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Review on the Challenges and Opportunities of Dairy Value Chain Development in Ethiopia

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Abstract: *Dairying is one of the livestock productions practiced almost all over Ethiopia, involving a vast number of small, medium, or large-sized, subsistence or market-oriented farms. However, the structure and performance of dairy sectors and its products marketing both for domestic consumption and for export is generally perceived poor in Ethiopia due to different challenges. These challenges vary across different production system to another and/or from one location to another. Among other challenges seasonality of production, spoilage (lack of milk collecting facilities), poor animal health and management, inadequate supply of quality feed, low productivity and genetics ,quality problem, weak vertical integration, absence processing plant, inadequate permanent trade routes and other facilities like feeds, water, holding grounds, lack or non-provision of transport, lack of access to land, ineffectiveness and inadequate infrastructural and institutional set-ups, prevalence of diseases, lack of credit and inadequate market information are dominant in Ethiopia. Therefore, market infrastructure facilities, producers cooperative, feed quality and quantity provision system need to be strengthen for effective dairy value chain development.*

I. INTRODUCTION

Ethiopia has one of the largest livestock inventories in Africa and holds large potential for dairy development mainly due to relatively favorable climate for improved high-yielding animal breeds (Abebe *et al.*, 2014). The livestock population census showed that Ethiopia has about 56.71 million cattle population. From the total population 98.66% are local breeds and the remaining are hybrid and exotic breed (CSA, 2015). From livestock sub sector, dairy sector is a development tool because it widens and sustains pathways out of poverty through securing assets of the poor, improving smallholder productivity and increasing market participation by the poor (ILRI, 2007).

The development of the dairy sector in Ethiopia can contribute significantly for poverty alleviation, improved nutrition and household income (Mohamed *et al.*, 2004). However, the dairy sector has not been fully exploited and promoted in Ethiopia; due to lack of modern animal husbandry and management, limited skilled manpower in dairy technology and marketing, inadequate distribution systems and limited health program of dairy cow affect the development of the sector and milk production (CSA, 2007). Generally, dairy value chain development comprises extension, input supply (feed, bull services, and veterinary services) milk production, dairy processing and milk and milk products marketing.

Dairy Value-chain analysis can play a key role in identifying the distribution of benefits of actors in the chain. That is, through the analysis of margins and profits within the chain, one can determine who benefits from participation in the chain and which actors could benefit from increased support or organization. This is particularly important in the context of developing countries (and agriculture in particular), given concerns that the poor in particular are vulnerable to the process of globalization (Kaplinsky and Morris 2001).

Overall, Ethiopia has a complex dairy value chain, with both formal and informal channels. The dairy value chain has a variety of entrepreneurial actors – smallholder and commercial producers, small and large processors, service and inputs providers, farmers' organizations and cooperatives. The dairy sector is growing in Ethiopia and is receiving new investment, although the demand for investment exceeds the supply.

However, Ethiopian dairy value chain faces severe constraints. The average milk production per cow is 1.5 liters per day, well below international benchmarks. Poor animal genetics, insufficient access to proper animal feed and poor management practices all contribute to the low productivity levels (CSA, 2015). Similarly, dairy producers and downstream actors in the value chains face many challenges in getting milk to market. For the most part, milk collection, chilling and transport, is not well organized and there are few economies of scale. Transaction costs are high and up to

20-35% of milk is spoiled or otherwise lost (SNV, 2008). Dairy cooperatives and some private processors seek to provide improved services and scale economies. Many cooperatives are having poor records of service delivery.

Challenges and opportunities for dairy production potential in Ethiopia dairy value chain among the general essence of understanding the status of milk production, marketing and utilization of the area along with the constraints hindering the development of the dairy sector. Therefore, this seminar is done to review the challenges and opportunities of dairy value chain in Ethiopia.

II. REVIEWED LITERATURE

Dairy production in Ethiopia

Ethiopia is reported to be endowed with the largest livestock population in Africa. According to the 2015 report of the Central Statistical Agency (CSA) the cattle population was estimated at about 56.7 million. The indigenous breeds accounted for 98.66 percent, while the hybrids and pure exotic breeds were represented by 1.19 and 0.14 percent, respectively. From the total cattle population, 44.55 percent are males and 55.45 percent females. This indicates the importance of male cattle particularly oxen for draft power. However, in the crop/livestock mixed farming system, oxen work for a maximum of 100 days in a year. This means that for the rest of the year oxen compete for the meager feed resources though unproductive. An appropriate alternative strategy needs therefore to be put in place to reserve the feed for dairy cows that produce not only milk but also replacement stock.

