

**ECONOMIC ANALYSIS OF DAIRY PRODUCTION
AND MARKETING IN EAST SIKKIM**

Dissertation Submitted to Sikkim University in Partial Fulfillment of the
Requirement for the Award of the Degree of

MASTER OF PHILOSOPHY

Submitted by

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Date: 25th July, 2014

DECLARATION

I, Pranesh Pandey, hereby declare that the issues and matters raised in this thesis entitled “**Economic Analysis of Dairy Production and Marketing in East Sikkim**” are records of my own effort, that the contents of this thesis did not appearance for the award of any previous degree to me as well as to anybody else to my best of knowledge, and no part of this has been submitted by me for any degree in any other educational institution.

This is being submitted in partial fulfillment of the requirements of the degree of **Master of Philosophy** in the department of Economics, School of Social Science.

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CERTIFICATE

This is certified that the dissertation entitled “**Economic Analysis of Dairy Production and Marketing in East Sikkim**” submitted to Sikkim University in partial fulfillment of the requirement for the degree of **Master of Philosophy in Economics** is the result of research work that is carried out by **Mr. Pranesh Pandey** under my supervision. No part of the thesis has been submitted for any other degree.

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ABBREVIATIONS

Avg.- Average

CAGR- Compound Annual Growth Rate

DI- Dairy Income

DESME- Department of Economics, Statistics, Monitoring and Evaluation

GPU- Gram Panchayat Unit

GSDP- Gross State Domestic Product

Kg- Kilogram

ml- Millilitre

gm- Gram

Mt.- Mount

Mtr- Meter

NDDB- National Dairy Development Board

No.- Number

PCI- Per Capita Income

Rs.- Rupees

SMU- Sikkim Milk Union

SNF- Solid Non Fat

Sq.km- Square Kilometre

viz.- Visually

w.e.f.- with effect from

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Livestock production plays a major role in the life of farmers in developing countries. It provides food, income, employment and many other contributions to rural development. The important roles of livestock in the developing countries within the agricultural sector in contributing to rural livelihoods and particularly those of the poor have been emphasized (Upton 2004). Livestock provide over half of the value of the global agricultural value and one third in the developing countries. Globally, livestock contributes about 40 percent to the agricultural gross domestic product (GDP) and constitutes about 30 percent of the agricultural GDP in the developing world (World Bank, 2009). Moreover livestock also provides traction for about 50 percent of the world's farmers and is a source of organic fertilizer for most of the world's croplands, converting waste products into inputs in the production of high-value food. For these reasons, the sector has a critical role to play in making agriculture sustainable, in reducing poverty, and in contributing to economic growth.

Livestock have been an integral component of India's agricultural and rural economy since time immemorial. India's livestock sector is one of the largest in the world. The result of the 18th Livestock Census (2007), derived from village level count, has placed the total Livestock population at 529.7 million. The major livestock population in India includes 272.03 million cattle, 159.81 million buffaloes, 140.54 million goats and 71.56 million sheep. It has 56.7 percent of world's buffaloes, 12.5 percent cattle, 20.4 percent small ruminants, 2.4 percent camel, 1.4 percent equine, 1.5 percent pigs and 3.1 percent poultry. In 2010-11, livestock generated outputs worth Rs 2075 billion (at 2004-05 prices) which comprised 4 percent of the GDP and 26 percent of the agricultural GDP. The total output worth was higher than the value of food grains (Planning Commission, 2011). Livestock sector grew at an annual rate of 5.3 percent during 1980s, 3.9 percent during 1990s and 3.6 percent during 2000s. Despite deceleration, growth in livestock sector remained about 1.5 times larger than in the crop sector which implies its critical role in cushioning agricultural growth.

A dairy is a business enterprise established for the harvesting of animal milk – mostly from cows or goats, but also from buffaloes, sheep, horses or camels – for human

consumption. A dairy is typically located on a dedicated dairy farm or section of a multi-purpose farm that is concerned with the harvesting of milk. Dairy farming from being a traditional family run business today has grown hugely to an organized dairy industry with technological specializations in every part of the process. We have seen tremendous growth in dairy farming equipment that helps modern dairy farms to manage thousands of dairy cows and buffaloes. This huge boost in the industry has created a lot of farming jobs for the people. The world dairy market witnessed significant changes in the 1990s (Blasko, 2010), until late 2007 and early 2008, milk production expanded by almost 2.1 per cent in every year. Ghosh et.al (2001) said in their study that, "Dairy, fisheries and forestry are other components of agriculture with great unexplored potential. So there is a need to pay more attention to these agriculture activities. In this, dairy farming can be the viable alternative to enhance the economic conditions of the farmers." Owing to the focus on dairying, the dairy farming and production trends in developing countries are increasing over the years (Gerosa and Skoet, 2012).

In the last three decades, world milk production has increased by more than 50 percent, from 482 million tonnes in 1982 to 754 million tonnes in 2012 (FAO, 2012). According to IDF Fact Sheet-2013, the gross production value of raw milk produced across the world equals 292 billion US dollar. In terms of value, the trade of milk products equals around 64 billion US dollar. Around the globe, approximately 150 million households are engaged in milk production i.e. equivalent to 750 million people. Milk production contributes to household livelihoods, food security and nutrition. In most developing countries, milk is produced by smallholders, and dairying provides quick returns for small-scale producers and is an important source of cash income.

Identifying dairy as a crucial importance to India, particularly among the landless, smalland marginal farmers and women, an integrated cooperative dairy development programme on the proven model of Anand pattern was implemented in three phases. The National Dairy Development Board was launched in 1965, which was designated by the Government of India as the implementing agency. The major objective was to provide an assured market round the year to the rural milk producers and to establish

linkage between rural milk production and urban market through modern technology and professional management.

During the last four decades, our nation's milk producers have transformed Indian dairying from stagnation to world leadership. India became the world leader in milk production with a production volume of 127 million tonnes (National dairy development board, 2011-12) and also India produces 17 per cent of the global milk (Indian Dairy Industry Analysis, RNCOS, Feb 2012). More than 40 per cent of Indian farming households, about two thirds of which own less than 1 ha of land, are engaged in milk production as this is a livestock enterprise in which they can engage with relative ease to improve their livelihoods. Regular milk sales allow them to move from subsistence to earning a market-based income.

The cumulative annual growth of milk in India stood at 1.64 percent during the period from 1950-51 to 1960-61, 1.15 percent from 1960-61 to 1973-74, 4.51 percent from 1973-74 to 1980-81, 5.50 percent from 1980-81 to 1990-91, 4.11 percent from 1990-91 to 2000-01, and 3.77 percent from 2000-01 to 2009-10 (GOI, 2010). In terms of per capita availability of milk, India has made rapid progress with the increase in the same 128g per day in 1980-81 to 214g per day in 2000-01, and further to 263g per day in 2009-10 (GOI, 2010). The rise in annual milk production from 31.6 million tonnes in 1980-81 to 112.54 million tonnes in 2009-10 has contributed a great deal to rise in per capita availability of milk in India. This has not only placed India on top of milk producing countries in the world but also ensured sustained growth in the availability of milk and milk products for the burgeoning population (Shah, 2013).

1.2 Dairy in Sikkim

Agriculture plays an important role in Sikkim and its economy, especially rural population (about 75 percent) of people are engaged in agriculture, and two-third of the overall work force depends on agriculture and allied activities, about 17 percent of state GDP is being contributed from this sector (Kumar, 2010). The availability of land for cultivation is only 16 percent of the total geographical area. With regard to livestock farming, 80 percent household in Sikkim owns livestock which plays vital role in income earning. Major animals found in Sikkim for Livestock farming includes- cattle, sheep, pigs, goat, poultry and yak. According to the 18th livestock

census (2007), the total livestock population in Sikkim were 169829 cattle, 1536 buffaloes, 4879 sheep, 110120 goats, and 6468 yaks.

On the merger of Sikkim with the Indian Dominion in 1975 the then Governor of Sikkim – Shri B.B. Lal initiated the idea of forming a Co-operative Milk Union in Sikkim, probably being encouraged with the success that had been achieved in the State of Gujarat. Therefore, the matter was taken up with Dr.V.Kurien, the then Chairman of National Dairy Development Board (NDDB) who also paid a visit to Sikkim in 1977 as a guest of the State. After discussion with the State Government, Dr. Kurien agreed to implement “Anand Pattern” Cooperative societies in Sikkim. Accordingly, from 1978 the Spear Head Team of NDDB started working in the three districts of the State viz East, West and South. Prior to this, Sikkim Livestock Development Corporation (SLDC) looked after the dairying business since its existence in 1977. Ultimately, on 1.7.1980, Sikkim Co-operative Milk Producers’ Union Limited was formed after being registered under the State Co-operative Societies Act, 1978 and having taken over the project from NDDB, it started functioning at the present complex at 5th Mile, Tadong and at Karfectar, Jorethang w.e.f. November 1981, as an apex level (two-tier) Organization of the primary Milk Producer’s Co-operative Societies (MPCS) at village level. The Sikkim Milk Union came into being during the Operation Flood –II programme of the NDDB and was established through financial assistance by the erstwhile Indian Dairy Corporation (IDC) and technical guidance of the implementing agency, the NDDB.

As per Sikkim Producers Cooperative Milk Union, in Sikkim there were 51 organised societies under Sikkim Milk Union in the year 1980-81. In this period of time the average milk produced (in kg) per society were 251.89. Again if we see the figure of 2011-12, then we find that the number of organized societies has increased to 303 and the average milk production has increased to 256.70 kg. The primary aim of the Sikkim Milk Union is to provide remunerative market for milk producers in the far-flung remote villages and make hygienic milk and milk products available to the urban consumers at reasonable rates thereby achieving their targeted objective which is to develop the dairy sector in Sikkim.

Since last four years, Sikkim Milk Union is performing well in its activities and business by earning profit and providing better services to farmers and consumers.

The turnover of Sikkim Milk Union has grown from Rs. 2384 lakhs in the year 2011-12 to Rs. 3058 lakhs in the year 2012-13, which is 28.27 percent growth. In comparative terms, the surplus earned during the year 2012-13 was Rs, 138.52 lakhs. Out of this Rs. 37.94 lakhs of profit after depreciation, Rs. 7.91 lakhs is depreciation, Rs. 35.35 lakhs has been paid to Employee's Gratuity, Rs. 46.18 lakhs has been provided for the farmer's price difference milk price revision, Rs. 9.42 lakhs to be paid towards employee ex-gratia and Rs. 1.72 lakhs paid towards LIC leave Encashment scheme for the employees. The Sikkim Cooperative Milk Producers Union Ltd is confident that the progress achieved in the last six years since 2007-08 will be taken forward in the coming years as well with the help of all concerned.

1.3 RESEARCH QUESTIONS

1. Whether dairy sector is important sector for the economy of Sikkim or not?
2. What is the livelihood status of the families engaged in dairy business?
3. Whether production of dairy products is profitable to the farmers?
4. How marketing of dairy products done by Sikkim Milk Union?
5. How to accelerate the growth of dairy sector in Sikkim?

1.4 OBJECTIVE OF THE STUDY

- To give an overview of the Dairy Sector in the economy of Sikkim.
- To see the livelihood status of families engaged in dairy farming.
- To analyze cost of production and marketing of dairy products.
- To suggest measures for the development of Dairy Sector in Sikkim.

1.5 RATIONALE OF THE STUDY

Dairy today is the basis of a multi-billion dollar industry worldwide. The production of milk, which is also made into cheese, butter, yogurt, etc., and other dairy products provides an important part of the food supply for many of the world's people, which has huge demand in the market.

According to Staal et al. (2008), “Among various livestock products, milk and milk products constitute a major share in the value of output from the livestock sector: in volume terms India is now the world’s largest milk producer. Dairy’s share of the total value from the livestock sector increased from about 49% in 1951/52 to some 70.8% in 2000/01 (equivalent to over USD 23 billion) followed by meat and meat products (15.6%), dung (7.5%) and eggs (2.8%). Milk and milk products have emerged as the largest agricultural commodity category by value in recent years.”

Agriculture is the main source of livelihood for the rural population of India and North -East India. Sikkim is an agrarian economy with predominantly rural population (about 75 per cent) and two-third of the overall work force depend agriculture and allied activities, with only 16 per cent of geographical area available for cultivation, about 17 per cent of state GDP is being contributed from this sector (Kumar, 2010). Amongst the various professions of socio-economic importance, animal husbandry deserves high priority in the state as it plays an important role in the economic upliftment of the weaker section of society engaged in cattle rearing and processing of milk and its products. It is important to analyse the production and marketing of high priority sector like dairy in Sikkim for the upliftment of Sikkim’s economy.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Conceptual Framework

Market: A market can be visualized as a process in which ownership of goods is transferred from sellers to buyers who may be final consumers or intermediaries. Therefore, markets involve sales, locations, sellers, buyers and transactions (Debrah and Berhanu 1991).

Marketing: The process of planning and executing the conception, pricing, promotion, and distribution of ideas, goods, and services to create exchanges that satisfy individual and organizational goals (Koontz, 2001).

Marketing costs¹: The total cost associated with delivering goods or services to customers. The marketing cost may include expenses associated with transferring title of goods to a customer, storing goods in warehouses pending delivery, promoting the goods or services being sold, or the distribution of the product to points of sale.

Market margins: When companies buy a product to act as a distributor or retailer, it must sell the product at a higher price than that at which they purchased it. In such situations, the marketing margin of a product is the difference between what a company pays for the product and what it charges for the product (Ronald Kimmons)².

Supply chain in milk/ dairy: A supply chain consists of all parties involved, directly or indirectly, in fulfilling a customer request. The supply chain includes not only manufacturer and suppliers, but also transporters, warehouses, retailers, and even customers themselves. Within each organisation, such as a manufacturer, the supply chain includes all functions involved in receiving and filling a customer request.

¹ <http://www.businessdictionary.com/definition/marketing-cost.html#ixzz38pJwrCt3>

² <http://smallbusiness.chron.com/marketing-margin-20421.html>

These functions include, but are not limited to, new product development, marketing, operations, distribution, finance and customer service (Chopra et al., 2010)³

2.2 Contribution of Dairy in Economy

The economic importance of dairy has been highlighted by the IDF Fact Sheet (2013), where dairy has been placed as a universal agricultural production and a dynamic global industry, with steadily growing production trends (+2.2 percent annually on average since 2000) which are forecast to continue in the long-term. Dairy industry also actively contributes to the economies of a number of communities, regions and countries in terms of employment generation, trade and above all income.

According to Ginder et al. (2003), the dairy industry brings the total economic effects to \$3.2 billion in Iowa State of US. Dairy is among the five largest commodity groups in the state. Their study suggests that productivity in this sector is more in few dairy that produce larger quantity of milk. They also favoured the transition of the composition of dairy produce from butter and fluid milk to more ice cream production. This shows the change in the taste and preferences of the consumer as time changes.

There are many things that dairy farming brings to a community, but the most measurable is its impact on the economy. Cryan (2004) while studying U.S. dairy industry and its impact on economy has mentioned that Dairy industry has “multiplier effect” viz. output multipliers, earnings multipliers, employment multipliers. Output multipliers show how much the economy’s output is increased by an additional dollar of sales from an industry. Impacts on household income are included in the output multiplier, but they are also accounted for separately through an earnings multiplier. This shows how much household earnings are increased by an additional dollar of

³ Chopra, S. Meindl, P. Karla, D.V. (2010) Supply Chain Management, Strategy, Planning And Operation, p.2, 4th edition, Dorling Kindersley (india) pvt. Ltd. Publishing house

sales from an industry. Another number of clear interests are the employment impact of an industry. The employment multipliers are the number of jobs created by increasing annual industry sales by one million dollars. Similar study has been conducted by Stevens et al. (2005), where they have evaluated the positive economic impacts or contributions in terms of revenues, income, taxes, or jobs, resulting from business activities associated with dairy farming and dairy product manufacturing in the Southeast United States.

O'Toole et al. (2008), in their study on "Economic impact of the Dairy and Blue Gum Plantation Industries in South West Victoria", informed that within the dairy intensive region, the dairy sector as a whole (milk production and manufacturing) generates 21 per cent of the region's output; adds 16.5 per cent to gross regional product; provides 13.7 per cent of the region's employment, generates 8.8 per cent of the region's income; is responsible for 50.4 per cent of the region's exports and 36 per cent of the region's imports. Multiplier estimates done by them to know the impact of dairy in the economy, indicated that for every dollar increase in regional dairy cattle output, 18 cents of extra output is created in the regional economy.

