

# Value Chain Analysis of Dairy in Merak and Sakteng



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## Abbreviations

AMEPP	Agriculture, Marketing & Enterprise Promotion Project
BAFRA	Bhutan Agriculture and Food Regulatory Authority
CoRRB	Council of RNR Research for Bhutan
DAMC	Department of Agricultural Marketing and Cooperatives
DoL	Department of Livestock
DLO	Dzongkhag Livestock Officer
DLS	Dzongkhag Livestock Sector
EOs	Extension Officers
FAO	Food and Agricultural Organization
FNPP	FAO Netherlands Partnership Programme
HH	Household
ICIMOD	International Centre for Mountain Development
IFAD	International Fund for Agriculture Development
IFPP	Integrated Food Processing Plants
IPPC	International Plant Protection Convention
JICA	Japan International Cooperation Agencies
Kg	Kilogram
MIS	Market Information System
MoA	Ministry of Agriculture
MT	Metric Tonnne
NSB	National Statistical Bureau
Nu	Ngultrum
PFO	Project Facilitation Office
PPD	Policy and Planning Division
RGoB	Royal Government of Bhutan
RNR	Renewable Natural Resources
RNRRC	Renewable Natural Resources Research Centre
RAMCO	Regional Agricultural Marketing & Cooperative Office
SNV	Netherlands Development Service
VC	Value Chain

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## **1.0 INTRODUCTION**

### **1.1 Background**

The present study is conducted as a part of ongoing collaboration between the Netherlands Development Programme (SNV) and the Department of Agricultural Marketing and Cooperatives, which has a broad goal of developing “A vibrant and responsive marketing institution for a sustainable RNR enterprise enhancement”. This study intends to identify the issues of market imperfections for the dairy products so as to better target relevant support. The strategy for doing so is to increase competitiveness, performance, and growth of the products/entire dairy sectors, which is expected to contribute to the improvement in economic and social conditions.

Livestock plays a very important role in the economy and social life of many people in Bhutan. Yak rearing is an integral component of highlander people, who live across the northern border from Ha in the west to Trashigang in the east. Most of the yak herders and their families meet almost all their needs from the yak. They consume milk as a component of milk tea and process it to make butter and variety of cheeses. Various meat and skin products are also made from the yak, which are either slaughtered or have met an accidental death (Tshering and Dorji, 2009).

The highlands of Merak and Sakteng are very different from the other gewogs in Trashigang dzongkhag. These two gewogs are not only the most remote but their culture also differs from other gewogs. Livestock rearing is the major source of livelihoods in this area and more than 90% households are dependent on pasture land. Cattles are mainly kept for milk, butter, cheese, and meat. Yaks, Zoomo, horses and mules are used as pack animals to transport goods.

Economically, cheese and butter seem to be the most potential products of these gewogs. Both women and men are involved in herding the cattle, processing milk and making cheese and butter. There are three types of cheese produced in the area: fresh cheese, fermented cheese and hard cheese. The peak season for the production of cheese and butter is summer.

There seems to be an excellent opportunity to add value and get better price for dairy products of this area. The way they handle the products is unique, which carries good name, but food safety and hygiene conditions need lot of improvement. In recent years, the production of milk vis-à-vis the demand for milk products is increasing. This requires more support in product diversification and market exploration. The productivity and carrying capacity is another issue which needs to be looked at carefully. In general, the dairy sector has great potential and significant challenges. It is suffering from multifarious problems such as, lack of adequate pasture land, large number of unproductive cattle, inadequate knowledge about cattle health, their nutritional requirements, insufficient information about markets, poor local capacity to provide necessary services to improve cattle efficiency and growth, poor linkage with adaptive research and extension, poor road system for transporting raw materials and dairy products, etc.

## 1.2 Objective

The principal objective of the study was to find out the actual situation of dairy subsector (viz. production practices, products flow, value adding option and market trend) in the gewogs and provide information on constraints, bottlenecks and potentials of dairy value chain.

## 1.3 Scope of the Work

The overall scope of the study is to understand the functioning and dynamics of dairy sector in Merak and Sakteng Gewog of Trashigang Dzongkhag under the broad domain of production, processing and marketing. The following were the details of the scope of work:

- Collect, compile and review available secondary data/livestock statistics and information
- Develop and administer data collection tools, primarily interview schedules, checklists and questionnaires
- Develop value chain map of dairy products
- Identify chain actors – from input suppliers to retailers
- Identify key constraints to and opportunities of the value chain
- Suggest possible solution to key constraints for the effective development of dairy value chain

## 1.4 Methodology

The data compiled and analyzed for the study was gathered using value chain methodology, which is composed of following parts:

- Functional analysis to identify the actors in the chain and the functions they perform
- Technical analysis to assess the constraints at different level in the chain: Input, production, processing, marketing
- Marketing analysis that quantifies the flow of commodity through different channels, pricing and distribution of value addition at different level

Source of information include published materials, semi-structured interviews with the concerned stakeholders, formal questionnaire survey with livestock herders and focus group discussion with processors and local traders.

**Review of Secondary Information:** The secondary information was collected from project documents, internet data and RNR statistics. Data of National Bureau of Statistics, Reports of Livestock Department and Commodity Chain Analysis Report were particularly used to get general overview of the dairy sector in Bhutan.

**Primary information:** Primary data are collected (1) by observing people, places and practices and (2) by asking questions to actors and supporters of dairy value chain. The field survey of Merak and Sakteng Gewog was conducted by RAMCO together with RNRRC Wenkher and Agricultural Marketing and Enterprise Promotion Project (AMEPP). A total of 150 households (75 households in each Gewog) were interviewed and personal observations were made to see the way livestock and dairy products are handled. A questionnaire based-survey was also conducted with buyers to collect quantitative data on dairy sector. A total of 4 buyers in Phongme, 5 in Khardung and one each in Rangjung and Trashigang were interviewed.

**Focus Group Discussion:** Focus group discussion was held one each in Merak and Sakteng gewog to understand the horizontal and vertical linkages between the actors of value chain.



Livestock extension officials and Gup of Merak and Sakteng gewogs, representatives of livestock herders -both male and female, and members of survey team took part in the discussions. Besides this, telephone and personal meetings were conducted with supporting agencies to understand the dynamics of the subsector and to explore ideas for interventions that address constraints and aids in the development of the value chain. The data and information provided by Dzongkhag Livestock Office, Trashigang were particularly used in analyzing the dairy value chain.

## 2.0 GENERAL OVERVIEW OF DAIRY SECTOR

### 2.1 Glimpse of the Country's Dairy Sector

Livestock are an integral part of Bhutanese farming system. Cattle, yak, sheep, goats, pigs, and poultry are the major livestock owned and reared by farmers. Altogether 667,553 livestock heads exist in the country; of which 319899 are cattle, 51,500 yaks, 26,966 pigs, 12415 sheeps and 28360 goats (Livestok Statistics, 2007). Similarly, the number of horses, mules and donkeys are recorded at 20,967,5183 and 153 and poultry at 200,629. Buffalo rearing with only 1551 animals is a marginal practice, and it is limited in souther part mainly in Samtse. Sheep and goats are traditionally not milked. Cattle, Buffalo, and Yak are the main source of milk. Yak rearing plays an important socio economic role in the alpine area, which is the focus of present study.

Table 1 shows the number of livestock raised by people in 2007 in each Dzongkhag. Of the total cattle population, 40% are raised in Samtse (11.2%), Chhuka (9.8%), Mongar (9.7%) and Trashigang (8.9%). The table shows that about two third of the yaks are raised in three Dzongkhag, with highest numbers in Gasa (23.5%) followed by Trashigang (23%) and Thimphu (19.6%). Similarly, over one fifth of sheep population is found in Trashigang (23%), whereas the highest numbers of goats (30%) are Bumthang. Chhukha had the highest number of pigs (17%) and Samtse has highest number of poultry (15%).

There is a strong emphasis on milk processing at the household level since butter and local cheese are major components of Bhutanese diet. In many areas, the primary purpose of keeping livestock is to supply draught power and manure for crop production as the Bhutanese rural economy is heavily a subsistence economy with mixed farming in agriculture and livestock. . Cattle and yak are also used to transport goods. Keeping of livestock for the purpose of meat production is very limited due to strong religious sentiments. However, with the changed in food habit the consumption of meat is increasing among the urban population. To meet the growing needs of the country a fair amount of meat is imported and the animals that die as a result of accident are also sold.

**Table 1: Number of Livestock in each Dzongkhag**

Dzongkhag	Cattle	Buffaloes	Yak	Horses	Mules	Donkey	Sheep	Goats	Pigs	Poultry
Bumthang	10595	151	3418	1280	129	11	821	46	4	702
Chhukha	31355	59	0	465	122	5	1327	8637	4568	14641
Dagana	14966	30	0	410	24	5	491	3964	1889	17863
Gasa	541	0	12076	672	579	0	194	0	45	747
Ha	9207	0	4874	759	629	2	1	109	805	3239
Lhuentse	13676	0	456	1669	189	6	151	24	792	7010
Mongar	31002	0	0	2034	564	19	62	313	2161	18609
Paro	15066	0	5388	1173	416	7	0	179	1418	13892
Pemagatshel	9339	0	0	429	530	4	4	114	1002	5374
Punakha	9372	0	0	648	28	9	0	37	1238	3630
S. jongkhar	17132	45	0	1401	254	10	52	445	880	8341

Samtse	35783	642	0	181	28	0	2582	5445	1481	30137
Sarpang	20582	237	0	304	4	0	600	3046	1794	27041
Thimphu	6030	0	1008 8	1084	229	11	29	46	1071	3097
Trashigang	28530	0	1181 3	3685	596	15	2866	129	1700	11802
Trasi Yangtse	11641	203	402	1288	324	19	43	173	1228	3028
Trongsa	9848	0	72	439	43	4	781	26	490	3585
Tsirang	11727	184	0	212	1	0	723	4936	1382	15195
Wangdue	19838	0	2913	1409	52	18	1680	341	1912	4884
Zhemgang	13669	0	0	1425	442	8	8	290	1106	7812
<b>Total</b>	<b>31989 9</b>	<b>1551</b>	<b>51500</b>	<b>20967</b>	<b>5183</b>	<b>153</b>	<b>12415</b>	<b>28300</b>	<b>26966</b>	<b>200629</b>

Source of Table: Livestock Statics 2007

Livestock rearing has traditionally been a measure of wealth, those having higher number of livestock and more family members were considered better off families. Even today, in places like Merak, Sakteng and Gasa Dzongkhag number of herds determine the status of the family and played an important role for security and finance. For many rural households, the livestock are the sole source of cash income. By taking manure and draught into consideration, the contribution of livestock would be higher (Dorjee, 1995). The in Bhutan also provide a sense of security to rural farmers in times of crop failure since they can be exchanged readily for cash or food grains (ICIMOD and MoA/PPD, 2006).

