

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Animal Agriculture is the main stay of the rural economy (AFSP, 2013). Livestock contribution is notable in the rural economy, and food security for the rural development in Nepal. Dairy sub-sector, among livestock commodity, is one of the key contributing sectors in Nepalese agricultural economy (Poudel, 2014). It shares around one third of the Agricultural Gross Domestic Product (AGDP) and contributes almost two third (63%) in the livestock GDP in Nepal. At household level, it contributes to maintain food and nutritional security and generates rural employment and ensures flow of money from urban to rural areas. In Nepal, more than 100,000 farm households are involved in dairy business and more than 1750 primary milk producers' cooperatives (MPCs) are engaged in delivering milk from rural to urban areas in Nepal (Shrestha, 2013).

Cattle and buffaloes are the major dairy species for milk production in the country. Naks, to some extent in the high mountain region, are also producing the milk. The estimated population of cattle and buffaloes are 7.274 million and 5.241 million respectively (MoAD, 2012). Despite larger cattle population, the buffalo contributes around 71% of the annual milk production and only rest 26% by cattle (MoAD, 2012). This is mainly due to extremely low productivity of non-descript indigenous cattle as compared to that of buffaloes (Shrestha, 2013). The population of yak and *chauries* has been reported to be declining rapidly due to various inherent and external constraints. Buffaloes are also being kept for meat purpose. The dairy sector is gradually emerging as commercial/ semi commercial enterprise particularly in the peri urban and rural area areas of the country (Poudel, 2013) and has a great future prospect to develop as a high value commercial product in the rural and peri urban area of Nepal (Shrestha, 2013).

Many issues and problems have been emerging with the existing milk marketing system from in the rural farming. The policy makers and farmers have the key challenge of how to address those issues of dairy value chain marketing and problems

so that milk marketing system, at least in the mid hills districts (Gorkha, Tanahun, Chitwan and Kashki) can be improved. Some key questions/issues on dairy marketing from the rural to urban area are as follow;

Over the ten years, the milk production has been increase but (1) milk quality has not been improved (2) the milk marketing is still traditional and (3) cool chain is not maintained to improve on the keeping quality of the milk. How can be the milk quality and the marketing in the rural area can be improved by improving the management in milk value chain to enhance on the rural farming economy through the rural development activities related to the dairy farming?

What are the constraints appeared in milk value chain? i.e. (1) milk production: buffalo breeds and farming systems (considering the inputs such as fodder seed/saplings, feeds and vet drug through agro vets, banking facilities, insurance, good agricultural practices (GAP) and healthy milking practices), (2) milk collection and milk transport (informal and formal), (3) milk Chilling/bulking (collectors: cooperatives, milk processing industries), (4) milk processing and transport (GMP: Good Manufacturing Practices) and distribution i.e. traders , (5) milk consumers in both village and cities and how dairy farming can be useful for rural development particularly in the Gandaki river basin.

1.2 Statement of the Problem

The latest milk production data of Nepal shows that 1,388,730 mt of milk with cow milk 400,950 mt (28.87 per cent) and buffalo milk 987,780 mt (71.13 per cent) has been produced in 2007/084. Of this volume, only about 10 per cent of milk (138,873 mt) is estimated of being used by the formal sector dairies Milk production is the regular activity in the rural area of the Nepal. This is the means to carry the money from the urban to the rural area of Nepal. It creates self employment in the farm family and employment to the milk sellers both in the rural and urban area. Production of 100 liters milk in the rural area can creates one full time employment in the country. Production of milk contributes (1) income (2) nutritious food particularly for vulnerable groups of people such as children less than 2 years, pregnant women, and the elderly and helps in the rural food security. Livestock production in these areas supports an estimated 10% of population and covers 50-60% of the total area.

But the potential of this type of commodity has not been fully explored for the improvement in the country in the line to rural development of the pastoralists.

The exact figure of the Gandaki river basin is yet to exploit, however roughly estimated data says only around 20% enters to the chain. Hygienic milk production/ lack of stringent measure on quality control / lack of awareness, scattered production and difficult geography- increased cost in collection and transportation, poor infrastructure for milk collection, chilling and transport. Poor infrastructure and information networking, Inadequate quality feeding resources for dairy animals, Serious depletion of animal feeding base due to deterioration in the forest areas for fuel wood and timber, and additional land for settlement and cultivation, Inadequate government support services due to lack of resources as many of the district and sub-district level (livestock service centres) face shortage of manpower as well as necessary equipments and veterinary medicines, inadequate and inappropriate breeding support services as there is shortage of improved breeding bulls as well as artificial insemination services, weak farm advisory services and training as there remains a big gap between the specialized and expanded farmers' are the most reoccurring problems in these sectors. Therefore the after mentioned project work has been designed to overcome these different types of problems observed in milk value chain existed, hence increasing the quality of milk and production as well. This research is supposed to answer the queries like "What is the existing situation of dairy production status and livestock production status in the country? ", Who are the the partners involved in the milk value chain and their role to improve the milk business?", What is the status of existing milk value chain and their operation?" and What are the strength, weakness and potentials of steps in milk value chain?" etc.

1.3 Objectives of the Study

The main objective of this study is to assess the existing milk value chain in rural dairy farming in the study area of Gandaki river basin in the milk production and marketing.

The specific objectives

1. To analyze the existing situation of dairy production status and livestock production status in the country and study area as well.
2. To identify the partners involved in the milk value chain and their role to improve on the milk business.
3. To assess the existing milk value chain and their operation.
4. To identify the strength, weakness and potentials of steps in milk value chain.

1.4 Significance of the Study

Milk production is the main daily regular activity in the rural area of the Nepal. This is the means to carry the money from the urban area to the rural area of Nepal. It creates self employment in the farm family and employment to the milk sellers both in the rural and urban area. Production of 100 liters milk in the rural area can creates one full time employment in the country (Singh, 2010). Production of milk contributes (1) income (2) nutritious food particularly for vulnerable groups of people such as children less than 2 years, pregnant women, and the elderly and helps in the rural food security. But the potential of this type of commodity has not been fully explored for the improvement in the country in the line to rural development.

Despite of the importance of the milk chain in the contribution of rural economy, the existing situation of the milk value chain in the line to rural development has not been studied and the propose study can help to evaluate the situation mainly in the milk shed area in the mid hills of Nepal. Therefore the proposed study is important to find out the problem related to milk value chain to improve the livelihood of the rural communities in the hills of Nepal.

1.5 Scope and Limitation of the Study

The rural area in the mid hills of Nepal is still under developed. The dairy farming is one of the tools among several others in rural development through improving the nutritional status and creating the jobs. But the limitations to block the opportunities are still not well documented in the country and therefore there is potential scope of

this type of study. The limitation of this study is that the study is only for one season and is short period of time.

1.6 Organization of the Study

The thesis has been divided into five chapters. The first chapter is introductory whereas the second chapter includes the literature review where different related literatures have been elaborated in nutshell. The third chapter is about research methodology where descriptions on sampling, population, site selection and time framework of the research process have been included.

The Fourth chapter includes the data presentation and analysis. This chapter includes both the qualitative and quantitative form of data presentations. Both tables and graphs have been used.

The data have been presented in the form of graphs. Household surveys, distance from milk chilling centers, total number of livestock heads in the study area etc. have been presented.

The last fifth chapter comprises of summary, conclusions and recommendations.

CHAPTER - TWO

LITERATURE REVIEW

The research entitled on Milk Value Chain analysis in the different areas of the Gandaki river Basins is the pioneer study in such topic in the area. Some researchers have been done regarding the value chain study on vegetables and meat etc. Therefore such researches on value chain analysis on other countries were cited. Different books, literatures, thesis, article, websites, papers etc were cited. The information on different topics were gathered from CBS, Nepal, Annual booklet of DLSO's of different districts and household surveys as well. Here's the description on literature review under few headings and subheadings. The literature made has been tried to comply with the objectives of the project as well.

2.1 Existing scenario on Dairy Sector Study of Nepal and the Study Area

The latest milk production data of Nepal shows that 1,388,730 mt of milk with cow milk 400,950 mt (28.87 per cent) and buffalo milk 987,780 mt (71.13 per cent) has been produced in 2007/084. Of this volume, only about 10 per cent of milk (138,873 mt) is estimated of being used by the formal sector dairies. (APP, 2014)

2.1.1 Historical Background on Dairy Development

Organized dairy development activities in Nepal began in 1952 with the establishment of a Yak cheese factory in Langtang of Rasuwa district under Food and Agriculture Organization (FAO) assistance in 1953. In 1954, a Dairy Development Section was established under the Department of Agriculture (DoA) and also a small-scale milk processing plant was started in Tusal, a village of Kavre district. In 1955, a Dairy Development Commission was formed. (Statistical Information on Nepalese Agriculture MoAC, Kathmandu. (Statistical Information on Nepalese Agriculture MoAC, Kathmandu).

The First Five Year Plan (1956-61) stressed on the need to develop a modern dairy industry. Accordingly, in 1956, a Central Dairy Plant, with an average milk processing capacity of 500 liters/hr was established in Lainchaur, with the financial

assistance from New Zealand and technical assistance from FAO. Around the same time, a second mini milk processing plant was established at Kharipati, in Bhaktapur district. The plant started processing of milk and marketing activities from 1958. In the process, prior to 1960, two additional cheese factories were established under the DoA in other two alpine districts of the country. In 1960, a Cheese Production and Supply Scheme were also established. The Dairy Development Commission was converted to the Dairy Development Board in 1962. So as to meet the growing demand for milk in Kathmandu, the Board was converted to Dairy Development Corporation (DDC) in 1969.

2.1.2 Dairy Cooperatives

History of dairy cooperatives dates back to the First Five Year Plan (1956-61) when the dairy cooperatives were formed in Tusal Village of Kavre district. However, the dairy cooperatives were became more effective only after December 1981, when DDC initiated the milk producers oriented program by encouraging the farmers to form their own Milk Producers' Associations (MPAs) along the lines of cooperative principles. The MPAs operated under the by-laws prepared by DDC. The MPAs had no formal legal status and they operated as single purpose primary cooperatives with milk trade and support to milk production as their main activities.

