

## Analysis of Existing Dairy Value Chains and Its Strands to Construct Viable Strategies for Upgrading: The Case of Urban and Peri-urban Area of Southern Tigray

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Received date: November 24, 2018; Accepted date: December 10, 2018; Published date: December 14, 2018

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### Abstract

The aim of this research was to analyze the existing dairy value chain and its strands to construct viable strategies for upgrading in the southern zone of Tigray with specific objectives of to explore the drivers, trends, and factors affecting dairy value chain upgrading and to construct viable strategies. Primary data were collected from multiple sources including a total of 120 producers [60 crossbred owners (urban dairy producers) and 60 local breed owners (peri-urban dairy producers)], value chain actors: 24 traders, 20 consumers, and 8 service providers in Edamehoni and Alamata districts. The collected data was analyzed using application of appropriate statistical tools and simple descriptive statistics. The result of the study showed that the trend of milk production has shown a slight increase from 2011 to 2015 in the study areas. Marketing channels or sale outlets in both urban and peri-urban areas for milk and milk products were individuals, restaurants, and cafeteria. The major constraints of dairy value chains in the studied areas are a shortage of improved feed, the high cost of feeds, inadequate extension services, and poor market access and absence of dairy producers-led-cooperatives. Generally, dairy value chains in the study area seem to be ineffective and weak. The major viable strategies for the upgrading of the dairy value chain are input supply, institution and capacity building interventions. Thus aforementioned dairy upgrading interventions should be aimed at addressing both dairy production techniques gaps and marketing challenges. The study further suggested establishing of dairy producers-led-cooperatives to solve input/output supply services, improving extension services, improves access services and associating the linkage among dairy value chain actors should receive due to attention in order to improve dairy production and marketing.

**Keywords:** Trends; Peri-urban; Smallholder; Dairy farming; Urban

### Introduction

Livestock plays an important role in the national economy. It contributes 10% of all formal export earnings accounting about 150 million USD per year and 300 million USD per year from the informal market sources. Moreover, livestock accounts for 15% to 17% of the total GDP and 35 to 49% of the agriculture GDP. At the household level, it contributes to the livelihoods of approximately about 70% of Ethiopians [1]. However, the development of livestock sector is challenged by a number of constraints such as unimproved (traditional technologies), limited supply of inputs (feed, breed, stock, and water), poor extension service, high diseases prevalence, poor marketing infrastructure, lack of marketing support service, lack of market information and limited credit services [2].

Dairying production is practiced in the pastoralist, agro-pastoralist, and crop-livestock mixed farming, urban and peri-urban ranges from small scale, medium scale, and large-scale practices. Based on climate, landholding, and integration with crop production, dairy production systems are classified as small-scale rural, peri-urban and urban [3]. While based on market orientation, the scale of operation and production intensity dairy production systems can be categorized as traditional smallholders, privatized state farms and urban and peri-urban systems [4]. The traditional smallholder dairy production system

is not market-oriented and most of the milk produced is retained for home consumption. Milk production in this system is characterized by low yield and seasonal variability [5]. In the case of privatized state dairy production system producers raise animals primarily to produce milk with intensive feeding and management practices to generate profits. They regard their milk production as an important business, rather than as a sideline activity [6]. Whereas urban and peri-urban dairy production sector accounts most of the country's improved dairy stock and serves as the major milk suppliers to the urban market [2]. The major sources of milk in Ethiopia are dairy cows that account 83% of total milk production, while goats and camels also account 17% of milk production in pastoralist areas [7].

Value chain analysis is essential to an understanding of markets, their relationships, the participation of different actors and the critical constraints that limit the growth of livestock production and consequently the competitiveness of smallholder farmers [8].

