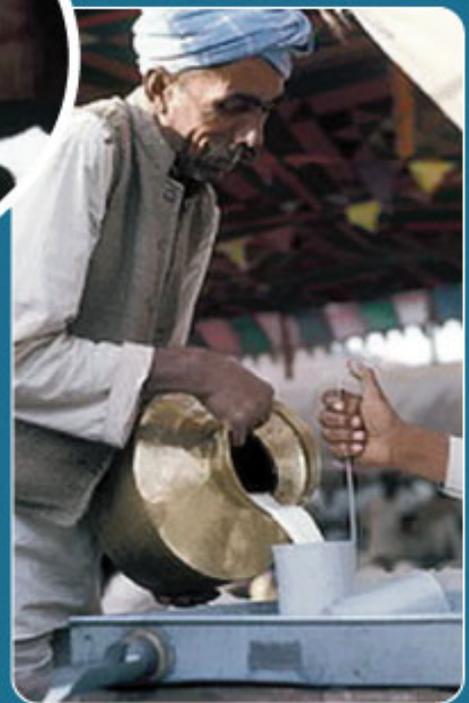


Smallholder dairy development: Lessons learned in Asia



**Smallholder dairy development:
Lessons learned in Asia**

**ANIMAL PRODUCTION AND HEALTH COMMISSION FOR ASIA AND THE PACIFIC
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
REGIONAL OFFICE FOR ASIA AND THE PACIFIC**

Bangkok, January 2009

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Foreword

Demand for dairy products in the Asian region has doubled since 1980 and, after more than half a century of declining real prices for dairy products, there are strong signs of a structural change in the global dairy sector that could make it attractive for investment. This offers livelihood and rural development opportunities for smallholder dairy producers in Asia who currently supply three-quarters of domestic consumption needs in a region projected to be the largest growing market over the next decade.

There are many successful business models through which smallholder milk producers in Asia have gained sustainable access to markets. However, to date, many of the insights on supporting inclusion of smallholder dairy producers are scattered throughout the literature. Building on two smallholder dairy workshops, organized in 2008 by the regional office of the Food and Agriculture Organization of the United Nations (FAO) in Bangkok, of which the first workshop was organized in cooperation with the Common Fund for Commodities (CFC), this publication presents a compilation of experiences and lessons learned from nine countries in the Asian region. It includes generic characterizations and specific models and factors that have influenced smallholder participation in dairy food chains – both good and bad. It also provides the context for regional growth in the sector and some practical guidelines on appropriate/inappropriate support to the sector.

FAO's objective in fostering Asian smallholder dairy development is not only in consideration of livelihood opportunities for small farmers but in recognition that investment in dairy has important spin-offs for rural development and nutrition. It is estimated that one additional off-farm job is created for each 10-20 litres of milk marketed per day. On the consumption side, the nutritional benefits of increasing the productivity of milk animals by just 20 percent could provide a daily glass of milk for every Asian child.

It is hoped that this publication will be useful for dairy stakeholders in the region, up and down the value chain, as they examine opportunities for sector investment and development. The lessons contained herein link decisions from the policy side to those influencing on- and off-farm issues related to enhancing efficiencies and returns from dairy value chains.

FAO, in collaboration with the Animal Production and Health Commission in Asia (APHCA), has a long-standing commitment to smallholder dairy development in the region. This publication is part of a broader regional initiative undertaken in collaboration with the CFC to provide guidance to stakeholders in the region and mobilize resources into a sector that holds vibrant opportunities for poverty alleviation, nutrition enhancement and broader economic development in rural areas.



Amb Ali Mchumo
Managing Director
Common Fund for Commodities



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Introduction: Dairy development in Asia

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Asia remains one of the most diverse regions in the world in terms of economic growth, changing food consumption preferences and relative availability of resources, both human and environmental. The shape of this diversity is reflected in regional dairy development patterns, marked by diverse growth paths, diverging growth patterns, different production/market systems and varying consumption preferences. These changing diets, demographic shifts and rapid advances in technology have led to the proliferation of different types of dairy products, prompting Asian consumers in both traditional and non-traditional milk-consuming countries to include more milk in their diets. This is evident in the nearly doubling in regional per capita milk consumption figures: from 32 kg per capita in 1981 to 64 kg per capita in 2007 (Table 1).

Table 1: Per capita milk consumption, milk equivalents

	1981	1990	2000	2007e
Kg/capita				
World	86	80	104	113
Developed	222	180	235	248
Developing	35	40	56	68
Asia	33	39	50	64
China	3	6	11	na
Mongolia	141	144	176	na
SE Asia	6	10	16	32
Thailand	8	14	26	na
Philippines	14	19	22	na
Malaysia	48	41	52	na
Viet Nam	1	1	8	na
South Asia	543	66	84	93
India	50	63	79	na
Pakistan	113	134	180	na
Bangladesh	16	17	18	na
Sri Lanka	24	28	33	na
Nepal	49	50	50	na
US	271	274	287	295
EU	na	363	496	382

Source: FAO estimates

consumption patterns are expected to translate into a nearly 120 million tonnes increase in world milk production, up 20 percent to 803 million tonnes by 2017. Over half of these output gains, or 63 million tonnes, will be produced in Asia, particularly China and India, two countries which are expected to account for a respective 16 and 20 percent of the global increase.

This has important implications for many countries, such as those in South Asia where milk is only second to cereals in terms of importance to overall per capita consumption. The importance of milk is evident within long historical traditions of both urban and rural milk consumption, largely influenced by cultural factors, such as those in Pakistan and India. These traditions have encouraged the continued existence of strong informal rural milk marketing systems, thus supporting growing trends in per capita consumption in those countries. By contrast, dairy development in other South Asian countries has lagged, such as in Bangladesh, Nepal and Sri Lanka, partly due to the lack of government support for the sector.

Aggregate consumption gains in regional dairy product consumption over the past decade mirror regional annual income gains of nearly 5 percent. Within a global context, the near doubling of regional milk consumption over the past 25 years, to an estimated 247 million tonnes in 2008, has placed Asia as the strongest growing region for milk and dairy product consumption. In fact, Asian consumers have generated nearly half of the global dairy product demand over the past decade.

Similar to previous trends, the Organisation for Economic Co-operation and Development (OECD) and the Food and Agriculture Organization of the United Nations (FAO) project that the strongest gains in dairy production and consumption over the coming decade will take place in Asia¹. Increasing incomes and a continuation in changing

¹ OECD-FAO agricultural outlook, 2008-2017.

Developments in South Asia stand in sharp contrast to much lower consumption levels in Southeast Asia, where average per capita consumption levels, at 32 kg per capita, are one-third the levels in South Asia. While India and Pakistan have the highest per capita consumption levels in Asia at 80 kg and 180 kg, respectively, most of the strongest consumption gains in percentage terms have been due to rapid gains in non-traditional milk-consuming countries, such as China and Viet Nam (Figure 1). Consumption gains have been largest in countries with low per capita consumption estimates. Estimates of per capita consumption range from 2–5 kg per capita in Cambodia and Lao People’s Democratic Republic to 11–15 kg per capita in Philippines and Viet Nam and to 40–55 kg per capita in Korea, Malaysia and Thailand.

Nowhere has the change in milk demand been as dramatic as in China, where consumption has increased from 5 kg per capita in 1984 to estimates of over 22 kg by 2007, growing on average of 9 percent per annum. Most of this growth has occurred since 2000 when technical advances allowed integration between dairy markets. An investigation by the China Association of Dairy industry found that in 2003 there were some 381 dairy products sold in different supermarkets in Beijing, much of which was produced in the grasslands of the North China region. Despite lactose intolerance (a historical constraint to fluid milk consumption in some countries in the region), the availability of more processed products, such as cheese and yoghurt, along with technological developments, such as UHT milk processing, have overcome the challenges of long-distance travel. The new technology has allowed more shelf-stable dairy products to be delivered to geographically and culturally diverse consumers.

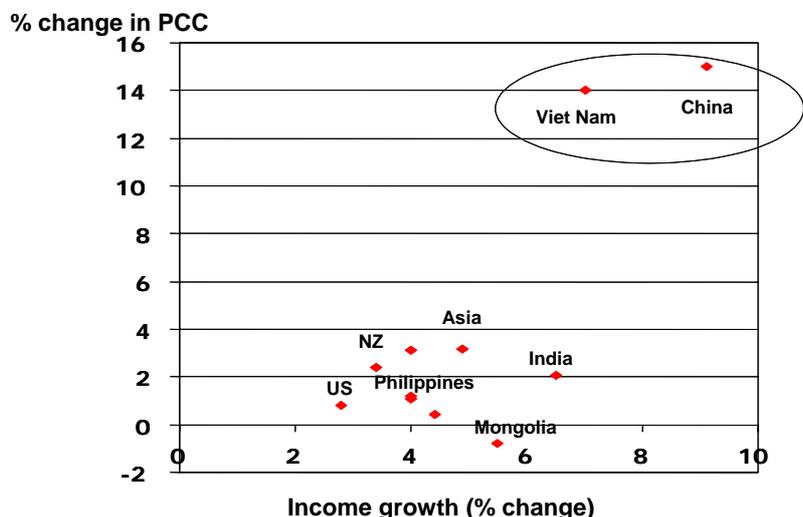
Government-invested milk promotion, in some cases through school milk programmes, also has been a catalyst in the expansion of demand. This has been particularly true in China where generic milk promotion and encouraged participation of smallholders in milk production have been national and regional policy. In addition, there have been significant incentives for processors who, while regrouping producers, are driving the next stage of China’s dairy development (Hu).

Production grows faster than in any other region

This rising regional demand for milk and dairy products (from 76 million tonnes in the early 1980s to an estimated 247 million tonnes in 2008) has translated into opportunities for local producers, the majority of whom maintain between two and five cows and supply more than 80 percent of milk in the region. Aggregate output gains for the region, growing annually by 5 percent over the past decade, have doubled the global average. With approximately 352 million head of cattle and buffalo (Annex Table 1), Asia became by 2005 the largest milk-producing region in the world – surpassing Europe.

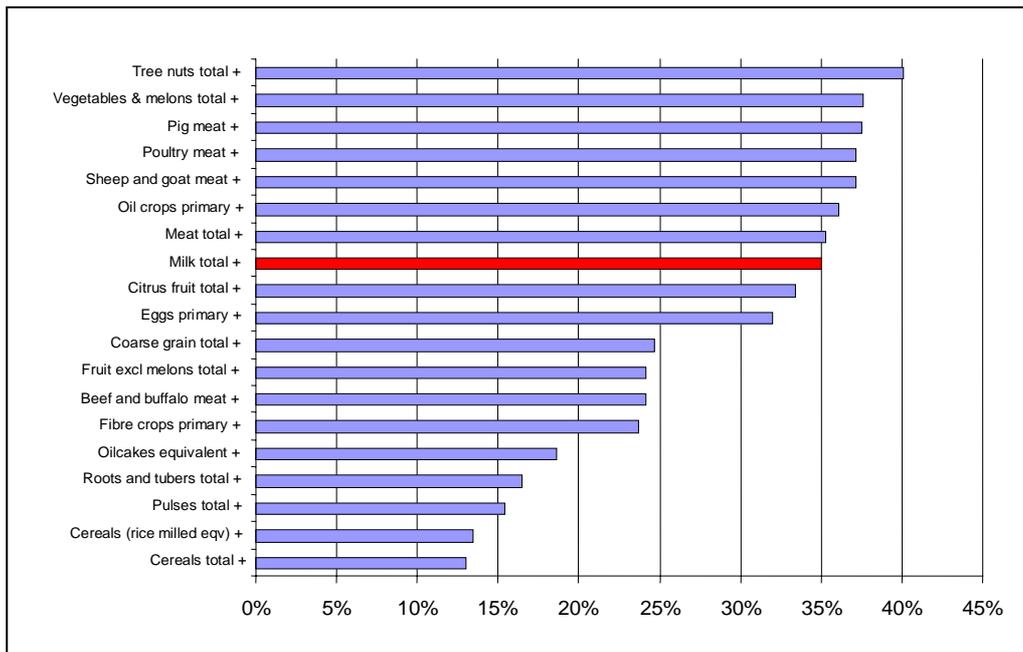
This has largely benefited smallholder dairy producers in a region where milk production is an integral part of the small-farm economy in many countries, providing cash, capital assets and nutritional benefits to tens of millions of households. Spread across the largest, most geographically diverse region in the world,

Figure 1: Strong income growth prompts increased milk consumption over past decade



aggregate growth in the Asian milk output over the past decade has been exceeded only by that of certain meats and vegetable crops (Figure 2). It also has likely served as a catalyst to overall rural development; FAO estimates that every 10–20 litres of milk marketed in traditional markets has created one non-farm job. Of concern, however, is the much slower growth in grain and fodder production (Figure 2). While many of the production systems in which animals are now located are low input–output systems, characterized by feed produced from local crops, increasingly the emergence of more commercial operations will require access to better quality feed.

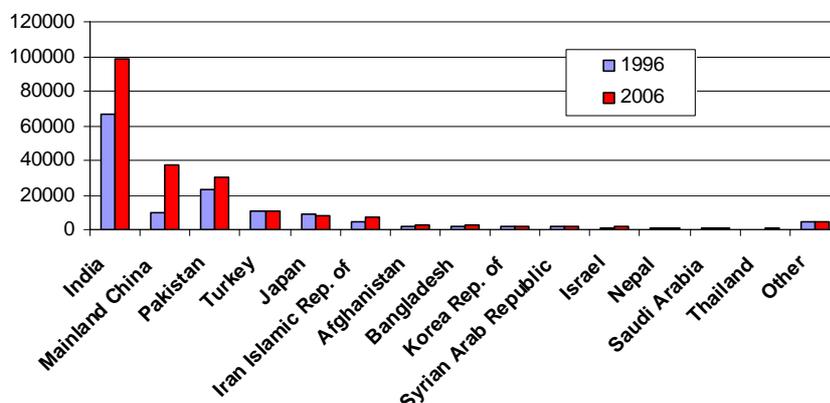
Figure 2: Growth in agricultural production in Asia, 1997–2007



Aggregate regional statistics mask the considerable differences in dairy development among subregions and countries. Nearly 80 percent of the production gains in Asia can be attributed to three countries: India (the world’s largest producer), China (the fastest growing market) and Pakistan, with output in India and Pakistan originating from low input–output crop-based systems in which milk from buffalos is important (Figure 3). And yet, the strongest gains over the past decade have been in Southeast Asia. This is also the area where lack of traditional consumption preferences for fresh milk, combined with low tariffs, has led to imported milk products accounting for nearly one-quarter of the subregion’s domestic requirements. When calculating dairy imports as a share of processed milk, this proportion in countries such as the Philippines and Viet Nam can jump to over 90 percent. It is clear from the trends that a growing appreciation for fluid milk and products made with locally produced milk is rapidly gaining acceptance.

Asia, as a region, provides feed and forage to more than half of the global cow population of 672 million (Annex Table) and appears to have been marginally successful in increasing output by way of raising production intensity. Over the past 15 years, yields have almost doubled, with productivity gains per animal

Figure 3 : India, China and Pakistan account for 80 percent of milk production gains over the past decade

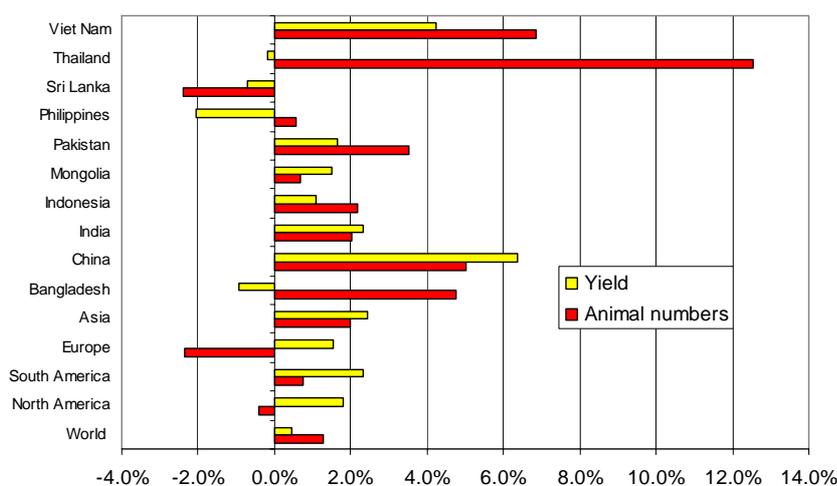


attributing to the nearly two-thirds of overall output gains. Yield gains have been very broad based, with Afghanistan, China, Iran and Viet Nam recording average annual gains that exceed 3 percent.

However, regional average yields, at less than 1 tonne per animal, remain below the global average and only one-tenth of the developed country average (Table 2).

In China and Viet Nam, double-digit production gains have been the strongest in the world. That growth has been supported by government assistance with the enhancement of cross-bred animal availability, which has resulted in average yield increases of between 4 and 7 percent (Figure 4).

Figure 4: Contribution of yield to milk output (over the past decade)



It is these successes that have prompted yield gains in the region to rise annually, at almost 3 percent – faster than in any other region. In developed countries, the expansion in output has been largely fuelled by enhanced yields per animal, with the exception of Australia and New Zealand where cows are mostly grass fed.

By contrast, productivity per animal in Africa appears to have virtually stagnate. It is clear that favourable economic signals to producers have the potential to quickly increase yields in many parts of Asia where producers poorly feed their animals. Thus,

there is ample scope for rapid increases in milk productivity simply by improving the feed quality of local crops.

Table 2 : Average yields (tonnes/animal/yr)

	1992	2007	% change
Africa	.18	.20	13
Asia	.52	.91	74
South America	.90	1.31	46
North America	6.8	9.01	32
Oceania	3.16	3.35	6
World	1.1	1.27	15

Opportunities for import substitution

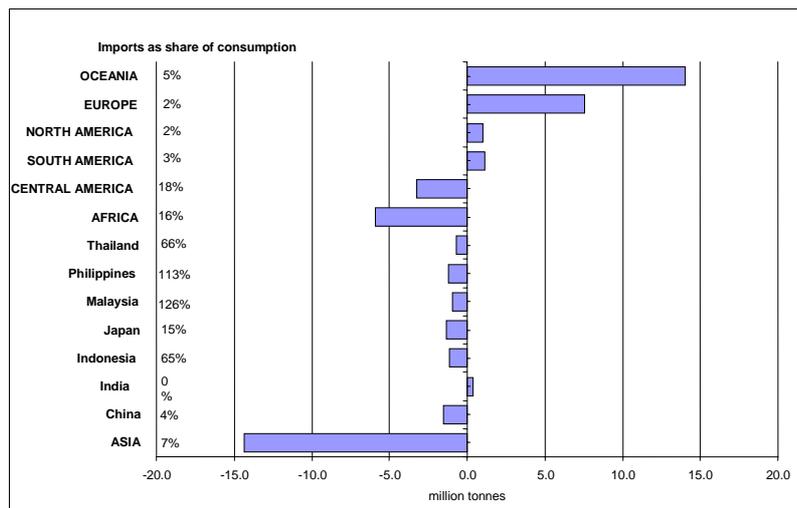
Despite the rapid production gains, growing regional demand has also led to a near doubling of imports in Asia over the past 25 years, particularly those of milk powder. Asian imports swelled from 10 million tonnes in the early 1980s to an estimated 19 million tonnes in 2008. Asia currently accounts for approximately half of the global dairy product trade and constitutes an important market for the major dairy exporters, dominated by New Zealand, the European Union

(EU), the United States and Australia (Figure 5). However, regional import dependency has remained stable at only 7 percent. This implies that the region as a whole has been relatively successful in supporting local industries to respond to the rising demand for dairy products. But regional averages can mask local realities. For instance, in South Asia, consumer preferences for fresh milk, local product availability and import barriers have limited trade with dairy product imports constituting only 1 percent of domestic consumption. In contrast, imported milk products into Southeast Asia supply nearly one-quarter of domestic requirements; when calculating dairy imports as a share of processed milk, this share jumps to over 90 percent in some countries.