In order to enable the MPAs with the formal legal identity and to make them more autonomous, DDC took initiation to convert these MPAs into Milk Producers' Cooperative Society (MPCS) in February 1989. For this, it encouraged and facilitated to register these MPAs in the Cooperative Office of Government of Nepal (GoN). According to the available information, presently about 1,603 MPCSs are registered in 53 districts of the country (Annex 1). The Cooperative Act, 1992 of the government governs these MPCS.

Like the MPAs, majority of MPCSs also operates as single purpose primary cooperatives. The main function of these MPCSs is to collect milk from the farmers (both the members as well as non-members), test it for quality, transport it for selling to the nearest milk chilling centers/milk processing plants of DDC and/or private dairies; receive payment for the milk from them; and distribute the payment to the individual milk supplier farmers. Apart from milk collection business some of the

MPCSs have also started the operation of milk chilling vats; and milk processing for producing various dairy products.

The dairy cooperatives in Nepal have adopted a three - tier system of which the MPCSs are the first-tier primary level cooperatives. In the second tier, MPCSs in different districts have formed district level District Milk Producers' Cooperative Unions (DMPCUs), which are registered under Cooperative Act as district level bodies. Presently, there are 36 DMPCUs in different districts (mainly in terai and mid-hills) and their main objectives are to deliver programs designed to support the increased production and processing of milk and milk products and to contribute to the financial and social upliftment of the rural milk producers.

In the third tier, the MPCSs and DMPCUs have formed Central Dairy Cooperative Association Limited Nepal (CDCAN). CDCAN is registered as their central-level cooperative organization. Established in 1993, CDCAN is a national level tertiary organization of all the milk producers' cooperatives at primary and secondary levels. CDCAN aims to bring increased economic benefits to milk producers and to contribute to make the country self-reliant in clean and high-quality milk and related products. It also implements policy advocacy activities at the central level to represent the interest of member organizations. Currently, 36 DMPCUs and 1,329 MPCS are affiliated to CDCAN.

2.1.3 Consumption and Supply of Milk and Milk Products

In earlier days when there were no organized dairies, demand for milk was fulfilled by raising cows/buffaloes by the people themselves or through the direct supply from the professional milk producers. These producers used to go house by house and deliver the required quantity of milk to the households. Dahi (yoghurt) filled in clay containers were produced by some traditional dahi makers and milk-based sweets were prepared by traditional sweet makers (haluwain). But after the advent of DDC, the scenario began to gradually change with the increasing supply of pasteurized milk and modern dairy products such as cheese, butter, ice cream etc. Many new sweet shops also started to emerge. Now, particularly in the urban areas, the situation has completely changed because many dairies in the organized sector have come up with

varieties of dairy products. Besides, different dairy products are also imported to cater the consumers' demand.

Although an effort was made to estimate the annual consumption of milk and milk products through internal supply and imports, it could not be done in the absence of data. Data of the private dairies and informal milk market is absent for internal supply. For imports, the Customs data gives only the aggregated monetary value of the imported dairy products (Annex 5). The Nepal Living Standard Survey, Statistical Report Vol. II (2003/04) has a Chapter on Consumption which shows only the amount spent for food consumption. It reports that on average 59 per cent of household consumption is spent on food expenditures in the country, and urban households spend less than 40 per cent on food, especially in Kathmandu where the share is just 29 per cent. Similarly, Household Budget Survey of Nepal (2008) conducted by Nepal Rastra Bank shows combined consumption expenditure on milk products and egg, and ghee and oil. Thus, both the reports do not give separate data on consumption quantity of milk and milk products. Import data published by Trade and Export Promotion Center (which is also based on the Customs data) shows that total milk products worth of NRs. 497.103 million was imported in 2007/08 (Central Bureau of Statistics, 2004))

The National Milk Marketing and Strategy Study (2001) has projected the demand for liquid processed milk for up to 2010 on the basis of growth trend of processed fluid milk demand from formal sector (sale by DDC and private dairies), population growth and income elasticity. The Study assumed three annual growth rate scenarios of 8.1 per cent, 11.1 per cent and 14.1 per cent as low, medium and high range, respectively. Similarly, the same Study has also projected an annual growth rate of 10 per cent for milk products. Mr. Surya Bahadur Singh, Deputy Coordinator of CLDP in his recent literature entitled Lessons Learned from Nepal Community Livestock Development Project has also stated "the demand for milk and milk products is expected to grow by about 11 percent per annum" (Central Bureau of Statistics, 2004).

Although demand for milk and milk products could have been projected based on this information, it is not done so since the above mentioned demand projections of milk and milk products are made by a study carried out almost a decade ago as well as personal estimation without supporting data. The projection could be unconvincing

and it would be inappropriate to base any future actions based on such projection. A detail national study about milk and milk product marketing is felt essential to assess the current consumption, demand for and supply of milk and milk products (Nepal Agriculture Strategy study, Volume I Main Report and Recommendations and Volume II Detail Sector Review and Analysis, Kathmandu).

2.1.4 Supply of Liquid Milk

Processed liquid milk is the prominent product of the dairy industry as almost 80 per cent of milk collection in the formal sector is used to produce processed milk. It is very difficult to know the supply of private dairies mainly because of the absence of data collection and reporting system. As such, the estimate of private dairies' supply is based on the available literature as well as proportion of private dairies' milk via DDC milk sold by the milk selling booths in the major markets.

2.1.5 Consumption and Supply of Milk Products

Various brands of the locally produced as well as imported modern and traditional milk products of varying categories are sold in the urban markets of Nepal. Kathmandu valley is the main market of the milk products. The major milk products available in the markets are imported Skim Milk Powder (SMP), Full Cream Milk or Whole Milk Powder (WMP), infant milk formula, dairy whitener, cheese, butter, sweetened condensed milk, ice cream and ghee; and locally produced cheese, butter, ghee, ice cream, paneer and yoghurt. Milk products from more than 20 countries from Asia, Europe, Australia and North America compete in the Nepalese market. Different varieties with various sizes and from ordinary to advanced packaging are available for most of the products (Dairy: World Markets and Trade (December 2007) World Bank, Doing Business, Kenya (2007) standard survey).

Milk products being available in the local urban markets indicate that there is ample demand for the modern as well as traditional dairy products. The demand for dairy products in the urban markets is expected to grow in the future mainly due to the increasing population and rise in income. Additionally, exposures to outer world mainly through the TV have particularly attracted the educated younger generation to consume the modern dairy products. Moreover, their demand is also expected to rise due to the increasing establishment of hotels and restaurants. Some years ago many

people even in the urban areas did not hear the name of Pizza. But now it has become a popular food item among the younger generation resulting in high demand for mozzarella cheese. Similar is the case with ice cream and paneer. It is very difficult to assess the response of local production as well as imports to this demand. This is mainly due to the absence of supply data of the private sector dairies. Moreover, there is also absence of data regarding the quantity of imported dairy products. However, indications are that almost all demand for SMP, WMP, baby food, dairy whitener and condensed milk is met by imported products; demand for cheese, butter, ice-cream and ghee is fulfilled by both the local production as well as imported products; and almost all demand for paneer and yoghurt is fulfilled by local production. Although DDC also produces SMP, it is used by DDC itself during the lean season when milk collection is low (Adaptation of Planted Forages by Smallholder Milk Producers IMF, World Economic and Financial Surveys, April 2008).

The dairy value chain is complex. Technically the milk chain start at raw milk production and ends when other processors, institution, and consumers utilized that were created in the value chain (Nigerian dairy, 2011).

2.1.6 Assessment of the Contribution of Dairy Development towards Food Security in the GRB's

The International Fund for Agricultural Development concisely defines household food security as “the capacity of a household to procure a stable and sustainable basket of adequate food.” The World Food Summit in 1996 has defined food security as “the situation when all people at all times have access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.” Since then several definitions have been put forward by different organizations but common to most definitions of food security are the elements of availability, access, stability, and utilization. In Nepal, majority of the population resides in the GRB's areas with about 65 per cent still dependent on agriculture for their livelihood. However, the current status of the crop productivity of large sectors of the rural population is exceedingly poor. Agriculture being subsistent in nature, crop yield is low and family labor is not fully employed. (Nepal Agriculture Perspective Plan, Final Report Main Document, Kathmandu. Central Bureau of Statistics, 2004) No major improvement in crop productivity has been achieved

though it has been in priority in all-national budget due to constraints in infrastructural support and capacities to make appropriate investment. In addition, the distribution of land is such that the number of small and/or marginal farmers and landless dominate the scene and the resources of this class of people are very meager and much of the household is heavily indebted. At this backdrop, the dairy sector has been playing a major role in order to ensure social justice amongst the GRB's farmers by providing off farm opportunities for increased employment and income generation. Dairy sector is directly contributing food security to the large number of population as part of their milk production is consumed within the farm households in the form of milk and milk products which encompass both elements of availability and access to food. The dairy sector is also contributing to the stability of food security of GRB's households because dairy animals form an integral part of crop- livestock integrated form of agriculture systems, in which they provide a steady stream of food and revenues for households, they can be used as collateral for credit, sold for emergency cash needs arising due to an injury or illness of productive family members, they also provide draught power, fertilizer and pest control, contributing to total farm productivity and hence to food security. The final element of utilization is materialized through production and consumption of milk-based foods which is a common practice in the farm households (Household Budget Survey Nepal, 2009).

Apart from the above direct contribution to food security, the dairy sector has been the major source of income generation contributing indirectly to food security in the rural areas. According to the available information, in fiscal year 2008/09 there were about 40,000 farmers of the GRB's areas directly involved in supplying milk to DDC and they were paid about NRs. 1,296 million (around 57 percent of the total DDC expenditure) for their milk. In this manner, the DDC has paid about NRs. 3.55 million per day on average to the rural areas of the GRB's. Although the exact figures about the farmers involved in supplying milk to the private sector dairies as well as the amount paid by these dairies is not available, based on their share in milk collection, it is estimated that about NRs. 3,00 million is paid to the farmers by them to the rural milk producers in the same fiscal year. (TechnoServe, 2005).

