it was 60.7% of the consumers' price followed by channel V, VI, and VIII, which accounted for 54.2% of the consumers' price. Cafes and rural wholesalers get the highest margin of 29.2% in channel V and VI, respectively. Whereas the lowest margin accounted for 3.6% by collectors in channel VII.

3.10 Econometric Model Outputs

3.10.1 Determinants of milk market participation

This model also helps to calculate the Inverse mills ratio that is used in to the supply function. The significant chi-square value of the model (182.36) indicated that Heckman selection model is appropriate for the data under considerations (for details refer to Appendix Table 4). Three independent variables namely, land at 10%, nonfarm income and distance to the nearest milk market influence producers market participation negatively significant at 5% level respectively. Income from crop and age of household head also affect producers' participation decision of milk at 1% significance level negatively.

Age of household head (AGE): As hypothesized, it influenced milk market participation decision negatively at 1% significance level. The marginal effect revealed that when the household age increases by one year, the probability of participating in the milk market decreases by 0.85%.

Land size (LAND): the model output result clearly depicts that land size had a negative impact on milk market participation and it was significant at less than 10%. Hence the marginal effect confirms that as land size increases by one hectare, the probably of milk market participation to the market decreases by 29%.

Distance to the nearest market (DNM: This variable was found significant to influence participation decision in milk market negatively at less than 5% significant level negatively. This implies that as dairy producer residents distance increases by a kilometre from the milk market, the probably of participation decision to the

market decreases by 7.3 percent.

Nonfarm income (logNFARMI): As hypothesized, other non-farm income of the household heads had negatively affected milk market participation decision at less than 5% significance level. On average, if a dairy producer gets non farming income increment by one percent causes 1.5% reduction in participating in milk market.

Crop income (logCROPI): It influences participation of milk market significantly and negatively at less than 1% significance level. Since, the result revealed that as income from crop increases by one percent participation decision of milk to the market decreases by the predicted value of 27.7%. In realty most of these types of farmers have been irrigation access and more hectare of land.

Table 12. First step heckman selection model with marginal effects

Variables	Coefficients	Std. Err	Marginal effect
SEX	.7772334	.935331	.0701727
AGE	-.0942235***	.0338021	-.008507
EDU	-.3193295	.2772534	-.0288307
MANEQ	-.1353735	.2773695	-.0122222
LAND	-3.211204*	1.761623	-.2899243
LogCROPI	-3.069039***	1.076004	-.2770889
logNFARMI	-.1632798**	.0677218	-.0147418
NMC	1.089878	.7360185	.0983998
INFO	.6773425	.7386585	.061154
DNM	-.8115988**	.3690459	-.0732754
ACEXT	-.2141931	.5794601	-.0193385
SFD	-.2620574	.8636463	-.0236599
HYBR	1.554085	1.860134	.1403109
TLU	.1178944	.1525519	.0106441
_cons	39.23724	12.62674	

Note: ***, ** and * at 1%, 5% and 10% indicate statistically significance level respectively.
Source: own survey result, 2014/2015

3.11 Determinants of level of participation in-farm level milk marketing

Inverse mills ratio (LAMBDA): The p-value of this variable is 0.061. This implies that the correction for selectivity bias is highly significant at less appropriate for this data and Mill's ratio corrects biased. Hence, this result suggests that there appears to be unobserved factors that might affect negatively both probability of dairy household market entry decision and marketable milk volume.

Supplementary feed (SFD): As expected, this variable influences milk market volume positively and significantly at less than 10%. The result shows that, as compared users of supplementary feeds from non-users, the volume of marketed milk volume would increase by 119.83 litres for users per household per year.

Improved milk cows (HYBR): As expected hybrid milk cows indicates a positive estimated coefficient which is significant at 1% significance level. This implies that as compared to non owners of hybrid milk cows the household who have hybrid dairy cows, milk marketed to the market increases by 692.5 litres per year.

Tropical livestock unit (TLU): This variable was found to influence the volume of milk marketed positively and significantly at less than 10% significance level. In addition as the number of cows increase, milking period may increase and milk marketed volume increase. Thus, the coefficient shows that a unit increase in tropical livestock unit lead to 24.89 litres increase in volume of milk marketed.

Table 13. Estimates of level of participation

Variables	Coefficient	Standard deviation	p- value
AGE	-.4107171	2.415878	0.865
EDU	10.68114	20.54922	0.603
MANEQ	-8.307653	21.83056	0.704
DNM	6.532357	20.13764	0.746
LAND	-18.78078	224.8759	0.933
LogNFRMI	-2.309267	5.679849	0.684
SFD	119.8349*	69.62317	0.085
HYBR	692.4908***	88.28532	0.000
TLU	24.87701*	13.83852	0.072
_cons	297.0576	135.3909	0.028
Mills or lambda	-192.3974	76.40392	0.012
sigma	192.39737		

Note**: *, **,** and *** at 10%, 5% and 1% significance level respectively.
Source: own survey result, 2014/2015

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

The study was aimed at analyzing dairy value chain analysis in Meta district of East Hararghe zone, Oromia region. The specific objectives of the study include mapping the dairy value chains in the study areas; identifying dairy marketing costs and margins of different value chain actors across key dairy marketing channels of the study area, and identifying determinants of participation decision and level of participation in farm level milk marketing of households.

