



Dairy Product Processing and its Marketing in Ethiopia: Current Scenario and Way Forward

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Abstract

Ethiopia is home for huge diversity of livestock and which has taken first position in Africa in its livestock potential. Ethiopia generates income from its livestock in the form of as source of food, cash in the form of foreign currency. Despite its huge livestock potential Ethiopia gained from livestock sector in general and dairy sector in particular is below from existing potential. The reason is the prevalence of diseases, poor genetic potential, poor access to market, poor health care in general in livestock sector and poor genetic potential, lack of infrastructure, existing informal market, adulteration of dairy product, seasonality of market demand in particular in dairy sector. In Ethiopia, milk production potential average milk yield per cow per day is about 1.48 liters day and in the countries, total milk yield potential is about 3.89 billion liters. Currently, in Ethiopia there are 32milk processing industries was establish in different parts of the country and they produce pasteurized milk (83.4%), yogurt and different kind of cheese (Provolone, Mozzarella, Gouda and Feta). Traditional Milk Processing practice throughout the country and produce naturally fermented milk, traditional butter, buttermilk, cottage cheese, whey and ghee. The milk producers used different techniques to preserve fresh milk without clotting, such as smoking of the container and boiling of fresh milk. Milk and milk product marketing in Ethiopia is practiced at local market up to 85% of milk produced in the country. In some area due to cultural difference and the distance from market is obstacle to marketing of milk and milk products. Therefore, the objective of this paper is dairy product processing and its marketing in Ethiopia.

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Keywords: Dairy; Ethiopia; Marketing; Processing.

Abbreviations: AACCSA: Addis Ababa Chamber of Commerce and Sectorial Associations; CE: Care Ethiopia; CSA: Central Statistical Agency; EMDIDI: Ethiopian Meat and Dairy Industry Development Institute; ILCA: International Livestock Center for Africa; ILRI: International Livestock Research Institute; IPMS: Improving Productivity and Market Success; USDA: United States Department of Agriculture.



Introduction

Cattle constitute the predominant element of livestock wealth in Ethiopia both in the agricultural high lands and pastoral and agro-pastoral low lands, and hence the proportional contribution to the national economy is considered to be high. Based on crude assessments, the contribution of cattle to the marketed milk and meat, national wide, is estimated to be 96 and 45percent, respectively [1].

The major constraint that hinder effective utilization of dairy and dairy product effectively were averagely about 147.86 liters of milk were rejected from each dairy plant per day because of machinery and plastic pouch defect also poor quality milk supply (Adulteration) and lack of quality and quantity packaging material, due to inadequate number of milk packaging material producing factory in the country and even the existing packaging material producing factory produce under their capacity even they produce not quality packaging materials and not deliver on time [2] and disease condition, thieves, lack of veterinary services, lack of credit, feed and feeding and poor extension services in two production system (mixed livestock and pastoral) at lowland of gambela region [3].

In addition, informal market system have negative impact on milk processing industries not delivery quality milk and create negative competition between milk processing industries in collecting quality milk. Have also impact on milk processing industry enforced to produce under their design capacity [2]. Before 1990 there were ten private milk processing plants have entered the milk marketing and processing in Ethiopia and increasing the amount of milk channeled via the formal markets [4].

In Ethiopia there are 32 dairy plants were established in different parts of the country and dairy plants were originated in Oromia, Addis-Ababa, Amhara, Afar and South regional state and their the average mean capacity of dairy plants of the country was 30, 119 liters per day. Eventhough, dairy sector face many challegens, the expansion of urbanization and increase population number increase the demand for milk and milk products [2].

Ethiopia has large number of dairy cattle, which account 7.15 million populations, but, the benefit come from the sector is not adequate as the resource country has. Different researcher in Ethiopia reported the status of marketing and processing of milk and its product. However, there is no review work on dairy product processing and its marketing in Ethiopia. Therefore, the objective of this paper is to review milk and its product processing and marketing what it seems in Ethiopia.

Literature review

Milk production in the world

Among the United States the 24 major States milk production during January 2020 was 17.9 billion pounds, up 1.2 percent from January 2019. December revised production, at 17.5 billion pounds, was up 1.3 percent from December 2018. The December revision represented an increase of 82 million pounds or 0.5 percent from last month's preliminary production estimate. The annual production of milk for the United States during 2019 was 218 billion pounds, 0.4 percent above 2018. Revisions to 2018 production decreased the annual total 7 million pounds. Revised 2019 production was up 60 million pounds

from last month's publication. Annual total milk production has increased 13.0 percent from 2010. Production per cow in the United States averaged 23,391 pounds for 2019, 241 pounds above 2018. The average annual rate of milk production per cow has increased 10.6 percent from 2010. The average number of milk cows on farms in the United States during 2019 was 9.34 million head, down 0.7 percent from 2018. The average number of milk cows was revised up 4,000 head for 2019. The average annual number of milk cows has increased 2.3 percent from 2010 [5].

