



A Review of Dairy Cattle Potentials, Drawbacks & Imminent Outlooks in Ethiopia



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Abstract

This review was provoked with the purpose of examine and comprehend dairy cattle performance, constraints and prospects of Ethiopian dairy production. Ethiopia holds tenth largest cattle population in the world which contributes 45% of the country GDP and almost all rural population of the country are based on livestock as a major source of income. From livestock production dairying is very crucial for farmers income and their major milk sources are cattle, camel and goats. In communal sense the country has mainly three types of dairy production system Rural, Urban and peri-urban. In urban and peri-urban system farmers insist and employed in dairy production as a main business and they contribute only 2% of total country milk production. Whereas the rural system practices subsistence mixed crop-livestock type of production system and they contribute 98 % of total country milk production. The country has diverse topographic and climatic conditions, adequate land resource, high livestock population, suitable agro-ecology, risk free environment, high yielding disease resistant breed and cheap labor force which makes the dairy production more comfortable. Accordingly with this comfortable environment, in the future outlook the country needed strong and competitive investors that can invest in feed processing, modern dairy farming, full milk processing equipment supply and maintenance, marketing and other dairy advisory works. Most importantly, the technology share of developing countries from western people is proven impractical because of socio-economic and climatic differences. The common Ethiopian dairy production constraints that have highly stated in various researchers were lack of AI and veterinary service, skill gap of farmers, high price and inadequate accessibility of feed and improved dairy cattle. Thereof dairy constraints probably display the policy gap of government and their less attention for the sector. Therefore, the absence of dairy sector policy increases uncertainty of future dairy productivity unless the sector policy starts to organize, guide and control it.

Keywords: Dairy cows; Potentials; Constraints; Prospects; Ethiopia

Abbreviations: AI- Artificial Insemination; CI- Calving Interval; CSA- Central Statistics Agency; DMI- Dry Matter Intake; DO-Days Open; E.C- Ethiopian Calendar; EMDIDI- Ethiopian Meat and Dairy Industry Development Institute; FAO- Food and Agricultural Organization; FCA- First Calving Age; GDP-Gross Domestic Product; Kg- Kilogram; Kg/d- Kilogram Per Day; L-Liter; NSC- Number of Service Per Conception; SHD- Small Holder Dairy

Introduction

The dairy sector is one of fastest growing sector with its significant contribution in employment opportunities and the country economic return in Eastern African countries. In Africa, Eastern Africa covers 68% of the continent milk production which is the first and leading milk production region; and the countries "Ethiopia, Kenya and Tanzania are among the biggest dairy producers" [1].

In Ethiopian agriculture is the major means of economy with about 55 million ha in various agro-ecological zones of unlimited

arable land [2]. The highlands of Ethiopia cover over 40% of the country land which is the largest in sub-Saharan Africa and it have a large potential for dairy farming [3]. The country holds diverse topographic and climatic conditions [4], adequate land resource, favorable climate with high livestock population, suitable agro ecology, risk free environment for work, high yielding disease resistant breed and cheap labor force [3], huge livestock genetic diversity and the government found out that livestock as a new source of country development [5]. Besides, there is a durable support from institutions, universities, colleges and agricultural

extension workers; thereof all opens an opportunity for smallholder farmers to wisely use (land, labor and feed source) to generate income and to attract foreigners for investment [3].

From the country livestock productivity dairy production is a crucial for farmers income and their major milk sources are cattle, camel and goats. In thereof milk sources dairy cattle covers 83 percent of total milk production [6], and indigenous local breeds are dominated around 97-98% with traditional production system [4], this higher coverage of local cows and their poor production performance influences people milk satisfaction in the increasing demand of milk and the country economic growth [7]. In the rural Ethiopia around 80% of population based on livestock as a major source of livelihood and the country having a tenth largest cattle population in the world in accounting 56 million heads and this covers for 45% of the country GDP [8] and 16% of national GDP [9].

Dairy farming involved all parts of the country weather subsistence or in market-oriented position [10]. The country total annual milk production is 1.0 million tones in all livestock milk sources and 0.8 million tones only in dairy cattle [9]. The annual milk gain of cattle covers over 85% of overall milk productivity and from the total number of livestock 11.4 million cows are estimated to be milking cows and it reaches around 20.4 percent [8]; and the average lactating periods of dairy cows were 6 months [11].

Ethiopian livestock sector receives 13% of the country export earnings and urban and peri-urban areas around three hundred thousand crossbreed cows are used for milk production with comparatively better management [9]. Most importantly, in Rural and Urban areas livestock opens a chance of getting protein rich-foods to fulfil the daily needs of population and also for poor households it helps to prevent them in keeping their wellbeing from falling to poverty [8].

In economic point of view, 70% of cost of animal production is feed and its quantity, quality and science of feeding drives livestock productivity [5]. For extensive smallholder livestock farming system grazing is the most practiced types of feeding in Ethiopia [12]. There are 28 feed manufacturer farmer unions that distribute feeds throughout the country and 32 privately owned plants. The constraints of feed processors were absence of raw materials, lack of market orientation and awareness for utilization of processed feed makes the farmer unions to work under their designed capacity and as a result accessibility of processed feed in Ethiopia are limited [5].

Dairy production system in Ethiopia classified as rural, urban/peri-urban & commercial systems [8] and the system also grouped in to highland smallholder, pastoralism, urban and peri-urban and intensive system [13]. In communal sense Ethiopian dairy production system can be divided into Rural, Urban and peri-urban system [4]. In rural production system, even though the sector creates more employment opportunity [8] and usually their adapted local cows are resistant to disease but farmers still

pauses in subsistence level with low income due to their poor management and husbandry practice [6]. This system as whole have almost similar management unit and practice subsistence crop-livestock mixed production system [13] and it mainly includes pastoralists, agropastoral and crop-livestock producers of rural lowland and highland areas [8]. On the other hand, in urban and peri-urban system farmers insist and employed in dairy production as a main business and mainly started with nurturing crossbreed cows [14] in around 50-62.5% improved breeds and their reproductivity mostly based on artificial insemination [6]. However, the reproductivity of rural system existed both cross and local breeds that normally benefits in bearable to maintain genetic diversity [14]. The milk production and its value-added product have the largest share on small holder dairy farmers [15] and most importantly the country 98 percent of total milk production produced in rural system [13] but urban and peri-urban system only contributes 2% of total country milk production [4].

The country dairy sector work division of rural system displays women are significantly provided in consistent daily income as a vibrant production extension to home nourishment in family security. The work of labor in dairy farming are most importantly adapted as a woman work and 85 percent of the tasks done by women. On the other hand, in urban and peri-urban system the household part of family has their own work in dairy production [15] and the involvement of gender is better than rural system as men also works in milking, taking milk to collection center, fetching water, cleaning stalls, taking care of animals and cutting and carrying forage and grass etc. Therefore in urban and peri-urban system women and men involvement have a great value for stable family income with increased dairy farming productivity [8].

Genetic improved trait of dairy cattle reproductive rate is economically importance for herd replacement and milk productivity; however, the influences of environment, diseases, nutrition and management constrains especially tropical cows have low fertility rate [12]. The breed preferences of Ethiopian farmers chosen crossbreed cows due to high milk yield but unsuccessful in rural production system because of their weak management with cow's poor resistance for disease. Whereas for local cows as they are disease resistant and even alive in poor management but having depleted measure in productivity of low milk yield potential [15] which is a main challenge for the dairy sector. While there is a potential to increase indigenous cows performance unless lack of management mostly feed insufficiency that makes local cows unrecoverable [3].