Dairy production is crucial in Ethiopia as milk and milk products are an important source of food and income generation. The country is known to have the highest number of cattle in Africa making it one of the biggest potential producers of milk and milk products in the continent. Despite the huge potential, dairy production has not been fully exploited and promoted in the country. In many instances, policy decision on livestock and livestock product marketing are taken in the absence of vital information on how they affect dairy producers,

traders, exporters, and consumers. Consequently, current knowledge, on a dairy product market chain, performance and prices are poor for designing policies and institutions to overcome the perceived problems in the marketing system [9]. Weak linkages among the different actors in the dairy value chain are some of the important factors that contribute to the poor development of Ethiopia's dairy sector [10,11].

Smallholder dairy farmers and other value chain actors have key economic and job creation opportunities. Most of the previous studies in the study were conducted in marketing chain only. However, the drivers, trends, and factors which affecting dairy value chains upgrading and viable strategies for the upgrading of smallholders are not clearly understood. For this reason, it has been difficult to formulate and implement the appropriate intervention in relation to dairy value chain development actions in the study area. Therefore, it is imperative to conduct comprehensive studies that can cover to construct viable strategies for the upgrading of smallholder dairy farmers in two selected district of southern zone of Tigray.

## Materials and Methods

### Descriptions of the study area

The study was conducted in the southern zone of Tigray (SZT) region, Ethiopia. The zone has high, low, and mid-altitude agro-ecologies [12]. The altitude variation in the zone ranges from 930 to 3925 m.a.s.l. Similarly, the mean annual temperature ranges from 9°C to 32°C. The annual mean rainfall ranges from 400 to 912 mm [13]. Edamehoni district is estimated to range from 1800 to 3250 m.a.s.l. The average temperature ranges from 12.07°C to 24.96°C. The mean annual rainfall ranges from 600-800 mm and the area is situated on geographic coordinates of 12° 47' North latitude and 39° 32' East

longitudes Alamata district is found in altitude range from 1178 to 3148 m.a.s.l. Average temperature ranges from 22°C to 40°C. The rainfall amount ranges from 615 to 927 mm with an average of 715.14 mm and the geographically the area lies at 39° 35' East longitude and 12° 15' North latitude [14].

### Sampling procedure

The multi-stage sampling procedure was employed to undertake the study. In the first stage, two districts (Edamehoni and Alamata) were selected purposively considering the potential for dairy farming from the five districts of southern zone of Tigray region. Secondly, each district was stratified into urban (crossbreed owning) and peri-urban (local breed owning dairy farming) based on their involvement in the dairy farming. Moreover, for urban dairy production system Alamata and Maichew and peri-urban dairy production system Simret and Selam-Bikalsi were selected purposively. Dairy farmers who owned 1-5 cows from indigenous and crossbred production system were selected from each study areas. Thirdly, from each selected areas 30 households were selected randomly for survey study. Equal sampling methods were employed to select 60 households from each of production system. A total sample size of 120 households was selected from the two districts. Then, value chain actors [input suppliers (4), traders (Restaurants, snack, café and hotels) (20), consumers (20) and service providers including: Office of Agricultural and Rural Development (OoARD) (2), DeditCredit and Saving Institution (2), artificial insemination service provider (2) and veterinary service provider (2)] were involved based on the availability and size. Accordingly, a total sample respondent of 172 was used for this study (120 smallholders' dairy producers and 52 other market actors participating in the dairy value chain).

Districts	Production system		
	Urban (crossbreed owners)	Peri-urban (local breed owners)	Total No of HH interviewed
Edamehoni	Maichew (N=30)	Simret(N=30)	60
Alamata	Alamata (N=30)	Selam-Bekalsi(N=30)	60
Total sampled HH	60	60	120
No=Number, HH=Household			

**Table 1:** Sampling layout of the individual interviews.

### Method of data collection

The data used for this study were collected both from primary and secondary sources. Primary data on the production and marketing system collected from producers, input supplier, retailers (Restaurants, snack, café, and hotels), service providers and consumers using semi-structured questionnaires and group discussion with key informants. The checklist was prepared for the discussion purpose with key informants. Secondary data were collected from different published and unpublished reports such as OoARD, Office of Trade Agency (OoTA) and various websites.