The study conducted by Neibergs et al. (2007) with regard to the contribution of dairy in Washington's economy in USA, came out with the conclusion that dairy production is a vitally important agriculture commodity in Washington's economy. There is both direct as well as indirect economic impact via dairy production in terms of income and employment growth within the dairy industry and its supporting businesses. Because of linkages in the industries, economic changes in the dairy sector have an impact on the general economy in Washington. Their estimation showed Washington's annual dairy farm's total economic impact to be \$1.47 billion dollars to the economy in 2006. In terms of employment, Washington's dairy direct employment effect was 6,168 jobs, its indirect employment effect was 3,626 jobs and its induced effect was 2,859 jobs. Washington dairy farms total employment was 12,653 jobs.

Similar study has been undertaken by Horner et al. (2013) to assess the economic contribution of Missouri's dairy product manufacturing industries to the state's economy in USA, their study came out with the result that in 2011, Missouri's dairy product manufacturing industry generated state revenue worth \$7.7 billion. Including

all the direct, indirect, and induced jobs created by Missouri's dairy product manufacturing industries, a total of 23,297 jobs were supported. These jobs provided \$1.2 billion in labour income. Missouri's gross domestic product (GDP) was \$2.0 billion larger due to the value added by Missouri's dairy product manufacturing industries. To capture the total economic contribution of the dairy product manufacturing industries upon Missouri's economy, they developed using estimated revenue and economic modelling software to estimate the multiplier effects.

According to the study of Schilling et al. (2010) in New Zealand, they found dairy sector to be significant and there is ongoing benefits in the economy via dairy. They mentioned that due to changes in dairy sector, in terms of growth in the volume and price in the sector, has led other sectors outside the dairy sector to be benefited which has generated in the improvements of standard of living in the economy. They too came out with the interesting result where they have highlighted the importance of dairy, as dairy contributes 2.8 percent to GDP, which is greater than the combined GDP contribution by fishing, forestry and mining. Dairy is 10 times greater than the wine sectors GDP, 40 percent larger than electricity, gas and water sector, 26 percent of the total goods export is accounted by dairy, and many more. This shows the contribution of dairy in economy. In relation to the study i.e. the role of dairy in New Zealand, the Governor of New Zealand, *Graeme Wheeler* (2014), delivered his speech titled, "The significance of dairy to the New Zealand economy." In his speech, he focussed the important role played by dairy in the economy especially in terms of exchange rate. He mentioned that there has been rise in dairy export revenue over the past two decades. He further said, "At \$15.5 billion, dairy exports make up almost a third of New Zealand's annual merchandise exports." According to him, an important factor that has led the rise in New Zealand's exchange rate has been the strength of the terms of trade and terms of trade has been improved due to rise in the price of dairy products.

World is familiar with the fact that today India is the leader in milk. According to the Economic Survey 2012-13, milk production has gone up from 53.9 million tonnes (MT) in 1990-91 to 127.9 MT in 2011-12. In terms of value dairy alone accounted 305484 crore in 2011-12, according to NDDDB. There are various studies that have been done to see the contribution of dairy in the Indian economy.

According to CSO (2013), the contribution of agriculture in the country's GDP is above 15 percent of which the share of livestock is about 3.9 percent. Further the livestock sector accounts 25 percent of total agriculture GDP, indicating a significant role in the socio economic situation of India.

Dairy, a subsector in livestock plays an important role in the rural economy of India according to Sarker et al. (2010). They advocated dairy to be a very important productive activity in Indian agriculture, which generates a regular flow of income to the farmer's family throughout the year. They also recognized dairy as an important activity suitable for employment generation and value addition in the agricultural sector in the Indian economy in general and for rural families especially, small and marginal farmers and landless agricultural labourers in particular. Similarly Shinde (2011) revealed that dairy accounts 65 percent share in livestock sector GDP. He further added agriculture has got a prime role in Indian Economy. Again in this, dairy provides income and employment not only to the workers sections of the society but also to the farming community of the country in general. Small holder farmers can be benefited if they combine dairy with crop production.

The introduction of White Revolution has significant impact in the dairy industry of India. Shukla et al. (1995) examined the impact of Operation Flood Programme (launched in 1970) on production, consumption and marketed surplus of milk and on income and employment generation on different categories of milk producers by comparing the programme and non-programme areas in Kanpur – Dehat district of Uttar Pradesh. Their findings suggested that the productivity of milch animals, production of milk and the marketed surplus were higher in the programme area compared to the non-programme area. On the whole, their assessment is that the programme had a positive effect on income and employment. Similar study of operation flood and its positive impact has been studied by Cunningham (2009), found that Operation Flood was a key element in the transformation of India into a self-sufficient milk producer, and even into a milk exporter. By pointing the way to the use of production-enhancing technologies, establishing more effective and efficient supply chains, and orienting producers toward markets, Operation Flood helped promote a more productive Indian dairy industry. Milk is now big business in India. His study shows as of 2007 India was the largest milk producer in the world,

and milk was a bigger contributor to the country's gross domestic product than rice. At least 20 percent of India's agricultural economy is composed of dairying, and about 70 percent of the rural population is somehow involved in milk production. The growth in production has made milk increasingly available to consumers, providing an important source of nutrition for millions of people. Similarly 80 percent household in Sikkim owns livestock which plays vital role in income earning (Kumar, 2010).

2.3 Dairy as a Source of Livelihood

Dairy can be the source of livelihood for millions specially in developing nations where farmer holds small dairy farming. FAO (2008), mentioned smallholder dairy development should be seen as an enterprise-driven approach to livelihood enhancement as well as an instrument of rural poverty reduction. It is not an end in itself and should be considered as part of the rural poverty reduction agenda. As regular earnings from selling milk enhance rural livelihoods appreciably, through: (i) better nutrition, (ii) higher disposable income, (iii) asset accumulation, and (iv) enhanced social standing, the majority of subsistence smallholder milk producers aspire to become more intensive small dairy farmers. Smallholder dairying reduces the incidence of poverty by sustainably increasing regular family income, asset accumulation and social standing, provides non-farm jobs – one job for every 10 to 20 litres per day of milk collected processed and marketed, enhances development opportunities for women, sustains the environment by promoting integrated farming and optimizing use of local natural resources, including the exploitation of locally generated fodder, feed and crop by-products for feeding animals.

Melesse et al. (2012) studied about dairy and its technology in Ada'a and Lume districts of central Ethiopia, where they found that the adoption of dairy technologies has significant impacts on livelihood indicators such as household income, nutrition, food security, health care and access to education. The result in both study areas shows a strong linkage between higher incomes and improvement of livelihood resulted from the introduction of dairy technologies. The income of dairy farmers in both districts is significantly raised due to the adoption of different dairy technologies most importantly improved breeds. The higher income of the farmers is highly attributed in both districts to the sale of milk. In the majority of dairy producing

households the income from dairying is more sustainable and regular. Moreover, it can be concluded that adoption of dairy technologies is a significant determinant for the increase in the household income of dairy farmers in both districts. Similar study on livelihood through dairy has been studied by Bhujel (2013) in Bhutan, where he concluded that the small holding dairy farming plays an important role in income generation and livelihood improvement of the household. Further this study indicates that the income from dairy are used in supporting various livelihood factors. Among these livelihood factors, income from dairy is used mostly for buying household items such as food items and clothes which are the basic necessities. Besides its roles in environmental conservation, its social contribution is noteworthy. Therefore, within the integrated farming system principles, small holding dairy farming is truly a foundation for sustainability and a pathway towards achieving self-reliance thereby the contentment and Gross National Happiness.

Hemme et al. (2003) emphasised the role of dairy as a livelihood for Indians. They mentioned more than 40% of Indian farming households, about two thirds of which own less than 1 ha of land, are engaged in milk production as this is a livestock enterprise in which they can engage with relative ease to improve their livelihoods. Regular milk sales allow them to move from subsistence to earning a market-based income. Also developments in the dairy sector will have important repercussions on their livelihoods and on rural poverty levels. Datta et al. (2010) also mentioned in their study that Dairying in India is more inclusive compared to crop production in the sense that it involves a majority of the vulnerable segments of the society for livelihoods. Nearly two-thirds of farm households in India are associated with livestock production, and 80 per cent of them are small landholders (≤ 2 ha). The livestock, specifically dairying is a supplementary enterprise to crop farming and is highly integrated with crop production. More than 75 per cent of the farmers keep 2-3 milch animals for subsistence of their livelihoods.

There are various studies based on the role of dairy in supporting livelihoods to the poor farmers of India. Almost all studies favour dairy which is helping small and landless farmers with regard to their livelihood. But there exist problem too for those practicing dairy which has been highlighted by Nargunde (2013). He concluded that “the dairy sector is still characterized by small-scale, scattered and unorganized milch

animal holders; low productivity; inadequate and inappropriate animal feeding and health care; lack of assured year-round remunerative producer prices for milk; inadequate basic infrastructure for provision of production inputs and services; inadequate basic infrastructure for procurement, transportation, processing and marketing of milk and lack of professional management.” But with these hurdles, dairy cannot be neglected. The dairy sector holds high promises as a dependable source of livelihood for the vast majority of the rural poor in India. This has been possible due to the model called AMUL, made especially for small-scale dairy producers, helping in both production and marketing. Over the last 50 years, AMUL holds high promises for smallholder dairy development in India.

Vallapureddy (2013) in his study also emphasised the importance of dairying for livelihood especially for poor farmers of rural India. He mentioned in rural India, people face a lot of hardship to earn livelihood. Maximum numbers of rural people are engaged in agriculture, livestock rearing, etc. Here to earn livelihood is very difficult just by practicing these occupation especially agriculture, where people are still dependent on erratic monsoon and so fail to earn minimum level of income for their sustenance. So by livestock rearing and selling milk, they can earn alternate income. His study shows the importance of livestock rearing and dairying but he has kept dairying as a secondary income source. Similar is the view point of Nedelea et al. (2009), while studying the dairy farming activities in Bangladesh, they emphasised dairy as an alternative source of income apart from cultivation. They concluded by advocating that dairy could give more social acceptability in a sense of self-sufficiency, generating consistent revenue, easy mode of loan facilities from the financiers/NGOs, waste management (dairy wastage could be used in the agricultural land as an alternative of fertilizer or help to generate fireworks for rural burner in kitchen).

According to the study conducted by Mumba et al. (2011) in Zambia, they concluded that Smallholder dairying in Zambia plays an important role in poverty reduction, employment opportunities, wealth creation and nutritional household food security. Therefore, Government, donors and other service providers need to allocate more resources towards holistic smallholder dairy development particularly in the areas of

marketing, value addition, infrastructure development, knowledge transfer and animal breeding.

2.4 Cost and Marketing of Dairy

Ghosh et al. (2002) in their study in Bangladesh mentioned that the cooperative farmers were producing more milk per cow compared to non-cooperative farmers. Price fluctuation in marketing is one of the important constraints for the small dairy farmer. The seasonal price fluctuation was higher. Similar study with regard to the seasonal price fluctuation in dairy product (cheese) has been put forwarded by Weber et al. (2012).

However, the cooperative price was fixed and it varied according to the fat content of the milk. The average price of milk received by the dairy farmers was higher with cooperative marketing system compared to non cooperative system. It means marketing channels of cooperative are more efficient than the other channels. The milk price is not fixed under the traditional marketing system and milk producers frequently suffer from low price, seasonal price fluctuation and irregular payments. Middlemen on the other hand, appropriate larger margins from milk market often mixing fresh milk with water and powder milk. The milk quality supplied to urban markets through middlemen was not of good standard and price of milk varied according to different types of consumers even at the same market. Generally, the infrastructures for milk marketing are not available in the markets. Lack of infrastructure also damages the quality of milk. But the cooperative provides all modern marketing facilities to their members for marketing their milk. The milk supplied under cooperative system is hygienic and guaranteed with price and quality (Ghosh et al. 2002).

Similarly, Omore et al. (2009) in their research work on Market mechanisms and efficiency in urban dairy products markets in Ghana and Tanzania, also emphasized on infrastructure and advocated that profitability is shown to be associated with higher investments in capital equipment including metal cans and transportation and processing equipment. Also, efficiency increase with scale of operation. Overall, these suggest favourable opportunities in more intensive enterprise can be achieved with investment in more intensive, sophisticated enterprises, pointing at opportunities for

those agents who are particularly entrepreneurial. Among small-scale milk sellers, formation of milk marketing institutions such as groups may be one policy goal with the aim of improving efficiency in the system overall.

Dhaka et al. (2006) while studying the marketing efficiency of dairy products for cooperative and private dairy plants in Tamil Nadu found that the marketing cost for toned milk is same in both the dairy plants, where as it is higher for standardized milk, full cream milk and flavoured milk in the co-operative dairy plant. The marketing cost has been found less in the cooperative plant for products like butter and ghee. All the dairy products earn more marketing margins in the private than co-operative dairy plant, except for toned milk.

Hemme et al., (2003) found that simulation of increased productivity, better farm financing and improved milk marketing, as they could result from pro-poor dairy development policies; show that landless rural dairy farmers do have the potential to reduce the cost of milk production to the level of the larger farms. They could thereby achieve an income from dairying that provides higher returns to labour than the prevailing minimum wage rate in the area and fully cover their production costs. Thus, landless people in rural areas theoretically have the potential to run a profitable dairy enterprise, which generates employment for family members, especially women, and significantly improves their living conditions. The main risks of dairying identified by the farmers are not having an animal in milk in any one year, the death of a lactating animal, and having to pay for straw, which is the main feed source.

Kumar et al. (2010) conducted their study in Assam, India, to see whether traditional milk marketing and processing is viable and efficient or not. They found that there is a continued dominance of traditional milk marketing and processing which are efficient too. The increased attention to quality by the growing middle class may work against these markets which are otherwise competitive and efficient. The quality gap can be bridged to a large extent by introducing training and certification programs for small scale milk and dairy product processors which in turn would be helpful in maintaining the efficiency and competitiveness of these milk market agents.

Karmakar et al. (2006) in their study suggested that If India has to emerge as an exporting country, it is imperative that we should develop proper production,

processing and marketing infrastructure, which is capable of meeting international quality requirements. A comprehensive strategy for producing quality and safe dairy products should be formulated with suitable legal backup.

2.5 Constraints Faced in Dairy Farming

The study conducted by Rajendaran et al. (2004) indicated that 80 percent of the milk produced by the rural producer is handled by an unorganized sector and the remaining 20 percent is handled by an organized sector. Their study favoured vital role played by dairy co-operatives in alleviating rural poverty by augmenting rural milk production and marketing. The major constraints present in the Indian dairy sector according to them is the involvement of intermediaries; lack of bargaining power by the producers; and lack of infrastructure facilities for collection, storage, transportation, and processing which affect the prices received by producers in milk marketing. Datta et al. (2002), in the context of unorganised sector marketing of dairy emphasised that marketing of dairy via unorganised sector may discourage small dairy farmers in the production of dairy, which is necessary in the scenario of the strong demand growth.

The major constraints identified by Yigrem et al. (2008) for dairy development in Shashemene–Dilla area, South Ethiopia, included availability and costs of feeds, shortage of farm land, discouraging marketing systems, waste disposal problems, lack of improved dairy animals, poor extension and animal health services, and knowledge gap on improved dairy production, processing and marketing. Moreover their study suggested that dairy development in the studied areas can be improved by encouraging private investors to establish dairy processing plant, and thereby rural and urban producers could be encouraged to enter into milk collection process. Again, smallholder dairy producers should be supported through services related to feed supply, land, and marketing systems, waste disposals, veterinary, AI, credit, extension and training. Similarly, Negassa (2009) studied the constraint of dairy farmers in Arsi zone, Ethiopia. The study found the three most frequently reported constraints were lack of feed (70 percent), lack of capital (43 percent) and lack of extension services (23 percent).

Khoveio et al. (2012) while studying the, "Economics of Milk Production and its Constraints in Nagaland," observed that low availability and high price of concentrate was the major production constraints in milk production for both cooperative and non cooperative member households, while low price of liquid milk was the major marketing constraint for cooperative members and delay in payment by unorganized sector was the major constraint for non co-operative members. Similar view has been understood from the study of Balakrishna (1997) in Karnataka favoured high cost of concentrate to be the major constraints in milk production in the study area. In addition to this, lack of veterinary facilities was also considered to be major constraints for many dairy farmers.

In order to study the constraints in dairy production and marketing, a schedule was developed in accordance with the available literature. Accordingly, constraints were identified which were related to both production and marketing constraints and thereafter the response of the sample households were recorded.

