

AN EXPLORATIVE STUDY OF MILK CHAINS IN SIALKOT DISTRICT PAKISTAN



**Thesis submitted to the Van Hall Larenstein University of Applied Sciences part of
Wageningen University in partial fulfillment of the requirements for the Masters
Degree of Agriculture Production Chain Management with specialization on Livestock
Chains**

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DEDICATION

I would like to thank my parents and younger brothers for bearing my absence and without their moral support completion of this thesis is not possible. They have tolerated my absence a lot and in my absences also learnt to cope with difficulties. I would like to dedicate this thesis to them.

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ABBRAVIATIONS

ACO	Agriculture Census Organization
FAO	Food and Agriculture Organization.
GDP	Gross Domestic Production
GOP	Government of Punjab
LDDB	Livestock and Dairy Development Board.
MOPW	Ministry of Population Welfare.
PARC	Pakistan Agricultural Research Council.
PDA	Pakistan Dairy Association
PDDC	Pakistan Dairy Development company.
PMD	Pakistan Meteorological Department
PRB	Population Reference Bureau.
Rs	Pakistani Rupee
RCCSC	Research Center for Conservation of Sahiwal Cattle.
SCCI	Sialkot Chamber of Commerce & Industry
SLDDC	Sialkot Livestock and Dairy Development Company
UNDP	United Nation Developmental Programmes
ZTBL	Zari Taraqiati Bank Limited

SUMMARY

The theme of the research is “To understand what profit margins are obtained by small dairy farmers and how profit margins can be increased for small dairy farmers”. The study was carried out in district Sialkot of Punjab province of Pakistan during mid of July to end of August 2011. The objective of the study was to find how profit margins can be increased.

The study includes desk research and field research. The desk research is carried out by literature review and field research is conducted by survey and case study. Forty surveys were conducted among two groups of farmers small and medium through pre-structured questionnaires. Forty consumer surveys were conducted among fresh and processed milk consumers through pre-structured questionnaires. Total eight cases were studied two dohdi's, two milk traders, two milk processors and two government departments.

The results of the farmer's survey revealed that 90% of milk is supplied to informal sector and 10% to formal sector. The farmers were using seven different marketing channels to get maximum price in spite of that the profit margins earned by small dairy farmers were not surprisingly different from each other. The major reason found for low profit margins was high cost of production and low farm productivity.

The fresh consumer survey results showed that they were not satisfied with quality of raw milk found in the market and processed consumer with price.

The case study of dohdi and milk trader showed that they were not afraid from development of formal milk marketing in the district. The processor and government were trying their best to improve the situation of sector.

The findings that cumulated in the form recommendation are expected to help Pakistan dairy development company for development of future projects.

CHAPTER 1 INTRODUCTION

1.1 Background

Pakistan is an agriculture country and agriculture is the second largest sector accounting for 21 percent of GDP (Pakistan Economic Survey, 2009-10). The estimated population of the country by the end of 2011 is 177.10 million comprising 91.59 million males and 85.51 million females (MOP, 2011). Sixty four percent of population is living in rural areas as compared to urban population (NIP, 2011). Agriculture is the largest employer in the country and is providing employment to 45% population of country. Livestock sector contributed approximately 53.2% of the agriculture value added and 11.4% to national GDP during 2009-10. Livestock sector have an average growth of 5% from 2003-2010. (Pakistan Economic survey, 2009-2010). The major products of livestock are meat and milk. PDDC (2006) White paper stated that 61% of the total milk production is coming from Punjab, 26% from Sindh, 11% from Khyber Pakhtunkwa (former NWFP) and only 2% from Balochistan.

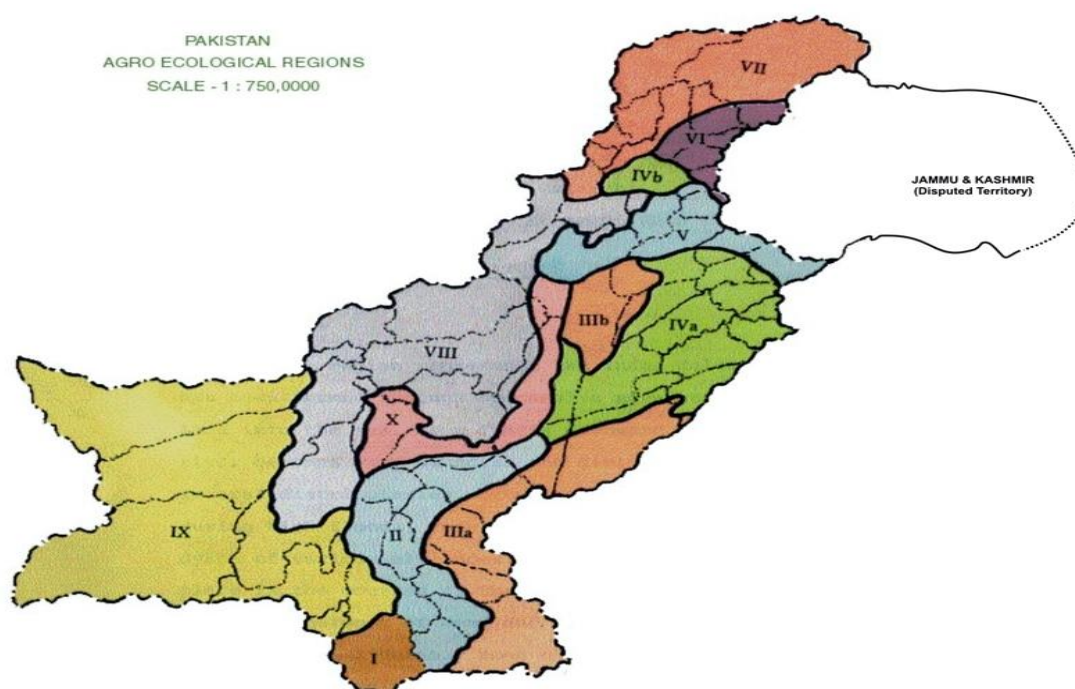
Pakistan is a country located in South Asia with total area is 796,095 km² and Islamabad is the capital city. Urdu is the national language and English is the official language. The total land under cultivation is 23.13 million hectare. The total irrigated area is 19.02 million hectares and non-irrigated area is 4.011 million hectares (MINFA, 2011).

Figure 1: Map of Pakistan



Pakistan lies in the subtropical arid zone and most part of the country falls under semi-arid climate. In 1980s, Pakistan is divided into ten agro-ecological zones based on physiographic and climatic diversity: I) Indus Delta; ii) southern irrigated plain; iii) sandy desert; IV) northern irrigated plains; v) Barani (rain fed) areas; VI) wet mountains; viii) western dry mountains; ix) dry western plateau; and x) Sulaiman Piedmont. (PARC, 2011)

Figure 2 Agro - ecological zones of Pakistan



There are four distinguished seasons in the country namely, summer, winter, autumn and spring. June is the hottest month and average temperature goes above 35°C in many regions of country while average temperature in winter falls below 4°C and can go below 0°C in mountainous areas. The average annual rainfall is estimated at 494mm, but there is a variation between the different regions of the country. Annual rainfall is recorded less than 100mm in parts of Balochistan and Sindh provinces to more than 1500mm in the foothills and northern mountains of Punjab and Khyber Pakhtunkwa provinces (PMD, 2011).

Dairy sector is not an organized sector as compared to developed countries. The dairy farming system is very different from Europe and other developed countries where it is considered as Independent business. It is estimated that 70% of the dairy farmers in the country are small dairy holders. These small dairy farmers contribute approximately 90% of milk for the dairy sector of Pakistan.

About 97% of milk is sold to informal sector as raw milk. The share of formal sector is only 3% and processed milk is mostly available in the form of UHT and a little portion as pasteurized milk (PDDC, 2006).

There are four UHT milk plants and eight milk pasteurized units. Out of eight milk pasteurized units, there only two units who do not receive milk from other farmers they processed their own milk. There are only three cheese plants and mostly making cheddar cheese. Nestle Pakistan is the biggest UHT milk processor in the country.

1.2 Research problem

Small dairy farmers are getting very low profit margins from their milk selling. As result farmers have very little bargaining power. There is a need to understand what profit margins are obtained by small farmers and how profit margins can be increased?

1.3 Justification of Study

Pakistan is the 3rd largest milk producing countries in world. However, Pakistan is not present in top-21 milk processing countries in world raking of IFCN (IFCN, 2009). According to PDDC (2006), 97% of milk is going to informal sector and only 3% milk is available for formal sector.

The government of Pakistan is currently spending 8.8 billion Pak rupees for the execution of seven projects. The focus of these projects are mainly on promoting milk and meat production and marketing; strengthening of extension services, delivery mechanism system to livestock farmers; prevention and control of livestock and poultry diseases; up-gradation of animal quarantine services and provision of veterinary services at farmer's door step (Economic survey of Pakistan, 2010-11).

Under the umbrella of PDDC, 1200 village milk collection centers has been established across Pakistan (PDDC, 2010). Livestock and Dairy Development Board has also established 210 village milk collection centers throughout Pakistan (LDDB, 2011).

There is a need to study to understand why still 97% of milk is going to informal sector and why farmer is delivering milk to informal sector despite of all government efforts to improve the economic status of farmer by improved milk marketing channels. Their also need to study that what are the possible strategies to increase the profit margins for small dairy holders.

1.4 Research objectives

To understand what profit margins are obtained by small dairy farmers and how profit margins can be increased for small dairy farmers?

1.5 Research questions

1. What are the current milk marketing options for the farmers in the district?

- 1.1 What are the current milk chains exists in the districts?
- 1.2 What portion of milk sold to which chain?
- 1.3 Why different milk marketing channels are chosen by farmers?
- 1.4 What are constraints faced by farmers?
- 1.5 What are profit margins earned by small dairy farmers?

2. What are consumers' demands for dairy products in the district?

- 2.1. What type of milk consumers are mostly purchasing in the district milk?
- 2.2. What are remarks of consumer regarding quality and prices of unprocessed milk?
- 2.3. What are remarks regarding quality and price of processed milk?
- 2.4. What are consumers demand regarding milk and milk products in the district?

What is the role of different chain actors in improving the value chain?

- 3.1 What is the role of government?
- 3.2 What is the role of processors?

CHAPTER 2 METHODOLOGY

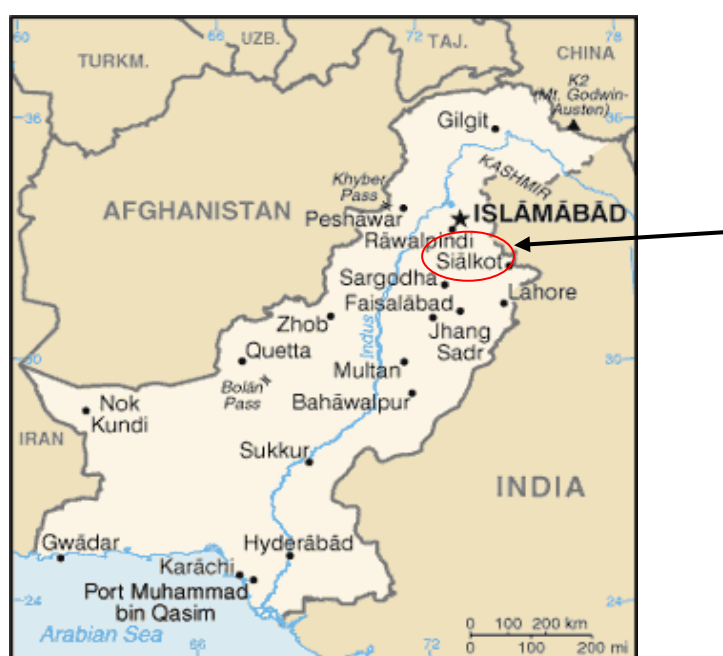
2.1 Study Area

The city of Sialkot is situated in the north-east of the Punjab Province of Pakistan. The city is located about 130 km north-west of Lahore. The city is boarded by snowy foothills of disputed Kashmir and only few kilometers from Indian –controlled Jammu.

Sialkot district has total area of 3016 km² with population density of 903 persons per km². According to population census organization (1998) population of district Sialkot was 2.7 million. It has 124 total union councils. The climate of district is humid subtropical. Summer in Sialkot is hot and humid while winter may become chilly and freezing. May and June are the hottest months whereas December and January are the coldest months. The rainfalls in monsoon season often results in flood.

The land is generally plan and fertile. The underground water is mostly used for cropping. The main cash crops grown the districts are wheat, rice and lentils.

Figure 3 Study area

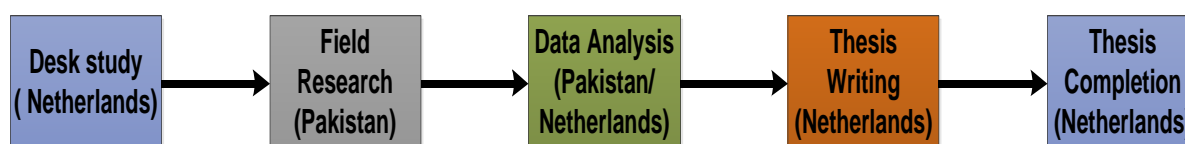


The major fodders grown in the district are sorghum, berseem, maize and oat. It is estimated that 70% of population is living in the rural areas of the district and their main source of income is coming from agriculture sector. Farming type is mix in the district. The primary source of income for some farmers is coming from agriculture farming whereas for others is livestock farming. Livestock farming mainly includes cows and buffalos. The size of the farm ranges from 1 cow or buffalo to more than 100. The most milk is sold to informal sector.

2.2 Research design

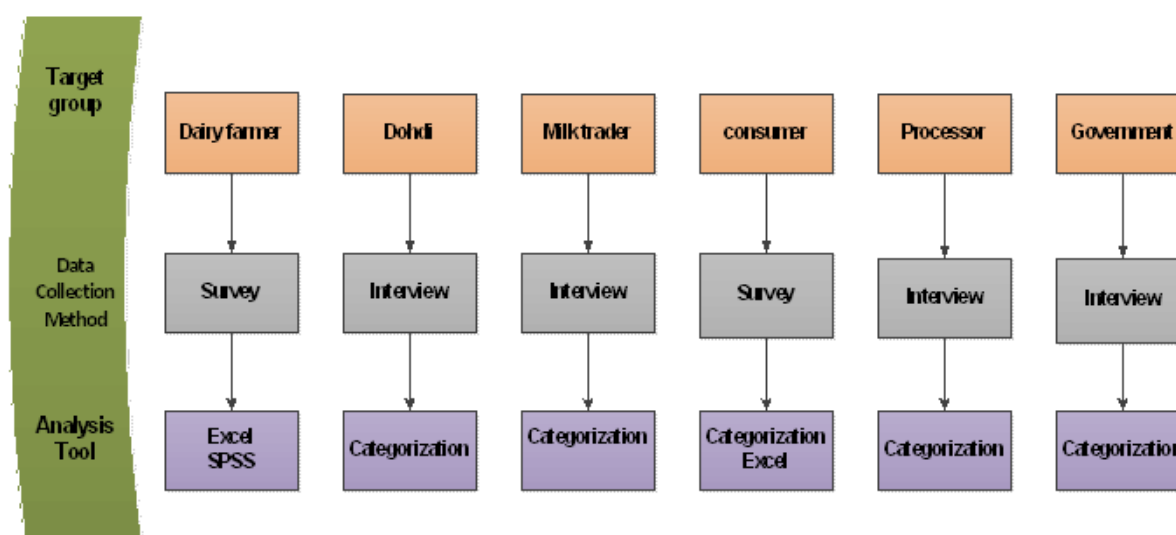
A research design is a procedural plan that is adopted by the researcher to answer questions validly, objectively, accurately and economically. A research design therefore answers the questions that would determine the path you are proposing to take your research (Kumar, 2011)

Figure 4 Research design



The study design is type of design that you are going to adopt to undertake your study (Kumar, 2011). The study design chosen was non-experimental and descriptive.

Figure 5 Study design



2.3 Conceptual frame work

The main theme of the study revolves around value chain concept. A value chain is a specific type of a supply chain, where actors actively seek to support each other so that they can increase their efficiency and competitiveness. They invest in time, effort and money and build relationships with each other actors to reach a common goal of satisfying consumer needs so that they can increase profits, (KIT and IIRR 2008)

The general environment of dairy sector of Pakistan was study by using PESTEC tool. It helped in understanding of different issues which had given support and hindrance to the process of development of dairy sector of Pakistan. The hindrance ultimately affected the profitability of small dairy farmers in the chain.

GTZ (2007) states that value chain mapping means drawing a visual representation of the value chain system. Maps identify business operations, chain operators and their linkages, as well as the chain supporters within the value chain. The visual analysis of chain was done by using tool of value chain map of Pakistan dairy sector and district Sialkot.

According to MDF (2005), Stakeholder analysis is the Identification of the key stakeholders in the analysis and planning stage of a change process, and an assessment of their interest

and the way in which these interests are likely to affect this process. This tool was used to identify key stakeholders in district Sialkot milk chain.

The SWOT analysis was used to find out the strengths in the sector, current weakness, and future opportunities for the growth and future threats.