The milk production overtime for the milk societies of EAC member states had been increasing. Kenya's milk production increased from 2, 224 million litres in 2000 to 4,115 million litres in 2017; Tanzania's milk production rose from 710 million litres in 2000 to 2,249 million litres in 2017; Uganda has witnessed milk production increase of 511 million litres in 2000 to 1,800 million litres in 2018; Rwanda's milk production over time has increased from 106. 45 litres in 2000 to 188 million litres in 2013; Burundi's milk production has also risen from 18.55 million litres in 2000 to 41.09 million litres in 2013; according to available data, South Sudan's milk production rose from 351.17 million litres in 2013 to 2,630 million litres in 2017 [6].

The milk production potential level of world countries from 2011 to 2016 million litres of milk increase for example, this countries are top milk producing countries which can produce India 23,915.85; USA 7,344.14; New Zealand 3,777.67; Turkey 2,983.84; Netherlands 2,682.5 [6].

The milk production in Sub-Saharan Africa

Majority of the world's low-income tropical livestock producers are in Sub-Saharan Africa and South Asia where dairy is produced in mixed crop- livestock systems, ranging from low input, extensive grazing to more specialized intensive enterprises [7]. Shittu et al. [8] intensive systems are common in countries such as Sudan, Egypt, Kenya, South Africa and Algeria which are the top milk producing countries on the continent in terms of milk volume, producing about 52% of total African milk. Apart from southern Africa, where high outputs have been reported, the rest of Africa is struggling to meet the milk demand of their respective countries. Much of the milk produced from extensive system is for home consumption or for sale at local markets, with only 5% of milk produced sold through commercial markets [9]. Nevertheless, milk production on the continent has doubled from 1996 with major growth taking place in North Africa, Kenya and South Africa with the other countries in Sub-Saharan Africa experiencing high relative growth but from an extremely low level [10].

Even though local production increased by 16.8% between 2005 and 2017 (1.5% per annum), undoubtedly, due to increased number of milk cows by 27% (2.5% per annum), demand far outweighed supply. Meanwhile, milk output for 2018 has been estimated at 45.7 million tonnes, almost unchanged from 2016, with higher outputs in South Africa, Algeria and Tunisia that were largely offset by lower production in Sudan, Ethiopia, Somalia and Tanzania [11]. The average milk yields of 461kg ECM per cow, which was only one fifth of the world average yield. An analysis of milk yield data from 2006 - 2016 showed a decrease of 8.1% (an annual decreasing rate of 0.74%) for Africa whereas Europe and the world saw an increase of 2% and 11%, respectively, with a decreased milk cow population of 6% in the case of Europe [8].

Milk production in Ethiopia

The milk production in Ethiopia mainly depended on the milk of cows and the milking months of local breed exist in countries are almost seven months of lactation and cows actually milking potential average milk yield per cow per day is about 1.48 liters day and average. Total cow milk production potential of the country is about 3.89 billion liters [12].

Study conducted at western high land area of Ethiopia the total annual milk produced of the area was 1.4 million liters from 256 farms. When the study tried to see by dividing the production system by saying urban and peri-urban dairy systems in which the study could see 57 farm (0.6 million liters) and 199 farms (0.8 million liters of milk, respectively). The more milk was produced from urban production system than peri-urban production. Due to the presence of a greater number of crossbred (local zebu type x Holstein Friesian) cows farmers could produce 43 litres/household/day in urban production system and 14.1 litres/household/day in peri urban production system [13,14].

The number of dairy cow shows the existing milk production potential of an area. The farmers of Benchi Maji zone more than 90% of farmers had dairy cow of averagely 6-10 and 1.1% of farmers had 16-20 dairy cow [15]. The East Shoa zone of Oromia farmers had dairy cow on average 2.9 dairy cow [16]. Similarly, Metema District on average dairy cow belongs to farmer was 3.0 [17]. The majority of producers (63.3%) in the pastoral system produced milk for home consumption, while the majority of mixed crop–livestock producers (40.0%) produced milk for selling purpose [3].

Modern milk processing industries in Ethiopia

In Ethiopia the numbers of dairy processing industries reported at different time and out of them, 32 milk processing industries was establish in different parts of the country [18]. Before it, there were 35 active dairy processing industries in the country [19]. Similarly, there were over 22 medium- and large-scale dairy processing companies in Ethiopia with nine of them operating in Addis Ababa and the rest in other major regional cities [20]. This indicates dairy industries raise and decline through time due different factors as different authors reported.