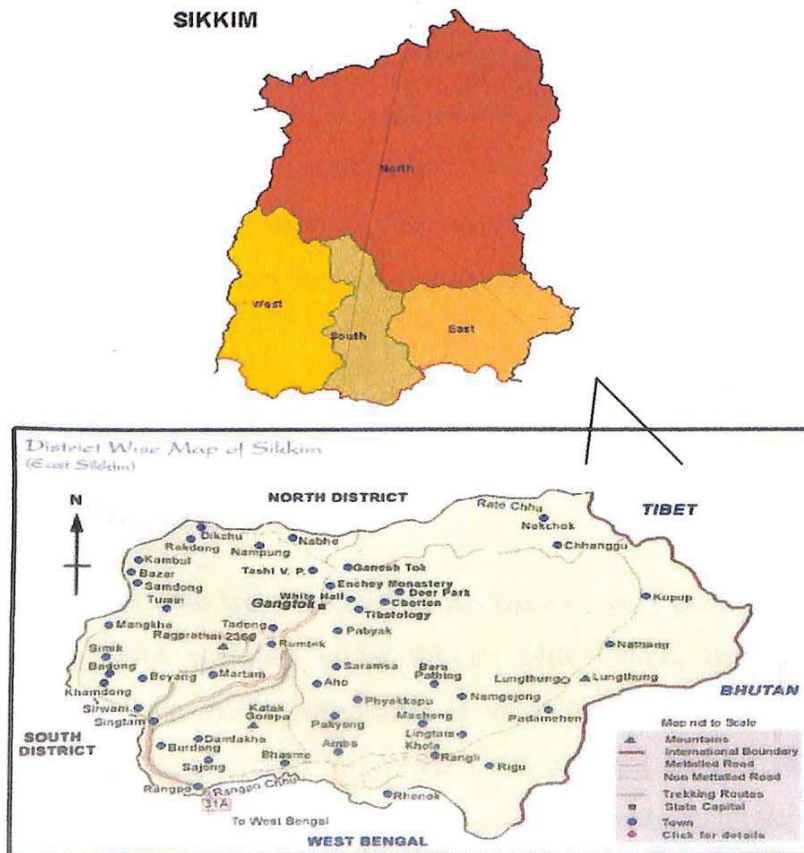
CHAPTER 3

METHODOLOGY

3.1 Study Area

The study has been concentrated in East Sikkim because of greatest percentage mix of urban and rural population. The study has been conducted in five Gram Panchayat Units of East Sikkim, namely- Assam Lingzey, Dholepchen, Khamdong, Namcheybung and Rawte-Rumtek. The study areas have high potential for livestock production which is mainly undertaken by smallholder producers. Livestock production is an important economic activity in the agricultural development and has historically played various roles both in economic life and in socio-cultural traditions of the study areas. There is also an existence of milk co-operative societies under the Sikkim Co-operative Milk Producer's Union in the study areas. Despite the potential and huge demand in the urban and sub-urban areas, existing production and income generating capacity of dairying is not encouraging.

MAP-3.1: Location of Study Area, East Sikkim .



3.2 Sources of Data

The study is based on both secondary and primary data. The secondary data have been collected for understanding the importance of dairy sector in the economy of Sikkim. The data has been collected from various published sources: Department of Animal husbandry, Directorate of Economics, Statistics, Monitoring and Evaluation, Government of Sikkim and Sikkim Co-operative Milk Producers' Union. The various Secondary data of Sikkim includes- State Gross Domestic Product of Sikkim, Total Revenue from dairy of Sikkim Milk Union, Total number of Cross and indigenous breeds of Sikkim, year wise production of milk and milk products from Sikkim Milk Union, total number of organised societies under Sikkim Milk Union, total number of individual members under Sikkim Milk Union, contribution of Agriculture and livestock sector to the SGDP of Sikkim, etc. The secondary information about dairy in world and national level has been collected from various published sources which includes Food and Agriculture organisation, NDDB (National Dairy Development Board), etc.

The primary data has been collected using the structured scheduled focusing on both dairy co-operative member as well as non-member households for understanding the livelihood status of families dependent on dairy in the study areas. The study has mainly emphasized on the production aspects as well as the marketing aspects of dairy. The data collected from the dairy households include milk production, consumption and marketed surplus, price of milk, annual income from dairy as well as non-dairy sources, expenditures in dairy and the demographic characteristics of the dairy household.

3.3 Sample Size and Method of Sampling

3.3.1 Sampling Procedure

The study areas were selected on the basis of dairy practices and the presence of dairy co-operative societies under Sikkim Milk Union, where both member and non-member households contributes to value addition of the dairy commodities in the area. The areas (Gram Panchayat Unit) selected for this study are Assam Lingzey, Dholepchen, Khamdong, Namcheybung and Rawte-Rumtek.

The 100 households were selected who were engaged in dairy farming. Out of total sample 20 households (farmers) from each GPU has been selected, where 10 households from each GPU belong to co-operative member households and 10 belong to non- member households.

Based on drawn sample, dairy household survey was carried out personally. In the course of data collection, there was an appropriate precaution to ensure collection of high quality information.

3.4 Method of Data Analysis

Descriptive statistics and econometric analysis were used for analyzing the data collected from the sampled dairy households in the study areas as well as data from the secondary sources to fulfil the required objective.

3.4.1 Descriptive Statistics

Descriptive statistics in the data analysis refers to the use of ratios, percentages, means, t, f, and chi test in the process of comparing socio-economic characteristics of the dairy households of the study areas. Similarly, descriptive statistics e.g., means, standard deviation and Compound Annual Growth Rate have also been used for analysing the secondary data. For descriptive analysis standard statistical software package has been used.

3.4.2 Econometric Analysis

For more details and extensive analysis of information, where data was collected from primary sources, a multiple regression analysis has been performed in the present study.

The multiple regression analysis has been performed to observe the factors influencing dairy income in the sampled dairy households. For this purpose, following simple regression model has been fitted.

$$Y_i = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + U_i \quad (i)$$

Where,

Y is dairy income of sampled household

X₁ is Total Number of Cattle

X_2 is Amount of Milk Sale

X_3 is Family Size

X_4 is Price of milk

a is the constant

b_1, b_2, b_3, b_4 and b_5 are slope coefficients

U_i is the error term

3.5 Costs and Returns Concepts

Fixed Cost: It includes interest on fixed capital and depreciation on animals, cattle sheds and implements and utensils. The interest on fixed capital has been worked out at the then prevailing rate of interest i.e. at 10 per cent per annum.

Depreciation on fixed capital has also been worked out for milking cattle (cows), cattle shed, implements and utensils keeping in view the present value and useful economic life of the capital asset (Khoveio et al. 2012).

Depreciation rate was worked as follows:

Cows - 10 per cent (productive life 10 years),

Cattle shed – 10 percent, (productive life 10 years)

Implements and utensils – 20 percent, (productive life 5 years)

Variable Costs

These costs include feed cost, labour cost, veterinary cost and other miscellaneous costs.

Feed cost: The cost incurred on green fodder⁴, dry fodder and concentrate to feed the animals constitutes feed cost. It was worked out by multiplying quantities of feeds and fodder consumed by animals with their respective prevailing prices in the study area. The entire sampled household adopted collective stall-feeding of their cattle.

⁴ Cost of green fodder was not taken into consideration due to availability in the study area at free of cost.

Labour Cost⁵: It included family as well as paid hired labour. The hired labour was calculated considering time utilised in various dairy activities and wages paid.

Veterinary Cost: It included the cost incurred on natural service, artificial insemination (A.I.), vaccination, medicines and other charges/fees of veterinary doctors.

Miscellaneous Costs: The cost of repairs, electricity, water charges, bucket, rope, salt etc formed this group⁶.

Total Cost: It was obtained by adding all the cost components included in the fixed and variable costs, i.e.

Total Cost = Total Fixed Cost+ Total Variable Cost

3.6 Costs per Litre of Milk Production

In order to estimate the cost per litre of milk, the total cost per day was divided by average milk production per animal per day, i.e.

$$\text{Cost Per Litre (Rs.)} = \frac{\text{total cost per day}}{\text{total milk produced per day}}$$

3.7 Profit margin per litre of milk production

With regard to the estimation of profit margin per litre of milk, total cost was subtracted the price of milk, i.e.

Profit margin per litre (Rs.) = price of milk – total cost

3.8 SCOPE AND LIMITATIONS OF THE STUDY

Area considered for this study was selected from five villages of East Sikkim, namely Assam Lingzey, Khamdong, Namcheybong, Dalapchand and Rawte-Rumtek. Due to financial and time constraints, not all dairy derivatives found in the study area were covered. However, the study focused on only major dairy derivatives both for cooperative as well as non cooperative member households.

⁵ Imputed cost on family labour was not taken into consideration.

⁶ Present study incorporated cost of salt and ropes in this section

3.9 ORGANISATION OF THE STUDY

The present study has been organized into six chapters, they are as follows:

Chapter I: Introduction

Chapter II: Review of Literature

Chapter III: Methodology

Chapter IV: Economy of Sikkim: a Brief Profile

Chapter V: Results and Discussion

Chapter VI: Conclusions and Suggestions

CHAPTER 4

ECONOMY OF SIKKIM: A BRIEF PROFILE

The present chapter has made an attempt to give a brief economic profile of the tiny Himalayan state of India, Sikkim. Before discussing the economic profile of the state, the study has start over with endowing information on location of Sikkim (section 4.1), demographic features of Sikkim (section 4.3), geographical profile (section 4.4) of Sikkim.

The economic profile in the chapter has been organised as follows: in section 4.5 the classification of population of Sikkim by economic activity from 1981 till 2011 has been discussed. Information relating to the different categories of workers, their share in total population and their annual growth rate has also been presented in this section. Section 4.6 examines the share of different sectors in the total GSDP of Sikkim from 2004-05 till 2011-12 along with the calculation of CAGR for the same time period. The contribution of livestock sector in GSDP of Sikkim during the period of 2004-05 till 2010-11 has been observed in section 4.7. The general profile of East Sikkim and the study area has also been presented in section 4.8 and 4.9 respectively.

4.1 Location

Sikkim is one of the far flung States of India. The State is located of the foothills of Eastern Himalayas between latitude of 27degree 49" and 28 degree 10" north and the longitudes of 88 degree 28" and 88 degree 55" East. Sikkim is the 22nd state of India came into existence with effect from 16th May, 1975. Sikkim is a very small hilly state in the Eastern Himalayas, extending approximately 115 Kms from north to south and 65 Kms from east to west, surrounded by vast stretches of Tibetan Plateau in the North, Chumbi Valley of Tibet and the kingdom of Bhutan in the east, Darjeeling district of West Bengal in the south and the kingdom in Nepal in the west. The state being a part of inner ranges of the mountains of Himalayas has no open valley and no plains but carried elevations ranging from 300 to 8583 mtrs above mean sea level consisting of lower hill, middle and higher hills, alpine zones and snow bound land, the highest elevation 8583 metres, being the top of the Mt. Kangchendzonga itself. Sikkim has been divided into four districts and each district has further been

bifurcated into two sub-divisions for administrative purpose except the East district which has four sub-divisions. Sikkim state being a part of inner mountain ranges of Himalayas is hilly having varied elevation ranging from 300 to 8540 meters. But the habitable areas are only up to the altitude of 2100 metres, constituting only 20 per cent of the total area of the state. The highest portion of Sikkim lies in its north-west direction. A large number of mountains having altitudes of about seven thousand meters stands here with - Kanchenjunga (8598 m.), The third highest peak in the world. The high serrated, snow capped spurs and peaks of Kanchenjunga look attractive consisting of Kumbha Karna (7711 m.), Pendem (6706 m.), Narsingh (5825 m.), Kabru Dome (6545 m.), etc. A number of glaciers descends from eastern slopes of Kanchenjunga into Sikkim where snow clad line is found above 5300 mtrs. The biggest of them is Zemu, from whose snout above Lachen monastery rises the river Teesta. Teesta is the main river and its main tributaries are Zemu, Lachung, Rangyong, Dikchu, Rongli, Rangpo and Rangit which form the main channel of drainage from the north to the south. It boasts of the great mount Kanchendzonga as its crown. Ethnically Sikkim has mainly three groups of people viz. Nepalis, Bhutias, Lepchas. The local language is Nepali. English is the official language. This jewel-like mountain state of ethereal beauty with an area of 7096 sq. km nestles in the heart of Himalayas. Cradled in the manifold splendours of nature deep within the snow clad Himalayas is Sikkim's capital Gangtok, wrapped in mists and clouds, a garden state with an incredible variety of rhododendrons and a host of other flowers. (State Industrial Profile of Sikkim, 2010-11; p: 2-3)

4.2 Demographic Features of Sikkim

Sikkim is a multi-ethnic state. Broadly, the population can be divided into tribal and non-tribal groups. Lepcha's, Bhutia's, Sherpa's are categorized as Scheduled Tribes. The Lepcha's are the original inhabitants of the state. Compared to other ethnic groups, the Lepcha's still maintain many of their traditional ways. The Bhutia's comprise, the Sikkimese Bhutia and Bhutia from Bhutan and Tibet. The Sherpa's are a marginal ethnic group in the state. Over 70% population consists of Nepalese. They are dominant ethnic group in the state. The people from the plain mostly involved in trade and services represent a marginal group (ibid; p: 3).

The total population of Sikkim according to Census of India 2011 is 610577. This accounts for only 0.05 per cent of the total population of the country. The population of the State has grown by 12.89 per cent between 2001-2011 as against 33.06 per cent between 1991-2001. The sex ratio (i.e., the number of females per thousand male) of population was recorded as 890 which have increased from 875 in the previous census. Total literacy of the State rose to 81.40 from 69.68 per cent in 2001 Census. Out of the total population of 610577 there are 323070 male and 287507 females. The total population in the North District constitutes 7.2 per cent, East District 46.3 per cent, South District 24.1 per cent and West District 22.3 per cent. Similarly decimal growth rate (2001-2011) is 31.34 per cent for North, 15.73 per cent for East, 11.65 for South and 10.69 per cent, for West whereas for State it is 12.89. The density of population is 10.34 in North, 297.26 in East, 195.8 in South and 117.01 in West as compared with State density of 86. The sex ratio is (females per thousand male) is 767 in North, 873 in East, 915 in South and 942 in West as compared to 890 for State. The literacy of State is 81.40 per cent in 2011 as compared to 74.04 per cent of the national level.

Table-4.2: Sikkim at a Glance, 2011

Sr. No.	Items	Sector	State
1	Area (in Sq. Kms)	State	7096
2	Number of Districts	State	4
3	Number of Sub divisions	State	16
4	Number of Block Administrative centres	State	31
5	Number of Gram Panchayats	State	176
6	Number of Panchayat Wards	State	989
7	Number of Municipal Corporations	State	7
8		State	610577
		Male	323070
		Female	287507
		Rural	456999
		Urban	153578

	Population (Census 2011)	Child Population(0-6 yrs)	64111
		Child Population(Rural)	49218
		Child Population(Urban)	14893
		SC Population	28275
		ST Population	206360
9	Density of Population(Persons/sq km)	State	86
10	Sex Ratio (Females/1000 males)	State	890
		Rural	882
		Urban	913
11	Child Sex Ratio (Females/1000 males)	State	957
12	Literacy (%) (census 2011)	State	81.40
		Male	86.60
		Female	75.60
		Rural	78.90
		Urban	88.70
13	Total Number of Workers	State	308138
14	Main Number of Workers	State	230397

Source: Population and demographic indicators, Census 2011

4.3 Geographical Area of Sikkim: The total geographical area of the state is 7096 sq. kms. The state is divided into four districts for which detail is given in table 4.3:

Table- 4.3: Details of the Districts in Sikkim, 2011

State/Districts	Area in	Share in	Population	Share in
North District	4,226	59.56	43709	7.16
South District	750	10.57	146850	24.05
East District	954	13.44	283583	46.45
West District	1,166	16.43	136435	22.35
Sikkim	7,096	100.00	610577	100

Source: DESME, Government of Sikkim

According to the table 4.3, it can be depicted that in Sikkim there are four Districts- North, South, East and West. Accordingly, the most populous District is East with 46.45 per cent of the total population and least amongst all is North which constitute only 7.16 per cent population. But in terms of proportion to total area of the state, then we can observe that North District occupies higher amongst all as shown in the above table.

4.4 Classification of Population of Sikkim by Economic Activity (1981-2011)

In table 4.4, we classify the population of Sikkim into different groups based on their economic activity for the period, 1981-2011. Total workers are divided into main workers, marginal workers and non-workers based on the volume of work. The main workers are further divided into cultivators, agricultural labours, workers engaged in household industrial activities and other workers.