In countries such as Sri Lanka, Philippines and Viet Nam where tariff levels are very low and consumers are familiar with and favour reconstituted milk products, import dependency has reached over 80 percent. And yet in China, a country that has experienced double-digit consumption gains over the past decade, imports constitute only 6 percent of total consumption. However, with imports estimated at nearly 2 million tonnes, China is the largest dairy product importer in the world, followed by Mexico, Russia, Egypt, Indonesia, Malaysia and Philippines.

As global dairy product supplies tightened in late 2006 due to drought in some exporting countries, as the EU intervention stocks drew down and as certain export subsidies discontinued, international dairy product prices rose to record levels. Rising faster and sooner than other agricultural commodities, prices for internationally traded milk powder hit a plateau and started declining in late 2007. While prices declined

Figure 5: Net trade position in dairy products, 2007

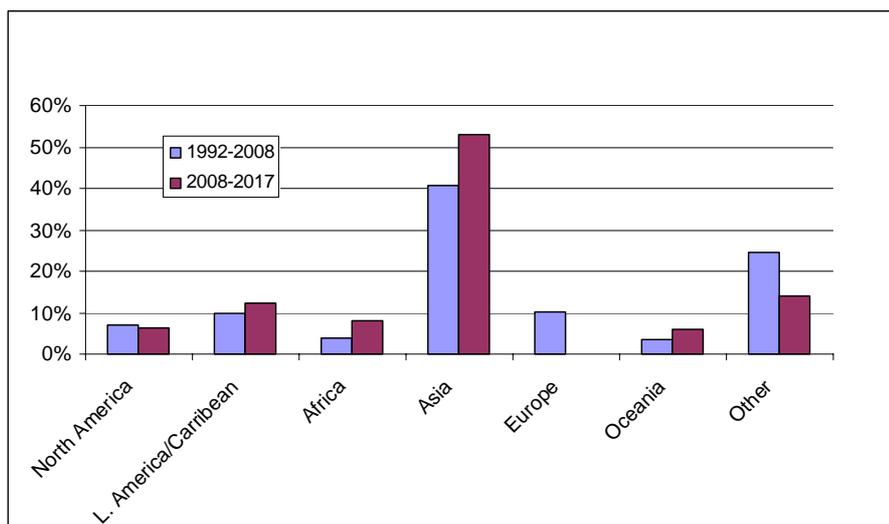


quickly in line with other agricultural commodities through 2008, many of the factors prompting higher prices (increased feed and other input prices and policy reforms) will likely underpin market fundamentals over the medium term.

In various studies, decades-long dairy product policies and support for the sector in OECD countries have depressed international milk-equivalent prices by an estimated 25–35 percent. Though unexpected, the price rises may reflect a market adjusting to a situation that has become less distorted by

government interventions. This potential structural² change in dairy markets implies a higher level of prices over the next decade. In their recent commodity projections, the FAO and the OECD estimated that prices of skim and whole milk powder will range between US\$3 000 and \$3 700 per tonne over the next decade – 50–90 percent higher than the previous five years’ average. In line with historical trends over the past two decades, production and consumption gains in milk markets over the next decade also are expected to take place in Asia (Figure 6).

Figure 6: Where will dairy production gains be located over the next decade?



This structural change also affords opportunities for producers in developing countries to expand output, particularly in Asia and Africa, which receive nearly 90 percent of milk powder exports from developed countries. The millions of households with milk producing animals across Asia who are some of the poorest in the world – in many cases landless – have a capacity to respond to economic signals, specifically higher prices. In countries with a large import

dependency, higher import prices create an opening for import substitution, particularly in countries such as Philippines, Sri Lanka and Viet Nam where imports supply as much as half the formal or processed dairy market demand.

² Structural changes in agricultural markets are those in which policy reform or factors outside the commodity sector lead to permanent shifts in the demand and supply curves. Examples could include the introduction of new technologies, concentration in industries and, in the case of dairy, an elimination of policies supporting the export of subsidized dairy products.

The region's challenge: How to ensure local participation in the growing demand for milk products

The opportunity for growth presents Asia dairying stakeholders with the challenge of supporting industry expansion in an increasingly complex and competitive environment, one characterized by longer dairy value chains and mounting pressures on resource availabilities. Dairy farming is still at the preliminary stage in most countries in Asia, with milk supplied by millions of smallholder farmers. But the dairy processing industry is gradually maturing to better meet the requirements of consumers. These diverging trends necessitate a closer look at the diverse structure of dairy industries within the region and their evolution under local conditions.

One of the benefits of supporting dairy development, particularly in Asia where domestic demand is expected to grow faster than in any other region, is that there are fewer economies of scale involved in production than in other livestock systems. Studies have empirically shown that smallholder dairy producers remain competitive in many areas in developing countries (Stahl *et al.*, 2003); nearly 80 percent of overall milk production gains over the past decade were supplied by producers with two to five cows. This is particularly evident where the opportunity cost of labour is low and where value is captured from non-food farm outputs, such as crop residues, manure and the opportunity for capital accumulation in the form of livestock (capita assets). However, as producers scale up to take advantage of the growing demand, smallholder systems become disadvantaged by economies of scale in marketing, input supply and service delivery.

To better shape broader stakeholder engagement and investment into the dairy sector, the opportunities for smallholder dairy producers need to be reviewed within a wide range of influencing factors: economic, institutional, commercial, legal, technological and social. The constraints and opportunities differ both by country and by specific locality, which can affect the development of effective strategies for enhancing smallholder contribution to the growing livestock-product demand.

Useful models need to be identified and analysed. It is particularly important that the enabling factors critical for successfully forging links between smallholder suppliers, processing facilities and traditional markets for fluid milk and other locally acceptable dairy products be identified, weighted and ranked. The selection of acceptable models needs to be based on local conditions, market access, cultural factors and consumption patterns. The possibilities range from enterprise-driven smallholder dairy operations (such as in the Philippines and Viet Nam) to cooperative systems (such as in South Asia) and to strengthened opportunities for subsistence farmers (such as in Bangladesh).

The following chapters present a review of experiences and lessons learned in nine countries (case studies) in Asia. Included is a review of policies that have fostered the growth of the dairy industry in each country and the models that have or have not been conducive to smallholder dairy development. Drawing from these FAO-commissioned case studies and from regional consultations,³ the final two chapters offer a summary of factors that have influenced the evolution of the sector, the lessons learned on successful and unsuccessful practices in sustaining smallholder participation in the rapidly growing sector and the policy process that fostered this development.

³ Drawing on regional expertise, the documentation in this publication was generated through a series of activities that included regional workshops. The first workshop (25–29 February 2008) developed a road map for a Strategy and Investment Plan for Smallholder Dairy Development in Asia, while the second (17–20 November 2008) produced a practical guide on dairy development planning and policy formulation. These publications and information on the workshops can be accessed at the APHCA website: <http://www.aphca.org/>

Annex Table: Asian milk production, yields and numbers of cows

	Milk Production (Average)				2007		Production gains:	
	1981-83 (1,000 tonnes)	1990-92	2000-02	2005-07	Cow Numbers 1 000	Yields ton/animal	1991-2007	Annual % 2000-07
ASIA (EXCL. CIS)	76 614	112 675	177 498	228 133	351 700	0.67	198%	4.8%
Afghanistan	876	862	1 941	2 282	9 218	0.25	161%	2%
Bangladesh	1 199	1 648	2 179	2 315	29 691	0.10	93%	1%
Bhutan	30	32	41	41	166	0.25	37%	0%
China Mainland	3 501	7 333	14 361	36 616	57 830	0.63	946%	18%
India	36 300	55 726	84 143	99 327	105 300	0.97	174%	3%
Indonesia	305	616	780	872	10 267	0.01	186%	1%
Iran Islamic Rep. of	3 056	4 026	5 926	7 677	35 130	2.20	151%	5%
Japan	6 799	8 341	8 394	8 137	1 092	7.45	20%	-1%
Cambodia	16	17	20	23	140	0.17	45%	2%
Korea DPR	63	90	91	96	41	2.20	52%	1%
Korea Rep. of	604	1 747	2 380	2 189	324	6.62	263%	-1%
Laos	3	5	6	6	34	0.20	75%	0%
Malaysia	37	39	39	46	98	0.48	27%	3%
Mongolia	227	296	374	386	1 466	0.27	70%	0%
Myanmar	437	528	634	1 001	2 464	0.45	129%	6%
Nepal	790	929	1 202	1 391	3 673	0.38	76%	3%
Pakistan	9 439	15 494	26 294	31 138	27 990	1.18	230%	4%
Philippines	33	31	11	15	7	1.92	-55%	6%
Sri Lanka	249	265	159	171	462	0.38	-31%	1%
China (Taiwan Pr.)	57	236	380	343	139		504%	-1%
Thailand	29	148	589	713	230	3.00	2362%	3%
Viet Nam	46	60	96	243	177	1.55	427%	15%
Global	363 112	442 510	592 142	662 269	672 305	1.00	82%	2%
Developed	259 080	290 155	335 912	341 629	10 285	9.0	32%	2%
Asia: share	21%	25%	30%	34%	52%			

Bangladesh: Social gains from dairy development

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Dhaka

Background

Bangladesh has a population of 140 million people; more than 80 percent of them, or approximately 15 million households, are located in rural areas. An estimated two-thirds of those households own livestock. Although population growth is slowing, there are still almost 1 000 people per sq km – the highest density of any country in the world (excluding small island-nations and city-states). The dwindling per capita land resource is one of the causes of persisting poverty in the country, according to contemporary human development reports from the United Nations Development Programme (UNDP): More than half the population owns less than 0.5 acres; the bottom 40 percent possesses just 3 percent of the total land area; 48 percent live below the poverty line; and 30 percent consume less than 1 900 calories per day (the minimum desired level is 2 300 calories).

Agriculture generates two-thirds of total employment, contributes a quarter of total export earnings and provides food security to the increasing population. Crop production and animal husbandry are interdependent in the country's mixed-farming system, with livestock performing multiple functions, including the provision of food, nutrition, income, savings, draught power, manure, transport and other social and cultural functions. With livestock, people who are poor and landless can still access common property resources, such as roadsides, open grazing areas and water bodies. Cattle are by far the most important farm animals; smallholders possess the majority of them, and they are directly linked to family income, nutrition and welfare. While animal husbandry is a part of mixed farming, the system of production is not well integrated, and maximum value is not always gained from the inputs and outputs. There is scope for basic improvements that can lead to greater integration and productivity.

In 2006, the livestock sector contributed 3 percent of gross domestic product (GDP), or about 18 percent of agricultural GDP.⁴ When the indirect benefits of draught power and manure for fuel and fertilizer are added to the direct economic output of meat, milk and hides, the value added of the livestock subsector almost doubles, to about 6 percent of GDP. Livestock also provide a critical cash reserve and steady cash income for many marginal farmers who grow crops essentially for subsistence or who have little or no land at all. The national herd comprises: 23 million cattle, 1.2 million buffalo, 20 goats and almost 3 million sheep. Milk production was 2.27 million tonnes in 2006, mainly produced by cows yielding, on average, 200–300 litres per 160/180-day lactation.

In the few specialized areas where cross-breeding has taken place, yields range from 1 000 to 3 000 litres over a 210/300-day lactation.⁵ Until quite recently, milk was a by-product of cattle, used largely for making traditional sweets and in tea. Per capita milk availability currently ranges from 40 to 50 g per day (14–18 kg per year). The gap between supply and demand is largely met by milk powder imports of about 20 000 tonnes annually, valued at some US\$70 million.⁶ Imports represent 0.16 million tonnes of liquid milk equivalent annually, feeding some 6–7 percent of total consumption and accounting for an estimated 55 percent of the formal dairy market. Although there is no specific nutritional target in the country for milk consumption, the figure of 250 g per day (90 kg per year) often appears in national plans, implying an annual milk requirement of 12.8 million tonnes – more than five times current production.⁷

⁴ Directorate of Livestock Services, Bangladesh, 2006–2007.

⁵ Directorate of Livestock Services, Bangladesh, 2006–2007.

⁶ Bangladesh Bank, annual report, 2006.

⁷ Kbd. Syed Altaf Hossain, Paper presented at the annual (2003) Bangladesh Animal Husbandry Association conference.

The history of the sector

The first dairy plant was set up in 1946 by the National Nutrients Company in the then Indian subcontinent, at Lahirmonhanpur, now in Sirajganj district (northern Bangladesh). Following the partition of India in 1947, the Eastern Milk Products Company took over through an exchange of properties. Milk and dairy products marketing eventually started in 1952 under the brand name Milk Vita in the then East Pakistan. The cooperative accumulated huge losses, as did the only other dairy venture, Asto dairy in Dhaka, which began in the 1960s. By 1970, both dairies had virtually ceased trading.

Acute scarcity of milk following independence from Pakistan in 1971 prompted the Government to commission two dairy studies, with support from FAO and the Danish International Development Agency (DANIDA). The studies' authors recommended establishing a sustainable cooperative dairy development programme based on buying surplus milk from smallholder producers and combining the businesses of Asto and Milk Vita into the Eastern Milk Producers' Cooperative Union Ltd, which became Bangladesh Milk Producers Cooperative Ltd (BMPCUL) in 1980.

The Milk Vita Cooperative Dairy Complex was established in 1973 and operated until 1978 under the auspices of the Ministry of Local Government, Rural Development and Cooperatives, with support from FAO, DANIDA and UNDP. The cooperative model was largely adapted from the successful Anand Pattern Dairy Cooperative in India. Two dairy plants and three milk collection centres were built, and milk collection from smallholders started in 1976. The Government also established a small dairy at Savar in the mid 1970s, close to Dhaka, to provide government employees processed milk from its Central Cattle Breeding Station.

At Milk Vita, the gap between milk supply and demand was originally met by recombining butter oil and the skimmed milk powder (that DANIDA and the European Economic Community provided) into liquid milk. By the end of the 1970s, more and more village cooperatives had been established and annual milk collection from some 36 000 smallholders had rapidly built up to 15 million litres. But by the mid 1980s, Milk Vita had virtually collapsed, with less than 3 million litres of milk collected annually. The problem was attributed to unfair competition from imports flooding in from subsidized over-production in Europe. At that time, whole milk powder was retailing at less than 20 percent of its cost price in Europe and one-third of the cost of milk production in Bangladesh.

By the beginning of the 1990s, import taxes were imposed to counter the adverse impact of the cheaper imports. Also at that time and following the recommendations of the FAO technical assistance team, the Government withdrew from day-to-day management of the dairy cooperative. Professional managers took over, turning Milk Vita into a profitable business.

Recent developments

Fortuitously, the turnaround at Milk Vita coincided with a growing market for processed milk as urbanization accelerated. This encouraged other investors to adopt parts of the Milk Vita smallholder dairy model. The sector now engages many enterprises, as Table 1 indicates. In 1990, processors collected just 1 percent of the total milk production of 1.5 million tonnes (30 000 litres per day); by 2006, this had increased to 7 percent of 2.27 million tonnes (384 000 litres/day).

Other developments since the 1990s:

- **Government-sponsored investment incentives** for a few medium- and large-scale farmers to purchase improved dairy animals; this initiative largely failed because the farmers were not well integrated into the dairy input supply and value chains and were unable to repay their loans.
- **Cheap sweetened condensed milk** is being produced from imported powder milk, sugar and vegetable oil by four large companies: Danish, Starship, Goalini and Kquality. The condensed milk has captured the lion's share of the tea-drinking market, though it is not a dairy product because it contains vegetable oil. The business model of these companies is based on the continued availability of cheap (subsidized) milk powder from developed countries. They have been hugely profitable because they took advantage of low international commodity prices. It will be interesting to see how they adapt their business model to cope with the recent significant increases in prices.

- Foreign investors such as Arla Foods Denmark (Dano brand) and the New Zealand Dairy Board (Anchor brand) have imported milk powder in bulk for repacking.

Table 1: Milk processing capacity, 2007

	Dairy (establishment year)	Average milk collection (litres/day)	Smallholder milk suppliers
1.	Milk Vita (1973)	200 000	150 000
2.	Amomilk (1996)	10 000	5 000
3.	Tulip Dairy(1998)	3 000	2 000
4	Arong–BRAC Dairy (1998)	80 000	70 000
5.	Bikrampur Dairy (1998)	10 000	6 000
6.	Ultra–Shelaidah Dairy (1998)	10 000	4 000
7.	Aftab (1998)	8 000	4 000
8.	Pran (2001)	40 000	30 000
9.	Grameen–CLDDP (1999)	7 000	6 000
10.	Rangpur Dairy (2007)	8 000	7 000
11.	Akij Group (2007)	4 000	500
12.	Grameen Danone (2007)	1 000	From CLDDP
13.	Savar Dairy (1974)	3 000	From own farm
14.	Army	Self-consumption	From own farm
	Total	384 000	284 500

Source: Khan.

Dairy sector policy and strategy

Following the establishment of Milk Vita, two dairy development studies were initiated in the 1980s as a preface to scaling up cooperative dairying elsewhere in the country. The Government and UNDP/FAO sponsored both studies. The first, in 1984, led to the National Cooperative Dairy Development Plan. The Chairman of the Indian National Dairy Development Board (NDDDB) orchestrated the second study, in 1987, which led to expanding the earlier plan into a formal strategy for dairy development in Bangladesh. The strategy proposed a regional approach, based on setting up four regional dairy cooperatives to collect milk from smallholder village cooperatives and process and market it safely and affordably to lower-income urban groups. The regional dairy cooperatives would be enveloped into a national dairy federation or a dairy development board. Detailed implementation programmes were prepared but have remained shelved for more than two decades.

Current government policy for agriculture aims to provide an enabling environment and supportive role in moving from a predominantly state function to a more diversified and environmentally sustainable commercial venture. The strategic framework targets non-crop agriculture, such as fishery, poultry and livestock, for accelerated investment.

After an intensive stakeholder consultation process, the Directorate of Livestock Services (DLS) and the Ministry of Fisheries and Livestock (MOFL) drafted the National Livestock Policy in 2005. It was finalized in 2006 under the recently completed Grameen Bank/UNDP/FAO Community Livestock and Dairy Development Project (CLDDP). Although the DLS and the MOFL adopted the policy, it has yet to be approved by the Cabinet, due largely to the succession of interim governments and prevailing civil unrest since it was prepared. Although the policy contains no separate dairy component, the Milk Vita and Grameen–CLDDP dairying models are promoted as “models for early adoption”.

Once approved, the policy will have several more tough challenges:

- implementation of the policy recommendations;
- acceptance of institutional reforms;
- establishment of regulatory frameworks and a legal body;
- enforcement of the laws and regulations;
- quality control assurance;
- collaboration with the private sector for veterinary services and simple diagnostic facilities.