2.4 Data Collection

The research model used for collection of data was mixed i.e. both qualitative and quantitative. The technique used for the collection of data is triangulation. It is the used for two or more independent sources of data within one study in order to ensure that the data is telling you what you think that they are telling (Saunders, Lewis and Thornhill, 2009). Both primary and secondary sources mentioned below were used to collect the required primary and secondary data.

2.4.1 Desk Study

The desk study was done for the collection of secondary data through literature, articles, international as well national reports, government publications, census and surveys.

2.4.2 Survey

The two surveys were conducted to collect primary data from dairy farmers and milk consumers in the district Sialkot by pre-structured interviewer administered questionnaire. The details of surveys were following.

2.4.2.1 Survey

A survey among forty dairy farmers was conducted. Two clusters of dairy farmers were made before survey i.e. small 1-15 cattle (Group1) and medium 16-95 cattle (Group 2). The pre-structured questionnaire was used to collect data.

2.4.2.2 Survey

A second survey was conducted among two consumers groups. For this purpose 20 raw milk consumer and 20 processed milk consumers were selected. The pre-structured questionnaire was used to collect data.

2.4.3 Case Study

The method used for the collection of data was triangulation. Case study involved interviews of six chain actors and two chain supporters. The interviews conducted through semi-structured questionnaire under three major categories namely processor, dohdi, and milk trader and government department.

1. Dohdi

Dohdi is person who collects milk from farmer and market milk by using different channels namely home delivery, milk trader and processor. The interview was conducted from two dohdi's to find out that how they are doing their business, is this business is viable for them or not, what constraints they are facing in their business and in what way they can improve their business.

2. Milk trader

The interview was conducted from two milk traders(large and medium) to find out that how much milk they are selling per day, what are the constraints they are facing, how establishment of a formal milk market will affect their business and how they can increase their profit margins in future.

3. Processor

The interview was conducted from two milk processor namely Nestle Pakistan and Millac foods. The interview helped to find possibilities and constraints for the establishment a formal milk marketing system.

4. Government

The interview was conducted to find the role of Pakistan dairy development company and Sialkot chamber of commerce and industries for improvement dairy sector with special focus to district Sialkot.

2.5 Data Analysis

Two types of data namely quantitative and qualitative were collected from the field and analyzed. The quantitative data was analysed by using Mann-Whitney test, Independent sample t- test and correlation in SPSS and Excel programme .The outcome compared with relevant literature information. The qualitative data was analyzed by categorization with the help of tables and diagrams.

2.6 Limitation of Study

The literacy rate of farmers was very low .The record keeping by farmers was improper. The availability of reliable data regarding cost of production was very difficult .The cost of production of milk per liter was calculated by the information provided by farmer. The farmer survey was conducted from male farmers only because access to female farmer was difficult due cultural setup of villages. The reliable literature especially research paper on dairy sector of India were not available freely. The research paper took time and money to order from library.

CHAPTER 3 LITERATURE REVIEW

3.1 Overview of dairy sector of Pakistan

Pakistan is the sixth most populous country in the world according to PRB (2010). National institute of population (2011) states that 110.46 million peoples are living in the rural areas of the country. They are directly or indirectly engaged with the agriculture sector. The agriculture sector remained an engine for rural economy of the country. Pakistan is gifted with large livestock population. It is estimated that the national herd consist of 35.6 million cow, 31.7 millions buffalo, 28.1 million sheep, 61.5 million goat, 1 million camel, 4.7 million asses, 0.4 million horses and 0.2 million mule (Pakistan economic survey, 2010-11). The trends in growth of agriculture and its sub-sector is mentioned in the below table from 2004-2011.

Table 1: Pakistan Agriculture sector growth in percentage

Year	Agriculture	Major Crop	Minor Crops	Livestock	Fishery	Forestry
2004-05	6.5	17.7	1.5	2.3	0.6	-32.4
2005-06	6.3	-3.9	0.4	15.8	20.8	-1.1
2006-07	4.1	7.7	-1.0	2.8	15.4	-5.1
2007-08	1.0	-6.4	10.9	4.2	9.2	-13.0
2008-09	4.0	7.8	-1.2	3.1	2.3	-3.0
2009-10	0.6	-2.4	-7.8	4.3	1.4	2.2
2010-11(P)	1.2	-4.0	4.8	3.7	1.9	-0.4

Source: Pakistan Economic survey 2010-2011

It is clear from the above table the livestock sector is continuously growing from 2004 till now with peak growth rate 15.8% in 2005-2006. The re-engineering and boost of the livestock started in 2005 with emphasis of government slogan "white revolution vision 2015". During that era two major government funded departments has been established namely Pakistan Dairy Development company and Livestock Dairy Development Board for development of livestock sector across Pakistan.

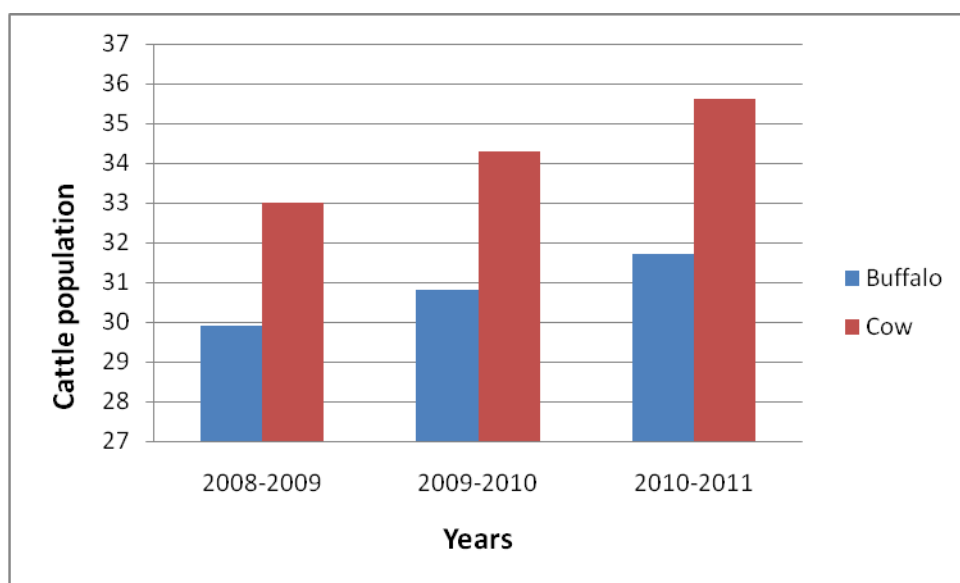
Milk is the largest and single most important commodity within the livestock sector of Pakistan. Pakistan is the 3rd largest milk producing country in the world with an annual production of 35.2 million tons energy corrected milk (ECM), 18th largest country in world for milk delivery with annual milk delivery of 6.8 million tons ECM and 19th largest country in world with reference to milk processed into tradable products with an annual volume of 3.3 million tons ECM (IFCN, 2009).

Afzal (2010) stated that the total value of the milk in the country is 1307 billion rupees which exceeds the combined value of the cash crops (1013 billion rupee). It is estimated that only 50% of the milk produced in the country is marketed and the remaining 50% is consumed at home. The sale of milk brings 653.430 rupees on yearly or 1.70 billion rupees on daily basis. The share of livestock sector is continuously increasing from 2004 onwards despite of unpredicted and massive flood in July 2010. There is a slight decreases of 0.6% in year 2010-11 as compared to 2009-2010 due to floods (Pakistan economic survey 2010-11).

3.2 Dairy herd composition

In Pakistan, a buffalo is traditionally raised as dairy animal and cow as drought animal. Buffalo is called black gold of Pakistan. It is playing a leading role in the national economy of the country by producing 68% of milk available. The cow milk share is only 27% and the remaining 5% milk is coming from sheep, goat and camel. The high fat content of buffalo milk is major reason for its milk preference. There are two breeds of water buffalo in the country namely Nili Ravi and Kundi. The home tract Nili Ravi breed is Punjab where as Kundi is found in Sindh and Balochistan. The average milk produced by Nili Ravi is 1800-2500 liters per lactation with 6.5% fat while Kundi produce an average of 1700-2200 liters per lactation with 6% fat contents. (Bilal, et al., 2006)

Figure 6 Cow and Buffalo population Pakistan



Source: Pakistan Economic survey (2010-2011)

The local cow breeds present in country are humped-type (*Bos Indicus*). It is generally believed that local cow breeds were domesticated in Pakistan around 4000 BC. There are fifteen breeds of indigenous cows present in the country. Only three breeds recognized as dairy breeds namely Sahiwal, Red Sindh and Cholistani. The home tract of Sahiwal and Cholistani is Punjab where as Red Sindh is found in Sindh. The 43% population in country comprises of recognized breeds (Khan, et al., 2008). The potential of Sahiwal cow reported by Rehman (2006) is 1552 ± 12 liters for an average lactation of 235 ± 1.4 days. Ashfaq (2000) reported the potential of Cholistani as 1233 ± 399 liters with average lactation of 200 ± 66 days. Mustafa, et al. (2003) reported the Red Sindhi can produce 1531 ± 35 liters in an average lactation of 277 ± 6 days. Shival cow has potential of producing maximum 5600 liters and average 2000 liters in 305-days (RCCSC, 2011)

The chart above shows the trends in the population of the cows and buffalos in Pakistan from year 2008- 2011. It is clearly depicted from the above chart that the growth per annum of cow is higher than the buffalos. The current estimated cow and buffalo population is 35.6 and 31.7 million heads.

3.3 Dairy farming system

Dairy sector in Pakistan is historically a subsistence sector dominated by small dairy holders to meet their daily need of milk, food and cash income. It is considered as more secure source of income especially for small and landless farmers in the rural areas.

There are 8.42 million dairy farming households who are raising 26.79 million cows and buffalos reported by agriculture census organization (2006).The table below through light on the number of dairy animals by households.

Table 2 Number of cattles by household

Number of Cattle	% of ownership by household
1-2	27.32
3-4	23.73
5-6	14.32
7-10	13.68
11-15	6.29
16-20	2.66
21-30	2.58
31-50	2.71
50 and above	6.72
Total	100

Source: Pakistan Livestock Census (2006)

It can be interpreted from the above table that 51% of farming households have an average herd size of 1-4 cattle whereas 28% households have 5-10 cattle. The categories of 51% and 28% farming household most of them are landless or have very small piece of land. The herd size between 11 to 50 cattle is owned by 14.23% household. The farmers who keep 50 and more Cattle represent only 6.72% of total ownership. The farmers have mostly mixed herd of cows and buffalos. The small holder dairy production system raises 71.4% of buffalos and 67.6% cows (Afzal, 2011).

Dairy production is also dominated by women and mostly involved in extension and practical veterinary services. There is scope for women to expand his role from production to marketing (USAID, 2009).

The farming is not mechanized milking and cutting of the fodder is mostly done by hand. Less than 1% farmers have milking machines. In 2005, Nestle Pakistan put the foundation stone of first commercial mechanized dairy farm in Pakistan.

3.4 Feed resources

The availability of good quality and surplus quantity feed recourses play a pivotal role in the development and improvement of livestock sector of a country. The provision of adequate nutritional quality of feed is likely to be the most limiting factor in increasing livestock production, although there is a market demand for the livestock products.

The feed resources can be divide into two major categories (1) Conventional (2) Non-conventional. Conventional feed resources can be sub-divided into three categories (i) Green roughages (ii) Dry roughages (iii) Concentrates. Green roughages include fodder crops, range grasses including shrubs and forbs, sugar beet tops, sugarcane tops, silages and tree leaves. Dry roughages include hay, straws, stovers and hulls. Concentrates include cereal grains, oilseed cakes and meals, cereal brans and polishing, molasses and sugar

beet pulp. Non-conventional feed resources refers to those feeds which are not traditionally used in animal feeding but have the potential to be used as feed e.g. agro-industrial by-products (sugar and cereal industry) and wastes available in the province. (Younas and Yaqoob, 2005)

It is stated by Younas and Yaqoob (2005) that 80-90% of the nutrient requirement of livestock are fulfilled by fodder crops in irrigated areas. The fodder crops can be divided into two major categories with respect to season (i) winter fodders (ii) summer fodders.

Winter fodders are planted from September till November. The common winter fodders include Berseem (*Trifolium alexandrinum*), Barley (*Hordeum vulgare*), Lucerne or Alfalfa (*Medicago sativa*), Oats (*Avena sativa*, L.). Summer fodders are grown from mid February to end of August. The common summer fodders include Cowpea (*Vigna unguiculata*), Guar (*Cyamopsis tetragonoloba*), Maize (*Zea mays*), Millet (*Pennisetum typhoides*), Sorghum (*Sorghum bicolor*) and Mott grass (PARC, 2011).

3.5 Animal breeding facilities

The animal breeding facilities are limited in the country due to the following reasons: (i) A limited number of genetic improvement programmes in the livestock sector by government. The breeding programmes require long duration for improvement of a breed. The donor agencies or government provide funding for those projects that give quick and visible results (Afzal and Naqvi, 2004). (ii) The farmers generally are not keeping their production records and breeding is mainly done by farmers on physical breed characteristics like colour of eyes, coat colour, tail length and shape of horns (Afzal and Naqvi, 2004).

The majority of the farmers are inseminating their dairy animals by bulls both in buffalo and cow. The artificial insemination technique was started in the late 50s in the country. The adaptability of farmers towards A.I is very slow. A.I is used to inseminate only 5% of the breedable buffalos and 7% breedable cows. There are 189 artificial insemination centers and 7 semen production units in the country. The semen of both buffalo breeds Nili Ravi and Kundi and two cow breeds Sahiwal and Red Sindh is produced locally at four semen production units. The semen of two exotic cow breeds namely Holstein-Friesian and Jersey is also produced locally (Afzal and Naqvi, 2004). There are 963 veterinary hospitals in the country where artificial insemination services are available (Afzal, 2009).

The role of the private sector cannot be ignored in this area. There are two major players in the private sector namely Altaf & Co and Profarm Pakistan. Altaf & Co is the oldest private company started his business activities in 1986 and representative of World Wide Sires USA. It is providing both indigenous as well as exotic breed's semen (Altaf & Co, 2011). Profarm Pakistan is the first one-stop dairy farm product and service provider in Pakistan and started operations in 2007. It is a joint venture between two Dutch companies; the blue link and CRV. Profarm is selling exotic breeds semen only. It is stated by the company that 100,000 farmers have used their products (Profarm Pakistan, 2011).

3.6 Animal health Services

Animal health services are considered as a prime responsibility of government in a country. In the global context, the World Animal Health Organization and Food and Agriculture Organization are playing their role for the availability of animal health service at global as well as country specific levels.

Pakistan is a federal state and under the constitution the many functions shifted to provincial level. Federal government departments are involved in the development of national policies and planning, animal quarantine and research on animal diseases, international and provincial coordination on animal diseases, import and export of animals and their products.

No animal welfare activities are under taken by federal government (Afzal, 2009 cited Ali and Ali, 2005).The provincial government departments are mainly involved in the provision of animal health services. The services provided by provincial government department include;(i)Diagnosis and treatment of animals(ii)Prevention of diseases(iii)Prophylactic vaccination and production of biologics (iv) Meat inspection (v)Veterinary training (vi)Research in animal health(vii)Prevention of cruelty to animals(Afzal ,2009).

There are six veterinary research and vaccination production institutes, 963 veterinary hospital, 2869 veterinary dispensaries, 2875 veterinary centers and 72 diagnostic labs running under the supervision of federal as well provincial government (Afzal, 2009).

3.7Agriculture credit facilities

The availability of credit timely to meet financial requirements of the farming sector is one of the key factors in the development of agriculture sector of a country. This fact has been recognized by state bank of Pakistan (SBP) a long time ago. SBP is doing every effort to provide directly needed credit to the farming community through a well establishment of infrastructure of banks. At the moment 20 banks with around 3,700 agriculture designated branches are facilitating farmers by extending agriculture credit throughout the country. These include five scheduled banks, two specialized banks (ZTBL and PPCBL) and 13 private domestic banks. These banks provide credit to the farming community for all types of farming activities (Pakistan economic survey ,2010-2011).The five scheduled banks and 13 private banks are providing agriculture credit at interest rate of 15-18% while ZTBL and PPCBL providing credit at 9% interest rate.

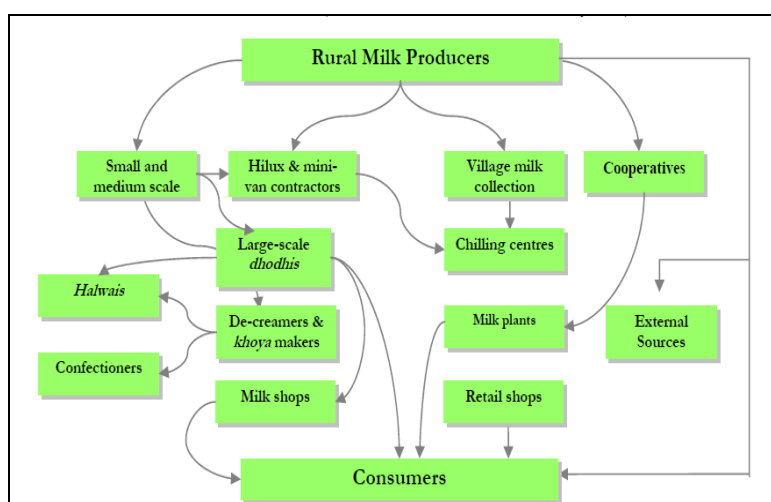
3.8 Milk collection and mmarketing chains

There are three distinguished milk collection and marketing system existing in the Pakistan namely; rural chain, peri-urban and urban chain and processed chain.