Currently, in Ethiopia there are 32 milk processing industries was establish in different parts of the country. The numbers of dairy plants exist in country part of region account the percent of 48%, 28%, 14%, 5% and 5% dairy plants in Oromia, Addis-Ababa, Amhara, Afar and South regional state; respectively. The major dairy processing plant products are pasteurized milk, yogurt and different kind of cheese (Provolone, Mozzarella, Gouda and Feta). About 83.4% of the total milk produce was pasteurized milk and about 12.69% was yogurt [2].

The industries processing capacity and type of inputs and source

The average mean capacity of dairy plants of the country was 30, 119 liters per day. The largest milk processing industries had capacity-processing milk up to 120, 000 liters per day, while the smallest dairy processing plant can process 4,000 liters of milk per day [2].

Major types of inputs use for milk processing industries are raw milk, plastic pouch, yogurt cups, rennet and cultures (for yogurt and cheese making). Dairy industries obtained raw milk directly from producers and indirectly from collectors, retailers and milk suppliers [2].

Type, amount of product and machine capacity

Dairy processing industries, which found in Ethiopia produce up to 24 dairy product and among them pasteurized milk, skimmed milk, yoghurt, fermented milk, table and cooking butter, cheese, cream and ice cream. The milk processing industries found in Ethiopia process the milk into pasteurized milk about 83.4% of the total milk produced in industries and 12.69% covered by yogurt. Average production of pasteurized milk in dairy plant was 8740.48 ± 16239.63 liter/day, yogurt 1330 ± 2280.46 liter/day and Gouda cheese was 33.81 ± 83.52 kg per day [2].

Pasteurizer machine have a capacity to pasteurize in mean average of 33695.24 ± 0358.92 liters of milk per day, cream separator have a capacity to separate cream in mean average of 26203.81 ± 25447.68 liters of milk per day, skim milk packing machine have a capacity to pack skim milk in mean average of 25000 ± 29534.25 liters of milk per day, capacity processing milk up to 120, 000 liters per day, yogurt packing machine have a capacity to pack yogurt in, mean average of 11370.48 ± 13344.38 liters of yogurt per per day, butter churner machine have a capacity to churn buttermilk in mean average of 1700 ± 6959.17 liters of milk per day [2].

Traditional milk processing, preserving and cleaning

Milk processing

Farmer process milk produced in their farms to other milk product in order to increase its shelf life. Out of the total milk produced was used for traditional processing and convert it into dairy products. The major products of the traditional milk processing were naturally fermented milk, traditional butter, butter milk, cottage cheese, whey and ghee [21]. The processing of butter-milk into cottage cheese of peri-urban producers was slightly higher than that of urban producers. The urban farmers more frequently used butter-milk for bucket-feeding of calves. The urban producers do not process butter-milk into cottage cheese and whey due to the lacking availability of fire wood for cooking. The majority of dairy farmers who live far from urban centres in Ethiopia processed milk into different byproducts [14].

Converting, milk to other product may be different from area to area depending on: environmental temperature, on quality and disease condition of animal [21]. For example, study conducted at Jimma town staying duration for milk to make butter, first of all, the milk is soured (*ergo*) for 3-7 days to coagulate and the sour milk then is churned (agitated) using two-third filled plastic container, bottle gourd (*Lagenariasiceraria*) and clay pot until the butter is separated from the buttermilk and then the butter is collected and washed with cold water, which is later on refined to get traditional ghee (nitirkibe-clarified butter oil) by heating butter on open fire in order to remove the water content and finally cooling [22,16]. When making the ghee a variety of spices are added to impart good flavors and taste to the ghee [23,15].

Traditional preservation of milk

The milk producers used different techniques to preserve fresh milk without clotting, such as smoking of the container and boiling of fresh milk before collection, or refrigeration. In different production systems, smoking was the predominant practiced. The most of urban farmers uses a refrigerator, an option which was almost not present in the peri-urban areas. Cooling by putting the container with milk into a cold-water

bath was practiced the peri-urban producers [14]. It is obvious therefore, that for technical and economic reasons technologies in fluid milk processing such as steam-pasteurization, sterilization and aseptic packing are not common on Ethiopian smallholder farms [13].

Smoking of milking and storage containers was done by using Kosorote (*Ocimumhaardiense*), Tejsar (*Cymbopogon martini*), Tenadem (*Rutachalepensis*) and wood splinters of 'Weyira' (*Olea africana*) were used [14]. Smoking is used to develop desirable flavor and aroma [24], increase shelf life of milk and facilitate fermentation. In addition to imparting pleasant flavor, it facilitates fermentation and increases shelf life of milk and milk products. Smoking has antimicrobial activity, thus inhibits the growth of microorganisms in milk.