Accordingly, the dairy development activities have been one of the major means to regularly channeling a large amount of urban money to the rural areas of GRB's

significantly contributing to total farm productivity and hence to food security and improve the living standards of the rural poor. (National Milk Marketing and Strategy Study, 2008)

Three districts namely; Chitwan, Tanhu and Gorkha comes under Gandaki River Basin (GRB) . These districts are representative of the terai, hill and high hills of Nepal in terms of climate, household and communities (FFIL CR ALSCC: INPB Nepal 2012). Study sites own the rural inhabitant. Study sites would represent smallholder farmers all across geographic regions of Nepal and elsewhere (Joshi, 2012). Dairy plays important role in this region as a source of income to the farming families for livelihood and food security in the rural area. Example: Buffaloes alone contribute about 84% of the milk production in the GRB and 29% of the total milk in the country. Buffalo is also the main source of meat in the region by providing 41,382 Mt (69%) of the meat and 25% of the total buffalo meat in the country. This signifies the importance of buffaloes in the rural area of GRB. Improvement in cattle and buffalo farming can play an important role in reducing rural poverty and food security and hence important in rural development. The GRB region is rich in animal resources as it owns ~20% of cattle population and ~30% of buffalo population of the country (MoAD, 2012) which are the main source of milk to support rural communities in the rural area of GRB. This situation justifies the development in milk production is the tools of rural development in GRP and in other similar context of the country.

Table 2.1: Ruminant population of Gandaki River Basin (MOAC 2010)

Species	Gandaki River Basin
Cattle	1,445, 717
Buffalo	1,453,577
Goat	2,012,376
Sheep	174,383

Source: MOAC, 2010.

The National Adaptation Program of Action (NAPA, 2011) to climate change has prioritized improvement of housing, nutrition (based on local feed and forage resource) and disease and parasite management to reduce vulnerability to climate

change for food security (TWG, 2010). It is predictable that Nepal's food security situation would be adversely impacted further with climate change that impacts negatively in rural development in GRB. Livestock has the potential to support the adaptation effort of the poor in the rural area of Nepal. In general, livestock is more resistant to climate change than crops because of its mobility and access to feed. However, it is important to consider that the capacity of local communities in the rural area to adapt to climate change to support livestock rearing will also depend on their socio-economic and environmental conditions, and on the resources they have available. Therefore it is important to timely consider climate change and consequences focusing to the livestock in the context of rural development.

Demand for dairy products in Nepal has been growing over the last decade and has doubled since 1995 and, after more than half a century of declining real prices for dairy products, there are strong signs of a structural change in the dairy sector of Nepal that could make it attractive for investment. This offers livelihood and rural development opportunities for smallholder dairy producers in Nepal who are currently supplying more than three-quarters of domestic consumption needs in the country projected to be one of the fastest growing agriculture sector over the next decade.

There are many successful business models through which smallholder milk producers in GRB's have gained sustainable access to markets. However, to date, many of the insights on supporting inclusion of smallholder dairy producers are neither sustainable nor scalable(Muruiki *et.al* ,2001) .The government objective in fostering smallholder dairy development in Nepal is not only in consideration of livelihood opportunities for small farmers but in recognition that investment in dairy has important spin-offs for rural development and food security. It is estimated that one additional job is created in milk value chain for each 10-15 litres of milk marketed per day. On the consumption side, the nutritional benefits of increasing the productivity of milk animals by just 20 percent could provide a daily glass of milk for every Nepali child (Samartha 2013). Increasing production of 100 liter of milk and fit in milk value chain can create 1 full time job to the rural youth (Singh, 2010) in the study area. The exact Figure is not available, but it is estimated that less than 10% of the total production of milk reaches the market. Steps in milk value chain are shown in Figure 1(SAMARTHA. 2010).

Figure 2.1: Milk value chain the hills of Nepal



Source: Questionnaire Survey, 2071.

Milk production in the rural area of the GRB's is the main occupation since more than century. Analysis done by NDDB during 2012 has indicated the strength of dairy in rural development, its weakness, opportunity and threats. This study has indicated the money flow from the urban area to rural area to support the food security and consequently help in rural development of GRB's.

2.1.6.1 Well established milk transport and payment system

Particularly in market channel three there is a well established milk transport and transaction system. This system is highly depend and built up on trust. The trust has no any written agreement. Milk is put on truck in the case of, in bus in the case of -the driver is responsible to take the milk safely and give to the agent /client/traders in as per the mark on the container and the instruction on who should collect and when the cars get back the traders/agents give instruction on who the payments are made in the same way. It was learnt that in some occasions this system was harmed and the consequences was affected the pastoralists but it has remained largely consistent and is a driving force in transaction. Not-withstanding this, the system has to be strengthened with the introduction modern systems like transaction through mobile phone, safe money transfer and money transfer through small scale financial institution (Alexander, D.Y., 2004).

2.1.6.2 Increased demand for milk and milk products in urban centers

It is apparent that as of other agricultural products the price for milk and milk products in urban centers are increased if not doubled. Given the existing asphalt road infrastructure the milk can easily transported to different urban centers like Pokhara, Damauli, Narayangardh and other urban centers through private companies or through organized pastoral communities after a value is added to increase its shelf life. In this case it would be helpful to capture the untapped demand.

2.2 Identification of key intermediates in the dairy value system

As per objectives, some intermediates existed in the milk value chain existed in the study areas were identified Descriptions on these are mentioned as the followings.

2.2.1 The Key Actors and their Functions

The key actors in the formal dairy value system include milk producer farmers, MPCSSs, MCCs, and milk processing plants/cheese factories. Firstly, there are rural farmers and their function is to be engaged in milk production. The next are MPCSSs established in the rural areas. Farmers from the surrounding villages carry their milk production to the nearest MPCSS where their milk is received, measured, recorded and samples are taken for quality check [mostly fat and solid-not-fat (SNF) test]. After receiving milk from all farmers, it is then transported by available means (vehicles, porters, carts, rickshaws, bi-cycles, horses) to the nearest MCC or cheese production center (in case of cow milk cheese). Some of the MPCSSs have their own chilling system where they chill the milk, deliver it to the DDC and/or private MCCs or sell in the local market (Amirsalehy, and Nili, H, Mohammadi, , 2012).

Next are the MCCs or cow cheese production centers where milk received from the MPCSSs is measured, recorded, and platform quality control tests are performed that generally include organoleptic test, fat and SNF test, clot-on-boiling (COB) test etc. Occasionally, adulteration test is also performed. Milk in the MCC is cooled by either instant chilling system or in the bulk milk cooling vat. In the cheese production centers, milk received from the MPCSSs is directly processed to produce cheese, butter

and other dairy products such as paneer, and sweets. Milk from the MCCs is transported to the milk processing plants in insulated bulk milk tankers (FAO, 2011).

Then there are milk processing plants. Here milk from the MCCs and MPCs after being received in the reception dock firstly undergoes quality control tests and quality passed milk is then measured and cooled prior to keeping it in an insulated milk storage tanks for further processing and producing pasteurized milk and milk products. After processing, milk and milk products are kept in cold store for sales (Kenya, May 2005).

2.2.2 Dairy Industry Task Force

The different tier of dairy industry task force includes middlemen, processors and retailers. These are described accordingly:

2.2.2.1 Middlemen

The middlemen are informal and they could be milk traders or contractors or farmers themselves. They are active in collecting raw milk from the farmers and transport it particularly to the MCCs or processing plants of the private dairies. They are also involved in collecting and transporting milk to the sweet shops, restaurants and tea shops. The middlemen are mostly active in the surrounding rural areas of the major urban centers because of easy transportation facility but not in the distant rural where there is lack of transportation facility or transportation is difficult. The transaction by middlemen is based on the price negotiation. The role of middlemen is thus limited to milk collection and transportation to the milk MCCs/processing plants. (Feeding Dairy Cattle, A manual for smallholder dairy farmers and extension workers in East Africa (January 2007, ILRI).

2.2.2.2 Processors

The milk processors are the main actors to mobilize various channels of milk and milk products marketing. They act as a bridge between the producers and consumers. They create different channels for milk collection from the farmers in the rural areas and for selling milk and milk products in the urban areas. In the rural areas, they form MPCs or channelize middlemen/farmers for milk collection and transportation. In the urban

areas they manage milk booths to sell processed milk. They either set-up own sales centers or create franchise shops to market milk products to the urban consumers. Moreover, they also channelize the products to the retail shops through arranging dealers. Due to increasing popularity of supermarkets/department stores, the processors have also started to market their products through these sales outlets. Thus the processors (Informal Traders Lock Horns with the Formal Milk Industry: The role of research in pro-poor dairy policy shift in Kenya (May 2006) ILRI, mobilize both the formal and informal sales outlet to channelize the milk and milk products to the urban consumers.

Accordingly, milk processing plants are the focal and play the crucial role in relation to different marketing channels for milk and milk products. They put a lot of efforts in creating and managing these marketing channels. Due to fierce competition for milk collection, the big milk processors have now started to adopt various measures to attract farmers towards them. These include arrangement of credit facility for purchasing dairy animals through financial institutions, veterinary health care and breeding services; support for fodder production through seed distribution and technical services; distribution of smaller milk chilling units with automatic milk analyzing system; trainings and exposure visits to the farmers. Through providing these services, the processors are making efforts to tie-up the farmers with them for assured milk supply. (Transforming the Kenyan Dairy Feeds System to Improve Farmer Productivity and Livelihoods (2007).

Similarly, in the sales and distribution front also the processors have been involved in motivating the operators of sales outlets to increase the sale of their products. The motivating measures include higher sales commissions on the products, and provision of other hardware support such as refrigerators, freezers and counter coolers. However, such measures are adopted only by the big processors mainly due to the requirement of enough financial resources. But, unfortunately, the processors have not been much serious in motivating the general consumers who are the ultimate destination of their products. Except for occasional advertisements in the print media and audio-visuals through radio and televisions by some, most of the processors are indifferent towards implementing such customer- oriented programs as awareness

campaign, product promotion, product presentation (packaging, selling methods etc.) to attract the customers.

The last actors are the milk selling booths/dairy shops and institutional buyers. The milk booths sell only milk to the consumers/tea shops, and dairy shops mostly sell milk products to the consumers. The milk selling booths operate for only 2-3 hours in the morning but the dairy shops are open from morning to evening. There are some such shops also which buy milk from the booths in the morning and put it in the refrigerator and sell it later with extra charge. The institutional buyers include hotels, supermarkets/departmental stores and fresh houses. Among these, hotels use milk and milk products for their own purposes whereas supermarkets/departmental stores and fresh houses sell milk products to the consumers.