The Government's National Strategy of Accelerated Poverty Reduction (NSAPR, 2005) sets out ways and means for achieving two of the Millennium Development Goals (MDGs): halving poverty and halving under-nutrition by 2015. The strategy document states that while the livestock sector as a whole grew 3 percent during the 1990s, poultry has demonstrated the most impressive growth rate, at around 10 percent per annum since the mid 1970s. Growth in milk production generally has mirrored the general trend in the livestock sector, with low productivity a major limitation to sector development because production remains primarily for subsistence and is highly dispersed. With rapid urbanization and income increases, the demand for livestock products, such as meat, milk and eggs, will continue to rise. The strategy targets local milk production to replace imports, which currently range between 10 and 20 percent of annual consumption. The strategy promotes community-based organizations of production, processing and marketing to overcome the constraints. Smallholder milk producers thus are expected to play a key role in helping to achieve the target and, in so doing, helping Bangladesh to achieve the MDGs relating to poverty and nutrition.

The NSAPR includes a school lunch programme to improve attendance and reduce the incidence of malnutrition as well as generating demand for local produce and catering services through backward and forward links. Community participation is a key driver. Currently, the United States' Department of Agriculture funds a small school milk programme in Bangladesh, for which the US company Land O'Lakes imports milk and then recombines it with its milk powder. Although they enhance the nutrition intake of school-age children, school milk schemes using imported milk powder have limited sustainability and are less beneficial to livelihood development as those using locally produced milk.

Affordable and readily available cattle treatment and other development support provided by Milk Vita and Grameen-CLDDP have encouraged the expansion of milk producers. Still, even though the Government now generally recognizes smallholder milk production in its development strategy, the absence of a comprehensive national dairy policy may limit the growth of the sector. What has been achieved so far primarily relates to the influence of a milk collection system introduced by dairies, which has resulted in a fairer price system for producers. Initially, a government ministry set Milk Vita's prices; but since becoming more independent in the early 1990s, Milk Vita has decided its own prices, in competition with the other dairies as well as imports.

Smallholder milk producers and marketing models

Smallholder milk producers play a key role in dairy markets in Bangladesh. They supply all the domestic milk for the informal traditional market and three quarters of the formal processed market (Annex I provides an illustration of the various smallholder milk producers). Milk Vita and Grameen-CLDDP institutionally promote the empowerment of smallholder dairy farmers, both men and women, in the value chain and business ownership/management process, which encourages their participation. Other processing dairies tend to focus on milk collection only.

Informal traditional markets model

Smallholder milk producers sell milk directly to consumers or milk supplier/middlemen at local markets (Figure 1). The middlemen cater to the demand of sweetmeat shops, bakeries, consumers, more distant markets and vendors. They pay producers up to 50 percent less for their milk than other models, such as those described in the following sections. In many cases, the middlemen provide loans to smallholders with interest rates of up to 20 percent per month.

Figure 1: Traditional milk trader model



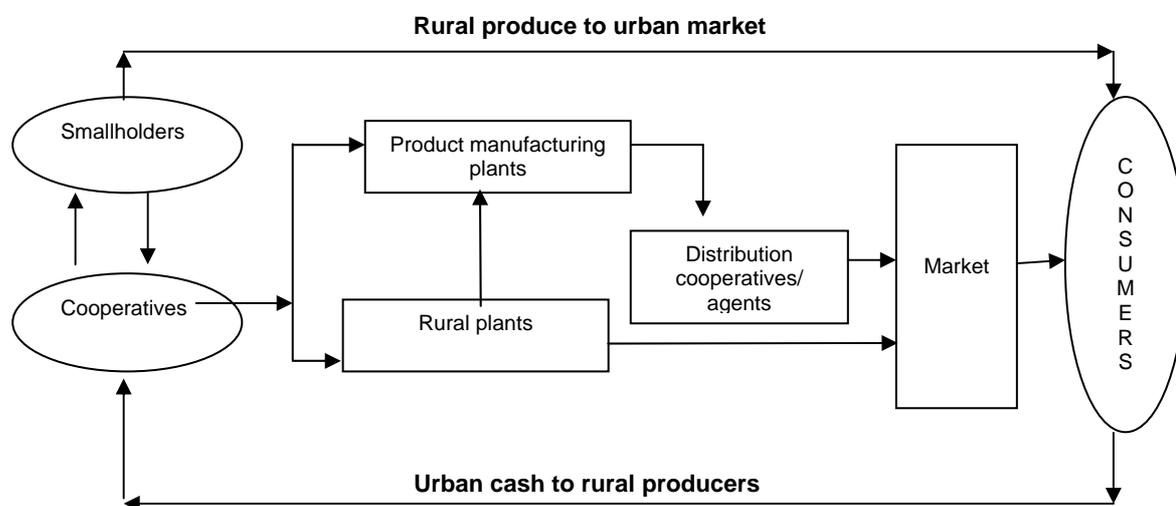
Milk Vita Cooperative model

The Milk Vita Cooperative model was adapted from the world-renowned Anand Model in India. It modestly started in the mid 1970s by providing 4 300 very poor, often landless, households in remote rural areas with a complete package of milk production-enhancing technologies, organizational skills and a milk collection-processing-marketing system. It has since grown into a successful commercial dairy enterprise, collecting from more than 100 000 smallholder members of some 1 200 primary village cooperatives and then processing and distributing the milk to all major cities in the country. In 2006, smallholder milk producers sold 75 million litres of milk surplus. They also earned patronage dividends from Milk Vita’s profits. The resulting increase in milking cow numbers and savings generated has helped cushion them against the devastating effects of severe flooding that regularly afflicts the country.

A novel aspect of the Milk Vita operation is its urban distributor cooperatives. These use locally fabricated “milkshaws” – an insulated box mounted on a traditional three-wheeled-cycle rickshaw chassis – to deliver affordable pasteurized milk and dairy products to urban shops and consumers.

The Milk Vita model (Figure 2) created jobs, reduced collection and distribution costs and improved milk quality by cutting delivery times, especially in congested city areas. One off-farm job was created for every 35 litres of milk collected, processed and marketed, and more than half those jobs are in rural areas. Democratically elected milk producer and distributor cooperative members are now in the majority on Milk Vita’s board of directors. These achievements encouraged the Government to withdraw from the day-to-day management, enabling the board to hire professional managers, which led to improved performance and created a platform for further expansion to bring more poor people into the dairy value chain. Since the late 1990s, Milk Vita has invested more than \$10 million to expand its milk collection, processing and marketing network and now delivers safe and affordable milk and dairy products to some 5 million low-income urban dwellers.

Figure 2: Milk Vita Cooperative model



The benefits of the Milk Vita Cooperative model:

- The model is a holistic, cow-to-consumer model.
- Milk production and productivity increase.
- Household nutrition and incomes increase.
- Communities are empowered through poor farmers' participation in the organized cooperatives and through accountability of the Milk Vita board and management to its milk producer members.
- Quantity of affordable and safely processed milk and dairy products for urban consumers is increased while the quality is enhanced.
- Substantial off-farm employment is generated.

Milk Vita continues to be a flourishing venture and has many recent imitators that have set up similar enterprises to process and market 70 million litres of milk annually. However, these enterprises do not provide cattle development or productivity-enhancement support and technology to milk producers.

Box 1: Milk Vita helps one woman create a dairy cooperative and change her family's prospects

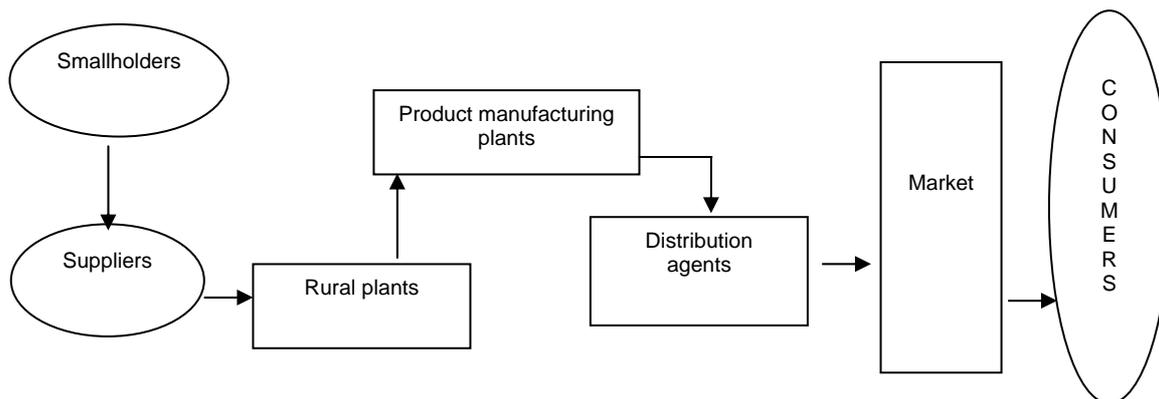
Sandhya Rani Bala lives with her family in the very poor village of Takerhat in Faridpur district, more than 200 km from Dhaka. Born in 1965, she married in 1980. With the help of her husband, she bought her first cow and started to sell her spare milk to Milk Vita to supplement her family's income. Encouraged by the support she received in the form of a fair milk price as well as patronage bonuses and animal husbandry support services, she helped form a village milk cooperative exclusively for women. It now registers more than 200 members. Mrs Bala initially earned 7 000 taka (\$100) per month selling her surplus milk. She has sold four cows over the past two decades, for which she earned approximately 200 000 taka (\$2 857) in addition to her regular milk sales and bonuses. She also bought an acre of land for 360 000 taka (\$5 150) for growing crops and fodder.

In 1995, Mrs Bala was elected to Milk Vita's board of directors, known as the Managing Committee, for two consecutive six-year terms. She says milk and cattle have changed her life and the lives of her family; her two sons were able to seek out higher educations, one now an engineer and the other in his final year studying medicine. Her husband has been very sick over the past four years, and the milk sales have financed part of his expensive treatment. Mrs Bala now owns eight cows, valued at about 400 000 taka (\$5 700) and sells 10 000 litres of milk annually, worth about 195 000 taka (\$2 800).

Private entrepreneur model

Private dairies, some owned by non-government organizations (NGOs), such as the Bangladesh Rural Advancement Committee (BRAC), usually operate through milk supplier/middlemen (known as *ghoshes* or *dudhwalas*) in place of rural groups or cooperatives (Figure 3). They collect milk for a specific dairy, however, smallholders involved in the system do not receive any value-added benefit – only the basic price for their milk.

Figure 3: Private entrepreneur model

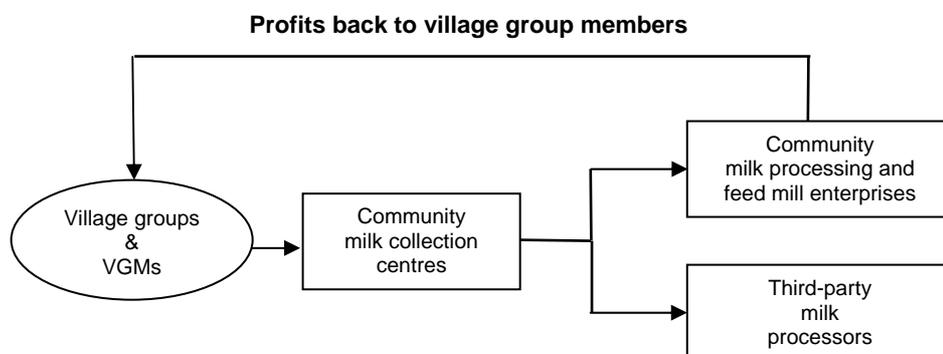


Grameen-CLDDP model

This is a profitable, integrated, community-owned crops-livestock-fish farming system that operates in one of the three poorest areas of the country and includes a dairy chain module. Established in 2000, the model was pioneered under the Grameen Bank/UNDP/FAO CLDDP project. Very poor landless families are organized into groups of five people. These village group members (VGMs) can access commercial loans for raising livestock and other income-generating activities. Some 80 percent of them have opted for dairy cows. The loans include compulsory animal feed and insurance components. VGMs have access, at full cost, to all the inputs needed to produce and market milk. They supply their milk surplus to community-owned milk collection centres for primary processing at community-owned dairy enterprises. The pre-processed milk is then sold to established dairies like Milk Vita, Bikrampur Dairy and Grameen Danone Foods for further processing and marketing. Some processed milk is also marketed locally. The VGMs own 70 percent of the community feed mill and dairy enterprises (Grameen owns the other 30 percent) and thus share in the profits. While in some ways it is a social dairying model, it is also commercial in operation.

The feed mill enterprises provide quality dairy rations, compounded from locally available agriculture by-products, for the VGMs who either have insufficient land or no land at all to grow their own feed and fodder. Once the smallholders have four or five cattle, they have enough dung to take a loan for a bio-digester to produce gas for cooking and lighting. The spent slurry from the bio-digester is then used to fertilize and increase the productivity of fish ponds. Every two or three years the ponds are emptied, the slurry dried and used as crop fertilizer. In this way, smallholder dairying has become an important component of an integrated and environmentally sustainable farming system for poor people.

Figure 4: Grameen-CLDDP model



Benefits for the village group members include:⁸

- Household nutrition; before the project, no households consumed milk, but now all 6 000 households with cows consume up to 1 litre of milk daily.
- Household earnings; the average daily earnings from fish and milk increased from \$.19 to \$1.25, enabling the purchase of other essential foods, schooling, etc.
- Household accumulation of physical assets; an increase of 145 percent for items such as tube wells for safe water, bio-digesters for clean cooking and lighting, sanitary latrines, etc.

So far, these benefits have resulted in moving more than 3 000 smallholder households out of poverty. The model is being scaled up across the country. For example, a Grameen Danone Foods Bogra Dairy started up in 2007 and produces inexpensive bio-yogurt for poor people. In five very poor districts in the Northwest, 10 000 smallholder families are being covered under a 10 billion rupee (\$15 million) programme that will operate until 2010 with funds and management from the Palli Karma-Sahayak Foundation.

Box 2: Cows, milk and one family's rise out of destitution

Lily Begum lives with her husband in Jokar Char village in Tangail district. Born in 1957, she married in 1972 at age 15. She had three sons, but the family lived in destitution. They used to own a tiny patch of land (one-fifth of an acre) until the Government appropriated it to build an elevated road in the mid 1990s. The family situation worsened until 1998 when the excavated land (such as the Begum's) was turned into fish farms. A Jokar Char Landless Women's Fish Centre was set up to manage some of the fish ponds, and Mrs Begum became a member. At that time she and her family lived in a kutcha (bamboo) house, with a few pieces of kutcha furniture. Mrs Begum first earned about 4 800 taka, or \$70, a year from her fish pond. When the Grameen Bank/UNDP/FAO Community Livestock and Dairy Development Project started, Mrs Begum borrowed 24 000 taka (\$378) from the new Grameen Bank Community Credit Scheme to buy a milk cow.

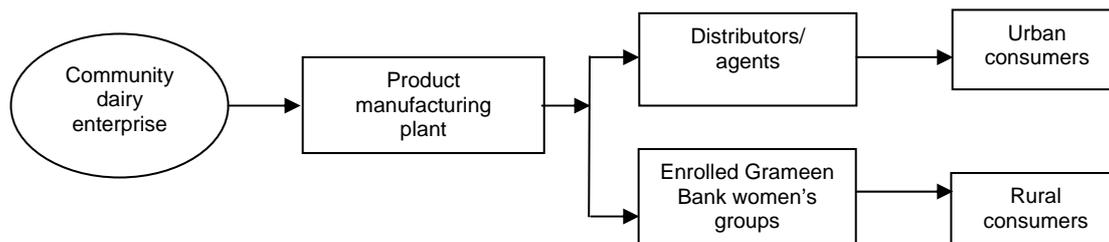
From 2000 to August 2007, she sold 13 500 litres of milk and earned 245 000 taka (\$3 550). Through her livestock, she earned a net profit of 162 000 taka (\$2 350), equivalent to 27 000 taka (\$390) per year. Currently, she has two milk cows and three calves, worth about 100 000 taka (\$1 450). With the earnings from the milk and selling animals, she established a rural engineering business for her elder son (the other two sons died), built two tin houses with concrete floors, built a bio-gas plant, purchased other household items (such as a refrigerator, a TV and furniture) and installed a tube well to provide clean water for her family and her neighbours.

Grameen Danone model

Grameen Danone Foods was created in 2006 as an innovative joint social venture between the Grameen Bank and Groupe Danone, a large French multinational dairy corporation renowned for its bio-yogurt. Danone recently established a new division called Danone Communities and gained approval from its shareholders to set up a 50 million Euro (\$70 million) mutual fund to channel investment into not-for-profit social ventures in developing countries. Ninety percent of the fund is invested in low-risk securities, the remaining 10 percent in higher-risk social ventures. The first social venture is Grameen Danone Foods, which produces low-cost, fortified yogurt for sale in rural communities. A pilot dairy enterprise was set up in Bogra. The long-term plan is build rural enterprises in ten other disadvantaged areas of Bangladesh. The Bogra enterprise began in February 2007 and currently purchases about 300–400 litres of milk daily from the Grameen–CLDDP Joysagar Dairy enterprise at Nimgatchi, about 50 km away.

⁸ Draft terminal report. Grameen Bank/UNDP/FAO Community Livestock and Dairy Development Project (BGD/98/009), 2007.

Figure 5: Grameen Danone model



Lessons learned

The following is a summary of some of the developments and lessons that have shaped smallholder milk production since organized dairying started in the latter half of the twentieth century in Bangladesh:

1. The country has a strong tradition of dairying, dominated by trader/middlemen and traditional indigenous milk products, which are still very important. Nearly all local milk is produced by smallholders and the sector is governed by the informal milk market (93 percent) while the formal market (7 percent) has a small but important and growing market share.
2. Long-term support from the Government and development partners/ projects kick-started the involvement of smallholders into formal dairy value chains; but schemes to promote larger, more intensive dairy farms have been largely unsuccessful due to poor services and market access. Government support is now very limited and has shifted to creating an enabling environment, with development efforts left to NGOs and the private sector.
3. Dairying can play an important role for poor rural families, especially for regular nutrition, income and jobs and in integrating farming systems (crop-fish-livestock) to optimize the use of available resources, including feed/fodder, land, water, etc.
4. Livestock and dairying enhance the capacity of poor rural people to cope with the annual monsoon floods (floods wash crops and fish away – livestock are kept at home and continue to produce food for home consumption and cash sales).
5. Successful models in which smallholders benefit from the complete dairy value chain include the Milk Vita Cooperative and the Grameen–CLDDP models. The Grameen–CLDDP model has been adapted for use in Nepal and inspired the local Grameen Danone Foods social business venture. The models provide assured markets for surplus milk plus the added value of ownership dividends and are reducing exploitation by middlemen money lenders.
6. The success of the Milk Vita model prompted substantial investment by others; currently, 14 dairy companies buy milk from nearly 300 000 smallholders. Private entrepreneur dairy models, however, provide limited value addition for smallholders in terms of livestock development services.
7. The dairy cow insurance scheme and feed mill enterprises play vital roles in the Grameen–CLDDP model, especially because smallholder dairy producers are prone to higher financial risk.
8. Condensed milk is produced from imported commodities, which, until very recently, were cheaper than fresh milk or locally produced condensed milk. Milk Vita is trying to compete with a product produced from fresh milk but has quality problems. BRAC and Milk Vita compete successfully with imported milk powder.
9. Domestic milk prices are no longer controlled. The recent substantial increase in the prices of internationally traded dairy commodities is creating opportunities for import substitution. There is strong interest in investing in the dairy sector; a favourable investment climate and high import tariffs (45 percent) are fostering foreign investment.

10. Modern, appropriate milk-processing technologies are now available at the plant level in about 20 districts (of 64), supported by local production of small-scale equipment.
11. School milk feeding schemes based on imported pre-packed milk are seen as counter-productive to sustainable smallholder dairy development.
12. There is an increasing awareness among governments, NGOs and the private sector about the significant economic and environmental benefits of sustainable and profitable social dairying in rural areas.