Usually, farmer's strength of dairying increases with the increment of milk yield with their prospered cost-effectiveness; this consistently motivates them to work hard energetically, retrieving the farm to have greater proportion of cross breed cows, good manure management, wise utilization of feed sources, finding a new way to be accessible in dairying information and exercise dairy production experience. Besides, they care for the

futurity of the farm through preparing for further expansion and fulfilling veterinary service, AI, market, and look over other dairying facility options [14]. The major imperative factors for the strength of dairy productivity are promotion on nutritional awareness, change feeding habits, urbanization and population growth; most importantly population growth enforcing to increase milk demand and supply chain at the same time within the organized dairy value chain [16]. The empowerment of dairy sector enterprises helps dairying to be influential and this will occur when the country government focus and handle farmers in coordinate with dairy cooperatives to have enough information access for nutrition, market, breeding, hygiene, health, milk handling and transportation and to join in a vertical relationship with extensionists and their actors [15].

In Africa population rate of milk demand displays suggestively more increment than milk productivity [17]. The country dairy productivity contributes a great role for poverty alleviation; however, the sector faced many challenges such as deficient skilled manpower, lacks modern animal husbandry management practice, lacks advanced technologies [3], and also shortage of processing equipment supply and its high cost, low market access, absence of enough urban and pre-urban dairy producer led cooperatives, poor market linkage of producer with value chain actors [16]. Thereof influences tensioned the milk producer and processor industries against the work power of their installed performance [13]. On the other hand, animal health issues are more influencing constraint for Ethiopian dairy sector due to their extremely poor feeding practice which decreases fertility rate, diseases resistance ability and finally increases mortality and morbidity rate [3]. In tropical area's internal parasites like liver fluke and round worm and also flies and ticks are commonly existing. Thereof and other parasites existence is probably due to lack of dairy farm herd management like feeding method, waste management, calf feeding and care [12]. The dairy health problems resulted from both considered and unconsidered abandoned constraints. The factors that come from managements like housing, feeding and veterinary service causes cows to be offensive, unhealthy, unwholesome and ended their life productivity unsuccessfully [15]. The inaccessibility of veterinary service, transportation difficulties and veterinary professional shortage stresses dairy sector in funding for loss of animals in diseases. The outcome of this all veterinary low performance comes from government monopolized service and their less attention for livestock sector [4].

In the success of dairy productivity market accessibility is one of the major determinant factor as market limits power of production in fluctuation of demand and supply, and inaccessibility of inputs [6]. In Ethiopia market access is limited and the marketing system is not well organized as the dairy production is dominated by smallholder farmers [6]. Formal and informal market are both available but unlicensed informal market are dominated especially in rural system [4]. In formal market most cooperatives and producers were deliver fresh milk to consumer whereas the

informal market milk may pass from two or more market agents or directly to the consumer [16]. Generally, Ethiopian dairy products export and inside consumption market is generally professed poor because of lack of market focused products, lack of production resource information, lack of infrastructure and agricultural inputs facilities (road, electric, transport, land, water and feed) and lastly illegal trade with illegal market are the most influences that drive dairy productivity inaccurately [3].

The government of Ethiopia hasn't applied any policy for milk quality [12], for dairy product marketing and processing at zonal as well as national level in safeguarding consumers health and for the product predictability [15]; only 13% of milk processing plant practiced milk quality control and pasteurization [12]. On the other hand, outside imported milk share influences the prices of country producers and the country producer marketing system also impact dairy production as informal system dominates and leads around 88% over formal market [4]. For thereof most dairy constraints, absence of dairy sector policy was the main cause and because of this the dairy productivity status shows today extremely doubtful figure.

Nowadays, the country dairy sector categorized as a transition level in shifting way to market oriented economy; as opened market, participation of the private sector and advancement of smallholder dairy are the main features of this phase. The increment of population and expansion of urbanization stirred and drives the outlook of Ethiopian forthcoming dairy productivity. In population augmentation, it is predictable that developing more dairy industry places in a major focus as it will have a major role in distributing milk for children and younger generation [3]. Therefore, the establishment of dairying and dairy industry with strong extension service and devotedly heartening farmers are strongly advisable for dairy sector futurity. This Review was initiated with the purpose of examining Ethiopian dairy cattle potential, their drawbacks and the forthcoming opportunities of Ethiopian dairy production. The paper particularly covers the country dairy cattle production systems, production and reproductive performance, constraints, policy, forthcoming outlook and other related dairying status of the country.

Dairy Production in Ethiopia

Dairy production system

Dairy production system in Ethiopia classified mainly based on objective and scale of production, location, agroecology, market orientation, access inputs and services. On the basis of climate, landholding capacity and integration with crop the dairy production system grouped as small-scale rural, peri-urban and urban [6]. Dairy system also classified as rural, urban/peri-urban & commercial systems [8]. On the other hand, Ethiopian dairy production system classified into four main groups highland smallholder, pastoralism, urban and peri-urban and intensive system [13]. The rural production system highland rural or

smallholder pastoralists are parts of rural system [18] and intensive or commercial system occurs in both peri-urban and urban production system [8]. In communal sense Ethiopia has mainly three types of dairy production system Rural, Urban and peri-urban [4].

Urban dairy production: This system is located in cities or towns and farmers are specialized dairy producer for sale of fluid milk without or little land resources and few numbers of farmers practice commercial dairy farming unless practiced in state sector. As the system farmers main source of income is milk, they manage animals in feed by growing fodder for dairy cattle on the segment of land or all land [4]. In urban system the location has a better infrastructure [8] with easily accessibility of inputs such as artificial insemination, feed, market [6], market information and other resources which makes them to start dairying based on market orientation [8]. Besides this accessibility of resources and having better market orientation makes them to hold higher exotic blood level of dairy cattle breeds [19]. There is a dominant improved breeds managed by herd labor [4] and these owner farmers are forced to buy feeds for better annual milk production and their breed improvement as they are located in cities. Farmers sold their milk 73 percent of total production, 10 percent takes as consumption, 9.4 percent gives for their calves and the rest 7.6 percent process as butter and ayib [12].

Peri-urban dairy production: The system producer farmers are mostly located in cities and small towns. The labor costs are raising and population density is high due to the expansion of urbanization [12]. In behind population augmentation, land for production is shrinking; some farmers graze their animal in roadside because of limited access for cultivable or pastureland. The country most improved breeds owned in this system; in which cows are 50% crosses to high grade breeds and they feed their dairy cows with purchased and home-produced hay by delivering both sources as an option [6].

Rural production system: Rural production system of whole farmers have almost similar management unit and practice subsistence crop-livestock mixed type of production system [13] and it mainly includes pastoralists, agropastoral and crop-livestock producers of rural lowland and highland areas [8]. The usual type of feeds and feeding are stub grazing, crop residue and native pasture. The indigenous cows are common breeds for the system [13]. The most usual milk surpluses are butter ghee, ayib and sour milk which marketed through informal way.

The constraints that influence the system were limited access to formal market and low input-output technology, unable to get incentives [8], seasonally dependency due to feed shortage and variability of rainfall [13], and inaccessible for market, transportation and other facilities due to the area remoteness makes various inputs to get in higher cost and decreases farmers productivity with higher cost of production [6]. Thereof influences

results to be 85% of farmers production kept for consumption and only 7% of it sold in market [6].

Furthermore, rural dairy production system contributes 98% of total country milk production and their milk surplus determinates includes demand of household and neighbors, production season, market accessibility and their herd size potential [12]. Farmers usually provide cattle for the purpose of milk, meat, hides and drafting power and also have a cultural impact on their social status [8], and threshing ripen crops, their dung as a manure [20].

Most importantly rural farmers lack awareness on leadership for achievement of current resource and service, and to work dairy farming as a business as they mainly practice mixed crop-livestock farming system. Thereof constraint influences farmers to have small number of cows in average 3-4 indigenous and 1-2 cross breed cows with their low productivity of 400–600 liters in 180-210 lactation days. Generally, in this system, even though the sector creates more employment opportunity [8] and local cows are resistant to disease [6] but farmers pauses in subsistence level with low income due to their poor management and husbandry practice.

The brief of urban/peri-urban versus rural system

In urban and peri-urban system farmers insist and employed in dairy production as a main business and mainly started with nurturing crossbreed cows [14] in around 50-62.5% are improved breeds and their reproductivity mostly based on artificial insemination [6]. whereas in the rural system the existence of both cross and local breeds benefits to maintain genetic diversity [14]. Milk production and its value-added product have the largest share on small holder dairy farmers [15] and most importantly the country 98 percent of total milk production produced in rural system [13] but urban and peri-urban system only contributes 2% of total country milk production [4].