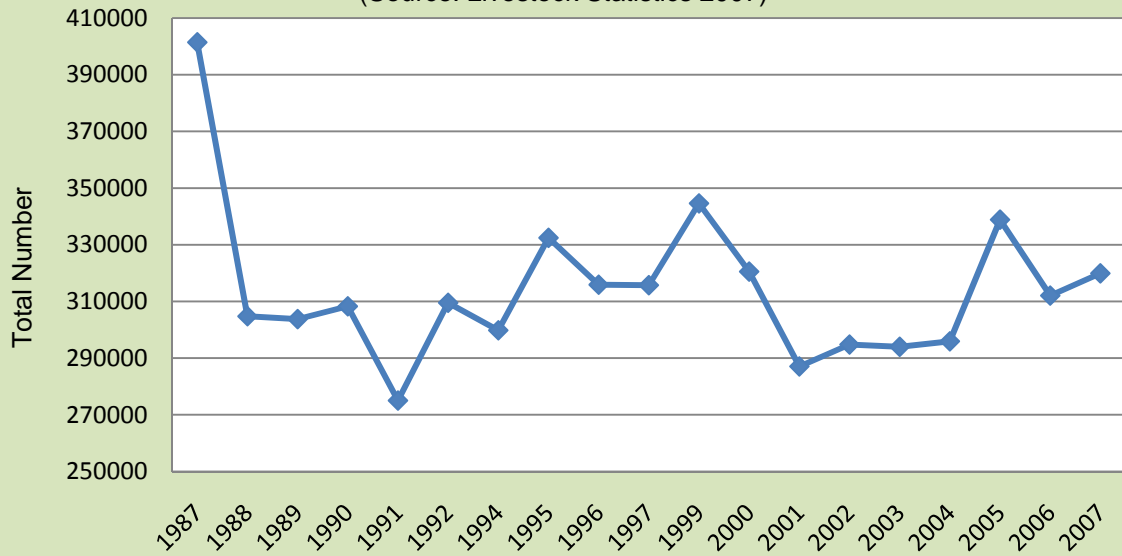
### 2.1.1 Trend of Livestock Population

The livestock statistics shows that the population of cattle, pig, sheep and goat has either remained stagnant or decreased over the past few years. However, the population of yak is still on raise. Despite the various efforts made by the government agencies to increase productivity, to decrease in size of the herds and change of the breeding system through adoption of exotic breed, the statistics reveal that there are still large numbers of unproductive animals. About 80% cattle reared in Bhutan are local breed. Of the 319,899 cattle, 208,783 (65%) are Nublang, 1865 (0.6%) are Mithun and 48,755 (15%) are Mithun cross. The number Jersey, Jersey cross, Brown Swiss Cattle and their cross is 1291, 53,797, 79 and 5,329 respectively.



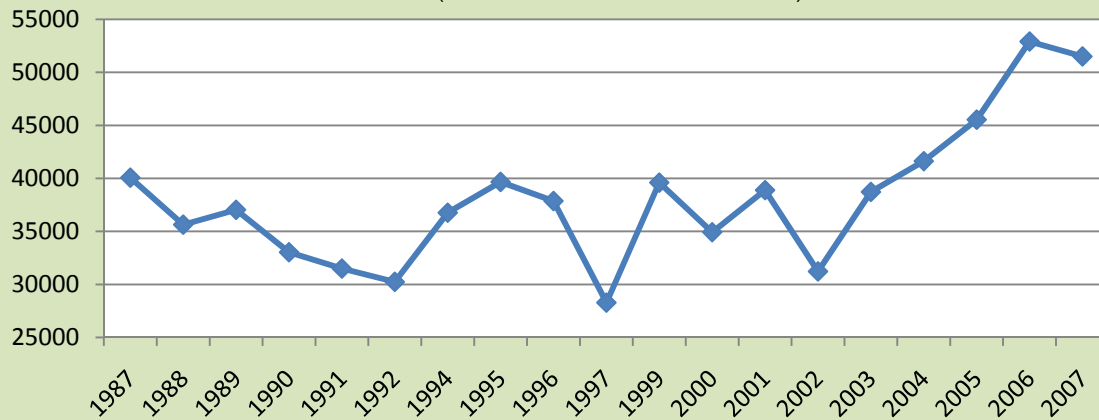
**Figure 1: Population Trend of Cattle in Bhutan**

(Source: Livestock Statistics 2007)



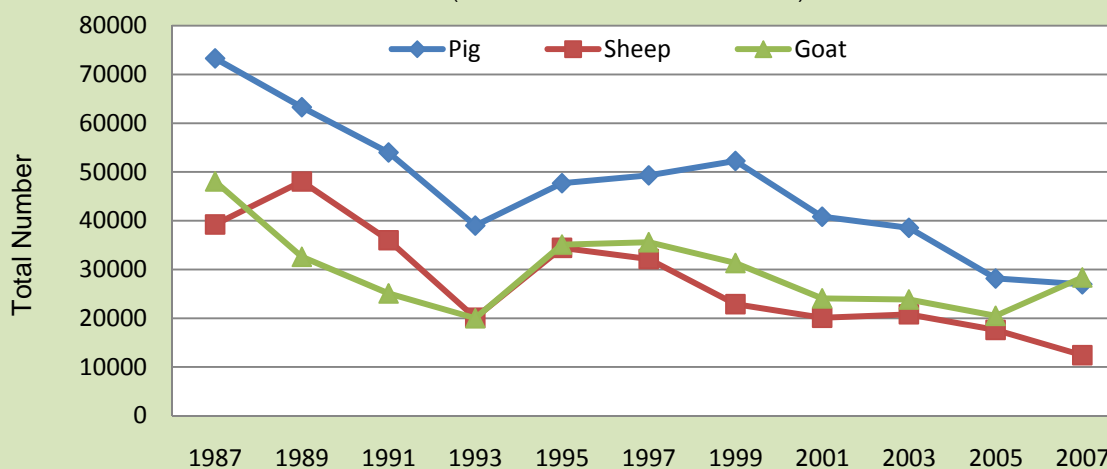
**Figure 2: Population Trend of Yak in Bhutan**

(Source: Livestock Statistics 2007)



**Figure 3: Population Trend of Pig, Sheep and Goat in Bhutan**

(Source: Livestock Statistics 2007)



## 2.1.2 Production

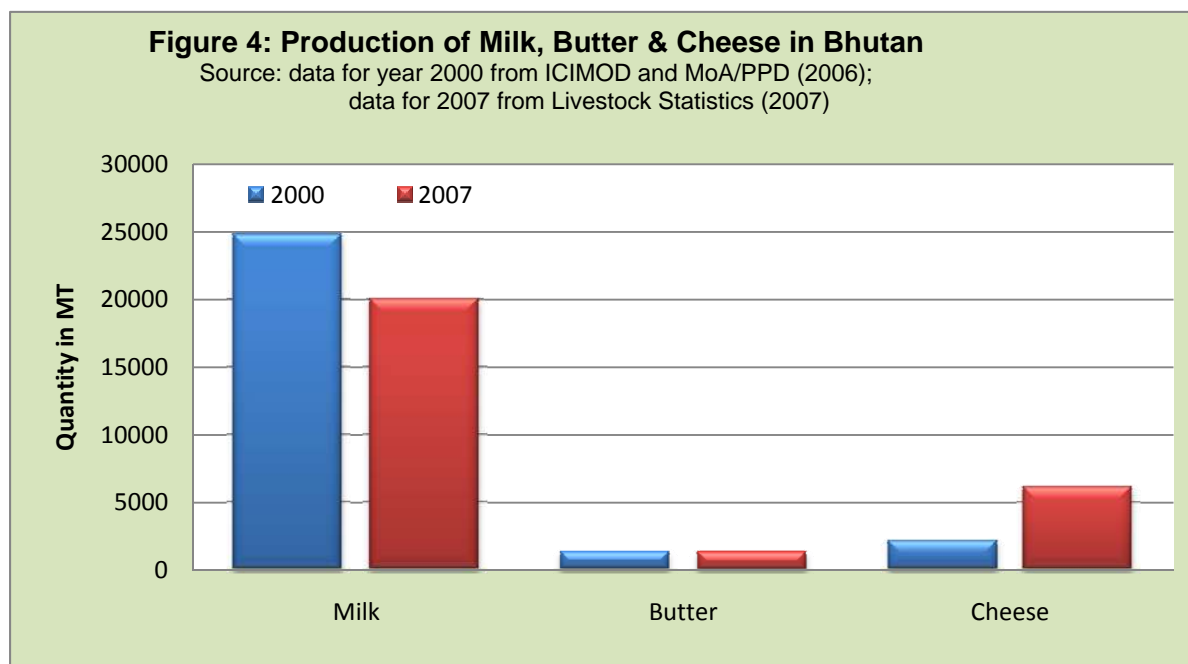
The total production of milk, butter and cheese in 2007 was reported as 20,059 MT, 1,393 MT, and 6146 MT. Trashigang is the leader in milk production, which produced about 2.7 million liters of milk. Of the total country's production, Trashigang accounts for 13.5% of total milk, 12.9% of butter and 5.7% of cheese. Chhukha, Thimpphu, Paro, Wangdue, Mongar and Samdrup Jongkhar also produced good quantity of milk (over 1 million liters each). The production of butter was highest in Chhukha followed by Trashigang, Wangdue, Paro and Mongar. For cheese Punakha, Wangdue and Chhukha are the largest producers. Of the total quantity of milk, 17% was sold in the market and rest is used to process butter and cheese. Of the total quantity of butter produced, 65% is for sale (DoL, 2007). Table 2 shows Dzongkhag wise production of milk butter and cheese in 2007.