Conclusions and prospects

Tens of thousands of very poor rural households have moved out of poverty as a result of the successful introduction of the holistic Milk Vita and Grameen–CLDDP smallholder dairying models. Many families now own up to 20 cows and have intensified and commercialized their milk production. The two models embrace a complete cow-to-consumer package of input and output services, and their ongoing scaling up has helped put the dairy sector in Bangladesh in a unique position to take advantage of the recent huge increases in the cost of imported dairy products, especially milk powder, by substituting imports with domestically produced milk.

The policies proposed in the draft National Livestock Policy (2006) and the National Strategy of Accelerated Poverty Reduction (2005) recognize that milk produced at the community level by smallholder households can play a significant role in improving nutrition, incomes and jobs. It is clear that a more detailed, long-term dairy development strategy is needed to translate those policies into a national dairy programme that clearly focuses on smallholder milk producers.

Such a strategy might include a clear vision/mission statement for enhanced smallholder participation in dairying; it could promote smallholder dairying under the National Livestock Policy as one of the strategies to help Bangladesh achieve its Millennium Development Goals of halving poverty and halving under-nutrition by 2015.

Three overarching strategic objectives that would help expand the dairying sector:

- raising awareness among policy makers and consumers about the nutritional benefits of local milk and dairy products;
- increasing the number of smallholders involved in profitable milk production and dairy value chains through diversification and better integration of their household/farm businesses;
- encouraging processors to set up smallholder milk procurement systems to substitute imports and enhance national food security.

It is important that an inventory be undertaken of appropriate dairy chain models, including their:

- competitiveness
- investment costs
- associated risks.

This could be accompanied by an inventory of strategic public- and private-sector stakeholders and followed by the development of an indicative investment programme with a focused, time-bound national action plan containing realistic and measurable targets, such as raising milk and dairy products consumption from 18 kg to 25 kg by 2015.

Government and dairy stakeholders should jointly develop the strategy, which should clearly identify the areas best addressed by the public sector and those best addressed by the private sector. The strategy would then inform policy-makers and industry stakeholders about opportunities for future investments in smallholder-oriented dairy development.

Box 3: Key definitions

Smallholder milk producer: Person or household, often landless or without assets, engaged in milk production for economic return on surplus milk, usually owning up to three cows.

Smallholder dairy farmer: Milk producers linked to milk processors through cooperatives or associations, or individually by milk traders/middlemen. Initially, they start with one animal but have potential to grow. Many household have moved out of poverty and now have 20 or more milk animals.

Informal market: Markets near to producer locations where producers directly or through traders collecting milk from farmers' homesteads sell milk to consumers or middlemen suppliers of sweetmeat shops, bakeries or against other trading contracts.

Formal market: The guaranteed market for smallholder milk producers in which regular processed milk and milk dairy products supply consumers, including institutional buyers such as hotels, restaurants, airline kitchens, superstores, etc.

Dairy value chain: The stages through which milk and dairy products are marketed from producer to consumer.

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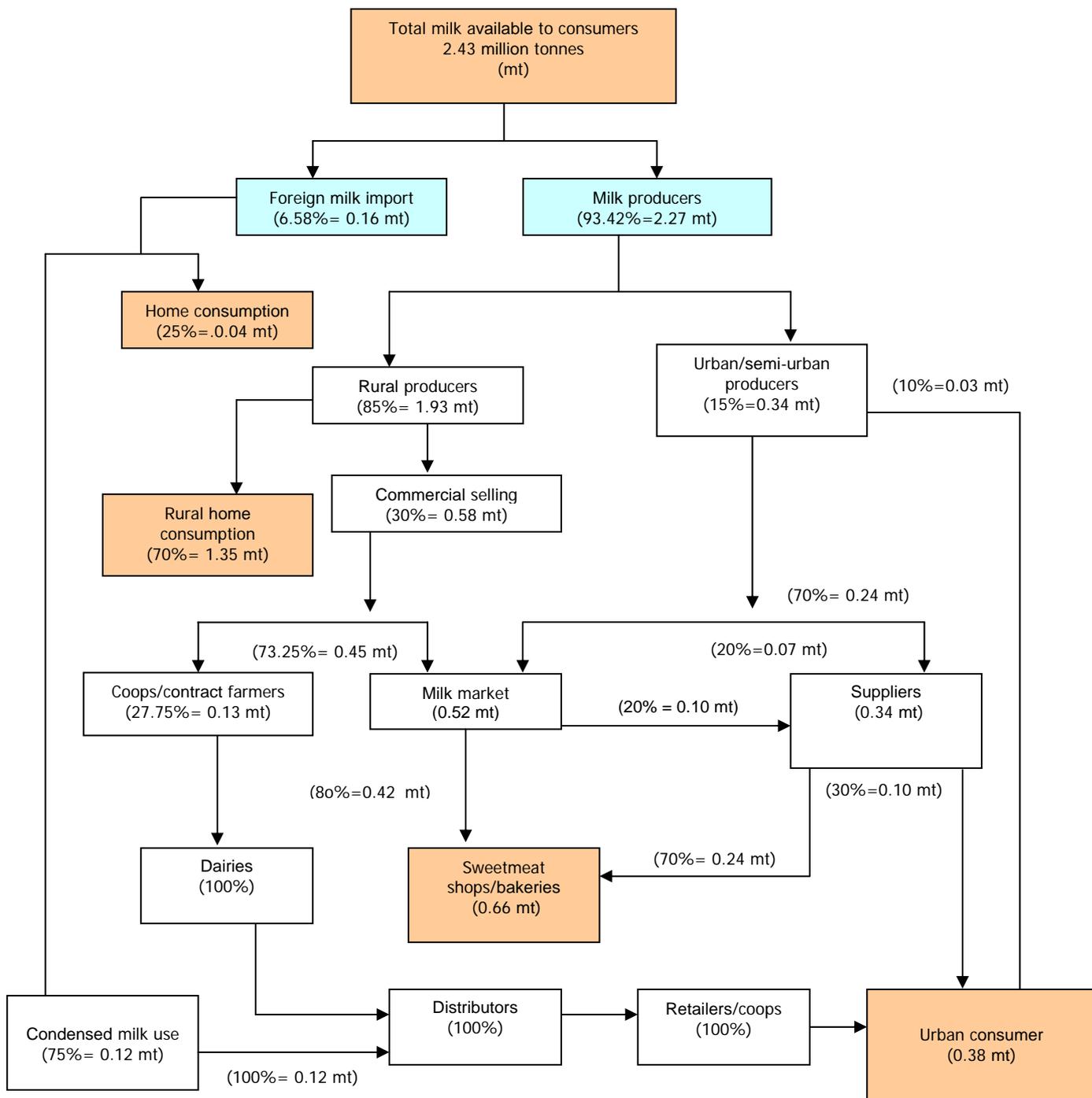
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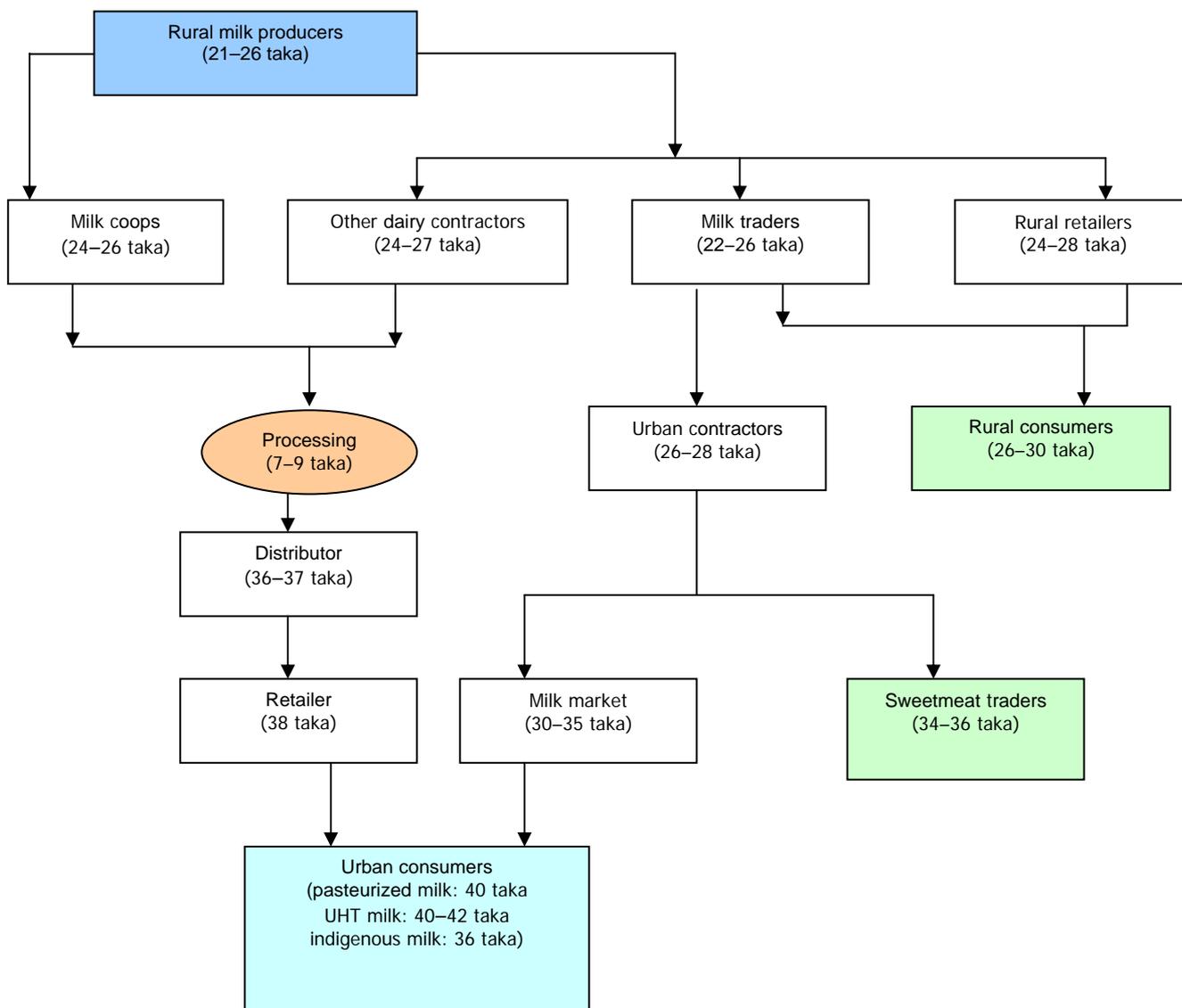
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Annex I: Milk flow chart



Milk production information from the Directorate of Livestock Services, processing information from dairy plants and flow data estimated from market operation /tendency.

Annex II: Milk price chart (December 2007)



Conversion: 70 taka = US\$1
 Cooperatives, other dairies and the market.

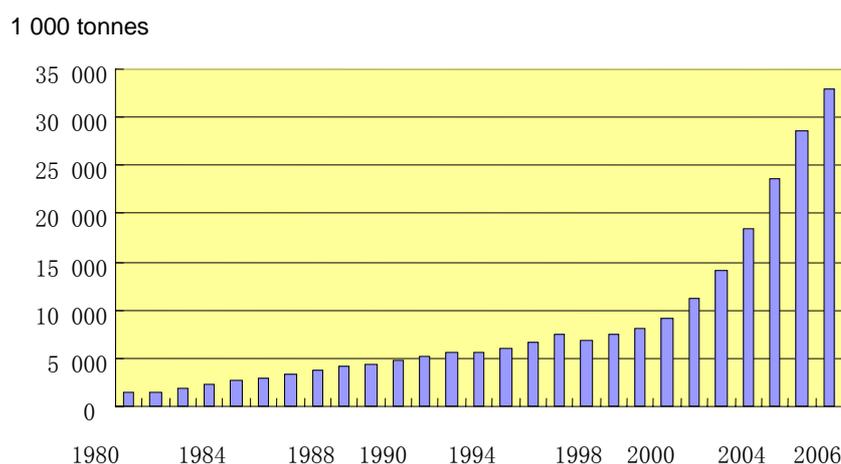
China: Dairy product quality as the new industry driver

Dinghuan Hu
Agricultural Economic Research Institute,
Chinese Academy of Agriculture Science
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China's population represents one-fifth of the global total, but total dairy product output accounts for only 4 percent of world production. Since the beginning of the twentieth-first century, however, the industry has been rapidly growing. Dairy product production jumped exponentially, from 9.2 million tonnes in 2000 to 33.7 million tonnes in 2006 (Figure 1). This striking development of the dairy industry has allowed the industry to fill the increasing domestic consumption demands and, more importantly, to provide employment and increased income for small farming households.⁹

This case study identifies the factors affecting China's dairy industry, reviews the implications for smallholder dairy farmers and offers suggestions on how to link them to the growth in demand. It is quite possible that some of the lessons learned in China, within the context of the industry's history and the current situation, will be helpful in linking small producers to markets in other Asian developing countries.

Figure 1: Milk output in China, 1980–2006



Source: *Chinese statistical yearbook*

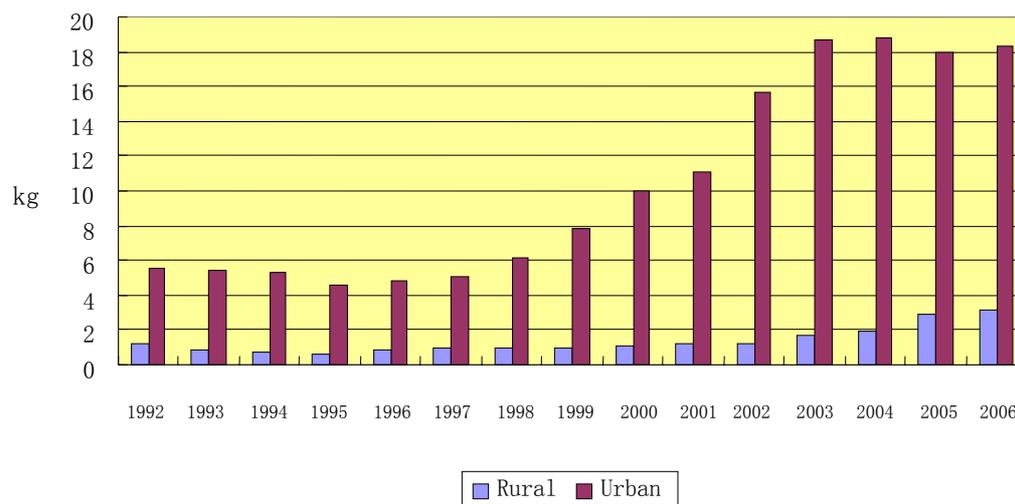
Dairy development in China

The economic reforms that began in the 1970s laid the foundations for a rapid development of the Chinese economy in general as well as the dairy industry. In 1980, total milk output was 1.4 million tonnes; by 2006, it had swelled to 33 million tonnes, with per capita consumption of milk rising from 1 kg to 25 kg over the same period (Figure 2).

There is a major difference in consumption of dairy products between urban and rural residents. The per capita consumption of dairy products among urban residents was nearly 6 kg in 1992, increasing to 18 kg by 2006. Among rural residents, the per capita consumption increased from 1 kg to 3 kg over the same period. The per capita consumption of dairy products of rural residents averaged only 17 percent of that of urban residents by 2006. Rural residents' consumption of dairy products is mainly constrained by low incomes but also by a limited tradition of fresh milk consumption (Hu, Fuller and Readron, 2005).

⁹ The income from dairy cow raising is higher than that from crop planting in China.

Figure 2: Per capita consumption of dairy products in rural and urban households



Source: *Chinese statistical yearbook*

From the 1970s to the beginning of the current century, the development of China's dairy industry can be broken down in three phases: i) the urban dairy industry phase, ii) the dairy industry phase in northern China and iii) the multi-modal dairy industry phase.

Urban dairy industry phase

Urban dairy development is also called the "urban suburbs dairy industry", which refers to the dependence on raw milk from suburban dairy farms (or nearby regions, including dairy cattle husbandry by rural households near medium- and large-sized cities) for the manufacture of dairy products consumed by urban residents (Xu Ji *et al.*, 1991). Traditionally, apart from minority ethnic nationalities inhabiting western pastoral regions, the Han nationality (representing 95 percent of China's total population) do not have a cultural tradition of consuming milk and other dairy products (Chen Zhao, 2001).

Initially, the practice of raising dairy cattle was to meet foreigners' demand for dairy products, with most of the cattle transported from Europe. With most foreigners inhabiting coastal cities, the early urban dairy industry concentrated there. Shanghai was one of the five open coastal cities in 1842. Special-purpose dairy cattle breeds were introduced to Shanghai from Europe before 1870 (Dong Debao *et al.*, 2000). In Tianjin, foreign missionaries brought the dairy cattle in the late nineteenth century (Wang Shugui, 2000), while foreign residents from Japan and Russia brought their cattle to Dalian City during the Japan–Russia War (Dalian City Dairy Products Project Office, 2000).

Influenced by the consumption habits of those foreigners, the Chinese urban residents realized the nutritional benefits of dairy products. This was reinforced by the changing food consumption tendencies of Chinese who lived abroad. The number of people drinking milk increased, generating dairy product markets in medium- and large-sized cities (Li Yifang, 1998). Chinese- and foreigner-operated dairy farms as well as rural households in the suburbs of the large cities supplied the raw milk for the urban demand (Dong Debao, 2000; Liu Yuanying, 2000). In 1956, the Government started its private-ownership reforms, and dairy cattle raised by private entrepreneurs were transferred to farms affiliated with the state-owned dairy-processing enterprises or to state farms in the suburbs (Wang Shugui, 2000).

Between 1949 and 1979, the growth rate of the Chinese raw milk supply slowed, increasing at an annual rate of 5 percent and increasing from 210 000 tonnes in 1949 to almost a million tonnes by 1979. The slowed growth was attributed to inadequate marketing systems and an inadequate feed supply. Because the supply of dairy products could not meet consumption requirements, the Government implemented an allocation system to ensure that old people, babies, medical patients and officials of a certain grade level were adequately supplied. There were no similar guarantees in small-sized cities and rural areas (Tuo Guozhu, 2000). It wasn't until the 1980s that rapid growth of the urban dairy industry took off.

Factors underpinning urban dairy development

Multiple factors triggered the rapid development: macro-economic issues, government policies and international assistance. Initially, rising urban incomes supported a growing demand for dairy products. The gap between consumption and production grew, and in cities, especially large cities, the fresh milk supply situation became “very tense” (Xu Ji *et al.*, 1991). To reduce these imbalances, the Government adopted policies to increase the productive capacity of the urban dairy industry. This included allowing private players to raise dairy cattle and contribute to the milk supply, thus breaking the single state-ownership monopoly (Tuo Guozhu, 2000).

To increase the purchase price of raw milk, the Government introduced milk price subsidies, which also stimulated the growth in milk consumption (Liu Yuanying, 2000). In addition, the Government invested a large amount of funds to further develop the industry. For example, the Beijing municipal government allocated US\$400 000 annually as a special fund to support dairy cattle development. It provided subsidies for cattle shed renovations and for new equipment on dairy farms (Liu Yuanying, 2000).

In the 1980s, China encountered imbalances in its grain supply, and some cities adopted the policy of exchanging grain for milk. In other words, the Government provided dairy farmers with a certain proportion of feed, based on the number of dairy cattle they owned (Chongqing Municipal Dairy Industry Administration Office, 2000). In addition, the Government adopted support policies that favoured suburban rural households raising dairy cattle (Ouyang Qian, 2000).