In spite of such a substantial potential, the dairy sector is not developed to the expected level. The milk production system is traditional and dominated by indigenous breeds of low genetic potential for milk production, accounts for about 97 percent of the country's total annual milk production (Felleke, 2003). The low productivity of the country's livestock production system in general and the traditional sector in particular is mainly attributed to shortage of crossbreed dairy cows, lack of capital by dairy producers, inadequate animal feed resources both in terms of quality and quantity, unimproved animal husbandry systems, inefficient and inadequate milk processing materials and methods, low milk production and supply to milk processing centers and poor marketing and market information systems.

III. Dairy production and marketing system in Ethiopia

The dairy sector in Ethiopia has large potential and role in the commercialization of the agriculture sector due to the country's large human and livestock population. The other contributing factors to dairying are the favorable climate for improved dairying, and the relatively disease-free highland environment with potential for animal feeding (Anteneh et al. 2010) and a huge gap between demand and supply of milk (Tegegne et al. 2007). In the commercial dairy sector, improved crossbreed cows contribute to more than half of the dairy output in urban centers like Addis Ababa (Tegegne et al. 2007).

Despite the potential for market-oriented livestock development, smallholder dairy development performance and its contribution to poverty reduction and economic development has remained very low. The poor performance of the dairy sub-sector can also be attributed to socio-economic, infrastructure and technical constraints, inadequate research and extension, and lack of policies relevant to the development of the dairy industry. Land tenure policies, feed availability, lack of adequate dairy services, breeds of cattle used, lack of marketing outlets, roads and transportation have their own contribution (SNV ,2008).

As is common in other African countries (e.g., Kenya and Uganda), dairy products in Ethiopia are channeled to consumers through both formal and informal dairy marketing systems. Until 1991, the formal market of cold chain, pasteurized milk was exclusively dominated by the DDE (dairy development enterprise) which supplied 12% of the total fresh milk in Addis Ababa (Holloway et al., 2000). Even though the proportion of milk channeled through the formal markets is still small, since 1991 the supply of milk and other dairy products from non-state actors (private and cooperatives dairy firms) have increased.

The informal market involves direct delivery of fresh milk by producers to consumer in the immediate neighborhood or sale to itinerant traders or individuals in nearby towns. In the informal market, milk may pass from producers to consumers directly or through two or more market agents. The informal system is characterized by no licensing requirement to operate, low cost of operations, high producer price compared to formal market and no regulation of operations. Hence, the informal (traditional) market has remained dominant in Ethiopia. Production is non market oriented and most of the milk produced is retained for home consumption.

The Ethiopian dairy production and market systems face severe constraints. Constraints to the development of livestock sector in general and dairy in particular includes shortage and fluctuation in quality and quantity of feed, poor breeding program, poor management practices, diseases, poor market infrastructure, poor service delivery, policy and institutional arrangements. The average milk production per cow is 1.35 liters per day, well below international benchmarks (CSA, 2015).

Furthermore, poor genetics, insufficient access to proper animal feed and poor management practices all contribute to the low productivity levels. Similarly, dairy producers and downstream actors in the value chains face many challenges in getting milk and milk products to market. For the most part, milk collection, chilling and transport are not well organized and there are few economies of scale. Dairy cooperatives and some private processors seek to provide improved services and scale economies, although success rates have generally been on a local level only. Cooperatives are characterized as having poor records of service delivery.

IV. Dairy products consumption in Ethiopia

Milk Consumption in Ethiopia shows that most consumers prefer purchasing of raw milk because of its natural flavour (high fat content), availability and lower price. Specific upper income market segments prefer and can afford packaged processed milk. Packaging costs alone may add up to 25% of the cost of processed milk depending on the type of packaging used. Polythene sachets of processed milk are cheaper alternatives.

Ethiopians consume less dairy products than other African countries and far less than the world consumption. The present national average capita consumption of milk is 19kg/year as compared to 27 kg for other African countries and 100kg to the world per capita consumption (FAO, 2003). The recommended per capita milk consumption is 200 liter/year.