### Methods of data analysis

The data collected from different sources were analyzed using SPSS version 20 and summarized using simple descriptive statistics. In order

to compare socio-economic characteristics of the respondents, access to credit services and market information produced and category urban and peri-urban dairy production by using independent t-test and cross-tabulation (Chi square-test) considering the objectives of the research.

## Results

### Descriptive of the households

#### Demographic and socio-economic characteristics of households

**Age:** Average age of dairy producers in the two studies is presented in Table 1. Out of the sampled household, the average age was 43.29 ± 13 and it ranges from 18 to 76. The average age of urban and peri-urban dairy producers was 43.13 ± 14.6 and 43.45 ± 11.31 years,

respectively and there was no significant ( $P > 0.05$ ) difference of age between urban and peri-urban households.

**Family size:** The average family size of urban and peri-urban households was  $3.3 \pm 1.72$  and  $4.97 \pm 1.64$ , respectively (Table 1). There was significant ( $P < 0.01$ ) variation in family size between urban and peri-urban households. The family size of urban and peri-urban households ranged 1-7 and 1-9, respectively.

**Land size:** Average landholding of urban and peri-urban households is presented in Table 1. There was significant ( $P < 0.01$ ) variation in land holding size between urban and peri-urban dairy farming households with  $0.29 \pm 0.15$  and  $1.07 \pm 0.64$  ha, respectively. The land holding size of urban and peri-urban households ranged between 0.25-0.75 ha and 0.6-2.5 ha, respectively.

**A number of milking cows:** The average number of milking cow size of urban and peri-urban households were  $1.96 \pm 1.04$  and  $1.58 \pm 0.7$ ,

respectively. There was significant ( $P < 0.05$ ) variation in milking cows size owns in urban and peri-urban households. The milking cow size owns urban and peri-urban households range between 1-5 and 1-3, respectively.

**Marketplace distance:** The distance of the market place from home of urban and peri-urban households is presented in Table 1. There was significant ( $P < 0.01$ ) variation in distance of the market place from home between urban and peri-urban dairy farming households with  $1.18 \pm .475$  and  $1.15 \pm 1.84$  kilometer, respectively.

**Farming experience:** The average dairy farming experience of urban and peri-urban households were  $5.2 \pm 6.68$  and  $15.32 \pm 10.6$ , respectively. A significant difference ( $P < 0.01$ ) was observed in dairy farming experiences between the two dairy farming systems. The dairy farming experiences of urban and peri-urban households ranged between 1-34 years and 1-45 years, respectively.

Variables	Productions system				T-test	Overall	
	Urban		Peri-urban			(N=120)	
	(N=60)		(N=60)				
	Mean	SD	Mean	SD	P-value	Mean	SD
Age (years)	43.13	14.6	43.5	11.3	0.895	43.3	13.0
Family size (No)	3.30	1.72	4.97	1.64	0.000***	4.13	1.68
Land size (ha)	0.29	0.15	1.07	0.64	0.000***	0.68	0.69
Milking cows (No)	1.93	1.04	1.53	0.70	0.015**	1.73	0.90
Distance from market (km)	1.18	0.47	5.15	1.84	0.000***	3.17	2.39
Dairy farming experience (years)	5.20	6.68	15.3	10.6	0.000***	10.3	10.2

Where \*\*\*= ( $P < 0.01$ ) and \*\*= ( $P < 0.05$ ) N= Sample size SD=Standard Deviation

**Table 2:** Socio-economic characteristics of households in Alamata and Edamehoni districts.

**Sex:** The proportion of males and female households involved in urban and peri-urban dairy farming in the study areas were 83.33% and 17.67%, respectively. In urban dairy production system groups, 82% and 18% of households were male and females. While 85 males and 15% females participated in peri-urban dairy production (Table 2).The present findings indicated that the participation of female household heads is lower than the male household head in both dairy production system.