Milk also passes through the informal channel. In this system, individual farmers or the contractors are the main actors who directly deliver milk to the individual households/tea shops/sweet shops etc.

2.3 Existing Channels within the Value System and Volumes Going through These Channels

Dairy industry is said to be a process from “Grass to Glass” which passes through different channels involving various actors. Figure 2 depicts the formal channel of raw milk to the milk processing plants as well as informal trading of raw milk. Seasonal variation in milk production and hence milk collection has been a regular phenomenon in Nepal due to dominance of buffalo milk. The main reason is attributed to seasonal breeding and calving pattern of this species. However, availability of green forage is also responsible indirectly for animals to set their breeding season physiologically (Action Aid Kenya, An analysis of the impact of Import surges on Rural Poverty in Kenya: The Case of Dairy Sub- Sector (March 2007) E. A. Birachi, Determinants of Coordination and Supply Chain Performance: The Case of Fresh Milk Supply Chains in Kenya (May 2005)

2.3.1 Volume of Milk Passing through the Channels

In the formal sector most of the milk passes through the MPCS @ MCC @ milk processing plants channel. In this system, whatever volume of milk is received in the

MCC from the MPCSSs is accounted regardless of the volume dispatched by the MPCSSs. The same practice prevails in case of milk directly received in the milk processing plant from the MPCSSs. As such, the volume passing from the MPCSSs to either MCC or milk processing plant remains the same. Since the MCCs are operated by the concerned milk processing plants and their own vehicle is used for transporting milk from the MCC to the processing plants, there is virtually no difference between the milk dispatched by the MCC and received at the milk processing plant. Similarly, a small volume directly passes from MPCSSs to cow milk cheese factories and from farmers to the Yak cheese factories.

It is very difficult to track the volume of milk passing through all these channels, particularly in case of private dairies and cooperatives that are not supplying milk to DDC (as all cooperatives are not the part of DDC system)⁵; and informal milk trading mainly due to unavailability of data. Even if the private dairies are also a part of the formal sector, they are very reluctant to share their data and information. As learned, although some years back Livestock Market Promotion Directorate of DLS had developed an information system with the consent of private dairies to share their data; the system did not work even for a short period mainly because of the erratic and inconsistent data received from the private dairies. As such, presently there are no ways to find out the reliable data of the private sector. For that reason, only that volume of milk received (milk collection) in the milk processing plants and cheese factories of the DDC could be presented.

2.3.2 Cross Border Trade of Milk

In the recent past, during flush season (November-February) there used to be oversupply of milk from the farmers mainly due to the seasonal variation particularly in buffalo milk production. The milk processing plants could not accept all the milk offered by the farmers and they were asked not to bring milk in the MCCs for once or twice a week. The days during which farmers were asked to halt milk supply to the MCCs was referred as “Milk Holidays.” The “Milk Holidays” started in 1991/92 but the problem was resolved by exporting milk by DDC to HIMUL of West Bengal, India for about one and half years in 1992/93. This was done with limited success again in 1990/2000. The volume of this cross border trade was not available in DDC. During 2000-2007, no any concrete measures were taken to ease the problem of “Milk

Holidays” except organizing seminars, discussions and conducting studies. But, in the last fiscal year (2008/09) DDC again exported 1,223 mt of milk to Patna Dairy, Bihar.

Apart from this formal cross border trading of milk, there is also informal trading in the border areas of Nepal and India by individual farmers/contractors. The actual volume of this trade is difficult to ascertain because of the trade occurring at individual level in the long border between these two countries. Feeding Dairy Cattle, A manual for smallholder dairy farmers and extension workers in East Africa (January 2007) ILRI.

This trading is mainly guided by the price factor i.e. milk flows to either cross border where price is higher marketing. Even though some of the MPCs are also involved in producing milk products and sell them in the local markets through their own production points, this practice is very limited. This is so because of the financial as well as technical constraints. The role of small farmers is thus to produce milk and market it through either MPCs or middlemen or by themselves. (Dairy: World Markets and Trade (December 2007) World Bank, Doing Business, Kenya (2007, standard Survey).

2.3.3 Existing Milk and Milk Products Value Chain Analysis and their Operation

2.3.3.1 Overview of the value chain

The value chain of the milk and milk products involves six distinct value adding activities from the production of the milk through reaching to the final consumer in the market. These activities include input supply; production; gathering (bulking); processing; transportation; and retail trading.

This part the actors involved in each of these segments of the chain and their interrelationships with other players; the value they add to the product; and the constraints and opportunities they face. In the course of analyzing this section enable to identify the type of interventions required at each chain segment which in turn, if addressed well will create smooth flow of the products and information along the chain eventually increases the competitiveness of the overall chain.

2.3.3.2 Production

It is the basic segment for any value chain analysis and it is the pivotal point where makes the value chain to develop and attain competitiveness. The improvement made in this level of the chain could have a significant implication in enhancing competitiveness in all other levels of the chain. It holds true particularly for agricultural value chains in general and milk and milk products in particular

2.3.3.3 Producers (Pastoralists)

These are the basis of the milk and milk products value chain. They have two major functions. One is livestock management so that production and productivity of livestock increases or at least maintained at current levels. The farmers have long term experience of properly managing livestock for getting better milk yield and reproduction year in year out. A good indication to this is they keep 60-70% of the herd as female animals.

2.3.3.4 Milk Transportation

The milk transportation task has two segments. The first involves transferring the milk packed in 5, 10 and 20 liter jerry cans from the production areas to the roadside bulking and collection centers. This is mainly done on women/men backs, bicycles, motorcycles. The second segment is milk will be transported from collection centers to the terminal market (traveling up to the distance of 30-150 kilometers. During milk transportation in this segment the producers do not travel with their milk. They send their milk by the drivers putting unique marks of string tied, color of the containers etc on the jerry can which enables their corresponding client in local collection center to easily identify the container. In this segment the activity is done by two transport companies.

Table 3.2: Showing the Distance from shed to Milk Market and Collection Centers

Distance from shed to milk Market and Collection centers			
Sites	Mean distance Travelled Value	Maximum Distance in Km	Minimum distance in km
Chanuali	3.04	7	0.05
Gorkha	1.68	5	0.05
Tanahun	51.56	200	0.5

2.4 SWOT Analysis of Dairy Sector

2.4.1 Strength of Dairy Sector

The strength of dairy sector to develop the rural area are; strong dairy cooperatives with their presence from the grass root level i.e. rural area to the central level and have become a strong channel between the rural milk producers and the milk processing industries keeping animal is a household practice and people are passionate in animal keeping , increasing involvement of NGOs and private sector in livestock development activities in rural area particularly in providing technical support services and veterinary health care, employment (full or part) for millions of HHs (formal and informal sector), stable and daily source of income, Cash flow from urban to rural sector. Any improvement in milk value chain in the rural area definitely helps in rural development. The review has proven that the rural dairy is the means to pull the money from urban area and ultimately the tool for rural development. (Muruiki *et.al* 2001).

2.4.2 Weakness of Dairy Sector

Despite of the strength, a dairy sector in Nepal has several weakness which can be corrected for rural development. Large number of low productive cattle and buffaloes (avg. annual production-469 liter/milking cow and 867/milking buffalo), Hygienic milk production/ lack of stringent measure on quality control / lack of awareness, scattered production and difficult geography- increased cost in collection and transportation, poor infrastructure for milk collection, chilling and transport. Poor

infrastructure and information networking, Inadequate quality feeding resources for dairy animals, Serious depletion of animal feeding base due to deterioration in the forest areas for fuel wood and timber, and additional land for settlement and cultivation, Inadequate government support services due to lack of resources as many of the district and sub-district level (livestock service centres) face shortage of manpower as well as necessary equipments and veterinary medicines, inadequate and inappropriate breeding support services as there is shortage of improved breeding bulls as well as artificial insemination services, weak farm advisory services and training as there remains a big gap between the specialized and expanded farmers' service needs and those delivered by DLS resulting in lack of knowledge among the farmers regarding improved dairy farming and hence limiting their capacity to adopt new technology for production enhancement, critical shortage of dairy animals as dairy heifer rearing practice is not common due to small landholding and lack of cost effective heifer rearing technology, high opportunity costs of land and labour particularly around the main highways and towns where the dairy farming activities is mostly carried out, shrinking farm labour is becoming a serious problem due to migration of youth for off-farm jobs within or outside countries, inadequate financial service is a serious problem particularly in the rural areas as the rural branches of the financial institutions were closed down due to insurgency in the past resulting in drastically curtailed investment in dairy animals, poverty and illiteracy among livestock raisers is severely hampering effective communication and the ability of livestock raisers to respond to new opportunities as lack of basic literacy among them complicates the extension process by requiring more face to face communication, limited market opportunities for a large proportion of the farming population caused by distance from market, poor access or lack of marketing mechanism and market information (Kate Sadler *et.al* 2009).

2.4.3 Opportunities in Dairy Sector

Livestock are widely distributed with even distribution of cattle and buffaloes throughout the country, consumption of milk and dairy products is traditional but there is increasing gap between demand for and supply of milk and milk products, market opportunities of milk and milk products have increased particularly in the densely populated urban areas, involvement of private sector in dairy business has

greatly increased with the establishment of new dairy industries and cheese factories, growth of tourism is also likely to provide increasing demand for modern dairy products, dairy cooperatives have strongly developed with their presence from the grass root level to the central level and have become a strong channel between the rural milk producers and the milk processing industries, increasing involvement of NGOs and private sector in livestock development activities particularly in providing technical support services and veterinary health care. Growth of tourism is also likely to provide increasing demand for modern dairy products; donors' support has created a positive environment for dairy livestock and dairy business development. (Nigerian Dairy Development Board, 2012)

2.4.4 Threats of Dairy Sector

Compulsion for coexistence of productive and unproductive (old, male, diseased) cattle further depleting scarce feeding resources, poor competitiveness- upsurge in import of milk and milk products, open and uncontrolled border with India, increasing cost of inputs including labor, shortage of labor- young generation seeking jobs overseas, reluctance of financial institutions on lending for agriculture, high opportunity costs of land and labour particularly around the main highways and townships where the dairy farming activities is mostly carried out, emerging diseases of zoonotic and economic significance, rising awareness on carbon trade among people has resulted in increasing closure of community forests (which are presently the main source of fuel wood and fodder to the community in many part of the country) for animal grazing and tree cutting which has pushed the poor further away from livestock keeping because they have been depending on free forest feed to the animals, higher cost of milk production due to rising cost of inputs and absence of mechanism to regularly assess the farmers' cost of milk production and relating it to the pricing of milk, discouraged farmers due to frequent closures and strikes by different political parties resulting in shifting from farming to other occupations. These are some important prevalent threat that is bottle neck for the rural development (Abolnik, 2014).