In addition to above, other traditional way of treating milk product and utensils predominantly practiced on farmers was the use of water and leaves of shrubs (such as *Combretum molle* (Abalo), *Ocimum suave* (DamaKessie) and *Buddlejalpolystachia* (Anfar)) twice a day, followed by drying and smoking with plants specifically used for this purpose (e.g. *Rosa abyssinica* (Qega), *Osyris quadripartite* (Keret), *Otostegia integrifolia* (Tinjut), *Olea Africana* (Woirra), *Thymus vulgaris* (Tosgne) and *Juniperus procera* (Tid) [13]. The local understanding, the practice of smoking the vessel by burning wooden chips of specific trees and shrubs has an advantage of imparting special taste and odour to the product, and to disinfect the vessels, thus reducing the numbers of micro-organisms and thereby extending the shelf life of the product [14].

Cleaning and smoking practice of milk handling equipment

The Smoking practice and purpose of smoking was to improve taste and flavor of milk and milk products. But, smoking practiced to destroy bad microorganism and to improve milk fermentation. The smoking practice in urban area to kill bad microorganism was because of better awareness of community in proper handling of dairy products [24].

The purpose of smoking was to improve the taste and flavor of milk products, to reduce bad microorganisms and to increase the shelf life of the products [25], and also smoking plants such as Cheba (*Acacia nilotica*), Abalo (*Combretum molle*), Ader (*Dichrostachys cinerea*), Asta, Kega (*Rosa abissinica*) and Woira (*Olea Africana*) [26-29] respectively for better flavor and aroma of milk and milk products [30,24].

Traditional milk processing in Ethiopia

Milk processing is usually designed to remove water from milk or reduce the moisture content of the product. Generally, milk processing is not well developed in Ethiopia. Smallholder milk processing is generally based on sure (fermented milk). Each household accumulates milk either from a single milking animal or large number of animal and that is processed in to different products such as; butter, cottage, cheese, whey and concentrated fermented milk. In Ethiopia, buttermilk is converted in to local cheese which is reserved for home consumption and considered as a staple food by many smallholders.

Ergo (Ethiopian naturally fermented milk)

The product typically was semi-solid and in smallholder dairy farms, it was produced from whole milk, while in milk cooperatives or other producer groups it was produced from skim milk. On average, milk was accumulated in a clay pot or a gourd over a period of 1 to 4 days and allowed to develop acidity. The

mean shelf life of fermented milk was 3.8 days. This fermented milk was the main product used as basis for further processing of various fermented milk products such as traditional butter, ghee, cottage cheese, buttermilk and whey [31].

Traditional butter (Kibe) and buttermilk (Arerra)

Yitaye et al. [31] reported that as the traditional butter produced from fermented whole milk, but not from cream. The traditional churning utensils were on average filled with about 11 litres of fermented milk, followed by agitation with a wooden stick to break the curd before churning. After this, the churning device was typically covered with a piece of skin or leather, which was stretched over the mouth and was securely tied. The final point of the churning process was detected by a sequence of indicators, such as observing the sound of the churned milk and the visual judgement of the surface of a piece of straw inserted into the churn. The butter was then kneaded in cold water and washed to remove visible residual buttermilk (*Arerra*). The average churning time reported was about 3.5 hours. The relative amount of whole milk converted into butter and cottage cheese was about 4.3 and 16%, respectively.

The buttermilk is a by-product of the formation of butter from fermented milk. At household level, part of this by-product was reported to be consumed by the household members and by suckler calves. The rest was processed in to cottage cheese [31].

Cottage cheese (ayib) and metataayib

On traditional way the churning of sour milk mainly at household level yield buttermilk and then buttermilk boiled by firing an iron or clay pot until a curd-mass formed. This was followed by cooling to coagulate the curd. The curd-mass yield cottage cheese and the cottage cheese is a soft curd-type cheese. While in one farm and in milk cooperatives or other producer groups it was produced from skim milk. Then, the curd was separated from the whey through a fine-meshed cloth or a sieve. It was observed that about a kilogram of cottage cheese could be obtained from about 11 litres of buttermilk or skim milk [31]. In some area of country, the cottage cheese was again processed into traditional hard cheese (Metata-ayib). This is carried out by putting the cottage cheese in a sieve container and squeezing was done in intervals for about 3 days until the water content was sufficiently reduced. After the cheese was drained sufficiently and became dry enough, spices were added to give a desirable flavour. The traditional hard cheese was reported to be able to store averagely about 2.1 years before consumption without losing its desired flavour and taste by the local consumers [24].