**Table 2: Dzongkhag-wise production of milk, butter and cheese**

Dzongkhag	Milk	Butter	Cheese
Bumthang	1209.97	41.34	252.04
Chhukha	1995.74	204.96	708.59
Dagana	421.94	25.1	93.9
Gasa	534.63	26.73	44.55
Ha	691.15	27.6	180.21
Mongar	1029.53	104.4	259.7
Paro	1680.25	107.47	847.3
Pemagatshel	435.36	28.27	69.73
Punakha	783.02	78.2	1194.02
S.jongkhar	1320.74	92.08	100.5
Samtse	672.42	28.14	22.51
Thimpphu	1702.21	93.23	295.22
Trashigang	2713.98	179.69	351.35
Trasi Yangtse	673.24	54.53	104.51
Trongsa	961.49	59.59	167.2
Tsirang	925.35	25.78	208.76
Wangdue	1412.76	157.23	726.18
Zhemgang	895.6	59.32	520.11
<b>Total</b>	<b>20059.36</b>	<b>1393.66</b>	<b>6146.41</b>

Source for the Table: DoL (2007)

Figure 4 shows that there has been slight decrease in the production of milk over last few years. In 2000, the total production of milk was 24,837 MT, whereas in 2007, it was reported as 20,059 MT. There was marginal increase in production of butter from year 2000 to 2007 and about 3 folds increase in the production of cheese (Figure 4).



### 2.1.3 Consumption

Dairy products are an essential component of the Bhutanese diet. Originally, there were two separate markets for dairy products. Butter and cheese in the northern area, milk and curd in the southern belt are consumed daily. These have been formed according to the religious and social structure of the country (FAO 1990). In the south of Bhutan, traditional products are closer to the Indians, like milk, lassi, curd and ghee, whereas in the northern part, only a very small amount of fresh milk is fed to the children or used in sweet tea. The butter produced is mainly used in “Suja” or butter salty tea which is a mixture of tea, water, butter and salt (Derville and Tenzin, 2007).

Three types of cheese are processed “datse” or soft cheese with a shelf live of 3-5 days; “Chugo” or hard cheese and “Yeatpa”, fermented cheese, with a shelf life of months. Datse or soft cheese is a very important component of the local diet. It is part of the national dish “emma datse and rice”, rice with chili cheese sauce. Chugo (hard cheese made from evaporated butter milk) is either chewed or used to make porridge, a special dish eaten during religious ceremonies. Fermented cheese is consumed in curry; added to datse it contributes to the taste and stickiness to the cheese sauce (Derville and Tenzin, 2007). The fermented cheese is mostly produced with yak milk and the present study area is well known for the production of such cheese.

In the past, considerable amounts of butter were traditionally used to fuel lamps in front of religious shrines. It has now been replaced by imported industrial products. The demand for dairy products is on raise with the urban population growth as well as with their increasing purchasing power (Derville and Tenzin, 2007 ). Almost all the milk and processed dairy products are consumed within the domestic market. Though there is a good potential to export Bhutanese cheese but local demand suprules the supply. However, there is huge discrepancy in production between peak production in summer and consumption in winter. In summer, dairy farmers find difficulty in selling their milk; not only because of higher production but also due to long distance of travel from dairy farms to market, lack of proper milk storage and transportation facilities.



## 2.1.4 Demand and supply condition

The demand for dairy products, mainly in urban areas, is very high and it is largely supplemented by Indian imports. From 1996 to 2005, the import of liquid milk has increased by 30 times and cheese by 9 times and yogurt 66 folds. Milk powder despite a smaller growth rate remains the largest import with a value of Nu 150 millions in 2005 (Derville and Tenzin, 2007).

The Dairy Chain Analysis Report shows that the supply of local milk and quality cheese is erratic and limited or non-existent. Though homemade soft cheese, local cheese is easily available in vegetable market but the supply of Gouda type cheese and other well packaged and labelled cheese and butter is erratic.

The supply of the industrial cheese especially the 1kg block Amul and Britannia is abundant and many quality conscious consumers prefer to buy these products over local ones since they have better packaging and longer shelf-life.

## 2.2 Dairy Farming in Merak and Sakteng

The present study is conducted in Merak and Sakteng Gewogs of Trashigang Dzongkhag, which are well known for dairy production in the country. These two gewogs are located in highlands of Eastern Bhutan, bordering Arunachal Pradesh of India (Map).

**Merak:** Merak is one of the remotest gewogs under the Merak-Sakteng Drungkhag in Trashigang Dzongkhag. It has an area of 867.7 sq. km. The gewog is not connected with motor roads and it shares a boundary with Shongphu gewog in the west, Sakteng gewog in the north, Kangpara gewog in the south and the Indian state of Arunachal Pradesh in the east. Merak gewog lies in the valley of Nyera Ama Ri and the altitude is about 3400-3500m above sea level. Nyakchung La, which is about 4100m and above is the pass between Merak and Sakteng gewogs and it stretches from latitude 27° 17.84' to 27° 18.51'N and from longitude 91° 50.76' to 91° 52.12'E

([www.trashigang.bt](http://www.trashigang.bt)). The gewog has 4 villages and a total of 231 households. The total population of the gewog is 1957 ([www.trashigang.bt](http://www.trashigang.bt)).



**Sakteng:** Sakteng gewog is located to the eastern most part of Trashigang Dzongkhag. It has an area of 910.9 sq. km. Gewog is bounded with Phongmey and Merak gewog of Trashigang

Dzongkhag and Arunachal Pradesh state of India. Sakten gewog has 8 villages viz Jonkhar, Murbi, Thrakthrek, Tengma, Pusa, Borangtse, Borangmang and Sakteng. There are 336 households with total population of 2251 ([www.trashigang.bt](http://www.trashigang.bt)).

The people of Sakteng are mostly dependent upon livestock and livestock products. Though some bitter buckwheat and vegetables are grown at Sakteng (4000 masl) no other cereal crops can be grown in such a high altitude. Maize, barley, potatoes and vegetables are grown in the lower areas of Jonkhar, Murbi and Thrakthrek villages. The important livestock products are butter, cheese, zoedey or yeatpa (fermented cheese), yak meat, wool. Yeatpa or zoedey, a special Bhutanese delicacy is produced in this gewog. Most of these products are bartered for food grains especially maize. People of Sakteng and other parts go to Phongmey, Radhi and Bidung gewog with their produces, travel around and exchange with rice, maize and textiles (the Bru or Drukhor system).



### **2.3 Profile of the Respondents**

A total of 150 livestock herders were interviewed for the present study, who represented 75 households each in Merak and Sakteng. Of the total respondents, 34% were women and 66% male. The average household income of respondents was about Nu. 3,500 per month and the number of family members reported as 7. A total of 161 (90%) of the total respondents were illiterate, couldn't read and write. For almost all the households in both the gewogs, cheese and butter are the main source of cash income.

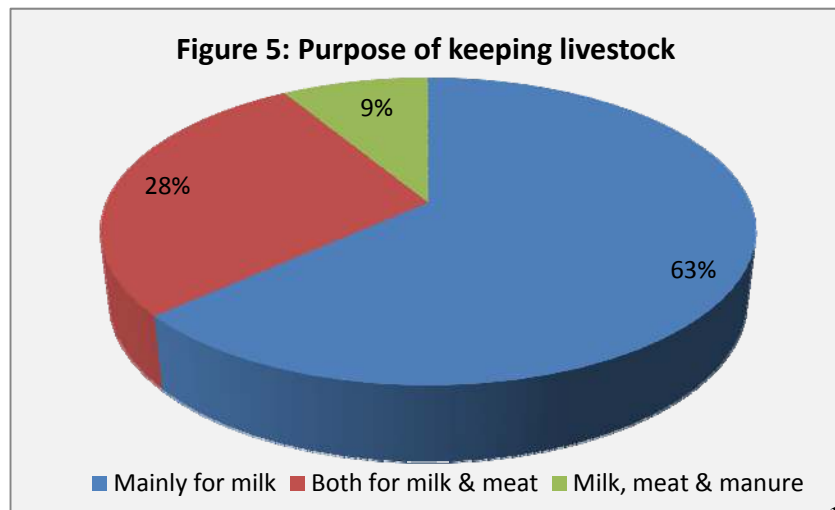
**Table 3: Profile of the respondents**

Respondent's profile	Merak	Sakteng
Number of herders interviewed	75	75
Male (No. of total interviewee)	47	52
Female (No. of total interviewee)	28	23
Average Number of Family Members	7.65	6.64
Monthly Household Income (Nu.)	3600	3460
Number of respondents who are literate	6	8



*Dairy farmers having lunch after the interview session*

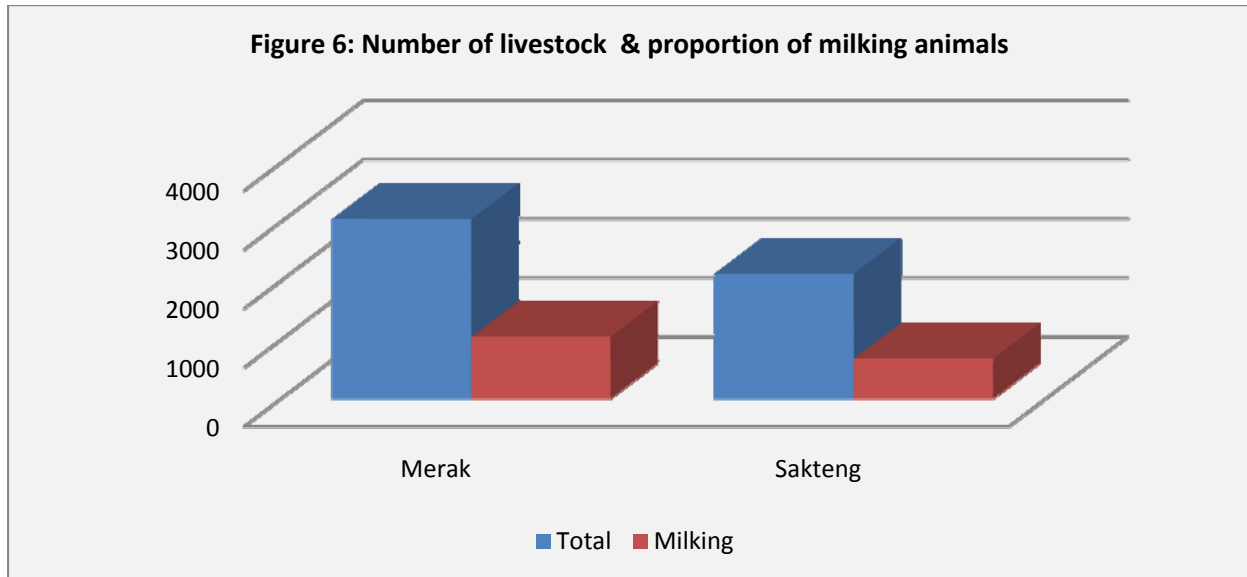
People of Merak and Sakteng gewogs have been keeping livestock since generations. The main purpose of keeping livestock in both gewogs is to produce milk, which is processed to make butter and cheese. Over 60% respondents said that they keep livestock mainly for production of milk, while 28% said that they also keep livestock for meat (Figure 5). Of the 150