3.8.1 Rural milk chain

The large portion of the milk is produced in rural as compared to peri-urban and urban areas of Pakistan. The significant portion of milk is either consumed by the family or it is directly sold to neighbour villagers. The remaining 30-40% of milk is marketed through complex marketing chain consist of multiple layers of middlemen who are involved in collection and marketing of milk. The farmers directly supply milk to village milk collection centers or dohdi's (milk collectors) usually collect milk from the farmers and sell it to large scale dohdi's. (FAO, 2009).

Figure 7 Milk collection and distribution system of Pakistan



Source: PDDC (2006)

3.8.2 Peri-urban and urban milk chain

The milk usage of urban population of Pakistan is 30% of the total milk produced in the country (PDDC, 2006). To fulfill the demand of urban population 5 to 15% of milk is produced in Urban and Peri-urban areas of the country respectively. Peri-Urban farms are usually located in a radius of 5-10km outside the major cities. Peri-urban farmers mostly operate on a small scale by keeping 10-50 animals and larger farmers may have 500 animals in cattle colonies. These farmers have more control over the market and have direct contact with consumers. They integrate both production and marketing function by themselves (FAO, 2009).

3.8.3 Processed milk chain

The share of formal processing industry is only 2-3% and the remaining 97-98% of the total milk produced in the country goes to informal sectors as mentioned above. It is estimated that 20% of the current milk production is lost from income generation due lack of better infrastructure required for handling perishable commodity like milk (PDDC, 2006).

There are three different channels through which milk is collected by the processors; (1) Milk collection through a third party, (2) Village milk collection center of processor, (3) Farmers' cooperatives. Mostly milk collected through milk collection through a third party and village milk collection center of processor whereas farmers cooperatives are not yet successful to date (PDDC, 2006)

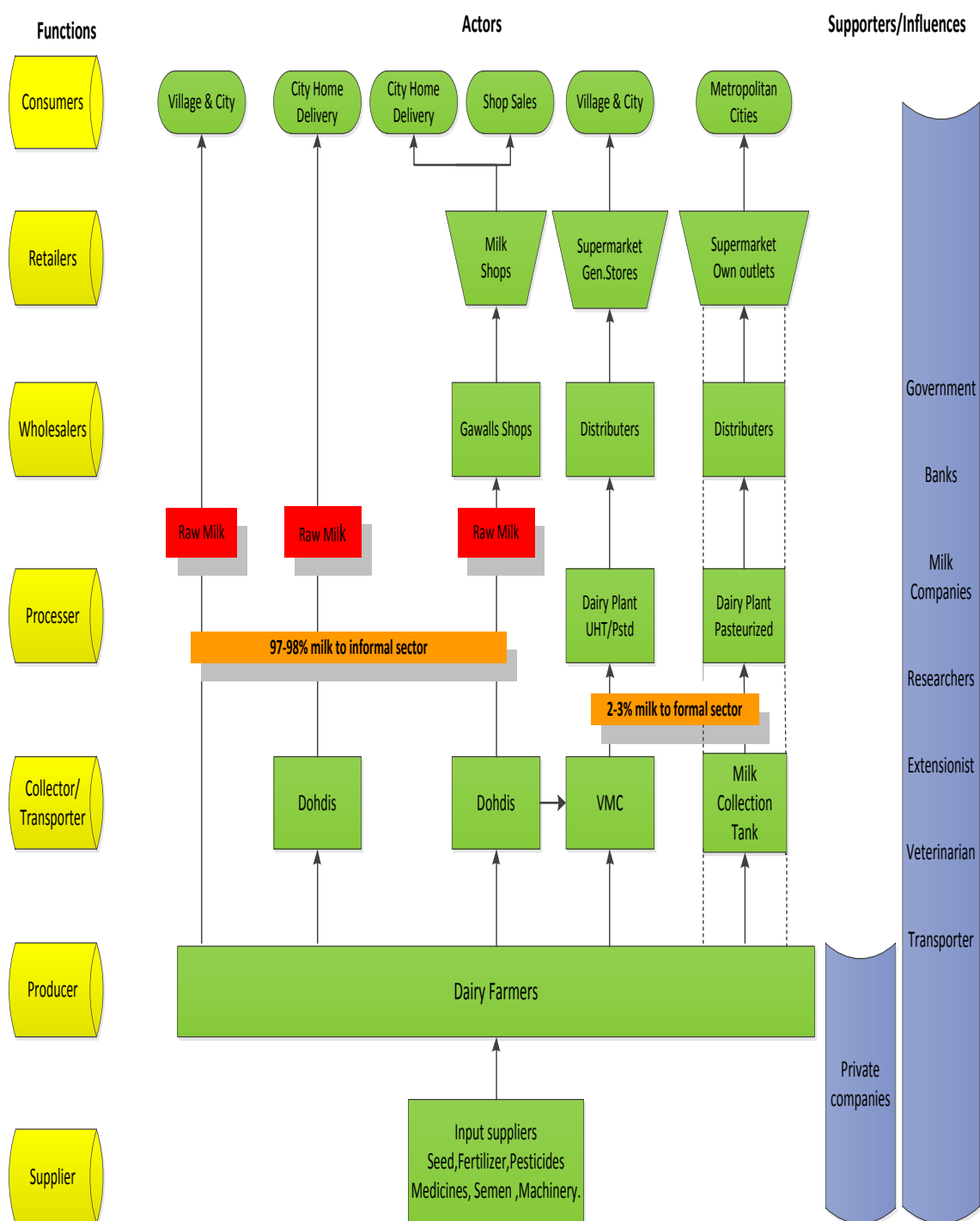
3.9 Dairy Industry

There are twelve currently commercial milk processing units are working in the country. Most of them are dealing with production of UHT milk and only four units are also producing milk pasteurization units. These milk processing units are making range of milk products. The detail of milk collection per day and different products made by different processors are attached (see Appendix III). Nestle is the largest milk processor in country with daily milk collection of 8, 43,681 litres per day and second largest milk processor is Engro Pakistan with daily milk collection of 8,00,000 liters per day.

3.10 Current dairy value chain

Broadly speaking there five dairy value chain existing in the country. The shortest chain includes only three chain actors' supplier, producer and consumer. The milk produce by farmer directly sold to consumers in village. The second chain includes four chain actors and dohdi acts as linking pin between producer and consumer. The third chain is little longer than second chain and include six chain actors. The fourth chain is processed chain is the longest chain including seven chain actors. The pasteurized chain owned by farmer is recent development in country started its first production in 2008 and include only four chain actors. Chain map below give an overview of the different chain existing in the country.

Figure 8 Current dairy value chain of Pakistan



Source: Author sector information (2010)

3.11The dairy sector environment

The general environment of the sector can be subdivided into following groups:

3.11.1 Political environment

The emphasis of the government started in 2005 with a concept to re-engineer the sector. Since then Livestock sector is one of priority areas of government for its developmental projects. The government is currently executing seven projects in livestock sector with an estimated cost of 8.8 billion Pakistan Rupees. These projects are mainly focused on the following areas;

- Promotion of milk and meat production.
- Better marketing of milk and meat production.
- Strengthening of extension services.
- Mechanized livestock farming.
- Prevention and control of livestock diseases.
- Up-gradation of animal quarantine.
- Services and provision of veterinary services at farmer's door step.

During year 2009-10, 207 milk producer groups (MPGs) was formed, 150 milk cooling tanks was installed and 566 progressive dairy farmers was registered for production of quality breeding cattle and buffaloes(Pakistan Economic survey, 2010-11).

The project "Improving reproduction efficiency of cattle & buffaloes in small holder's production system "has been completed in 2009-2010 .During 2009-2010, 502,996 superior quality semen doses, 2,031 embryos were collected and 178,318 AI services were given.

Government has already launched two historic mega projects in for improvement and development of sector namely Pakistan Dairy Development Company and Livestock Dairy Development board. European Funded project "Strengthening of Livestock Services Project". Duration of project was seven years (2003-2010).The project was aimed to eradicate rinder pest disease from the country to enhance efficiency and effectiveness of delivery of livestock services, improvement of disease diagnosis, monitoring and reporting system, vaccine production particularly against newly emerging and trans-boundary animal disease and capacity building of veterinary staff.

In August 2007, The Australian government has provided funding through Agriculture Sector Linkages Program (ASLP) for a dairy project to be implemented within Pakistan aimed to improving dairy production of small holder dairy farms by improving current extension services. Charles Sturt University (CSU, Wagga Wagga Australia) is working in collaboration with the Livestock and Dairy Development Board (LDDDB) for the implementation of this project. The following are two major themes of the ASLP I.

- To provide support for a model system of smallholder dairy production.
- To capture and enhance the knowledge relevant to smallholder dairy farmer.

3.11.2 Economic environment

The sector needs economical support for the development. The private sector joined hand with the Government to convert dream of "white revolution" into reality and continuously giving financial as well technical support to the sector. The example of the financial support by private sector is given in figure5.

Table 3 Private sector support for PDDC foundation

Company	Pak Rs.Million
Tetra Pak	25
Nestle Pakistan	20
JDW Sugar Mills	15
Engro Foods	10
Millac Foods	10
Nirala	10
Shakarganj	10
Noon Dairies	5
Unitech	1.5
Agha Nadeem	0.5
TOTAL	107

Source: PDDC (2006)

The private milk processors like Nestle, Engro, Haleeb and Millac are also providing free of cost technical services and trainings to farmers. Nestle is also offering credit facilities for purchasing of milking cows or buffalos. These loans are interest free for farmers.

3.11.3 Social environment

The social setup of the sector is bit complicated. The farmers are not interactive with each other. They did not tried to be united for attaining better profit for their product. The concept of community farming is also underestimated by farmer because of their personal issues among farmers in a village.

The second millstone is participation of women in the dairy sector .A very small percentage of the women are participating in the dairy sector because of lack of knowledge and training in dairy sector.The community empowerment through livestock development and credit (CELDAC) is a project of UNDP started in 2006 for women.

It addresses each stage of the value chain starting from raising cows that produce milk which is then transported to a central processing plant where it is pasteurized, homogenized, processed and graded into different fat contents, and bottled and marketed. This project provides support to women for the full range of activities and services required to bring a product or service from its conception to its end use and beyond. This process eliminates the middleman resulting in an increase in rural income leading to economic empowerment of women. The project ensures coordination and cooperation between its stakeholders resulting in more effective allocation of resources and assets between firms (CELDAC, 2011).

3.11.4 Technological environment

The small farmer is very far from modern farm mechanization. The main reason behind is the non-availability of farm equipment at village level and farmer now how about latest machinery available in dairy sector. The manual work at farm level is time consuming and adds cost to farmer.

The second most important issue at farmer level is non-availability of high milk producing breeds and their semen. The semen available in market loses it quality due to mishandling. The inseminators are also not well trained.

The energy crisis in the country badly affected the development of the formal sector. The village milk collection centers are running on generators and not allowing the processor to

pay more to the farmers. The processing cost also increased due to energy crisis resulted in high prices of milk for consumers.

3.11.5 Natural environment

The natural disaster especially the floods in the country badly affected the sector. According to economic survey of Pakistan (2011), the growth of livestock decreased to 3.7 % (2010-11) as compared to 4.3 % (2009-10). The last year flood badly affected the entire stakeholder in the chain and resulted in loss of billion rupees. The flood is coming due to naturally change in global climate of earth. This year floods are also expected in the various region of Pakistan especially Sindh province.

3.11.6 Cultural environment

In villages keeping of cattle is the tradition of farmers. Farmers are keeping either one or more cattle. They may use their milk for home consumption or sell it. There are lot of events are arranged by villages as well by government dairy farmers where different types of competition held.

CHAPTER 4 RESEARCH FINDINGS

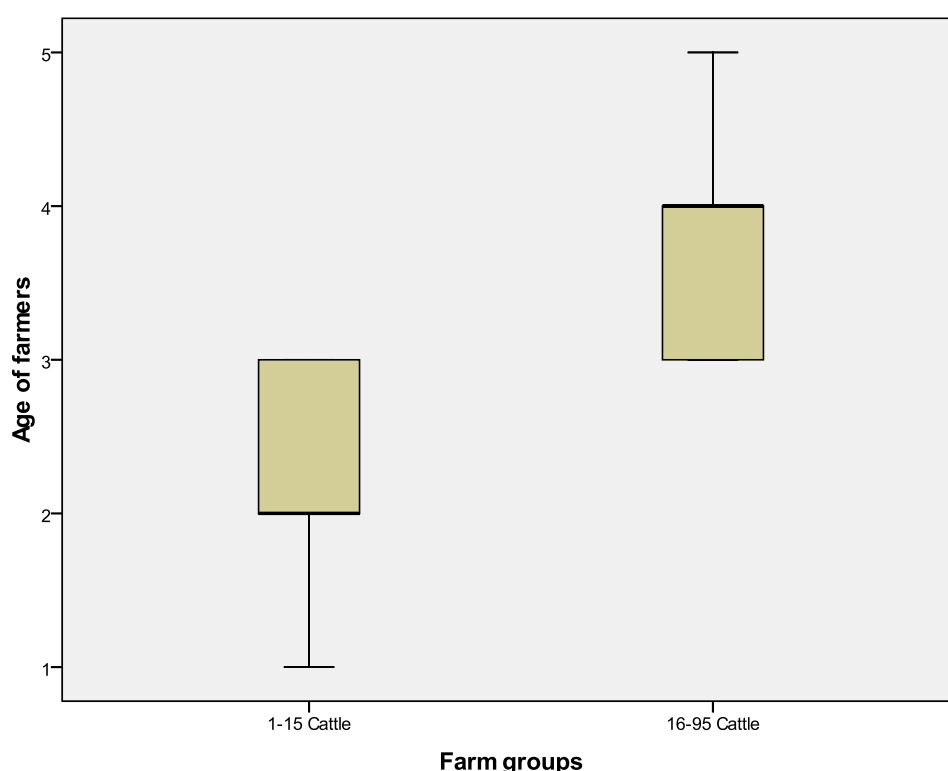
4.1 Farmers' background

The survey includes three types of farmers, rural, peri-urban and urban farmers. The survey is conducted from farmers who are farming in north, east, west and south of district. All respondent are male farmers and no female farmer is found during survey.

4.1.1 Age

The age of the farmers included in the survey are falling in the range given below;
1=15-18 years, 2=19-25 years, 3=26-35 years, 4=36-45 years, 5=46-60, 6=>60. The results of the test shows that $p=0.000 < \alpha$ which mean that there is a significant difference between the average age of both groups.

Figure 9 Farmers' age

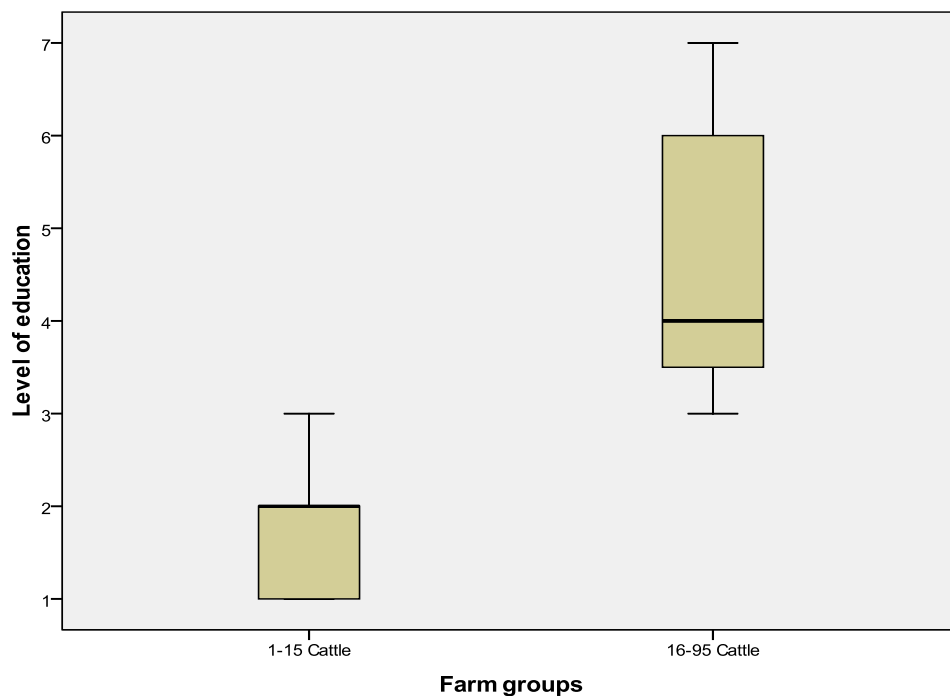


The above graph shows that most of farmers in farm group 1-14 cattle fall in age range of 3 and 4 while farmers in group 15-95 cattle fall in age range of 4 and 5.