Traditional ghee (NeterKibe)

Traditional ghee was made by evaporation of the water from butter by heating and melting of butter in an iron or clay container until bubbling ceases. The ghee was decanted into another container leaving the curd material in the pan [31]. Then finely grounded spices are added and stirred until it is mixed uniformly. Then the product is stored in clean equipment and can be stored for several months. The presence of different spices makes good flavor of the products and helps to increase the shelf life [24]. It could be stored for about 2.8 years without losing the quality desired by the local consumers [31].

The microbial quality of dairy product

Pauline [32] reported that cheese is a fresh or matured product obtained by draining after coagulation of the whole,

skimmed or partially skimmed milk. Its principle of processing is based on the coagulation of the protein in milk, during which about 90% of the milk fat is encapsulated. The coagulated mass is called curd; the remaining liquid is called whey. Curd consists mainly of milk proteins (casein) and milk fat; while whey mainly contains water, milk sugar (lactose), protein (serum proteins) and B-vitamins.

Cheese can be considered as a good medium for bacterial growth due to their nutrient content and long storage duration. Several steps in their production can cause bacteriological hazards. Though pasteurization of milk can destroy most of the pathogens posing risk to public health, yet, the potential bacteriological hazards can still be found in the final products after pasteurization through the improper handling. The results indicate the unhygienic conditions prevailing during distribution or sale where most of the products are sold in open containers at local market [33].

Yoghurt is a dairy product produced by the controlled fermentation of milk by lactic acid producing bacteria. Two species are commonly used in the commercial production,

which are *Lactobacillus bulgaricus* and *Streptococcus thermophilus* [34]. *Ergo* is a traditional Ethiopian fermented milk product, which has some resemblance to yoghurt. It has thick, smooth and uniform appearance. It has white milky color when prepared carefully. It constitutes a primary sour milk product from which other products may be processed. As the major fermented dairy product, *Ergo* is popular and is consumed in all parts of the country.

Worku et al. [35] reported on the study done on commercially prepared and traditionally home-made yoghurt (*Ergo*) retailed in Addis Ababa, the average count of LAB was found to be log 9.6 cfu/ml; and that of Aerobic Mesophilic Bacteria (AMB) and Psychrophilic Bacteria (PB) was shown to be around log 9 cfu/ml. Similarly the average count of coliform and fecal coliforms were indicated to be around log 6 cfu/ml.

Butter is a traditional food which is widely consumed all over the world, directly or as ingredient in processed food such as pastries and convenience dishes. Its nutritional value (due to high content of fats, vitamins and minerals), and unique and pleasant flavour make butter practically appreciated by consumers. Butter can be made directly from milk or by separation of milk and subsequent churning of the cream [36], but Ethiopian traditional butter (Kibe) is made from Yoghurt (traditional *Ergo*) not from cream [37].

Butter has an attractive appearance with white to yellowish color and semi-solid at room temperature. It has pleasant taste and odor when fresh but, changes in taste and odor occur if it is not stored in unrefrigerated condition and not further processed. Butter is the most shelf stable of milk products and it has important role in diet, both in rural and

urban areas. In addition to direct consumption, butter is used as oil for food preparation and in Ethiopia it is also used for hair dressing and as skin cosmetics by both sexes and for coffee roasting in traditional ceremonies [38].

The moisture content of traditional Ethiopian butter ranges from 20 to 40% compared to international standard butter of 16%. Butter spoilage occurs by putrefying microorganisms when it is stored in unrefrigerated condition for long period of time. Microorganisms having lipolytic activity highly cause the rancid-

ity or loss of flavor of butter. The average total bacterial count of 6.18 cfu/g and 7.25 cfu/g was isolated from butter sample collected from Selale and Sululta respectively [20]. Similarly, the average TBC of 7.49 cfu/g in which higher count was recovered from butter samples collected from rural producers and open markets compared to sample collected from dairy farms.

Milk and milk product marketing in Ethiopia

Milk marketing in Ethiopia

Majority of the dairy products were sold in local market. More than 85% dairy plant were not export milk and milk products whereas fewer industries were export the products to Djibouti, Saudi Arabia and Juba [2]. Milk and milk by products prices varies around different seasons and locations. Amount of milk sale increases during the wet season was high in mixed crop- livestock system. The increase of milk yield and supply to the market is mainly due to more cows calving in the wet season and increased feed availability [3]. The dairy farmers in Dire Dawa have only two market outlets for selling their milk. These are selling to neighbors (i.e., individual consumers) and retailers. There is no formal milk marketing system both in the urban and peri-urban areas of Dire Dawa [39] and also there is no formal milk marketing system in Nekemte and Bako milk shed areas in western Ethiopia.