In peri-urban and urban production system small number of farmers are linked the business than in rural system but they are specialized, commercially-oriented and more focused types of farmers. They target crossbreed and ranking productive dairy cows on average 2-3 crossbreeds or exotic breeds with the potential of milk production 1120-2500 liters over 300 lactation days. For rural system they practice subsistence mixed crop-livestock type of production system and their herd size reaches 3-4 indigenous cows and 1-2 cross breed cows but their productivity is very low around 400–600 liters in 180-210 lactation days [8].

The location of urban and peri-urban system is located more resource accessible areas in and around cities and towns; they feed industrial by product as concentrate like oil seedcakes and wheat bran. But for rural system feed in stub grazing, crop residue and native pasture [13] due to limited accessibility of market and low input-output technology [8] which makes them to remain in

low productivity. In the milk supplier formal channel urban and peri-urban producers are the leading supplier; but most milk processors owning their dairy cows is a common practice to ensure adequate milk supply and quality similar with cafés and restaurants [8]. On the other hand, rural system was unable to get incentives [8], and are inaccessible for market and transportation which decreases farmers productivity, paying higher cost of production and as a result they consume 85% of their production [6].

Labor and Work Division

Work division in rural systems: In rural dairy production women significantly provided in consistent daily income as a vibrant production extension to home nourishment in family security [8]. The survey that have conducted in Essera district at Southern Ethiopia states that women were the performer of marketing for dairy products [21]. The work of labor in dairy farming are most importantly adapted as a woman work and 85 percent of the tasks done by women. In milk processing at formal and informal domain women are the most worker in the highlands. In such a way the involvement of women is vital to the accomplishment of the visualizations of proposed Ethiopian government plan. Women and children are ended almost all dairy farming activities in rural system specifically in remote areas. The habit of doings in attention for animal's care, processing and for value addition activities mostly Women are the accountable body. In this way on cattle activities women devote their time on average 8-9 hours. From these hours more time around 4-5 hours/day they give for preparing forage, feeding and watering. On the rest time they give for milking, storage and cleaning the room. whereas, men doings are related with marketing activities and children involved in keeping animals and milk collection [8].

Work division in urban and peri-urban system: In this system the household part of family has their own work in dairy production [15] and the involvement of gender is better than rural system as men also works in milking, taking milk to collection center, fetching water, cleaning stalls, taking care of animals and cutting and carrying forage and grass etc. So that in this system women and men involvement have a great value for stable family income with increased dairy farming productivity [8]. Mostly females participate in dairy farm operations which includes: milking, cleaning (barn and milk containers), milk storing, preserving, quality control, processing and marketing (milk, butter and other products). On the other hand, dairy herd management practices all family members were participated. The herd management activities that are mostly used for extension service and training includes feeding, watering, health management, pasture management and heat detection [15].

Employed labor in dairy sector: In Ethiopian highlands the largest rural employer is placed and the rural production system daily base full-time jobs are estimated to be 224.5 within the milk

production of one thousand liters, from these 70% are family and 30% are hired labor. Whereas within similar one thousand liters of milk production in peri-urban/urban production system 26.3 full-time jobs are needed and from these labors 65 % and 35% are family and hired labor respectively. In annual basis its estimated that 200 and 300 days are a work duration of rural system and peri-urban/urban production system respectively [8].

The number of labors present on dairy sector were varies season to season; in months June to August, January to May and on the rest months there were a surplus, shortage and sufficient laborers respectively. Most farmers fence shortage of labor due to absence of readily available labor for dairy production. Farmers usually used hired labor for barn cleaning, forage development, feed collection, transporting grasses and plowing land. When their children were at school, they used to manage their livestock by tethering, stall and home feeding methods [15].

Potentials of Ethiopian dairy cattle

The country highland areas are expected to be the potential area of dairy production as they have better agro-climatic condition and low disease pressure [22]. In livestock productivity dairy production is a crucial income for Ethiopian farmers; in which cattle, camel and goats are their major milk sources. In the country dairy sector, dairy cattle covers 83 percent of total milk production [6] and 97-98% of dairy cattle breed dominated by indigenous local breeds with traditional production system [4]. Although dairy productivity contributes a great role for poverty alleviation but the country dairy sector deficient in skilled manpower, lacks modern animal husbandry and management practice, and also lacks advanced technologies and advanced people that can operate technologies. Thereof reasons influence milk producer and processor industries against their installed performance [3].

Lactation length: in definition lactation is the time of cows after parturition that starts to secret milk until the time of drying off. In dairy cattle lactating cows, there are three lactation stages early, medium and late lactation. The lactation periods of dairy cattle differ in various places for example Debre Birhan, Sebeta, Shambu, Melkasa, Welenchiti, Gonder, Bahir Dar Zuria lactation periods were 9.7, 10, 10.53, 10.8, 11.4, 9.17 and 10 months respectively. Mostly cows give milk for ten months lactation period and two months rest in drying off but in Ethiopian case lactation periods were in between minimum of 8.7 months which is recorded in Debre Markos and the maximum reaches 12 months in Kombolcha [23].

Milk yield potential: The milk yield of each cows depends on month of calving, feed availability and milking experience [15] and also on type of breed, production system and their management [23]. The highest milk was recorded in the first four months of lactation periods and after that it declines; in the

months May to September milk yield increases due to high supply of feed [15] and in higher cities produce more than lower cities due to the availability of input facilities [23]. Local cows have a low genetic potential for milk production and it tickles as a major limitation for supply chain; for this reason selection of breed and appropriate management is needed to make them productive [15]. For Ethiopian endogenous cattle the average milk yield reaches 1.5 to 2 liters/day in 150-180 lactation days [12] and also reported their productivity is lower around 0.5 to 2 liter/day in 160 to 200 lactation days. On the experience of ILCA participating farmers the first and second lactation periods shows significant variation; in which the first lactation of crossbreed cows annual average milk yield was 1769 and 2347 liters for the second lactation [12].

The average dairy cattle milk potential of indigenous cows in Haramaya district was 2.23 liter/day [24] and as general in rural system the local breed average milk yield of indigenous breed was 1.1 to 2.1 liters per day and for peri-urban and urban system it reaches around 2.7 to 1.9 liters and 3 to 3.4 liters per day respectively [25]. On the other hand, for improved crossbreed cows daily milk yield in the cities of Bishoftu, Akaki, Adama and Hawassa were 11.6, 10.8, 11.3 and 10.32 average liters per day respectively that shows more comparable milk yield between them. Whereas for Bahir Dar, Gonder, Debre Markos, Bahir Dar Zuria and three towns of Horo Guduru Wollega zone were 7.8, 7.3, 5.2 and 7.21 liters per day respectively. When we compare Bahir Dar Zuria from thereof, it shows the least producer in milk yield [23] and finally for the range of individual cross breed cows' daily milk yield in urban and peri-urban areas of the same milkshed area were recorded 10 to 16 and 9.5 liters for urban and peri-urban respectively [8].

Dairy cattle herd size: In peri-urban areas of Addis, Gonder, Bahir Dar, Adwa and Axum milk shed areas the average herd size were 11.8, 6.5 and 6.5, 4.83, and 4.83 TLU respectively, whereas for Debre Markos, Hawassa city, Boditi, Shashemene and Dilla the average herd sizes were 7.35, 3.15, 3.9, 3.34 and 1.51 per household. The Haramaya district farmers holding capacity was two to three cows about 33.3 percent of them and the rest 66.7 percent owns only one cow per household [24]. Most importantly thereof herd size and farmers dairy productivity determined with the accessibility of improved feeds, breeds, industry byproducts, market, land, AI service and other management activities [23].