Similarly CSA (2005) reported that only 15.4% of the milk produced is sold in the market where as 54.7% milk produced is consumed at home. The remaining, 29.5% of the milk produced, is converted into butter and cottage cheese or ayib using traditional processing technologies. It is to be expected that these proportions would start to change as collection infrastructures improve around the country. On the other hand, they regularly consume other dairy products such as butter, ayib (cottage cheese) and fermented milk.

V. Dairy Value Chain Analysis

Value chain is an innovation that enhances or improves an existing product or introduces new products or new product uses (Fleming, 2005). The major ones include: actors along the chain and their functions and linkages among themselves, governance mechanisms for the chain and roles of actors e.g. power relations and principal drivers of the chain functions, impact of upgrading products, services and processes within the chain and distribution of benefits among actors within the chain (Kaplinsky, 2000; Kaplinsky and Morris, 2001; Rich *et al*., 2008 and Betela, 2015).

The core assumption behind 'pro-poor' value chain interventions is that vulnerable upstream agents (such as smallholder farmers) can be 'pulled' into specific markets, and therefore successfully integrated into economic dynamics to which they were hitherto excluded, or, at best, only participated under very unfavorable conditions. Practitioners aim to accomplish this through: building and enhancing linkages between the 'middle' of the value chain (processors, traders, exporters and farmers' organizations) and the market; strengthening the relationship between the same 'middle' of the value chain and smallholder farmers, and strengthening the supply capacity (ability to produce increased volumes of goods or services with particular attributes) to ensure that these goods and services are produced at a lower cost and in line with market requirements, increasing overall competitiveness (SNV,2012) Likewise, study by Tilahun, et al., (2012) as cited in Betela (2015) reported that dairy value chain development comprises extension, input supply (feed, bull services, and veterinary services) milk production, dairy processing and milk and milk products marketing.

VI. Dairy value addition

Value addition refers to the act of adding value(s) to a product to create form, place, and time utility which increase the customer value offered by a product or service. Income growth, urbanization, and technological advances, along with ever expanding global trade in agriculture, have contributed to a growing global demand for processed products with added values. The emerging trend for processed agricultural products in the global market creates opportunities for smallholder farmers in the developing countries to benefit from such opportunities by linking their activities to value chains through vertical and horizontal linkages (Vermeulen et al., 2008).

Yet, there are ample opportunities for smallholder farmers in the domestic markets for them to supply products with added values. Farmers add values to milk to get products such as butter, cottage cheese, skimmed milk and aguat watery products from cottage cheese making for social factors like holiday and fasting and for customer satisfaction.

Forty one percent of the respondents conducted milk value addition for social factors such as holidays and fasting. About 16% of the respondents carried milk value addition in response to consumer quality preference (Birhanu, 2011).
In addition to serving as mechanisms in generating income, milk value added products are potential avenues to minimize losses and increase milk storage life, a unique opportunity due to strong local demand for such products. The basic patterns of milk value addition such as churning soured milk to make butter, dehydrating butter to make ghee and removing whey to butter to regulate milk fermentation are common practices in Ethiopia.

VII. Important of Dairy Value Chain Analysis

This value chain analysis (VCA) describes the market factors, investments, actors and relationships in the dairy value chain. It discusses the many challenges, in terms of both constraints and opportunities that these actors face, and suggests many potential entry points for market-based activities and business models that could help to expand the value chain and improve its profitability in ways that benefit all of its actors and stakeholders.

A primary purpose of the VCA is to inform the dairy milk value chain strategy, which will contribute to win-win outcomes for all actors and stakeholders. It will also provide a useful source of information and perspective to other actors, stakeholders, planners and practitioners in the dairy sector. There are stakeholders, who are not direct actors/players in the dairy value-chain, but contribute to its development. The stakeholders in question take different forms such as government; development organizations or promoters and input suppliers are necessary and have played very important roles in the development of the dairy subsector. These stakeholders may fall in any of the categories given below and appropriate data collection tools or checklists of information required were prepared.

