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Smallholder Dairy Farming in Bhutan: Characteristics, Constraints, and Development Opportunities

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Chapter 2

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CONTEXT

Livestock are raised in Bhutan for various reasons including milk, food, and manure production, draught power, as a source of income, and as assets. Dairy products, especially butter and cheese, form an important component of the Bhutanese dietary system and more recently have become an important source of cash for some households. About six cattle breeds are used for milk production in Bhutan.

During 1989-1999, the population of crossbred cattle (crossed with exotic breeds) increased by over 100% whereas the indigenous cattle population decreased by 9% and the overall cattle population decreased by 2.4%. There has been a steady increase in total milk production in the country mainly due to the increased number of crossbred cattle. However the growth of the dairy development sector has also encountered several constraints, particularly in terms of market development. This study was initiated to examine the issues and problems of market-oriented smallholder dairy farmers in Bhutan and to provide recommendations for the development of the dairy sector.

STUDY SITES AND METHODOLOGY

Two milkshed districts (dzongkhags) Chukha and Bumthang, both with milk cooperative society facilities, were selected to represent south-west and east central Bhutan. Within these, Darla geog, with a chilling facility for 1,000 l of milk, was selected as the study site in Chukha dzongkhag, and Chokhor geog with a milk cooperative and Tang geog without as the study sites in Bumthang dzongkhag. Thimphu district in the northwest, with no cooperative facility, was selected in view of the market potential for dairy products in Thimphu town. The study in Thimphu dzongkhag was limited to urban and periurban areas of the town, in particular Chang geog.

A rapid market appraisal and consumer survey was carried out in the capital city of Thimphu. A total of 75 consumers – hoteliers, civil servants, and businessmen – were

covered by the survey as well as 17 retailers of locally produced and imported dairy products.

The information was collected through structured questionnaires.

DAIRY PRODUCTION SYSTEMS

The majority of the population of Bhutan (overall 79% rural and 21% urban) eke a subsistence living from agriculture and most of these are smallholders. Smallholder dairy farming is an integral component of the mixed smallholder farming system in Bhutan and has been a focus of many rural development projects and plans. Considerable efforts and money have been spent on dairy development through the 5th to 8th 5-Year Plans (1982-2002) (Roder et al. 2001), and substantial improvement and development has been achieved so far. However, little has been documented about the achievements or related problems.

Cattle production in Bhutan can be categorised into two broad systems: transhumant and sedentary.

Transhumant system

The more traditional transhumant system involves cattle migration. In summer (May-June), cattle move to the cooler regions where they are herded on traditional grazing land (tsamdok) at altitudes of about 1,200-3,000m. By late autumn they move down to the subtropical regions. A subsystem, share herding, is practised in places like Paro and Haa. In this subsystem a special herding partnership is formed between cattle owners from the cooler regions and those from the subtropical regions. The herding responsibility changes hands with the migration but the ownership of the cattle remains with the original owner. The herd sizes range from about 20 to some 80-100 cattle, and the predominant breed is the local Siri and Mithun crossbreed.

Sedentary system

This system can be considered as a crop-cattle system. From two to eight cattle are kept around the homestead. The cattle are mostly grazed on common property resources (CPRs) and brought to the homestead at night, some home-mixed supplement may be given to milking cows. Some cows, particularly improved breeds, may be stall fed. In peri-urban areas that are accessible by road, the practice of keeping and stall feeding improved dairy cows is increasing.

Production of milk and milk products at household level

Most farmers keep cattle and produce some milk, mainly for home consumption. In areas near to the market and accessible by motor vehicles, the trend towards market-oriented production is increasing. Most farmers in such areas produce milk over and above the household needs and earn a substantial income from selling it. Farmers in the Deothang Milk Cooperative Society sell an average of 1.5-3 l of milk daily. Tamang and Gyeltshen (1998) reported an average monthly household production of 125 kg in winter and about 308 kg in summer.

Livestock holding and herd size

Cattle holdings in the surveyed areas consist of 83% crossbred and 17% indigenous cattle. Of the total population, 58% were breedable females and only 26% were males.

The remaining 16% were calves below 1 year of age. This is a clear indication that the improved cattle population has been increasing over the years through government intervention. The average cattle holding per household among the surveyed farmers was eight, whereas the national cattle holding per household is estimated to be around five.

In response to the interview question of whether to increase, decrease, or maintain the existing herd size, 29% of farmers wanted to increase, 39% to reduce, and around 32% to maintain their herd size. Generally it was those farmers who had direct and easy access for the sale of dairy products who wanted to increase their herd size, irrespective of the existing number and farm labour requirements. Farmers with a limited landholding, no farm labour, and a large herd size wanted to reduce the number of cattle. Those farmers who had an established market for dairy products, adequate land for pasture development, and manpower for cattle herding wanted to maintain the existing herd size.

Source of income

In the east central dzongkhag, 90% of the surveyed farmers' income was from dairy farming, in the southwest and northwest, 50-60%. Overall, field crops, especially potatoes, were the major source of income in the east central dzongkhag (Bumthang). Paddy was the main crop in the southwest and northwest dzongkhags. Off-farm activities such as contract work, agricultural machinery hire, and operation of taxis, also contribute to family income.