4.1.2. Level of education

The farmers included in the survey have wide range of educational level. The level of education is classified in categories as 1= None, 2= Primary 3= Matric, 4=F.A, 5=B.A, 6=.M.A, 7= Professional degree. The results of the test shows that $p=0.000 < \alpha$ which mean that there is a significant difference between the level of education of both groups.

Figure 10 Farmers' education background

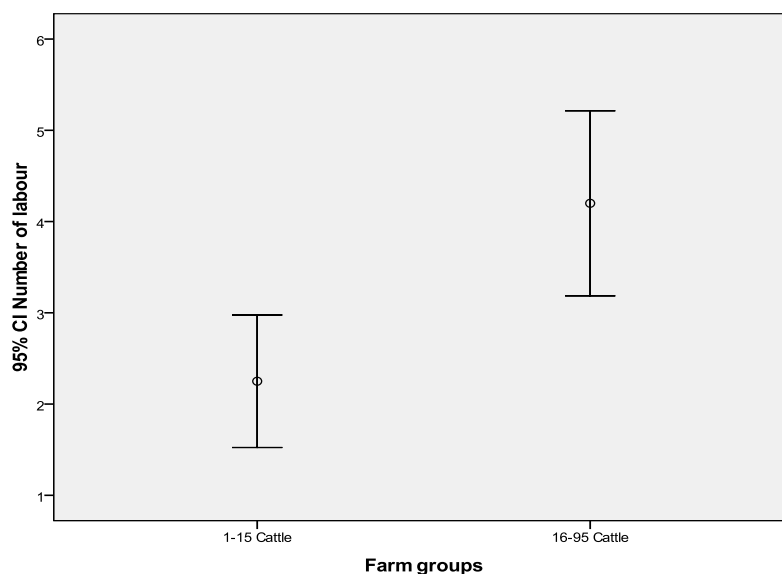


The above graph show a clear picture that farmers in farm group size 1-15 cattle never gone to school or they mostly attended matric level of education. On the other hand, the farmers in farm group size 16-95 cattle average level of education is F.A with few farmers having matric as well as professional degrees.

4.1.3 Number of people working at farm

The independent –t test is used to find out that is there is difference in the number of the labour working at both type of farming groups. The results of the test shows that $p=0.002$ which is lesser than $\alpha=0.05$. It means that there is a significant difference between the number of people working at farm in both groups.

Figure 11 Average numbers of people working at farm

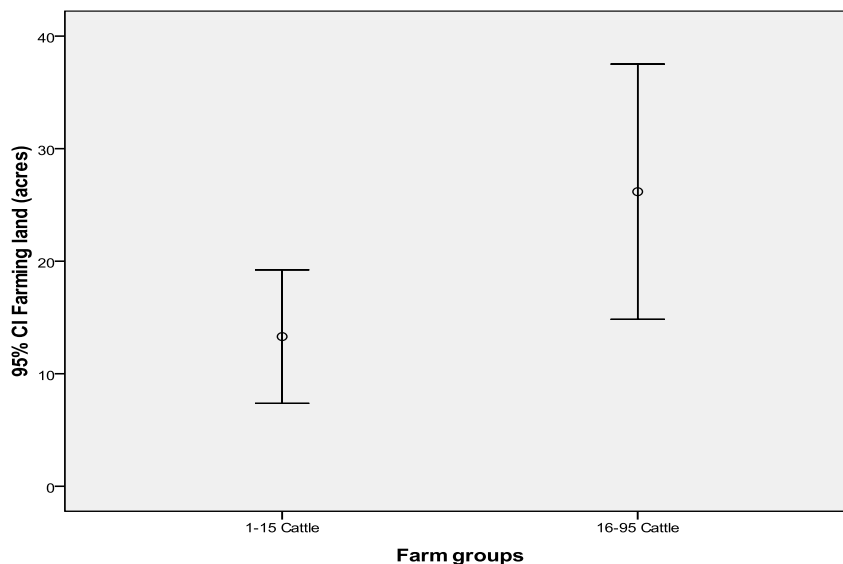


The average number of labour working at small farms is 2.25 labour units where as the figure is almost double for large farmers.

4.1.4 Farming land

The researcher want to find out find out is there a difference between the two farming groups in total farming land or not. Independent sample t-test was used and found that $p=0.042 < \alpha$ which means that there is a significant difference in farming land between two group.

Figure 12 Farmers' average farming land

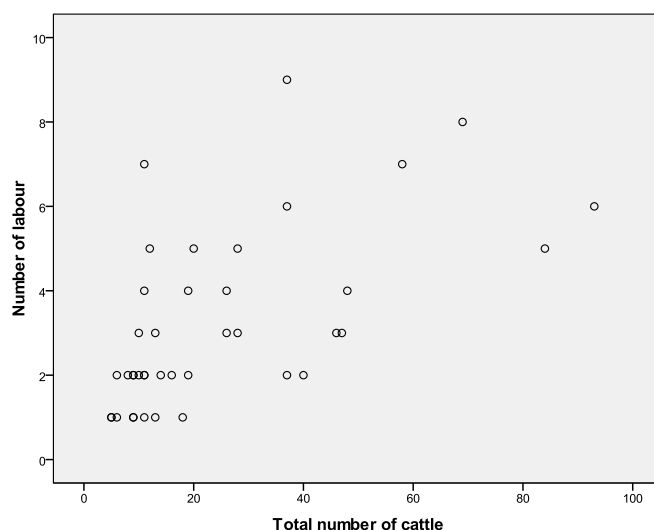


The above figure shows very interesting results that small farmers have less farming land vice versa.

4.1.5 Total number of cattle and farm labour

The researcher want to find out that is there a correlation exist between total number of cattle and farm labour. The results of correlation shows that $p=0.00 < \alpha$, it means that there is significant correlation.

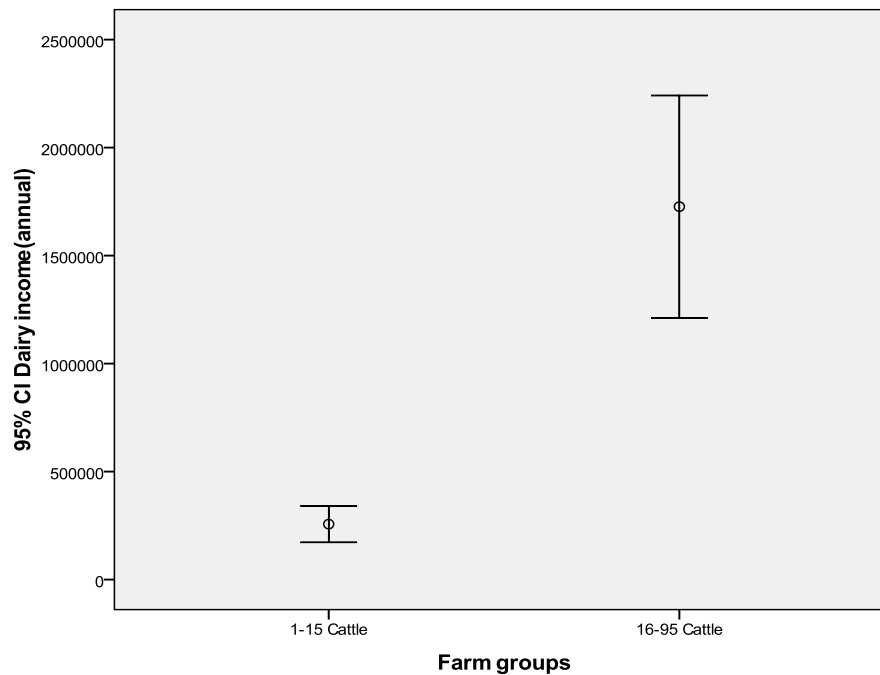
Figure 13 Correlations of the cattle and labour



4.1.6 Farm income

The researcher want to find out find out is there a difference between the incomes of two farming groups. For this purpose, he used independent sample t-test and found that $p=0.000 < \alpha$ which means that there is a significant difference in income of two groups.

Figure 14 Farms' average income

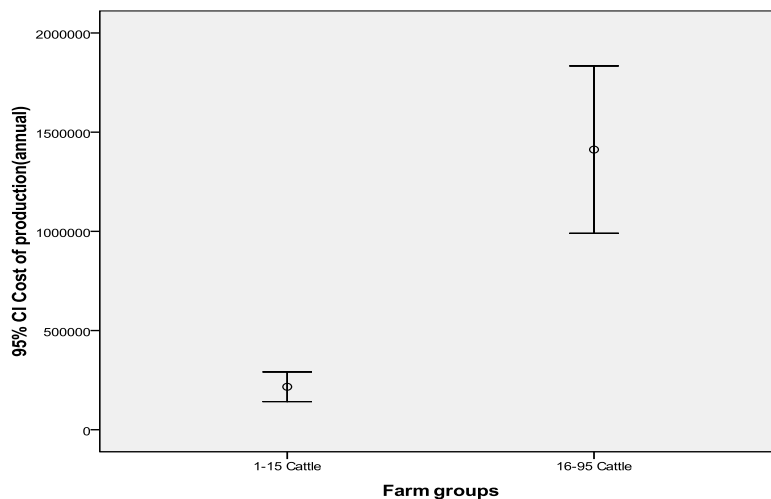


The graph shows that the small farmers earn less money than medium farmers.

4.1.7 Production cost

The researcher want to find out find out is there a difference between the costs of production of two farming groups. For this purpose, he used independent sample t-test and found that $p=0.000 < \alpha$ which means that there is a significant difference in cost of production of two groups.

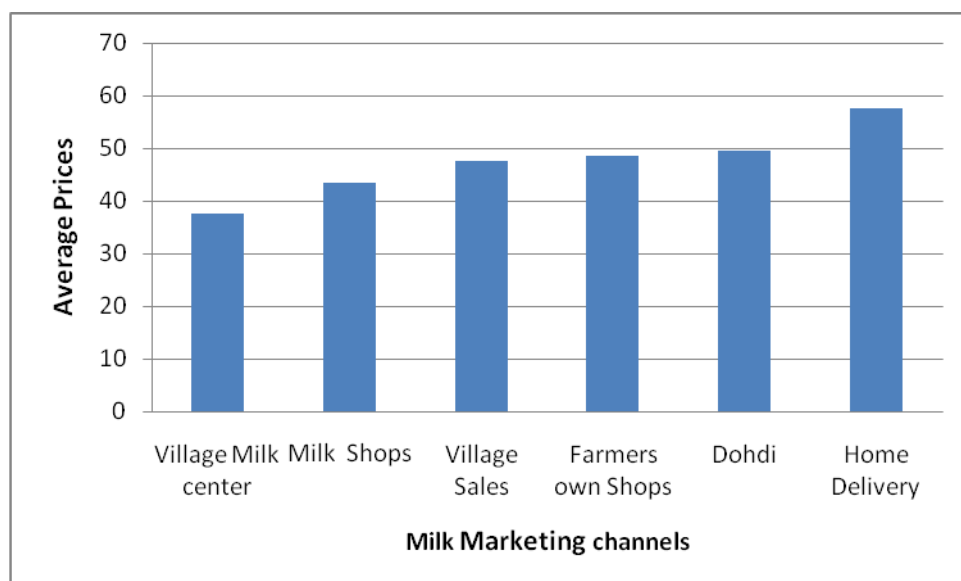
Figure 15 Average production cost



4.1.8 Average milk prices and marketing channels

It is found from results of survey that farmers used six milk marketing channels for marketing their milk.

Figure 16 Average milk price and marketing channels



The above graph shows that the highest milk prices are received by from home delivery and lowest by village milk collection center of processor.

4.1.9 Marketing channels and proportion of milk sold

The table below shows milk marketing channels and proportion of milk sold found by the farmers in district.

Table 4 Marketing channels and proportion of milk sold

Marketing channels	Proportion of Milk sold	Group1(n=20)	Percentage	Group2(n=20)	Percentage
Dohdi	100%	16	80	15	75
Farm Sale	100%	1	5	0	0
Milk shops	100%	0	0	1	5
Dohdi +Home delivery	75% +20%	1	5	0	0
Own milk shop	100%	2	10	1	5
Milk shop+ Farm sale	65+35%	0	0	1	5
Milk Processor	100%	0	0	2	10

4.1.10 Reasons for different milk marketing channels used by farmers

The table below shows four common reasons for choosing different milk marketing channels.

Table 5 Marketing channels used by farmers

#	Reasons	Total Responses(n=40)	Percentage
1	High price	38	40%
2	Better payment mode	9	9.5%
3	Inconsistent yearly price	9	9.5%
4	Loan facility	38	40%

The main reason for choosing different milk marketing channels by farmers is to get high price and loan facility.

4.1.11 Preference Informal milk sector

The farmers prefer to deliver milk to informal market due to the following reasons;

- High Prices paid by informal sector.
- Pick and drop facility provided by Dohdi.
- Credit facility provided by Dohdi.
- Help given by Dohdi in farming activities especially in milking.
- Provision of farm inputs especially concentrates.
- Daily mode of payment.
- Very low prices of milk paid by formal sector compare to informal sector.
- Non-availability of village milk collection centers in most of villages.

4.1.12. Profit margins

There were sixteen small farmers who were selling milk to dohdi, two farmers own their milk shops, and one farmer was selling milk in village and one farmer was selling 75 % milk to dohdi and 25% milk to home delivery.

The farmers who were selling milk to dohdi, they were getting prices per liter of milk ranges between 37.5 Rs to 50 Rs. Their profit margin ranges from 4.20 Rs to 10 Rs per liter.

The two farmers who own their own milk shops were getting prices per liter of milk as 40Rs and 42.50 Rs. One farmer was earning 5 Rs and other farmer was 6.40 Rs per liter of milk.

One farmer who was delivering 25% of milk to homes was selling milk at 60Rs per liter. He was earning 6 Rs per liter. The remaining 75% of the milk sold to dohdi at 45 Rs per liter and he was earning 4.5 Rs per liter. One farmer who was selling milk directly from farm at 47.50 Rs per liter was earning 4.75 Rs per liter.

4.1.13 Constraints faced by farmer

The results of the survey showed that there are five major constraints faced by farmers which are mentioned below;

- Low productivity.
- Insufficient financial support.
- Insufficient technical support.

- Uncontrolled quality and price of farm inputs.
- Low milk prices.

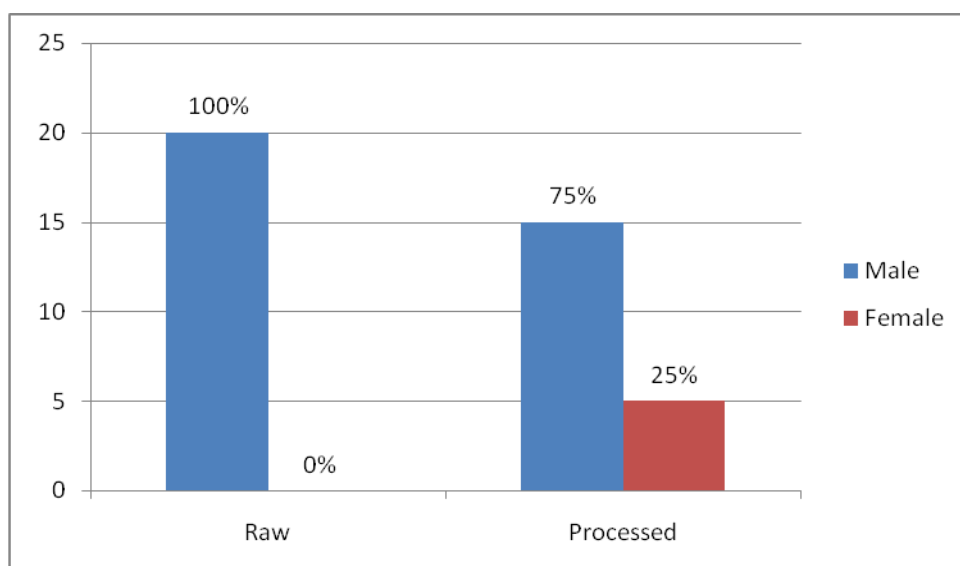
4.2 Consumers' survey

The consumer survey is carried out randomly sampling from two types of milk consumer i.e. fresh milk and processed milk. The survey is conducted at raw milk shops, sweet shops, supermarkets. There are consumers who are happy to take part in survey and some consumers hesitate to take part in survey.

4.2.1 Type of milk purchased by male and female

The survey is conducted randomly from forty consumers. The sample population is divided into two groups, raw and processed milk consumers.

Figure 17 Milk purchased by male and female



The result of the above graph shows that the purchase of raw milk is totally in hand of males because of its common availability at milk shops. Female do not like to stand in a queue for the purchase of milk. The participation in of female is 25% in purchase of processed milk as compared to males which is 75%.The females are going to supermarkets for purchase of grocery and processed milk is available at all supermarkets.

4.2.2 Remarks about quality and price of unprocessed milk

The result shows that 65% of the consumers who are using raw milk are not satisfied with quality of milk however they are satisfied with the price of milk.