Table- 4.4: Classification of Population of Sikkim by Economic Activity (1981-2011) (%)

Sr. No.	Item	1981	1991	2001	2011	Annual Growth Rate
Absolute Number						
1.	Population	316385	406457	540851	610577	3.10
2.	Main Workers	147436	164392	212904	230397	1.88
A	Cultivators	88610	97834	101200	117401	1.08
B	Agricultural Labourers	4887	13793	9081	25986	14.39
C	Worker in Household Industry	1586	1309	3168	5143	7.48
D	Other Workers	52353	55785	99455	159608	6.83
3.	Marginal Workers	5378	4329	50139	77741	44.85
4.	Non Workers	163571	237736	277808	302439	2.83
Share in total population						
I	Main Workers	46.60	40.45	39.36	37.73	
A	Cultivators	28.01	24.07	18.71	19.23	
B	Agricultural Labourers	1.54	3.39	1.68	4.26	

C	Household Industry	0.50	0.32	0.59	0.84	
D	Other Workers	16.55	13.72	18.39	26.14	
II	Marginal Workers	1.70	1.07	9.27	12.73	
III	Non Workers	51.70	58.49	51.36	49.53	

Source: Statistical Journal 2013, Department of Economics, Statistics, Monitoring and Evaluation, Government of Sikkim

Note: a, b, c & d= Main + Marginal Workers

It has been observed from table 4.4 that from 1981 till 2011, the per cent share of non workers in total population were highest amongst all in every period of time. As time has progressed, the share of main workers comprising of cultivators, agricultural labourers, household industry workers and other workers which were 46.60 per cent in 1981 has declined to 37.73 in 2011. The declining share of main workers in total population as shown in table 4.4 indicates increase in the unemployment rate. However the per cent share of marginal workers in total population has increased over a period of time which has been shown in table 4.4.

The annual growth rate has also been shown in the table 4.4 where marginal workers annual growth rate from 1981 till 2011 is highest among other section of workers and there is a marginal increment in the category of cultivators and main workers.

4.5 Sector Wise Contribution to GSDP of Sikkim

The sector wise contribution to GSDP of Sikkim at current price (Rs. in lakhs) and their CAGR has been presented in table number 4.5:

It has been observed from table 4.5 that the contribution of total agriculture sector in Sikkim's GSDP was Rs 28503 lakhs during 2004-05 where it accounted approximately 16.39 per cent share in GSDP and it was Rs. 38088 in the year 2011-12 which was approximately 7.42 per cent share in GSDP. This shows that there has been huge decline in the agriculture sector contribution in Sikkim's GSDP. During the same period of study, the observation relating to primary sector and its contribution in Sikkim's GSDP shows during 2004-2005 its contribution to total GSDP was 18.71 but was decreased dramatically to 8.26 per cent during 2011-12. Similarly the contribution of secondary sector to GSDP during 2004-05 was 28.72 per cent but later in 2011-12, it has dramatically increased to 58.89 per cent. The secondary sector

contribution in GSDP of Sikkim is highest. Table 4.5 also shows the tertiary sectors GSDP which accounted 52.58 per cent share in GSDP in the year 2004-05 but as time has progressed, its share in total GSDP of Sikkim has declined to 32.85 per cent in the year 2011-12.

Table- 4.5: Revised GSDP of Sikkim at Constant Prices (base year: 2004-05) (Rs. in Lakhs)

SECTORS	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12*	CAGR
Total	28503	29835	29900	31307	32999	34565	36466	38088	4.1
Agriculture									
Primary Sector	32533	33878	33915	35248	36901	38476	40391	42389	3.7
Manufacturing	6720	6877	7413	8500	9265	125173	177714	182739	57
Secondary sector	49946	55842	59790	65729	88565	242201	282850	302125	30
Industry	50154	56059	60015	65968	88955	242622	283338	302962	29.9
Total of tertiary sector	91436	101225	108680	116846	128033	159424	155187	168517	9.1
Gross State Domestic Product	173915	190945	202385	217823	253499	440101	478428	513030	17.4
Per Capita Income	30727	33324	34834	37108	42605	73106	78560	83149	16.2

Source: DESME, Government of Sikkim

*Provisional Estimates

The CAGR of various sectors as observed from the table 4.5 indicates, manufacturing sector, sub sector of secondary sector has shown an impressive trend with 57 per cent

growth rate per annum, while primary sector's growth rate is very less as compared with other sectors.

4.6 Contribution of Livestock Sector in GSDP of Sikkim

The contribution of livestock sector, sub sector of agriculture sector, in total GSDP of Sikkim has been presented in table 4.6. It has been confirmed by observing the table that the trend is downward for both the sectors with regard to the contribution in total GSDP of Sikkim. The contribution of livestock sector in GSDP of Sikkim in 2004-05 was 3.19 per cent which further declined to 1.28 in 2010-11. Even the annual growth rate shows fluctuating trend in this sector. Similar is the situation of agriculture sector which declining trend in the contribution to GSDP of Sikkim. (GSDP in respect of Agriculture and Livestock Sector (in lakhs) of Sikkim and their annual growth has been presented in Appendix-A)

Table 4.6: Sectoral Contribution of GSDP in Respect of Agriculture and Livestock Sector (in %)

Years	Livestock Sector	Total Agriculture
2004-05	3.19	16.39
2005-06	3.16	15.62
2006-07	3.05	14.77
2007-08	2.91	14.37
2008-09	2.57	13.02
2009-10	1.34	7.85
2010-11	1.28	7.62

Source: DESME, Government of Sikkim

4.7 Profile of East Sikkim

East Sikkim has total area of about 954 Sq. Km and has 4 sub division and 10 block administrative centre. East district has 283583 inhabitants. The density of population was 297.26 sq/ km and sex ratio is very high as 873 female per 10000 males. This district has more educated people and has literacy rate of 83.9 per cent according to 2011 census. It is also clear from the table that decadal growth of population in

Sikkim during 2001-2011 was 15.73 per cent. The general profile of East Sikkim has been presented in table 4.7:

Table- 4.7: General Profile of East Sikkim

Sr. No.	Items	Sector	District
1	Area (Sq. Km.)	District	954
2	Number of Sub division	District	4
3	Number of Block Administrative centre	District	10
4	Number of Gram Panchayat Unit	District	52
5	Number of Panchayat Wards	District	290
6	Number of Municipal Corporation	District	3
7	Population (Census 2011)	District	283583
		Male	151432
		Female	132151
		Rural	161096
		Urban	122487
		Child Population(0- 6 yrs)	27984
		Child Population(Rural)	16223
		Child Population(Urban)	11761
		SC Population	15305
		ST Population	78436
8	Density of Population(Persons/sq km)	District	297.26
9	Sex Ratio(Females/1000 males)	District	873
		Rural	849
		Urban	905

10	Child Sex Ratio(Females/1000 males)	District	960
11	Literacy (%) (census 2011)	District	83.9
		Male	88.5
		Female	78.5
		Rural	80.0
		Urban	88.9
12	Number of Total Workers	District	139678
13	Number of Main Workers	District	111058
14	Decadal Growth of Population (%)	2001-2011	15.73

Source: DESME, Government of Sikkim

4.8 Profile of the Study Area

The study has been conducted in five Gram Panchayat Units of East Sikkim, namely- Assam Lingzey, Dholepchen, Khamdong, Namcheybung and Rawte-Rumtek. Table 4.8 shows the general profile of the respective Gram Panchayat Units.

Table-4.8: Profile of the Study Area (2011)

Gram Panchayat Unit	Assam Lingzey	Dholepchen	Khamdong	Namcheybung	Rawte-Rumtek
Area(hac)	907.78	598.95	764.91	873.38	593.85
Total number of Households	809	558	661	1126	851
Total Population	3471	2553	2881	5128	3987
Male	1939	1290	1540	2703	2127
Female	1802	1263	1341	2425	1860
Population(0-6 yrs)	357	252	350	524	326
Total Workers	2190	901	1519	2870	1711
Literacy Rate	78.66	83.27	79.18	78.71	79.81
Sex Ratio	929	979	871	897	874

Source: DESME, Government of Sikkim

It has been observed that with regard to the total area, among five GPU's, Assam Lingzey is higher amongst all with 907.78 hectare, while Rawte-Rumtek is in bottom with 593.85 hectare. But in terms of total population Namcheybung tops the chart with 5128 and lowest population is in Dholepchen GPU. In terms of sex ratio, Dholepchen ranks first with 929 (female per 1000 male) and Khamdong is in bottom with 871. Likewise literacy rate is higher in Dholepchen as compared to others which have been clearly shown in the table 4.8.

In this chapter, an attempt was made to present and examine a brief economic profile of Sikkim along with the general profile of Sikkim, East Sikkim and the profile of the study area. With respect to the contribution of livestock sector in the total GSDP of Sikkim as discussed in this chapter, it has been examined that the share of livestock sector in the total GSDP of Sikkim is declining from 2004-05 till 2010-11. In this backdrop, there is an essence for economic analysis of dairy which is a sub sector of livestock farming. The study has been conducted to analyse dairy production and marketing in East Sikkim.

CHAPTER 5

RESULTS AND DISCUSSION

The present chapter has outlined the brief over view of Dairy sector in the economy of Sikkim. Section 5.2 has been devoted to observe the livelihood status of families engaged in dairy farming. In section 5.3, an attempt has been made to analyze the cost and marketing of Dairy products in East Sikkim. Section 5.4 has been devoted to examine the various constraints faced in dairy farming. Finally section 5.5 incorporates various suggestions for the growth of dairy sector in Sikkim.

5.1 Over view of Dairy in Sikkim

The comparative situation of milk production of Sikkim with respect to major milk producing states of India is presented in table 5.1.1:

Table-5.1.1: Estimates of Milk Production-2006-07 to 2010-11 ('000 Tonnes)

State	2006-07	2007-08	2008-09	2009-10	2010-11
Andhra Pradesh	7938	8925	9570	10429	11203
Gujarat	7533	7911	8386	8844	9321
Punjab	9168	9282	9387	9389	9423
Rajasthan*	10309	11377	11931	12330	13234
Uttar Pradesh	18094	18861	19537	20203	21031
Sikkim [#]	49	42	42	44	43
All India	102580	107934	112183	116425	121848

Source: National Dairy Development Board, Government of India

*2006-07-revised figure

#Figures from 2007-08 onwards are estimated based on the number of animals in milk as per livestock census 2007 and the yield rate of concerned neighbouring State (for Sikkim yield rate of West Bengal) has been used.

Table 5.1.1 shows the estimates of milk production during 2006-07 to 2010-11 ('000 tonnes). It can be observed from the table that Uttar Pradesh has highest production

capacity to produce milk as in 2006-07, the total milk production was 18094 thousand tonnes and in the year 2010-11 it was 21031 thousand tonnes. It seems that from 2006-07 to 2010-11 its production quantity has increased by 15 per cent. But the growth rate of Andhra Pradesh is quite impressive which has recorded 41 per cent increase in milk production during the study period. The increase in the production of milk in Gujarat during the same period of study is 23 per cent. Similarly Rajasthan accounted 28 per cent growth rate in milk production and Punjab registered 2 per cent growth rate in milk production during same period. During the same period of study in all India level per cent of increased in milk production was recorded at 18 per cent. In contrast to the result of other states and India too, the situation of Sikkim is different, as production of milk has declined approximately by 14 per cent.

Growth Status of Producer Member and Organised Societies under Sikkim Milk Union

As Table 5.1.2 shows, from 1980 till 2012, there has been an increase in the number of producer members in dairy cooperative under Sikkim Milk Union from 2,000 in 1980-81 to 9,758 in 2011-12 in absolute numbers. Simultaneously, if we observe the growth status of number of organised societies under Sikkim Milk Union during same period, the absolute number of organised societies has appreciated from 51 (1980-81) to 303 in (2011-2012).

Table- 5.1.2: Growth status of organised society and producer members under SMU

	NO.OF SOCIETY ORGANISED	PRODUCER MEMBERS
1980-81	YEAR	2000
1981-82	55	2573
1982-83	55	2573
1983-84	59	2573
1984-85	59	2722
1985-86	59	2722
1986-87	77	3690
1987-88	119	3870
1988-89	119	4160

1989-90	134	4245
1990-91	134	4317
1991-92	134	4392
1992-93	134	4392
1993-94	134	4392
1994-95	134	4392
1995-96	137	4407
1996-97	156	4426
1997-98	164	4649
1998-99	174	4749
1999-00	170	5269
2000-01	172	5500
2001-02	173	5788
2002-03	173	6537
2003-04	173	6537
2004-05	187	6561
2005-06	227	7176
2006-07	224	7597
2007-08	240	8193
2008-09	273	8768
2009-10	289	9562
2010-11	291	5985
2011-12	303	9758
CAGR	5.3	4.1

Source: Sikkim Cooperative Milk Producers' Union

The Compound Annual Growth Rate with regard to the number of organised society and producer's member under Sikkim Milk Union has been registered at 0.053 and 0.041 respectively, which indicates as time has progressed by one year the number of organised cooperative Society under Sikkim Milk Union has increased by 5.3 per cent per annum. The growth rate of membership under Sikkim milk union for the same period has been registered at 4.1 per cent per annum.

Contribution of Dairy in GSDP of Sikkim

The present study shows the Dairy Income of SMU and GSDP of Sikkim from 2004-05 till 2011-12. It has been observed from table 5.1.3 that the growth rate of Dairy Income of SMU has been registered at 17.6 per cent per annum during the study period while the growth rate of GSDP of Sikkim registered 17.4 per cent per annum. The study found that the CAGR for DI of SMU is slightly higher than that of GSDP of Sikkim during the study period.

Table- 5.1.3: Dairy Income of SMU and GSDP of Sikkim from 2004-05 till 2011-

12

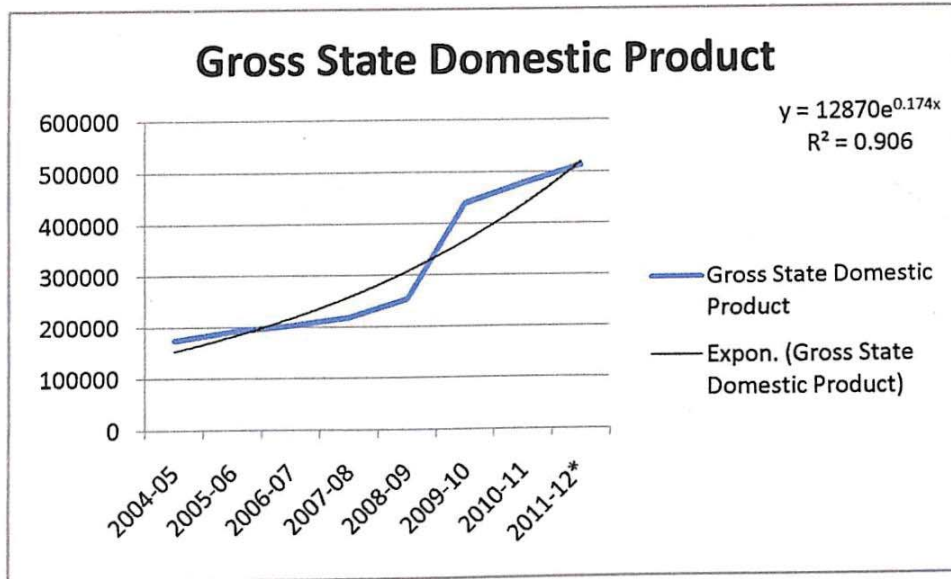
YEAR	DI of SMU at constant price (2004-05) Rs. In Lakhs	GSDP at constant price (2004-05) Rs. In Lakhs	% Share of DI of SMU in GSDP of Sikkim
2004-05	380.13	173915	0.22
2005-06	441.96	190945	0.23
2006-07	533.04	202385	0.26
2007-08	546.65	217823	0.25
2008-09	737.85	253499	0.29
2009-10	919.74	440101	0.21
2010-11	1109.22	478428	0.23
2011-12	1244.96	513030*	0.24
CAGR (%)	17.6	17.4	

Source: DESME, Govt. Of Sikkim,
Sikkim Cooperative Milk Producers' Union

*Provisional estimates

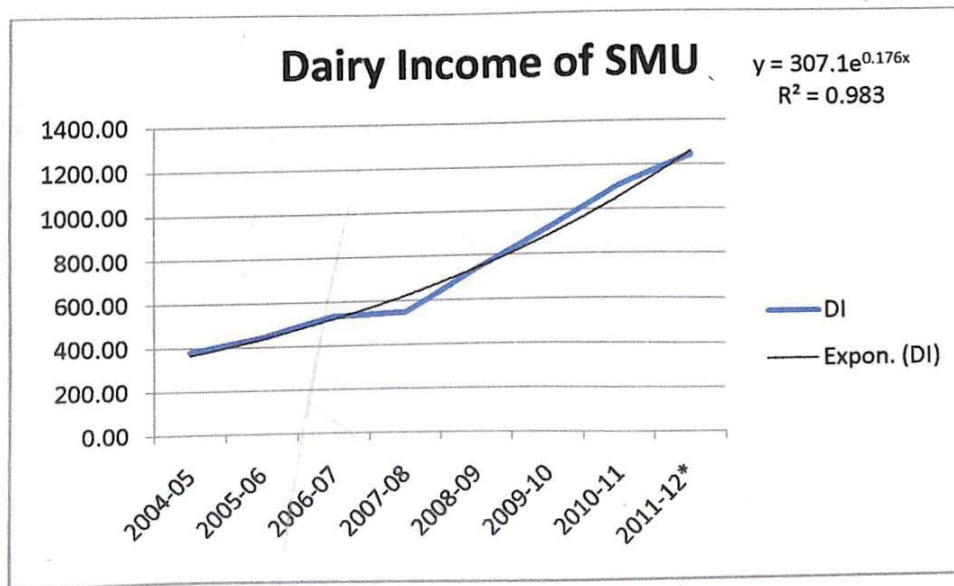
But while having a glance with respect to the per cent share of Dairy income of SMU in GSDP of Sikkim, it has been found that the trend is quite fluctuating during the study period which has been shown in table-5.1.3. On an average, the per cent share of Dairy income of SMU in GSDP of Sikkim is only 0.24, which is very less indicating less importance of Dairy income in the GSDP of Sikkim.