SPECIES AND BREEDS OF DAIRY ANIMALS

Breeds

The predominant local cattle breed in Bhutan is the Siri, which is found all over the country. Although a poor milk producer, this breed has survived over centuries as a result of its adaptability to different agroecological systems, its disease resistance, and its usefulness as a draught animal. Siri are used as the base stock for developing composite breeds with breeds like Jersey, Brown Swiss, and Mithun. The Mithun crossbreeds are more common in the lower temperate and subtropical regions (150-2,600m); the Mithun males are popular as draught animals and the females because they have a higher fat content in their milk. Brown Swiss crossbreeds are found in the higher altitudes of the temperate region, whereas Jerseys are more prevalent in the lower temperate and subtropical regions of the country. A small number of Swamp crossbreeds and improved buffalo (mainly Murrah) are also found in the southern belts.

The Renewable Natural Resources (RNR) statistics for 1999 put the population at 344,595 head of cattle and 1790 buffalo. Crossbreeds of Jersey and Brown Swiss constituted about 13% of the total cattle population.

The overall cattle population shows a slightly declining trend from 1986 to 1999. But there was a steady increase in the population of exotic crossbred cattle upto 1992 and a big jump in their number thereafter. There are no data available for crossbred cattle prior to 1986, but if an extrapolation is made from the curve, it suggests that the population became more noticeable from the late 1970s to the early 1980s. This could be attributed to the impact of the distribution of Jersey and Brown Swiss bulls for crossbreeding purposes under the 2nd and 3rd 5-Year Plans (1966-1975).

Production parameters

There is wide variation in production both across and within breeds, depending on management practices and availability of quality feed. The Siri, which is known for various desirable attributes, gives a poor milk yield. Under the farmers' extensive management system, the average yield is about 1.3 l daily, and 300-380 l in a lactation period of about 270-280 days. The F1 (Mithun crossbred) female, Jatsham, is prized for its high milk fat content of $10.5 \pm 2.2\%$. In terms of milk yield, it seems to perform better than the Siri, producing about 2-3 l of milk per day, that is, about 600-650 l during a lactation period of 270-280 days. The F2 crossbreed is reported to be better than the Siri but inferior to the Jatsham in terms of milk yield (Phanchung 1996). In the Nublang Farm at Tashiyangphu, the average first- and second-lactation milk yield of Siri was reported to be around 529 l and 599 l respectively when the lactation length was adjusted to 305 days; the normal lactation length of Siri is reported to be around 250-270 days (Tshering 1998). A nationwide survey of the breed reported an average milk yield of 478 l in a lactation period of 264 days.

For the pure Jersey cows kept by farmers using improved husbandry and feeding, the average milk yield in a lactation period adjusted to 305 days was reported to be around 2322 and 2518 l for the first and second lactation respectively, with a daily yield ranging from 4 to 15 l (Rai et al 1999). A survey in Tsirang reported an average daily yield of 5-6 kg for pure Jersey cows in the summer months (Sherpa and Wangchuk 2000). However, milk yield was reported to be higher in cows fed with good quality fodder and concentrates.

ANIMAL FEED RESOURCES

In the smallholder mixed farming system prevailing among the farmers in Bhutan, the cropping system, the agroecological conditions, and the animal type influence the use of feed resources. The most common feed resources available to farmers are CPRs, forest, cultivated fodder, and crop residues. A survey in 1996 in the temperate regions of the country has shown that forest grazing and CPRs are the most important feed resources (Table 2.1 and Roder et al. 1999).

Fodder Source	Relative Contribution (%)
Forest grazing	23
Natural grassland	38
Improved pasture	9
Fallow land	15
Fodder trees	15
Crop residues	13

Source: Roder et al. (1999)

In winter, in areas where paddy is not grown, fallow-field grazing seems to be the dominant feed resource. Feeding of hay in the winter months contributes substantially in areas where improved pasture is well established. Rice straw, barley straw, wheat straw, and maize stovers also contribute about 13% of the feed during the hungry-gap period (November to March).

Common property resources

Common property resources in the Bhutanese context can be put broadly into two categories: (1) grazing for yaks (throughout the year) and migrating cattle (in the summer) on the alpine rangelands and sub-alpine meadows; (2) forest and community grazing grounds around settlements. The latter constitute the major source of fodder for village cattle (Table 2.1).

Cattle graze on undergrowth and browse several species of fodder shrubs in the forest, and these provide about 20% of the fodder requirements of the cattle population in the country (Roder et al. 1999). Fodder tree branches are sometimes cut and carried to the homestead to be stall fed to milking cows or as a supplement to grazing, especially during the winter months.

Bhutan has about 569,000 ha of permanent grazing land, an average of 1.36 ha of natural grazing land per head of grazing animal (Roder et al. 1999). Within Bhutan, the dzongkhags, Haa, Gasa, Wangdue, Bumthang, and Trashigang have large tracts of natural grassland, while in the remainder of the east and the south there is much less grassland but large tracts of dense forest. The productivity and nutritional value of the natural grassland is generally very low.

Cattle are grazed on the land left fallow as soon as the crop is harvested. The quality and quantity of fodder available can vary substantially depending upon the crop, the weed flora, and the harvesting system. Grazing of fallow land was cited as the most important fodder source in some areas.