Table 6 Quality and price of unprocessed milk

#	Description	Satisfied (n=20)	Unsatisfied (n=20)	Satisfied %	Unsatisfied%
1	Quality	7	13	35	65
2	Prices	12	8	60	40

The main reasons for their unsatisfaction with quality are following;

- Adulteration of Water.
- Adulteration of powder milk.
- Dust , dirt, straw and flies
- Unhygienic conditions at milk shops.

4.2.3 Remarks about quality and price of processed milk

The result shows that 75% of the consumers who are using processed milk are satisfied with quality of milk however only 25 % are not satisfied because of following reasons;

- Powdery material at bottom
- Taste of UHT milk
- Sometime milk expires before expiry date

Table 7 Quality and price of processed milk

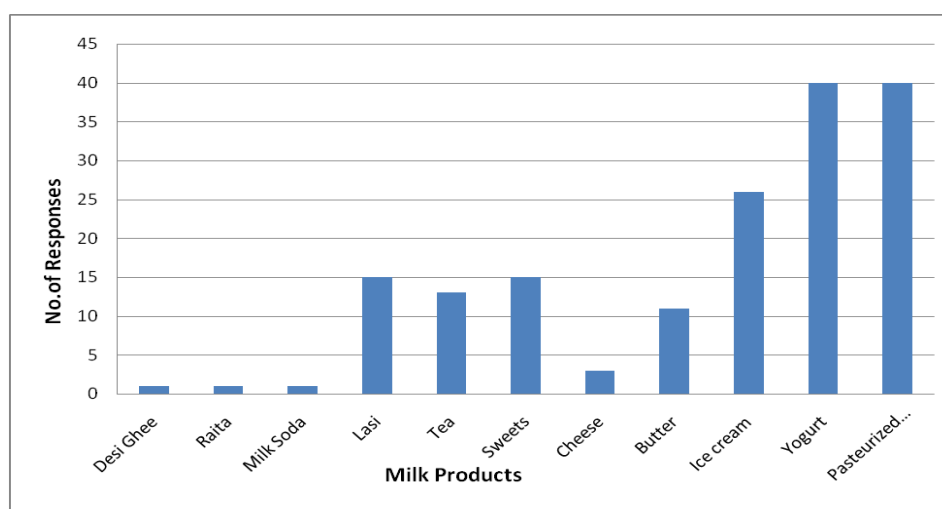
#	Description	Satisfied(n)	Unsatisfied(n)	Satisfied %	Unsatisfied%
1	Quality	15	5	75	25
2	Prices	0	20	0	100

It can be depicted from the table that all the consumer who are using processed milk (UHT) are not satisfied with prices of milk. The price UHT milk is between 70-76 Rs per liter which very high in their opinion. The Price of the processed milk should be between 60-65 Rs per liter.

4.2.4 Consumers demand regarding milk and milk products

The question is asked from both type of consumer who are using raw as well as processed.

Figure 18 Consumers demand regarding milk and milk products



made from milk. It is evident from the graph that the pasteurized and yogurt is the most consumable product made from milk. The second most consumable product is ice cream followed by sweets and Lasi. The least consumable products are desi ghee, raita and milk soda.

4.3 Case study

The case study include two dohdi's , two milk traders(milk shop owners),two milk processors and two government departments.

4.3.1 Dohdi Interviews

Interview 1

The first interview was conducted from a Dohdi who was living in a village which was 22 Km towards eastern part of Sialkot city. The name of the village was Mastpur and Dohdi name was Shahad Mahmmod .He was doing this business from last 5 years and collecting milk from his village farmer name Mr.Zaheer Ahmad.He was collecting milk from only one farm in summer as well as winter .He made an agreement with farmers to pick his milk for whole year. He was collecting currently total 100 kg of milk daily. He was paying 45Rs per liter for Buffalo milk and 35 Rs for cow milk. He is paying 45 Rs for the mix milk in summer and 40 Rs in winter. His mode of payment farmer is daily. He is selling milk to a nearby sweet making shop nearby town with name of chobara about 25 mints by bike. He was receiving 50 Rs per kg of milk. He was getting money on daily basis but sometimes on weekly basis. In this case he had to manage money from his friends to pay farmer. Farmers was also getting interest free loan from him and he was receiving back his money on daily basis deduction from milk selling of farmer.

He was present at milking daily in morning as well as in evening. He was also milking cows and buffalos with the farmers .So, there was no chance of adulteration in milk. If any doubt, then he boiled milk at farm in presence of farmer to see how much khoya per kg was obtained. Mr.Mahmmod was currently facing the following constraints in his business;

- It was difficult for him to collect more milk from different farmer at motor bike.
- Farmers were chaining Dohdi after 3-4 months. It's very difficult to find farmers who are giving milk on yearly basis.
- Road Infrastructure was hurdle especially in rainy season for the milk collection and delivers to retailer.
- If he get sick or had to go to do some important work. It's very difficult to find an alternative person who can do his duty.

He was not afraid from formal milk sector. He stated that it's a positive sign for him to expand his business. Formal sector pay reasonable price and with consistence mode of payment then he was happy to deliver his milk to formal sector. He mentioned that he can improve his profits by following ways;

- A three wheeler on low interest rate.
- The yearly supply of same amount of milk by farmers.
- There should be a facility from Government to provide chillers and chilled transportation.

Interview 2

The second interview was conducted from a dohdi who was living in a village which is 20 kilometre towards south part of Sialkot city. The name of village was Rajwan and dohdi

name was Muhammad Mushtaq. He was doing this business from last 35 years and collecting milk from twelve farms in summer as well as winter. Mushtaq had an agreement with five farmers to pick his milk for whole year and remaining farmers have no contract with him.

He was collecting currently total 280 kg of milk daily in summer and 580 kg in winter. He was paying 40Rs per liter for buffalo milk and 35 Rs for cow milk. He was paying 37 Rs for the mix milk in summer as well as in winter. His mode of payment to farmer was daily, weekly and monthly. He was selling milk in city to three different channels namely small milk shops, big milk shops and sweets shops. He was receiving 50 Rs per kg of milk. He was getting money on daily basis, weekly basis and monthly basis. In this case he had to manage money from his friends to pay farmer. Farmer was also getting interest free loan from him and he was receiving back his money on daily basis, weekly basis and monthly basis deduction from milk selling of farmer. Some farmers were paying back money in cash.

He was present at milking daily in morning as well as in evening. He was also milking cows and buffalos with the farmers. There was no chance of adulteration in milk. If any doubt, then he boiled milk at farm in presence of farmer to see how much khoya per kg was obtained. He was currently facing the following constraints in his business;

- It was difficult for me to collect more milk from different farmer at motor bike.
- It was very time consuming processes to deliver milk to city on horse cart.
- Farmers were chaining dohdi after 3-4 months. It's very difficult to find farmers who were giving milk on yearly basis.
- Road infrastructure was a hurdle especially in rainy season for the milk collection and delivery to the retailers
- If he get sick or have to go to do some important work. It's very difficult to find an alternative person who can do his duty.

He was not afraid from formal milk sector. He stated that it's a positive sign for him to expand his business. Formal sector pay reasonable price and with consistence mode of payment then he was happy to deliver his milk to formal sector. He mentioned that he can improve his profits by following ways;

- A four wheeler will help in collecting more milk and saving his time in delivering milk.
- The yearly supply of same amount of milk by farmers.
- There should be a facility from Government to provide chillers and chilled transportation.

4.3.2 Milk trader

Interview 1

Mr. Haji Asghar was a milk trader and owns a milk shop in cantonment market of Sialkot. He was doing this business from forty five years. He was purchasing his total milk from fifteen dohdi's and not a single liter of milk was purchased from farmers. He was receiving 1000 kg of milk per day. He was purchasing more milk in summer and less milk in winter. He was paying forty five rupees per kg of mixed milk (cow and Buffalo) to dohdi's throughout the year. He was paying to dohdi's in cash on daily basis. He had two types of customers one who were paying for milk on daily basis and others who were monthly paying basis. He was using Khoya method to test the quality of purchased milk. He was providing interest free credit facility to dohdi's on the condition that they had to provide milk for a specific time period. He was getting back his money by deducting from the daily payments. The three products which he was selling at his shop are mentioned below in the prices;

- Raw milk(50Rs per Kg)

- Yogurt(60 Rs per Kg)
- Tea Cup(15 Rs per 100 ml)

He was facing the following constraints in his business:

- Government fixed 45 rupees price to sell 1 kg of milk. It is only possible when you are doing adulteration of water in the milk.
- Customer was not happy from price of milk.
- Price of electricity and gas charged by the government from shops is very high.
- In future, if a pasteurized milk shops will open then it has no effect on my business. There are many milk shops in the city but they have no effect on my business.
- He wants to see following improvements to get more profit from my business;
- More milk volume sales per day.
- Supply of good quality of milk by dohdi.
- The government should fix price of milk according to quality of milk.

Interview 2

Mr. Haji Asghar was milk trader and owns a milk shop in cantonment market of Sialkot. He was doing this business from forty five years. He was purchasing his total milk from fifteen dohdi's and not a single kg of milk was purchased from farmers. He was receiving 1000 kg of milk per day. He was purchasing more milk in summer and less milk in winter. He was paying forty five rupees per kg of mixed milk (cow and Buffalo) to dohdi's throughout the year. He was paying to dohdi's in cash on daily basis. He had two types of customers one who were paying for milk on daily basis and others who were monthly paying basis. He was using Khoya method to test the quality of purchased milk. He was providing interest free credit facility to dohdi's on the condition that they have to provide milk for a specific time period. He was getting back his money by deducting from the daily payments. The three products which he was selling at his shop are mentioned below in the prices;

- Raw milk(50Rs per Kg)
- Yogurt(60 Rs per Kg)
- Tea Cup(15 Rs per 100 ml)

He was facing the following constraints in his business:

- Government fixed 45 prices to sell 1 kg of milk. It is only possible when you are doing adulteration of water in the milk.
- Customer is not happy from price of milk.
- Price of electricity and gas charged by the government from shops is very high.
-

In future, if a pasteurized milk shops will open then it has no effect on my business. There are many milk shops in the city but they have no effect on my business. He wants to see following improvements to get more profit from my business;

- More milk volume sales per day.
- Supply of good quality of milk by dohdi.
- The government should fix price of milk according to quality of milk.

Interview 3

Mr.Ch Ghulam Rasool was milk trader and owns a milk shop in central part of Sialkot. He was doing this business from sixty five years. He was purchasing his total milk from eighteen dohdi's and twelve farmers. He was receiving 800 kg of milk per day in summer and 2000 kg of milk in winter. He was paying 47per kg of mixed milk (cow and Buffalo) throughout the year. He was paying to dohdi's in cash on daily basis and to farmers on daily as well as monthly basis. He had customers who are paying for milk on daily basis in cash. He was using Khoya method to test the quality of purchased milk. He was providing interest free credit facility to trusted dohdi's and farmers on the condition that they had to provide milk for a specific time period. He had no fixed pattern for receiving his money back. The three products which he was selling at his shop are mentioned below in the prices;

- Raw milk(50Rs per Kg)
- Milk sweet(360 Rs per Kg)
- Laddo(300 Rs per Kg)
- Desi ghee(480 Rs per kg)

He was facing the following constraints in his business:

- In summer milk volume of milk supplied by dohdi and farmer is reduced.
- Quality of milk decreased.
- Earning decreased due available of less volume of good quality milk for sale.
- Price of electricity and gas charged by the government from shops is very high.
- Government fixed 45 rupees price to sell 1 kg of milk. It is only possible when you are doing adulteration of water in the milk.

In future, if a pasteurized milk shops will open then it has no effect on my business. It may help me to improve quality of milk and way of selling milk.

I want to see following improvements to get more profit from my business;

- Availability more volume of good quality in summer
- The government should fix price of milk according to quality of milk.
- Gas price unit should be reduced for shops.

4.3.3 Processors' interviews

4.3.3.1 Nestle Pakistan

The semi-structured Interview was conducted from Mr. Bill McDonald Stevenson who was working in Nestle as head of milk collection and dairy development stationed in Lahore. It was the largest milk UHT processor in the country with processing capacity of 3.5 million liter per day. It was collecting 843681 liter of milk per day from 25,000 farmers and milk vendors. It is collecting 52% of milk from farmers through 3000 Nestle village milk collection centers and 48% from milk vendors.

Nestle Pakistan was continuously working on to increase milk collection capacity from farmers by increasing village milk collection centers to ensure better quality of milk to consumers. It was collecting milk on total solid basis from farmers as well as vendors. It was paying 37 Rs per liter at 14 % total solids. The mode of payment to farmer was once a week directly to his account.

The current rate of rejection of milk was 15% which he wants to reduce it to 5%. He had recruited a team of 60 dairy development executives and 200 milk collection supervisors to lower down rate of rejection. This team was dedicated for helping the farmer to reduce cost of production and increase milk volume of better quality milk.

Nestle was also offering training programmes on modern dairy farm practices at his Nestle sarsabaz dairy farm and training center to his registered farmers free of cost. In addition to farm support services, Nestle had unique interest free loan facility and availability of imported cows at door step to his registered farmers.

The key constraints faced by Nestle in establishment of formal milk sector were mentioned below;

- Adulteration rate was very high in milk.
- Huge amount of money was spent every day on milk testing.
- Farmers sign contract with Nestle to provide milk but they broke contract for high price from other processor.

- Small milk volume collection from far off villages' cause of high transport cost.
- Energy crisis in the country was core cause of increased cost of production.
- Feudal system was barrier in establishment of village milk collection centers.
- Training to female farmer was a big challenge in rural areas.

4.3.3.2 Millac Foods

The semi-structure interview was conducted from Mr.Malik Tasawer Hussain.He was general manager supply chains in Millac foods (Pvt) stationed at Lahore. It was the third largest milk processor in the country with processing capacity of 0.5 million per day. Their main product was powder milk, condensed milk and pasteurized milk and yogurt. They processing 10,000 liter per day pasteurized milk and selling in Karachi only at the moment through their own outlets. Millac was going to lunch his pasteurized milk products in Lahore in 2012 and after that expanding to other cities of Punjab.

It was collecting milk directly from dairy farmers and finished the system of village milk collection centers. It was pioneer in introducing system of farmer milk collection center by installing free of cost chillers to dairy farms who were registered with company and signed contract for yearly supply of milk .It was also providing dairy advisory services free of cost to farmers for improvement of milk quality and quantity. However, it was not providing any type of credit facility to farmers. It was collecting milk from 250 dairy farmers at the moment in Punjab. It was collecting milk from farmers at criteria of 13 % total solids in milk and paying 40 Rs per liter of milk. The mode of payment to farmer was unique, twice a week directly to his account.

The key constraints faced by Millac foods to establishment of formal milk sector were mention below;

- Breaking up of contract by farmers for supplying milk on yearly basis.
- Adulteration in milk by milk vendors.
- Availability of good quality of milk.
- High rate of illiteracy in rural areas.
- No consumer awareness programme about quality of milk by government.
- No legislation against the people who are doing adulteration in milk and selling adulterated milk to consumers.
- There was no support by the government to processor.
- Transportation cost was very high.

4.3.3.3 Pakistan Dairy Development Company

The interview was conducted from Mr.Mian Mazhar Ahmad, chief executive officer Pakistan Dairy Development Company (PDDC or, as it is commonly known, "Dairy Pakistan").PDDC established under Section 42 of the Companies Ordinance, 1984 and was incorporated as Pakistan Dairy Development Company on the 9th September 2005.It has been established to drive the development of the Pakistan dairy sector. Dairy Pakistan is a Public-Private sector joint initiative to bring about structural long term change in the dairy industry in Pakistan. It has a vision to turn Pakistan into one of the top five dairy manufacturing countries in the world. Dairy Pakistan is embarking on a phased plan targeting all the key players in the dairy sector. Dairy Pakistan is chartered to coordinate, manage and facilitate initiatives leading to the development of the dairy sector in the country.

PDDC is running currently following programmes to facilitate the farmers:

A) Model farm programme

PDDC has a Model Farm Programme in operation. This programme provides technical assistance to existing dairy farmers as its primary focus. Through the activity of this programme, PDDC is bringing more modern farm management techniques to dairying in Pakistan. A major thrust is to provide the 'management tools' required to implement management changes and so this technical assistance programme also entails the provision of selected assets through a mix of deferred payment grant, and soft loan through one of four partner Banks .

PDDC can provide all or any mix of this equipment to the farmer on 50 % three year deferred subsidy, and mark up free. The balance of 50% the farmer has to pay on monthly instalment in 3 years. During the term of the loan the farmer will receive a comprehensive farm advisory service to teach the proper management of the dairy herd, and ensure that the changes are fully understood and implemented. All our farm advisory services are free of cost. 1100 models farms have been developed across the country to date. For list equipments see (appendix IV)

B) Cooling tank scheme

In Pakistan, only a small proportion of milk is handled by milk collection systems which cool milk within a reasonable time frame and hence maintain its quality. The lack of a national milk collection system which chills milk shortly after milking and then keeps it cool until appropriate processing or consumption, puts milk quality at risk and leads to its rapid spoilage. The non-availability of cooling tanks at the local level is a big handicap as unhygienic practices are used instead of proper refrigeration. Such practices may include adding ice or often unsafe, illegal preservatives. This reduces profitability to the original farmers, ruins the milk quality and overall is a health hazard to consumers. In order to change this, a programme of promoting cooling tanks to industry participants has been completed is planned. This enhances quality and increases profitability of the chain actors namely farmers, dohdi, milk trader and processor.