**Educational level:** About 26.7%, 25%,21.7%,13.3%,10% and 3.3% of urban dairy farming households educational level were diploma, secondary school, primary school, degree, non-educated, and writing and reading, respectively. While the peri-urban 50%, 43.3% and 6.7%, were, non-educated, primary school, and writing and reading,

respectively (Table 2).There was significant ( $P < 0.01$ ) variation in the educational level of the households between the two dairy farming system. Comparatively, there were more educated households in urban (90%) than peri-urban households (50%).

**Occupation of household head:** As shown in Table 3, about 45%, 23% 23% and 9% of urban dairy farming households were involved in dairy farming, government employee, crop and livestock farming and private employee, respectively. While 70%, 26.7% and 3.3% of peri-urban household were engaged in crop and livestock farming, dairy farming and private employee (Table 2). A higher number of full-time dairy farmers were noted in urban dairy farming as compared to the peri-urban system.

Variables	Production system				Chi square-test	Total	
	Urban		Peri-urban			(N=120)	
	(N=60)		(N=60)				
	Frequency	%	Frequency	%	P-value	Frequency	%

Sex							
Male	49	82	51	85		100	83
Female	11	18	9	15	0.624	20	17
Education level							
Non-educated	6	10	30	50		36	30
Writing and reading	2	3.3	4	6.7	0.000***	6	5
Primary school	13	21.7	26	43.3		39	32.5
Secondary school	15	25	-	-		15	12.5
Diploma	16	26.7	-	-		16	13.3
Degree	8	13.3	-	-		8	6.7
Occupation							
Crop and livestock farming	14	23	48	80		62	51.7
Government employee	14	23	-	-	0.000***	14	11.7
Private employee	5	9	2	3.3		7	5.8
Dairy farming	27	45	10	16.7		37	30.8

Where \*\*\*= (P<0.01) % = Percent, N= Sample size

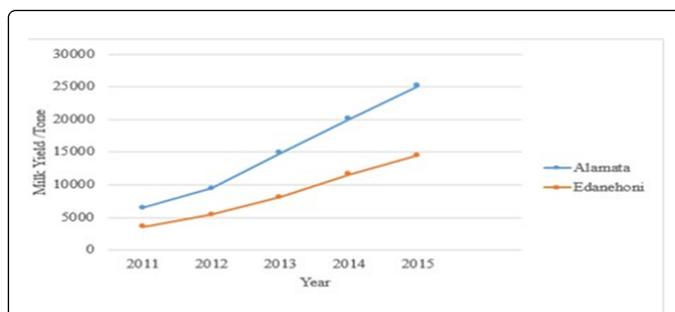
**Table 3:** Socio-demographic characteristics of households Alamata and Edamehoni districts.

### Drivers, trends and factors affecting dairy value chains upgrading

**Drivers of dairy value chains upgrading:** Milk and milk products are highly consumed in Southern Zone of Tigray. The key drivers of dairy value chain upgrading in the study area are increasing nutritional awareness, increases income, changes in feeding habits, urbanization, and population growth. Population number of the studied districts has been increasing from 133,961 and 121,634 in 2011 to 151,575 and 136,883 in 2015 for Alamata and Edamehoni districts, respectively [14]. Population growth has a crucial role in driving the dairy value chain upgrading with the increase of dairy products supply to match with the rapid increase of the demand.