Improved pasture

Establishing pasture in arable land started at the beginning of the 5th 5-Year Plan (1982-1987) and by 1998, Bhutan had about 11,000 ha of improved pasture (Roder et al. 1999; 2001). Improved pasture has been cited as the most important fodder source in the temperate areas of Bumthang, Wangdue, Trongsa, Zhemgang, Paro (Roder et al. 1999), and Haa (personal observation). These dzongkhags have the largest areas of improved pasture on a household basis, with more than 0.2 ha per milking cow. Improved fodder is mainly fed to milking cows, bulls, and growing cattle. Excess grass is cut and made into hay for winter feeding in these areas.

In the temperate areas, improved pasture consists of a mixture of white clover, tall fescue, cocksfoot, and Italian rye grass while in the subtropical areas, green leaf desmodium, molasses grass, ruzi grass, and stylo are grown.

Fodder crops

Traditionally, farmers grow small quantities of fodder crops that are fed primarily to milking cows and draught animals during the dry season. At an elevation of 2,500-4,000m, the most important fodder crops are turnips, radishes, and pumpkins. At high altitudes, individual households may cultivate up to 0.3 ha of turnips annually (Roder et al. 1999). At lower altitudes, maize is cultivated, to be fed to draught animals during rice transplantation. Wheat is cultivated in a range of production systems including the rice-based systems after the rice harvest. Oats, by virtue of higher biomass production, have partly replaced wheat as a winter fodder in the rice-growing areas of Thimphu, Paro, Wangdue, and Trongsa.

Fodder trees

Fodder trees are important feed resources in many parts of Bhutan especially during the dry winter season. In fact, fodder trees were reported to be the most important fodder source in Punakha, Wangdue, Trongsa, Chukha, Zhemgang, Lhunsi, and Mongar where between 76 and 100% of households have fodder trees with individual households owning between 1 and 1,015 trees (Tshering et al. 1997). The most important fodder tree species were *Ficus roxburghii* followed by *F. cunia*. These fodder trees are mainly grown around the homestead, along fences, and along borders of cropland.

The yield of a fodder tree is strongly influenced by the age of the tree and the management. The reported yield range is quite wide between and across species. The highest yield was reported for *F. roxburghii* followed by *Artocarpus*, kanue, khamari, and kutmero. The survival of newly-planted fodder trees was estimated to be less than 20%. This could be mainly due to poor management.

At elevations above 2,000m the choice of fodder tree is limited. The most important fodder trees are willow, *Quercus semicarpifolia*, *Populus robusta*, and Chinese pear, fodder yields from these trees were estimated at 4t, 2t, 4t, and 12t per ha per year, respectively.

Crop and agroindustrial residues

Crop and agroindustrial residues account for a major portion of the feed requirement of cattle. Maize, wheat, and buckwheat straw are important winter feeds in the areas where they are grown, while rice straw is used by almost all farmers in rice-growing areas. Other important crop residues include inferior and broken grain, and husks and chaff (by-products of milling). Residues from chang (local brew) production also provide an important feed for dairy cattle.

Commercial concentrate mixtures

Commercial concentrate mixtures are supplied by a feed manufacturing plant in Phuntsholing; feeding of concentrate mixture is mainly confined to the government and peri-urban dairy farms. Concentrate feed is unaffordable for most farmers and not readily available even if they could afford it. Between 33 and 97% of the sample households in the survey districts fed concentrate mixture while 89% also fed a home-made mixture consisting of mustard oil cake, maize flour, chang residue, salt, kitchen waste, and boiled water.

LIVESTOCK HEALTH SERVICES

Health management

Animal health is known to play an important role in animal production. In turn animal health is influenced by factors such as disease resistance, nutrition, and the animals' environment. The most common infectious diseases of cattle in Bhutan are foot-and-mouth disease (FMP), haemorrhagic septicaemia (HS), black quarter (BQ), and respiratory diseases. Bhutan has been fortunate enough to be able to eradicate rinderpest through rigorous vaccination and has been provisionally declared as a rinderpest free country. Control of diseases such as FMD, BQ, and HS is carried out through regular mass vaccination.

Parasite infestation is a major economic disease as it affects milk production to a considerable extent. Intestinal worm infestations and external parasite, mainly tick, infestation were the major problems in cattle in all the survey areas. Farmers receive adequate veterinary treatment for intestinal worm and liver fluke in their cattle from the livestock extension centres. However 30% of the surveyed farmers claimed that there were no drugs available against tick infestation in the veterinary centres despite a high rate of seasonal infestation of ticks in cattle.

Infestation by liver fluke is very common in rice-growing areas while roundworm infestations are more widespread. Periodic de-worming is advocated to control these parasites. Tick infestation and tick-borne diseases (babesiosis, anaplasmosis, and

theileria) are other major problems in cattle especially in the subtropical areas. A study in the east (Sharma et al. 1999) showed the incidence of tick-borne diseases to be about 19%. Other emerging diseases are bovine enzootic haematuria (BEH) and oak poisoning. The oak-poisoning morbidity rate in most cases is 100% with about 20% mortality. The poisoning results from consumption of oak leaves during the hungry-gap period. The incidence of BEH has been found to be around 62% in the east (Sharma 2000).