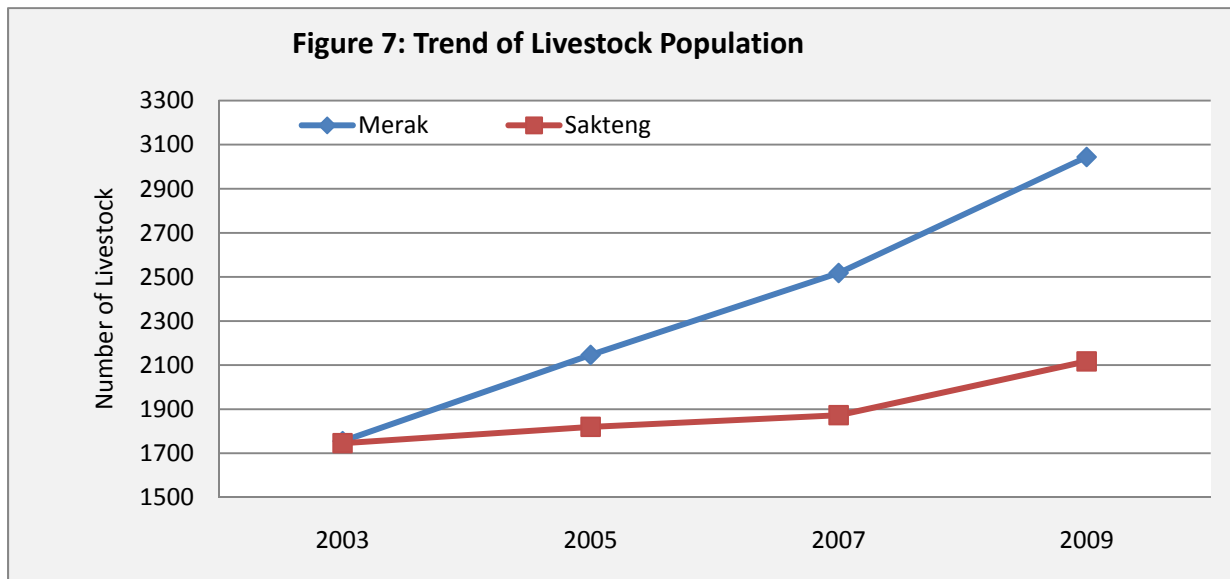
respondents, 138 (92%) mentioned that the livestock rearing is the major source of cash income for their families.

## 2.4 Number of Livestock and Population Trend

The total numbers of livestock with the respondents in Merak were 3,044, of which only 34.5% were milking, whereas in Sakteng, the total number was 2,117 with 32% milking animals (Figure 6). The number of livestock per household ranged from 5 to 150. On an average, it came to 40 in Merak and 28 in Sakteng. Based on these figures, the total number of livestock could be estimated as 9,375 in Merak and 9,484 in Sakteng.



The respondents said that the population livestock is increasing. In Merak, 6 years ago the respondents had a total of 1,755 livestock where as 2009 the number reached to 3,044 (Figure 7).



## 2.5 Livestock Rearing Practice

The people in Merak and Sakteng practice semi-nomadic type of life style and prefer free grazing. None of the herders practiced stall feeding. About 44% of the respondents said that they did not keep any land for growing fodder trees, 18% keep up to 40 decimal, whereas 29% grow fodder plants in up to 1 acre of their private land (Figure 8).

Except one all 150 respondents mentioned that they keep on moving their livestock from one place to another depending up on the availability of fodder and seasons. From 2 to 9 months they keep their livestock out of their own village. During winter, they generally move with their livestock to low altitude areas, whereas during summer they move towards high altitude areas.

The livestock herders of Sakteng move their herds towards Radhi and Phongme during cold winter season. They keep their livestock at different places, like Thangro, Tshethang Gangling, Loobshing, Kherugnang, Thakthik, Shingdukpa, Mardongma, Borthabsa. Similarly, the livestock herders of Merak move their herds towards Khaling and Kangpara during the winter months. They keep their livestock in grazing lands of Ngugthang, Ngugu, Shingnga, Shingarong, Khelphu, Chebling. As per mutual understanding, the herders give butter, 'ghee' (dehydrated butter) and cheese to the land owners.

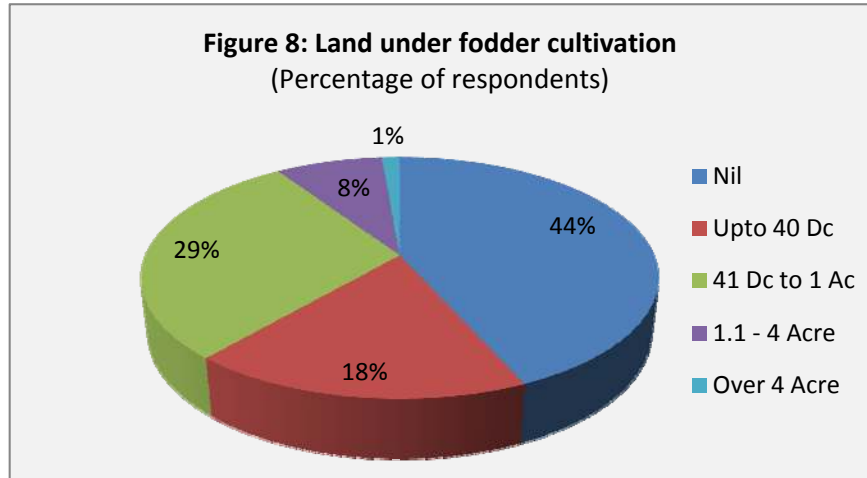
Despite the problem of pasture and various other issues, 94% respondents showed their interest to increase the number of their livestock. Only 9% mentioned their unwillingness about increasing the number.

## 2.6 Inputs/Service

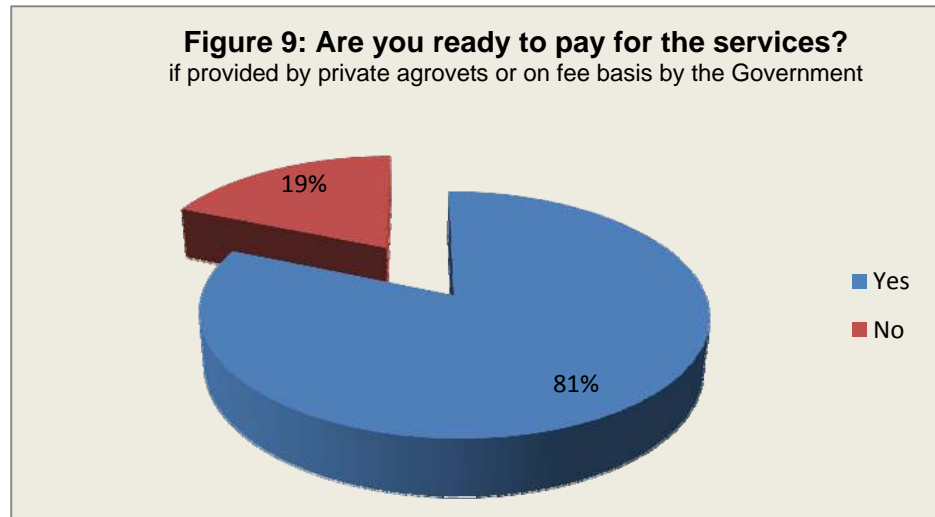
During the survey, only 37% of the respondents said that RNR Extension Officials provide technical advice and some inputs. Whereas a majority (63%) of the respondents mentioned that they do not get any inputs and services in the villages. The low coverage of extension services is mainly because of migratory nature of livestock herding. Since dairy farmers keep on moving from place to place, it becomes difficult for extension agents to provide technical advices and vaccination services to all..

Low availability of pasture is cited as the most important area that needs improvement. Breed improvement, animal health and medicines, training and technical advice are also suggested as important areas that need to be looked at by service providers.

It is very impressive to know that the livestock herders of Merak and Sakteng are ready to pay for the needed services. Of the 150 respondents, 81% said that they will pay for the services if