### Trends of dairy value chains upgrading

**The trend of milk production:**The dairy sector is one of the growing agricultural sub-sectors in the southern zone of Tigray, which has generated significant economic returns and employment opportunities along the dairy value chains. According to [14], the average milk production has been rising from 6,441 and 3,567.84 tons in 2011 to 25,124.8 and 14,500.08 tons in 2015 for (Alamata and Edamehoni ) districts, respectively (Figure 1). The same source as indicated in Figure 2, the number of local and crossbred milking cows has been slowly increasing from 13,565 and 6,229 in 2011 to 24,244 and 14,988 in 2015 in (Alamata and Edamehoni) districts, respectively. The number of crossbred cows has been also increasing from 705 and 472 in 2011 to 1407 and 2209 in 2015 in Alamata and Edamehoni districts, respectively. This rise in a number of crosses breeds and milk production has been attributed to a favorable policy, technological intervention, and improves extension services to dairy sectors.



**Figure 1:** Milk production trend in (2011-2015) in the study areas.

**The trend of dairy product marketing:** Dairy products in the study area are channeled to consumers through both formal and informal dairy marketing systems. The Bokra Union Dairy Processing Cooperatives (BUDPC) started its operation in September 2014 in Maichew town of Edamehoni district. In 2014/15 about 33.3% dairy producers from Edamehoni site sell fresh milk for BUDPC with the contractual agreement [14].Whereas most of the Edamehoni and all Alamata districts dairy producers deliver fresh milk to the consumer in the immediate neighborhood or sale to itinerant traders or individuals in nearby towns. In the informal market, milk may pass from producers to consumers directly or through two or more market agents. The trend of the dairy products market is growing from time to time due to the market information, market access and increasing demand for dairy products [14].

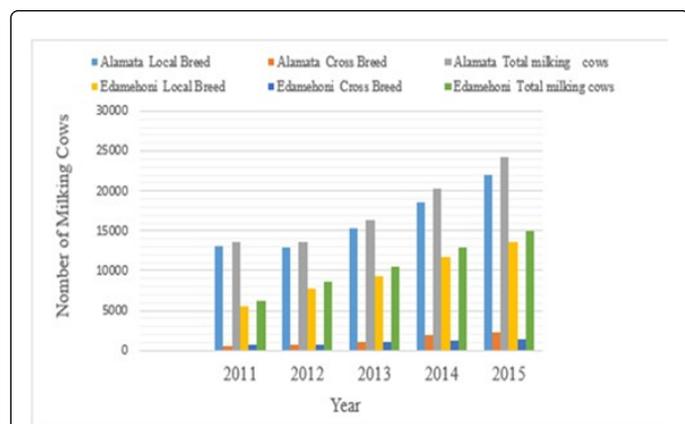


Figure 2: Trend of milking cows' number in (2011-2015) in the study areas.

**Trends in dairy product processing:** Producers and traders process about 0.52 kg and 1.21 kg/fresh milk week per households during non-fasting and fasting periods, respectively into butter and cheese [14]. BUDPC process about 300 liters/day fresh milk into butter and cheese and sell these products to individual consumers, hotel/restaurants, and dairy cafes. However, BUDPC is not functional from June 2016 until the reporting period. However, the dairy product processing is increasing from time to time due to demand and profitability in processor and dairy farmers [14].

**Trends of dairy product consumption:** Among the dairy products, most consumers prefer purchasing of raw milk because of its natural

flavor (high-fat content), easy availability in their vicinity, affordable price, and long-established experience for consumption of raw milk. The trend of dairy product consumption in the study areas raised from 2011 to 2015 by the rate of 1.45% and this is due to good awareness and income generation of the consumers [14].

### Constraints and opportunities in dairy value chain development

To develop the dairy value chain in a sustainable manner, identification of the major bottlenecks and opportunities of the existing dairy value chain has a paramount role.

#### Constraints along dairy value chain

**Constraints on input supply system:** Constraints associated with input supply of dairy value chains which those considered as major bottlenecks are presented briefly (Table 4). The existing constraints were identified and stated in both production systems and there are notable differences in the extent and significance of constraints. According to the respondents, there are different challenges in the dairy value chains and these are prioritized as the major problems and constraints. Main constraints recognized by the actors are critical problems for dairy value chain upgrading and these are the common problems of urban dairy producers are a shortage of improved feed (95%), high feed cost (93%) and a shortage of land for forage development (72%). While the main constraints of peri-urban dairy producers were high feeds cost (78%), shortage of improved feed (77%), and (62%) inadequate extension services. The overall major constraints at input stage in the study areas were a shortage of improved feed and high feeds cost.