The most important diseases with regard to milk production are various reproductive disorders, nutritional deficiency diseases, and mastitis. The incidence of nutritional deficiency diseases has not been recorded. Dorji (1999) reported the incidence of infertility to be as high as 63% of all cows in Bumthang, the incidence of sub-clinical mastitis in eastern Bhutan was found to be about 24% (Sharma et al. 1998).

Animal health care services are provided by one veterinary hospital in each district and 109 livestock extension centres manned by 347 animal health staff. These field services are supported by a national referral laboratory, four regional veterinary laboratories, two satellite laboratories, a vaccine production centre, and two quarantine stations. All the laboratories are reasonably established and well equipped.

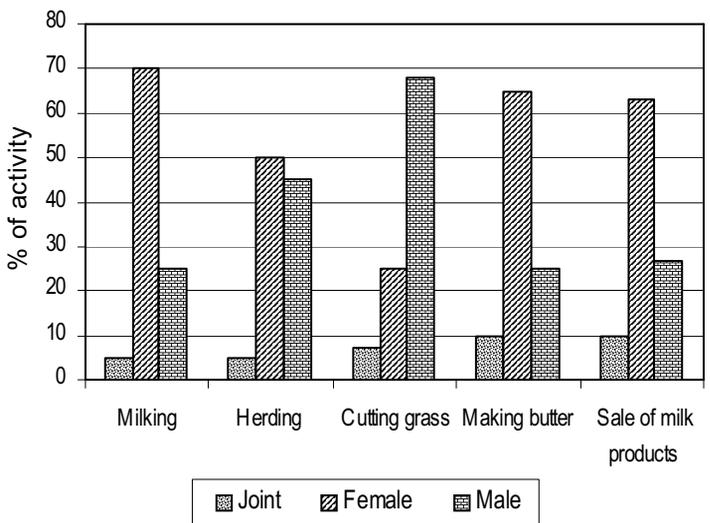
Cattle health management is recognised as an important aspect of dairy husbandry. Farmers ensure their cattle herds are vaccinated in good time against all major and notifiable diseases at their respective livestock extension centres. Although the animal health service in Bhutan is quite impressive, with a network of veterinary centres throughout the country, the recorded mortality of cattle over the last 3-5 years was around 130 heads in 82 households.

GENDER AND LIVESTOCK

The activities related to dairy farming are generally shared by family members. However, the contribution of women to activities like milking, milk processing, feeding, feed preparation, and fodder collection is higher than that of men. This could be attributable to the gender imbalance in the workforce available in individual households as men are more likely to be engaged in off-farm work (Roder et al. 1999). The contribution made by children to some activities, such as herding, is considerable.

In the surveyed areas, only three of the total average family of nine were actually available for farm labour (Figure 2.1). The majority of the household were not able to contribute to farm labour as they had other occupations, for example, attending school, working in

Figure 2.1: Proportion of household activities related to dairying by gender



were not able to contribute to farm labour as they had other occupations, for example, attending school, working in government jobs, or as monks and nuns.

MARKETING OF DAIRY PRODUCTS

The dairy component of the traditional Bhutanese farming system is basically subsistent, and in most areas the marketing of dairy products remains very basic and traditional and is limited to the management of local surpluses and shortages. There is no organised marketing system; occasional unplanned surpluses are bartered, or sold for cash at a high price. It is, in fact, questionable, whether these products should really be considered as surplus, considering family needs for other products and cash.

Organised marketing of livestock products is very limited and exists only in certain parts of the country. However, changes in dairy production are taking place especially in the areas with access to marketing opportunities for dairy products. The ever-expanding urban population provides better marketing opportunities. For example, in the case study areas, most of the surveyed farmers produced milk for market. The fresh whole milk is sold directly to the processing units and collection centres, providing an important source of cash income.

Economics of dairy production in peri-urban areas

A case study dairy farmer in Thimphu earned a total gross income of Nu⁴ 758,000 in 2000 from eight milking cows. The farm's overall net income was estimated to be Nu 383,000/year and net return excluding labour costs was Nu 347,000. The farm had a high net return mainly because there were no financial obligations such as the repayment of loans, and the feed costs were low because the farm used mostly local feed resources and cattle were grazed in the nearby forest. The feed cost accounted for only 21% of the total variable costs. The farm's breakeven production point was 15,000 l/year at an output price of Nu 25/l; the breakeven price of milk production was Nu 12.5, 50% of the output price of Nu 25/l.

Dairy marketing system

Almost all local dairy products are marketed through an informal, unorganised system. Imported dairy products are marketed through a comparatively well-organised, but nonetheless inadequate, system. However, there are now three milk processing units (MPUs) of different capacities in Bhutan (Trashiling MPU in Trongsa [500 l/day], the MPU in Bumthang [1,000 l/day], and Bhutan Dairy Limited (BDL) in Phuntsholing [4,500 l/day]) and some milk collection associations in the east for marketing fresh milk. Fresh milk marketing is mostly confined to places with access to processing facilities and peri-urban areas where producers take advantage of the urban population who buy milk for fresh consumption. In general, the major proportion of locally produced milk is processed, and consumed and/or marketed as butter and datse cheese (a cheese processed from the buttermilk after extracting the butter).