There are various players (from individuals to institutions) in the dairy sector that play sundry roles at different levels. These include: farm input suppliers, producers of different scales, cooperatives and unions, extension service providers, traders, processors, distributors, industry facilitators, development partners and consumers as end users. However, earlier studies (Lemma *et al*., 2008; Yilma *et al*., 2011), reported that weak linkages among the different actors in the dairy value chain are some of the important factors that contribute to the poor development of Ethiopia's dairy sector.

VIII. Challenges and Opportunities of Dairy Value Chain Development

Challenges

Belachew 1998; Belachew and Jemberu 2003; Yacob as cited in Ayele *et al*. 2003, and Yonad, 2009 identified the following challenges in dairy sector:-

Seasonality of demand: The demand for milk and dairy products is very much affected by seasonal fall of demand among the Orthodox Christians (that comprise about half of Ethiopia's population) during the fasting season and the fasting days. The majority of the Orthodox Christians practice fasting more than 200 days per year, during which time they abstain from consuming animal products. When dairy enterprises process only pasteurized milk with a short shelf-life, this means that processed volumes go down during the time when people (fast) consume less. For example, during the fasting season in 2012, the Ada'a Dairy Cooperative decided to receive only 75% of milk produced by its members. The price per litre of milk also dropped by ETB 1.00 which was later adjusted to the previous price. The cooperative also dumped about 10,000 litres of fluid milk due to storage problem (Alemayehu, N., Hoekstra, D. and Tegegne, A. 2012).

***Animal health problem*:** Poor animal health and management are major constraints of dairy development in Ethiopia which cause poor performance across all dairy production systems. Many of these problems result from the interaction among constraints themselves e.g. poorly fed animals develop low disease resistance, fertility problem, partly because the animal health care system relies heavily on veterinary measure. Poor grazing management systems continue to cause high mortality and morbidity (e.g., internal parasites).

***Feed and nutrition*:** Inadequate supply of quality feed is the major factors limiting dairy productivity in Ethiopia. Improved feeding is crucial to provide satisfactory environment for animal growth and feed supplements stimulate higher milk productivity. Feed, usually based on fodder and grass, are either not available in sufficient quantities due to fluctuating weather conditions or when available are of poor nutritional quality. These constraints result in low milk yields, high mortality of young stock, longer parturition intervals, and low animal weights.

Low productivity and genetics: The productivity of indigenous stock is a major constraint in dairy development. In the indigenous herds genetic potential for milk production is low. However, there is still a potential for increased production through improved management; selection of the best animals; improved reproduction; etc. Similarly, the

potential for production of marketable milk is not fully exploited in the indigenous herd. The selection of efficient breeds specifically adapted to respond to those elements in the environment that are subject to man's control is the necessary step to improve the dairy sector.

Quality problem: Adulteration is the major problem in processing and marketing. Milk adulteration is usually done by farmers and brokers. Both hygienic and nutritional aspects are important in milk quality. It is important to identify where adulteration in particular occur in the marketing chain: - farmer level, middlemen, distribution.

Collection problems: Delays in collecting milk from the farmers to the processing plants and in delivering from the processors to the distributors contribute to high incidences of spoilage. Poor customer care coupled with unreliable and unhygienic processing methods contributed to poor product quality which in turn suggests the need to strengthen management and investment in udder hygiene and cold chain technologies. The use substandard milk collecting utensils and buckets for up lifting the milk from the supply centers, where many smallholders are doing their sells, may result in poor milk quality. Similarly, non-existence of chilling and cooling center at potential milk producing and supply area also cause a deterioration of milk quality.

Institutional concern: Development of dairy co-operatives is too slow and they are too weak. Due to problems with the leadership and competence in cooperatives a lot of a dairy cooperative do not concentrate on dairy and divert the limited resources into other activities.

Lack of technical support: Milk suppliers need to have technical support on the process of production including feeding and nutrition, breeding, sanitation and milk hygiene, human and animal health, marketing and handling and transportation of milk towards collection centers. Through appropriate technical support and capacity improvement, the core problem of milk value chain (shortage of raw milk supply, access to reach the raw milk, and method and means of milk collection) could be tackled.

Lack of infrastructures: Infrastructures, especially access roads that reach the rural community has limited the supply of marketable milk to collection centres. Even if farmers have the capacity to produce more milk than they are doing today, they are not encouraged to make effort on milk production they cannot sell. On top of inconvenient infrastructures the milk collection centers are not at the level of what they should be and needs special attention at different sites.