International assistance also played an active role in the industry development, thus increasing the milk supply. Approximately 20 medium- and large-sized cities received a total of \$156 million from the World Food Programme (WFP) and the European Economic Community (Tuo Guozhu, 2000).

Prior to the 1990s, the major products in large cities, such as Beijing, Shanghai, Tianjin, Dalian, Nanjing, and Kunming, were pasteurized milk and small quantities of milk powder. Due to the limited supply of fresh milk, pasteurized milk provided the only form of liquid milk to urban residents.

Even though China was moving towards a market economy as of the early 1990s, people’s lifestyles were still fairly regulated. That situation combined with the limited selection of products and the lack of refrigeration resulted in the habit of drinking milk only in the morning. Dairy processing enterprises have since developed sophisticated distribution systems, providing milk to consumers at any time.

However, since the 1990s, the growth rate of the urban dairy industry supply has declined. In Beijing, for example, dairy product output in 1990 was 77 000 tonnes. By 1999, it was only 129 000 tonnes, with an annual growth rate of 0.46 percent. In many cities, the annual growth rate has averaged less than 1 percent, far below the growth rate of double-digit gains during the 1985–1990 period: 11.8 percent in Beijing, 12 percent in Shanghai and 15 percent in Tianjin.

The falling growth in urban dairy systems is attributed to the following factors:

- rapid development of the national economy, which prompted urban industries, housing construction and commerce to expand outside of city limits, raising land values and thus restricting the construction of dairy farms;
- increasing wage rates in urban suburbs;
- environmental regulations that required original dairy farms, gradually surrounded by new residential houses, to close or move farther from the downtown area;
- decreasing and higher-priced farmland and a scarcity of fodder and feed resources;
- higher production costs, influenced by many of the other four factors, which reduced profitability; for instance, the Bright Dairy and Food Co., one of the largest dairy-processing enterprises in Shanghai, had ten dairy farms in 1985 and only two in the early 2000s, after the others had been shut down and/or consolidated (Jiang Yaming, 2004; Wang Yongkang, 2004).¹⁰

¹⁰ The author of this case study report visited the Ninth Pastoral Farm of the Shanghai Bright Group to talk with the farm’s director, Jiang Yaming, who mentioned the major difficulties in operations; this is the summary of his five points.

The dairy industry phase in northern China (1980–2000)

China's overall raw milk supply has not declined in the context of lower urban or peri-urban availability. Rather, the North China agricultural region gradually became the major source of raw milk to dairy processors in the country. The North China agricultural region refers to the crop cultivation zone north of the Yellow River, especially those located in Inner Mongolia Autonomous Region and Heilongjiang and Hebei provinces.¹¹ In 1975, the raw milk output of those three areas totalled less than a million tonnes and accounted for only 13 percent of the national total. By 1985, the regional output more than doubled, to 2.4 million tonnes and then rose to 10.7 million tonnes a decade later. In 2006, the total output of the three areas jumped to 18 million tonnes, or more than half of the national output (Table 1).

Table 1: Raw milk output in the North China agricultural region

	1975	1980	1985	1990	1995	2000	2005	2006
Output (100 t)								
Inner Mongolia	645	702	2 590	3 960	5 120	8 300	6 969	8 805
Hebei	216	265	1 000	1 430	3 890	9 620	3 486	4 170
Heilongjiang	130	1 385	1 540	1 027	1 666	1 565	4 442	4 646
Total	991	2 352	5 130	6 417	10 676	19 485	14 897	17 621
National	7 552	13 422	28 940	47 510	67 260	91 890	28 648	33 663
Ratio (%)								
Inner Mongolia	8.5	5.2	8.9	8.3	7.6	9.0	24.3	26.2
Hebei	2.9	2.0	3.5	3.0	5.8	10.5	12.2	12.4
Heilongjiang	1.7	10.3	5.3	2.2	2.5	1.7	15.5	13.8
Total	13.1	17.5	17.7	13.5	15.9	21.2	52.0	52.3
National	100	100	100	100	100	100	100	100

Source: *China dairy statistical report*, Department of China Dairy Yearbook

The remarkable and rapid development of the dairy industry in these three areas can be attributed to many reasons favouring competitiveness and production. Compared with dairy husbandry in the suburbs or even in some of the agricultural regions south of the Yellow River, these areas have encouraging conditions for dairy cattle husbandry. Per capita farmland availability in Heilongjiang and Inner Mongolia is 0.6 h and 0.5 h, respectively, exceeding the national average by 0.3 h. It is certainly far larger than the per capita farmland in the suburbs of Beijing, Shanghai and Tianjin (0.2 h, 0.1 h and 0.3 h, respectively). These three areas have fairly abundant labour resources and low wages. For example, the proportion of the population of rural residents engaged off-farm is 18 percent (Hebei), 11 percent (Heilongjiang) and 10 percent (Inner Mongolia), compared with 74 percent in Shanghai, 66 percent in Beijing and 54 percent in Tianjin.¹²

Wage rates also play a decisive role in determining the production cost of raw milk. At \$400, the per capita income in the North China agricultural region is lower than in the suburbs and among rural residents in South China. In Beijing, Jiangsu, Shanghai, Tianjin and Zhejiang, it ranges from \$627 to \$883. As well, air temperature influences a cow's milk production; the average temperature in North China is more than 3°C lower than in South China.

Additional factors supporting dairy development in the North China agricultural region: i) Dairy product consumption in medium- and large-sized cities has exceeded the development pace of urban dairy industries. ii) Local governments have adopted policies to promote industry development. iii) Investment in dairy-processing enterprises has increased. iv) Available credit, foreign investment and access to technology also have increased.

¹¹ In the North China Pastoral Zone, due to serious desertification of grassland, inconvenient communication access and other reasons, the dairy industry has not developed as expected (John Longworth, 1998).

¹² In Jiangsu and Zhejiang provinces in South China, the share of rural residents working off-farm is 56 percent and 63 percent, respectively.

Growth in dairy consumption prompts a regional shift in dairy production

From 1992 to 2000, the annual average growth rate of the raw milk supply was 3 percent in Beijing, 9 percent in Tianjin and 0.8 percent in Shanghai. However, during the same period, expenditure on dairy products in those three cities grew at an annual average rate of 52 percent, 33 percent and 29 percent, respectively. The gap between supply and demand has created conditions for dairy products from other regions to enter the urban markets.

Local policies support the process

The financing of local governments in China is heavily reliant on local taxation. This dependency has prompted local governments to actively develop and attract outside businesses to local regions through tax policies. In the coastal regions in South China, due to their existing industrial base, local governments have initiated policies on taxation in town and village enterprises (TVEs). At the same time, they have absorbed rural labourers in large quantities so as to increase the income of rural residents (Sonobe, Hu, Otsuka, 2002; Hu, 2003).

In the North China agricultural region, which lacked an industrial base as of the 1980s, the local governments pushed to develop the local dairy industry through policy and capital support. For example, the government of Inner Mongolia listed the dairy product processing industry as the leading sector of the whole autonomous region. From 1980 to 1985, total investment in dairy product processing was \$11 million, and the autonomous region initiated the technical transformation and expansion of 25 dairy-processing enterprises (E. Guangyu, 2000). The governments of Shijiazhuang City and Tangshan City in Hebei province perceived the dairy industry as a “pillar” for development in general and made use of preferential policies to support the dairy industry and leading enterprises, encourage rural farmers in dairy cow husbandry and attract outside investment. To encourage more enterprise investment, those city governments reduced by half, over a five-year period, the local portion of the income tax required for production, dairy product processing and feed-processing enterprises. As well, investment initiatives of more than \$3.75 million were exempted from land-use taxation, and land rent fees were reduced by half (MOA Dairy Industry Project Office, 2004).

The original dairy-processing enterprises in the North China agricultural region were small in scale with limited processing capacity. For example, in 1978, Heilongjiang province had 34 dairy-processing enterprises, with a daily processing fresh milk capacity of 340 tonnes, or an average daily processing capacity of only 10 tonnes per enterprise (Zhang Xiulan, 2000). In Hebei province, the daily fresh milk-processing capacity (excluding Sanlu Dairy Group) was less than 5 tonnes (Ju Guoquan, 2000).

Dairy product processing expansion in Inner Mongolia

By 1987, the number of dairy-processing enterprises in Inner Mongolia had increased to over 100. However, with limited market access to the high-demand areas in China, more than half of the processing capacity was not used (E. Guangyu, 2000). For instance, the Huhhot Hui Nationality Food Processing Plant (which later became the Yili Industrial Group (Yili Group)) had total fixed assets of only \$8 000, consisting of small factories and hand-made workshops. With the change in management came multiple system reforms. In 1993, the Yili Group became an equity enterprise, and in 1996, its stock was sold on the Shanghai Stock Exchange Institute. By going public, Yili leveraged funds urgently needed for expansion; its revenues reached \$106 million, generating profit of \$8.2 million. That expansion contributed to the daily fresh milk-processing capacity in Inner Mongolia reaching 2 900 tonnes (Yili Group, 1999, 2003).

The China Meng Niu Dairy (later called the Inner Mongolia Meng Niu Dairy or Meng Niu Group) was established in July 1999 as a dairy-processing enterprise with high-level administrators and technicians taken from the Yili Group and with investment funds of only \$1.25 million. Adopting a strategy of “establishing the market first and then establishing the factory”, the sales of Meng Niu dairy products increased from \$5 million in 1999 to \$263 million in 2002. Its fresh milk daily processing capacity increased by 1 700 tonnes (Niu Gensheng, 2003).

The successful processing enterprises also included the Wandashan Dairy in Heilongjiang province (Zheng Xinmin, 2003) and Sanlu Dairy Group Co.¹³ of Shijiazhuang in Hebei province (Gao Yucheng, 2003). These enterprises absorbed local resources and, with loans, expanded their processing capacity while establishing milking stations. They additionally expanded dairy husbandry to increase the fluid milk supply in the region (Hu, 2005).

Financial support for industry expansion

Large quantities of capital funds have been invested into the dairy-processing enterprises in the North China agricultural region. Having listed on the Chinese exchange in 1996, Yili's stock had acquired \$49 million from capital markets as of end 2003 (Yili, 2004). Meng Niu procured a total of \$1.706 billion from the Hong Kong stock market (Xie Baokang, Cheng Dong, 2004). The investment has provided enterprises in the region with adequate funds to expand factories, invest in modern equipment and technologies, assist rural households in dairy cattle husbandry in surrounding regions to expand their milk supply and develop sophisticated product-marketing strategies.

Foreign capital entered the North China agricultural region through joint ventures, establishing processing enterprises and making use of the local resource advantages to benefit from the growing demand for dairy products throughout the country. The Shuangcheng Nestlé Co. is a joint venture between the Swiss Nestlé Co. and Shuangcheng Dairy and Food Industry Co., producing milk powder as its major product. Total investment, generating an average daily fresh milk processing capacity of 900 tonnes, has increased from \$10 million to \$75.8 million. The three international financial institutions of Morgan Stanley, Yinglian Investment and Dinghui Investment injected funds into the enterprise in October 2002 and October 2003. In the first-round capital increment, those three institutions provided a total of \$26 million, drawn from companies abroad; in the second round, they invested a total of \$35 million (Yu Yongfang, 2005).

New technologies open markets

The dairy industry in the North China agricultural region started to grow in the 1980s. This movement has linked to the growing demand in the South China market where the per capita income was higher, particularly in medium- and large-sized cities. At that time, the major product was milk powder due to restricting transportation conditions and the lack of cold chain facilities. The proportion of national milk powder produced in the region was 58 percent in 1982, rising to 78 percent by 1991. However, it declined to 69 percent by 1997 (Nan Qingxian, Lu Ling, 2000). Dairy product supplies from the North China agricultural region currently dominate national production.

Through the production of processed milk powder, the abundant raw milk resources in the North China agricultural region were tapped, but it had disadvantages. In particular, the use of milk powder was not very convenient and the taste was not perceived as good as liquid milk. More importantly, many urban consumers believed that milk powder was not as nutritious as liquid milk (Guo Benheng, Zheng Xiaoping, 2000). These perceptions restricted further growth of milk powder consumption and created a surplus. By end 1997, 50 000 tonnes of milk powder were in stock, accounting for 15 percent of the total national milk powder output. This resulted in financial difficulties for some small- and medium-scale processing enterprises, in some cases even bankruptcy, which impacted the income of dairy farms and dairy cow-raising households that provided raw milk to those enterprises (Tuo Guozhu, 1999).

At that time, however, the dairy industry in North China identified a new development opportunity: ultra-high temperature (UHT) processing technology. Introduced by foreign enterprises to meet the demand of high-income consumers, UHT technology fed on large quantities of raw milk to eventually produce low-cost milk products. Initially, the products were more expensive and thus of little interest to consumers in medium- and large-sized markets (Hu, 2005). The Yili Group began using UHT processing equipment from the Swedish Tetra Laval Holdings & Finance SA in 1996, going into production a year later. Reward came swift. By second quarter 1998, UHT milk was in strong demand among consumers in medium- and large-sized cities (Sun Xianhong, Zhang Zhiguo, 2006). Meng Niu acquired its UHT technology in 1999; a year later it

¹³ This paper was written before the company declared bankruptcy as a result of the 2008 scandals related to milk products containing melamine.

adopted new packaging, developed by the same Swedish company. Although it reduced the cost of the final product, its shelf life also reduced, from the original 6 months to 45 days. The low-cost UHT milk enabled Meng Niu to enhance its competitiveness and expand its market share in medium- and large-sized cities (Sun Xianhong, Zhang Zhiguo, 2006).

According to the China Association of Dairy Product Industry, the output of UHT milk increased from 2 million tonnes in 1999 to 3.8 million tonnes in 2000 and to a remarkable 48 million tonnes in 2004. Its share of liquid milk output increased from one-fifth in 1999 to nearly 60 percent by 2004 (Table 2).

Table 2: The output and proportion of liquid milk variety in China¹⁴

	1999	2000	2001	2002	2003	2004
Output ('000s)						
Pasteurized milk	5 815	8 291	6 965	10 485	12 549	18 470
UHT	2 045	3 785	7 146	15 397	31 987	47 820
Yoghurt and other	1 640	2 827	4 126	7 520	9 030	14 380
Total	9 500	14 903	18 237	33 402	53 566	80 670
Proportion (%)						
Pasteurized milk	61.2	55.6	38.2	31.4	23.4	22.9
UHT	21.5	25.4	39.2	46.1	59.7	59.3
Yoghurt and other	17.3	19	22.6	22.5	16.9	17.8
Total	100	100	100	100	100	100

Source: China Dairy Industry Association

The rapid expansion of UHT milk in China resulted from several conditions:

- UHT milk allowed fresh milk to be transformed to meet the shortage of urban milk and effectively used the milk resources in North China to meet the demand of the broad mass of consumers in medium- and large-sized cities.
- The problems of liquid milk transportation and long-distance transportation were solved by technology that didn't require a cold chain system.
- UHT milk can be preserved under constant temperature for a fairly long period of time, thus allowing consumers to buy several boxes and thus avoid the inconvenience of purchasing milk daily.
- It eliminated the need for household delivery of fresh milk and overcame the requirements of limited milk consumption to only certain times of the day, especially among higher-income consumers who frequently travelled and had less time flexibility than lower-income consumers.
- It is ideal for retail store stocking, particularly because it doesn't require refrigeration.
- Advertising convinced consumers that UHT milk is more nutritious than pasteurized milk (Hu, 2005).

The UHT technology was instrumental in opening markets to the dairy-processing enterprises in North China and thus to the region's rapid development of dairy cow husbandry (Hu, 2005). Having a good resource base and competitively produced milk allowed the region to dominate in the liquid milk market and become competitive with urban processing enterprises. Yili is now the second-largest and Meng Niu the third-largest dairy-processing enterprises in China, behind the Shanghai Bright Dairy.

Multi-modal dairy industry phase (2000 to the present)

Since 2000 and supported by the sustainable and high-speed development of the dairy sector, the market in China has gradually changed from one of shortage to relative surplus (Tuo Guozhu, 2000). There have been two primary supporting factors: first, local economies and governments adopted accommodating policies, which resulted in dairy-processing enterprises expanding investment that pushed production beyond consumption. According to the China Association of Dairy Industry, by 2002 the capacity of the national dairy-processing industry exceeded the country's processing needs by 30 percent (Fang Yousheng, 2003). Second, heightened competition to capture greater market share led dairy-processing enterprises to reduce prices (Yi Chengjie, 2004). Thus the small enterprises that operated with obsolete equipment and backward

¹⁴ The association has not published any new data since 2004.

technology, were poorly managed and lacked product competitiveness were forced out of business (Tuo Guozhu, 2000). It was at this point that China's dairy industry entered into a multi-modal development phase: dairy industry restructuring became characterized by integration and asset recombination.

The first development in this multi-modal industry phase was **a linking between, or gradual integration of, dairy enterprises in the North China agricultural region and urban dairy enterprises**, leading to a gradual disappearance of enterprise borders. The original urban dairy enterprises started to feel pressure as Meng Niu, Yili, Sanlu, Wandashan, etc. entered into markets of medium- and large-sized cities with their UHT milk and milk powder. Peri-urban dairy enterprises that had certain scale and market share quickly adapted their original strategy of safeguarding suburban resources through sales of pasteurized milk and started to explore foreign, export markets. During this period, the Shanghai Bright Dairy formed its development strategy of "using national resources to explore the national market" (Wang Jiafen, 2002). Here, "resources" refer to the milk supply in Heilongjiang province and Inner Mongolia. By building dairy-processing factories in North China, where the milk source is abundant, the Bright Dairy procured its low-cost raw milk. The "national market" refers to cities beyond Shanghai. In 2002, Bright Dairy's share of total milk sales beyond Shanghai reached more than 60 percent (Wang Jiafen, 2003).

By 2004, Bright Dairy operated 14 dairy-processing factories in 11 provinces and autonomous regions beyond Shanghai. Currently, it has a total daily milk-processing capacity of 6 508 tonnes (including dairy product processing plants in Shanghai). Its major milk source is North China, specifically from processing factories in Inner Mongolia (UHT milk) and Heilongjiang province (milk powder). Obviously, accessing resources enabled Bright Dairy to compete with the Meng Niu and Yili enterprises in North China.

Bright Dairy also has processing factories in Beijing and Tianjin, with major products consisting of pasteurized milk, yogurt and dairy beverages. Its aim is to seize the dairy markets in other cities. And it has processing factories in Jiangsu, Henan, Hubei, Hunan, Guangdong and Shaanxi to make use of local raw milk resources and thus dominate the markets in those cities.

The Beijing Sanyuan Group Foods in Beijing also has established a factory in Inner Mongolia, producing UHT milk, milk powder and yogurt. The company has a factory in Shanghai to produce pasteurized milk, yogurt and dairy beverage that compete with the Bright Dairy. The Nanjing Weigang Dairy Group in Nanjing, Jiangsu province, operates processing factories in Shanghai and in Anhui and Jiangxi provinces to expand its market share in those areas (Table 3).