Figure 5.1.1: Trend line showing GSDP Growth of Sikkim (2004-05 till 2011-12)



Source: Sikkim Milk Union

Figure 5.1.2: Trend line of Dairy Income of SMU from 2004-05 till 2011-12



Source: Sikkim Milk Union

From the present study it has been observed that the high priority sector i.e. Dairy sector has not been developed much in the tiny Himalayan state, Sikkim. Milk production in Sikkim showed a fluctuating trend when compared with other top milk producing states of India, where the milk production is increasing. In fact, the state has witnessed a decline in milk production during the period 2004-05-2010-11. This decline is noticed despite the increase in the number of organised co-operative societies and producer members under Sikkim Milk Union during the same period.

This is very disturbing given the fact that a significant share of population is depending on the sector for their livelihood (Kumar, 2010). This calls for locating the factors that possibly aid this poor performance of the sector in the state. In this backdrop, we make an attempt to analyse the livelihood status of people engaged in dairy farming in Sikkim, which is discussed in the following section.

5.2 Livelihood Status of Sample Households

To understand and analyse the livelihood status of families engaged in dairy farming in Sikkim, the data of 100 farmers (50 co-operative members and 50 non-members) has been collected. Descriptive statistics and econometric analysis of sampled dairy households has been then applied. The descriptive analysis has been employed to describe the general characteristics of sampled Dairy household. The econometric analysis has also been employed to identify the determinant factors which are responsible for the dairy income of the sampled household via multiple regression analysis.

5.2.1 Milk Production and Dairy Household Herd Breed Characteristics

5.2.1.1 Description of the sampled herd size

The total number of cattle in five different villages in East Sikkim, namely: Assam Lingzey, Dholepchen, Khamdong, Namcheybong and Rawte-Rumtek, were found to be 150 for co-operative members and 116 for non-members.

Table-5.2.1.1: Total Herd Size Among members and Non-members

Village	Member	Non-member
Assam Lingzey	24	23
Dholepchen	24	19
Khamdong	41	25
Namcheybong	26	24
Rawte-Rumtek	35	25
Total	150	116

Source: primary survey, 2014

Note: Figures in the parenthesis in the above table represents the mean herd size of the sampled household

The result in table 5.2.1.1 clearly showed that cooperative member household have larger herd size as compared to non member household with 3 as compared to 2.3. Again we can classify the location wise, types of herds between member and non member in the sampled households.

5.2.1.2 Description of Herd Breeds in the sampled Location

The result from the table 5.2.1.1 indicated that there are 266 dairy cattle in the sampled household from which 185 are local breed cattle and only 81 are cross breed cattle. In terms of local breed cattle, Khamdong is highest with 46 local cattle and lowest is in Assam Lingzey with 26 local breed cattle. But in case of cross breed cattle, Assam Lingzey is highest among others with 21 cross breed cattle and lowest is Dholepchen with only 7 cross breed cattle, this has been presented in table 5.2.1.2. Co-operative membership wise, local breed and cross breed cattle are 107 and 78 (for co-operative members) and 43 and 38 (non-members) respectively. Figure in the parenthesis represents the average local and cross breed cattle in different location for both the member as well as non member household, where it has been observed that the average local breed and average cross breed for member and non member households were 2.14, 1.56 and 0.86, 0.76 respectively. The above result highlights that the local breed in the sampled household is more than a double then the cross breed cattle and also co-operative member household herd size is higher as compared to the other participant i.e. non-member household, in relation to both categories of breeds.

Table-5.2.1.2: Classifications of Herd Breeds by Location

Location	Local breed		Cross breed	
	Member	Non-member	Member	Non-member
Assam lingzey	18 (1.8)	8 (0.8)	6 (0.6)	15 (1.5)
Dholepchen	21 (2.1)	15 (1.5)	3 (0.3)	4 (0.4)

Khamdong	22 (2.2)	24 (2.4)	19 (1.9)	1 (0.1)
Namcheybong	16 (1.6)	17 (1.7)	10 (1.0)	7 (0.7)
Rawte-Rumtek	30 (3.0)	14 (1.4)	5 (0.5)	11 (1.1)
Total	107 (2.14)	78 (1.56)	43 (0.86)	38 (0.76)

Source: Primary Survey

Note: Figures in the parenthesis in the above table represents the mean value

5.2.1.3 Productivity of Dairy Cattle Breeds

The quality of cattle determines the value as well as the volume of milk. This line is totally valid in case of the dairy sampled household in East Sikkim. The results in table 5.2.1.3 shows that the mean milk yield per day of local breed was 3.9 litres while cross breed was 7.9 which was more than a double.

Table-5.2.1.3: Mean Yield and Sale of Milk by Breeds

	Milking Local Breed	Milking Cross breed	t-value
Mean milk yield per day	3.9	7.9	7.17 (0.00)*
Mean milk sold/per day (litter)	2.3	5.5	2.21 (0.02)**
% of milk marketed	59	70	

Source: Primary Survey

Note: Figures in the parenthesis in the above table represents p-value

*significant at 0.01 per cent level, ** significant at 0.05 per cent level, *** significant at 0.10 per cent level

The independent samples t-statistics in Table 5.2.1.3 indicated that there is strong and significant difference between local and cross breed milking cow on their mean milk yield per day. There is also strong and significant difference between local and cross breed milking cow with regard to their mean milk sold per day. Again the per cent share of marketed milk per local breed and cross breed dairy cow was estimated to be 59 per cent and 70 per cent. The result clearly shows cross breed cow to be more productive than a local breed cow.

5.2.1.4 Milk Production and Productivity

The result for the average household milk production and productivity has been presented in table 5.2.1.4. With regard to milk production, the average milk production in litres per day for co-operative member household was 7.1 litres and for non cooperative member was 5.1 litres. Highest milk production in litre per day was observed in Assam Lingzey with an average of 8 litres per day and lowest was in Dholepchen with an average of 4.05 litres a day. But if we observe member and non member separately, than we see that Khamdong member household produce 9.5 litres milk a day which is highest amongst all and lowest is Dholepchen with 4.5 litres a day. Again if we see non member household milk production, then we find that highest milk producing non member household are from Assam Lingzey with 7.7 litres milk a day. With Regard to milk productivity, the average milk productivity (litres/cow/day) for member household is 5.6 litres while for non member household is 4.4 litres. Milk productivity in litres per cow per day is highest in Assam Lingzey with 6.9 litres, which belong to member household and lowest in Khamdong i.e. 2.9 litres, which belongs to non member household. To sum up the result, we can express that in terms of milk production or in terms of milk productivity, cooperative member are much more efficient than non member. The independent samples t-statistics in table 5.2.1.4 indicated that overall member and non member mean milk production per day is statistically significant confirming there is difference in the mean milk production. But if we compare village wise, member and non member mean milk production, than t-statistics reveal that apart from Khamdong village, which is highly significant, there is no other village whose mean difference of milk production per day is there between member and non member. With regard to milk productivity per cow per day, the result is as similar as mean household milk production. The t-

statistics suggests that member and non member mean milk productivity per cow per day is statistically significant indicating there is difference in the milk productivity and same as earlier result and only Khamdong milk productivity is statistically significant.

Table-5.2.1.4: Mean Household Milk Production and Productivity

Village	Mean Household milk production(litres/day)			Milk productivity (litres/cow/day)		
	Member	Non-Member	t-value	Member	Non-Member	t-value
Assam lingzey	8.3	7.7	0.20 (0.84)	6.9	5.9	1.05 (0.30)
Dholepchen	4.5	3.6	0.75 (0.46)	3.8	3.9	-0.15 (0.87)
Khamdong	9.5	3.5	3.09 (0.00)*	6.3	2.9	3.6 (0.00)*
Namcheybong	5.4	4.2	1.61 (0.12)	4.8	3.8	1.39 (0.17)
Rawte-Rumtek	8.1	6.5	0.54 (0.59)	6.2	5.4	0.33 (0.73)
All	7.1	5.1	2.05 (0.04)**	5.6	4.4	1.91 (0.05)**

Source: Primary Survey

Note: Figures in the parenthesis in the above table represents p-value

*significant at 0.01 per cent level, ** significant at 0.05 per cent level, *** significant at 0.10 per cent level

Extending the previous result presented in table 5.2.1.5, it has been analyzed the location wise mean milk productivity per cow per day between local and cross breed. The result in table 5.2.1.5 shows that cross breed cow is far more productive when compared with the local cow. As we can see that milk productivity per cow per day for cross breed cow is 8.72 where as for local cattle, it is 3.62.

Table-5.2.1.5: Breed wise total milk production and productivity

Village	Household total milk production(litres/day)			Milk productivity(litres/cow/day)		
	Cross breed	Local breed		Cross breed	Local breed	t-value
Assam lingzey	111	48.75		7.93	4.43	5.26 (0.00)*
Dholepchen	26	55.25		8.67	3.07	5.83 (0.00)*
Khamdong	76	54.50		7.60	3.21	5.61 (0.00)*
Namcheybong	35.50	60.50		5.92	3.78	2.87 (0.00)*
Rawte-Rumtek	58.50	87.75		9.75	4.62	2.02 (0.05)**
All				7.87	3.79	7.17 (0.00)*

Source: Primary Survey

Note: Figures in the parenthesis in the above table represents p-value.

*significant at 0.01 per cent level, ** significant at 0.05 per cent level, *** significant at 0.10 per cent level

The independent sample t-statistics in table 5.2.1.5 shows that mean milk productivity per cow per day is statistically significant indicating there is difference in the milk productivity among cross breed and local breed cow across the sampled study area.

5.2.1.6 Market Participation by Dairy Household

In the study area, the most important marketable dairy product is milk, due to less quantity of milk production, milk products like butter, churpi, etc. are processed in a very small quantity, more over those processed products are directly consumed in the dairy household. The share of milk sold is high for member household as compared to non member. The reason behind this is, co-operative member are more market oriented than non member and their quantity of milk production is also much higher as compared to the other counterpart. The result from the survey indicated that mean

milk sold by member household in the study area is 5.5 litres milk a day while non-member household sold only 2.6 litres of milk a day.

Table-5.2.1.6: Mean Yield and Sale of Milk by Membership

	Member	Non-member	t-value
Mean milk yield per day	7.1	5.1	2.05 (0.04)**
Mean milk sold/per day (litter)	5.5	2.6	3.24 (0.002)*
% share of milk marketed	77.5	51	

Source: Primary Survey

Note: Figures in the parenthesis in the above table represents p-value

*significant at 0.01 per cent level, ** significant at 0.05 per cent level, *** significant at 0.10 per cent level

The independent sample t-statistics in table 5.2.1.6 shows that mean milk yield and milk sold per day between member and non member is statistically significant indicating there is difference between member and non member. The result also showed that 77.5 per cent and 51 per cent sampled member and non member household respectively, were found to participate in the milk market.

5.2.1.7 Size of Land Holdings

Sample households in the study area were post-stratified into different categories⁷, viz. landless, marginal, small, medium and large households. The marginal farmers dominated the scenario with 62 sampled households practicing dairy farming. Medium and large farmers were least in numbers with 7 and 3 respectively. With regard to mean milk production (litres/day) and mean milk sale (litres/day), it is very interesting to observe that landless farmers have higher production and sale than any participants. Their mean milk production and sale per day is 8.02 and 6.1 respectively. The very fact for this result is there is no other earning source for the landless farmers through which they can sustain their livelihood. Moreover maximum family members

⁷Landless (without any land); marginal (≤ 1 ha); small ($>1\leq 2$ ha); medium ($>2\leq 4$ ha); large (> 4 ha)

in landless category were involved in this business and increase the production of milk to become more market oriented. In contrast to this result, medium and large land size households, they produce less amount of milk per day which has been shown in the table no. Moreover they consume more and very little are left for sale. This shows that they have other parallel sources of income which does not compel them to depend on dairy farming. Again we can see that there is more number of marginal land holder followed by small land holder. The total share of mean milk production is high for marginal farmers.

Above all, from the result in table 5.2.1.7, the mean production and marketing of milk in the sampled household per day shows that the sampled households are not market oriented as it was expected. Overall mean production and marketing of milk was 6.1 and 3.7 litres per day, respectively. Only approximately half of the total milk production is left for sale in the sampled households.

Table-5.2.1.7: Share of different categories of households in production and marketing of milk in the sampled household

Land Size	Number of dairy household	Mean Milk production (litres/day)	Share in Milk Production (%)	Mean Milk sale (litres/day)	Share in Milk Marketing (%)
Landless	10	8.0	17.2	6.1	15.2
Marginal	62	5.9	60.4	4.1	63.5
Small	18	5.8	13.1	3.6	15.9
Medium	7	5.7	6.6	2.0	3.5
Large	3	5.5	2.7	2.7	1.9
All	100	6.1	100	3.7	100

Source: Primary Survey

The study found that the average number of cattle between member and non-member household in five GPU was 3 and 2.3 respectively. Member household holding of both cross and local breed was higher as compared with non-member household. But the discouraging fact is that there is on average 0.86 cross breed cattle holding by member and 0.76 by non member household. The holding of local breed cattle was

higher for both member as well as non-member household with an average of 2.14 and 1.56 respectively.

Mean milk yield per day by cross breed was higher as compared to local breed in the study area but the holding of cross breed is very less which resulted in less milk production in the study area. It has also been observed that landless farmers have higher production and sale of milk per day than any participants. They were totally dependent upon dairy and were more market oriented.

5.2.2 Socio-economic Status of Sample Households

5.2.2.1 Cooperative Members and Non Members:

From the sampled households from five different GPU's in East Sikkim, 50 per cent were Cooperative members as they were found to sell raw milk in the collection centre at the time of the survey, while the rest 50 per cent were non member household, practicing dairy farming. As shown in table 5.2.2.1, the mean family size of co-operative members was higher than the non member households, as the mean family size for member household was 5.72 whereas for non member household was 4.98. The family size of the member and non-member households was found to be significant at less than 1 per cent probability level shown by the independent sampled t-statistics. With regard to milk yield, mean milk yield per day per member and non-member sampled dairy household, it was 7.1 and 5.1 litres respectively. The mean value of milk produced per day per member household is quite higher than non-member household. Here the independent t test for member and non member with regard to milk yield shows statistically significant.

One notable thing that has been encountered in the result, i.e. non member household's total income is much higher as compared to member households while the income apart from dairy is very high for non member as compared to member household. It can be infer that due to non opportunity to earn income from other sources member households are compelled to practice dairy co-operative in the study area. The independent samples t-statistics with regard to total income apart from dairy per month and total dairy income per month between member and non member shows significant result which indicates that there is difference between member and non

member sampled dairy household with respect to total income apart from dairy per month and total dairy income per month.

With regard to the other socio-economic variables presented in the table 5.2.2.1, there exist no such differences between member and non member household as indicated by t test.