Reproductivity of dairy cows

In dairy farming dairy cattle reproductive rate with genetic improved trait is economically importance for herd replacement and milk productivity. Although reproductivity has great importance for dairy farming but due to environmental, diseases, nutrition, management and genotype constraints tropical cows have low fertility rate [12].

Artificial insemination: In various dairy production system accessibility of artificial insemination is wide-ranging and this is one of the major challenges that influence dairy producers [14].

Farmers use artificial insemination as a genetic improvement based on its accessibility. The accessibility of AI is high in and around Addis Ababa, due to this reason farmers artificial insemination usage reaches about 77.4 percent and the rest 3% for natural mating, 19.4 use both as optional. on the other hand, in Shashemene, Dilla, Bishoftu, Gonder and Boditi around 50,50, 22.5, 20, 48.4 percent of them use artificial insemination respectively and the rest use natural mating and both natural and AI. For Debre Markos town they only use natural mating; this indicates that the accessibility of artificial insemination has a great difference between towns and continues to regions of the country [23].

First calving age (FCA): In Ethiopia dairy cattle first calving age of endogenous and cross breed heifers reaches around 35.1 to 53 months and 29.8 months for local and cross breed cows respectively. In this age of heifers there are some endogenous and exogenous factors that affect puberty. From endogenous includes genotype, growth and body weight; and exogenous factors consist of season of birth, rainfall, nutrition, thermal stress, rearing method, parasite and diseases [12].

Calving interval: In dairy farming to maintain the continuity of the farm with obtaining appropriate economic profit and reimbursement one year of calving interval is commonly supposed and acknowledged. As the researcher explored CI highly differs between 25, 50 75 percent levels of cross breeds which were 22.15 ± 4.22 , 17.52 ± 4.36 , and 15.70 ± 3.21 for 25,50 and 75% respectively [22].

On the other hand, due to the factors of nutrition, season, milk yield, parity, suckling and uterine involution; one year interval is not to do so for the country production system, accordingly cross breed dairy cattle calving interval on central highlands shows 25.95 months [12].

Days open (DO): in definition days open meaning: the waiting days of dairy cows between calving and conception and the increment of these days reduces cow's profitability because of reduced milk production, breed cost increment, replacement cost and increased risk of culling. In west Gojjam zone the days open was recorded for local breeds 294.60 ± 43.20 , whereas for crossbreeds of 25, 50 and 75% of blood level were 112.80 ± 42.00 , 109.80 ± 54.00 and 103.50 ± 36.00 days respectively. In Andassa breeding ranch DO of Fogera breed shows 280 ± 3.4 . on the other hand, for highland and lowland Zebu breed DO were 215 and 250 days respectively [22].

Number of services per conception (NSC): in Amhara region West Gojjam zone average value of NSC for local and different blood level was much different. As the researcher stated local cows and crossbreed of 25, 50 and 75% blood level recorded 1.67 ± 0.61 and 1.71 ± 0.40 , 1.51 ± 0.34 and 1.66 ± 0.41 respectively, and overall 1.63 ± 0.44 service times per conception. On the other hand, NSC of 1.28, 1.54, 1.59, 1.54 and 1.52 were recorded for Metekel ranch, North Gonder, Burie district and Andassa livestock research center and Assella Town respectively [22] (Table 1).

Table 1: Days open and Number of services per conception.

Parameter		Rural Mean ± SD	Peri-urban Mean ± SD	Urban Mean ± SD	Overall Mean ± SD
DO in day					
-local		346.80±33.60	303.60±38.40	233.40±57.60	294.60±43.20
-Cross	-25%	141.00±34.80	122.10±32.40	75.00±60.00	112.80±42.00
	-50%	174.90±27.60	83.70±56.40	70.50±78.00	109.80±54.00
	-75%	151.50±43.20	79.50±33.91	79.20±34.80	103.50±36.00
NSPC					
-local		2.51±0.73	1.37±0.71	1.13±0.40	1.67±0.61
-Cross	-25%	2.17±0.38	1.95±0.83	1.00±0.00	1.71±0.40
	-50%	2.17±0.53	1.35±0.49	1.00±0.00	1.51±0.34
	-75%	1.95±0.22	1.60±0.50	1.44±0.0.50	1.66±0.41

Days open and number of services per conception (N=180)

Source: (M. Kassahun, 2016)

Managements of Dairy Cattle

Feed and nutrition: The farmers feeding in urban dairy farming mostly zero grazing is common practice due to their small land holdings [26]. In economic point of view, 70% of cost of animal production is feed and its quantity, quality and science of feeding drives livestock productivity [5]. For extensive smallholder livestock farming system grazing is the most practiced types of feeding in Ethiopia [12]. There are 28 feed manufacturer farmers union that distribute feeds throughout the country and 32 privately owned plants. The constraints of feed processors such as absence of raw materials, lack of market orientation and awareness for utilization of processed feed makes the farmer unions to work under their designed capacity and as a result accessibility of processed feed in Ethiopia are limited [5].

The feeds hay and crop residues are most common feeds with concentrate of available agro-industrial byproducts [23]. In many countries 60 percent of dry matter intake is crop residue, and in Ethiopia 13 million tons of crop residues are produced in annual base but it has low voluntary intake due to its low digestibility rate. In some parts of Ethiopia farmers practice urea treated straw and this increases their milk yield 0.5 to 2 liters per day; on thereof treatment farmers fence major impacts like higher price of urea and plastic, ammonia smell, time constraint for harvesting and also storage difficulty [12].

In Bishoftu farmers experience to feed their cows concentrate feeds of noug seedcake and wheat bran and other forages like crop residues, stored hay, vegetables, fruit wastes and legume forages which is very important for multi-agricultural advantage and environmental protection. Feeding fruit wastes for animal diet clean and conserve the environment, but most rural areas lack such experiences in taking fruit wastes as animals feed before outflows on the environment. In most towns like Jimma, Badalle, Ambo, Gimbi and Naqamte, Adet, Merawi they commonly feed

cows in grazing and stall feeding, whereas the towns in nearby Addis like Ejere and Hinchini towns as there is more demand and farmers are more informed in dairying, they fed animals improved feeds concentrates and some forages in stall feeding; and in Addis Ababa hay with wheat bran concentrate feeding were main feed sources. In Hawassa, Adwa and Aksum, they practice grazing, crop residues, hay and local beer byproduct (atella) whereas in Jimma, Shambo, Fincha & Kombolcha commonly feed their cows noug cake and wheat bran concentrates; in addition to thereof Jimma farmers fed cows green feed as a basal diet [23].

Usually in Ethiopia feeds of cultural byproducts like atella from traditional beer and other non-conventional feeds utilized as a supplement, and are less competitive between farmers. There are ten identified non-conventional feeds in Addis Ababa milk shed area; which includes lentil hull, faba bean hull, field pea hull, rough pea hull, tela atella (local brewery residue), Katicala atella (local liquor residue), cabbage waste, orange peel, banana peel and poultry litter. Thereof non-conventional feeds divided into four main groups: wastes of vegetable and fruits, poultry litter, Atella and pulse hulls [12].

The country dairy sector landholdings: Agriculture is the sustenance of Ethiopian economy with about 55 million ha in various agro-ecological zones of unlimited arable land [2]. The highlands of Ethiopia cover over 40% of the country land which is the largest in sub-Saharan Africa and it have a large potential for dairy farming. But because of the absence of attention on dairy sector farmers incapability to access land influences in expansion of dairying, feed production and building other dairy enterprises; and most importantly the higher cattle population with inadequate feed availability as a result of restricted land for pasture establishment [3]. The agricultural system that practices in the highland areas are predominantly subsistence smallholder mixed crop-livestock type of farming [4]. Although farmers land

in rural system competing for crop production and planting forages but mostly herd size decides the land limit. Farmers that have larger herd size of both cross and indigenous breed cattle is motivated to plant forages in better land holdings than the smaller one [14]. The augmentation of human population is on the means of urbanization increment which affects grazing land and fodder feeds to be deficit for dairy farming; in this way the continual of dairy production hangs on the hand of land influences [4].