Variables	Production system					
	Urban (N=60)		Peri-Urban (N=60)		Over All (N=120)	
Constraints	Frequency	%	Frequency	%	Frequency	%
<b>Input stage</b>						
Shortage of improved feed	57	95	46	77	103	86
High cost of feeds	56	93	47	78	103	86
Lack of improved dairy cows	6	10	23	38	44	37
In adequate extension services	11	18	37	62	46	38
In adequate credit access	28	47	21	35	49	41
Shortage of land for forage development	43	72	11	18	54	45
Limited veterinary and artificial insemination services	21	35	35	58	56	47
<b>Production stage</b>						
Low genetic potential	21	35	58	97	79	66
Lack of knowledge and skills on feeding practices	13	22	21	35	34	28
Poor husbandry practices	17	28	23	38	40	33
<b>Processing stage</b>						
Shortage of processing equipment	12	20	18	30	30	25

High cost of processing materials	12	20	10	17	22	18
<b>Marketing stage</b>						
Low market demand	7	12	12	20	19	16
Poor market linkage among value chain actors	9	15	13	22	31	26
Absence of dairy-led-cooperatives	27	45	33	55	58	50
Lack of market accesses	42	70	31	52	73	61
% =Percent						

**Table 4:** Main constraints of dairy value chain analysis.

**Constraints at production stage:** According to the households' response, the low genetic potential (66%) and poor husbandry management practices (33%) are the major constraints for both production systems.

**Constraints at processing stage:** The major constraints in the dairy product processing stage of the study area are a shortage of processing equipment and the high cost of processing materials.

**Constraints at marketing stage:** Marketing of dairy products is constrained by many constraints. The following major constraints identified in both production systems include low market access (61%), the absence of urban and peri-urban dairy producer-led-cooperatives (50%) and poor market linkage between producer and other value chain actors (26%).

### Opportunities for dairy production and marketing

Even if the dairy sector of the study sites is challenged with many constraints, there are potential opportunities to be utilized well for the future development of the dairy sector. The major available opportunities which can catalyze the development of dairy sector in both study sites. The availability of some progressive farmers who have adopted improved dairy cows has shown remarkable improvement in their livelihood and this positive change will motivate others to engage in dairy farming. Other opportunities are the existence of suitable agro-ecology for dairy production, high demand for milk and milk products, relatively cheap labor force, strong support from regional research institutions, Universities and TVET for the development of

the sector and increasing urbanization coupled with growing incomes of the consumers, availability of by-products from flour processing factories and Raya brewery as source of feed for dairy cows, involvement of financial institution in providing credit along the value chain and establishment of new institution such as Raya brewery company for link market accesses. Dairying provides the opportunity for smallholder farmers to use land, labor and feed resources and generate regular income. Therefore, market opportunity and connection are the major issues for smallholder dairy development in addition to supporting services such as adequate land access, organizing input supplies (improved breeds, feeds, artificial insemination, land accesses and drugs) and provision of credit and extension services.

### Viable strategies for upgrading dairy value chain

Based on the above finding of dairy value chain analysis in urban and peri-urban dairy production systems constraints and opportunities have been identified. Accordingly, the following options can minimize the existing constraints in the dairy value chains. The main viable strategies for the upgrading of smallholder dairy farmers for market-based activities to expand the value chain and improve their income generation from dairy products should focus on input intervention, institution intervention, and capacity building (Table 5). Introduced complementary value chain interventions and created linkages with existing and newly established value chain actors play a vital role in dairy value chain development.