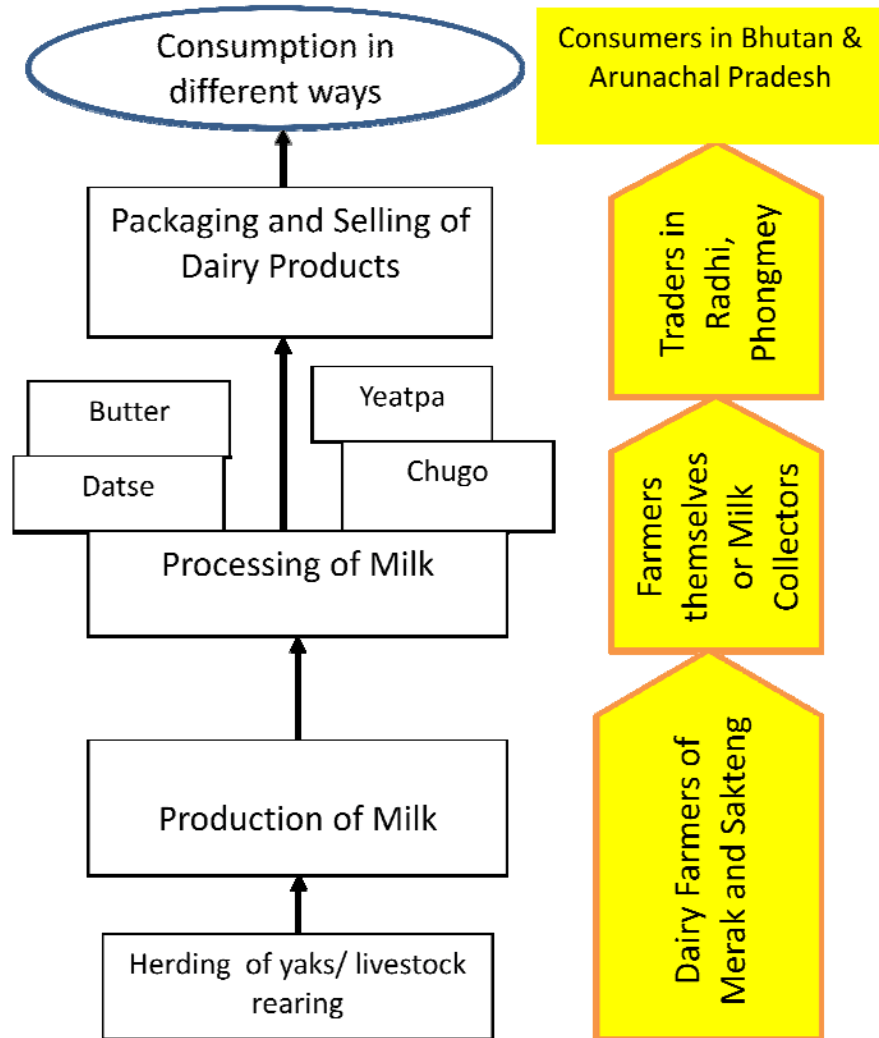
provided by private veterinary firm or Government units on fee basis. However, as livestock herders keep on moving their herds from place to place, it is not easy to cater the services. Even for vaccination of animals against foot and mouth disease, rabies, etc, the extension officials find it difficult to provide the services. There are some traditional beliefs as well which do not allow getting their animals vaccinated.



### 3.0 Value Chain Analysis

Value chain (VC) analysis is a method for accounting and presenting the value that is created in a product as it is transformed from raw inputs to a final product consumed by end users. VC analysis is also synonymously referred to as production chain or market chain. Major value adding activities in dairy chain are depicted in Figure 10.. VC analysis aims to assess both goods and services along the chain and the relative strengths and weaknesses in the links among various actors involved in the chain. Thus, the efficiency of a market chain is a result of how well the actors in the chain are organized and also how well the chain is supported by a range of business development services.

**Figure 10: Major Value Adding Activities in Dairy Chain**

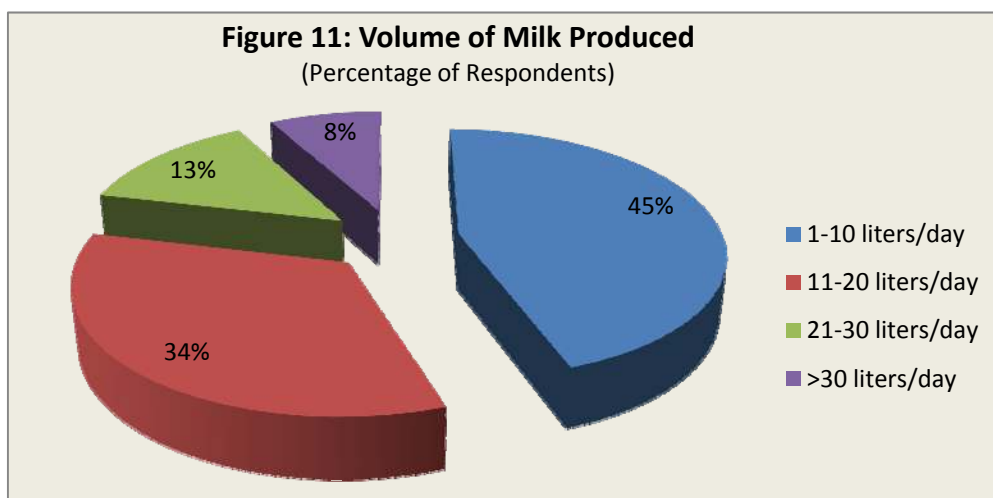


### 3.1 Production and Product Varieties

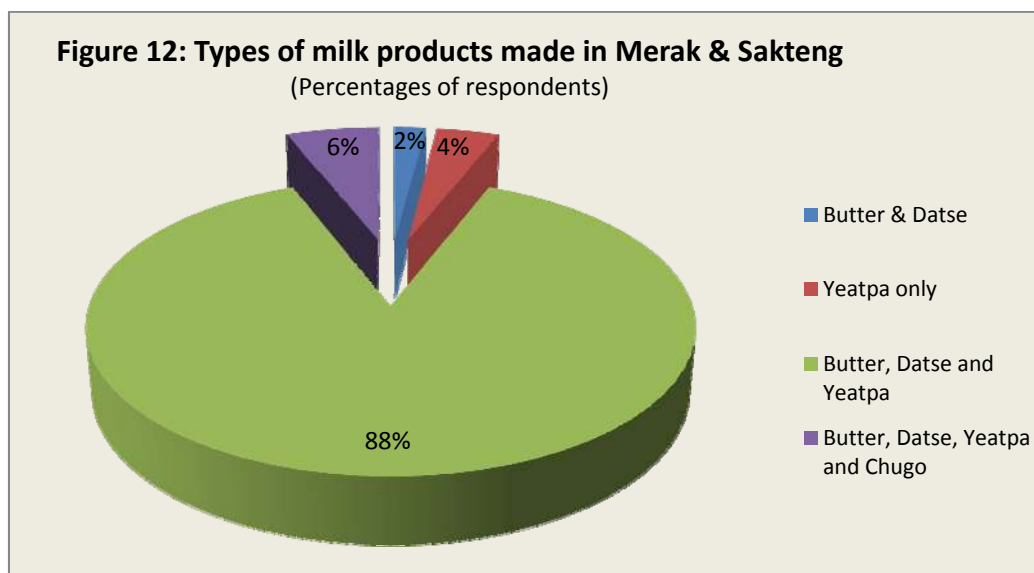
On an average production of milk per household is estimated to be 16.9 liter/day. The range of production varies from 3 liters/day to 120 liters/day. Most livestock herders get below 20 liters/day (Figure 11). Of the 2,540 liters milk produced by 150 respondents, only 47 liters is reported to be sold in the market. Almost 95% respondents do not sell the milk rather they use it to make butter and products.

The main products made out of milk are:

- Butter
- Fresh cottage cheese “Datse”
- Fermented cheese “Yeatpa”
- Hard cheese “Chugo”



During the survey, it was noted that about 88% respondents use milk to make butter, fresh cheese and fermented cheese. Only 2% use milk to make butter and fresh cheese, whereas 4% make only the fermented cheese from their milk (Figure 12).



Based on the information collected from the focus group discussion held with the dairy farmers, *Gup* and Livestock Extension Officials in Sakteng and Merak, the total annual production of milk is estimated as 729,890 liter. It is mainly produced from yak. As there is no market for fresh milk in the villages, most of the quantity is processed to make butter, *datse* and *yeatpa*. Table 4 presents the approximate quantity of each of these products. In addition to these products '*chugo*' is also produced by the yak herders of Sakteng and Merak, and it is mainly sold in Arunachal Pradesh of India.

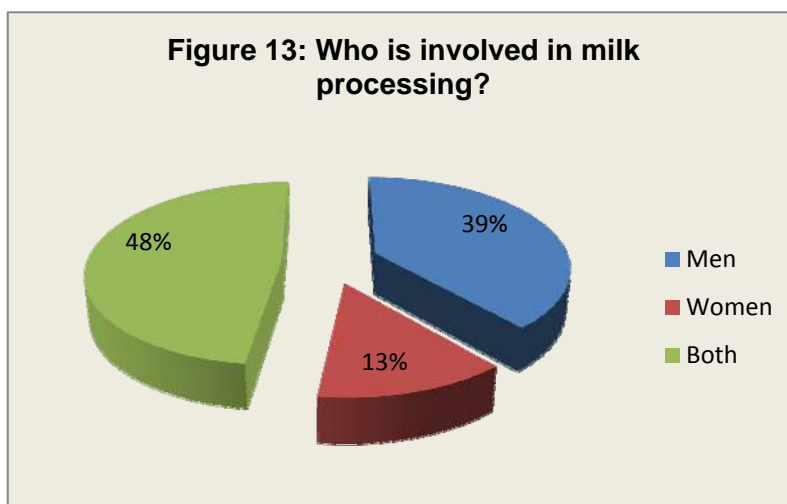
**Table 4: Total Production of Milk and Milk Products in Sakteng and Merak**

Milk Products	Production (kilogram per year)
Milk	729,890

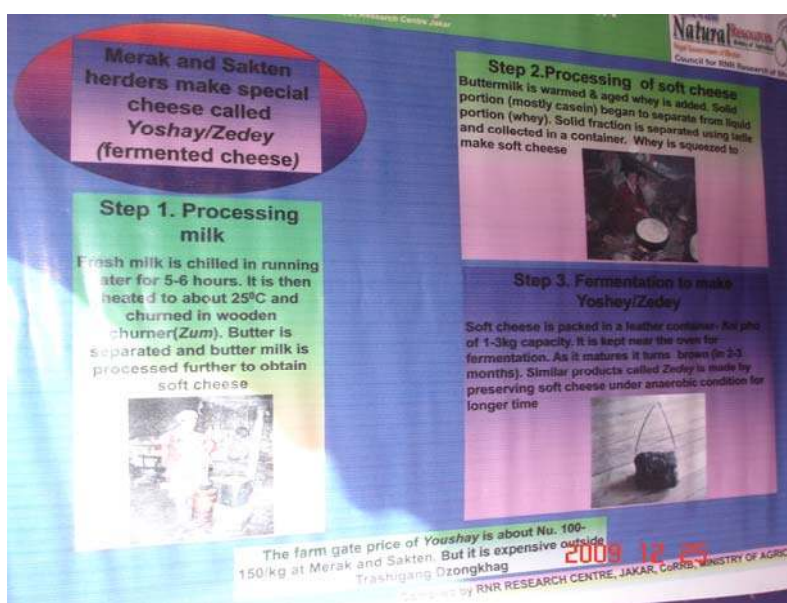


Butter	53,809
Fresh Cheese (Datse)	94,318
Fermented Cheese (Yeatpa)	46,225
Meat	23,824
Wool	3,749

Of the total respondents, 97.4% mentioned that they make milk products both for their own consumption as well as for sale, whereas the rest make these products simply for their own consumption. Interestingly, 48% respondents mentioned that both men and women are equally involved in milk processing activities whereas 39% said that it is more of men's job and 13% mentioned it as women's job (Figure 13).