The current dairy marketing system in the sampled study areas can be classified into three main subsystems or channels as described below, involving farmers, middlemen, traders, retailers, and processing plants. The middleman is the agent between the trader and the farmer, who can also be a producer. The trader is the person who collects from the middlemen and transports to the market centres, usually performing the job of a wholesaler and supplying to the retailers in the local market or urban market centres.

⁴ 42.5 Nu = US\$1 (in 2000) the Nu is on par with the Indian rupee

The survey of local dairy product traders revealed that each trader supplies regularly to a number of contract retailers who sell directly to the consumers. Some traders also act as retailers, after supplying the required quantity to their contract retailers. Thus, the people involved in the system can have more than one function: farmers can be just producers selling their products, but they may also function as middleman; similarly middlemen, traders, and retailers can perform more than one role.

Marketing channels for dairy products

Although supply and demand basically determines the flow of dairy products, the accessibility and availability of transportation and markets also exerts an influence. Different market outlets (trade within the village, middleman and traders, and processing and collection units) are all part of the dairy marketing system. However, for the producers, not all market outlets or places are equally accessible, for various reasons. In the following, the market outlets are divided into two categories: the domestic market, that is urban markets within Bhutan but outside the farmer's dzongkhag, and the local market, that is the local towns and shop settlements that are visited frequently by the farmers. There are three basic marketing channels.

Producer/farm — local consumer/market

Most dairy products in Bhutan are marketed through this channel. Many producers sell their products directly from their own farms. In the study areas, many farmers sell their dairy products within the village to neighbours and also to people from other villages. Considering the small quantities the farmers have for sale and the time constraints, trade within the village is advantageous for most farmers. Beside the trade within the village, the farmers also use the local market for selling their dairy products. The main buyers include shopkeepers, local town residents, civil servants working in the area, and passers-by. Producers also sell fresh whole milk direct to consumers in close-by urban areas, for example, producers in villages nearby Thimphu sell whole milk direct to consumers in the town. Similarly, producers in Babisa village of Thimphu sell their milk direct to the Dantak (Indian road construction company) workers. These producers have virtually no marketing costs as the consumers come to the farm and collect the milk in their own containers.

Even in areas with marketing opportunities for milk, farmers retain a certain amount for processing into butter and cheese for home consumption and for sale. In the winter around 42% of the surveyed farmers retained a proportion of milk for processing into butter and cheese and in summer around 21%. These processed products are traded within the village or taken to local markets when they are visited for work or to purchase necessities such as salt and cooking oil.

More producers retain milk during winter as then they have time for processing as there is less farm work, and the butter and cheese do not spoil so easily. Furthermore, the overall quantity of milk produced also decreases in winter; the small quantity produced is retained entirely for home consumption by some households. About 20% of the producers in winter and 27% in summer retained fresh milk mainly to use in the preparation of sweet tea.

Producer — middlemen/traders — consumer outlet

Marketing through middlemen or traders is often used for the sale of dairy products like butter and cheese by dairy producers without easy access to market outlets, but

sale of fresh whole milk through this channel is uncommon. Producers with large herds process the milk and sell the products to middlemen or traders who take it to the domestic market centres. Thimphu is the main domestic market for butter and cheese coming from Samchi, Haa, and Phuntsholing through traders or middlemen. The middlemen and traders supply to contract retailers and vendors on a wholesale basis. Some informal and unwritten contractual agreements are made, particularly regarding the price and quantity to be supplied or purchased every week.

The local Saturday and Sunday markets in Thimphu are the main markets for the sale of butter and cheese. Therefore, the traders of dairy products, particularly butter and cheese, try to deliver their produce to Thimphu by Friday evening to distribute to the contract vendors and retailers the same evening for sale the next morning.

Producer — milk processing units/collection centres — retailers — consumer outlet

Currently, the sale of milk and milk products through this type of structured or organised system is limited to a few areas only, and is more common for the sale of fresh liquid milk. The producers sell their milk to the processing units or collection centres at a fixed price.

Milk marketing in Darla

The Bhutan Dairy Limited (BDL) in Phuntsholing, a government-owned plant leased out to the private sector, is the only organised processing facility for farmers from Darla to market fresh whole milk. Darla itself has a chilling centre with a capacity of 1,000 l established for the collection and storage of milk supplied by farmers. At present the actual supply is only about 500-600 l every 2 days, after which the milk is delivered to Phuntsholing. The main reasons for the low and irregular supply of milk by farmers are the low price offered by BDL, the high local demand for butter and cheese, and for some farmers the inaccessibility of the chilling plant or collection points. If BDL does not initiate a promotional programme and seriously review their pricing policies and other related issues, the supply of milk is likely to deteriorate further as the Darla Hydro Project presents a big market for almost all local products.

The Phuntsholing plant has a processing capacity of 700 l/h or 4,500 l/day based on a 6 h shift. The plant receives some 600 l daily from India, but the total supply still does not meet the plant's requirement and it is said to be operating far below the breakeven point. However, the plant sells liquid milk made from a combination of fresh (30%) and reconstituted (70%) milk, so it can increase its output and sell more milk than it receives.