Table 3: Distribution of factories of China's top eight dairy-processing enterprises

Enterprise	District	No. of processing factories	Daily processing capability (tonnes)	Main products					
				Fresh milk	UHT	Yogurt	Dairy drink	Milk powder	Others
Sanyuan	Beijing	7	1 227	*	*	*	*		*
	Tianjin	1	100	*					
	Inner Mongolia	2	350	*	*		*	*	
	Shanghai	2	130	*		*	*		
Bright Dairy	Beijing	4	360	*		*	*		
	Tianjin	1	300	*		*			
	Heilongjiang	1	1 000		*			*	
	Inner Mongolia	1	350		*				
	Shanghai	4	3 750	*	*	*	*		*
	Jiangsu	2	250	*		*	*		
	Henan	1	140	*	*	*			
	Hubei	1	128	*	*	*		*	
	Hunan	1	80	*		*			
	Guangdong	1	300	*		*	*		
Meng Niu	Shanxi	1	200		*	*			
	Beijing	1	250			*	*		
	Inner Mongolia	2	5 700		*		*		
Yili	Henan	1	800		*				*
	Beijing	1	500			*	*		*
	Hebei	2	360		*		*	*	
	Inner Mongolia	2	5 600		*	*		*	
	Shanghai	1	280			*	*		*
	Heilongjiang	2	240		*			*	
Wandashan	Shanxi	1	800		*	*			
	Tianjin	1	350			*	*		
	Liaoning	1	150		*		*		
Weiwei	Heilongjiang	1	1 200		*			*	
	Jiangsu	1	560	*					*
	Shandong	2	600	*	*	*	*		
	Shanxi	1	180	*		*		*	
Sanlu	Hebei	10	3 660	*	*	*	*	*	*
	Henan	1	460	*	*	*			
Weigang	Shanghai	1	50	*					
	Jiangsu	4	500	*	*	*	*	*	
	Anhui	1	50	*					
	Jiangxi	1	70	*	*	*	*		

Source: *China dairy statistical report, 2005*, Department of China Dairy Yearbook

The Yili Group went on to open factories in Beijing and bought a processing enterprise in Shanghai to produce pasteurized milk, yogurt, dairy beverages and ice cream and thus avoid long-distance transportation requirements. The Meng Niu Group has broadened its production to include yogurt and dairy beverages.

The second development in the multi-modal industry phase was the **expanding diversity of dairy products**. Since 2000, choice among dairy products in China has increased very rapidly. In 2003, a variety investigation by the China Association of Dairy Industry found a total of 381 dairy products produced by different manufacturers on the shelves in the Huapu, Jingkelong and 11 other supermarkets in Beijing. They included 45 types of pasteurized milk, 45 UHT milk choices, 111 types of yogurt, 62 different whole milk powders, 8 sugar-added whole milk powder varieties, 16 skimmed milk powder types and 94 different baby formulated milk powders (Li Yifang, 2003). In January 2006, students at the Graduate School of the Chinese Academy of Agricultural Sciences conducted a survey on liquid milk marketing in nine supermarkets in Beijing. They found that, on average, each supermarket offered 167 varieties of liquid milk, consisting of 6 types of pasteurized milk, 32 UHT milk varieties, 93 different types of yogurts and 36 distinct dairy beverages (Table 4).

Table 4: The variety of dairy products sold in nine Beijing supermarkets

Supermarket	Area of shopping	Food area size	Total products varieties	Area of frozen dairy products	Area of fresh dairy products	Varieties of dairy products
	sq m		No.	sq m		No.
Carrefour	16 000	4 500	22 000	155	220	181
Wal-Mart	18 000	5 000	20 000	120	180	272
Lotus	12 600	3 500	18 000	80	150	127
Chengxiangcangchu	2 500	1 200	5 100	35	50	190
Chaoshifa, Shuangan Store	700	550	3 000	25	30	179
Champion	3 000	2 000	4 500	80	120	126
Chaoshifa Shuangyushu Store	3 960	1 800	6 000	30	50	182
Chaoshifa Nongkeyuan Store	1 560	780	4 200	20	30	126
Xidan	4500	1700	4200	50	70	124

Source: Survey data by the author and students, February 2006

The rapid increase of dairy product varieties is in response to strong competition for dairy products by consumers, with each “large-scale dairy product processing company relying on the development of new products to expand their market and increase the added value of dairy products to obtain even higher return” (Du Binhua, 2003).

The third dimension of the multi-modal industry phase was the **concentrating of dairy-processing capacity in large-scale enterprises**. The number of dairy-processing enterprises with a capacity of more than 50 tonnes per day was 698 in 2005 and 717 in 2006, generating total sales of \$6.1 billion and \$7.7 billion, respectively. The top-ten ranking of these enterprises, according to sales, are Yili, Meng Niu, Sanlu, Bright Dairy, Mead Johnson, Jiabao, Wandashan, Taizinai and Yahua. The total sales of those ten top enterprises were \$6.1 billion in 2005 and \$7.7 billion in 2006. Although those ten enterprises represented less than 2 percent of the total number of dairy-processing enterprises in China also in 2005 and 2006, their combined sales exceeded more than half of the total dairy product sales (Table 5).

Table 5: The total sales of the top-ten dairy-processing enterprises (unit: US\$ million)

Enterprise name	2005	2006
Yili	1 623.3	2 178.5
Meng Niu	1 443.3	2 166.1
Sanlu	993.9	1 158.0
Bright	920.5	961.7
Meadjohnson	200.0	266.7
Jiabao	254.4	254.4
Shuangcheng Nestlé	360.0	244.7
Wandashan	200.0	206.7
Taizinai	62.7	156.8
Yahua	38.1	145.7
Total	6 096.3	7 739.3
National gross sales	11 491.1	13 885.6
Proportion of national gross sales (of the 10) (%)	53.1	55.7

Source: *China dairy statistical report*, 2006 and 2007

The fourth development is that in order to seize the market, the dairy-processing enterprises had to hugely **invest in marketing and advertising** to improve their products' image among consumers. According to ACNielsen, total advertising expenditure for dairy products in January–October 2003 was \$353 million. Of that, Fujian Changfu Milk spent \$11.5 million, which accounted for 30 percent of its marketing budget. Wandashan's advertising expenditure was \$13.5 million, or 10 percent of its marketing budget. Wahaha spent \$30.1 million on advertising, which was 9 percent of its marketing budget; Meng Niu spent \$46.75 million, also 9 percent of its marketing budget, only to be surpassed by Yili, which spent \$53.4 million (8.7 percent of its marketing budget). Bright Dairy spent only \$27.1 million, accounting for 5.5 percent of the marketing budget, while Sanlu limited its marketing expenditure to 2.9 billion yuan (\$349 million) (Zhongqiu Advertisement, 2003). By 2004, Meng Niu became the new champion by spending \$38.8 million on advertising, followed by Yili, at \$26.8 million (Dong Suyu, Nie Yan, 2005).

Finally, **foreign investment** played a very important role in accelerating the development of dairy products in China. There are three ways for foreign capital enterprises to enter the Chinese market: The first method is to directly establish a dairy-processing enterprise in China and produce branded dairy products. As previously noted, Nestlé built up a large-scale milk powder processing enterprise in the 1990s in Shuangcheng City, Heilongjiang province, through a joint venture. Since then, it has continuously expanded its production scale. By 2004, its total investment into milk powder production reached nearly \$84 million (China Network, Harbin Channel); its revenues reached \$3 billion, ranking the joint venture as fourth among dairy-processing enterprises in China. Among the top-ten dairy-processing enterprises, three are linked to direct foreign investment.

The second method is through joint ventures, such as the Daneng Co., which bought up shares of the Bright Dairy through stock purchases. By end 2005, through numerous purchases, Daneng owned 12 percent of Bright Dairy stock. Meanwhile, Daneng handed over its brands to the Bright Dairy, and both parties agreed to establish a dairy product research centre (Gao Suying, 2005).

The third method is through direct investment. For example, in 2002, Morgan Stanley, Dinghui Investment and Yinglian Investment invested more than \$26 million in the Meng Niu Group, buying 32 percent of the company stock. In 2003, these institutions injected an additional \$35.2 million into Meng Niu from their foreign mother companies. Currently, the three companies own one-third of Meng Niu Group stock (Hu, 2005).

Dairy production in Chinese farm households

Before the policy reforms that began in the 1970s and opened China to the outside world, there were no individual dairy cow-raising farm households or individual milk sellers in the country. The Government did not allow private dairy cow operations; the state-operated and the commune-owned dairy cow farms were the main source of raw milk (Xu and Yin, 2004). Since the implementation of the household contract responsibility system, the Government reversed its policy restricting individual farm households from raising dairy cows. Within the context of increasing market demands for dairy products and promoted by government policy, more and more farm households have engaged in dairy cow raising and milk production.

Dairy cattle farms in China are pyramid shaped: At the base are small farm households that own 1–5 dairy cows while at the top are the large operations with more than 1 000 dairy cows. According to the Dairy Association of China, there were approximately 1.37 million dairy cattle farms in 2002. Of them, 1.14 million (or approximately 83 percent) owned 1–5 cows. By 2006, the total number of dairy cattle farms and farm households nearly reached 1.6 million, up 15 percent compared with the data for 2002 (Table 6).

Table 6: Number of dairy farms, by number of cows owned in China, in 2002 and 2006

Herd size	No. of farms		No. of cows		Milk output (tonnes)	
	No.	%	No.	%	No.	%
Year 2002						
1–5	1 140 022	83.30	3 042 197	44.79	4 951 102	37.30
5–20	200 083	14.62	1 991 830	29.32	3 665 841	27.62
21–100	25 698	1.88	950 090	13.99	2 115 959	15.94
101–200	1 789	0.13	243 137	3.58	673 210	5.07
201–500	650	0.05	193 814	2.85	603 855	4.55
501–1000	262	0.02	172 991	2.55	605 886	4.56
>1000	112	0.01	198 488	2.92	658 050	4.96
Total	1 368 616	100.0	6 792 547	100.0	13 273 903	100.0
Year 2006						
1–5	1 271 729	81.00	4 034 876	44.10	5 356 552	35.31
5–20	263 715	16.80	2 714 241	29.67	4 135 290	27.26
21–100	30 780	1.96	1 257 814	13.75	2 827 367	18.64
101–200	2 294	0.15	335 503	3.67	713 905	4.71
201–500	950	0.06	336 148	3.67	741 448	4.89
501–1000	336	0.02	235 228	2.57	707 555	4.66
>1000	162	0.01	234 816	2.57	688 867	4.54
Total	1 569 966	100.0	9 148 626	100.0	15 170 984	100.0

Sources: *China dairy statistical yearbook*, 2006 and *China dairy information*, 2007

Obviously the small-scale dairy cow farms dominate the milk production, serving as the main suppliers of raw milk to Chinese consumers and processors. Their numbers expanded considerably since the policy reforms began, but particularly over the past decade and despite the many obstacles involved in shifting from crop growers to dairy husbandry, such as lack of credit,¹⁵ production practices and market access. The factors supporting the inclusion of more than 1 million farm households into smallholder dairy production entail: i) good economic returns; ii) policy/institutional support from central and local governments; iii) involvement and support from private sector milk-processing enterprises.

The economics of dairy production

Most of the farm households shifting from crop growing to dairy husbandry are driven by favourable economic returns (Hu, 2005). Farmer income from growing crops is much lower. Table 7 presents a cost-profit analysis (or calculation of returns) of planting maize or potatoes compared with dairy husbandry. The average milk yield from a dairy cow in a farm household is 4 875 kg per year, which translates into a value of \$1 334. The total production cost of the milk is \$1 062, leaving a net annual profit of \$273 and a cost-profit rate of nearly 27 percent. By comparison, a farmer choosing to grow 1 mu of potatoes realizes annual net profits of \$76, while that of a farmer growing 1 mu¹⁶ of maize earns \$19 of net profit.

The profit from dairy cow husbandry is greater than from growing potatoes or maize; the net profit from raising one dairy cow is 14 times larger than from growing 1 mu of maize and 3.6 times larger than growing 1mu of potatoes.

In most parts of China, the small-scale dairy farmers also plant maize, which is used to feed dairy cows, thus reducing the need to buy feed. Fermented dairy cow manure can be used as an organic fertilizer for growing the maize, enhancing yields at a low cost as well as reducing environmental pollution.

¹⁵ The price for purchasing a dairy cow is more than 10 000 yuan (US\$1 200), but the annual income of a farm household is only 3 000–5 000 yuan.

¹⁶ 1 mu = 0.067 ha

Table 7: Comparison of the costs of dairy cow raising with maize and potato growing

Per mu/per cow	Unit	Dairy cow raising (no.)	Maize growing (mu)	Potato growing (mu)
a. Output of main products	Kg	4 875.9	423.5	1561.8
b. Total output value(c+d)	US\$	1 334.2	74.2	179.1
c. Output value of main products	\$	1 204.2	71.6	178.9
d. Output value of by-products	\$	130.0	2.6	0.2
e. Total cost (f+k)	\$	1 061.6	54.9	102.8
f. Production cost (g+h)	\$	1 058.3	45.1	91.3
g. Materials and service charge	\$	920.9	25.1	57.6
h. Labour cost(i+j)	\$	137.3	20.0	33.7
i. Family labour (monetary value)	\$	136.8	18.7	29.6
j. Labour-hiring cost	\$	0.5	1.2	4.1
k. Land cost(l+m)	\$	3.3	9.8	11.5
l. Land rent	\$	0.0	0.7	0.4
m. Self-owned land rent	\$	3.3	9.1	11.1
n. Net profit(b-e)	\$	272.6	19.3	76.3
o. Cost-profit ratio (n/e*100)	%	25.7	35.2	74.2

Source: Compilation of cost-profit ratios of agricultural products of the whole country compiled by the Price Department of the National Development and Reform Commission, 2007.

Policies promoting dairy development

“I have a dream and my dream is that each Chinese person, and especially the children, can afford to buy one *jin* [500 g] of milk to drink every day,” Chinese Premier Wen Jiabao said in 2006. In recognition of the relative profitability of dairy operations, the central Government as well as local governments interested in supporting industry development have formulated favourable policies to encourage farm households to buy breeding stock.

Since 2000, the State Council and its relevant departments enacted favourable policies to promote the sector, which led to: i) 10 000 high-yielding cow embryo transfers; ii) development plans in large milk-producing regions; iii) studies on key technologies and integrated demonstration of technologies in the fifth five-year development plan; iv) Circular of the Ministry of Agriculture on the Rapid Development of Animal Husbandry” transmitted by the General Office of the State Council; v) the fifth five-year plan of animal husbandry, feed, national food industry and light industry and the long-range objective plan of 2015; and vi) a programme of dairy industry in the land reclamation and cultivation sectors.

The more important objectives of the Government are focused on increasing farmer incomes through dairy cow husbandry and dairy-processing projects. Under the leadership of the central Government, local governments, especially those of Inner Mongolia, Heilongjiang and other provinces, have supported the dairy sector because of its contribution to farmers’ income as well as to overall economic growth.

In supporting these policies, relevant ministries and commissions as well as local governments have invested considerable resources (Table 8). Since 2002, for example, the central Government has issued national debt funds to support 16 dairy-processing projects. In total, these projects received \$21 million. Use of national debt funds has mobilized the resources of banks, local governments, enterprises and social forces to assist the sector. The ministries and commissions, under the State Council, have continuously invested in dairy industries, such as with the Ministry of Agriculture’s Good Animal and Poultry Varieties Engineering Programme. The central finance department alone invested \$6.5 million in animal breeding, or one quarter of the programme’s total investments from 1998 to 2001. In 2002, the Ministry of Agriculture invested 126 million yuan (\$15 million) to set up 17 original-stock dairy farms, 9 bull stations and 6 embryo-transfer centres. The embryo-transfer activities were initiated in nine cities, provinces and autonomous regions (Beijing, Xinjiang, Heilongjiang, Inner Mongolia, Ningxia, Shaanxi, Shanxi, Hebei and Shandong). A year later, in 2003, the Ministry invested more than \$14 million in animal and poultry variety/stock engineering (Hu, 2005).

Table 8: Policies and measures adopted by local governments and dairy-processing enterprises to encourage farm households to raise dairy cows

	Regions	Events	Source of data	Remarks
	Government policy			
1.	Shijianzhuang City and Tangshan City, Hebei	Dairy cow-raising households can obtain loans of up to 10 000 yuan, based on having an identity card, and up to 50 000 yuan on the provision of a certificate of house property. The specialized dairy development fund of the city financial department will pay 50 percent of the discounted interest for farm households that have borrowed money.	<i>Dairy Industry Talking</i> , pp.29-30	
2.	Shuozhou City, Shanxi	Construction of dairy cow barns on land contracted by farm households. If the farm households have no land to construct cattle barns, the village or township governments will provide them with land for free. For each dairy cow added, a farm household will receive a loan of 3 000–5 000 yuan, with a discounted interest rate from the government. If a village has more than 200 dairy cows, the government will build a milking station.	<i>Dairy Industry Talking</i> , pp.31-32	
3.	Shuangcheng county, Heilongjiang	The farmers are organized in dairy associations, with members eligible for loans to purchase dairy cows.	<i>Dairy Industry Talking</i> , p.46	Nestlé is located in Shuangcheng County.
4.	Tianjin	The government supports the construction of dairy cow-raising areas, providing 400 000 yuan for each.	<i>Dairy Industry Talking</i> , pp.52	
5.	Daxing district, Beijing	The government stipulated a policy in 2002 to support and encourage farmers to raise dairy cows. A farm household can get a bank loan of 5 000 yuan to buy a dairy cow. The government encourages farmers to use high-quality bull semen and embryo transfer technology, through the provision of 150 yuan and 1 500 yuan subsidies for each cow, respectively.	<i>Yearbook of Chinese Dairy Industry</i> , 2003, pp.131	
6.	Tumotezuo League, Inner Mongolia	The government helps farm households obtain bank loans to buy dairy cows. In 2000–2002 and with government assistance, farm households received a total of 190 million yuan from banks for the purchase of some 18 000 dairy cows.	<i>Yearbook of Chinese Dairy Industry</i> , 2003, pp.136	
7.	Daqing City, Heilongjiang	The government uses 7 million yuan to offer discounted interest loans for farm households to purchase imported dairy cows. The farm households are eligible for loans of 8 500 yuan for purchasing a dairy cow and 400 yuan as discounted interest.	<i>Yearbook of Chinese Dairy Industry</i> , 2003, pp.138	
8.	Huairou district, Beijing	From 1984 to 1998, the government encouraged farm households to raise dairy cows through the provision of loans ranging from 20 000 to 40 000 yuan, with a discounted interest rate. The government later renewed this policy.	<i>Yearbook of Chinese Dairy Industry</i> , 2004, p.173	
9.	Yanmao Hui autonomous county, Xinjiang	The county government pursues a project of "100 households with 100 dairy cows engineering". The dairy-processing enterprises provide dairy cows and the cows are distributed to farm households and fed by them, with the farm households using the milk yield to pay the enterprises for their dairy cows.	<i>Yearbook of Chinese Dairy Industry</i> , 2002, p.185	

10.	Wuhan City, Hubei	Wuhan City government encourages farm households to purchase dairy cows from other regions. The dairy cow farmers can get a subsidy of 8000 yuan to buy a dairy cow from other regions and 4 250 yuan to buy a high-yielding cow from a foreign country.	<i>Yearbook of Chinese Dairy Industry, 2005, p.98</i>	
Enterprise support				
11.	Huhehot and Baotou cities, Inner Mongolia	Cooperative dairy cow farmers are eligible for loans of 6 000 yuan from the Meng Niu Group or 4 500 yuan from the Yili Group to buy a cow. The farm households repay the loan from the earnings of milk sold to the company within a three- to four-year period.	<i>Dairy Industry Talking, p.43</i>	The two cities are source areas of raw milk for the Yili and Meng Niu processing companies.
12.	Shijiazhuang City, Hebei	The Sanlu Group helps households to purchase dairy cows through a variety of programmes: 1) “leasing” the dairy cows to farm households according to the value of the cow. The households repay the company by using one-third of earnings from milk sales each month. When the “lease” is paid off within three years, the households own the cow. 2) The company sells dairy cows to farm households at a 30 percent-discounted price. 3) The company agrees to be a loan guarantor for a farm household borrowing half the buying price of a cow from a bank.	<i>Dairy Industry Talking, p.76–77</i>	The Sanlu Group is the largest milk powder processor, located in Shijiazhuang City, Hebei.