As per the information provided by livestock herders of Merak and Sakteng to make one kg of butter they need 11.66 liters of milk. The time taken to process milk varies depending upon the temperature, quantity and quality of milk. On an average, it takes about 45 minutes to make these products from milk. Regarding the quality requirements, 51.3 % respondents mentioned that there is no need to meet any requirements of the buyers whereas the rest highlighted the need of improvement in packaging materials, cleanliness, hygiene and sanitation.







*Butter wrapped in leaves*



*Yeatpa in yak skin*



*Chugo beaded in thread*

Box 1 describes the method of milk processing in Merak and Sakteng, which is slightly different than that in Ha, Bumthang and other parts of country as described by Tshering and Dorji (2009).

#### **Box 1: Method of milk processing**

**Maa (butter):** Milk is heated to 20-25°C and after a while a few drops of curd is added into it. Milk is then kept for 1-2 days until it becomes curd, which is then churned. Time taken for churning depends on the size of churner and quantity of milk. The herder uses a lot of strength to move the plunger up and down several times. As the agitation progress, the herder checks the status of fat globules. First, very small butter globules of the size of pin heads are appeared but after continuation of churning, the bigger size butter globules are formed. Then churning is stopped and lumps of fat floating on the surface are removed into another vessel. Butter is then put in cold water to harden it. After that round balls are made from the butter and wrapped in leaves, mostly with rhododendron leaves.

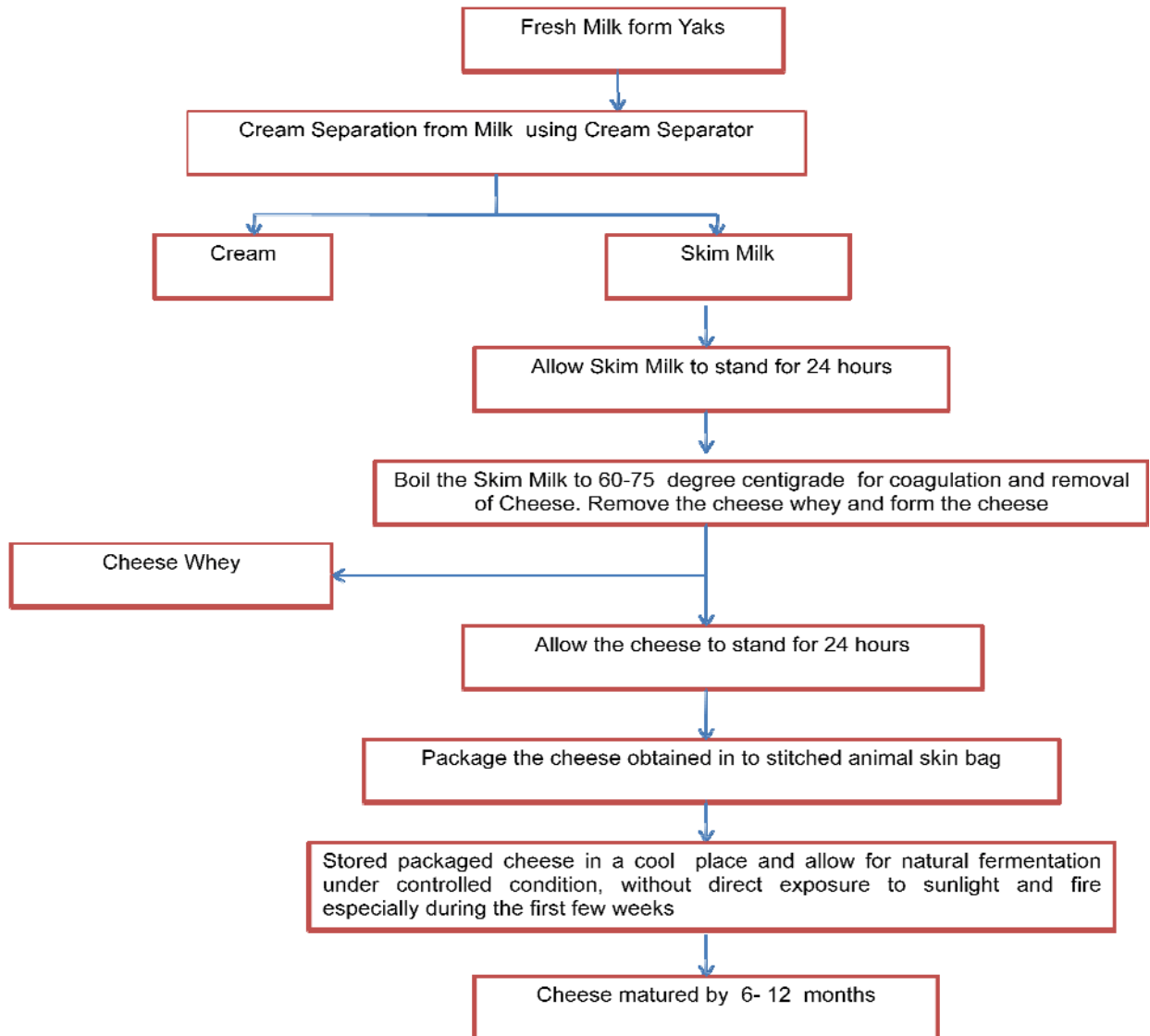
**Datse (soft cheese):** The butter milk is warmed up on the fire and softly tossed until the cheese starts forming. Once the cheese particles flocculate, the mixture is taken out of the fire and cheese is gathered with the help of ladle. After that whey is drained out from the pot. The cheese balls are put in a piece of cloth and squeezed to remove the whey. If consumed fresh, as soft cheese, it is called datse. The fresh cheese can also be dried and sold as hard cheese, “chugo”, or left fermented and sold as fermented cheese, “Yeatpa”.

**Chugo (hard cheese):** To make *chugo* the datse is further processed. Then it is put into cloth and pressed hard between stone slabs to drain out whey completely. Then it is sewed into thread and dried up. This comes in small rectangular shape approximately 2-3 cm and sold in a beaded ring.

**Yeatpa (fermented cheese):** To make *yeatpa*, the fresh cheese is kept for 1-2 day to drain out the water. It is then packed in yak skin. Generally, the fresh skin of the male progeny (*koi pho*) of Tibetan breed (Goleng) and female yak is used to wrap the cheese. The *koi pho* is considered unproductive and is killed within one week of calving to get their leather (Tshering and Dorji, 2009). The bacteria present in the cheese as well as the micro-organisms present in the fresh skin accelerate fermentation process (microbial activity). It takes about 6 months to get the Yeatpa ready for consumption and sale. Fermented cheese has strong smell, hence it is used in a small quantity to prepare different types of soup and curry.

Fermented cheese is specialty item of Merak and Sakteng Gewogs. It is made in unique way and has special taste and strong smell. DLO Trashigang has been working to improve the hygiene and shelf life of fermented cheese by introducing cream separator and technique of preservation, which includes grinding of matured skin packed fermented cheese and mixing it with vegetable oil. It can be then preserved in air tight utensils of different presentation with proper labeling and logo of producers group. The process is described in Figure 14.

**Figure 14: Steps in Fermented Cheese Making (Yeatpa)**



There are two types of hard cheese produced in the country; one prepared by the herders of Haa comes in square shape and weigh around 300g. It is inferior in taste but has more shelf life than the hard cheese 'chugo' prepared by the herders of Merak and Sakteng (Tshering and Dorji, 2009).

Meat production is not the main aim of livestock farming. Though many people eat meat and they do sell the meat of animals killed by accidents or slaughtered to earn some cash.



*Meat is being dried for consumption during winter*

### 3.2 Marketing Channels

Marketing channels describe the routes taken by products from producers to consumers. It consists of individuals and firms involved in the process of making the products available for consumption. Milk products of Merak and Sakteng Gewogs follow one of the following four routes (Figure 13).

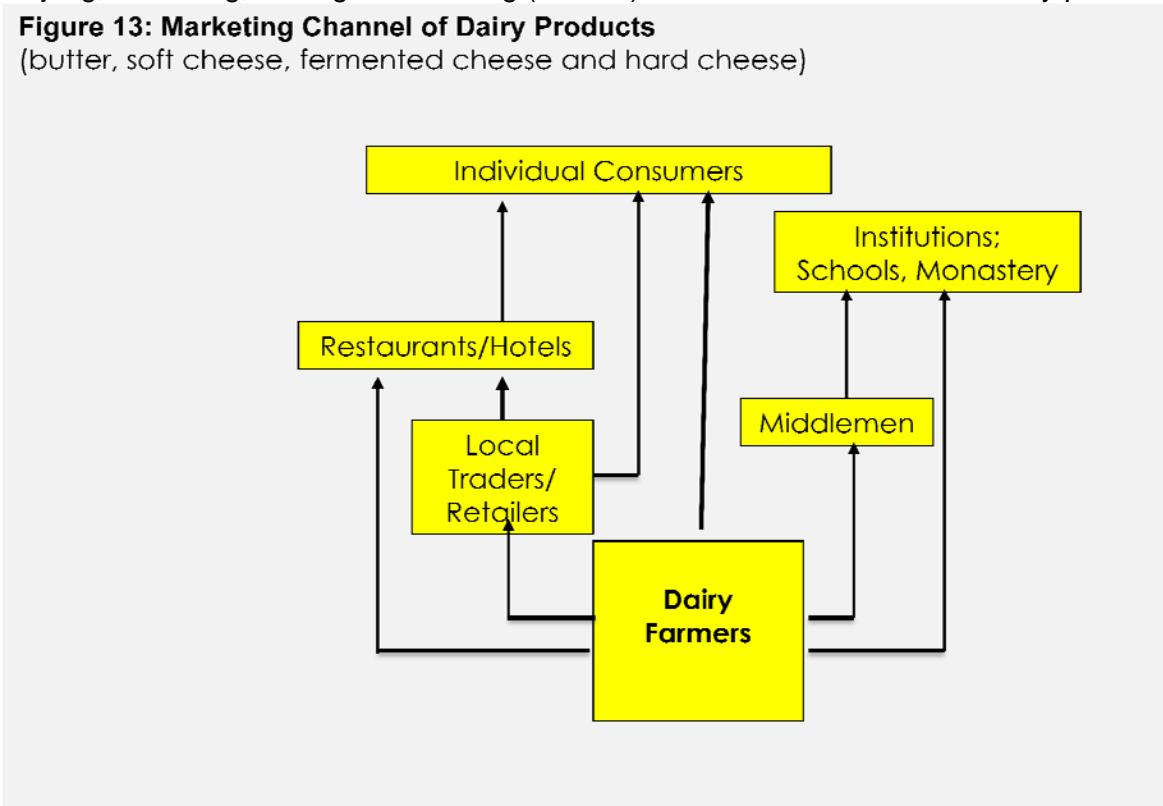
- Dairy farmers – local consumers (individual households)
- Dairy farmers – local traders/retailers – consumers
- Dairy farmers- local traders/retailers- restaurants/hotels- consumers
- Dairy farmers- middlemen – institutional buyers- consumers

According to our survey, 75% of the dairy farmers sell their products to local traders in Radhi and Phongmey. The remaining 25% respondents sell their dairy products to various places depending upon their convenience from the place of temporary huts established while migrating their livestock for fodder.