Milk marketing in Bumthang

Similarly, in Bumthang, the MPU serves as the main market for the farmers within Chamkhar Valley to sell their liquid milk. The MPU has a capacity of 1,000 l/day. It gets milk from the Government Brown Swiss Farm and from farmers in nearby villages. At present the MPU has on average 25 farmers supplying milk to the unit. The quantities of milk supplied by the government farm and the farmers in the past three years, and the price offered by the MPU are shown in Table 2.2, the total supply at present is about half the capacity.

The quantity of milk supplied to the MPU by the farmers is expected to increase in the future, the small increase at the end of 2000 (Table 2.2) was mainly due to the increase in the milk price. Most farmers supplying milk to the MPU reported that the present

milk price (Nu 11 per l) was still low enough to restrict their supply. A slight increase in the price of milk per litre is likely to encourage more farmers to supply milk to the MPU and/or present suppliers to increase their quantities. Milk is supplied by producers located up to 5 km from the MPU.

Table 2.2 Milk supply to the milk processing unit and prices offered per litre (1998-2000)

Source	1998 (l/ day)		1999 (l/ day)		2000 (l/ day)	
	Summer	Winter	Summer	Winter	Summer	Winter
Brown Swiss Farm	500	250	350	200	250	120
Member farmers	200	250	250	150	250	250
Total supply	700	500	600	450	500	370
Price offered (Nu/ l at 4% fat content)	10	10	10	10	11	11
Source: Survey 2000						

Daily, the MPU produces 50 kg of hard cheese, 23 kg of soft cheese, and 40 kg of gouda. About 10 kg of local butter and 20 kg of datse cheese are produced every Sunday. These quantities are not able to meet the demand, particularly during the tourist season when it is reported to be very high.

Milk marketing in Thimphu

The sale of fresh whole milk is not organised formally in Thimphu except for the pasteurised packed milk supplied by BDL, which is sold through retailers and agents. On average about 600-700 l are sold through different retail outlets at Nu 25/l. Local fresh milk is sold by producers to consumers through informal arrangements, the price per litre (Nu 20-25) is much higher than the price received by the farmers in Bumthang and Darla who supply to the processing units.

Marketing costs and margin

The costs in marketing dairy products include all expenses incurred on the product by the producer until the product enters the consumer's bag, that is costs of product preparation, packaging, handling, transportation, storage, product losses, and so on. The sale of dairy products on the farm usually involves minimal or no marketing costs, except the processing costs when butter and cheese are sold. When the products are taken to the local markets (towns, processing units, Sunday markets, and roadside shops), marketing costs include transportation and labour charges.

The average marketing margins for butter and cheese for wholesale and retail were estimated from the survey results. The marketing margins for the producer are 68% for butter and 50% for cheese. It may not be appropriate to assess the efficiency based on these margins without careful analysis of different costs incurred through various marketing activities required at different stages. However, the results, indicate that the producer is likely to be better off with the higher margin on butter. The most common costs incurred at producer level include the processing and packaging costs (mainly time as the packaging materials used are from the jungle — banana leaves and bamboo for baskets). On the other hand, the most important costs for the middlemen and traders include transportation and losses during transportation and storage. The product losses are reported to be as high as 5-10% in the summer, especially for datse cheese, due to lack of storage facilities but winter losses are said to be minimal, at 1-2%. Most retailers reported that in summer they quite often sell their products at zero profit margin so as to ensure that at least the cost is covered.

Consumption pattern, preference, and use of dairy products

Fresh milk consumption is uncommon among the Bhutanese, except in the south and some parts of western Bhutan, where a certain proportion of fresh milk is used for preparing sweet tea or occasionally for fresh consumption especially for children. The major proportion of milk produced in the country is processed into butter and cheese, which form a substantial part of the Bhutanese diet. The butter is mostly used for preparing the salted butter tea (suja) that is commonly consumed by the majority of the Bhutanese population and the cheese is used as an important ingredient in almost all Bhutanese curries. Some processed cheese (mostly imported) is consumed direct.

A rapid market appraisal was conducted in Thimphu, to study consumer preference and consumption pattern of dairy products. The appraisal covered a total of 75 consumers representing different income and occupational groups. The sampled group was categorised into three different groups: civil servants (47, average family size 6.8), business and private entrepreneurs (22, average family size 9.2), and hoteliers (6) (as catering organisations, the hotels were expected to be important consumers of dairy products).

Purchase of dairy products by urban consumers

Overall, the businessmen and civil servants' purchased an average of 14.6 l and 10.8 l of fresh liquid milk per month, respectively. However, only half of the businessmen and one third of the civil servants actually purchased fresh milk. The liquid milk included both fresh whole milk and pasteurised packed milk supplied by BDL in Phuntsholing.

On average about 83% of the total respondents purchased milk powder for sweet tea; 76% purchased local butter for use in butter tea; and 87% datse cheese for use in curry. These figures reflect the importance of cheese and butter as ingredients in Bhutanese cooking.