Traditional/informal milk markets have played a key role in dairy development in Ethiopia. Informal, small-scale markets control over 90% of marketed milk in the country. Producers sell their milk to anyone whom they come across every day. Dairy cooperatives and formation of milk groups gives producers a guaranteed access to market and sell their milk [39]. Study conducted in western highland of Ethiopia the comparison of the two dairy production systems showed that the proportion of milk sold higher in the urban system than peri-urban system (47% versus 21%) [14]. This due to urban farmers has, the access to a better market which might be related to the increasing urbanization [40,41].

The marketing price of milk was different in variation of season and agro-ecology. At lowland area of Gambela shows marketing of milk and milk product's average price for fresh milk price (Birr/liter) at wet season 2.89 ± 0.13 in pastoral production system and 3.85 ± 0.08 in mixed crop-livestock production system and at dry season 8.78 ± 0.10 in pastoral production system and 7.96 ± 0.11 in mixed crop-livestock production system [3].

In some part of country marketing practice of milk was not developed. In high and low altitude areas, milk marketing was absent due to cultural restriction and absence of milk buyers. Farmers do not sold milk in Ezha districts of Guragie Zone, Alle district of Segen Zone and Huet Eju Enesie District of East Gojjam Zone [25,24]. However, marketing milk practiced in some amount reported 30.83% in Chencha districts and 12.78% in Kutcha district. But, marketing practiced at enough amount in Sebeta town, Asayita district and West Gojjam Zone who in practiced fresh milk marketing [29]. Weakening of milk marketing in some part of the countries was due to absence of milk buyers, cultural taboo and lack of surplus milk for sale. In addition, marketing of fresh milk is not common due to cultural restriction and due to scarcity of milk and lack of market in and around Zeway town, Oromia region and Ezha district [25].

In the mid and high altitude if the producers have access to market they are willing to sale milk which is important for the

development of the dairy sector but low awareness in low altitude is still a problem but milk sold for consumers, milk cooperatives and for cafeterias in some amount. Moreover, people live in mid altitude of town area sold milk for cafeterias found town and in their nearby small towns and milk sold to milk cooperatives. Generally, in rural areas milk was sold by transporting in to the customers house [24].

Butter marketing in Ethiopia

Butter marketing is different according the topographical variation, agro-ecology and access to market. The different authors reported different price of butter at different time from countries corner. For example, price of butter at lowland area of Gambela kg/ ETB at wet season 23.38 ± 0.40 in pastoral production system and 27.00 ± 0.48 in mixed crop-livestock production system and at dry season 31.88 ± 0.34 in pastoral production system and 37.75 ± 0.35 in mixed crop-livestock production systems [3].

Butter marketing system practiced throughout the country of Ethiopia, in city administration (market place), around homesteads for consumers and both around homestead and market place [25]. Peoples participate at butter marketing; selles butter at market place those who nears to market place and other peoples far from some distance from market place selles around homesteads [42,24]. The kind of butter buyers participate in buying butter were consumers, traders and both consumers and traders. Topographical variation determine to whom farmers selles, in low altitude areas butter was sold for consumers while in mid and high altitude areas butter was sold for both consumers and traders and for traders The peoples from low altitude and high altitudes that sold butter for consumers liked butter is expected to be free from adulteration and the distance from market enforce them to sell at low prices [28,24].

The overall average price of butter in Huet Eju Enesie District, East Gojjam Zone of Ethiopia was 125.02 ± 0.8 ETB/kg. Butter price in Motta town on average was (140 ± 0.11) ETB/kg). The lowest butter price was (122.5) ETB/kg) in high altitude [24]. On other hand, there were different study conducted throughout the countries reported one kilogram of butter price in Ethiopian birr, and 100, 93 and 110 ETB/kg in East Shoa Zone, Keffa and Sheka Zone and Alle districts of southern Ethiopia, respectively. And Tsegaye and Gebreegziabhar [28] 130 and 134.5 ETB/kg in Chencha district and Wolaita Zone. Similarly, and Melku [29] reported 125 and 123 ETB/kg in Kutcha district and West Gojjam Zone, respectively. The price of one kilogram butter varies throughout the countries, this is due to the price of butter is varied according to season of the year (wet season is cheaper than dry season), holidays and in every year when the price of other economic activities is increased [24].

The study conducted in Gimbi District, West Wollega Zone butter prices were fluctuating in the dry and wet seasons, in holydays and festivals period and non-fasting condition, which were ranging from ETB 50.00 for a kilogram in the wet season to about ETB 70.00 - 80.00 for a kilogram in the dry season at farmer level. Retail prices ranged between ETB 135.00 to 150.00, depending on product quality and market demand. The reason for having such variation of marketing price of dairy products (butter and milk) due selling time and the farmers in wet season they have sufficient amount of forage for their dairy animals [43].