The data were collected from both primary and secondary sources. The primary data were generated from individual interview using semi-structured questionnaire and checklist. The primary data for this study were collected from 121 producers randomly selected from four *kebeles* of Meta district and 46 traders selected from four of the market was from selected kebeles and others were Harar, Dire Dawa, Kulbi and Meta district and 28 consumers selected from Harar, Dire Dawa and chelenko. The analysis was made using descriptive statistics and econometric model using STATA 11 software. In this study, determinants of dairy farmer's participation decision and level of participation in-farm level milk marketing has been analyzed using Heckman two-stage selection model.

Of the 121-interviewed dairy producing sample households, 90.08% were male headed and the rest 9.92% were female headed from sample households in the district of four sample kebeles. Of this percentage 69.72%, 30.28% and 91.7% 8.3% of male and female head dairy households were milk participants and non participants respectively. Mean age of milk market participants were 44.03 years while that of non participants were 57.5 years. With regard to educational status of the two groups of participants and non participants, illiterate were 47.14%, adults education 20.69%, (1-4) grade 20.69%, (5-8) grade 11.49% for participants and illiterate 44.12%, adults educational 32.35%, (1-4) grade 8.82%, (5-8) grade 11.76% , (9-12) grade 2.95% educational status for non participants.

Collectors were engaged in purchasing milk from remote areas and sell at town markets to rural and urban wholesalers, retailers and for consumers in market. Rural wholesalers purchase milk from producers and milk collectors and sell directly to retailers, urban wholesalers and cafes. Retailers purchase milk from collectors, producers, collectors urban and rural wholesalers and sell to consumers. Cafes also purchase from collectors, rural and urban wholesalers and directly sell to consumers.

The finding shows that, age, land, nonfarm income, crop income and distance to the nearest milk market influenced producers' market participation significantly and negatively. While number of milking cows also affects producer's participation decision in milk market positively. Moreover, the result indicated that marketed milk volume was also affected by hybrid dairy cows, supplementary feed and tropical livestock unit positively and significant.

4.2 Recommendations

The government and stakeholders disseminate new x-breed or improved dairy cows, improved feed, give available extension service, and training and continuously follow up to increase production and marketed milk volume.

Because of Borena or improved milk cows gives higher milk production it may help to recover production costs. It is, therefore, clearly indicated that governmental organizations, universities and other stakeholders who are concerned to support those farmers must strengthen training, follow up and other supports to dairy producers in the district.

Tropical livestock unit also affected volume of milk marketed positively and significantly. Since livestock diseases and shortage of water supply are major challenges to livestock production in the study area, governments and other stakeholders involvement of improved livestock types, disease resistant and adaptable species, veterinary services and adequate water supply should be provided by the responsible bodies of governments and NGO with farmers of dairy producers.

Milk market participation also influences negatively and significantly by age of household head, land size, nonfarm income, crop income and distance to the nearest milk market. So governments and other stakeholders must improve the breeds of dairy cows to increase milk production at the same time increasing their number of cows. Even if land is scarce resource, households in the district adopted zero grazing land system which implies that increasing number of cows by feeding factory feeds will also be the best alternative.

Those farmers who have another adequate crop income generates but not know the value or the advantage of milk income benefits those farmers who must change their production system to dairy products as because of demand of dairy products increases. Other farm income of crop may be destroyed by natural damage and may be seasonal so, this production of dairying of damage is controlled, and owning of land is scarce from the district.

Distance to the nearest milk market influences marketed milk volume negatively. Therefore, Governments and those stakeholders must give technical support to change their consumption system and how to get benefit from dairy cows by value adding.

5 REFERENCES

Upton, M. 2004. The role of livestock in economic development and poverty reduction. pro- poor livestock policy initiative, working paper 10, FAO: Rome.

Mohamed, A.M., Ahmed, Simeon, Ehui and Yemesrach Assefa, 2004. Dairy development in Ethiopia. EPTD Discussion Paper No. 123. International food policy research institute, NW Washington, D.C, U.S.A.

DAGRIS (Domestic Animal Genetic Resources Information System). 2007. International livestock research institute, Addis Ababa, Ethiopia. Available from http://dagris.ilri.cgiar.org.

CSA (Central Statistical Agency). 2014. Area and production forecast of major crops: agricultural sample enumeration surveys, various issues, Addis Ababa, Ethiopia.

CSA (Central Statistics Authority). 2008. Reproductive performance of dairy cows under farmer's management in and around Mekelle, Ethiopia**.** Livestock research for rural development, 26 (5). Guide for preparation of papers.

MOA (Ministry of Agriculture). 1985. Ethiopia's Agriculture Sector Policy and Investment Framework: Addis Ababa, Ethiopia: Ministry of Agriculture and Rural Development.

Tsehay Reda. 2001. Small scale milk marketing and processing in Ethiopia. In: D. Rangnekar and W. Thorpe. (eds.), Smallholder dairy production and marketing-opportunities and constraints. Proceedings of a South–South workshop held at NDDB, Anand, India, 13-16 March 2001. NDDB (National Dairy Development Board), Anand, India, and ILRI, Nairobi, Kenya, Pp: 352-367.

Holloway, G., and Ehui, S. 2002. Expanding market participation among smallholder livestock producers: A collection of studies employing Gibbs sampling and data from the Ethiopian highlands. socio-economic and policy research working paper 48. ILRI, Nairobi, Kenya. 85p.

Bradhan, P. 1990. Symposium on the state and economic development. *Journal of Economic perspective.*3:3-7

Belay, G,Tesemma, T, Becker H.c. and Merker, A. 1993. Varation and interrelationships of agronomic treats in Ethiopian tetraploid wheat landraces. Euphytica 71, 181-188.

Heckman, J. 1979. Sample selection bias as a specification error, *Econometrica*, 153-161p.