Lack of access to land**:** perhaps the greatest institutional and socio-economic constraint that the dairy industry faces today arises out of socio-economic rather than technical problems; i.e. the lack of access to land for expansion of the dairy enterprises and feed production. The problem of inadequate feed is a result of the limited land availability for pasture establishment especially on productive highland areas where dairy cattle can flourish and where the density of the population is high.

Lack of credit: Capital requirements for smallholder dairy producers are high and may be especially constraining for women farmers. Institutional credit schemes need to be long-term. If, for example, a pregnant three-year-old cow is the starting stock for the family dairy, credit terms should be for at least three years. Loans are ideally accompanied by an insurance system to mitigate animal loss risks.

Inadequate extension and training services**:** Effective and adequate extension services, advice on animal nutrition and feeding management, reproduction, hygiene, extension works to transfer new technologies, training in milk handling and marketing, farm management and dairy production efficiency are not always available to the dairy farmer. There is no extension to supply information about technologies to improve production and marketing to estimate certain development. A shift towards a developed dairy industry requires more support from advisory services and more effective links with research services.

Moreover, the structure and performance of livestock and its products including dairy products marketing both for domestic consumption and for export is generally perceived poor in Ethiopia (Ayele et al. 2003 and Betela, 2015) due to: (1) underdeveloped and lack of market-oriented production, (2) lack of adequate information on livestock resources, (3) inadequate permanent trade routes, (3) facilities like feeds, water, holding land, (4) lack or non-provision of transport, (5) ineffectiveness and inadequate infrastructural and institutional set-ups, and (6)Prevalence of diseases, illegal trade and inadequate market.

IX. Opportunities

The large livestock population, the favorable climate for improved, high yielding animal breeds and the relatively disease-free environment for livestock make Ethiopia to have a significant potential for dairy development. Considering the important prospective for smallholder income generation and employment opportunities from the high value dairy products, the development of the dairy sector can contribute immensely to poverty alleviation and improved nutrition in the country. With the present trend characterized by transition towards a market-oriented economy, the dairy sector appears to be moving towards a takeoff stage. Liberalized markets, involvement of the private sector and promotion of smallholder dairy are the main features of this stage (Ahmed *et al.*, 2004).

Dairy is a development tool because it widens and sustains three major pathways out of poverty: (1) securing assets of the poor, (2) improving smallholder productivity and (3) increasing market participation by the poor" (MoA, 2013). The dairy industry is essential for rural Ethiopia and it is potentially the largest rural employer in the Ethiopian highlands and pastoral/ agro-pastoral areas. With continued urbanization, growing population size, demand for milk by the children and younger generation, it is expected that the dairy industry will become a major player in agricultural development and has further potential to contribute significantly towards increased income and employment.

According to report of (SNV, 2008; Betela *et al.*, 2015; the following are opportunities of value chain Ethiopia dairy sectors at different level:-

At the production level include equipment supply and leasing, farm input supplies via organized check-off systems for groups of large farmers, milk testing and recording services, transport services and private extension services.

At the farm level, investment potential lies in medium and large dairy farming but also there is potential in food processing and provision of advisory services including breeding technologies. There is opportunities to invest in dairy feed processing and feed technologies.

Within the processing and packaging component, emerging opportunities include investment in modern processing equipment, supply of processing inputs and packaging, equipment supply and leasing and marketing support services.

A number of existing small and medium scale dairy processors have limited capacity in terms of financial capital, equipment, technology and/or expertise. Some of such firms are interested in joint venture with other private investors local or foreigner to expand their operations. Similarly, some of the existing companies are also seeking for equity participation from foreign companies and individuals while others are considering outright purchase.

With the relative fast growth registered in the dairy industry, there is a need to establish firms that provide dairy industry and related support services. Such services include artificial insemination; farm input supplies and market information, establishment of collection centers and distribution facilities, dairy breeding and farming.

Post-harvest milk loose are high, especially during the peak seasons, when production level is high. This is due to limited access to milk collection centers. So far only the Sebeta Agro-industry and the LAME Dairy (formerly known as DDE) have limited number of milk collection centers. The other private and cooperative firms lack collection centers and facilities. In addition, substantial amounts of milk are spoiled in transit. This is due to the substandard containers and mode of transport used to collect and transport milk from up to 100km distance which lead to delays and high temperature build up in the milk. Thus, investment opportunities exist in establishing more and better managed milk collection centre as well as reliable milk distribution facilities including transport facilities and cold chains.