Milk product marketing and seasonality in Ethiopia

Factors affecting the prices of milk and milk products included season, fasting and non-fasting days, and access to urban sites; to some extent the quality and sources of dairy products also influenced their price [14]. As doctrine in Ethiopian Orthodox Christians are abstained from animal products including dairy products for about 200 days per year, being the longest fasting is 55 days prior Easter. For this reason, farmers process milk frequently during fasting period to extend the shelf life of dairy products. The fluctuation in supply at dry season attributed by feed shortage, when there is an increase in demand over supply and absence of formal milk marketing system [44,23].

Butter and milk marketing constraints

The dairy products are marketed informally via different channels and mainly hampered by many constraints. Low amount of milk produced, distance to the market and high cost of transport was the major among the constraints [43].

The major constraint identified as problems in part of country were the less possibilities of improved dairy production technology; under developed dairy market and absolute absence of private or government dairy processing plants; the seasonality of demand for and supply of dairy products due to vast fasting (more than 200 days per a year); spoilage/perishable nature of milk; shortage of initial working capital for butter traders and milk traders; The adulteration was their critical butter and milk-marketing problem. butter traders complains adulteration with filth, cheap source of vegetable butter ('sheno-lega'), banana and 'kocho'(byproduct of 'enset'); The lack of consumer skill to test butter quality, and complete absence of grading and standardization for butter and presence of large number of unlicensed local traders; absence of licensing and inspection of competing dairy products traders to ensure achievement of minimum hygiene and quality standards, less access to credit and lack of storage facilities were found to be the vital dairy marketing as well as production problems [45].

Constraints and opportunities for dairy developments in Ethiopia

Constraints

In Ethiopia, the livestock sector in general and the dairy sub-sector in particular do not make a substantial contribution to the national income, despite their large size, due to numerous socio-environmental factors. The poor performance of the dairy sub-sector is attributed to socioeconomic, infrastructure and technical constraints, inadequate research and extension activities, and lack of policies relevant to the development of the dairy industry [46].

The major challenges in milk processing industries of the country were milk supply through informal market, shortage of milk in quality and quantity, lack of cold truck vehicles to collect milk from milk producer or collection center and final products to market or consumers, lack of quality and quantity packaging material, interruption of electric power and irregular current flow of electric power, lack of existing original milk processing machine spare parts producing factories, lack of trained man power on machine maintenance or repair, lack of well-equipped laboratory facilities especially in microbiology laboratory and milk consuming habit of the country. These challenges have great effect in milk producing and marketing [2].

Moreover, other challenges observed in milk and milk products marketing are: high seasonality of milk and milk products production and supply to market easy spoilage of milk, lack of milk collecting facilities, lack of marketing and milk quality skills by women, there is poor feeder rural, poor quality control systems at milk collecting centers [47].

Production constraints determine the state of dairy cattle production. Some of the constraints farmers faced in lowland area of Ethiopia were feed shortage, health problem, environmental factors, conflict, thieves, management and genotype. The interactions of these factors limit the efficiency at which genetic potential of a given animal species is being utilized. The major constraints in lowland area for milk marketing were low milk quantity, long distance to market, spoilage and cultural limitation [3]. In areas where the climate is hot and humid, the raw milk gets easily fermented and spoiled during storage unless it is refrigerated or preserved. However, such storage facilities are not readily available in rural areas and cooling systems are not feasible due to lack of the required dairy infrastructure and when available they are too costly for poor smallholder producers [21]. Averagely about 147.86 liters of milk were rejected from each dairy plant per day because of machinery and plastic pouch defect also poor quality milk supply (Adulteration) [21].

Opportunity

The countries have high numbers of livestock population and suitable climate for livestock production. The sector has great milk potential and at existing situation, the resource is not touched as its potentials. Government of the country gives strong attention in milk production and processing and has good working condition. Government has provided technical support, provide consultancy service and provide professional training on milk processing, quality control, products input and diversification. A number of non-governmental organizations are involved in the sector. The expansion of urbanization and increase population number increase the demand for milk and milk products. The expansions of loan provider financial institution. Currently constructing railway Addis Ababa to Djibouti has great opportunity to generate of market for milk and milk products. And the expansion of different industry growing is another opportunity [2].