In west Gojjam zone the average landholdings were 1.88, 1.13 and 0.29 ha per household for rural, peri-urban and urban areas respectively; whereas for overall mean of Bure district, Mieso district, and Mecha and Bahir Dar Zuria landholdings were 1.33, 1.76 and 2.66 respectively [22].

In rural area the grazing land is 0.37 ha whereas for national and regional its decreases around 0.26 and 0.31ha respectively. In Bale high land, Mieso district, and Bure district mean grazing land was 0.33, 1.32 and 0.07 ha per household respectively. The reason behind farmers access for these less landholdings was because of population increment in today urbanization expansion in that more land used for crop cultivation [22].

Dairy cattle housing: The variation of dairy cattle housing depends on system of production, agro-ecology, physiological stage and classes and/ or breeds of milking cows. Usually milking cattle housed at night time. There is a higher significant difference in their type of houses either roofed or simple corral with no roof in between local and cross breed and in urban and peri-urban system. Whereas rural production systems mostly keep local cows together with their living house [22]. Most livestock housing constructed based on environmental conditions weather tropical or temperate climates for reducing stress and disease by giving attention for dairy management activities such as nutrition, milking and sanitation of housing influences in disease exposing ability [12].

Manure management: urban and peri-urban farmers have better dairying awareness and good manure management; even though they have small land resource but their awareness for dairy production motivates them to perform better dairy manure management practice. Train farmers for manure management to use for many agricultural advantages like biogas and soil fertility plays a great role for the health of stock in safeguarding the environment [14]. Accordingly, the rural farmers in Ethiopia that practice biogas decreases one tenth of their total Urea and DAP chemical fertilizer usage in one production year [27]. In household level especially heads have a better positive mandated influence for manure and other management activities [14].

The strength of dairying: The major imperative factors for the strength and increment of dairy productivity are promotion on nutritional awareness, change feeding habits, urbanization and population growth; most importantly population growth plays a crucial role in forcing to increase milk demand and supply chain

at the same time within the value chain [16]. Farmers strength of dairying increase with the increment of milk yield; the greater gain of milk yield consistently motivates them to work hard energetically, retrieving the farm to have greater proportion of cross breed cows, good manure management, wise utilization of feed sources, access to information, exercise dairy production experience and prepare for further expansion of the farm through fulfilling the accessibility of veterinary, AI, market, and other services and facilities [14]. The farmers adopting power of improved dairy cows and dairying performance results in higher employed workforces and also the minor increment of both crossbreed and local cows will open favorable policy, scientific intervention and strong extension service for enlarging dairy production [16].

Dairy farm record keeping: The importance of recording dairy cattle is for keeping control, follow up and decide for each animal based on their recorded history. Most importantly recording is used for managing and checking the farm economics weather the animal productivity is going well or not with yesterday history start from breeding; birth date, sire, dam, calving date, vaccination date, health problems, treatment, milk yield, feed and all other dairy farming related records. If the specific animal is not going well; it is decided to cull based on the performance recorded history. Record keeping is not well known for smallholder farmers, even for modern dairy farms there is a minimal purposive awareness among farmers and because of this they are confused in identification between animals. Records should be simple and easy to understand and to use clear exemplary records information as an input for veterinarian diagnoses and other management activity. Generally, as record keeping have many imperative advantages for the continual of dairy farming so that farmers needed to have awareness first on the purpose of recording and then preparing well organized records for presenting easily to each animals [12].

Dairying, market and extension service

Milk processing: On the current status of Ethiopian dairy sector most dairy industries own their dairy farm to ensure supply and quality of milk and they are thirty-two in number [28]. The country population growth increases dairy demand and dairy processing industries also continuously increases time to time. Fresh milk was the major consumers preference as it has high fat content, vicinity, affordable price, long established experience and dairy product consumption increased year to year due to awareness creation and income generation of consumers [16]. In dairy sector cost of packaging, demand and supply fluctuation, milk quality, poor husbandry practice, lack of transparency and accountability are influences that constrain dairy processing [6]. In Bahir Dar Zuria and Mecha district of Northwestern Ethiopia the traditional products include butter, ghee Ayib, Arera, Ergo, Zure and Metata Ayib; and from these Zure and Metata Ayib are the region unique products [29].

Milk consumption: Dairy products were taken lonely or with other food stuffs and mostly consumed in zone level and transported to other parts of the country. Children are prioritized in consumption of milk whereas cottage cheese and butter were not prioritized as it consumed with other food stuff [15]. In urban and peri-urban dairying from the total milk production, they sold 73 percent, 10 percent used for consumption, 9 percent takes for feeding calves and the rest 8 percent processed into butter and cottage cheese [8] and for rural system 85% of farmers production kept for consumption and only 7% of it sold in market [6]. The abstaining of Christians in taking animal product for over 200 fasting days/year affects milk productivity in fluctuating milk demand. In these fasting times farmers enforced to travel in slow production as a result of most milk processors decrement in milk buying price [3].

In the last ten years back remembrance of dairy sector that has passed with much increment in milk production about 1.5 to 2.2 and 2.9 billion liters in year 2001 to 2005 and 2010 respectively which is linked with the increase in number of cows for population augmentation and demand requirement from the year 2001 to 2010; even though in the preceding years their annual consumption rate was declined from 26 kg to 16 kg in the year 1980 to 2009 interval periods. Thereof milk consumption and production rate ascribed that, the country population augmentation and milk production are extremely mismatched [4].

Milk marketing: In developing countries, the power of participation of smallholder farmers to market for selling and exchanging their agricultural product alleviates poverty. Dairy as a sector contributes for the people in security of asset and market participation for the poor and as improvement area for smallholder farmers [30]. In the success of dairy productivity market accessibility is one of the major determinant factor as market limits power of production in fluctuation of demand and supply, and inaccessibility of inputs [6]. In Ethiopia market access is limited and the marketing system is not well organized as the dairy production is dominated by smallholder farmers [6]. The choice of selling for milk significantly depend on the time spent after milking. the delayed milk has higher probability in selling directly for consumer than collector. The probability of selling milk directly for consumer increases by 5% in delaying one hour from the normal sending time [31]. The seasonal variation of milk marketing affects farmers in lowering milk price. Therefore, it's important to have a contractual agreement with milk collector and processor for giving guarantee of sustainable marketing for producers [32].

There is high increment of demand in urban areas especially for pasteurized milk and unstable supply because of the rural areas inefficient delivery system and inadequate market outlet [28]. Formal and informal market are both available but unlicensed informal market are dominated especially in rural system [4]. In formal market most cooperatives and producers were deliver fresh milk to consumer whereas the informal market

milk may pass from two or more market agents or directly to the consumer [16]. The market constrains dairy sector as only 5% of raw milk is sold in commercial market [28]. Generally, Ethiopian dairy products export and inside consumption market is generally professed poor because of lack of market focused products, lack of production resource information, lack of infrastructure and agricultural inputs facilities (road, electric, transport, land, water and feed) and lastly illegal trade with illegal market are the most influences that drive dairy productivity inaccurately [3].

Informal market: The term informal market to mean: participant farmers in market without license and government intervene for the purpose of low cost of operation and high producer price in comparing with formal market. The system farmers have no enough knowledge for milk handling with inadequate cooling system, water resource and other material facilities [6]. The long fasting period of Ethiopian Orthodox Tewahedo believer limits milk informal market especially for smallholder farmers [12]. In Haramaya district farmers practice almost 94.3 percent of respondents in informal marketing system and they sold their milk 61.54% of their production and from this milk 72.13% it was sold directly for consumer. This indicates that collectors, traders and other supply chain actors were almost out of work in which it affects to increase unemployment rate [24].

Formal market: The closeness of market facilities, government enterprise and milk groups makes the country most energetic situations for fresh milk formal marketing in smallholder farmers [33]. Although this type of market appears in the last decades in Addis Ababa and major regional towns but it has much lower share of market than neighboring countries about 2% and for Kenya and Uganda 15% and 5% respectively. In this market system milk is released to processing plant through private collectors or cooperatives and suppliers much care of milk quality than informal system to control their milk rejection at delivery quality tests [6].