The programme offers milk cooling tanks of various sizes and other accessories such as generators, voltage stabilizers, water boiler and water pumps corresponding to the size of milk cooling tank. The programme entails the provision of these items of equipment under a loan arrangement for which PDDC pays the interest. Project aims to provide a 90% soft loan component to selected programme participants."

The project proposed the installation of more than 6000 cooling tank. The project activities have been limited due to non-availability of funds after Installations of total 12000 cooling tank across Pakistan. This reflects a policy change from the Board of Directors which has moved the focus of this programme from the processors to the producers.

C) Biogas plant

PDDC has introduced economical production of biogas. Electricity crisis is big challenge for the country. This initiative is providing alternative and renewable energy for rural communities, while reducing environmental impacts and improving fertility of Land. PDDC has completed 961 biogas plants throughout the country. A 50% grant contribution is made to the development of the biogas plant. This gas is now being successfully used to run small generators and petter engines. It offers an important solution to the faltering power supply in rural areas.

D) Rural service provider scheme

Productivity enhancement in the rural economy depends on increasing the degree of mechanization employed in tasks such as feed harvesting. (It is noted, in addition, that there is a lack of rural labour for such tasks as well). Many farmers, however, may not be able to afford the necessary equipment to boost productivity and ease labour shortages. PDDC considers that one way to achieve productivity while avoiding unnecessary capital expenditure may be to follow a “rural service provider” business model. In developed rural economies, for example in New Zealand, Australia and Europe, not all farmers own all the equipment needed to operate their farms. Instead, they engage the services of a rural contractor, who owns and operates expensive and specialized equipment. This contractor will provide services to a number of farmer clients, bringing the capital costs down, and charging operating costs at acceptable levels.

PDDC’s rural service provider programme aims to increase fodder production by developing fodder harvesting services throughout Pakistan. This will be achieved by either partnering with existing rural contractors or farmers to offer additional services and by creating new rural service providers in areas not being serviced by existing contractors or farmers. PDDC will support the purchase of fodder harvesting equipment, and land preparation implements (see detail in appendix IV). All the above mentioned equipments are provided on mark up free and 10 % grants. The principle amount has to be paid in 5 years time. Total rural service provider developed by PDDC is 37.

E) Community farm

This programme is grouping poorer farmers in a manner which allows them to receive technical and financial assistance to introduce improved farm management practices. It is important that the needs and wishes of the community are taken into account when establishing the structure, nature and scale of the community organization. Such grouping is intended to allow the necessary technical and financial assistance to be provided in an economic manner, while providing opportunity for poorer farmers and their families to build stakes in society.

Community farms will be able to produce milk in greater volumes, of better quality and more profitably than single farming. This will provide greater income for the participant farmers and provide opportunities for growth that they are currently denied.

The programme focuses on delivering technical advice and knowledge to promote the use of improved farm management practices, leading to increased productivity and profitability. This will then provide opportunity for participants to grow equity and wealth, hopefully providing a ‘stepping stone’ for the individual to establish a dairy farm in his/her own right. This would then provide an opening for another small farmer to take his place in the community farm, and to take advantage of the opportunity to grow his/her farming skills, equity and wealth.

The scale of each community farm involves 10 – 30 households generally with livestock holdings of 1 – 4 animals. PDDC is flexible in terms of the scale of investment provided that the proposal is economically viable. If the proposed farm is to occupy single premises then funds can be made available for the purchase of land for this farm if necessary. Ideally a proposed community would be located in an area where cultivated land is available for lease in order to provide an economic source of fodder for stock. It has proved beneficial to select long settled communities with close ties and links (possibly family) that reduce the chances of conflict and dispute.

The initial proposal is for 100 community farms to be installed over a five year period, as follows:

Years	Year 1	Year 2	Year 3	Year 4	Year 5
No. of farms	10	20	20	25	25

Total 30 community farms are running at the moment, 14 in Punjab and 16 in Sindh. A grant component of 25% will be available on a phased basis for the items provided by PDDC (See appendix IV). There may be opportunity for links with the PDDC milk pocket development programme, which may provide improved use of resources.

F) Dairy extension services

PDDC is first department in history of Pakistan who understands and bridge the gap between all the stakeholders in the dairy sector. The activities described above are supported by an active dairy extension department working in all across Pakistan providing trainings to farmers, both men and women about good dairy farm management practices.

PDDC has conducted 64 field days and 91 discussion groups, reaching more than 5000 farmers and highlighting the technology that is critical to progress in the dairy sector.

4.3.3.4 Sialkot Chamber of Commerce and Industries

The semi-structured questionnaire based interview was conducted from Dr. Muhammad Aslam Dar, head of livestock wing in Sialkot chamber of commerce and industry. Sialkot chamber of commerce & Industry (SCI) is a trade body, which was established in 1982. It comprises of industrialists, importers and exporters belonging to the various fields. The number of members of this chamber for the year 2008-2009 is approx. 6,500. Most of them are connected with sports, Surgical, Gloves, Leather Garments and Badges.

It is vibrant chamber that started and completed many self help basis projects which are mentioned below;

- Airport
- Dry port
- Export processing zone.
- Improved road network
- Hospitals
- Schools.

In 2008, SCCI started livestock awareness programme as new inactivates. In this regard, SCCI arranged many seminars and field days for awareness for farmers in the districts. It has a plan to establish Sialkot livestock and dairy development company (SLDDC) near future with focus to work on following areas;

- Dairy
- Beef
- Poultry
- Milk Processing.
- Agri services.

Five very active industrialists had already started commercial dairy farms in the district. Three out of five dairy farms were highly mechanized equipped with state of art milking parlour and imported milking cows. They were selling their milk to commercial processors as

well as to home delivery in the city. There demand was to establish a pasteurized milk unit in the district by chamber.

The SSCI future plan is to assist farmers through SLDDC in the following key areas;

- Profitable farm practices
- Nutrition
- Animal health
- Reproduction
- Farm rental machinery
- Interest free loan

SLDDC will provide these facilities step by step. It has plan to establish its own farm as well as training center where it can provide training to registered farmers as well as new farmers coming into dairy business.

SLDDC first preference will be to collect milk from farmers directly. However, dohdi's who will fulfil the quality standards set by the company will be welcomed. The mode of payment to farmers as well as to dohdi's will be on weekly basis directly to their account.

SLDDC will lunch pasteurized milk and yogurt as its first product to enter into formal milk product. Consumer preference for different milk products will be find out on yearly basis by conducting consumer survey. The future products will be developed according to surveys reports. It will market his products by his own outlets to ensure maximum quality within affordable price. After successful lunching in district Sialkot, it will open other outlets nearby districts.

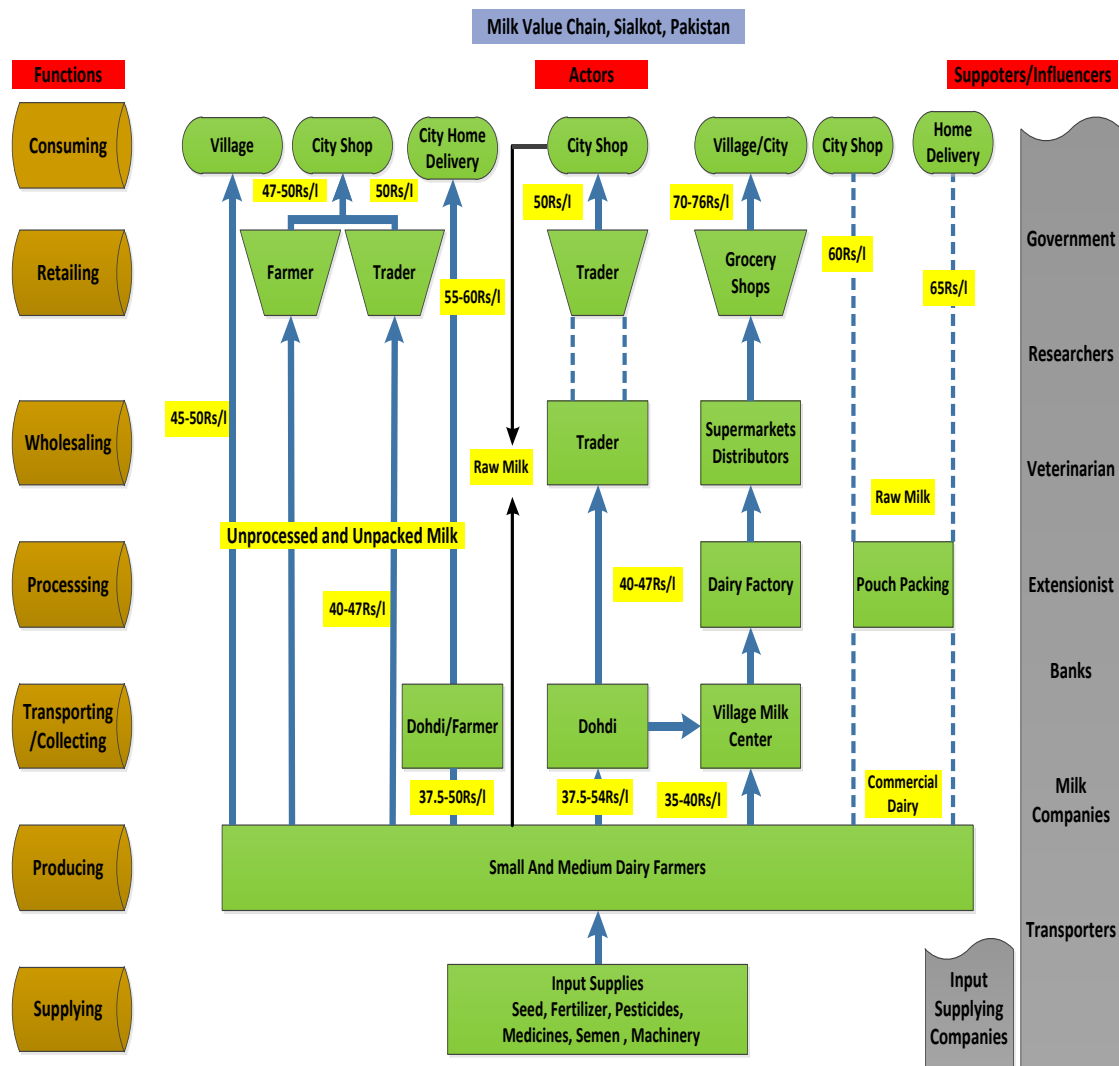
4.4 Sialkot dairy value chain

The chain map given below clearly shows that there are seven distinguished milk chains exists in the district.

Chain 1

This chain consists of small farmers who are directly selling their milk to village by having their own shop in the village. They are usually having some side business with in the same shop. They are either selling grocery or farm inputs like fertilizer, concentrate along with milk. They are selling their milk at 45-50 Rs depending upon the quality and type of milk. If the cow and buffalo milk is mixed, then the price is 45 Rs. They are selling buffalo milk at 50 Rs.

Figure 19 Sialkot dairy value chain



Chain 2

The second chain consists of farmer who has their own milk shops in the city. They are usually peri-urban or urban farmers. They are transporting their milk by themselves to city. They well recognized for their quality of milk. They are selling milk in price range of 47-50Rs per liter.

Chain 3

The third chain consist four chain actors namely input suppliers, farmers, milk traders and city consumers. The milk is transported to milk trader by a single farmer or a group of farmers who pool together for milk transportation to city. The farmers are getting 40-47Rs per liter of milk depends upon quality of milk. They are usually found in a radius of 25 Km from city.

Chain 4

The fourth chain also consist of four chain actors namely input supplier, farmers, dohdi and city consumers. These farmers are peri-urban. They either directly sells their milk to homes in city or they give their milk to dohdi who also deliver milk to homes in city.

Chain 5

This chain comprises of five chain actors input suppliers, farmers, dohdi, milk traders and consumers. Dohdi is collecting milk from farmers and transporting to milk traders in the city. The whole marketing responsibility is on dohdi. The farmers are getting 37.5-54 Rs per liter of milk. The dohdi is a chain coordinator for this chain.

Chain 6

This chain has seven chain actors namely Input suppliers, farmers, dohdi, village milk collection center, dairy factory, supermarket/distributor and consumer. The milk is either picked by dohdi or taken by the farmers themselves to nearest village milk collection center. The milk is then collected from village milk collection center by dairy factor. Most of the village collection centres belong to milk processors. However there are few rich milk contractors they have their own milk collection centers and transportation system. They supply milk to different milk processors. The processors and the private milk contractors are giving only 35-40 Rs/liter of milk.

Chain 7

This is started in January 2011. There are two farms owned by Investors. They imported Holstein-Friesian and Jersey cows from Australia. They have automatic milking parlour and the milk is directly going to milk cooling tank. After cooling at 4 °C, the raw milk is packed in pouches and sold out at their own outlet at price of 60 Rs/liter. They also are giving home delivery at price of 65 Rs/liter.

4.5 The Stakeholders analysis

According to MDF (2005), stakeholder analysis is the identification of the key stakeholders in the analysis and planning stage of a change process, and an assessment of their interest and the way in which these interests are likely to affect this process. Stakeholder analysis helps in deciding whom to involve in which way in the analysis and planning.

Table 8 Stakeholder analysis

Name	Objectives	Influence on Chain
Input Suppliers	Supplying Inputs like seed, fertilizers, medicines, semen, concentrate, and machinery.	Medium
Producers	Production of good quality of milk at low cost. Supply of quality milk to consumers. Fulfilling the requirement of the market demand.	Low
Dohdi	Collection, transportation and delivery of milk to milk traders as well as home delivery. Information flow from farmers to market and market to farmers regarding milk quality and prices.	High
Village Milk Center	Collection and price fixation according to quality of milk .Information flow from farmers to processor and backward regarding prices, milk quality, farmer's requirement for agri services.	Medium.
Milk Trader/Retailers	Buying milk from dohdi. Selling milk and milk products like yogurt, Lasi, Sweets, Tea, and Ghee to consumers. They are involved in setting of milk quality, quantity and prices.	High
Consumers	Purchase of good quality milk and milk products at affordable prices.	Low
Livestock and Dairy Development Department	Provision of veterinary services to farmers. Milk quality check up in market.	Medium
Tehsil Municipal Administration	Control of milk quality and prices at milk retail shops.	Medium
Punjab Rural Support Programme	Improvement farmer livelihood through development milk collection center and selling of milk at better prices to middleman or processors.	Medium
Pakistan Dairy Development company	Provision of farm advisory services to farmers, establishment community farms and village milk collection centers, development of rural service providers, Instalment of biogas plants, arrangement of dairy farm management trainings and establishment of milk processing unit in district Sialkot.	Medium
Sialkot Chamber of Commerce and Industries	Arrangement of Seminars and gathering for farmers on latest trends in dairy sector in Pakistan.	Low
Zari Taraqati Bank	Provision of credit facility to farmer at low interest rate than commercial banks for improvement of their livelihood through better farming.	Medium
Commercial Banks	Provision of credit facility to farmers at commercial interest rate improvement of their livelihood through better farming.	Low

CHAPTER 5 DISCUSSION AND CONCLUSIONS

5.1 Milk chains districts

There seven distinct milk marketing chain exist in the district. The chains can be categorised into three milk chain systems in narrow view, rural milk chain, peri-urban milk chain and urban milk chain and processed milk chain. FAO (2009) also described same three milk chains existing in the Pakistan. These chains developed in the district as result of convince and suitability of business style of different chain actor's involved in the sector. Each chain has its advantages and disadvantages.

The rural milk chain has advantage that farmer do not have to go to city to deliver milk. Farmer sells his milk to neighbours or to dohdi. The interesting fact found from chain analysis is that in some villages' processor is offering the same prices as dohdi but the farmers are not willing to supply milk to processor. There are mix types of farming groups found in rural areas small, medium and large.

In Peri- urban and urban milk chain, the small farmer group are usually located in near to city and most of them selling their milk by themselves. The result of survey shows that 3 small and 2 medium farmers are found in this chain. The small farmers are usually found in urban areas where as medium farms are found in peri-urban areas. The fact presented by FAO (2009) that 5-15% production of milk coming from peri-urban and urban milk chain is now reduced. The peri-urban and urban farmers are reducing day by day due to government legislation to keep animals out of urban area and secondly high prices of fodder and concentrate.

The formal milk chain is very weak in the district. The oldest player is Nestle Pakistan and Millac foods also started their operations three years back. Nestle is collecting milk through his milk collection center while Millac foods is collecting milk directly from farmers. The result of the survey shows small farmers are not giving milk to formal sector and interesting fact is that only 2 medium farmers out of 20 are giving milk to formal sector. It is presented in Pakistan economic survey (2010-11) that 150 milk cooling tanks were installed and 207 milk producer groups were organized. No producer group was found during the survey in the district. PDDC (2006) highlighted that 20% of the milk lost due lack of better infrastructure for milk handling. Six milk cooling tank of 1000 liters capacity were found in the district. Five owned by a Nestle and one by milk trader. These cooling tank were not operating at their full capacity because poor coordination with farmers. The formation of producer organization can increase the delivery of quality milk to processor as well as consumers.