Production system						
	Urban (N=60)		Peri-Urban (N=60)		Over All (N=120)	
Viable strategies	Frequency	%	Frequency	%	Frequency	%
Input supply intervention						
Introduce improved forage seeds	38	64	50	83	88	73
Improvement on crop residues utilization techniques	27	45	52	87	79	66
Feeding of supplementation with concentrate feed	30	50	35	58	65	54
Improves animal husbandry practices	23	38	33	55	56	47

Supplying genetically improved dairy cows	21	35	34	57	55	46
<b>Institutional intervention</b>						
Establish new input /output dairy producer -led- cooperative	52	87	49	82	101	84
Linkage with flour and brewery processing factories	47	78	38	63	85	71
Improves artificial insemination and veterinary services	44	73	48	80	92	77
Improves credit services	46	77	49	82	95	79
Improves extension services	31	52	42	70	73	61
Contract farming with local market	26	43	29	48	55	46
<b>Capacity building intervention</b>						
Processing in to diversified dairy products	25	42	29	48	54	45
Training to value chain actors	45	75	51	85	96	80
Promote their dairy products	9	15	17	28	26	22

**Table 5:** Strategies for upgrading of dairy value chain analysis.

### Input supply interventions

The major input supply interventions in the dairy value chains and these are listed as the major interventions are presented in (Table 5). The major interventions recognized by the actors are critical for dairy value chain upgrading and these are the common interventions for urban dairy producers about (64%) introduce improved forage seeds, (50%) feeding of supplementation with concentrate feed and (45%) improvement on crop residues utilization techniques. While the peri-urban dairy household interventions reported are improvement crop residues utilization techniques (87%), introduce improved forage seeds (83%), feeding of supplementation with concentrate feed (58%) and supplying genetically improved dairy cows (57%). In this regard, introducing improved forage seeds (73%) and improvement of crop residues (66%) are identified as very important interventions in the study areas.

### Institutional intervention

In the study areas, households need to improve the timely availability and effectiveness of services through well-trained personnel in the dairy value chains. This can be achieved through-service training of local service providers: The four most frequently reported institutional interventions of urban households are establishing new input/output dairy producer-led- cooperative (87%), creating linkage with flour processing factories and brewery industry (78%), improving credit services (77%) and improving artificial insemination and veterinary services (73%). Likewise, the four most frequently reported interventions of peri-urban households are established new input/output dairy producer-led-cooperative (82%), improving credit services (82%), improving artificial insemination and veterinary services (80%) and improving extension services (70%). In this respect, establishing new input/output dairy producer-led-

cooperative (84%) is identified as priority institutional intervention in both dairy productions.

### Capacity building

To create knowledge-based smallholder dairy development in the study area, there is an urgent need of capacity building interventions on dairy value chains. Training of dairy producer farmers on dairy production techniques and marketing systems are important interventions for the upgrading of the dairy value chains. The most frequently reported capacity building interventions in the two Production systems are training to value chain actors (80%) and processing into diversified dairy products (45%).

### Discussions

#### Drivers, trends, and factors affecting dairy value chains upgrading

The trend of dairy production and marketing was rising from time to time and the demand for the dairy product was also increasing in both study areas. This is due to the population growth, urbanization and increasing of income generation. Similarly, higher incomes, larger urban populations, and continued population growth could fuel higher demand for dairy products [15]. The population number in the study areas from 2011 (133,961 and 121,634) to 2015 (151,575 and 136,883) was increasing in Alamata and Edamehoni districts, respectively. Population growth has a role in driving the dairy value chain upgrading through supply and demand of dairy products. The dairy sector is one of the growing agricultural sub-sectors in the southern zone of Tigray, which has generated significant economic returns and employment opportunities along dairy value chains. The milk production increased from 6,441 and 3,567.84 tons in 2011 to 25,124.8 and 14,500.08 tons in 2015 in Alamata and Edamehoni districts,

respectively. The reason for increased milk production is associated with favorable policy, (provision of dairy house shed and credit services), technological intervention, population growth (increment of milk demand), increased crossbred cows, improved dairy husbandry practices and technological intervention, increased milk demand, and improved extension services.