### 3.3 Market Places

Radhi and Phongmey are the major market places for the dairy products of Merak and Sakteng. During the survey 75% of the respondents mentioned these two places as the most important market centers for their dairy products. Remaining 25% dairy farmers mentioned Trashigang, Ranjung, Khardung, Bidung and Tawang (in India) as market destinations for dairy products.

**Figure 13: Marketing Channel of Dairy Products**  
(butter, soft cheese, fermented cheese and hard cheese)



### 3.4 Value addition and prices

Almost all dairy farmers process milk at household level using traditional knowledge. Dzongkhag Livestock Office, Trashigang conducted trials to improve the efficiency of traditional way of processing products by providing training and cream separator. This technology is found to be well accepted by the farmers as it is less time consuming and the product lasts longer. The packaging materials used are normally leaves of Ericaceae family. Dairy farmers prefer to use leaves for packing butter and soft cheese and there might be a rationale of making use of leaves from a particular plant. However, the fermented cheese is packaged in yak skin.

According to an estimate 1 kg butter and 2 kg fresh cheese can be produced from 13 liters of milk. If price of milk is considered at Nu 20.9/liter, the cost of milk for making 1 kg butter and 2 kg cheese comes around Nu 271.7. If we add the cost of time and firewood consumed in processing milk the total value addition cost will be more than Nu 275. In the market butter is sold at Nu 128.3 and cheese is sold at Nu 64.7/kg. This means that the total value generated by milk processing is only 257.7. On other words, the livestock herders of Merak and Sakteng would have gained more income had they sold fresh milk to the consumers at the price quoted. But, there is virtually no market for fresh milk in the areas, except few civil servants and schools. Hence, processing of milk is the only way to get benefit out of livestock rearing. However, the price of fermented cheese is quite high, which gives an opportunity to them in taking advantage of their unique technique and indigenous knowledge. During the field survey, the dairy farmers mentioned that there is a very good demand for hard cheese in State of Arunachal Pradesh, India.

**Table 5: Price of Milk Products as Cited by the Respondents**

Items	Average Price (Nu)	Range (Nu)
Milk	20.9	15-25
Butter (per kg)	128.3	100-170
Fresh Cheese (per kg)	64.7	40-130
Fermented Cheese (per kg)	141.5	110-200
Hard Cheese (per thread)	65	40-140

### 3.5 Average cost of production per litre of milk and kg of meat

Dairy farmers of Merak and Sakteng do not keep any record of the cost involved in livestock rearing. They have been rearing livestock since many generations and generally raise the yak from their own herds. They keep on moving their herds from place to place with minimum cash investment in inputs. We therefore found it difficult to estimate the cost of production for milk as well as for meat, wool and other bye products. However, Yak Chain Analysis Report revealed that the cost per litre of milk is slightly cheaper in the eastern system with Nu19.8/litre and more expensive in the western system with Nu 24.6/litre (FNPP and MoA/DoL, 2007).

## **4.0 Problems and Constraints**

Dialogue with dairy farmers, livestock extension officials, Gup of the respective Gewogs and local traders has identified various issues and constraints relating to production and marketing of dairy products and some of the major broad issues are listed as below:

### **4.1 Pasture**

Management of pasture is cited as one of the major issues. Decrease in size of Tsamdro (grazing land), limited range land and restriction to enter in the forest areas pose difficulty to properly feed the livestock. On one hand, the dairy farmers have a small landholding and low level of understanding about pasture development, while on the other hand the number of unproductive cattle is going up. This situation caused high pressure on existing pasture land and result in low productivity.

### **4.2 Breed Improvement**

Limited number of breeding bull and inadequate effort to breed improvement is another constraint which results in low productivity. Due to scattered herd and lack of knowledge among dairy farmers, the breeding bull available in the villages could not perform well. Reduction in population of unproductive cattle and promotion of improved breed could be an important area of intervention for promotion of dairy subsector in Merak and Sakteng.

### **4.3 Processing and packaging**

The traditional way of processing cheese and butter has limited shelf life to only a few days. The refrigeration facilities are not available in the villages. Packages of appropriate production and post-production technology are totally lacking. Furthermore, the dairy farmers keep on moving their herds from place to place which makes it difficult to set fixed equipment in one place. The option for portable cooling box or solar structure needs to be looked at for preserving butter and cheese. The traders mentioned that if cheese is refrigerated for long periods of time, it loses its taste.

### **4.4 Consistency**

Lack of consistency in quality, sizes and supply is another major constraint. Being processed at farm level, it is difficult to maintain the homogeneity and consistency of the products. The taste varies greatly from lots to lots and one can easily see varying shapes and sizes of dairy products in the market. Farmers group equipped with the required equipments also lack consistency in supply.

### **4.5 Inaccessibility**

Herds are scattered and households producing milk are considerably far from major consumption centers. It is very difficult to sell the milk and get required services and inputs on time. Due to inaccessibility, dairy farmers have to pay higher price for the inputs, which result into high cost of production.

## 4.6 Research and Extension

Though DLO has been actively involved in promoting dairy subsector in Merak and Saketeng and extension official have been providing technical services. There is still a need to improve the performance of research and extension for the commercialization process. A strong coordination is required at the field level among the forest, livestock and other concerned stakeholders.

Most of the above discussed problems have often cited in various reports. Dairy stakeholders workshop took place in Trashigang Dzongkhag has identified the following constraints (Dem and Wangchuk, 2003):

- Non-availability of appropriate dairy breed and breeding stock
- Inadequate feed and fodder resources
- Poor marketing system (infrastructure, logistics, packaging etc)
- Lack of group initiative
- Poor quality dairy products
- Increasing number of unproductive cattle
- Poor management of breeding stock
- Lack of adequate technology
- Inadequate coverage of service delivery
- Difficult access for water resources for both cattle and pasture development

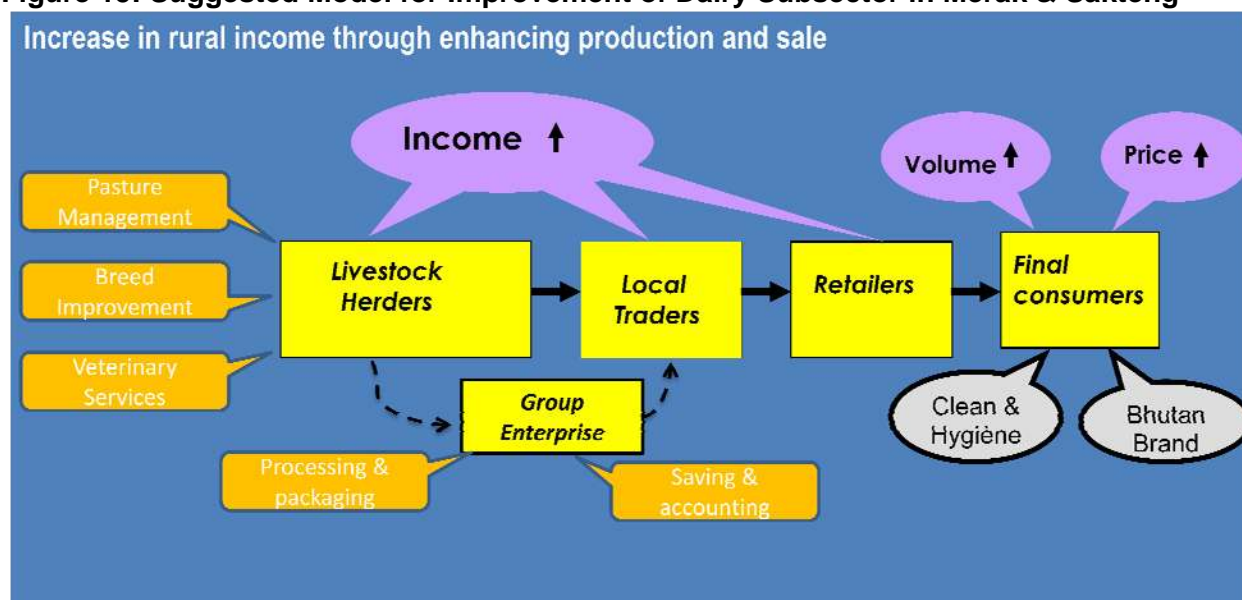
## 5.0 Value Chain Upgrading Strategy

A VC promotion strategy for the dairy subsector of Merak and Sakteng has been developed based on mapping and detailed analysis carried out to identify (i) the comparative advantages of the subsector and (ii) the most pressing bottlenecks that are hindering the growth. RAMCO in close cooperation with Dzongkhag Livestock Office, Trashigang, RNR RC Wenkher and AMEPP PFO has carried out a survey on the dairy subsector with its objective being to identify major challenges that affect smallholder dairy farmers, local traders, processing industries and suggest ways and means for improvement.

Based on the analysis of functional flow, mapping of actors and supporters and market analysis, we suggest the following model (Figure 15). As depicted in the figure, we believe that consumers will pay better price and consume more volume of dairy products, if they are produced in clean and hygienic way and provided with some quality assurance, like Bhutan Brand. Dairy farmers will be able to produce more milk and quality products if they get better veterinary services and support in breed improvement and pasture management.