The current scenario

Ethiopia has largest population of livestock in Africa and believed to have the largest livestock population in Africa. The total cattle populations, which accounts 65.35 million and out of this the female cattle constitute about 55.90 percent and the remaining 44.10 percent are male cattle. On the other hand, the total cattle in the country 97.76 percent of local breeds and hybrid and exotic breeds that accounted for about 1.91 percent and 0.32 percent, respectively. But milking-cows are about 12.57 million heads in the country. Currently, the total milk production from 12.57 million milking cows in the country is estimated at about 3.89 billion litres. The production per cow is 1.48 litres of milk per cow per day and the average lactation length is about seven months [12].

The increasing trend of urbanization and population growth led to the appearance and expansion of dairy processing enterprises. The urban demand is served by a processing industry that is expanding and that actively works with its supply chain to source increasing quantities of milk through the formal channel. Commercial processors include large cooperatives and spe-

cialized and lead farms that are equipped with modern technology for the production of pasteurized milk and dairy products (e.g. yogurt and cheese). In addition, large dairy farms (privatized state farms) are involved in milk processing. They have their own milk processing plants, and process milk of their own production, as well as milk purchased from nearby producers [48].

Per capita consumption of milk is approximately 19 kg per year [11], which is below recommended of 200 litres, reduced by 181 litres and this also much lower than Africa and world per capital average of 40 kg/year and 105 kg/Year respectively [9]. However, the country is a net importer of dairy products with import values significantly exceeding export values. In five reference years, 2005-2009, export values increased from about 73,000 USD to 123,000 USD, while import values increased from about 5.6 million USD to 10.3 million USD during the same period. Although milk production generally tended to increase during the last two decades at the national level, the per capita milk consumption has decreased from 26 litres per annum in 1980 to 22 litres in 1993, 19 litres in 2000, 16 litres in 2009 [20] and 19 liters in 2018 [49].

Milk and milk products contributes 63 percent to gross value of ruminant livestock production. Estimated calf consumption and wastage of milk is 32% of the milk produced. Households consume approximately 85% of the milk collected, 8% of the milk is processed into products with longer shelf life, and 7% is sold [50]. During peak production in the wet seasons, rural farmers, not part of formal cooperatives, face challenges marketing their milk as most regions experience a surplus. More surplus milk may be processed at the home into local cheese or butter.

Conclusions and Recommendations

Conclusions

Ethiopia is one of the African countries where there is high population of livestock resource. However, the livestock in the countries has very low improved dairy cow and local dairy cows, which account up to 98%. This condition defines the milk production potential of existing livestock. But, farmers produce milk and up to more than 60% milk left for home consumption, this constrained by lack of formal marketing, distance to market, lack modern technology for milk processing and etc. In Ethiopia milk processing is well developed in traditional way in which milk are processed in to *Ergo*, butter (Kibe) and Buttermilk (*Arerra*), ghee (NeterKibe), Cottage cheese (Ayib) and Metata ayib. Modern milk processing dairy plant in Ethiopia processes milk in to pasteurized milk, yogurt and different kind of cheese and it not well developed in countries. The milk and milk product marketing varies from area to area and year to year throughout the countries. Milk and its product marketing constraint by adulteration, informal marketing and seasonality of demand on the products.

Recommendations

Based on above conclusion the following recommendations are forwarded:

- The local dairy cow average milk yield is averagely 1.5 lit, to improve the milk yield farmer should apply selection of dairy cattle whose have good genetic potential and mating them with local breed.

- Milk processing plant should process dairy product in quality that to be computing in global market.
- Government should encourage dairy cooperatives by fulfilling the essential dairy processing equipment and their maintenance when the equipment face a problem.
- Government should build milk and milk product evaluating laboratory at large market site thereby it can prevent adulteration of the product.
- Government should encourage formal marketing by distributing cooperatives to countries corner. Location.

The way forward

- Promoting marketing channels as improving the way to selling and buying milk and milk product.
- The genotype of local dairy cow needs improvement and it can be performed by continuous up grading of blood level of cross breeds.
- The quality of milk needed to be accessed on global standard thereby involved in exporting market.
- Strengthening of coordination's of cooperatives and private dairy processing plant to produce good quality milk and milk product to be competitive in global market.
- Applying right research, which could eliminate existing constraint in dairy processing and marketing.
- Improving the technical efficiency of milk production which enable the dairy farmer to produce maximum output under given set of inputs and technology has to be given due consideration.
- Develop dairy sector using modernized technology like biotechnology which enhance applying animal estrus synchronization, embryo transfer and in-vitro fertilization thereby encouraging milk production for increasing demand for developing human population.
- Strengthening of farmer's organization and giving of training contribute for the development of the sector.
- Promote innovative private investment in research and development in the country.

Conflict of Interest

Author declares there was no any conflict of interest exists.

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