CHAPTER- THREE

RESEARCH METHODOLOGY

In the present study both descriptive and exploratory research design have been applied to study the Milk value Chain in the three districts of the Gandaki River Basin. This research has also been designed to discover both qualitative and quantitative information about the samples.

3.1 Research Design

The study was conducted in for dissident districts of Gandaki River Basin namely (1) Gorkha at Palungtar (2) Tanahun Dulegaunda (3) Chitawan at Chanauli.

Total 90 farmers 30 farmers from each research sites were selected to collect the information. The farmers were selected from Buffalo/Cattle Raising Groups of the research sites. The farmers providing at least 10 liters or more milk to the cooperatives were selected. A structured questionnaire was used to collect the information (See Annex 1).

Figure 1. Map of Gandaki river basin and selected Research Sites (See Annex 2)

3.2 Rationale of the Selection of the Study Area

Districts of Gandaki River basin (GRB) have been experiencing in dairy business. Cattle and buffalo farming are important as a source of milk production in this area. These areas are occupying the central part of country, over about 40% of the country. The existing asphalt road infrastructure the milk were easily transported to different urban centers like Pokhara, Damauli, Narayanghard and other urban centers through private companies or through organized pastoral communities after a value is added to increase its shelf life.

3.3 Nature and Source of Data

The study is based on both qualitative and quantitative nature of data Quantitative information is supported by qualitative information and vice versa. Data source were

of two types; viz. primary and secondary. Field survey was the basic source of the primary data. Data were collected from field survey, personal interview, case study and focus group discussion.

3.3.1 Primary Source of Data

Total 90 individual farmers, 30 farmers from each research site, were interviewed using structural questioner. Information were collected from buffalo keeping farmers, Milk collection center, milk chilling center, milk processing factories, milk distributing booth consumers and agro vets in the research sites.

3.3.2 Secondary Source of Data

The data on dairy status of the country was collected from the Central Bureau of Statistics, Babarmahal. This type of work will also help to take the precaution in animal husbandry in the milk value chain evaluation. The milk production, collection, transportation, processing and selling data were obtained from Government, milk cooperatives, DDC, private dairy from research sites, in and around of GRB's.

3.4 Universe, Sample Size and the Sampling Procedure

The universe of the study was 500 sample .The sample size was 18 % of the total universe balancing the same percentage from the existed milk cooperatives.

Table 3.1: Total Sample Size and Sampling

S.N	Universe	Sample size	Sample percent
Damauli	175	30	17.14
Chitwan	200	30	15
Gorkha	125	30	24

Source: Household survey, 2071/72.

Samples were collected from total 90 household (HH) focusing to the buffalo and cattle keepers. Total 30 HH, out of total cattle and buffalo from the Buffalo cooperatives from each research sites, was randomly selected and used to collect the information. Both secondary and primary data from the major milk producing sites were collected covering the whole milk value chain from production to the market as

well as the policy, regulatory and institutional framework under which the sub-sector is operating. The farmers providing at least 10 ltrs of milk production in the cooperatives were selected. Simple random sampling and systematic random sampling have been used as respondents. Actively working intermediates (key informants) were also used. Household survey, interview, observation, focused group discussion and interview with the key informants were adopted to collect data. For this, structured questionnaire and guidelines were developed (See Annex 1).

3.5 Data Collection Techniques and Tools

To collect primary data, the structured questionnaire, semi or unstructured interview and observation methods were used. Data was collected using PRA technique. There were both open end and close end questions included. The questions included in the questionnaire tried to attempt the findings listed in the objectives. Especially, the existing pattern of livestock and milk production, Milk value chain, role of key intermediates and the constraints and opportunities were tried to obtain as well. (For further See Annex 1).

3.5.1 Household Survey

Samples were collected from total 90 household (HH) focusing to the buffalo and cattle keepers. Total 30 HH, out of total cattle and buffalo from the Buffalo cooperatives from each research sites, was randomly selected and used to collect the information. (See questionnaire, Annex)

3.5.2 Key Informant Interview

Farmers were interviewed and considered as key informant for household survey. Again, persons including officers of DLSO's of the concerned districts, chairman of the Local cooperatives, vehicle drivers and local vendors as well etc. were interviewed were to obtain the cross verification of the answers received from the farmer's interview. (See questionnaire, Annex)

3.5.4 Data Presentation and Analysis

The data presentation is descriptive, analytical and interpretative. Microsoft XL, SPSS were used to summarize the data and for statistical analysis. Minitab was also used wherever applicable. Most of the data are descriptive.

CHAPTER - FOUR

DATA PRESENTATION AND ANALYSIS

This chapter as a whole has been subjected to data presentation and analysis. The result obtained is objective oriented i.e it has more or less tried to answer the queries set as the objectives. The different findings have been organized under the following headings

4.1 Existing Situation of Dairy Milk Production Status in Gandaki River Basin

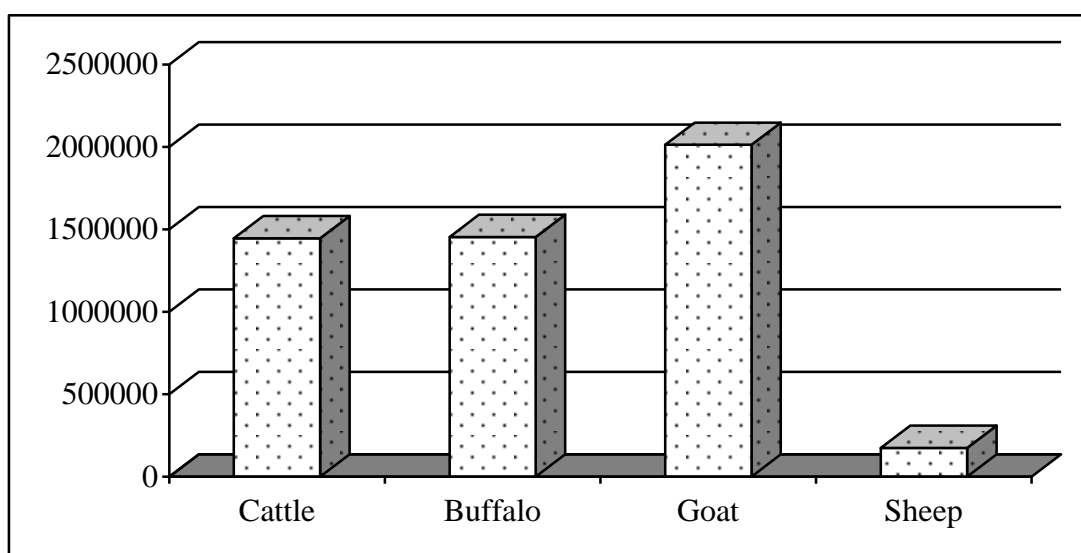
Gandaki River Basin is repetitively exemplified as the most potential a country in livestock resource. The resource forms an integral part in the agricultural system and basis of livelihood for entire rural and semi-urban population in most part of the country. The purpose of livestock production is diversified and includes the provision of draft power, food supply, source of income, means of transportation, alternate energy source. (Mugerewa *et.al* 2009). In these areas, beyond the economic advantage as a source of income it matters social prestige and status in the community. With regard to the national economy, Livestock production plays a significant role the country's national economy. It contributes about one-third of agriculture's share of GDP, or nearly 15 percent of total GDP. There are approximately 1.5 million cattle, 1.5 million buffaloes, 0.1 million sheep, 2 million goats. The raising of livestock always has been largely a subsistence activity. Cattle in Gandaki River Basin are almost entirely of the zebu type and are sources of milk and meat. However, these cattle do relatively well under the traditional production system. Meat and milk yields are low and losses high, especially among calves and young stock. Contagious diseases and parasitic infections are major causes of death, factors that are exacerbated by malnutrition and starvation due to frequent drought. Recurring drought is a factor for the loss of huge livestock resource that influences the animal population, although it is difficult to determine the extent of losses. Practically all animals are range-fed. During the rainy seasons, water and grass are generally plentiful, but with the onset of the dry season, forage is generally insufficient to keep animals nourished and able to resist disease.

Table 4.1: Showing the General District profile of livestock Species

District Profile	
Species	Gandaki River Basin
Cattle	1,445, 717
Buffalo	1,453,577
Goat	2,012,376
Sheep	174,383

Source: CBS Report, 2071

Fig. 4.1: Showing the General District profile of livestock Species



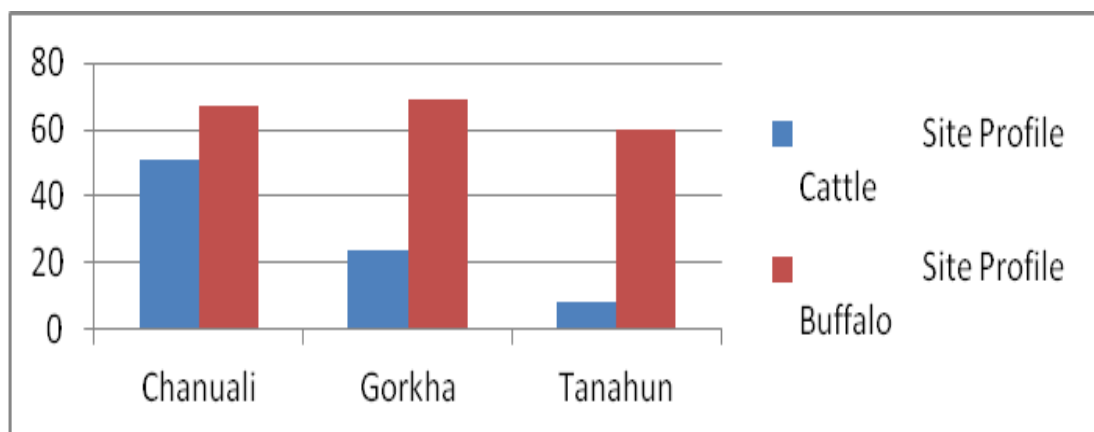
Source: CBS Report, 2071

Table 4.2: The total livestock heads of the study site

Site Profile		
Name of the Sites	Cattle	Buffalo
Chanuali	51	67
Gorkha	24	69
Tanahun	8	60

Source: Household survey 2071/72

Fig 4.2: Graph showing the livestock heads of the study site



Source: Household survey 2071/72

In spite of the existing enormous livestock resource and great potential for increased livestock production, the productivity is disproportional lower due to various livestock management problems, prevalence of major endemic diseases, poor feeding and high stocking rate on grazing lands. Lack of support services such as extension services, insufficient data with which to plan improved services, and inadequate information on how to improve animal breeding, marketing, and processing are also critically affect the production.