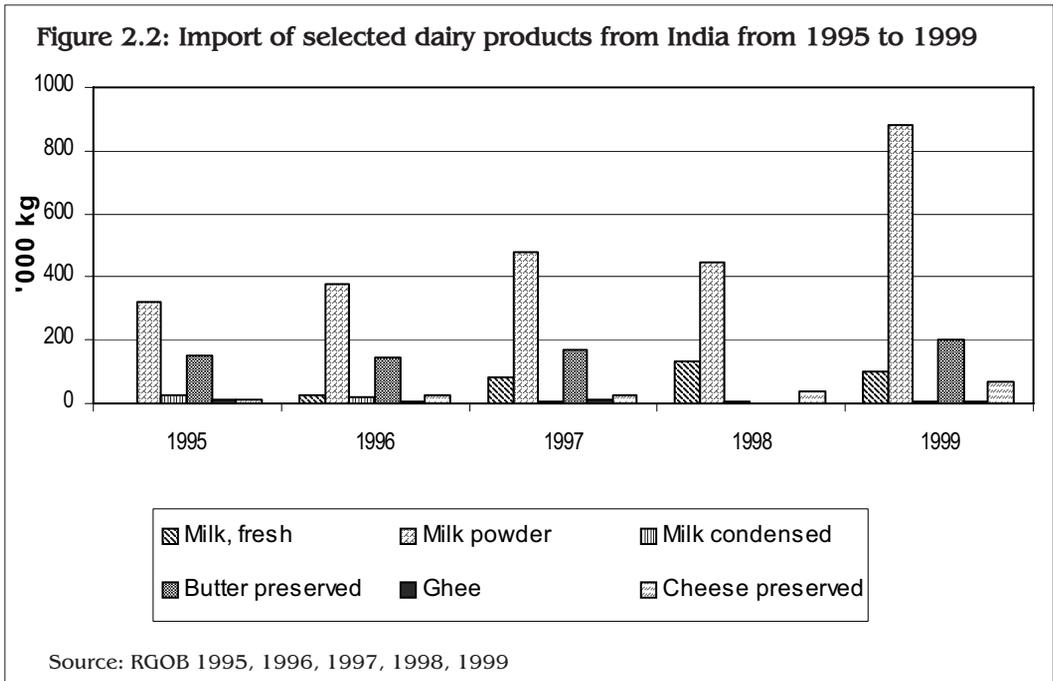
All the sampled hotels depended on imported products; they did not purchase fresh milk or local cheese, except for one hotel that purchased datse cheese. On average the hotels purchased about 40.7 kg of imported milk powder, 26.3 packets of processed butter, and 33.8 tins of preserved cheese per year.

About 59% of the sampled households purchased imported milk powder because it was easily available; and about 41% for reasons of convenience, preference, and hygiene. Some 57% of the respondents said that local dairy products were not readily available, which is an important consideration for all consumers. The hotels in particular reported that ready availability and regular supply are important in the running of their day-to-day catering business. About 43% did not buy local products due to poor quality, poor hygiene, irregular supply, and adulteration.

SUPPLY AND DEMAND OF DAIRY PRODUCTS

In general, the supply of dairy products (milk, butter, and cheese) in Bhutan is a function of production, with other factors having very little or no effect. In Thimphu, however, the supply is influenced by a variety of factors including production, season, price, and transportation. At the same time the demand for dairy products is also determined by many factors including income, price, taste, preference, quality, and availability.

The domestic supply of livestock products in general is unable to meet the local demand, especially in the main urban areas throughout the country where the majority of the population depend on dairy products imported from India (Figure 2.2). It may not be appropriate to consider the annual dairy imports as equalling the excess demand over domestic production, however, the huge annual imports from India clearly reflect a shortfall in domestic production.