Dairy extension and training services: The Ethiopian farmers of total household less than one percent householders were served in livestock extension package. From livestock extension service more than half (60%) was given for poultry development whereas for dairy development was less than twenty percent. This indicates that less extension service was derived the dairy sector. In upgrading the sector government extensionists should organize for directing farmers filling their skill gap, subsidy and fortify future advancements [11]. Most importantly in financial service smallholder dairy (SHD) farmers are in influence and their knowledge and skill of dairy farming is limited; farmers that have dairy background is needed to have practical training at least for two to three months [12].

The dairy productivity needs extension of technical support until consumption in related with managements such as consultation service, feeding and nutrition, breeding, sanitation, milk hygiene, health (human & animal), marketing, handling and

transportation to and from producer to consumer, collector and processor etc. [3]. The Farmers training leads for dairy development and creates an important intervention for sector modification. The most stated dairy actors capacity building intervention were dairy producer, processor and value chain actors and essentially dairy institutions have a mandate in training for filling the gap of farmers in coordinating with extension workers [16]. Farmers are not accessible for extension information to supply technologies that disturbs productivity in decreasing technology inputs and marketing. Consequently high comprehensible linkage with all dairy actors in means of extensionists are needed [3].

Milk quality and Relevance remarks

Status of milk quality: The most determinant factors that influence milk quality of dairy sector includes storage facilities, environment, milking condition, storage and transportation system until consumption, health and hygiene for dairy cattle in stock and humans in milking. The major important diseases in dairy related illness in consumption of unpasteurized milk from over 90% of reports was bacteria [34].

In dairy sector mixing solid and liquid adulterates in milk are common practice and for this constrain farmers most are adulterants [15] and the adulterates continues until consumption [3]. Farmers should get awareness training in the importance of milk quality, controlling methods and build their mind attentively to know for whom they are producing and they should get a reasonable price to ensure their consistent production [15]. In cleaning of milking equipment, personnel hygiene and washing of udder before milking decreases bacterial loads in milk and which contributes for the quality of processed milk product. However, in urban, peri-urban and rural production systems only 56%, 22% and 2% of sampled respondents wash cow's udder before milking respectively [35].

The equipment's that farmers most dominantly used in milk storage and marketing were plastic jerrycans which affect milk quality in contaminating through uncleaned milk fat droplets as those materials are not easy to clean due to their narrow opening [24].

In fact, after milking to safeguard milk quality cooling milk below 4°C is scientifically recommended but in Ethiopia, Haramaya district small-scale milk producers of all selected respondents didn't use any cooling system before selling their milk [24]. There are some innovative solar ice technologies that are practiced in smallholder level for keeping milk cool that needs further improvement and also it is advisable to share other country experience for milk quality constraint mitigation [34].

Ethiopian dairy sector has a responsibility in reducing foodborne disease and giving guarantee for consumers safety with pragmatic work that ended in action beyond their policy and organizational rules. The institution EMDIDI mostly fit to organize public bodies that are working in dairy sector. However,

there is mandate overlapping between dairy institutions especially EMDIDI with other institutions. The governing bodies of Ethiopian food safety consists of: Food, Medicine and Health Care Administration Authority, Feed administration and control authority and Veterinary [34].

As an exemplary model from Ethiopian dairy industry; Hiruth milk processing and production enterprise have done a great job in creating a positive relation with their milk suppliers that contributes immeasurable role for milk quality and on their hopeful productivity. This enterprise makes easy accessibility of feed for their milk suppliers in credit basis, they train them and also, they build system of payment based on their milk quality which motivates them to produce in giving much care for milk quality. In contrast, for some other processors paid similar price for all and due to this reason most smallholders adulterate and motivate for carelessness [34].

Relevance remarks: The absence of country milk quality standards in safeguarding people health is an important challenge that stresses consumers with incredible milk product and only 13% of milk processing plant practiced milk quality control and pasteurization [12]. The government of Ethiopia particularly dairy sector has a responsibility in reducing foodborne disease and giving guarantee for consumers safety with pragmatic work that ended in action beyond their policy and organizational rules [24]. As a result, the most important remarks in dairy sector to be considered primarily before applying milk quality standards especially for developing countries like Ethiopia should proclaim the accessibility and delivery of inputs, land tenure security, filling skill gap and other extension supports for milk supplier smallholder farmers, and finally giving time for exercising the possible setup of dairy productivity with structured strong supply and demand chains. There must be a comprehensible work in leading smallholders for producing trustful quality dairy products with informing policy, advising development agencies and designing dairy intervention project which are inherently given as a responsible for dairy and livestock professionals and veterinarians [34]. Most importantly before any quality standard, farmers and other dairy actors should get awareness training in the importance of milk quality, controlling methods and build their mind attentively to know for whom they are producing for and they should get a reasonable price to ensure their consistent quality production [15].

Driver drawbacks of country dairy farming

Developing countries dairy farming continues at lower level due to absence of appropriate technology, agro-ecological and socio-economic conditions of smallholder farmers. There are many opportunities in Ethiopia to grow up dairy productivity as one important country economy return [15]; however, the sector has influenced various drawbacks in several years and still it didn't meet its potential [6]. The most shortcomings that farmers struggle in dairy production were absence of cultivation

land for improved forages, absence of grazing land, inadequate veterinary service followed by Infectious and parasitic diseases, lack of AI service and low productivity of indigenous breeds [4]; and shortage of quality and quantity of feeds, absence of clean water; inaccessibility improved dairy breeds, lack of skill in farm management and husbandry practice [12]. Ethiopian high population augmentation constrains farmers to cultivate more land and purposively insisted in traction animals as the annual population growth rises in 2.9-3 percent of total population [12]. Although the current consumption rate of milk in Ethiopia is increasing around 19 liters per person but there are disparities in various areas. In addition to urbanization resulted population growth Ethiopian dairy productivity also derived by income levitation and in their lifestyle [23]. Some of dairy production drawbacks that impact Ethiopian dairying are discussed as follows;

The remoteness of dairy inputs: In milk production and processing progression, input supply places the first pathway to take place in milk production to consumption channel. These inputs include AI, veterinary service, improved forage, pasture seeds, credit services, and value-added technologies [15] and cows/heifers, bulls, feeds, milk can and cooling tank, processing plant and other processing equipment's, improved breeds, infrastructure (roads, market, electric, water and others) and milking machine etc. [6]. The milk processing and dairy farming inputs accessibilities are varied from system to system in which in urban and peri-urban systems are more accessible than rural system [6].

Farmers wasted time for water in long distance travel which makes the dairy productivity more stressful; especially for lactating cows the water need is extremely essential. The frequency of water that livestock takes varies depending on season, water source and species; in dry season livestock takes water every day whereas in wet season takes every two days. Farmers give water priorly to dairy cows about average 25 liters of rationed per day. Although water for dairy production is highly important but continuously water was unavailable in dairy producer households [15]. Besides, in rural areas there is a limited road access for milk collection in which farmers go far a long distance in leg to reach the collection center. As farmers are influenced by inconvenient infrastructure, even though they can produce more milk but unable to sell their milk easily. This infrastructure makes milk to delay and exposes for spoilage; most importantly the absence of chilling center on potential collection area and on long distanced travel cars results milk quality problem in processing and consumption as non-qualified input gives non-qualified product [3]. The major input supply chain interventions for urban dairy were introduce improved forage seed, feeding supplementation with concentrate and the last crop residue utilization techniques. While for pre-urban areas the major interventions were crop residue utilization techniques, improved forage seeds, feeding supplementation

with concentrate feed and supplying improved dairy cows. Most importantly improved forage seeds and crop residues were very important interventions [16].