4.1.1 Milk Production and Marketing in Gandaki River Basin

Milk production in these areas is largely from by the smallholder farmers in these areas of the countries. However, the production is less market oriented and a minor portion of the locally produced milk enters the commercial sector owing to the marketing constraints and lack of processing techniques suitable for smallholder dairying. (Alfred George et.al, 2004) .In order to sustain milk production to satisfy the increasing demand, efforts to increase milk production should go hand in hand with efforts and knowledge to dispose milk surpluses above local requirement in the milk producing villages. The manufacture of stable marketable products including butter, low moisture cheese and fermented milks will provide smallholder producers with additional source of cash, facilitate investment in the milk production, yield by products for home consumption and enable the conservation of milk solids for future sale or consumption. The main source of milk production in these areas is cattle and

buffalo. Based on the system of production, Milk production can be viewed at three different sources. These include:

4.1.2 Major Milk and Milk Product Markets

There are three major milk and milk products markets were identified. These are Dumre, Damauli and Narayanghad. On average a total of 6150 liter of milk enters to this market per day from these markets. There is a permanent tractor/ tractor etc which transports milk from. According to the focus group discussion with milk freighters association and information obtained from the transporters, up to 1500 liters of milk is supplied in dry season and up to 4600 liters of milk is during wet season from the area. On the average 1050 liter is supplied on daily basis. Out of the total milk supplied to the local gathering center 2592 liter (15%) is transported.

4.1.3 Pastoral Milk Production

Livestock production in pastoral areas system that supports an estimated 10% of population covers 50-60% of the total area. However, because of the rainfall pattern and related reasons shortage of feed availability milk production is low and highly seasonally dependent. In this system indigenous stock grazing in pastures in extended rangeland throughout the year and milked twice a day. No supplementary feeding is provided.

4.1.4 The Small Holder Milk Production

The small holder farmers have high potential for dairy development. These areas are occupying the central part of country, over about 40% of the country. In these areas agricultural production system is predominantly substance smallholder mixed farming, with crop and livestock husbandry. In this system feed for livestock consists of forages, crop residues and stub grazing and hay native pastures. The majority of milking cows in the smallholders milk production are indigenous breeds which have low production performance with the average age at first calving is 53 months and average calving intervals is 25 months. The average cow lactation yield is 524 litres for 305 days, of which 238 litres is off-take for human use while 286 litres is suckled by the calf. But also a very small number of crossbred animals are milked to provide the family with fresh milk butter and cheese. Surpluses are sold, usually by women,

who use the regular cash income to buy household necessities or to save for festival occasions (Mugerewa et. al, 2009). Both the pastoralist and smallholder farmers produce 98% of the country milk production (MOA, 1985 E.C).

4.1.5 Urban and peri-urban milk production

This system developed based on the high market demand in and around major cities and towns for milk and milk products. The main feeds sources are agro-industrial by products (Oil Seed Cakes, Bran, etc) and purchased roughage.

Farmers use all or part of their land for home grown feeds. Generally, the primary objective of the production system is to sale milk as a means of additional cash income. The system basically characterized by small scale intensive husbandry with cross breeds not more than 10 heads and managed under zero grazing.

4.1.6 Intensive Dairy Farming

The system is basically characterized by a more specialized dairy farming practices by state and private commercial farms. Most of the intensive dairy farms are concentrated in and around these areas are basically based on cross bred stock. The urban, peri-urban and intensive dairy farmers are produce 2% of the total milk production of the country. The system mostly run with cross bred animals more than 20 heads feed on improved pastures, hays and supplemental agro-industrial feeds. Currently, most of the state dairy farms are decline in their management that has been the major causes of inefficiencies in production. There is a downwards trend in milk yields and herd performance. Both the herd size and total number of cows have been on declining trend suggesting acute short fall of replacement herd and supply of breeding stock to smallholder farmers.

4.1.6.1 Quantity of Milk Produced

The quantity of milk produced in the study area provides the basic outlines on Milk consumption/ Day and Market Availability. To estimate the total milk production in the pastoral area the following parameters were used: livestock population, female and lactating animals' proportion in the herd size, length of lactation period and milk yield per day per animal. Moreover the following assumptions were also used to

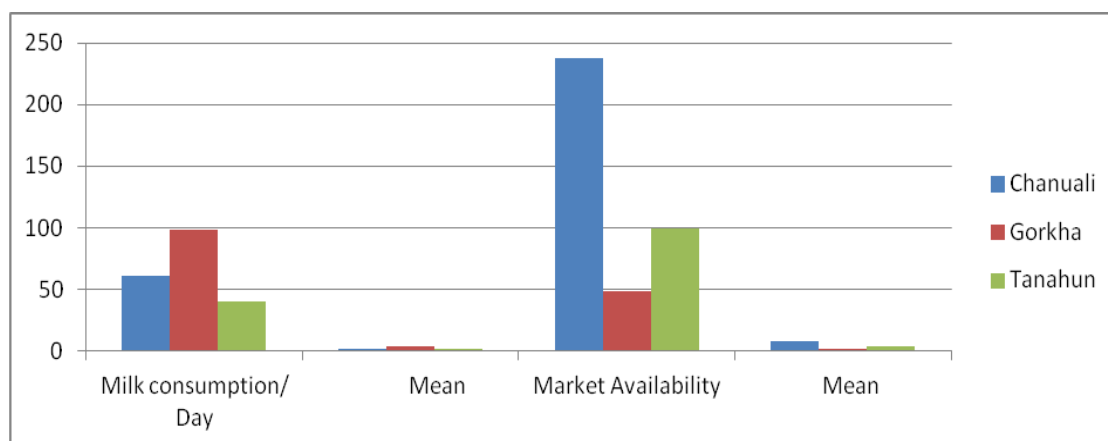
identify the milk production size for each of the milk producing species. Milk: Out of the total population in these areas, the mature female animals kept for milk production are identified and it is found to be 38.42% and of these about 60% assumed is milk producing animals annually (CSA, 2000/2001). Besides this proportion the productivity of milk i.e. milk litre/ animal /day identified from the study and ranges between 0.5 litters and 2.5 litters and an estimated average of 1.5 litters/cattle. The lactation length also ranges between 120 to 305 days based on availability of feed and water as well as length of dry seasons and an average of 270 days is considered.

Table 4.3: Showing Household Consumption and Market availability

Home Consumption/ Market availability				
	Milk consumption/ Day	Mean	Market Availability	Mean
Chanuali	61	2.03	237.5	7.917
Gorkha	98.7	3.29	48.8	1.626
Tanahun	40.5	1.35	99	3.3

Source : Annual Report, DLSO's, 2071 Tanahun, Chitwan and Gorkha.

Fig 4.3: Graph showing Household Consumption and Market Availability



The table shows that a very little of the total production goes to the market despite huge potentiality.

4.1.6.2 Seasonal Variability of Milk Production

Milk production and productivity is affected by the seasons of the year. There is more milk is produced with high productivity (litre/animal) (March, April and May) and short rainy season called (September and October) and productivity is fluctuated over season and years. Seasonal variability of milk production in these areas is basically managed by amount and distribution of rainfall, and availability of forager and water. Based on these events milk production is fluctuated in the four seasons of year and from year to year container. Tying of the tail is important in the local setting because cows carry a lot of dust or mud from the stable on their body. During milking, a lot of this dust is dislodged by the constant waving of the tail to drive way flies. This constitutes one of the most direct methods of milk contamination. The following figure depicts the percentage of pastoralists using the stated practices.

4.16.3 Milk Products

The pastoralists and agro-pastoralists of these zones have been doing a traditional milk processing practices at the household level and produces butter, skimmed milk, yoghurt. They produce milk products like butter to cope the problem of short shelf life of fresh milk. This is because the fresh milk will not stay fresh in some areas even until they reach to the market hence they are forced to process it to butter to cope with the risk of perishables. The study revealed that the more the farmers are far from the market they tend to process the milk and produce butter. Moreover the higher the wealth (livestock) the farmers have the higher will be the intensity and size of milk processed and changed into different milk products. According to the FGD with the farmers and women milk processing cooperatives, the proportion of the skimmed milk production from the whole milk is ranged from 70% to 80 % with an average of 75% where, yoghurt production is on average estimated to about 25% of the total processed whole milk values. It was also learnt that that 1kg of butter was produced from 8-12litters of whole milk (depending on the season- in wet season takes 12 litre and in dry season 8 litres). Hence on the average 10 litters whole milk is considered to produce 1 kg of butter. Above all it is apparent that the proportion of the butter product per unit of whole milk varies based on the breed type, parity, milking management and feed types.

4.1.7 Milk Marketing

In these areas, Milk and milk products are channeled to consumers through both formal and informal marketing systems. Until 1991, the formal market of cold chain, pasteurized milk was exclusively dominated by the DDC which supplied 12 percent of the total fresh milk. Recently, however, private businesses have begun collecting, processing, packing and distributing milk and other dairy products. Still, the proportion of total production being marketed through the formal markets remains small (Muriuki et. al 2001). Formal milk markets are particularly limited to peri-urban areas. The informal market involves direct delivery of fresh milk by producers to consumer in the immediate neighborhood and sale to collectors or traders nearby towns. In the informal market, milk may pass from producers to consumers directly or it may pass 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. The informal (traditional) market has remained dominant.