5.2 Milk marketing channels

PDDC (2006) showed diagrammatically four milk marketing channels namely dohdi, hilux & minivan contactor, village milk collection center and cooperatives. The result of the survey reveals that there are seven different milk marketing channels used by farmer for marketing their milk namely dohdi, farm sale, milk shops, dohdi + home delivery, own milk shop, milk shop + farm sale and milk processor. Two milk marketing channels described by PDDC (2006) hilux & minivan contactor and cooperative were absent in the district Sialkot.

It is found from the survey that small farmer sold their 80% milk to dohdi while 75% medium farmers sold their milk to dohdi. 5% of small farmers are selling their milk directly from their farms either in villages or in peri urban areas. There is no medium farm found in peri-urban or urban area because of high cost of land and fodder. They are selling their total milk to dohdi.

The percentage of small farmers who are selling milk to milk shops is found to be zero while 5% of medium farmers are selling their milk to milk shops in cities.

Dohdi + home delivery milk marketing channel is only adopted by 5% of the small farmers who are farming in urban area. However, there is no such evidence found in case of medium farmers. It is found that small farmers are selling 75% of milk to dohdi and 25% to homes.

The fifth milk marketing channel chosen both types of farmers group is own milk shop. The percentage of small farmers found in this marketing channel is 10 where as medium farmers is only 5.10% of the small farmers have their own milk shops in village while 5% of medium farmers have their own milk shops in the city. The medium farmers have their own transportation for carrying milk to city while small farmers have no such type of arrangement. These farmers are selling total milk produced on farm through their own milk shop.

There are 5% medium farmers who are selling their 65 % milk to trader milk shops in city and 35% milk directly from farm sale. The small farmers are not using this marketing channel. The formal milk marketing channel represents only 10% of the medium farmers who are supplying their milk to Nestle Pakistan. The small farmers are not using this channel for marketing their milk at all.

The results of the survey clarify that milk delivered to informal sector is 90% as compared to formal sector which is 10% in the district. These figures differ from the figures presented by PDDC in white paper (2006) that 97% of milk delivered to informal sector and only 3% to formal sector. There is a need to conduct a research on national level that who much milk is currently sold to formal sector and informal sector. It helps the government to develop a future strategy for development of dairy sector of Pakistan. FAO (2009) described that the rural farmers only market 30-40% of the milk and remaining 60-70% consumed at home. The results of the farmer survey shows that maximum 10% of milk is consumed by farmers at home and remaining 90% is marketed regardless the farmer is small or medium. This changing trend is due to the fact that milk demand in urban areas is increasing as result of migration of people from villages to peri-urban and urban areas.

5.3 Marketing channels are chosen by farmers

The results of the survey disclose four major reasons to choose different milk marketing channels by farmers. There are 40% responses came from farmer to choose different milk marketing channels is to fetch high price.

Only 9.5 % responses came from 40 farmers that they use different milk marketing channels to have netter mode of payment. These farmers brought the fact to light that the mode of payment of informal market is not reliable and delay of payments sometimes for two weeks by the dohdi. The delay in the payment not only affects their business but also their dependents.

There are 9.5% farmer's responses to fact that the prices of formal as well as informal sector are not consistent over the year that's why they use different milk marketing channels. The prices offered by informal as well as formal sector are high in summer and low in winter.

There are 40% framers responses that show that they use different milk marketing channels to avail interest free loan facility. The small as well as medium farmers prefer to avoid loan from banks .The reason behind is the high interest rate which is not possible for them to return. The commercial banks are providing agriculture loan on 15-18% and secondly lengthy procedure for loan approval.

5.4 Constraints faced by farmers

There are five major constraints found in the survey which includes;

5.4.1 Low productivity

The farmer survey showed that average milk productions of lactating cows and buffalos are low. The average milk produced per cow per day ranges from 5- 7 liters and buffalo 3.5 -5 liters. Nili Ravi can produce an average of 7 liters per day (Bilal, et al., 2006) with 6.5% fat. In farmers point of view major factors behind is non-availability of better breeds, semen and fodder shortage factor which are contributing to low productivity.

Research conducted by Ahmad, Burrell, Rashid and Sultana (2008) proved that good farm management practices like free access to water, un-tying of animals, green feed and cooling of cattle adopted by 30 small dairy farmers increased milk production of 0.50- 7 liters per day per animal. It shows that the role of genetics is less important than better farm management practices.

Afzal and Naqvi (2004) stated that government is working on different breed improvement programmes like supply of bulls, land-grant schemes, herd-book schemes, provision of artificial insemination services, progeny testing programmes, import of exotic germplasm and cross breeding. A.I is used to inseminate only 5% of the breedable buffalos and 7% breedable cows. The fact found during study that limited numbers of trained and qualified inseminators are available. Farmers had very bad experiences with the artificial insemination and prices of good quality semen are high from private companies

The fodder shortage in Pakistan occurs in May-July and November-January. Forage yields achieved by research institutes are 50-100% higher than achieved by farmers. (Wynn, et al., 2006). FAO (2009) stated that milk demand is very high in summer whereas production drops due to fodder shortage. It means that better fodder varieties are available and are not in reach of farmer or farmer do not want to know. Small farmers are not familiar with the fodder conservation methods like silage and hay.

5.4.2 Insufficient financial support

There is no adequate financial support system for the farmers. The interest rate of commercial banks is very high 15-18% which is not profitable for a small and medium farmer. The government bank is providing loan at 9% interest rate but the procedure is very lengthy. All the banks require land documents as security. The farmers have to depend mainly on dohdi for interest free financial assistance. It is stated in Pakistan economic survey (2010-2011) that 20 banks with 3700 branches in the country working for providing agriculture credit. There were only four branches of ZTBL found working in villages and not a single branch of other banks found operating in rural areas. No microfinance bank was found in villages. Free availability of financial support to farmer can improve productivity of his farm. Credit availability can expand the livestock sector more than double (economic size) which increased per family per month income from livestock sector by 181%. (Mahmood, Khalid and Kouser, 2009)

5.4.3 Insufficient technical support

There are six veterinary research and vaccination production institutes, 963 veterinary hospital, 2869 veterinary dispensaries, 2875 veterinary centers and 72 diagnostic labs in the running under the supervision of federal as well provincial government (Afzal, 2009).

The insufficient technical support is a cause of low productivity and high cost of production especially for small farmer. The farmers have not enough financial resources to afford private veterinary doctor for regular visits. The researcher found only two veterinary hospitals and one insemination center working in district. The staffs were very limited at those centers.

5.4.4 Uncontrolled quality and price of farm inputs

The farmers told that quality and prices of farm inputs are not controlled. There is no check and balance by the government authorities for the quality and prices of farm inputs. The farm input prices are continuously increasing and always out of stock.

5.4.5 Low milk prices

The farmers told that the price set by the district and provisional government for raw milk is 45 Rs per kg for consumer. The criteria for setting price of milk according to milk quality are not followed by authorities strictly. Tehsil municipal administration officers are just doing their job regardless of the fact that their negligence can badly affect the chain.

5.5 Profit margins earned by small farmers

The farmers who were selling milk to dohdi, they were getting prices per liter of milk ranges between 37.5 Rs to 50 Rs. Their profit margin ranges from 4.20 Rs to 10 Rs per liter. The two farmers who own their own milk shop getting prices per liter of milk as 40Rs and 42.50 Rs. One farmer was earning 5 Rs and other farmer 6.40 Rs per liter of milk. One farmer who was delivering 25% of milk to homes was selling milk at 60Rs per liter and earning 6Rs per liter. One farmer who was delivering 25% of milk to homes was selling milk at 60Rs per liter. He was earning 6 Rs per liter. The remaining 75% of the milk sold to dohdi at 45 Rs per liter and he was earning 4.5 Rs per liter.

One farmer who was selling milk directly from farm at 47.50 Rs per liter was earning 4.75 Rs per liter

The above results shows that selection of milk marketing channel is not too much importance in get more profit. The main reason behind is the better farm management practices which was adopted by one of farmers who was getting 10Rs profit per liter and supplying milk to dohdi while other farmers also marketing milk by themselves but getting less price.

5.6 Type of milk used by consumers

The survey results showed that 100 % male consumer in the district who were purchasing raw milk .75% of male and 25% of female consumers were those who were purchasing processed milk (UHT).The research unveil the fact that pasteurized milk was not available in the district. The consumers who were using processed milk have only option to use UHT milk.

There were only four processor who processing pasteurized milk and delivering milk to metropolitan cities like Lahore and Karachi. The demand of pasteurized milk was very high in these cities. The processing industry was not able to fulfil the demands of the consumers in these cities. It was not possible for the current processing industry to sell milk to other cities.

5.7 Consumer remarks regarding quality and prices of unprocessed milk

The result of showed that 65% of the consumers who were using raw milk are not satisfied with quality of milk however they were satisfied with the price of milk. The consumers were not satisfied with the quality of milk because of adulteration of water, dust, dirt straw, files

and unhygienic conditions of milk handling at milk shop. The consumers who were consuming fresh milk mostly belong to middle salary class or they do not like the taste of UHT milk. They were using fresh milk from generation to generations and its difficult for them to shift to taste of UHT milk.

5.8 Consumer remarks regarding quality and price of processed milk

The result showed that 75% of the consumers who were using processed milk were satisfied with quality of milk however only 25 % were not satisfied because of powdery material at bottom, taste of UHT milk and Sometime milk expires before expiry date. It can be depicted from the results of the survey that the entire consumers who were using processed milk (UHT) were not satisfied with prices of milk. The price UHT milk was between 70-76 Rs per liter which very high in their opinion. The price of the processed milk should be between 60-65 Rs per liter. They were purchasing UHT milk because they had no option in market for processed milk.

5.9 Highly demandable milk and milk products:

The results of the survey showed that pasteurized milk and yogurt were highly demandable products for both raw as well processed milk consumers. The price of processed milk which was affordable for consumer ranges between 55-65 Rs.

Ice cream was the third most highly demandable product found in the survey consumed then sweets, Lasi and tea follow it. The Ice cream available in the, market was coming from two types of sources. One from processed industry and secondly made by local ice cream shops. The consumption of local made ice-cream was very high as compared to processed ice-cream. The reason behind was the high price of processed ice-cream and not available at every shop.

The sweets made from milk were all locally prepared by sweet shops as well as milk trader. It evident from the milk trader interview the price of sweets made from milk was very high. One kg of sweets ranges from 300- 360 Rs per Kg.

Lasi was also very highly demandable milk product and the level of demand was same as sweets. Lasi is a mixture of milk and yogurt together. It may be plain, salty or sweet depends upon the taste of consumers. It prepared freshly. It is found during the survey that one of processors Haleeb foods also started Lasi in tetra pack. The price was double than the normal price of one glass of Lasi from milk shops. The consumers were hesitant to purchase processed Lasi because of high price.

5.10. Role of Government

The government was supporting the farmers by different programmes and schemes through PDDC, livestock and dairy development department, Punjab and LDDDB. There are 8.4 million dairy farming household in the country according to agriculture census organization (2006).

The emphasis of the government started in 2005 with a concept to re-engineer the sector. Since then Livestock sector is one of priority areas of government for its developmental projects. The key issue which government was addressing at the moment through these projects are following;

- Promotion of milk production
- Better marketing of milk
- Strengthening of extension services
- Mechanized livestock farming

- Prevention and control of livestock diseases
- Up-gradation of animal quarantine
- Improving reproductive efficiency of cows and buffalos
- Alternative energy sources (biogas)
- Community farming
- Development of model farm

The budgets for these services were not adequate to execute these projects in each district village. It was estimated that 60% percent of the total livestock population is in Punjab. There are 256 villages only in district Sialkot which is very small district of Punjab. It looks very difficult for government to built animal hospital in each village. However, the provisions of mobile veterinary services are realistic. The government livestock department developmental budget was currently diverted to rescue and provide veterinary service to those areas affected by floods.

The special initiative projects like PDDC and LDDDB, their budgets were also reduced by the government to utilize these budgets to overcome major challenges of country like flood, war on terror and energy crisis. These departments were very active from 2005-2009, after that due insufficient availability of fund the activities of these departments become very slow.

The Sialkot chamber of commerce and industries is an array of hope for the farmers. It had history of developing and successful managing mega projects like Sialkot international airport. Frequent meeting held in SCCI regarding the issue of establishment of milk pasteurized unit in collaboration with PDDC. This project was already approved by prime minister of Pakistan. The project was delaying due to non-availability of fund.

SCCI is a vibrant chamber; it has ability to take self-funded initiatives. The interview of head of livestock wing showed that the industrialists of Sialkot were slowly entering in this new business. It showed a very positive sign for livestock sector and development SLDDC in near future. It might become platform for the farmers to help in solving their issues regarding dairy sector.

5.11 Role of Processors

Pakistan is the 3rd largest milk producing countries in world. Pakistan is not present in top-21 milk processing countries in world raking of IFCN (IFCN, 2009). It means that there is a huge room for processor to grow. The processors were also trying their best to help the farmers through different initiatives. These services were not adequate at moment for the farmers in the district. Secondly, the low prices offered by processor as compared to dohdi, is major hindrance of the farmer to deliver milk to formal sector. The farmers were not happy with milk collection system of processing companies. The farmers complains that milk collectors were not checking their total solids properly as result they get less price of their milk from company.

On the other hand, the processors were to able to pay more prices of milk because constraints faced by them like adulteration rate was very high in milk, huge amount of money was spent every day on milk testing, farmers signed contract with Nestle to provide milk but they broke contract for high price from other processor, small milk volume collection from far off villages' cause of high transport cost ,energy crisis in the country was core cause of increased cost of production and legislation against the people who were doing adulteration was very loose.

PDDC (2006) highlighted a fact that most of the milk collected by processor and village milk collection center whereas farmer's cooperatives were not yet successful to date. The system of milk collection by the different processors was in state of transition. Stevenson (2011)

stated that Nestle Pakistan reduced the milk collection from third party system up to 50% and future target was to procure as much as possible milk from farmers either directly or through village milk collection centers. Hussain(2011)mentioned that Millac food stopped purchasing milk from third party as well as from village milk collection centers. Millac food was only purchasing milk from farmers directly. More milk collection to formal sector is only possible by the formation of producer groups or cooperatives. There is need to study that how farmers producer group or cooperatives can be made.

5.12 Conclusion

The SWOT analysis was used to find out the strengths in the sector, current weakness, and future opportunities for the growth and future threats.

Strengths	Weaknesses
<ul style="list-style-type: none">• 3rd largest milk producing country.• Government, private and International projects supporting the sector.• Huge population of farmers.• Increase in milk delivery to formal sector.• Increase in demand of processed milk and milk products.• High demand of dairy product	<ul style="list-style-type: none">• Adulteration.• Low productivity of cattle.• High cost of production at farm level.• High cost of milk collection and testing.• Selling of low quality milk in market.• Weak milk quality legislation of government• Fluctuation in farm inputs
Opportunities	Threats
<ul style="list-style-type: none">• SCCI to establish milk pasteurization unit.• Pasteurized milk availability.• Future market processed milk products like yogurt, Lasi and sweets.• Farmers to make cooperative/producer groups.• More international projects to support sector.	<ul style="list-style-type: none">• Import of low price powder milk from other countries.• Floods in the country.• Energy crisis.• High price for imported farm inputs.• Fluctuation in fuel prices.

It can be concluded from this research that there were seven milk chain exist in the district. The farmers were using seven different milk marketing channels to get maximum profit from milk selling. It was clear from the result of farmer's survey that profit margins earned by farmers by using different milk marketing channels were not surprisingly different. The real problem for low profit margins was low farm productivity and high cost of production.

The male consumers were using mostly purchasing raw milk and females were not found purchasing raw milk. The females do not like to stand in lines for purchasing milk at milk shop. There were 25% female found in purchase of processed milk because of convince in purchasing milk. The consumer who were using raw milk were not happy with quality of milk because of adulterations where as consumers who were using processed milk were not happy with price of milk. All respondent like to consume pasteurized milk in an affordable price ranges between 55-60 Rs per liter.

The government were trying to develop the sector through different projects because of floods and energy crisis in the country reduced the budget of different projects. The reduction in budget affected the efficiency of different projects. Silakot chamber of commerce

and industries can play an active role in the development of the dairy sector of district Sialkot. It has history of developing and managing many projects successfully.

The private sector was trying to develop the sector through different developmental schemes and incentives. The private sector efficiency was also affected by floods and energy crisis in the country. The processor was not able to pay more prices for milk per liter because of high transportation cost, high chilling cost at village milk collection centers and high cost for milk quality checking. It was difficult for processors to collect milk from each village of district because of high transportation cost. The establishment of village milk collection centers was not possible to political, social, technological and economical reasons.

CHAPTER 6 RECOMMENDATIONS

The following are the suggestion to PDDC for improvement of portability for small dairy holders;

- Coordination with research institutes, government and private departments and universities to bring latest knowledge about profitable dairy farm management practices.
- Training facilities for both men and women for the profitable farm practices.
- Training for fodder conservation like silage and hay to reduce cost of feeding in fodder shortage periods.
- Training for record keeping at farm level.
- Provision of extension services at farmer door step.
- Provision of veterinary services to farmers by better coordination at district level government livestock department.
- Arrangement of field day, farmer discussion groups and training by PDDC as well as inviting different experts from private as well as government department and research institutes.
- Formation of producer groups/farmers cooperatives.
- Provision of cooling tank to small dairy farmers or producer organization.
- Availability of farm machinery to small farmers through rural service providers.