Establishment of dairy breeding farms is another investment opportunity that is not yet fully exploited. Ethiopia has adequate land for dairy farming and the climatic conditions are favorable for this venture. A well-established dairy farm would produce milk and also breed in-calf heifers for sale. With the growth registered in the dairy industry, the demand for in-calf heifers is expected to increase. On the domestic market, the cost of an in-calf heifer ranges between Birr 7000 and Birr 12000. Currently most of the heifers on sale are cross breeds type reproduced with in the country. Most of them do not have records of pedigree and production. They are sold for their color (black and white) rather than level of performance.

X. CONCLUSION AND RECOMMENDATION

While analyzing dairy value chain as source of employment and a business opportunity for poverty alleviation, it should be understood in the context of the contribution of dairy production to livelihoods and income generation for smallholder farmers through the production of higher-value products compared to most crops. In this way, this sector is considered as feasible place to dairy farming, but unfortunately people in the sector have to face financial difficulties. And also they don't have the educational background to plan the dairy farming in the large scale; further co-op society has not enough technological facilities to preserve the pure milk. And also they don't have the value added strategies

like milk toffee, ice cream, yoghurt in the large scale. Due to that government and non-government organizations should focus their activities toward dairy farming. More over different researcher in the previous section reported many challenges that hinder the development of dairy value chain in Ethiopia, the following conclusion are given based on the reviewed literature:-

Marketing: Reducing the cost of marketing of fluid milk produced in peri-urban areas is an essential element for economically viable dairy production system. To help potential dairy farmers, collectors (cooperatives/private companies) could offer incentives (e.g. subsidized transport cost, reduced membership requirements) to stimulate dairy value chain development. Milk quality is another factor which needs to be addressed on-farm as well as at collection centers. Once sufficient scale has been achieved, establishing chilling facilities could be considered.

Demand: Fluctuation in the demand of milk and other dairy products is in line with the various fasting periods observed by Orthodox Christians. Milk is traditionally considered in many parts of Ethiopia to be a food item that is essential only for children and convalescent persons. Its nutritional benefits for normal adults tend to be overlooked.

Seasonality in demand for milk as a result of fasting still results in drop in milk price and is a disincentive for producers. During the fasting season the demand for fluid milk sharply drops and wastage is common.

Processing: The common solution for such seasonal drop in demand is to process fluid milk into butter and cheese. Processing of milk to add value to the raw product for the benefit of the members; the performance of the cooperatives is weak compared to other countries dairy processors improve the value chain performance of dairy sector in Ethiopia. Business oriented management is required to make the cooperatives efficient, effective and competitive. Improvement in this area is required to avert the potential danger of collapse of the system.

Feed: One of the limitations in the case of feed processors and producers is that there is no reliable quality and nutritional composition of the feeds. Regulatory action is also weak. Dairy ration should be formulated based on age, milk production, physiological stage, climate, and genetic blood level of the animals. However, in the current practice every producer, processor and feed retailer uses his own experience to formulate ration. This requires the attention of the public sector to regulate and monitor the quality of animal feeds.

Improving animal genetic resources: The supply of improved dairy animals can be through creating linkages between suppliers and potential dairy farmers. Keeping proper and up-to-date records is the basis for genetic improvement of dairy animals. Most of the smallholder dairy farmers do not keep farm records. This will contribute for inbreeding problems and reduced performance of animals.
There is an increase in milk demand and to some extent consumption; possibilities/capacities for improvement are available (*Natural and genetic resources),* new product development to increase customer selection (lifestyle products, pro-biotic yogurt, cottage cheese), there is political stability and conducive investment climate, government policy reforms, market orientation that are favorable for dairy investment, the cost of production for livestock products is generally low in the country, low cost of labor and production cost are among the opportunities that creates positive future for dairy value chain development.

Expanding market infrastructure facilities strengthen cooperatives and providing support to enhance their processing capacities, improving feed provision system and seed quality need to be done regularly. Likewise, a careful planning is required for the generation of appropriate and demand driven technologies in order to attain sustainable dairy value chain development from dairy sector.

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