### Value chain constraints

The present study generally revealed that in both dairy production system various dairy value chain constraints were identified which factors affecting to the upgrading of the value chain: The major constraints associated with input supply for dairy production are a shortage of improved feed and the high cost of feeds. This is in line with the study reported by [16], value chain analysis for Ethiopia. According to the respondents, there are different challenges in dairy production and marketing system in both production systems. The identified constraints include a shortage of improved feeds, the high cost of feeds, poor market access and absence of dairy-led-cooperatives. This finding is in line with [17] who reported that shortage of feed, high costs of feeds, seasonal milk demand, lack of formal marketing systems, knowledge gap regarding improved dairying and access for credit for expansion were identified as constraints which could reduce the perception of dairy producers. Despite many problems and constraints, there are important dairy production opportunities in both production systems.

### Viable strategies for the upgrading of smallholders

In this study area three main interventions (input, institution and capacity building) are important for the upgrading of smallholder dairy farmers. It notes that these types of interventions are important dependence on strategies to simultaneously for the upgrading of smallholder dairy farmers. In both dairy production systems, the challenge of input supply could be solved by the following important input supply interventions mechanisms such as introducing improved forage seeds, substitutes the low supply contents of local available feedstuffs and introducing of technologies such as choppers and urea treatments to improve crop residues, creating awareness about feeding animals with concentrate feed based on physiological status and using genetically improved dairy animals.

The study also indicated that success of farmer's dairy value chain depends on the institution intervention. The most important interventions are establishing new input/output dairy producer-led-cooperative, linkage with flour and brewery processing factories, improving artificial insemination and veterinary services and improving credit services.

Another intervention for the upgrading of the dairy value chain is capacitating main actors who participate in the dairy value chains. Training of farmers on the processing of fresh milk into diversified dairy products and other value chain actors could be upgrading the dairy sectors

### Conclusions and Recommendations

The major constraints which influence the dairy value chains of both dairy production system are a shortage of improved feed, the high cost of feeds, lack of market accesses, low genetic potential and limited veterinary and artificial insemination services. The rapid urbanization, the subsequent increase in human population and standard living of the urban inhabitants, income generation, job creation and relatively

conducive climate of the area is an opportunity for the development of dairying in the area.

From the above constraints and opportunities this research revealed that the main viable interventions for upgrading of smallholders were identified in order to alleviate the main constraints and this main intervention are input supply intervention as introducing improved forage seeds, improvement of crop residues and feeding of supplementation with concentrate feed, institutional interventions are establishing new input/output dairy producer-led-cooperative, improves credit and extension services and improving artificial insemination and veterinary services and capacity building are training to value chain actors and processing of fresh milk into diversified dairy products are very important to upgrading of dairy sectors in the study areas.

From the findings of the study, the most problem dairy value chain face was a lack of dairy farm input supply (such as improved feeds, the high cost of feeds, improved dairy cows, and breeding services), credit services, artificial insemination and veterinary service and low milk productivity. Therefore, there is a need to input supply interventions and good quality improved dairy farm inputs into dairy farmers and apply good management system to increase dairy production.

Most of the smallholder dairy producers in the study sites have been using traditional dairy production technique that results in low milk production. Creating capacity building intervention of smallholder dairy producer for quality and quantity milk production are one of the ways to assist dairy producers in building on their resources to create more income by managing their dairy farm skill fully and get a good price in the market. Hence, all concerned organizations (chain enablers) should focus on the provision of appropriate training for both dairy producer farmers and extension agents on how to manage improved breed dairy cattle and incorporate new technologies profitably into farm level production strategies.

### Acknowledgement

We are grateful to the offices of agriculture for organizing farmers and providing secondary data. We are also indebted to the local farmers who devoted their time, energy and their resources for to collect the data.

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