Table-5.2.2.1: Socio-economic characteristics of Cooperative Members and Non-Members

Variables	Member	non member	t-value
Age	49.96	48.16	0.72 (0.47)
Family size	5.72	4.98	2.54 (0.01)**
No. of cross breed milking cow	0.44	0.34	0.71 (0.47)
No. of local breed milking cow	0.82	0.80	0.15 (0.87)
Quantity of milk produced per day	7.10	5.10	2.05 (0.04)**
Total income per month apart from dairy income	6367.90	17101.60	-6.52 (0.00)*
Monthly income from dairy	4432.10	2698.40	1.90 (0.06)***

Source: Primary Survey

Note: Figures in the parenthesis in the above table represents p-value

*significant at 0.01 per cent level, ** significant at 0.05 per cent level, *** significant at 0.10 per cent level

Table 5.2.2.2 shows the percentage of social variables in the sampled dairy household like sex, religion, and educational status between co-operative member household and non-member household. To have a glance with regard to sex, it has been found that the female participation rate in dairy farming for both member and non member

household was very less, here male dominates with 80 per cent and 82 per cent for member and non-member household respectively. The chi-square test reveals that there is insignificant relation, which means there is no such difference between member and non member's mean gender participation rate. With regard to religion, the chi-square test shows significant relation for both members as well as non-member household. In terms of education level, most of the sampled households both members as well as non-member has not even crossed their primary education and falls under the category of 1-5 which has been shown in table 5.2.2.2:

Table-5.2.2.2: Socio-economic characteristics of Cooperative Members and Non-Members

	VARIABLES	MEMBER (%)	NON-MEMBER (%)	CHI-SQUARE VALUE
Sex	Male	80	82	0.06 (0.79)
	Female	20	18	
Religion	Hindu	84	72	5.12 (0.07)***
	Buddhist	8	24	
	Christian	8	4	
Education	Illiterate	34	14	5.76 (0.12)
	1—5	28	34	
	6—10	34	44	
	>10	4	8	

Source:

Note: Figures in the parenthesis in the above table represents p-value

*significant at 0.01 per cent level, ** significant at 0.05 per cent level, *** significant at 0.10 per cent level

5.2.2.3 Socio-Economic Status of Sample Households: Across Location

The survey was conducted in five villages of East Sikkim namely- Rawte-Rumtek, Khamdong, Assam Lingzey, Namcheybong, Dholepchen. With regard to different socio-economic indicators in five villages, only the mean age and quantity of milk produced per litre per day across the villages was found to be different and was significant at 1 per cent significance level, which has been revealed by f-test in table 5.2.2.3. Apart from age other socio-economic variables like family size, number of cross breed and local milking cow, total income apart from dairy and total dairy income, the f-test shows that there is no difference in other socio economic variables across the village.

Table-5.2.2.3: Socio-economic characteristics of sampled dairy household by location

Variables	Rawte-Rumtek	Khamdong	Assam Lingzey	Namcheybong	Dholepchen	f-value
Age	51.05	55.55	44.60	51.00	43.10	3.81 (0.06)***
Family size	5.15	5.60	5.30	5.50	5.20	0.32 (0.85)
No. of cross breed milking cow	0.30	0.50	0.70	0.30	0.15	1.95 (0.10)
No. of local breed milking cow	0.95	0.85	0.55	0.80	0.90	1.16 (0.33)
Quantity of milk produced per day	7.31	6.52	7.99	4.80	4.06	2.23 (0.07)***
Total income per month apart from dairy income	11398.90	13256.20	12973.65	12414.75	8630.25	0.72 (0.57)
Monthly	4751.10	3493.80	5176.30	2635.20	1769.70	1.97

income from dairy						(0.10)
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Source: Primary Survey

Note: Figures in the parenthesis in the above table represents p-value

*significant at 0.01 per cent level, ** significant at 0.05 per cent level, *** significant at 0.10 percent level.

Location wise, the percentage of social variables in the sampled dairy household like sex, religion, and education status has been shown in table 5.2.2.4. With regard to gender, we can see that apart from Assam Lingzey, there is no other village which shows satisfactory female participation in dairy farming. It is quite discouraging fact to see that Namcheybong sampled household have 0 per cent female participation rate. But Assam Lingzey has perfect equality with regard to gender participation; this has been shown in table 5.2.2.4. The chi-square test indicates that there was a significant difference in sex of sampled dairy households across the villages at 1 per cent significance level.

With regard to religion, in every villages of sampled household, the percentage of Hinduism is high as compared to other religion apart from Rawte-Rumtek. Sampled households in Dholepchen has 100 per cent Hindu, while in Assam Lingzey and Namcheybong, there is no Buddhist followed by no Buddhist Christian in Dholepchen. The chi-square value shows that there is difference with regard to religion.

With regard to education level, we can see that only in Khamdong, Assam Lingzey and Namcheybong, only 5, 10 and 15 per cent, respectively, sampled household have attended higher secondary i.e. above class 10. There are 35 per cent illiterates in Rawte-Rumtek which is highest amongst other and lowest illiteracy rate is in Dholepchen. An attainment of primary education is highest for Dholepchen with 40 per cent in 1—5 and 50 per cent in 6—10. The chi-square value shows that there is difference with regard to Education level.

Table-5.2.2.4: Socio-economic characteristics of sampled Dairy Household by Location

	Variables	Raw te-Rumtek (%)	Khamdong (%)	Assam Lingzey (%)	Namcheybon g (%)	Dholepchen (%)	Chi-square-value
Sex	Male	90	85	50	100	80	18.45 (0.00)*
	Female	10	15	50	0	20	
Religion	Hindu	40	70	95	85	100	35.59 (0.00)*
	Buddhist	55	25	0	0	0	
	Christian	5	5	5	15	0	
Education	Illiterate	35	30	20	25	10	11.48 (0.48)
	1—5	25	25	30	35	40	
	6—10	40	40	40	25	50	
	>10	0	5	10	15	0	

Source: Primary Survey

Note: Figures in the parenthesis in the above table represents p-value

*significant at 0.01 per cent level, ** significant at 0.05 per cent level, *** significant at 0.10 per cent level

5.2.3 Composition of Monthly Income of the Sampled Dairy Household

The result in table 5.2.3 shows that Assam Lingzey ranks first in terms of total monthly income earning from dairy practice and Dholepchen earns least from dairy with Rs. 5176.35 and Rs. 1769.75, respectively. It is very disheartening to see the result regarding the per cent share of dairy to household's total monthly income in different location of East Sikkim. The contribution of dairy income to the total monthly income is highest in Rawte-Rumtek followed by Assam Lingzey with 29.4 and 28.5 per cent, respectively and lowest is in Dholepchen with 17.2 per cent. The

result shows that dairy is not generating the income as expected and dairy farming is not extensively done in the sampled household.

Table-5.2.3.1: Composition of Monthly Income of the Sampled Dairy Household

sources of income	Assam Lingzey	Dholepchen	Khamdong	Namcheybong	Rawte- Rumtek
monthly income from dairy	5176.35	1769.75	3493.8	2635.25	4751.10
monthly income from other sources	12973.65	8630.25	13256.2	12414.75	11398.90
total monthly income	18150	10400	16750	15050	16160
%share of dairy income	28.52	17.02	20.86	17.51	29.40

Source: Primary Survey

In the same manner, there has been an observation with respect to the composition of monthly income of cooperative member as well as non-member household. This section has tried to find out the per cent share of dairy income to the monthly total income. The result has been presented in table 5.2.3.2 which shows that non member household total monthly income is much higher as compared to co-operative member household's income. But if we compare the contribution of dairy income to the total monthly income in the sampled household, then it has been found that 41.04 per cent income is contributed by dairy for co-operative member while only 13.63 per cent dairy income contributes to the total monthly income of non-member. The result indicated that, in the study area, household who are not engaged in dairy cooperative earns income from other sources or they are engaged in other activities which pays them well and they are not market oriented. Moreover they are not dependent on dairy as compared to member household.

Table-5.2.3.2: Composition of Monthly Income among Member and Non-member Households

Sources of income	Member	Non-member
Monthly income from dairy	4432.10	2698.40
Monthly income from other sources	6367.90	17101.60
Total monthly income	10800	19800
% share of dairy income	41.04	13.63

Source: Primary Survey

5.2.4 Factors Influencing Dairy Income of the Sampled Households

It has been observed from the table 5.2.4 that out of the different explanatory variables such as total number of cattle, per day average amount of milk sale, family size and price of milk, amount of milk sale and price of milk has significant influence on dairy income in the sampled household of east Sikkim. It is interesting to observe that a unit change in average amount of milk sale per day has helped to increase the income in the study area by 0.94 units and a unit change in price of milk increase the income in the study area by 0.16 units. The other variables does not seems to have any significant influence on the income of the dairy farming family, as observed from the estimated value of the student t-test.

The model has been found to be good fit in terms of value of coefficient of determination i.e. R^2 , as 96 per cent of variation in dairy income has been explained by the model and remaining 4 per cent is unexplained.

Similar study has been undertaken by Kimaro et al. (2013), where they have performed simple linear regression analysis to identify the various variables which are influencing the income from dairy farming. In their study, they have considered independent variables like- Education level, Household size, Number of dairy cattle, Price per litter, Market availability, Amount of milk sold per day, Advise on good husbandry, Group membership. Their study found that four explanatory variable out of seven had significant influence on income from dairy farming. The significant variables influencing dairy income were- Price per litter, Market availability, Amount

Table-5.2.3.2: Composition of Monthly Income among Member and Non-member Households

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of milk sold per day and Advise on good husbandry. They found Amount of milk sold per day to be the most important influencing factor amongst all.

The present study is consistent with the study of Kimaro et al. (2013); in terms of most important influencing factor for dairy income i.e. the amount of milk sold. Price of milk is also significant. Other variable incorporated in the present model seems insignificant.

Table-5.2.4: Dairy income functions in the sampled households

Dependent Variable: Total Dairy Income

Number of observation: 100

Variable	Estimated Coefficient
Total Number of Cattle	0.03 (0.15)
Amount of Milk sale	0.94 (0.00)*
Family Size	-0.02 (0.21)
Price of milk	0.16 (0.00)*
Constant	-7247.31
R ²	0.96
F-value	659.03 (0.00)*

Source: Primary Survey

*significant at 0.01 per cent level, ** significant at 0.05 per cent level, *** significant at 0.10 per cent level

Note: Figures in the parenthesis in the above table represents p-value

In essence, our analysis of socio-economic profile of sample households brings out the following:

- (a) There exists significant difference between a member and a non-member household only in variables such as family size, milk yield per day, and income from dairy, total income per month and religion practices.

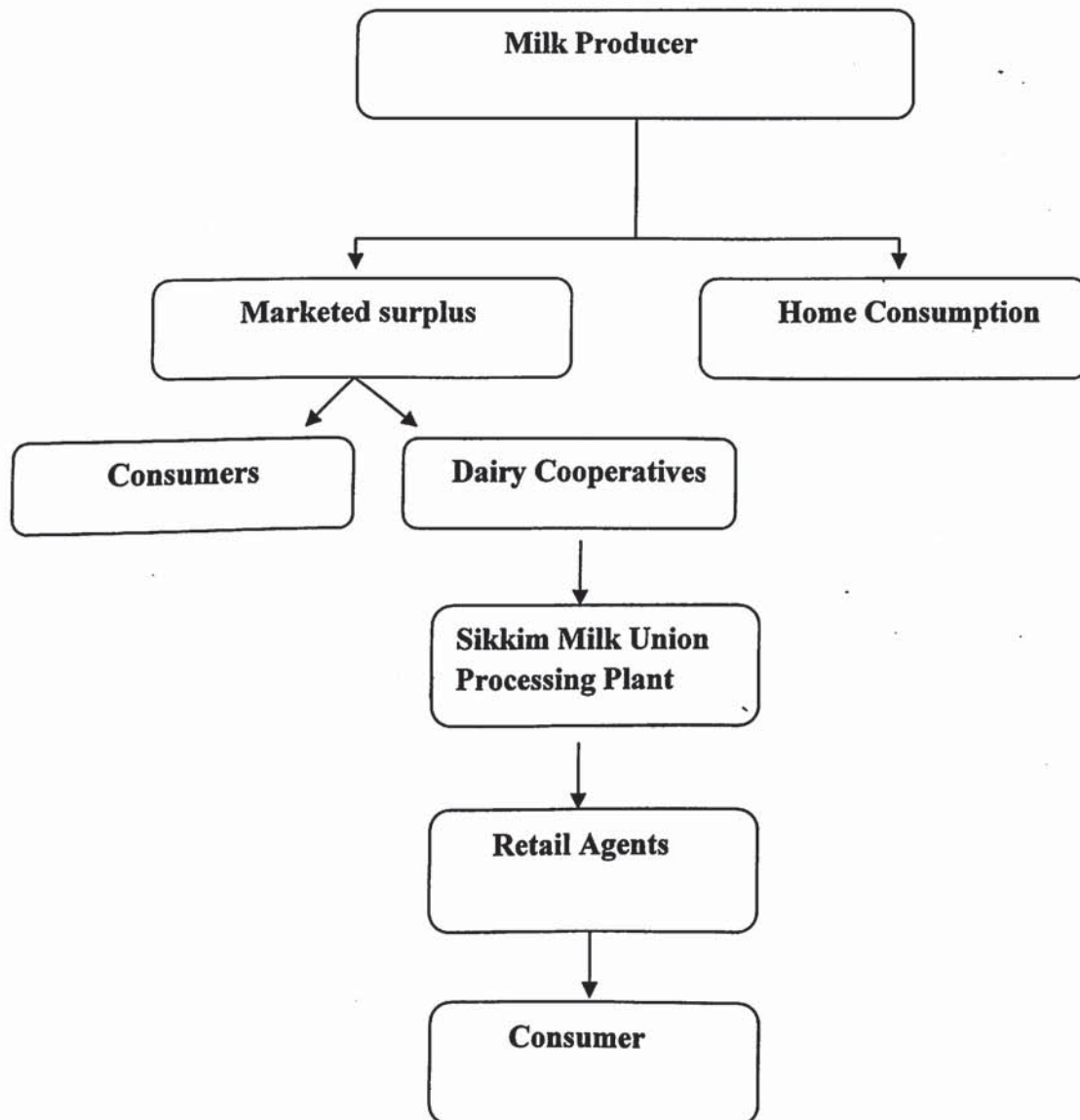
- (b) Livelihood status of the family belonging to a non member household was better compared to a member household in terms of income earning per month. In the case of latter, major share in income originates from sources other than dairy farming. On the other hand, a member household is depending entirely on income from dairy farming which is reflected in their lower income per month. The per cent share of dairy income to the total income for member household was 41.03 per cent while for non-member household it was just 13.63 per cent.
- (c) There has been significant difference in socio-economic variables such as age, quantity of milk production, religion and gender participation across five GPUs selected for the study.
- (d) It has also been observed from the study that out of the different variables such as total number of cattle, per day average amount of milk sale, family size and price of milk, amount of milk sale and price of milk have significant influences on dairy income in the sampled household of east Sikkim.

5.3 Marketing of Dairy Products in East Sikkim

This section discusses the marketing of dairy products in East Sikkim. From the household level survey in East Sikkim, conducted in five different GPU's, it has been confirmed that livestock farming is heredity in nature in Sikkim. Dairy farmers are categories in two groups one is cooperative member and non-cooperative member. Cooperative societies are formed under the umbrella of Sikkim Milk Union. Dairy products produced by non member household in the study area are mainly used for household consumption. The non-member producing surplus dairy product is subjected to sale in the local market.

To understand the marketing of milk, the structure of milk supply chain has been examined:

Figure-5.3.1: Structure of Milk Supply Chains



The marketing of milk and its product is done by Sikkim Milk Union. In informal sector, most of the households produce milk for their own consumption or sale to the nearby households and restaurant and sweet shops in the local market. Role of middle man was found negligible in East Sikkim.

5.3.1 Milk Procurement by SMU

The data regarding milk procurement by sikkim milk union has been collected and presented below:

Table-5.3.1: Milk Procured from Society

Sources of Milk	in kg
Gangtok Dairy Plant	1209506
Jorethang Dairy Plant	3341249
Total	4550755
Average Procurement per day	12468
Milk Procured from other Dairies	
i) Bhagirathi Milk Union	1099000
ii) Delight Dairy	1941710
iii) Barauni Dairy	1221910
Total Milk Procured from outside the State	4262620
Average Procurement Per day from other Dairies	11678
Total Average Procurement per day	24641
Total Milk Procurement per year	8813290

Source: Annual Report (2012-12), Sikkim Milk Union

From table-5.3.1, it has been confirmed that Sikkim does not produce sufficient amount of milk to fulfil its growing demand. It procures only 12468 litres of milk per day. Rest of the milk is procured from Bhagirathi Milk Union, Delight Dairy, Barauni Dairy on an average of 11678 litres per day.