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APPENDICES

Appendix I

Farmer Survey

Farmer Name: _____	Son of: _____
Village/District: _____	Phone #: _____
Interviewer: _____	Date: _____

General Information

1. What is your age?

<input type="checkbox"/> < 14 yrs	<input type="checkbox"/> 15 to 18 yrs	<input type="checkbox"/> 19 to 25 yrs	<input type="checkbox"/> 26 to 35 yrs	<input type="checkbox"/> 36 to 45 yrs	<input type="checkbox"/> 46 to 60 yrs	<input type="checkbox"/> > 60 yrs
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2. What is your level of education?

<input type="checkbox"/> None	<input type="checkbox"/> Primary/Mid	<input type="checkbox"/> Matric	<input type="checkbox"/> F.A	<input type="checkbox"/> B.A	<input type="checkbox"/> M.A	<input type="checkbox"/> Diploma/ Professional	<input type="checkbox"/> Other
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3. What is total number of people working at your farm?

4. What is your primary source of income?

☐ Cropping Horticulture
Dairy Other _____
Sheep/goat

5. How much land do you manage? Y/N

<input type="checkbox"/> Owned _____ Acres/Kanals	<input type="checkbox"/> Leased _____ Acres/Kanals
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6. Do you own any of the following transportation assets owned?

Asset	Y/N	Year of Purchase
Bicycle		
Motor bike		
Three wheeler Bike		
Four wheel		
Donkey Cart		

7. Who does the following tasks for the majority of the time?

Activity	Father	Mother	Brother	Son	Laborer	Other
Milking						
Fodder cutting						
Feed and water stock						
Animal care & cleaning						
Caring for calves						
Milk sales						
Other _____						

8. How is the labour paid? (please tick all appropriate)

- ☐ Money _____ Rs per month
☐ _____ % share in the yield if crops grown at the farm per annum
☐ Share green fodder for animals
☐ Other _____

Cattle inventory

1. How many cattle & buffalo do you currently have on farm?

Cattle	Number of animals:
Milking cows	
Dry cows	
Heifers (females reached puberty)	
Breeding Bull	
Buffalo	Number of animals:
Milking buffalos	
Dry buffalos	
Heifers (females reached puberty)	
Breeding Bull	

Marketing and Economic

1. Do you receive money from off-farm sources?

☐ Yes ☐ No if yes, then what type of job are you working on outside the farm?

- ☐ Government
☐ Private
☐ AgriServices
☐ Retired/Pension
☐ Other Farm Work (eg harvesting for a friend/villager)
☐ Other _____

Farm income	<input type="checkbox"/> Rs.
Non-farm income	<input type="checkbox"/> Rs.
Total	<input type="checkbox"/> Rs.

2. Please estimate what the following farm enterprises contribute towards the total farm's income and the farm expenses/costs. (Each column should add up to 100%)

Activity	Income %	Costs %
Dairy (buffalo and cows)		
Other livestock		
Cash crops		
Horticulture		
Other farm activity _____		
TOTAL	100%	100%

3. Which channel and what price do you generally receive for selling of milk in summer and winter?

Marketing channel	volume sold	Summer Price	Winter Price

4. How much milk do you generally sell and consume each day in summer and winter?

	Consume (kg/day)	Sell (kg/day)
Winter		
Summer		

5. How many milk processors operate in your village?

<input type="checkbox"/> None	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4-6	<input type="checkbox"/> 7-10
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6. What options do you have for accessing financial assistance?

<input type="checkbox"/> processors	<input type="checkbox"/> Dohdi	<input type="checkbox"/> Neighbour/friend	<input type="checkbox"/> NGO	<input type="checkbox"/> Bank	<input type="checkbox"/> Other
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7. Who is more frequently contacted for assisting you in business?

Who is more frequently contacted for help?	Extremely Common 1	Common 2	Neither common or rare 3	Rarely 4	Extremely Rarely 5
Himself/ Family member	↑	↑	↑	↑	↑
Private Dairy Expert	↑	↑	↑	↑	↑
Government Dairy Expert	↑	↑	↑	↑	↑
Milk processor Dairy Expert	↑	↑	↑	↑	↑
Other: _____	↑	↑	↑	↑	↑

8. What are your biggest challenges or issues currently in producing milk?

Challenge/Issue	Extremely Unimportant	Unimportant	Neither Important or Unimportant	Important	Extremely Important
	1	2	3	4	5
Fodder/Feed resources	↑	↑	↑	↑	↑
Health of animals	↑	↑	↑	↑	↑
Genetics/Reproduction	↑	↑	↑	↑	↑
Marketing	↑	↑	↑	↑	↑
Lack of training	↑	↑	↑	↑	↑
Other _____	↑	↑	↑	↑	↑

9. What are the current milk marketing constraints that you are facing?

10. What are the Key components in the milk value chain you want to improve for making your business more profitable?

11. What is your expectation from the following chain Supporters?

Government

Milk Processors

Consumer survey

Name:

Gender:

Male ☐

Female ☐

1. What is your education level?
2. What type of milk do you consume?

Raw	Boiled	Pasteurized	UHT	Powder

3. What brand of processed milk you are buying?
4. What price you are paying per liter of milk?
5. What type of yogurt do you like to consume?

Unprocessed	Pasteurized		UHT	
	Plan	Flavoured	Plan	Flavoured

6. What brand of processed yogurt you are buying?
7. What price you are paying per liter of milk?
8. What type of product do you mostly like to consume made from milk?

1	2	3	4	5	6
Ice cream	Butter	Cheese	Desi Ghee	Sweets	Other

9. Do you satisfied with quality of unprocessed milk available in the market?

Yes ☐

No ☐

10. If you are not satisfied with quality of unprocessed milk in the market give your comments?

11. Are you satisfied with price of unprocessed milk available in the market?
Yes ☐ No ☐
12. According to your opinion what should be the price of unprocessed milk?
13. Are you satisfied with quality of processed milk available in the market?
Yes ☐ No ☐
14. If you are not satisfied with quality of processed milk in the market give your comments?
15. Are you satisfied with price of processed milk available in the market?
Yes ☐ No ☐
16. According to your opinion what should be the price of processed milk?
17. From where do you like to purchase milk?
Dohdi ☐ Milk shop ☐ Farmer ☐ General store ☐ Bakery ☐
Supermarket ☐
18. Which packaging of processed milk do you prefer to buy?
Loose ☐ Plastic pouch ☐ Pet bottle ☐ Tetra Pack ☐
19. Do you like pay home delivery charges for milk?
Yes ☐ No ☐
20. Which type of milk do you prefer to consume available in affordable price and quality?

Middle man interview

Name: _____ Son of: _____

Village/District: _____ Phone #: _____

Interviewer: _____ Date: _____

The interview conducted from middleman is based on the following Semi-structured questionnaire;

1. From how long you are in this business?
2. From how many framers you are collecting milk?
3. What is your total milk collection per day?
4. Do you collect same amount of milk per day in summer and winter?
5. Do you pay same price per liter of milk in summer and winter?
6. Is there is a difference in payment of price per liter of cow and buffalo milk?
7. What price you are paying per liter of milk to farmer?
8. What is your payment mode to farmer?
9. What is your quality criterion of purchasing milk?
10. Where you are selling your milk?
11. What is your price of selling milk?

12. How do you receive money after selling your milk?
13. How do you check adulteration in milk?
14. Do you provide credit facility to farmers?
15. How you get back your credit from farmers?
16. What are the constraints you are facing in your business?
17. How a formal milk marketing system will affects your business?
18. What improvement you want to see for get more profit in your business?

Milk trader interview

Name: _____ Son of: _____
 Village/District: _____ Phone #: _____
 Interviewer: _____ Date: _____

The interview conducted from middleman is based on the following Semi-structured questionnaire;

1. From how long you are in this business?
2. From how many farmers and middleman you are collecting milk?
3. What is your total milk collection per day?
4. Do you collect and receive same amount of milk per day in summer and winter?
5. Do you pay same price per liter of milk in summer and winter?
6. Is there is a difference in payment of price per liter of cow and buffalo milk?
7. What price you are paying per liter of milk to farmer?
8. What price you are paying per liter of milk to middleman?
9. What is your payment mode to farmer?
10. What is your mode of payment to middleman?
11. What is your quality criterion of purchasing milk?
12. Where you are selling your milk?
13. What is your price of selling raw and boiled milk?
14. How do you receive money after selling milk?
15. How do you check adulteration in milk?
16. Do you provide credit facility to farmers and middleman?

Interview Questionnaire for Nestle Pakistan

1. Kindly can you introduce the company?
2. Can you explain the detail of dairy product range made by company?
3. Are all your products are available locally in all the provinces of Pakistan?
4. Are you collecting milk from all provinces?
5. What are your channels of collecting milk?
6. What is your criterion of collecting milk?
7. What is your price of collecting milk in summer and winter?
8. What type of farm support services you are providing to farmers?
9. Mostly farmers are not happy with criteria of milk collection and prices. How do you satisfy them?
10. What is your mode of payment to farmers?
11. What is your role in the improvement of farming system of Pakistan?
12. What type of quality control system you are using in your company?
13. Some consumers are not happy with quality of milk and how do you ensure quality of milk in future?
14. What is the reason behind recently increase in prices of milk?
15. Why you are not making pasteurized milk?
16. How you are creating awareness about processed milk in public?
17. What are the challenges you are facing at the moment for development of your business?
18. What is your future Vision for the development of dairy sector of Pakistan?

Interview Questionnaire for Millac Foods

1. Kindly can you introduce the company?
2. Can you explain the detail of product range made by company?
3. Are all your products are available locally in all the provinces of Pakistan?
4. Are you collecting milk from all provinces?
5. What are your channels of collecting milk?
6. What is your criterion of collecting milk?
7. What is your price of collecting milk in summer and winter?
8. What type of farm support services you are providing to farmers?
9. Mostly farmers are not happy with criteria of milk collection and prices?
10. What is your mode of payment to farmers?
11. What is your role in the improvement of farming system of Pakistan?
12. What type of quality control system you are using in your company?
13. How you are creating awareness about Pasteurized milk in public?

14. What is your future plan of selling liquid milk in different provinces?
15. What are the challenges you are facing at the moment for development of your business?

Interview PDDC

1. What is the role of PDDC in the development of dairy sector?
2. How PDDC in future is going to help the farmers?
3. What is the role PDDC is the development of formal milk sector?

Sialkot chamber of Commerce and Industries

1. What is the role of chamber in the development of livestock sector of Sialkot?
2. How currently chamber is helping the farmers?
3. 3. What are the future plans for the famers?
4. Do you have a plan to provide credit facility?
5. What will be your criteria for collection of milk?
6. What will be your channels of milk collection?
7. What will be your mode of payment?
8. What will be your strategy to get milk from middlemen?
9. What will be your strategy to get milk share in comparison with existing processors?
10. What will be your strategy for the milk marketing?
11. What type of milk products you are going to lunch in the market?

Appendix II

1. Mann-Whitney Tests for Age

Ranks			
Farm groups		N	Mean Rank
Age of farmers	1-15 Cattle	20	12.30
	16-95 Cattle	20	28.70
	Total	40	

Test Statistics ^b	
	Age of farmers
Mann-Whitney U	36.000
Wilcoxon W	246.000
Z	-4.654
Asymp. Sig. (2-tailed)	.000
Exact Sig. [2*(1-tailed Sig.)]	.000 ^a

2. Mann-Whitney Test for level of education

Ranks			
Farm groups		N	Mean Rank
Level of education	1-15 Cattle	20	10.63
	16-95 Cattle	20	30.38
	Total	40	

Test Statistics ^b	
	Level of education
Mann-Whitney U	2.500
Wilcoxon W	212.500
Z	-5.468
Asymp. Sig. (2-tailed)	.000
Exact Sig. [2*(1-tailed Sig.)]	.000 ^a

a. Not corrected for ties.

b. Grouping Variable: Farm groups

3. T-test for Number of people working at farm

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Number of labour	Equal variances assumed	3.277	.078	-3.272	38	.002	-1.950	.596	-3.156	-.744
	Equal variances not assumed			-3.272	34.431	.002	-1.950	.596	-3.161	-.739

4. T. test for farming land

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Farming land (acres)	Equal variances assumed	4.932	.032	-2.106	38	.042	-12.875	6.113	-25.251	-.499
	Equal variances not assumed			-2.106	28.672	.044	-12.875	6.113	-25.385	-.365

5. T. test for dairy income

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Dairy income(annual)	Equal variances assumed	53.351	.000	-5.899	38	.000	-1469962.550	249200.836	-1974443.269	-965481.831
	Equal variances not assumed			-5.899	20.021	.000	-1469962.550	249200.836	-1989751.240	-950173.860

6. T. test for cost of production

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Cost of production (annual)	Equal variances assumed	53.433	.000	-3.843	38	.000	-1195707.600	204629.380	-1609958.122	-781457.078
	Equal variances not assumed			-3.843	20.198	.000	-1195707.600	204629.380	-1622288.870	-769126.330

7. Correlation of number of cattle and labour

Correlations

		Total number of cattle	Number of labour
Total number of cattle	Pearson Correlation	1	.596**
	Sig. (2-tailed)		.000
	N	40	40
Number of labour	Pearson Correlation	.596**	1
	Sig. (2-tailed)	.000	
	N	40	40

** . Correlation is significant at the 0.01 level (2-tailed).

Appendix III

Name of Companies	Collection L / ay	UHT Milk	Tea Whitener	Powder Milk	UHT Cream	Ice Cream	Flavoured Milk	Desi Ghee	Pasteurized Milk	Butter	Cheese	Yogurt
Engro Foods Limited	800,000	Olpers	Tarang	Yes	-	Omore	-	Tarka	-	-	-	
Noon Pakistan Limited	113,000	Nurpur	Chai Mix	-	Nurpur	-	Nurpur		Nurpur	Nurpur	Nurpur	
Nestle Pakistan Limited	8,43681	Milpkak	Everyday	Nido	Milpkak	-	Nesvita	Milpkak	-	-	-	Nestle
Shakarganj Food Products Ltd.	155,000	Good Milk	Chika	-	Good Milk	-	Oolala	Good Milk	-	-	-	-
Millac Foods Limited	150,000	-	-	Powder Milk	-	-	-	-	-	-	-	-
Haleeb Food Limited	100,000	Haleeb	Tea Max	Skim Powder	Nutritious Thick Cream	-	Candia Candy Up	Asli	Dairy Queen	Daizy	Daizy	Daizy
Idara-e-Kissan	500,000.	-	-	Whole Milk Powder, Veg-Milk Powder	-	-	-	-	Halla	Halla	-	Halla
Premier Dairy Limited	100,000.	Vania	Vania Taza Dam	Pure Gold, Green Valley, Sun Rise, Cheetah Powder, Top Star	-	-	-	Vania	-	-	-	-
Gourmet Foods	160,000.	-	-	-	-	Gourmet	-	-	Gourmet	-	-	-
Pakola Products Limited	120,000.	Pakola	-	-	-	-	Pakola Flavored Milk (11 Flavors)	-	-	-	-	-
Nirala Dairy	120,000.	Nirala	-	-	Nirala	-	-	Nirala	-	-	-	-
Prime Dairies Limited	100,000.	Prime	-	-	-	Prime	-	-	-	-	-	Prime

Appendix IV

List of equipments provided by PDDC to model farmers

Category	Item
Animal Identification	Ear Tags Ear Tag Application Marker Pen
Water Supply	Tube well boring and piping Golden water pump
Fencing	GI pipe, wire, bricks
Mastitis Control	Mastitis testing kit Teat dip cup Teat dip solution
Shed Cooling	Fan GI water piping with spray nozzles
Feed Preparation and Provision	Manger.Toka Machine or upgrade components Feed grinder
Milking Machine	Single and double clusters
Fodder Cutters	Sickle bar movers .Harvest cutter
Generators	Petrol and Diesel
Vaccination	Automatic vaccination Gun
Horn Dis-budding	Gas dis-budder
Deworming	Automatic Drenching Gun
Weighing scale	Tape
Temperature Detector	Digital thermometer

List of equipment provided by PDDC to rural service providers

Sr.No	Items Descriptions
1	Single Row maize Harvester.
2	Forage Harvester
3	Sickle Bar Mower or Rear Mounted Drum
4	Simple Plough
5	Chisel Plough
6	Disc plough
7	Seed Drill
8	UAF Bed Planter
9	Forage Feeding Wagon
10	Laser Leveller
11	Front Blade
12	Rotavator
13	Manure Spreader
14	Tractor

Equipment provided to Community farm

PDDC can provide the following equipment to allow changes in farm management, depending on the community's requirements:

Sheds

Shed cooling system

Fencing

Feed Preparation Equipment

Milking machine

Pump and boring

Cooling tank

Water troughs

Mastitis control equipment

Biogas