Source: Collected by the author

Local governments have supplied funding for dairy-processing enterprises to buy equipment from foreign countries, to invest in dairy barns and dairy plants and construct dairy farms. They have provided farm households with loans and allowed farmers to raise mortgage credits on their dairy cows, cattle barns, related facilities or equipment and other fixed assets from the banks. To ensure and stabilize the raw milk supply, dairy-processing enterprises helped farmers to procure loans by providing guarantees.

Dairy enterprises and their supportive role

The rapid increase of raw milk in China is closely related to the strong link between dairy-processing enterprises and dairy producers, in terms of the former’s promoting the latter’s development. There was a time when the insufficient supply of raw milk constrained dairy development. In response, dairy-processing enterprises helped farm households buy cows and improve their husbandry knowledge, which became both an incentive for farmers to enhance their income and expand the milk supply. Interventions by Sanlu and Jinniu (Box 1) as well as Meng Niu, Yili and others focused on helping farm households to first access cows or a bank loan for buying cows and then offering technical guidance.

Box 1: Linking processors and farmers by leasing animals to households

Beginning as a cooperative of 18 farm households with 30 cattle and 170 sheep, the Sanlu Group Co. has become China's largest milk powder-processing company, with total assets of US\$324 million and annual income of \$1.158 billion. To help expand the milk supply and help itself grow in the early 1990s, Sanlu sold, at favourable rates, some 2 080 dairy cows from its own farm in Hebei province to households that were willing to raise them. The farmers paid off the price of the cows through their milk sales. Additionally, Sanlu also helped families access bank loans by serving as the guarantor. Through this support, Sanlu developed more than 4 100 dairy cow-raising households in 754 villages of 24 counties of Hebei (author's investigations, 2004).

The Jinniu Group Co., a medium-sized dairy-processing enterprise in Jiangxi province, also offered itself as a guarantor for cow-buying bank loans for families with labourers younger than 40 and willing to raise dairy cows. The company provided those households with technical training and established technical service stations in villages with a large dairy cow population, providing veterinary service in disease control and cow breeding. The company's feed-processing mill also extended concentrated food to those households, and Jinniu set up milk collection stations in villages to make selling milk more convenient. In the six years after beginning operations (in 1992), Jinniu developed 11 specialized dairy cow-raising villages and 436 dairy cow households, feeding some 8 800 cows (Li Yifang, 1998).

Models linking smallholder dairy cow farmers and the market

1. Dispersed raising and the mobile-dispersed milk-collecting model

From the 1980s to the 1990s, dairy-processing enterprises turned to a mobile-dispersed milk-collecting model to purchase raw milk. The consignee of the enterprise went from household to household with a milk-tank truck, buying their milk (with cash) and transporting it to the processing plant. There was no focus on specific households, and the households were free to sell to any enterprise.

The most serious problem of this model was the inability to guarantee the quality of the raw milk because it was aggregated and stored in a container. The farm households did not have appropriate chilling equipment, thus leading to high bacteria counts. Some households violated regulations and mixed water into the milk, resulting in economic losses and a lower quality of milk. The dairy-processing enterprises responded with concentration meters to determine the level of adulteration when collecting the raw milk. However, some households then resorted to other ways of nullifying the test, with the quality of the milk declining even further (Hu, 2005).

2. Linking companies and farm households through milking stations

In the mid 1990s in response to the difficulties with the mobile model, most of the dairy-processing enterprises began setting up collection stations. They built mechanical milking facilities; farmers took their cows to these stations for milking. Under the supervision of management personnel, milk was directly transported through the milking machine to storage tanks, thus maintaining low temperatures and preventing the adulteration of the milk. Typically, the stations were constructed in villages with a large dairy cattle population. Currently, one milking station services about 200 dairy cow households. The farmers take their cows to the station at a fixed time (twice a day). The workers at the station maintain a record of the milk procured and pay the households once a month.

Types of milking station owners:

- **The dairy-processing enterprise milking station**

To ensure its milk supply, some large dairy-processing enterprises, such as Meng Niu and Yili, have built milking stations near the processing plant or in villages or towns with large dairy cow populations. The company then leases the stations to individuals who must provide the milk back to it.

- **The individual milking station**

In some cases, private individuals have built a milking station and then sell the collected milk to one or more dairy-processing enterprises.

- **The dairy cooperative milking station**

Over the past decade and supported by government policies, specialized cooperatives have developed rapidly, including those organized by dairy cow farmers. These cooperatives have constructed stations to collect milk from their members. Funds for the construction came from a government project and/or members of the cooperative (Box 2).

The construction of milking stations directly benefits dairy cow farmers by reducing labour requirements and ensuring the availability of a stable market and technical training. The dairy-processing enterprises benefit from a stable source of high-quality raw milk and limited opportunities for milk adulteration (Duan, 2007).

Box 2: Government support to milking stations

1. *Beijing Miyun County Ligezhuang Dairy Raising Cooperative obtained 100 000 yuan in government funds to construct a milking station, purchase equipment and technically train its members.*
2. *Shanxi Jinzhong Yuci District Xiuwen Dairy Association sourced 150 000 yuan from the government to purchase sterilized milk tanks and milk-testing and other equipment.*
3. *Lianshan District Dairy Raising Cooperative bought milking machines with 150 000 yuan it obtained from the government.*
4. *Zong Zhai town in Qinghai Huangzhong county used 150 000 yuan of government funds to purchase milk tanks.*

Source: *China dairy industry yearbook*, 2006, p. 61

3. Dairy husbandry areas or dairy zones

In this model, dispersed dairy cow farmers are grouped into a designated area or zone. Dairy-processing enterprises construct the necessary infrastructure, with input from farmers and township government. Some individuals also invest in the construction. Typically, at a minimum, there are dozens of households in a zone, with a combined total of approximately 200–300 cows, though sometimes as many as 500–1 000 cows. The cow sheds/barns and other facilities are uniformly designed and constructed, and the households manage their own cows. They also produce, harvest and process their own fodder. They buy concentrated feed from a specialized processing plant. Although each household feeds its own cows, the milking, disease control and other supportive activities are contracted to administrative and managerial departments within the region.

The government and/or the dairy-processing enterprise provides each zone with technical assistance and supervision; the geographical separation between production and residential areas results in better disease control and limits possible infection between humans and animals. With government support,¹⁷ some large-scale dairy-processing enterprises have invested in these zones. For instance, with about 100 million yuan, Sanlu (based in Shijiazhuang, Hebei province) established more than 200 zones, in cooperation with farm households. The Sanlu-created zones adopted the model of “one separation and four unifications”, which means that households own the dairy cattle and the zone management provides “unified milking, unified milk selling and unified services” for households. Similarly, the Yili Group set up 85 zones with 300–500 dairy cows in each and 92 areas with 500–1 000 dairy cows each.¹⁸

¹⁷ The largest support from the provincial government in dairy cow zones has been the provision of land. In rural areas of China, the use of land is strictly controlled. The provincial government's support includes the use of wastelands that are not suitable for crop cultivation or allows a transfer of a portion of cultivated land for use in dairy cow farming.

¹⁸ In Huhehot City and Hulunben'er grassland of Inner Mongolia and Du'er'bote grassland of Heilongjiang.

Dairy zones enable several advantages: i) households can access stable markets and technical services; ii) the quality of raw milk is improved; iii) sufficient quantities of quality raw milk can be guaranteed for enterprises; and iv) assistance in financial subsidies is available through the government's supporting policies (Box 3).

Box 3: A dairy zone example

Wuqing district in Tianjin municipality first obtained subsidies for the construction of dairy zones in 2002, along with 5 million yuan in financial support from the government to expand and improve the condition of the dairy cattle. Consequently, the district's dairy cow population reached 33 000, a 65 percent increase in one year. Similarly, the governments of Beichen district and Jinghai county, also in Tianjin, appropriated specialized funds for building roads and a bridge that would help promote the development of dairy zones (Li, 2003).

4. Pastoral dairy parks

In pastoral regions/areas, households with large herds have joined together with assistance from dairy-processing enterprises. In 2003, the Yili Group invested more than 13 million yuan to build an integrated dairy cattle pastoral region in Huhehot City. This entailed individual pasture land, an area for raising cattle and a modern milking station. Each household in the pastoral park owns more than 200 dairy cows, for a combined total of more than 6 000 cows in the park. The annual output of fresh milk is estimated at 30 000 tonnes. The Yili Group also constructed six other pastoral parks, each with a cow population between 1 000 and 3 000; the Meng Niu Group set up five large dairy cow pastoral parks.

In the pastoral parks, the milk-processing enterprise invests in its construction (including necessary facilities) and the farm households raise the cows. The enterprise also provides technical assistance to ensure that good genetics of the animals and good husbandry management. Some pastoral parks also produce organic milk (author's investigation).

5. Dairy farm household cooperatives

There were no farmer associations or cooperatives representing smallholders in the dairy sector in China until recently. The dispersed smallholder dairying households lacked the negotiating and bargaining power necessary to benefit from marketing arrangements with dairy-processing enterprises and feed marketing enterprises. After 2000, the Government recognized the potential importance of farmers' cooperatives and established cooperative societies. The Government issued the Law of Farmer Specialized Cooperative Society in 2007, thus providing a legal basis for farmer cooperatives to organize. Some local governments are exploring the possibility or are already helping dairy operators set up dairy industry cooperatives. In Heilongjiang province, for instance, the Anda City government helped establish more than 50 dairy associations and dairy industry cooperatives. Among them, the Taipingzhuang Dairy Association has more than 730 members, with a total of 4 200 dairy cows producing a daily output of more than 30 tonnes of milk.

Challenges for the smallholder dairying households

Smallholder dairying households encounter considerable problems, mainly related to: i) poor remuneration resulting in declining income and ii) difficulties in meeting the quality standards for raw milk.

Declining incomes for dairy producers

According to the Ministry of Agriculture, since early 2007, dairy cow farmers' incomes have decreased gradually: 40 percent of households are not breaking even, and the average earnings from each cow are now 1 500 yuan, lower than in 2006. Some dairy cow farmers have resorted to selling or slaughtering their cows due to the low profitability.¹⁹

¹⁹ "Loss incurred in 40 percent of the dairy cow raisers in the whole country and the Ministry of Agriculture considers that the milk price forming mechanism is not reasonable", <http://www.yndaily.com> 2007077.

The reduction in incomes is due to higher production costs and relatively stable milk prices paid by the processors. Price collusion among processors is resulting from an oligopolistic market structure, with the purchasing price of raw milk controlled by only a few dairy-processing enterprises. The dispersed farm households have no bargaining power and are unable to negotiate higher prices; thus, they are obliged to receive the price offered by dairy-processing enterprises.

While the milk price paid remains fairly constant, the price of feed is rising: Over a one-year period, feed corn prices increased by 16 percent and dry alfalfa hay prices increased by more than 20 percent. In comparison, the purchasing price of milk in Heilongjiang, Inner Mongolia and Shanxi increased only by 7 percent, 6 percent and 3 percent, respectively²⁰ – despite rising prices of milk products in international markets.

Quality control of raw milk

Of considerable concern to the industry and consumers are effective controls on milk quality. The quality of raw milk not only influences the quality of dairy products and the safety of consumers on the one hand, but it limits its use in the production of value-added products. For instance, in the course of fermentation of sour milk and milk drinks, some raw milk cannot be used if the level of antibiotics is too high.

Before the 1980s, most raw milk was supplied by state-owned dairy farms to consumers in urban areas, and the quality could be controlled easily. After the 1990s and the expansion of smallholders, effective supervision became very difficult. Considering that most dairying households had a capacity of less than five head of cattle and owing to the great difference among the households in technical and management skills, sanitary conditions and quality awareness, quality problems in raw milk production have evolved into a major concern.

Current quality problems in raw milk include: i) variable protein levels due to the influence of different feeding regimes; ii) high bacteria count; and iii) high levels of antibiotic substances due to farmers' lack of knowledge. Often when dairy cows are given antibiotic substances, the farmers, due to economic interests or lack of knowledge, do not stop milking them (Hu, 2005).

Prospects

The development of China's dairy industry over the past decade has been an impressive one. Encouraging participation of smallholders in milk production has been a component of national and regional policies to promote regional development and reduce poverty. Large processors also have played a significant role in expanding and keeping smallholders in operation. Through the introduction of centralized milk collection stations, millions of small farmers have entered the sector, particularly in the poor western provinces. This has been supported by enabling policies of central and local governments, especially those that encouraged investments in higher-quality animals and infrastructure.

Although China's dairy sector has enjoyed rapid growth, it has encountered new challenges – the most visible of which was revealed in the melamine scandal in 2008. The dairy industry is experiencing considerable transformation – the quantity-based expansion is being replaced by the need to ensure milk quality. It is difficult for scattered smallholder dairy farmers to produce the quality of milk that processors and markets require. Developing large commercial dairy farms is unlikely to be a viable model in China, particularly in the medium term. Rather, alternative models in which an enterprise provides a milking station and proper management to smallholder dairy farmers, dairy parks and farmer associations are developing and proving to be practical. Many other different organizational models exist in practice. This calls for further evaluation on the performance of different organizational forms for linking smallholder farmers with the processors.

It is clear that the large processors have dominated and will continue to drive the next stage of China's dairy development. Critical to ensuring strong growth in the sector is the development of incentive systems for

²⁰ *China securities journal*, 26 November 2007; "The dairy cow raisers kill their dairy cows as a result of increase of cost and thus resulting the high price of milk in the whole country."

rewarding good practices to increase milk quality, either market based or institution based. The processors need to take a leadership role in setting up effective premium-based pricing systems to support a sustainable dairy sector. Implementing higher standards means higher costs for producers. It is important to understand the cost of compliance to adhering to these new standards, particularly to small farmers if they choose to participate in the evolving systems. In addition, it is important to look at innovative ways of sharing these costs between the farmers and processors, ensuring that farmers receive a fair price for high-quality milk.

China's dairy development policies, particularly regional policies, are very much biased towards large dairy farms. The Government needs to promote rural economy growth and improve the well-being of the rural population through increased technical support and financial subsidies. The policy objectives should focus on enhanced dairy practices, farm management and better-quality milk. The regional governments tend to focus on their regional economy in the short term, prioritizing a quantitative increase in production. Less attention is paid to improving financial rewards for a quality product through enhanced farming practices (through technical training). This has resulted in demand imbalances, which are characterized by limited supplies of raw milk nationwide and oversupplies in some regions. Limited incentives are in place for farmers to improve their farming and raw milk-quality management. Current policies promoting large dairy farms will need to be re-visited, if one of the policy objectives is to provide effective assistance to smallholder dairy farmers.

It is also clear that the current oligopolistic economic stage of the sector, owing to smallholder inability to negotiate with the large-scale dairy processing enterprises, results in dispersed smallholder dairy farmers not receiving fair prices for their raw milk. Therefore, dispersed households need to organize themselves and strengthen their capacity to negotiate with enterprises, thus ensuring long-term profitability to their investment and economic activities. The Government should formulate a positive policy to encourage and support the smallholder dairy farmers to establish institutional systems, such as cooperative organizations.

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India: Increasing demand challenges the dairy sector

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Over the span of three decades, India has transformed from a country of acute milk shortage to the world's leading milk producer, with production exceeding 100 million tonnes in 2006. This phenomenal success is attributed to a Government initiative known as Operation Flood (1970–1996) and its intense focus on dairy development activities. In that initiative, rural milk shed areas were linked to urban markets through the development of a network of village cooperatives for procuring and marketing milk. And milk production and productivity were enhanced by ensuring the availability of veterinary services, artificial insemination (AI), feed and farmer education. The investment paid off, promoting production gains of 4–5 percent per annum.

However, that growth has slumped to less than 3 percent in recent years, raising cause for concern. The slowdown is attributed to the decline in investment in the dairy sector since the end of the Operation Flood initiative. Central and state government allocation for dairy development has diminished in the past two five-year plans.

Emerging situation

Dairy is currently the top-ranking commodity in India, with the value of output in 2004 at 1.179 billion rupees (US\$39 million), which is almost equal to the combined output value of rice and wheat. Despite the importance of the dairy sector in overall GDP, it receives less government budgeting than the agriculture sector. Further, there has been no concentrated investment in the development of value-added or innovative products, nor any serious effort to support and modernize the informal sector.

In light of the increasing demand driven by the growing population, higher incomes and more health consciousness, the slowdown in dairy industry growth is severely worrisome. Based on estimates by the National Dairy Development Board (NDDB), the demand for milk is likely to reach 180 million tonnes by 2022. To supply the market, an average incremental increase of 5 million tonnes per annum over the *next* 15 years is required – a doubling of the average incremental rate achieved over the *past* 15 years. In the absence of sufficient increased production, India will need to rely on the world market for imports. And because of the huge volume required, it will affect global milk prices. Thus, focusing on areas for local dairy development is critical.

Traditionally, the policy environment has favoured the expansion of cooperatives, which ultimately crowded out the private sector. However, liberalization of the sector in recent years has encouraged private investment in dairying. In 2002, the Milk and Milk Products Order (MMPO) ushered in major policy changes friendly to the private sector and a momentum of activity that is likely to increase dramatically in the coming years. Large Indian and multinational corporations, such as Reliance, Pepsi and Coca-Cola, are planning significant investments.

Nowadays, both the private sector and the cooperatives drive the value chains. Because of the many unsuccessful cooperatives in the country, other models of dairy farmer organizations are being explored, such as mutually aided cooperative societies (MACS) and producer companies.

Millions of small and marginal farmers in dairying who own two to three animals and produce an average of 5 litres comprise a critical portion of India's dairy industry. Livestock development in general and dairy development activities in particular are key components of pro-poor development strategies because livestock distribution is much more equitable than land distribution. Thus, changes in the dairying environment have important implications for the smallholder farmers and for poverty reduction.

The following characterizes India's dairy farming and its relevance to inclusive growth:

- Small and marginal farmers own 33 percent of land and about 60 percent of female cattle and buffaloes.
- Some 75 percent of rural households own, on average, two to four animals.
- Dairying is a part of the farming system, not a separate enterprise. Feed is mostly residual from crops, whereas cow dung is important for manure.
- Dairying provides a source of regular income, whereas income from agriculture is seasonal. This regular source of income has a huge impact on minimizing risks to income. There is some indication that areas where dairy is well developed have less incidence of farmer suicide.
- About a third of rural incomes are dependent upon dairying.
- Livestock is a security asset to be sold in times of crisis.

Factors affecting the competitiveness of the dairy sector

To assess the dairy sector's competitiveness, a performance analysis looked at five factors: demand conditions, market structure, factor conditions, related supporting industries, and government and the enabling environment.²¹

Demand conditions

Demand for dairy products in India is likely to grow significantly in the coming years, driven by more consumers, higher incomes and greater interest in nutrition. Consumption of processed and packaged dairy products is increasing in urban areas. Because of the increasing competition from the private sector, several national and international brands have entered the market and expanded consumers' expectation of quality – although only among a small proportion of the population. In many parts of the country, people still prefer unpacked and unprocessed milk delivered by a local milkman because of its taste and the perception of freshness. The price elasticity for milk is high, thus demand for milk is very sensitive to price changes.