**Figure 15: Suggested Model for Improvement of Dairy Subsector in Merak & Sakteng**



The specific areas that need improvement are briefly discussed below:

### 5.1 Pasture management

Fodder is valuable as productivity and animal health largely depend up on the quantity and quality of fodder. Production of fodder requires land, seed, fertilizer and labor for cultivation, harvesting, preparation and distribution to the animals. In case of Merak and Sakteng, where people keep large number of livestock and have small agricultural land holding, it does not seem feasible to opt for stall feeding and to grow enough fodder plant on farmland. There is a need to graze livestock on range land and collect fodder from the forests. For sustainable utilization of forest plants and range lands, dairy farmers need training and technical advises. They need to try to avoid spoilage of fodder as much as possible. Best way is allowing livestock to graze on a fenced pasture. Strong interaction is needed between forest officials and livestock herders.

### 5.2 Improvement of breed and livestock management

Animal health, production and reproduction mainly depend on right management of the animals and the type of breed. Livestock genetic improvement programmes aim at identifying superior animals for specific traits and allowing only these animals to be parents of the next generation. The use of genetically superior animals is expected to result in improvements in the efficiency of production, which in turn ensures that livestock products are more cheaply available to the human population.

The Department of Livestock operates within the broad framework of the programmes such as breed improvement, dairy development, health coverage, fodder development, extension development, human resources and infrastructure development. Efforts are already underway from DoL for breed improvement and management. The three major Divisions (Livestock Production, Livestock Health and Livestock Input Supply) need to work closely to bring intended impact on livestock breed and management aspects.

### 5.3 Veterinary Services

Veterinary services are essential to have a successful dairy operation. In case of an acute problem of animal health, a veterinarian services may need to be readily available. Early treatments reduce costs and losses; hence the veterinarian should be accessible to help dairy farmers for treatment of animals as soon as possible. Since Merak and Sakteng are well known for livestock rearing, at least one Veterinary Doctor should be placed in these gewogs to take the appropriate action on time.

### 5.4 Processing and packaging

Processing is essential for the dairy sector as milk has a very short shelf life. The dairy farmers may be encouraged to form cooperatives and establish processing unit one each in Merak and Sakteng. These processing units should initially concentrate on butter & cheese (soft, hard and fermented). Appropriate packaging materials may need to be provided on cost sharing basis. Packaging not only protects the product but also enhances the shelf life. Once dairy farmers realize this then they will invest from their own pocket to make the product presentable.

Labeling also could be initiated. For packaging cheese clean leaves could be used to project an indigenous and natural touch. A brand would be necessary to enable the consumers to identify and assess the products. Having unique lifestyle and rich tradition of livestock rearing, the dairy products made by highlander people of Merak and Sakteng carry special values with them. Hence, branding would add value in fetching better price in the market.

Development of cool chain facilities at all stages of the marketing chain is deemed necessary for an effective marketing. Cool chain facilities should be available not only at the production points but also at the retail outlets with transport being carried out in cool box.

It is very important to maintain high quality standard as in order to attract consumers and to keep the competitors at bay. Being food products of animal origin sincere efforts are needed to create awareness among producers, processors and traders on cleanliness & hygiene of products and should follow BAFRA standard. Regular monitoring should be carried out to ensure that standard practices for clean milk production and processing and proper storage of cheese and butter are being followed.

### 5.5 Creating awareness and capacity building

Awareness raising campaign should be organized on the **4-F** emphasizing major factors for improving even the subsistence level milk production:

- Forage
- Feed
- Feeding techniques
- Fertility

These four components of improved milk production can be realized without sacrificing security of subsistence and do not require major capital input.

Technical backstopping services need to be provided both at production and processing level. An exposure trip may be organized for the dairy farmers of Merak and Sakteng to visit commercial farms in the area. By seeing other farms doing commercial dairy farming with improved breed, at least some farmers will ask how they got there and what the others known they themselves do not



know. That will be the point where training may start. It should be clear from the beginning that isolated technical trainings will not be sufficient to get a successful commercial dairy started. The trainings have to be united by a systemic umbrella that always comes back to the interdependency between forage, feeding, management, health, reproduction, production and economic success. So training should be organized in a modular way linking one field with the other.

## **5.6 Group enterprise**

Dairy farmers may be encouraged to form a group or cooperative and the group leaders and cooperative executives should be trained in all aspects of production, processing and marketing of dairy products, so as to make them able to render all necessary assistance to the individual members. Subsidies are a dangerous field and they increase dependency. However, to kick-start the process and establish group enterprises some incentives are required. Especially, the subsidies are needed to overcome the risks that may occur while changing the dairy farming from subsistence to commercial dairy farming. Support that benefit the large number of villagers or group members should be provided, for example the improved bull, milk processing unit that will be owned and operated as group enterprise, cool boxes, packaging and bottling facilities.

## **6.0 Conclusions**

Dairy production in Bhutan has good perspectives. Consumer preference for milk products of all kind is high. At present, milk production in Bhutan is not sufficient to satisfy the market demand and to enable private dairy industry to run up to capacity. Milk products, mainly milk powder and butter is imported from India and other countries, showing that demand is not met by national production by far. That shows good perspectives for increasing milk production for the next years. If we look at Trashigang Dzongkhag alone with nearly 47,700 habitants and calculate a conservative demand of 0.25 liters per head a day the demand for milk would be about 11,925 liters of milk a day for this area alone.

In the study area most farms are very small with an average size of no more than an acre of land. Farmers keep over 10 livestock per household, mostly of local breed of very low milk production. Animals generally graze freely in the public lands. Stall feeding is not a common practice. Green fodder is available only (Derville and Tenzin, 2007) seasonally from thinning out maize plantings or from weeding. Fodder conservation is not practiced. Milk production per animal is about one to three liters under these conditions with a lactation period of less than nine month and a calving interval (estimated) of more than 14 month.

Nevertheless, there are number of farmers specializing in milk production and processing of specialty cheese from yak milks. These farmers have technical knowledge about milk production, gained by training and self study/experience. They consider milk processing a business that generates good income opportunities. According to the information of these dairy farmers, dairy production has good perspectives due to a growing market. However, fodder is a major constraint that hinders the development of dairy subsector. A large number of low yielding animals, unavailability of veterinary services and inaccessibility are also found to be the challenges.

Training is offered by DLS at Gewog or Dzongkhag level on a number of subjects related to animal production and dairy. However, it seems that women and young people have little participation in these trainings, even if they are the persons in the farm doing the job, specially feeding and milking, but also much of the field work. Livestock Extension Officials are placed in

each gewog and they are supposed to provide technical advices and veterinary services to dairy farmers. But their outreach seems quite low and many dairy farmers still found unaware about animal health, sanitation and hygiene.

There are two broad areas where support services are needed:

- Improvement of productivity
- Delivery of the milk products to the market

To improve productivity there is a need to address the issue of pasture management and encourage dairy farmers to plant fodder trees, keep a few but high yielding animals and take special care about sanitation and hygiene. Capacity building of dairy farmers on 4-F is very important for increasing overall production of milk and animal health.

As for the delivery of milk products and improving business performance there is a need to improve processing and packaging techniques. For assuring consistent supply of quality products, it would be necessary to develop and strengthen farmers' groups/cooperatives on the one hand and provide support for product diversification and value addition. Appendix 1 provides brief outline of the action to be taken by various organizations--- in Bhutan.

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[Poverty Analysis Report 2007](#)

[www.trashigang.bt](http://www.trashigang.bt)

## Annex 1: Action Plan

**Notes:** DoL = Department of Livestock, Dz = Dzongkhag, RNR-RC = Renewable Natural Resources-Research Center Jakar, T-DLO = Trashigang Dzongkhg Livestock Office, Eos = Extension Officials, BAFRA = Bhutan Agriculture and Food Regulatory Authority, RAMCO = Regional Agricultural Marketing and Cooperative Office.

Objectives	Actions	Responsible Organization
<b>To increase productivity of livestock through stock improvement, better management of pasture and animal health care</b>		
Improve the breeding stock	Continue the breeding program through AI development	DoL, RNR-RC, Jakar, T- DLO
	Increase the performances of the local breed: promote cross breeding and reduce number of unproductive cattle	
	Research on the local breeding practices through strengthening linkage with other alpine dairy areas (Sikkim, Nepal)	
Improve pasture	Facilitate conversion of land into pasture including leasing of barren land for private or community usage	DoF
	Support the improvement of the common pasture around the villages	DoF, T- DLO
	Enhance common pasture (half for grazing and half for harvest) around the villages	T- DLO
Improve livestock management	Increase the extension services coverage; make arrangement for the posting of Vetreniray Doctor to provide emergency servies in Merak &Sakteng	DoL
	Encourage the adoption of improved management practices to increase the production & profitability	T-DLO, Eos
	Provide training on 4-F (fodder, feed, feeding techniques and fertility of animals), which is important for improving animal health and milk production	
	Encourage herd health planning through promoting the economic benefits.	
<b>To improve the business performance of producers and processors in response to changing market conditions and consumer demands</b>		
To increase the products homogeneity and hgiene of the products	Create awareness about hygienic milking and milk handling	BAFRA, T-DLO, RAMCO
	Formation of dairy farmers' group/cooperative one each in Merak and Sakteng	RAMCO, T-DLO
	Provide incentives and training to group leaders for establishment of small scale milk processing units, one each in Radhi and Phongmey	RAMCO, Dz
	Arrange cool boxes for the transportation of fresh	RAMCO, Dz

	milk and milk products from farm to processing units	
To support dairy farmers and milk processors in marketing and value addition of dairy products.	Create awareness and strengthen capacity for maintaining the consistency in quality and supply of the local products	RAMCO, T-DLO, BAFRA
	Carry out study on consumer behaviour for: -Brand building -Development of marketing strategies. -Understanding market intelligence -Running in-store promotions. -Designing point of sale promotional materials.	RAMCO
	Support products diversification to satisfy the growing urban demand and quality requirements (paking milk products in different sized, clean and transparent utensils, categorizing into short and long shelf-life products, varieties with traditional natural touch to descent pack)	RAMCO, Dz
	Improve the presentation of the products through making provision of proper packaging and labeling materials	RAMCO
	Provide support for marketing promotion and branding of the product, e.g. "Bhutan Brand" targeting niche market and BAFRA standards	RAMCO, BAFRA