4.2 Partners Involved in Milk Value Chain

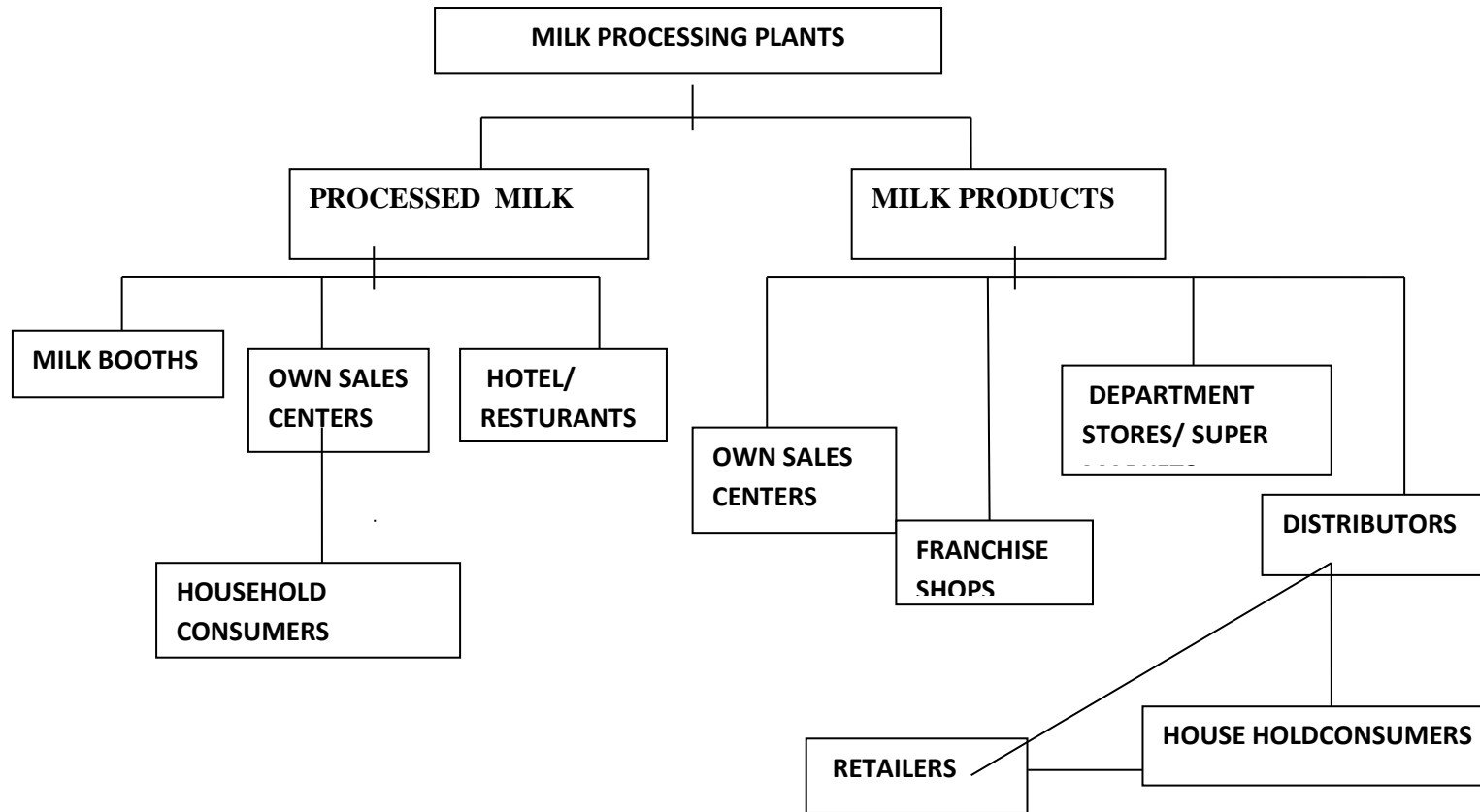
Following are the partners involved in milk value chain in different tiers. They have been described accordingly.

4.2.1 Milk and Milk Products Production and Marketing

Milk is one of the most important livestock products. It is the main diet for pastoralists. Milk production from milking animals (Cattle, Buffalo) is influenced by their population and distribution, and the availability of natural pasture and water. Besides, types of animal breeds, the composition of milking animals in herd and etc are one of the most important factors influencing milk production in the pastoral systems. The milk production also directly correlated with the environmental situation. The better the environment/climate the better is the milk production and vice versa. The milk producing animals (cattle, buffalo) in all studied pastoral areas are indigenous and cross breeds. Cattle are well recognized in their dual purposes production and hardiness. Moreover the study identified that during prolonged dry season and drought hazard, milking cows move further away from pastoralists' camp to take advantage of grazing and water sources. The animals milking frequency per day varies based on the type of livestock species and seasonal calendars of the year. In

wet season, where forage and water is relatively available, lactating cows are milked twice a day during early in the morning before grazing time and evening after grazing. Traditional cows those lost their calf due to death will not be milked even though they are able to supply milk. On the other hand, during prolonged dry periods where feed and water is highly scarce.

Figure 4.4: Flow of Processed Milk and Milk Products



Source: Questionnaire Survey, 2071

The above ascribed flow chart is easy and comprehensive. It describes about different levels of intermediates of milk value chain and marketing. The Milk marketing in the study area seeks the following key actors with the role of whose there is value addition in the milk and its products.

4.2.2 General Features of the Open Markets

Milk and milk product marketing in these areas is done to fulfill their main basic needs require for their livelihood. Food is the most important one. The pastoralists supply fresh milk, butter, and yoghurt. Milk market is being open and competitive.

Table 4.4: Table showing the general cost of milk Byproducts

Cost of Milk Byproducts	
Milk Byproducts	Price/kg
Paneer	540
Dahi	80
Cheese	550
Butter	500

Source: Local dairy Price list of GRB's, 2071.

Though the prices of different products seemed accordingly, the price however fluctuated due to various factors. The table illustrates that with the diversification in products, the value of milk gets more added.

4.2.3 Adulteration

Milk and milk products are very susceptible to adulteration. In study area, milk and milk product adulteration increases as the product is moved to market from areas where closer to the pre-urban and urban centers. There is less adulteration at production level. Water is used as substance for milk adulteration and butter of plant fat is used for adulterating butter.

4.3 Milk Value Change and their Operation in GRB's

4.3.1 Number of Buyers and Sellers in the Market

Except in the terminal market, milk sellers are milk producers and are all women and girls. In terminal market like Narayanghad the majority of the sellers are traders and in terms of sex here also all are girls and women. Buyers are market participants particularly pastoralists who directly on spot consume milk. Other buyers include tea and coffee shop owners, restaurants and hotel owners. Few intermediaries in the market: It is customary to see many intermediaries in many kinds of products marketing such as livestock, horticulture, grains and etc. In contrast in milk and milk product marketing there are insignificant numbers of intermediaries in study areas.

4.3.2 Price Uniformity across Location

One peculiarity we came across in milk and milk product marketing was price uniformity especially for milk across the locations. One of key incentives for trading is product price differential in space and time. The less number of intermediaries in the market may attribute to constant price across locations.

4.3.3 Packaging /containers:

The supply milk to the market using local materials like Dumre and Damauli and Narayanghad cans and retail at the market with a cup which has a volume of 300ml. While the Butter is supplied by Chitwan dairy milk in different tins and cups. Generally the milk consumers prefer to buy milk from the local container.

4.4 SWOT Analysis

There are different levels of strength, weaknesses, opportunities and threats recognize in the dairy sub-sector of GRB's. These are describes accordingly:

4.4.1 Strength of Dairy Sector

The strength of dairy sector to develop the rural area are; strong dairy cooperatives with their presence from the grass root level i.e. rural area to the central level and have become a strong channel between the rural milk producers and the milk

processing industries keeping animal is a household practice and people are passionate in animal keeping , increasing involvement of NGOs and private sector in livestock development activities in rural area particularly in providing technical support services and veterinary health care, employment (full or part) for millions of HHs (formal and informal sector), stable and daily source of income.

4.4.2 Weaknesses of Dairy Sector

The pragmatic weakness of the dairy sector were Hygienic milk production/ lack of stringent measure on quality control / lack of awareness, scattered production and difficult geography- increased cost in collection and transportation, poor infrastructure for milk collection, chilling and transport etc.

4.4.3 Opportunities of Dairy Sector

The opportunities are wide as livestock are widely distributed with even distribution of cattle and buffaloes throughout, consumption of milk and dairy products is traditional but there is increasing gap between demand for and supply of milk and milk products, market opportunities of milk and milk products have increased particularly in the densely populated urban areas, involvement of private sector in dairy business has greatly increased with the establishment of new dairy industries and cheese factories, growth of tourism is also likely to provide increasing demand for modern dairy products, dairy cooperatives have strongly developed with their presence from the grass root level to the central level and have become a strong channel between the rural milk producers and the milk processing industries

4.4.4 Threats of Dairy Sector

Compulsion for coexistence of productive and unproductive (old, male, diseased) cattle further depleting scarce feeding resources, poor competitiveness- upsurge in import of milk and milk products, open and uncontrolled border with India, increasing cost of inputs including labor, shortage of labor- young generation seeking jobs overseas, reluctance of financial institutions on lending for agriculture, high opportunity costs of land and labour particularly around the main highways and townships where the dairy farming activities is mostly carried out, emerging diseases of zoonotic and economic significance, rising awareness on carbon trade among

people has resulted in increasing closure of community forests (which are presently the main source of fuel wood and fodder to the community in many part of the country) etc were some pragmatic threats of the milk producing areas in the Gandaki river basins.

CHAPTER - FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The chapter deals with the summary of the findings, conclusions and recommendations. They are mentioned below.

5.1 Summary

Summary of the findings is the concise form of the findings of the research under socio economic information of the respondents, milk value chain of the three districts of the Gandaki River Basin and their SWOT's analysis.

There are approximately 1.5 million cattle, 1.5 million buffaloes, 0.1 million sheep, 2 million goats. The raising of livestock always has been largely a subsistence activity. Cattle in Gandaki River Basin are almost entirely of the zebu type and are sources of milk and meat.