5.3.2 System of Milk Collection

Based on Anand model of Gujarat, Sikkim Cooperative Milk Producers' Union is an apex cooperative organization, on two tier basis, which performs functions of collection, processing and marketing of milk produced by rural farmers. The primary aim of the Sikkim Milk Union is to provide remunerative market for milk producers in the far flung remote villages and make hygienic milk and milk producers available to the urban consumers at reasonable rates and stabilizes price of milk by connecting areas of surplus milk to the milk deficient towns and cities.

Sikkim milk union organises the milk cooperative societies at village level, where society appoints its Secretaries and President for the functioning of the society. Their main task is to manage the society and incorporate the farmer for collection of milk.

They also maintain the account of their respective society. Union provides training to the Secretaries and other executive member of the society for their respective tasks.

The milk which society procured is tested for quality assurance where SNF (Solid Non Fat) and Fats are the major indicators. With regard to the quality testing of milk, Secretary of the society performs their duty. On the basis of quality tested, the price of milk is decided for each farmer, assigned by the Union. They maintain accounts for each farmer regarding their daily supply of milk, monthly payment, etc. Daily collection of milk is transported (which is arranged by Milk Union for each society) to Milk Union for further processing.

5.3.3 Marketing of Dairy Product by Sikkim Milk Union

For Cooperative member, they have an access to Sikkim milk union which provide market for their product. SMU carries their market under the head of Deputy General Manager with number of support staff. Milk and Milk Product marketing is being carried out directly through their commission agents. Agents are divided in two units (215 agents in Gangtok unit, East district and 83 agents in Jorethang Unit, South district) who are appointed by Sikkim Milk Union.

In East District Marketing of milk and milk product is carried out through the vehicle arranged by Sikkim Milk Union. They operate seven milk routes to distribute milk and milk product to consumer with the help of normal and refrigerated vehicles.

In South and West District SMU hire the service of private transporters to distribute milk and milk products at Jorethang, Namchi and Geyzing.

Milk distribution at Sikkim Milk Union begins as early as 2:30am .The first to arrive at the dairy dock is the individual route helpers. The route helper takes his daily share of milk demand in his particular milk distribution route from the dispatch incharge. The quantity of the milk to be loaded is verified with the daily demand statement of that particular route by the route helper and the dispatch incharge. For products also there is a challan whereby the route helper and the dispatch incharge know what is the quantity and to whom the product is to be delivered. The vehicle then departs for their respective milk delivery duty latest by 3:20am from the dairy dock. The driver of the vehicle then sees to it that milk is delivered as per the demand sheet prepared

by the office incharge of supply. Accordingly, the amount for the sales proceeds is also collected during the time of milk delivery. However at times some dues are kept by the agents due to some reason or the other. The same is recovered the next day. The milk distribution work is completed for the day by 9:30 am by the entire marketing vehicle.

The individual agent demand for the next day is collected and the demand prepared as per the daily demand sheet whereby details of milk and milk product requirement for the next day are entered by the driver and the route helper for the agent in the daily demand sheet of the existing day. Once the daily demand sheet is prepared individually for the marketing vehicle a compiled plant demand sheet is prepared for the packaging in charge to carry out packaging of milk and milk product. After completion of the packaging of milk and milk product the same is stored in the cold storage room to be dispatched in the early morning. 80 per cent of agents, who are currently under Marketing Section of Gangtok unit, East District have their own cooling facility in the form of deep freezer to store the milk which is sent from the plant. As a support from the union, they have distributed a total of 47 number of deep freezer to the remaining agents who did not have the cooling facility of their own. This has been confirmed via primary survey and personal interview extending farmers, cooperative societies and SMU.

5.3.4 Product Mix of the Dairy Plant:

According to the Annual Report 2012-13 generated by the Sikkim Cooperative Producer's Milk Union, the following products are being produced by their plant:

1. Pasteurized Fresh Cow Milk
2. Toned Milk (3 per cent Fat and 8.5 per cent SNF)
3. High Cream Milk (4 per cent Fat and 8.5 per cent SNF)
4. Butter- 1kg
5. Paneer- 1 kg, 200gm
6. Curd- 500gm, 200gm cup and 100gm cup
7. Lassi- 200gm
8. Churpi- 500gm and 1kg
9. Cream- 1kg

10. Ice cream in 90 ml, 200ml, 500ml,1000ml cups and family packs and in candies in vanilla, chocolate, strawberry, elachi, orange, mango, etc.

In addition to the diverse products produced by Sikkim Cooperative Producer's Milk Union, the following table shows the various milk and milk products produced during the period 1995-96 to 2011-12.

Table-5.3.4.1: Milk and Milk Products under SMU

Year	Liquid Milk	Butter	Paneer	Churpi	Curd	Cream
1995-96	1960000	8888	511	1413	38053	14310
1996-97	2291000	18050	878	4623	174	14657
1997-98	2512000	10271	1468	4392	31119	10159.65
1998-99	2447000	12850	4844	9370	480	10159.65
1999-00	2667000	8692	6233	4588	46762	10303
2000-01	2690000	10570	2895	2072	412	206
2001-02	3183000	10320	5104	5166	459	921
2002-03	3234000	6357	3323	6315	31119	9113
2003-04	3184000	9021	7568	3717	33865	14355
2004-05	2561000	8082	4196	1009	13989	11243
2005-06	3068000	17179	8686	5000	938	616
2006-07	3610000	22513	13310	4564	52167	27680
2007-08	3469000	14011	18065	3191	30010	16630
2008-09	4243000	10369	12579	5131	54420	4299
2009-10	5074000	8277	25145	4008	59567	8639
2010-11	6361000	13831	11635	4847	76320	14180
2011-12	7934000	20655	47059	6222	121407	25562

Source: Sikkim Milk Union

Table-5.3.4.2: CAGR of Milk/Milk Products under SMU

Variables	CAGR
Total Liquid milk production per year (1996-2012)	0.066*
Total butter production per year (1996-2012)	0.019
Total curd production per year (1996-2012)	0.227**
Total churpi production per year (1996-2012)	0.018
Total paneer production per year (1996-2012)	0.211*
Total cream production per year (1996-2012)	0.037
Total revenue from dairy per year (1981-2013)	0.128*
Number of organised society (1981-2012)	0.053*
Producer members (1981-2012)	0.041*
Avg. Milk produced in kg per society per day (1981-2012)	-0.006***
Avg. Milk produced in kg per member per day (1981-2012)	0.005

Source: Compiled from Annual Report of SMU

*significant at 0.01 per cent level, ** significant at 0.05 per cent level, *** significant at 0.10 per cent level

The details of dairy in Sikkim have been collected from Sikkim milk union. The growth rate of milk production and its products has been calculated and is presented in table 5.3.4.2

Referred to table, during 1996 till 2012, the liquid milk production of Sikkim Milk Union has registered a growth rate of 6.6 per cent per annum which has been found to be statistically significant at 0.01 per cent level. The butter production of Sikkim Milk Union has registered a growth rate of 1.9 per cent per annum during 1996 till 2012. The production of curd has recorded a growth rate of 22 per cent per annum during the period under consideration and which has been found to be statistically significant at 0.05 per cent level. The production of churpi has registered a growth rate of 1.8 per cent per annum during the period of study. The paneer and churpi production of Sikkim Milk Union has been registered the growth rate of 21 and 3.7 per cent per annum respectively, where growth rate of paneer has been found to be statistically significant at 0.01 per cent level. The revenue from dairy of Sikkim Milk Union for the period of 1981 till 2013 has been recorded a growth rate of 12 per cent per annum which has been observed to be statistically significant at 0.01 per cent level. If we observe the number of organised society, under Sikkim Milk Union, then we find its growth rate for the period from 1981 till 2012 to be 5.3 per cent per annum. Thus as time has progressed by one year the number of organised cooperative Society under Sikkim Milk Union has increased by 5.3 per cent per annum. The growth of individual members in the society under Sikkim milk union for the same period has been registered at 4.1 per cent per annum and it is significant at 0.01 per cent level. If we have a glance with regard to the growth rate of average milk production per kg per society for the same period i.e. 1981-2012, then we find it to be decreasing with -0.6 per cent per annum. For the same period, the growth rate of average milk production per kg per member has been registered at 0.5 per cent per annum.

From the growth analysis it can be understood that total liquid milk production of Sikkim Milk Union, total butter output, production of paneer, output of churpi, production of curd and cream production of Sikkim Milk Union, and total revenue from dairy of Sikkim Milk Union, total number of organised society and its members and the milk production by those individual members has been registered a positive growth. Such trends in the growth rate may be due to operational and organisational changes in favour of Sikkim Milk Union that has supported the business of milk economy in Sikkim.

Table-5.3.4.3: Mean and Standard deviation of Milk/Milk Products under SMU

Variables	Mean	Standard Deviation
Total Liquid milk production per year (1996-2012)	3558117.64	1570002.23
Total butter production per year (1996-2012)	12349.18	4716.84
Total curd production per year (1996-2012)	34780.06	32641.63
Total churpi production per year (1996-2012)	4448.706	1958.36
Total paneer production per year (1996-2012)	10205.82	11550.24
Total cream production per year (1996-2012)	11354.90	7695.16
Total revenue from dairy per year (1981-2013)	47547090.91	69409895.69
Number of organised society (1981-2012)	155.71	72.4
Producer members (1981-2012)	5139.84	2062.75
Avg. Milk produced in kg per society per day (1981-2012)	236.25	44.53
Avg. Milk produced in kg per member per day (1981-2012)	6.88	1.59

Source: Compiled from Annual Report of SMU

Referred to the table-5.3.4.3, if we observe the average liquid milk production of Sikkim Milk Union during 1996 till 2012, it has been recorded at 3558117.64 kg per year with a standard deviation of 1570002.23 kg, which signifies high rate of oscillation. The variation in milk production is very high compared with butter, curd, churpi, paneer and cream. Such high value of high variation may be due to the fact

that all other items are produced from liquid milk whose production can only define the production of the subsidiary items. In the same manner, the average revenue of Sikkim Milk Union from dairy during 1981 till 2013 has been recorded at Rs. 47547090.91 with a standard deviation of Rs. 69409895.91, which indicates high fluctuation in the total revenue during the period of study. This has been clear from the data as per Annual Report 2012-13 of Sikkim Milk Union, as in the year 1981 the total revenue from dairy has been recorded at Rs.1904000 but in 2013; it has been registered at Rs. 305643000, which shows huge change. With regard to the number of organised societies under Sikkim Milk Union during 1981 till 2012, its average value has been estimated at 155.71 while its standard deviation has been registered at 72.40. This too holds good amount of variation, since in the year 1981 the total number of organised societies under Sikkim Milk Union was 51 while in 2012 the number rose to 303. Same is the case for producer membership under Sikkim Milk Union, as the average membership during 1981 till 2012 has been registered at 5139.84 and its variation was high during the study period. During the same period of study, the average milk produced in kg per society has been estimated at 236.25 kg per day with its standard deviation of 44.53 kg which indicate less variation in the production of milk by the societies. Similarly average milk produced in kg per member has been recorded at 6.88 kg per day with its standard deviation of 1.59 kg, indicating less variation during the study period.

The data regarding milk/milk products, its consumer price and retail margin has been collected from SMU and their retail agents from various places in East Sikkim.

Table-5.3.4.4: Milk / Milk Products Offered and it's Consumer Price and Retail Margin in Sikkim

Milk	Price	Retail Margin
Toned Milk (3.0% Fat and 8.5% SNF)	Rs 17/- per 500ml.pouch	0.34
High Cream Milk (4% Fat and 8.5% SNF)	Rs 38/-per 1000ml.pouch	0.76
Loose Milk in Cans	Rs. 28/-per kg	
Sikkim Premium Tetrapak	Rs. 50 per litre	2
MILK PRODUCTS		

Butter Fresh_ 1kg	Rs 380/-per pack	3
Paneer_ 1Kg	Rs 260/-per pack	5
Paneer_ 200gm	Rs 60/-per pack	4
Curd 500ml pouch	Rs 34/-per pouch	0.75
Curd 200 ml pouch	Rs 16/-per cup	0.50
Churpi	Rs 140/-per kg	4
Cream 1000 gm	290/-per kg	5
ICE-CREAM		
90ml Cup	Rs.15/-	
Vanilla/strawberry/Mango/others		2.7
Vanilla/Strawberry/Mango sticks/others	Rs. 15/-	2.7
250ml	Rs. 25/-	
Vanilla/Strawberry/Mango/others		4.5
500ml	Rs. 45/-	
Vanilla/Strawberry/Mango/others		8.1
1000ml	Rs. 90/-	
Vanilla/Strawberry/Mango/others		16.2

Source: SIKKIM MILK UNION RETAIL AGENTS

It has been found from the table-5.3.4.4 that the retailer margin is maximum in case of ice-cream 1000ml Vanilla/Strawberry/Mango/others followed by 500ml Vanilla/Strawberry/Mango/others. In case of milk products, the maximum retail margin was found in case of paneer. Toned milk has the least market margin. It has been in the recent years that Sikkim Milk Union is diversifying its product to meet the consumer demand.

5.3.5 Costs and Margins

5.3.5.1 Cost and Margin of Dairy at Household Level

Table 5.3.5.1 shows per litre cost and margin of sampled dairy household between cooperative members and non-members in the study area. From the table, it can be observed that with regard to the total variable costs, non member household incur

higher cost as compared to the member household, for member total variable cost is Rs. 10.24 per litre whereas for non member household it is Rs. 14.55 per litre. Total variable cost incurred by the member and non member household includes; cost on concentrates, salt, dry fodder, hired labour, ropes, veterinary and transportations. In relation to the total fixed cost incurred by the both the households, it can be observed that member household incurs cost more than the non member household but with their difference is minimum. Total fixed costs constitute Rs. 2.26 for member and 2.23 for non member household. Price paid to the non member household is higher as compared to the member household as member milk price is Rs. 25.79 per litre where as non member price is Rs 30. Profit margin per litre for member is greater than non member despite of low price paid to member household; this has been revealed in the study as member household profit margin per litre milk is Rs.13.29 as compared to non member which is Rs. 13.22. This is because of the efficiency in member household.

Table-5.3.5.1: Cost and Margin of Sampled Dairy Household

(Rs. per litre)

Particulars	Member	Non-member
Concentrates	7.77	9.05
Salt	0.51	0.55
Dry fodder	0.33	1.08
Hired labour	0.37	2.55
Veterinary	1.16	1.08
Ropes	0.10	0.12
Transportation	0.00	0.12
Total Variable costs	10.24	14.55
Interest on fixed Capital	1.08	1.06
Depreciation on fixed	1.18	1.17
Total Fixed Costs	2.26	2.23
Total Cost	12.50	16.78
Price Of Milk	25.79	30
Profit Margin Per Litre	13.29	13.22

Source: Compiled from Primary Survey

5.3.5.2 Cost and Margin of Dairy Products in Sikkim Milk Union

Table 5.3.5.2 shows the cost of processing, marketing and other costs of Sikkim Milk Union during 2013. In addition to the various cost incurred, net profit per litre milk of SMU has also been calculated.

Table-5.3.5.2: Cost of processing, marketing and other costs in 2012-13

Item	In Rs.
Expenditure	
Raw Materials Consumed	169871676
Manufacturing Expenses	25160761
Cost Of Processing Per Litre	2.85
Purchase Of Products For Trading	5725778
Cost Of Procurement of milk Per Litre Including Transportation Cost	25.84
Payments To And Provision For Employees	18520078
Administrative Expenses	3497915
Per litre Cost Of Administrative Expenses	0.40
Sales revenue	238437975
Selling And Distribution Expenses	11197788
Cost Of Marketing Per Litre	1.27
Veterinary Services & Extension Activities	502912
Cost Of Veterinary Services Per Litre	0.06
Profit/Loss Before Depreciation	5352065
Depreciation	2833006
Profit Before Tax	2519059
Provision Of Income Tax	793957
Profit After Tax	1725102
Statutory Reserve	431276
Net Profit Carried Over	1293826
Total Milk Procured Per Year (In Litre)	8813290
Net Profit Per Litre Of Milk After Tax	0.195739

Income	
Sales	238437975
Other Receipts	1071999
Variation In Stock	318999

Source: Compiled from Annual Report of SMU

It can be depicted from the table 5.3.5.2 that per litre cost of processing of SMU in the year 2012-13 has been estimated Rs. 2.85. Per litre cost of milk procurement including transportation cost has been recorded at Rs. 25.84 while per litre cost of administrative expenses was registered Rs. 0.40. Cost of marketing per litre of milk has been accounted Rs. 1.27 whereas per litre cost of veterinary services was accounted Rs. 0.06. Finally per litre net profit after the payment of tax of SMU has been calculated, this accounted at Rs. 0.20.