The shortage and poor quality of feeds stresses animals in decreasing milk yield, increasing mortality rate of young calf, lengthen parturition interval and retarded growth rate [15] and to be easily a carrier of diseases and lastly productivity life span ended with high mortality rate of lactating cows [3]. The feed inadequacy influence was because of shortage of land, variability of weather condition, absence of feed processing companies and skill gap of informative technologies like silage making, hay making and urea treatment which makes feed the major challenge for dairy farmers [15]. Moreover, notably local breeds of Ethiopia are stress resistant and people still practice traditional feeding practice for them in giving less attention for productivity that constrains indigenous cows in all production systems [4]. The common problems of urban dairy producers in rank were shortage of improved feed, high feed cost and lastly shortage of land for forage development. Whereas for peri-urban constraints in rank were high feeds cost, shortage of improved feed, and inadequate extension services. From thereof the major drawbacks were shortage of improved feed and high feed cost [16]. In the constraints of feed costs, unavailability of feed and roughness compliance to their circumstance about 15.4% of farmers were interrupted from dairy business [15]. The common dairy production constraints were lack of AI and veterinary service, inadequate accessibility of feed, the higher price of feed and dairy cows [6] and skill gap of dairying and processing, absence of AI professionals, quality testing instruments, simple processing machines, maintenance service and extension services, dairy production and processing inputs are highly tensioner for the dairy sector [4]. Most importantly the technology share of developing countries from western people are proven impractical because of socio-economic and climatic differences [12]. As a result the challenge that restraint the people were low capacity of value chain actors and high demand of cross breed cows [15]. Generally, in most areas of Ethiopia such as; Hawassa, Boditi, Shashemene, Dilla, Mekelle, Jimma and Bahir Dar feed inaccessibility and costly to get is a major constraint. On the other hand, disease, large number of local breeds, shortage of land and market constraint, waste disposal are also drawbacks that influence the dairy productivity [23].

Milk losses from farm to consumption: In dairying post-harvest loss reaches around 40% of produced milk from milking to consumption. This is mainly due to milking contamination, long storage time, adulteration, and lack of advanced system for transportation and distribution of milk [26].

The map of world food program shows 1 in 9 population of the world around 8.5 million people exposes in poverty and their house always cloudy in hunger. The food constrain is repetitively mentioned drawback for the aliveness of global futurity, in 2050

the population augmentation of 9 billion people needs 70% increment of food production which is a strong call for everyone in contribution for this global issue.

The most important matter that gets more attention today is significant scarce foods losses before reaching to consumer through food value chain channels. In East African countries from food post-harvest losses milk were a major loss; such as in Tanzania, Ethiopia, Kenya, and Uganda shows 9.9, 14.2, 17.8, and 23.9 million US dollar losses respectively. This was because of; their poor market access, inadequate handling practice and shortage of electric power service which makes milk to form spoilage and product losses before market. For developing countries due to the absence of advanced technologies in transportation and market infrastructure, the more extended the distance exposed for more milk losses through milk channel and in addition to these farmers also loss milk due to rejection in collection center by traders and processors. The farmers consider rejected milk as a lost milk as the economic value of preparing rejected milk to cheese and butter is low in comparing to selling milk. Sometimes rejected milk opens a chance for household consumption and animals which makes economic value in uncertain. From the total milk produced 9% of milk lost in the chain and the major factors for such milk loss were milk collection center long waiting time, lack of milk handling practice, inappropriate milk carrying tools, type of transportation used, and ineffective communication with other partners [36].

Financial constraints: The payment system of farmers used both in cash and credit but they mostly used credit system and farmers have limited finance and education commonly in developing countries that constrains them in low technology acceptance and longtime adaptability [12]. The supply and demand proportion determines the price of milk but due to socio-cultural factors farmers sell their milk at lower price for neighbors [12]. The financial service credit facilities are not easily accessible [6] and due to the sector higher financial problems over 90% of farmers in dairy sector were didn't receive credit from formal credit institutions [15]. The constraint of high requirement of capital for smallholder dairy producers mostly influence women farmers [3] and in general dairy sector financial limitation restricts to achieve their common goals and maintain their production almost without promotion [15].

Animal health and veterinary service: The Most dairy problems resulted from both considered and unconsidered abandoned constraints and which it births other serious influence in dairy productivity. The factors that come from managements like housing, feeding and veterinary service causes cows to be offensive, unhealthy, unwholesome and ended their life productivity unsuccessfully [15]. Animal health issues are more influencing constraint for Ethiopian dairy sector due to their extremely poor feeding practice which decreases fertility rate, diseases resistance ability and finally increases mortality and morbidity rate [3]. Besides, in tropical areas internal parasites like liver fluke and round worm and also flies and ticks are commonly existing. Thereof

and other parasites existence is probably due to lack of dairy farm herd management like feeding method, waste management, calf feeding and care [12]. The inaccessibility of veterinary service, transportation difficulties and veterinary professional shortage stresses dairy sector in funding for loss of animals in diseases. The outcome of this veterinary low performance comes from government monopolized service and this is because of the less attention of livestock sector [4]. The disease and parasite of dairy cows affects their development depending on their management status and ecological zones [6]. In contributing for development of the country universities should built social and technical skills in research with well-equipped facilities to solve the major dairy production constraints of extension service and research support in light of teachers to students. Although Ethiopia has many rivers, lakes and ocean water sources but due to lack of wisely use of water resource there is a scarce of water in many rural areas that depress and expose for disease in dairy farming [12]. In general, for better dairy productivity an experience of various countries like India and Kenya shows that private veterinary service is extremely necessary to serve the need of dairy farms energetically without any interruption [15].

The institutional boundaries: The households want to improve availability of service timely in well trained personnel in the value chain [16] in this way for the advancement of dairy farming institutions are needed to organize and integrate farmer training centers facility, milk collection center, milk processing and marketing facilities, credit institutions, cooperative groups, research and extension services [12]. The main purpose for establishment of cooperatives in dairy is to improve (technical efficiency and bargaining power), reduce transaction cost and to minimize market risks that farmers face [37]. The organized and strongly advanced coordination of institutions in the supply chain increases the business profitability with consistent productivity [38]. Dairy actors of Dire Dawa dairy industries has a weak linkage because of unorganized structure of their value chain [39].

There were four most institutional interventions in urban households; establish new input-output dairy producer led cooperative, make linkage between brewery industry and flour factory, improving credit service, and improving AI and veterinary service. Similarly, the four most interventions for peri-urban households were; established new input-output dairy producer-led-cooperative, improving credit services, improving artificial insemination and veterinary services, and improving extension services. Generally, in both urban and pr-urban areas establishing new input-output dairy producer-led-cooperative were the first major intervention [16]. The limited dairy enterprises with the dominance of local cows in low milk yield restrains dairy sector to have higher milk demand and lower milk supply [15]. The dairy sector cooperatives were very weak to upgrade dairy productivity [3] and most importantly they lack technical knowledge, marketing skill, value chain linkage; and are inefficient and ineffective [6].

Generally, the institutional concern major dairying and

processing constraints were shortage of processing equipment supply and its high cost, low market access, absence of enough urban and pre-urban dairy producer led cooperatives, poor market linkage of producer with value chain actors [16]. So that to have powerful dairy sector enterprise the governments of Ethiopia should focus and handle farmers in dairy cooperatives to have enough information access for nutrition, market, breeding, hygiene, health, milk handling and transportation; and there must be a way that facilitate farmers and dairy cooperatives to have a vertical relationship with extensionists [15].

Breeding and genetics: The crossbreed composition of dairy cows had 25, 50 and 70 % composition of exotic blood level. Mostly rural system blood level less than 50% but for urban and peri-urban system it reaches 50-75% as the blood level increases from rural to urban [22]. In peri-urban system major oxen have > 75% exotic inheritance in which they use for natural mating [40]. The major restriction of dairy production was primarily low genetic potential and secondly poor husbandry management practice [16]. In dairy production even though, different farmers have different breed preference, mostly crossbreed were better due to high milk yield but unsuccessful in rural production system due to their weak management with cow's poor resistance for disease. On the other hand, in choosing local cows they have a depleted measure in productivity because of their low milk yield potential [15] which is a main challenge for the dairy sector [3]. Although there is a potential for increasing indigenous cows productivity unless lack of management mostly feed insufficiency makes local cows unrecoverable [3].