There are three major milk and milk products markets identified. These are Dumre, Damauli and Narayanghad . On average a total of 6150 liter of milk enters to these markets per day from these markets. Information obtained from the transporters revealed that, up to 1500 liters of milk is supplied in dry season and up to 4600 liters of milk is during wet season from the area. On the average 1050 liter is supplied on daily basis. Out of the total milk supplied to the local gathering center 2592 liter 15% is transported. The average cow lactation yield is 524 litres for 305 days, of which 238 litres is off-take for human use while 286 litres is suckled by the calf.

This system developed based on the high market demand in and around major cities and towns for milk and milk products. The main feeds sources are agro-industrial by products (Oil Seed Cakes, Bran, etc) and purchased roughage. Farmers use all or part of their land for home grown feeds. Generally, the primary objective of the production system is to sale milk as a means of additional cash income. The system basically characterized by small scale intensive husbandry with cross breeds not more than 10 heads and managed under zero grazing. The key actors in the formal dairy value system include milk producer farmers, MPCSSs, MCCs, and milk processing plants/cheese factories. Firstly, there are rural farmers and their function is to be

engaged in milk production. The next are MPCs established in the rural areas, Milk and milk products were channeled to consumers through both formal and informal marketing systems.

SWOT analysis revealed that the strength of dairy sector to develop the rural area are; strong dairy cooperatives with their presence from the grass root level i.e. rural area to the central level and have become a strong channel between the rural milk producers and the milk processing industries, The pragmatic weakness of the dairy sector were Hygienic milk production/ lack of stringent measure on quality control / lack of awareness, scattered production and difficult geography- increased cost in collection and transportation, poor infrastructure for milk collection, chilling and transport etc. The study concludes that there are opportunities which the competitiveness of milk subsector can be built up on untapped high milk production potential.

5.2 Conclusions

Based on the figures and facts, the study has been concluded accordingly. Small scale farmers viz. Pastoralist culture of keeping more female animals (60-70% of the herd) in Gandaki River Basin areas. There is Good practice of forming informal milk producer and marketing groups within villages. Out of the total milk supplied to the local gathering center 2592 liter (15%) is transported Milk producer farmers, MPCs, MCCs, and milk processing plants/cheese factories are the key intermediates of milk value chain. The price of milk gets added when its byproduct gets diversified. There is big potential for milk sources in the districts of GRB's and should be exploited fully.

5.3 Recommendations

Different recommendations have been enlisted accordingly.

5.3.1 Infrastructure

- The need for electricity for establishing cooling chains is a prerequisite; accordingly it is a positive move in the area for rural electric power expansion being developed.
- Therefore, government rural electrification program need to be expanded in some of the pastoral areas where there is high milk potential. (Aamir et al., 2009).
- Means of transportation and bandha and strikes should be politically addressed.
- Establishment of loan facilities is at most.
- The policy of compulsory selling of milk to be implemented.

5.3.2 Productivity improvement

- It is apparent that the productivity of milk in these areas is very low i.e. on average 1.5 liter/ cow per day. The productivity varies with the types of the seasons in the year. The productivity increases during wet season in March, April and May and short rainy season in September and October).
- The amount and distribution of rain fall affect the availability of feed and water hence affect the productivity. Among others milking cow management considering feed and feeding management ,animal diseases control (mastitis), availability of AI etc are factors contributed to the low productivity of milk (OIE,2008).
- Promote the value chain approach as an economic tool to tackle the problems of milk and milk products value chain
- Present the intervention points identified and enrich by accepting more from the stakeholders and show how the situation needs a holistic approach

5.3.3 Environment management

- The cheapest source of feed for livestock is natural resources. As a result pastoral communities depend on rangelands for grazing their animals. T

- The economic significance is that about 100% of the total milk and milk products marketed in come from indigenous livestock which, thrive on natural pastures in the rangelands. There is also poor management of pastures in these rangelands characterized by burning. This has a negative impact in that some important pasture species like legumes may find it difficult to re-grow after burning.
- It was established that pastures in the rangeland cattle corridor areas studied are of low quality.

5.3.4 Establish Gandaki River zone pastoralists' milk and milk products stakeholder forum (commodity oriented):

- Promote the value chain approach as an economic tool to tackle the problems of milk and milk products value chain
- Present the intervention points identified and enrich by accepting more from the stakeholders and show how the situation needs a holistic approach.
- Establish permanent stakeholder forum with the private sector plays a leading role and decide permanent meeting period to evaluate the work progress done by different actors
- Recruit business development service provider to the chain that facilitate communication among the stakeholders, who disseminate information to all of the stakeholders and who facilitate the stakeholders' meetings.

5.3.5 Support the Improvement of Milk Market and Marketing

- Develop milk market development strategies for Gandaki River Basin pastoral communities.
- Show the profitability of the milk business in Gandaki River Basin to the big private companies to invest on UHT/pasteurizing milk processing industry and to establish chilling centers at different potential milk production sites o Support pastoralists to organize themselves into milk marketing groups and cooperatives with a voice

- Educating pastoralists on the need for milk marketing and meat consumption. Deliberately step must be taken by government to instill the culture of milk and meat consumption.
- Promote the introduction of appropriate rural milk transporting facilities and lobby for the improvement of village/feeder roads

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Annex1
Questionnaire

Study on the Dairy value Chain in rural dairy farming System as a tools for rural development for food security in the hills of Nepal

(Gorkha: Palungtar, Tanahun: Dulegaunda, and Chitwan: Chanauli, Kashki)

1. Household Characteristics and Milk Production

1.1 Household Characteristics

Name of the respondent:

- VDC :
 Ward :
 Village :
 Age of the respondent :
 Sex : (a) Male (b) Female
 Education of respondent :
 Ethnicity :
 Occupation of the respondent : (a) Primary..... (b) Secondary

No. of family members of the respondents by age category

Age	Male	Female
Less than 16 years		
16-60 years		
Above 60 years		

1.2 Educational status of the family members

Education category	Male	Female
Illiterate		
Literate only		
Primary level		
Secondary level		
SLC		
College and university level		

1.3 Major Occupation of the family members

Sex	Occupation			
	Agriculture including livestock	Agriculture and business	Agriculture and service	Service/enterprise only
Male				
Female				

1.4 Land use pattern and size of holdings

Land Type	Own land (Ropani)	Rented-out (Ropoani)	Rented-in (Ropani)	Total Ropani
Khet (low land)				
Bari (upland)				
Marginal land				
Pastureland /rangeland				
Kharbari (bush land)				
Total land (ropani)				

2. Milk Value Chain

2.1 Milk Production

2.1.1 Animal population and herd composition

What is the animal population and herd composition of your farm?

Animal Species	Improved			Local		
	Adult		Heifer	Adult		Heifer
	Milch	Dry		Milch	Dry	
Cattle						
Buffalo						
He Buffalo						

2.2 Milk Production performance

Milk production performance of buffalo

Buffalo breeds	Peak milk yield/day	Total milk yield per 300 days of lactation	Remarks/Breed of buffalo
1.Lime			
2.Parkote			
3.Gaddi			
4.Murrha			
5. Unnamed local (unidentified)			

Milk productive performance of Cattle

Performance/milk yield.	Peak milk yield/day	Total milk yield per 300 days of lactation	Remarks/breed of cattle
1.Local			
2.Jersey			
3. Holstein Friesian			
4. Others			

3. Value Chain Actors on milk production and marketing in the rural area

What are the different inputs used for milk production and their sources?
Please provide the data to be filled on the use of input related to the milk value chain?

3.1 Input sources and supplies on milk production

3.2 Milk use and available for marketing

Did you experience the milk production and consumption changed over the year? and if yes answer the followings?

3.2.1 Milk Use (home)

Years	Total milk production (ter /day)	Home consumption (ml/d)	Available milk to sale	Milk used for product diversification	
				Quantity used	Milk Products (Ghee, paneer etc)
Now					
5 yrs back					
10 yrs. back					

3.2.2 Milk marketing (collection and transportation)

Please provide the following information about the milk products and marketing?

Annex 2

Questionnaire to the Milker/Key Informants

1. Do you wash your hand and udder before milking?
Yes No
If yes, Do you use detergents chemical/ antiseptic while washing hand and udder?

If yes, what detergent you used for washing?

Equipments:

2. Do you wash the utensil used for milking and milk transportation?

If Yes, what chemical you used for cleaning?
3. Milk Distribution system
 - Mode of distribution (Processed, unprocessed and Product diversified):
4. Distance traveled for milk marketing.
5. Gender perspective in milk value chain
6. Who mostly does buffalo milking practices?
 - (a) Adult female (b) Adult male
 - (c) Male child (d) Female child
7. How much time is allocated for buffalo milking?

Gender involvement	Time spent for buffalo milking(hours) per day	
	Morning	Evening
Adult male		
Adult female		
Male child		
Female child		

8. Have you ever received training on hygienic milk production over the 5 years period of time?
(a) Yes (b) No
9. Who has received the training?
(a) Adult male (b) Adult female (c) Male child (d) Female child
If yes, what was the duration of the training? -----
10. Was the training useful to you for clean milk production and marketing?
(a) Yes (b) No
11. If not, what is the best way to improve the quality of milk from cattle and buffaloes?
(a)-----
(b)-----
(c)-----

Present and future

1. Do you think milk production and buffalo rearing is affected by change in rainfall pattern and its magnitude?
a. Yes b. No
2. Do you think milk production and buffalo rearing is affected by temperature fluctuation and its magnitude?
a. Yes b. No
3. Is there any possibility to tackle with changed consequences in buffalo keeping due to changed in climatic parameters? In terms of practices to be followed.
a. Yes, it is possible to tackle
b. No, it is hard to tackle
c. I have no idea on this issue
4. If yes, do you think differences in men's and women's roles in cattle and buffaloes milking will be visible?
a. Yes
b. No
5. Constraints and threats faced by milk producer, sellers and distributors
- 5.1. Milk producers

5.2. Milk sellers

5.3. Milk distributors

6. Suggestions (to improve milk value change system)

1.

2.

3.

4.

5.

6.

Annex 3: Map of Gandaki River Basin