5.4 Constraints Faced by the Dairy Farmers

The dairy farmers faced several problems in developing their dairy enterprise. The dairy farmers were interviewed to assess the major constraints in dairy development. The major constraints in the development of dairy sector are shown in table 5.4:

Table-5.4: Various constraints faced by dairy farmers (%)

Item	% of famers
1. Lack of knowledge in production:	78
2. Lack of own fund	69
3. Lack of credit facilities from banks	70
4. Shortage of feed/fodder	65
5. Lack of good breed	85
6. Less price paid by the co-operatives	60
7. Lack of training	80

8. Lack of market facilities	40
9. Lack of quality testing facilities	20
10. Insufficient Veterinary Services	30
11. Lack of government support	79

Source: Primary Survey

1. Lack of knowledge in production: 78 per cent of the farmers in the study area reported that there is a lack of knowledge in the techniques of dairy production.
2. Lack of own funds: to establish commercial dairy farming needs a required amount of funds. About 69 per cent of the respondent in the study area faced with a problem of funding which hindered them in practicing dairy farming.
3. Lack of training –farmers complained lack of knowledge in production was due to lack of training facilities for practicing dairy. About 80 per cent of farmers in the study area complained in this regard.
4. Lack of good breed: It was the major constraint for farmers which hinder them to increase dairy production. Nearly 85 per cent farmer faced similar constraint, which hinders them to enter into the market.
5. Lack of credit facilities from banks – Most of the farmers (70%) also stated that banks and cooperative institutions were reluctant to provide credit facilities to small and marginal farmers.
6. Less prices paid by the co-operatives: In the study area milk price per litre paid to the farmers by dairy co-operatives is less as compared to the price that farmers receive in the local markets. 60 per cent farmers were not satisfied by the price fixed by dairy cooperatives.
7. Lack of market facilities- Compared with most of the constraints faced by the farmers, lack of market facilities accounted relatively lesser per cent which was reported by the farmers in the study area. Only 40 per cent farmers complained in this regard. The presence of SMU in the study area facilitated farmers in milk marketing.

8. Lack of quality testing facilities: Less per cent (20 per cent) of farmers reported lack of quality testing facilities in the study area because of well equipped quality testing machines provided by SMU in every society with well trained testing personnel.
9. Shortage of feed: Shortage of feed concentrate is the root cause of poor performance of dairy sector in general as the genetic milk production potential of crossbred cow could not be exploited fully in absence of proper nutrition.
10. Insufficient Veterinary Services: 30 per cent reported to have problem in veterinary. Due to Lack of proper veterinary extension system there is poor perception to the farmers towards dairy enterprise as a viable alternative to crop husbandry.
11. Lack of Government support: Dairy development needs good governance and policies which may support dairy farmers. Present study found 79 per cent of farmers reporting lack of required support from the government side.

5.5 Suggestions to Improve the Growth of Dairy Farming in Sikkim

- i. Awareness and training with regard to dairy must be organized either by Government or by SMU for progressive dairy farmers.
- ii. Cooperative banks and other commercial banks should come forward to extend liberal credit facilities to the farmers particularly small and marginal farmers for the development of dairy enterprise.
- iii. The governments have to give support to the dairy farmers by providing subsidies, proper prices and market facilities.
- iv. Establishing a veterinary service center to improve the efficiency of the artificial insemination scheme, veterinary services must be provided to the farmer door on all bases at a reasonable cost.
- v. Attempts should also be made to improve the quality and increase the quality of manufactures feed in the cooperative sector so that quality feed can be supplied at reasonable prices. The dairy farmer especially weaker sections of society will be supported with subsidized credit for calf rearing and feeding the cattle during dry seasons.
- vi. The organizational support for milk producers through the cooperative sector should streamlined and expanded organization for primary cooperatives for

milk procurement should be extended to areas where the local market is unable to absorb the milk production steps should be taken to reorganize and develop rural market for milk.

- vii. Awareness regarding milk cooperative society should be created among small and marginal farmers.

CHAPTER 6

CONCLUSION AND SUGGESTIONS

An attempt has been made in the present study to analyze dairy production and marketing in East Sikkim. The study has been undertaken with the following objectives in mind: (i) To give an overview of the Dairy Sector in the economy of Sikkim. (ii) To see the livelihood status of families engaged in dairy farming. (iii) To analyze cost of production and marketing of dairy products. (iv) To suggest measures for the development of Dairy Sector in Sikkim. The research questions undertaken in the study were: (i) whether dairy sector is important sector for the economy of Sikkim or not? (ii) What is the livelihood status of the families engaged in dairy business? (iii) Whether production of dairy products is profitable to the farmers? (iv) How marketing of dairy products done by Sikkim Milk Union? (v) How to accelerate the growth of dairy sector in Sikkim?

The study has incorporated both primary as well as secondary data for the purpose of analysis. The secondary data have been generated from the published sources. Primary data have been generated by using an interview schedule by conducting field survey amongst the sampled families of East Sikkim via personal interview method. Descriptive statistics and econometric tools have been used to analyse the data.

The conclusions of the study are as under

- i. From the present study it has been observed that the high priority sector i.e. Dairy sector has not been developed much in the tiny Himalayan state, Sikkim.
- ii. Milk production in Sikkim shows a fluctuating trend and while compared with other top milk producing states of India, their milk production is increasing as time has changed where as Sikkim's milk production shows declining trend. Though from 1980 till 2012, there has been an increase in the number of producer members and organised cooperative societies under Sikkim Milk Union and though the growth rate of Dairy Income of SMU has been registered at 17.6 percent per annum from 2004-05 till 2011-12, but on an average, the percent share of dairy income of SMU in GSDP of Sikkim is

only 0.24, which is very discouraging and shows less contributing sector in Sikkim economy.

- iii. The study found that the average number of cattle between member and non-member household in five GPU was 3 and 2.3 respectively. Member household holding of both cross and local breed was higher as compared with non-member household. But the discouraging fact is, there is on an average 0.86 cross breed cattle holding by member and 0.76 by non member household. The holding of local breed cattle was higher for both member as well as non-member household with an average of 2.14 and 1.56 respectively.
- iv. Mean milk yield per day by cross breed was higher as compared to local breed in the study area but the holding of cross breed is very less which resulted in less milk production in the study area. It has also been observed that landless farmers have higher production and sale of milk per day than any participants. They were totally dependent upon dairy and were more market oriented. The present study identified variables like- amount of milk sale per day and price of milk, which can positively influence dairy income in the sampled household.
- v. Socio-economic profile of sampled dairy household which comprised both cooperative member as well as non-member household showed only variables like family size, milk yield per day, income from dairy, total income per month and religion practices were found to be different between member and non member household. Apart from these variables, other socio economic variables like age, number of local milking cow, number of cross breed milking cow, sex and education were found to be statistically insignificant resulting, no differences in these variables. Location wise study of socio economic variable showed that age, quantity of milk production, religion and gender participation in dairy farming were found to be different while other variable were found to be indifferent among five GPU's taken into consideration.
- vi. It has been observed that livelihood status for the family belonging to non member household were better as compared to member household who are engaged in dairy farming in terms of income earning per month. The total income per month from other sources apart from dairy for member household was only Rs. 6367.90 per month while for non member household it was Rs.

17101.60. Though dairy income was higher for member household i.e. Rs. 4432.10 per month as compared to non-member household which was Rs. 2698.40 per month. The percent share of dairy income to the total income for member household was 41.03 percent and for non member it was just 13.63 percent indicating no dependency in dairy by non-member.

vii. Dairy farmers are categorized in two groups one is cooperative member and non-cooperative member. Cooperative societies are formed under the umbrella of Sikkim Milk Union. The raw milk is collected and processed by Sikkim Milk Union. The processed milk and milk products are marketed through its agents. Dairy products produced by non member household in the study area are mainly used for household consumption. The non-member producing surplus milk is subjected to sale in the local market and nearby household. The role of other middle man is negligible

viii. Cost and margin of per litre milk has been estimated in the sampled dairy household. Per litre total cost was higher for non member household as it accounted at Rs. 16.78 per litre where as member household accounted at Rs. 12.50 per litre. Despite of lower price received per litre of milk by member household i.e. Rs. 25.79 as against Rs. 30 by non-members, profit margin per litre of milk for member is greater than non member, as member household profit margin per litre milk is Rs.13.29 as compared to non member which is Rs. 13.22. This is because of the efficiency in member household.

ix. It can be depicted that per litre cost of processing of SMU in the year 2012-13 has been estimated Rs. 2.85. Per litre cost of milk procurement including transportation cost has been recorded at Rs. 25.84 while per litre cost of administrative expenses was registered Rs. 0.40. Cost of marketing per litre of milk has been accounted Rs. 1.27 whereas per litre cost of veterinary services was accounted Rs. 0.06. Finally per litre net profit after the payment of tax of SMU has been calculated, this accounted at Rs. 0.20 (approximately).

It has been observed that the high priority sector i.e. Dairy sector has not been developed much in the tiny Himalayan state, Sikkim and the production of milk in the state over a period of time shows fluctuating trend. The contribution of dairy income of SMU in the GSDP of Sikkim is also very less. It has been observed that

livelihood status for the family belonging to non member household were better as compared to co-operative member household who are engaged in dairy farming in terms of income earning per month. It has been studied that dairy is not contributing much in the livelihood of the sample farmers in the study area.

Suggestions to Improve the Growth of Dairy Farming in Sikkim

- i. Awareness and training with regard to dairy must be organized either by Government or by SMU for progressive dairy farmers.
- ii. Cooperative banks and other commercial banks should come forward to extend liberal credit facilities to the farmers particularly small and marginal farmers for the development of dairy enterprise.
- iii. The governments have to give support to the dairy farmers by providing subsidies, proper prices and market facilities.
- iv. Establishing a veterinary service center to improve the efficiency of the artificial insemination scheme, veterinary services must be provided to the farmer door on all bases at a reasonable cost.
- v. Attempts should also be made to improve the quality and increase the quality of manufactures feed in the cooperative sector so that quality feed can be supplied at reasonable prices. The dairy farmer especially weaker sections of society will be supported with subsidized credit for calf rearing and feeding the cattle during dry seasons.
- vi. The organizational support for milk producers through the cooperative sector should streamlined and expanded organization for primary cooperatives for milk procurement should be extended to areas where the local market is unable to absorb the milk production steps should be taken to reorganize and develop rural market for milk.
- vii. Awareness regarding milk cooperative society should be created among small and marginal farmers.

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Appendix-A

Table-1A: GSDP in Respect of Agriculture and Livestock Sector (in lakhs) of Sikkim

Years	Livestock Sector	Total Agriculture	Total GSDP
2004-05	5550	28503	173915
2005-06	6029	29835	190945
2006-07	6165	29900	202385
2007-08	6328	31307	217823
2008-09	6502	32999	253499
2009-10	5877	34565	440101
2010-11	6111	36466	478428

Source: DESME, Government of Sikkim

Table 2A: Annual Growth of GSDP in Respect of Agriculture and Livestock Sector (in %) of Sikkim

Years	Livestock Sector	Total Agriculture	Total GSDP
2004-05			
2005-06	8.6	4.7	9.8
2006-07	2.3	0.2	6
2007-08	2.6	4.7	7.6
2008-09	2.8	5.4	16.4
2009-10	-9.6	4.7	73.6
2010-11	4	5.5	8.7

Source: DESME, Government of Sikkim

Appendix-B

Interview Schedule

1. Name: _____ Age: _____

Sex (M/F): _____ House C/H No. _____ Village _____

2. Family details

(i) No. of Members: _____ (ii) Highest Qualification of head _____

(iii) House Type*: _____

(*Pucca = 1; Kuchha = 2; Semi Pucca = 3; Pucca with Tin/Asbestos/Tiled Roof = 4; Kuchha with Thatched Roof = 4; Kuchha with Tin/Asbestos/Tiled Roof = 5)

(iv) Occupation^{\$}: _____

(^{\$}Livestock Rearing = 1; Cultivation = 2; Other Business = 3; Govt. Service = 4; Private Service = 5; Profession = 6; Wage Labour = 7; Any other = 8 [Specify])

(v) Type of Occupation[@]: _____

([@]Permanent (Fixed Income) = 1; Variable Income = 2; Daily Wage = 3; Weekly Wage = 4; Monthly Wage = 5)

(vi) Other Parallel Sources of Income⁺: _____ (⁺see iv)

(vii) Approximate income (Mention Amount in)[#]: _____

([#]Daily = 1; Weekly = 2; Monthly = 3)

(viii) Approximate Monthly Income from Dairy Farming: _____

3. Type and Area of Land on which Dairy Farming is done

Type of Land	Agricultural Land	Fallow Land	Low Land	High Land	Any Other (Specify)
Area in acre (mention if any other unit is used)					

4. Status of Land on which Dairy Farming is done (Check the appropriate Box '✓'):

Privately Owned	Leased in	Rented	Govt. Land	Any Other (specify)

5. Status of grazing land for cattle (Check the appropriate Box '✓'):

Privately Owned	Leased in	Rented	Govt. Land	Any Other (specify)

6. Details of cattle and milk (in quantities)

- i) How many cattle do you have? _____
- ii) How many cross breed cattle do you have? _____
- iii) How many local cattle do you have? _____
- iv) How many milching cattle do you have? _____
- v) How much milk do all of your cattle give during summer time? (In the entire day: both morning and evening) (both times) :cross breed _____
local _____
- vi) How much milk do all of your cattle give during winter time? (In the entire day: both morning and evening) (both times): cross breed _____ local _____
- vii) Are you a member of cooperative society? _____
- viii) How long you have been the member of cooperative society? _____

- ix) What benefits you are getting from the cooperative society?

- x) How much milk do you sell to the milk collection center in a day (morning and evening) during the summer time? _____
- xi) How much milk do you sell to the milk collection center in a day (morning and evening) during the winter time? _____
- xii) How much milk do you sell to the milk local market in a day (morning and evening) during the summer time? _____
- xiii) How much milk do you sell to the milk local market in a day (morning and evening) during the winter time? _____
- xiv) What is the SNF content of the milk that you provide to the collection center? _____
- xv) What is the Fat content of the milk that you provide to the collection center? _____
- xvi) What is the procurement price of milk? _____
- xvii) How many months does the cattle give milk continuously for? (i.e. lactation period) _____
- xviii) How many such periods does the cattle have during its lifetime? _____
- xix) How many of the cattle that you currently own did you purchase?

- xx) What is the purchase price of the particular cattle? If more than one, list each price individually. _____
- xxi) Do you sell cow dung? _____
- xxii) How much you earn from selling cow dung? _____
- xxiii) Do you keep the cattle after it completely stops giving milk? _____
- xxiv) If you give away the cattle, where do you send it? _____
- xxv) If you have sold the cattle, how have you made? (or would make if plan to sell it) _____

7. I) Cost of Milk Production

- a. Price of cow/s –
- b. Interest per annum on loan –
- c. Source of finance – self/banks/Co-operative/SGSY/Other
- d. Cow shed -
- e. Implements / canes / utensils

7. II) Operational Costs

Quantity / Price

Item	Quantity	Price
a. Feed (concentrates, etc.):		
b. Rice-straw:		
c. Green grass / fodder		
d. Water (units):		
e. Medicines:		
f. Veterinary services :		
g. Hired labour purpose :		
h. Family labour:		
i. Transportation cost (from house to Co-operative):		
j. Transportation cost from house to local market		
k. other costs (specify):		

8. Do you process milk? if yes

- a. What kind of products do you make? _____
- b. What is the cost of processing? _____
- c. What is selling price -
- d. What is the market price of milk products that you produce?

- e. Where do you sell milk products? _____
- f. How much is your home consumption of milk? _____
- g. How much is your home consumption of milk products? _____

9. Government support for dairy production

10. What constraints do you face in milk production and marketing?

(yes/no)

- a. Lack of own fund
- b. Lack of institutional finance
- c. Lack of local consumption
- d. Low price in the local market
- e. Less marketing surplus
- f. Less profitability
- g. Perishability of milk
- h. Lack of high quality breeds
- i. Lack of government support
- j. Lack of marketing infrastructure
- k. Lack of knowledge in production technology
- l. Lack of training facilities
- m. Other constraints
- n. Shortage of feed
- o. Lack of veterinary services
- p. Lack of quality testing

11. What suggestions do you want to make for the improvement of Dairy production?