The country dairy policy and forthcoming outlooks

The country dairy policy: by definition policy is the guideline that formulates, facilitates and transforms the dairy sector to participate dairy actors equally for common benefit in common standardized regulating system for conducting a positive working environment [15]. The outcome of today veterinary low performance comes from government monopolized service and their less attention of livestock sector. Moreover, there are administrative, financial and logistical problems in government for service providers to deliver time sensitive issues for farmers like Artificial insemination or natural service, vaccination and deworming; due to this reason, they are limited to serve in some regions [4]. The country as a whole hasn't any policy that have applied for milk quality for safeguarding consumers health; only 13% of milk processing plant practiced milk quality control and pasteurization [12] and the chain actors have not any chance to talk each other about their value chain restraint issues as the dairy sector has not articulated applicable policy in dairy product marketing, processing and quality assurance at zonal as well as national level [15]. On the other hand, outside imported milk share influences the prices of country producers and the country producer marketing system also impact dairy production as informal system dominates and leads around 88% over formal

market [4]. Thereof all dairy constraints are the result of the dairy sector policy nonappearance and in which dairy policy increases uncertainty of future dairy productivity unless the sector policy stands to organize, guide and control the system. In general, the nonappearance of Ethiopian dairy sector policy for dairy producer farmers, processors and other dairy actors Weakens dairy production with the higher milk demand-supply variation in the country population [41].

Dairy production forthcoming outlooks: The country dairy sector today categorized as transition level in shifting way to market oriented economy; as opened market, participation of the private sector and advancement of smallholder dairy are the main features of this phase. The increment of population and expansion of urbanization stirred and drives the outlook of Ethiopian forthcoming dairy productivity. In population augmentation, it is predictable that dairy industry will have a major performance in distributing milk for children and younger generation. The Establishment of dairy industry with strong extension service and actively motivate farmers in dairy productivity is advisable for dairy sector [3]. The country holds diverse topographic and climatic conditions [4], adequate land resource, favorable climate with high livestock population, suitable agro ecology, risk free environment for work, high yielding disease resistant breed, cheap labor force, and strong support from institutions, universities, colleges and agricultural extension workers and this all facilities open an opportunity for smallholder farmer to use (land, labor and feed source), to generate income and attract foreigners for investment [3].

The average milk production is significantly increasing that supports the country economy return [16] and for poverty alleviation and improvement of nutrition [3]. In the continual country population augmentation milk demand increases and it will open more employment opportunity following with the increment of milk production to satisfy their milk demand [6]; This chance of dairy farming employment opportunities and its income generation makes the sector more imperative on today and tomorrow smallholder farmers [8].

Investment prospects: in Ethiopian dairy sector there is a limited monetary capital, equipment and technology capacity for small and medium processors. In behind this to increases their productivity some of them wants a joint venture either with local private investors or foreigners. The dairy sector most importantly has open opportunities for investment in feed processing, modern milk processing supply of inputs for groups of large farmers, milk testing and other full processing equipment supply and maintenance, breeding technology and artificial insemination, packaging and leasing, marketing and other advisory services. The limited accessibility of milk collection center is the major constraint for most Ethiopian milk post-harvest loses today as it has inadequate contact with producers. Because this gap, the investment opportunities are open in establishment of milk

transport distribution facility, cold chains and milk collection center. Furthermore, most private and cooperatives lacks collection center and even available collection centers are not in good upright position as the system uses inferior containers and risky mode of transportation substantial amount of milk spoiled and losses in transport [3]. This all shows the existence of dairy sector opportunities for investment.

Conclusion and Recommendation

This paper mainly covers Ethiopian dairy cattle production systems, production and reproductivity performance, constraints, policy, forthcoming outlook and other dairy related status of the country. Dairy production is one of the major sources of population livelihood for the country which helps them to not fall in poverty. However, in practice the government of Ethiopia didn't have effective and functional policy that can control and lead the dairy sector in milk quality, dairy product marketing and processing and their devotion is still unexperienced and clueless.

The empowerment of dairy sector enterprises helps dairying to be influential and this will occur when the country government focus and handle farmers in coordinate with dairy cooperatives to have enough information access for nutrition, market, breeding, hygiene, health, milk handling and transportation and to join in a vertical relationship with extensionists and their actors.

The higher coverage of local cows and their poor production performance influences people milk satisfaction in the increasing demand of milk and milk products and the country economic growth. Therefore, facilitate dairying resources for better management and crossing indigenous cattle to use improved cows are the best advisable options for the sector. Most importantly, this government weakness constrains farmers for incapable to access land for forage production and dairying further expansion. As a result, the country higher cattle population declined by inadequate feed availability in restricted land for pasture establishment. Moreover, dairying in the tropics were influenced by disease and parasites due to their weak dairy farm herd management. The inaccessibility to veterinary service, transportation difficulties and veterinary professional shortage stresses dairy sector in funding for loss of animals in diseases. The outcome of this veterinary low performance comes from government monopolized service. Therefore, generally the availability of favorable policy and strong extension service is highly imperative for farmers adopting power of improved dairy cows, dairying performance, accessibility of resources and for the higher increment of employed workforces.

Recommendations

a) The continuity of dairy production hangs on the hand of land influences; in this way the government should give attention for the dairy sector and resolve the dairy farmers land inaccessibility.

b) It is desirable for governments to build conducive policy

environment that serve equally for investors, country producers and other actors in milk production; in following this it's also advisable for sector governmental extensionists to give a support for smallholder farmers in filling their financial and skill gap as less extension service have derived in dairy sector.

c) The seasonal variation of milk marketing affects farmers in lowering milk price. Therefore, it's important to have a contractual agreement with milk collector and processor for giving guarantee in sustainable marketing for producers.

d) In improving feed shortage of producer farmers work with extensionists and build solution maker team in awareness creation for making easy feeds such as crop residue treatment, urea treatment and other supplementary feeds are strongly recommended. In addition, planting the mixture of grass legumes and fodder trees, wisely utilization of crop residues can increase the chance of farmers to raise dairy production by decreasing feed constraint.

e) The government to be succeed in the country dairy production setting motive extension workers with appropriate salary is primarily worthwhile. In addition to their salary, extensionists knowledge should be practically measured to be able to demonstrate farmers particularly in simple feed processing trails, hygiene (personnel and animals), calf rearing, feeding, market information, value chain and the like dairying experiences.

f) As experience of India and Kenya private veterinary service is extremely necessary to serve dairy farms energetically without any interruption, therefore, there should be a way to experience other countries dairy experience that will see under the ground beyond looking country professional's experience in media.

g) For using unemployed professions and both genders in dairy sector; government of Ethiopia should give attention in extending dairy farming for societal gender issue as dairy business more dominated by male genders and most importantly the government also advisable to focus in widening chances of getting employment opportunities in dairy business for graduated professions and other unemployed people of the country.

h) In dairy production to exemplify others boldening a model producer and processor is very important. In some milk processing enterprises for their milk supplier farmers, they make easy accessibility of feed in credit basis, training and also, they build system of payment based on their milk quality that motivates them to produce in giving much care for milk quality. This way of controlling milk quality is more advisable without the affection of farmers in price and their relation will be believable and consistent.

i) Farmers should train for the importance of milk quality, controlling methods and build their mind attentively to know for whom they are working for, as farmers are the most milk adulterants and they should get quality instruments in reasonable

price to ensure milk quality. Consistently there must be appropriate and parallel price in between milk producer farmers, collectors and dairy processor industries.

j) Finally, and most importantly for the building influential dairying in the country the government of Ethiopia should thoughtfully focus and handle all dairy actors to have enough information access, skill of dairying, access for marketing, accessibility for dairy inputs, possible support in extensionists and creating a way to have enough cooperative relationship between producer farmers and other actors.

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Conflict of Interest

The authors have not declared any conflict of interests.

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