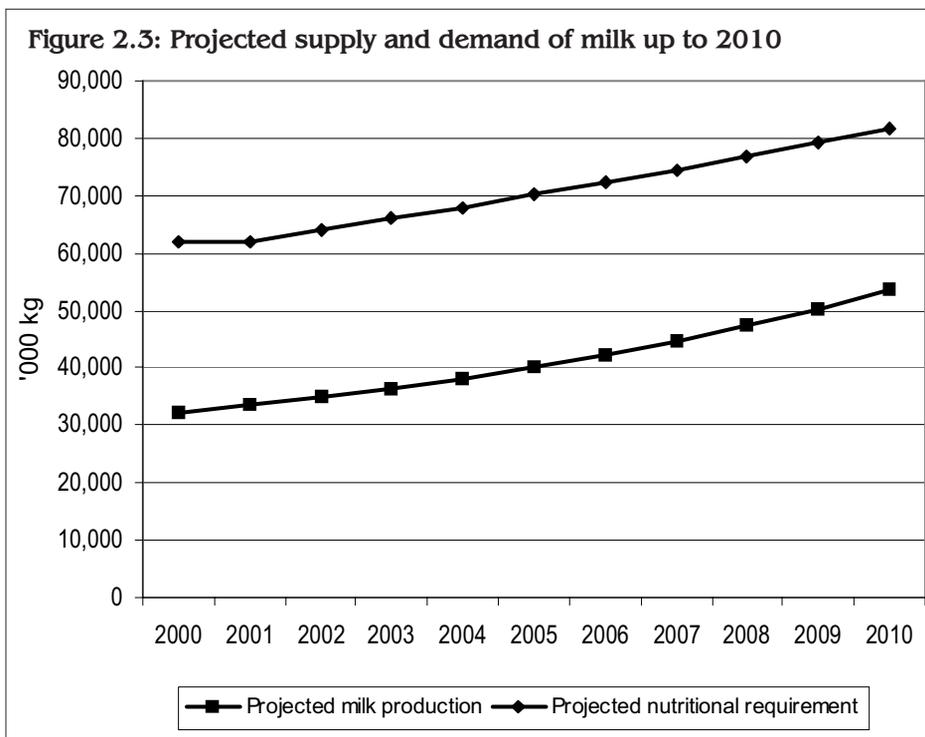


Imports of dairy products

It is difficult to be precise about the statistics on imports of dairy products, as most of the available information seems to underestimate the actual quantity being imported into the country. However, the information compiled by Revenue and Customs (RGOB 1995, 1996, 1997, 1998, 1999) provides an important baseline reflecting the inability of domestic production to meet the growing demand. The increasing trend in importation of dairy products from India clearly reveals the significant production deficit, with huge amounts of milk powder, processed butter, and cheese being imported in the last five years.

Projected demand and supply

A 10-year projection of demand and supply was made (2000-2010) based on the available data on the increase in annual production over the past 10 years and the expected increase in human population. The 'nutritional demand' is based on the recommended minimum requirement of 250g per capita per day. With the present population growth rate of 3.1% per annum, the population of Bhutan is expected to increase from 678,000 in 2000 to 895,000 by 2010. The annual milk production during the same period is expected to increase from 32,357,000 kg to 53,683,000 kg (Figure 2.3).



The projections reveal that if the growth in milk production continues at the same rate over the next 10 years the production will not be able to meet the basic nutritional requirement of the projected population. It seems likely that Bhutan will remain a milk deficit country for some time to come and that imports of dairy products from India will continue at an increasing rate. The official statistics indicate that there was a three-fold increase in the total value of livestock product imports between 1995 and 1999. The low quantity and quality of domestic production, and the easy availability of imported processed dairy products which are well packed and more hygienic, are likely to encourage increased importation of dairy products from India in the future. When pursuing and implementing dairy development activities in Bhutan, it will be necessary to address these problems.

CONSTRAINTS, OPPORTUNITIES, AND RESEARCH AND DEVELOPMENT ISSUES IN DAIRY PRODUCTION AND MARKETING

Fodder development

Despite about 20 years of activities aimed at production of improved fodder, fodder shortage is still rated the most important constraint on increased milk production and sustainability. The small gain towards meeting the feed requirement has been offset by the increase in livestock population.

Land shortages are widely considered to be the single most important limitation to fodder resource development. One view is that land shortages occur because farmers allocate lower priority to fodder development than to cash crops such as apples and potatoes. This in turn can be attributed to dairy farming generating a lower income

than cash crops due mainly to the lack of marketing opportunities, which is reflected by the fact that farmers in areas with marketing opportunities are ready to use arable land for pasture development. Whatever the cause, it is evident that farmers do not generally spare land for fodder resource development.

The most effective approach to improving fodder availability is thus likely to be the development of feed resources that require less land and exploration of possibilities for integrating growing of fodder within the existing farming systems, rather than emphasising pasture development. For serious dairy farmers willing to allocate land for growing fodder, the development of a feed garden incorporating grass, legumes, and fodder trees presents great potential for increasing fodder production.

Research and development issues

In Bhutan, livestock production in general remains far below the domestic requirement, and it is supplemented by huge annual imports from India. Annual imports of dairy products from India have increased steadily over the last five years. In 1999, Bhutan imported dairy products worth Nu 35,000,000 (fresh, powdered, and condensed milk, buttermilk, yoghurt, fresh and preserved cheese, preserved butter, and curd). The trend in importation clearly suggests that opportunities exist for the growth of smallholder dairying in Bhutan.

Although overall production in the country seems to be low, with a better market infrastructure, larger quantities of milk and milk products could enter the market. Marketing is as important as production, better structured and organised marketing systems need to be introduced and the existing systems should be improved. For example, at present there are very few organised marketing structures for the sale of fresh milk, and the performance of the existing organised marketing units is questionable if looked at in terms of membership. In most cases, withdrawals of members, an irregular supply of milk, and lack of interest from new members in joining are the most commonly raised issues. One reason for the organisations' unpopularity is very clear, the prices offered for milk are not very attractive, around half the direct market price.

In general, consumers prefer local produce because of its freshness and nutritional value. The reasons consumers gave for not buying local dairy products thus indicate areas where improvements could be made. About 57% of consumers reported lack of availability as the main problem, 16% were not happy with the erratic supply, and 12% with the poor quality. The respondents bought the easily available imported products because domestic products were not readily available.

Many consumers felt there was a need to maintain the quality of local products, particularly to check for adulteration. The consumers' suggestions for maintaining quality include the introduction of strict quality control measures, such as setting standards and frequently checking the quality of the products, and taking legal action against defaulters. The establishment in urban areas of sales counters especially designed for dairy products has been suggested by the consumers in order to improve access to dairy products. At present they depend on the weekly markets for the purchase of products like butter and cheese.

The consumers also felt there was a need for the concerned authorities to educate traders and producers, particularly with regard to product handling, packaging, processing, and hygienic issues, in order to improve quality.

In general, marketing opportunities are the main driving forces for producers to produce more of any type of product. Identification of market opportunities and the development of proper marketing strategies for milk and milk products for selected groups of villages would be a useful approach to support dairy development.

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