Table 1: Demand conditions	
Market size and growth	Market growth is due to high per capita consumption, increasing population and health consciousness
Consumption patterns	Consumption of processed and packaged dairy products is increasing in urban areas
Consumption patterns	Unpackaged milk is still preferred because of taste and price
Sophistication of consumers	Consumer awareness on product quality is increasing but in a very small portion of the population
Receptivity to new products	Mostly urban consumers have a very low but increasing interest in new products
Price elasticity	Price elasticity is high
Impact of market opening on demand	Consumers now have a variety of quality products

Market structure

Until 2002, cooperatives traditionally were the dominant players in the formal sector. With liberalization of the dairy industry, private investment has increased quite significantly. However, the organized sector's share in milk procurement is very low because a large proportion of the milk and milk products are sold through the informal channel (Table 3). The informal demand absorbs approximately 41 percent of the milk and milk products produced in the country, accounting for about 75 percent of the marketable surplus of milk. The formal channel, with its packaged milk and dairy products, accounts for only about 25 percent of the marketable surplus, which is about 15 percent of production.

²¹ The first four factors were drawn from the diamond model; see Dr Michael E. Porter, 1985. *Competitive advantage creating and sustaining superior performance*. The fifth factor is from an adaptation of a model for agro industry value chains by Carlos Da Silva; see Carlos Da Silva and Hildo M. de Souza Filho. 2007. *Guidelines for rapid appraisals of agrifood chain performance in developing countries*. FAO publication. Rome.

Table 2: Market Structure	
Performance	Still large share of produce; 85% of marketable surplus goes through informal channel
	Quality of milk through informal channel is an issue and to some extent in formal channel as well
Competitive structure	Little competition to cooperatives because private sector was not allowed in the sector until recently
	Entry of supermarkets in retailing of milk is increasing the competitive structure
Governance (value chain type)	Governance of cooperative structures is constaining efficiency and expansion
Role of "lead" or organizing firms	Role of lead agency has been hampered by government interference in cooperatives
Farmer organization	Immense scope for improving management and governance through farmer organizations
Marketing chain capacity and efficiency	Scope for enhancing efficiency of distribution
Distribution channels	Cooperatives have a well-developed distribution channel in urban areas
How market signals are conveyed or distorted	Government and political interference in price setting, limits prices being determined by market forces.

The informal sector consists of the village milk vendors who procure loose milk from farmers and sell it in urban and peri-urban areas directly to consumers, small private processors or hotels. The milk vendors also may sell processed products, such as paneer or separated cream. The quality of the vendors' milk and milk products is not guaranteed. Largely sold in loose form, it is often adulterated with several additives to control spoilage.

Table 3: Flow of milk through different channels			
Share of marketable surplus	% of production	Total production (million tonnes)	Use
	100%	100	
	45%	45	Home consumption
	55%	55	Marketable surplus sold in urban and rural markets (informal and formal)
34.5%	19%	19	Sold in urban markets as loose unpackaged milk
40%	22%	22	Sold as processed products through informal markets
14.5%	8%	8	Sold as packaged milk through formal markets
12.7 %	7 %	7	Sold as packaged milk products through formal markets

Cooperatives are the central players in the formal dairy sector. The cooperatives have a three-tier structure – i) primary societies at the village level, ii) unions at the district level and iii) federations at the state level. Currently, there are 14 federations in India.

The success of the Gujarat Cooperative Milk Marketing Federation (GCMMF), known for its Amul brand and its Amul model of cooperative, is acclaimed. However, there is a perception that cooperative organizations generally have failed in other parts of the country. A less recognized fact is that the cooperatives in other states are organized differently than the GCMMF cooperatives. The GCMMF cooperatives operate as a true representative of farmers and are run by professionally qualified managers. In most other states, the cooperatives are managed by civil servants, function more as government bodies and are weak representatives of farmers.

Of the 14 major state cooperatives in the country, 10 have state government equity, of which 6 have government equity in excess of 51 percent. Twelve of the 14 cooperatives have government officers as

managing directors who are appointed by the state government. It is not uncommon for these officials to change up to three times a year. Because of such governance, cooperatives are mere parastatals and do not work in the true spirit of cooperatives – with elected farmer representatives and professionals who run the organization. This governance structure influences the functioning of the entire chain, from the state federation to the village societies and thus significantly impacts farmers' involvement in the chain.

The primary differences between the GCMMF cooperatives and other state cooperatives are price and services. In Gujarat, the price paid to farmers is based on fat content; there is regular testing of milk each farmer supplies. In most of the other states, there is hardly any testing of milk. In other state cooperatives, the village society president wields a lot of power and typically decides the prices paid to farmers. Reportedly, farmers with some degree of influence receive higher prices while those without receive lower remuneration. Being the lead organizations, the cooperatives also set a benchmark for prices paid by other buyers, such as local vendors and private dairies, who tend to pay 50 paise or 1 rupee (\$.02) more than that paid by the cooperatives. Thus, if the farmgate price paid by the cooperative is low, other players also pay a low price.

For most of the private dairies, agents procure the milk from farmers. Some private dairies have established village societies for milk collection that follow the cooperative model. However, this model requires much larger investment and is not economically feasible, considering that cooperatives receive considerable development support from the government (such as feed subsidies). It is not uncommon for private dairies to make loans to farmers, which is a key reason for the somewhat large share of milk directed to this channel.

Factor conditions

Factor conditions for dairying entail the quality of animals, human resources and technical skills, land availability, capital, credit, infrastructure and other inputs relevant to the value chain, as the following explains.

The quality of animals is critical in determining its milk productivity and hence overall production. Currently, low productivity per animal hinders development of the dairy sector. Despite being the world's largest milk producer, India's productivity per animal is very low, at 987 kg per lactation, compared with the global average of 2 038 kg per lactation.

The low productivity is a result of ineffective cattle and buffalo breeding programmes, limited extension and management on dairy enterprise development, traditional feeding practices that are not based on scientific feeding methods, and limited availability and affordability of quality feed and fodder. In addition, the limited supply of quality animals is exacerbated by policies limiting interstate movement of animals. Indigenous cattle and buffalo make up 45 percent of the country's total milch population, in contrast to the cross-bred cows at 10 percent.

Animal health and breeding services provision, veterinary infrastructure development and vaccinations are the responsibility of the state government. These services have traditionally been provided for free or at a very subsidized rate. In the past few years, there has been increasing awareness that the state pays heavily to offer these services, which are easily available to farmers (Ahuja *et al.*). Consequently, many states have instituted partial or full-cost recovery fees for providing the services.

Table 4: Factor conditions	
<i>Herd</i>	
Herd inventory	Very large number of indigenous animals with low productivity and a small portion of cross-breeds
Breed	Lack of policy focus on strengthening indigenous breeds
Feed	Very poor awareness of quality feed, which hinders productivity
	Farmers not interested in quality feed because of the low price of milk
	Increasing feed costs
Veterinary medicine	Availability is not an issue
Veterinary medicine costs	Duplicate or cheap medicines
<i>Human capacity</i>	
Farmer technical capacity	Knowledge and new techniques are not accessible
Support services technical capacity	Accessibility to good quality veterinary services is an issue in many parts of the country
Organization and managerial capacity	Organizational and managerial capacity of farmer cooperatives is very poor
Entrepreneurial capacity	Entrepreneurial capacity is hindered by a low capacity to take risks
<i>Credit or finance market</i>	
Formal credit mechanisms	Access to formal credit mechanisms is very poor
Informal credit mechanisms	Accessible but at very high interest
<i>External economies</i>	
Transmission of learning	Very poor extension support services, leading to very poor knowledge transfer
Social capital and trust	Strong social capital and trust in the villages, which can sustain dairy farmer organizations if properly managed

In addition to the State Department of Animal Husbandry, Dairying and Fisheries, the milk cooperatives and NGOs (BAIF, JK Trust) provide services in many states. So do trained private sector AI technicians, although for a fee. As well, state livestock development agencies are being set up as autonomous bodies to offer services in animal breeding in the form of procurement, production and distribution of breeding inputs (such as semen and liquid nitrogen), training and promotional activities.

Despite these initiatives, the availability of services remains limited. Currently, AI services cover only 15 percent of the breedable animals. Cattle and buffalo breeding programmes have been initiated but have not had the desired impact because of a lack of coordination between the different state departments. And extension activities in dairy management are woefully lacking. Farmers have not been able to take advantage of the potential of their animals because they lack information on feeding and management practices. Extension, especially for women involved in livestock rearing, would enhance dairy production considerably.

Crop residues are the single largest bulk feed material available to farmers for feeding livestock, specifically ruminants. They include coarse straws, fine straws, leguminous straws, pulses straws and sugarcane tops. Fodder from common property resources is another major source of feed for animals. But lack of efficient management of common property resources is a major constraint in availability of these resources for fodder. The area under cultivated fodder production is limited only to 5 percent of the total cultivable land. In the states of Haryana, Punjab, Gujarat and some parts of Rajasthan, land use for green fodder production is estimated at 10 percent or more. There is a need for restructuring the land use strategy to elevate the overall proportion of cultivable lands for fodder production.

Concentrates used for fodder include coarse grains, such as maize, sorghum, bajra and other millets, and other cereal by-products, such as rice bran/polish and various oil meals, including groundnut cake, mustard cake, coconut cake, soybean meal, cotton seed meal and sesame cake. The escalating price of feed ingredients is a major cause for concern. In many states, cooperatives are involved in producing feed concentrate and selling to farmers at subsidized rates.

Scarcity of fodder resources is likely to be a major constraint in the development of the dairy sector unless adequate measures are undertaken to augment them. Another important issue regarding feed is the lack of regulations to ensure quality. In the absence of a coherent policy, all kinds of substandard feeds are available in the market.

Formal/informal credit: Lack of access to credit to expand the herd is a critical problem for farmers. There is little access to formal credit through the cooperatives. Informal credit is available from private traders and agents of private companies, but the interest rate is very high. And these loans may or may not be linked to dairy activity. When taking a loan from a trader, the farmer is then tied to selling the milk to that trader, often at a low rate. The *Working Group Report on Animal Husbandry* emphasizes the low or non-availability of credit as a primary constraint in livestock sector activity, indicating that: “Public sector lending is abysmally very low. The commercial banks are not favourably disposed to providing credit to livestock farmers and the cooperative credit system is very weak, resulting in excessive dependence of livestock farmers on informal sources [and] usually at exorbitant interest rates. Efforts should be put on correcting these distortions and ensure timely availability of inputs and services, including credit to livestock.”

Vaccines/medicines: The Government and the private sector are involved in producing medicines and vaccines. However, quality control is a critical issue. An important policy question is whether the government should be involved in the manufacturing and production of vaccines or should it instead take on a regulatory role to ensure quality and availability at a reasonable price.

Related supporting industries

Strong supporting industries are critical for the development of any industry. In the case of dairying, the National Dairy Research Institute pursues research and education in all aspects of dairying: microbiology, chemistry, technology, engineering, animal genetics and breeding, livestock production and management, animal nutrition, animal physiology, dairy economics and dairy extension education.

Table 5: Related and supporting industries	
Processing capacity	Lack of processing capacity in the country, including primary processing by bulk chilling
Processing capacity	There are government subsidies on bulk chilling and processing infrastructure
Transportation and distribution	Because of low productivity, transportation costs for procurement are high
Dairy farmer services	Availability of health and breeding services could be enhanced; extension is almost non-existent
Specialized finance and credit	Exists on paper but is very difficult to access
Relevant research capacity and use	Good research capacity

Processing capacity: At present, there are 678 registered dairy processing units processing 12–15 percent, or 26.63 tonnes, of the milk produced in the country each year. Of the total units registered under the MMPO, 403 are private dairies processing around 11.83 tonnes per year, whereas 212 cooperative dairies process 10.36 tonnes per year. The remaining 63 government plants process 4.44 tonnes per year. These dairy plants are registered in the different states of India. There is immense scope to increase the processing capacity and direct a greater share of milk and milk products through the formal channel.

Primary processing is another factor in need of critical attention to ensure the quality of milk through the supply chain. In addition to the Clean Milk Programme and other rural development schemes, the Government has provided subsidies for bulk chilling and processing infrastructure to support the dairy industry. But credit remains a problem; specialized credit exists on paper but is difficult to access for dairying. There is significant private sector investment in feed manufacturing and the manufacturing of medicines and vaccines.

Government and the enabling environment

The dairy sector in India has traditionally been highly regulated. The government projects and programmes in place for enhancing dairy development include subsidies for developing infrastructure for milk processing and testing. The Clean Milk Production Programme is a centrally sponsored scheme that is being implemented by the State Department of Animal Husbandry, Dairying and Fisheries with several objectives: i) the creation and strengthening of necessary infrastructure for the production of quality milk and milk products at the farm level up to the points of consumption; ii) improvement of milking techniques; and iii) training to enhance awareness on the importance of hygienic milk production. Several other rural development initiatives support dairying, such as through the District Rural Development Agency and women's self-help groups.

An area of government support that has not been capitalized on so far is the investment in promoting the nutritional aspects of milk, particularly pasteurized milk versus loose milk. Detailed information about policy regulations regarding the dairy sector in India is available online at www.indiandairy.com.

The policy history

Until 1991, the dairying sector was licensed under the Industries Development and Regulation Act (IRDA, 1951). This resulted in preferential treatment given to milk cooperatives that were outside the purview of the legislation. In 1991, the dairy sector was swept up in the move to liberalize the economy. Consequently, the IRDA was replaced by the Milk and Milk Product Order in 1992, which contained the following provisions:

1. The main objective of the MMPO is to maintain and increase the supply of liquid milk of desired quality in the interests of the general public and to regulate the production, processing and distribution of milk and milk products.
2. Any person or dairy plant handling more than 10 000 litres of milk per day or 500 tonnes of milk solid per annum needs to be registered, with the registering authority appointed by the central Government.
3. Every holder of a registration certificate can collect or procure milk only from the milk shed assigned under the registration certificate. The milk shed, is defined as "an area geographically demarcated by the registering authority for the collection of milk or milk product by the holder of a registration certificate".

Amendments were made to MMPO in 2002 to further liberalize the sector and encourage dairy entrepreneurs from the private sector. The milk shed concept was abandoned, allowing for milk supplies to be procured from any area.

Traditionally, the cooperatives have not had much competition from the private sector. In the liberalized environment characterized by open procurement of milk, there is incentive for private players to invest in the sector. Consequently, many agencies, organizations and agents have started buying milk. But a major difference is that they are not backward investing in dairy development activities through the offering of producer services. In the coming years, the lack of involvement in dairy development by the various players is likely to constrain further growth of the industry.

In this environment, dairy farmer organizations and cooperatives will have a strong role to play in supporting dairy development activities. If they were to establish higher prices to farmers, for instance, the private sector and other players would be forced to pay at least that much as well.

Policy and regulatory issues

Agriculture is a state responsibility in India, and the State Department of Animal Husbandry, Dairying and Fisheries, within the Ministry of Agriculture, is responsible for the dairy activities. Consequently, the focus of the activities and budgetary allocation is biased towards agriculture rather than livestock.

Table 6: Enabling environment	
National sector regulation	
Key regulatory actors (ministries)	Department of Animal Husbandry is under the Ministry of Agriculture, hence focus on livestock is underemphasized, particularly in light of the high value of the sector.
Price regulation	Price setting by cooperatives
Food safety	Regulated through the Milk and Milk Products Order
Informal regulations	Very difficult to control quality in traditional channels Huge premium on fat content of milk compared with formal regulations; thus buffalo milk fetches much higher price
Formal sector support	
Domestic sector (national)	Approaches being taken to modernize the sector
Subsidy support	Various subsidies available for milk processing and testing infrastructure
Inward investment promotion	Very little investment on the promotion of health or quality of milk
Provincial/local	
Key regulatory actors (ministries)	State Department of Animal Husbandry, Dairying and Fisheries is the implementing agency at the state level
Informal regulation & transparency	Lack of milk testing equipment and thus transparency, leading to low payments
Formal sector support	Availability of veterinary services; paravets are working with the Department of Animal Husbandry, Dairying and Fisheries
Formal sector support	Availability of services in remote areas through the government
Donor/NGO roles	Donor agencies are very actively involved in livestock sector development

There are several issues related to milk pricing policies that require serious review and reconsideration. Because cooperatives are mostly managed by civil servants, there is some government influence in determining milk prices. But the state cooperatives are supposed to base the price paid to farmers on the fat and solid-not-fat (SNF) content of milk. In the case of the better-managed cooperatives in Gujart, the system works that way.²² However, it is less the practice elsewhere. As noted previously, the village society president often wields a lot of power and determines the price randomly, without testing the fat or SNF content.

Also as previously mentioned, the cooperative price becomes the benchmark price for other buyers (vendors and private dairy agents) and when it is low, so are the other prices paid. Thus there is no incentive for farmers to sell to the other buyers; only about 15 percent of the milk is sold this way for the marketing of packaged milk and milk products. Policy efforts should focus on enforcing testing as the basis for milk pricing. This can be achieved by ensuring availability of testing machines at all milk collection centres, educating farmers to sell milk only based on testing and setting up policy norms for all players in the sector to collect milk only when it has been tested.

Another important aspect of milk pricing is the huge premium on the fat content compared to the non-fat solid content. Thus buffalo milk fetches a much higher price than cow milk, which has lower fat content.

Industry SWOT analysis

Within the framework of the competitiveness drivers and issues, the smallholder dairy sector's strengths, weaknesses, opportunities and threats have been assessed. The strengths and weaknesses are factors that are

²² Gujarat farmers receive the highest share of consumer prices compared to any other state in the country.

directly controllable, while opportunities and threats derive from the external environment. As evident in Table 7, there are a large number of weaknesses in the sector, implying considerable scope for interventions. This SWOT analysis entailed matching each of these elements with an appropriate action.

Table 7: SWOT analysis of performance drivers

Strengths	How to build on them
<ul style="list-style-type: none"> • Large number of small and marginal farmers involved in dairying • An effective marketing channel helps to meet the demands of the urban consumer • Very large number of animals and huge scope to enhance productivity • Self-sufficiency in medicine production and do not have to rely on exports 	<ul style="list-style-type: none"> • Strengthen economic viability of dairy farms by interventions on the input side as well as ensuring more fair farmer prices • Increase the link between rural production areas and urban markets • Focus on strengthening the indigenous breed to help significantly enhance productivity • Ensure availability of quality medicines by strengthening regulatory framework for quality
Weaknesses	How to correct them
<ul style="list-style-type: none"> • Large share of milk (70–85%) of marketable surplus goes through informal channel where quality is a big concern • Sometimes quality is an issue in the formal channel as well • Very little competition to cooperatives because private sector was not allowed to participate in until recently • Farmers do not share in the benefits of high demand because of poor governance of cooperatives • Milk production is scattered over a large number of farmers producing miniscule quantities • Milk distribution is limited to urban and peri-urban areas • Low milk prices because of lower prices declared by cooperatives, which results in low prices of milk paid by all players • Ad hoc export policies and a ban on exports • Quality of milk and milk products are a barrier to entry to the export market, especially the EU and the USA • Lack of policy focus on strengthening indigenous breeds • Non-existent extension facilities • Farmers' prices are not based on fat measurement, which affects their profitability • Because of low access to credit and risk-taking ability, farmers cannot increase their herd size 	<ul style="list-style-type: none"> • Focus on quality issues even in the informal channel by training traders and by enforcing food quality regulations • Develop infrastructure and training for clean milk production • Support a fair playing field for the private sector • Bring about changes in cooperatives to make them true representatives of farmers instead of functioning as parastatals. • Support to dairying as an enterprise to encourage commercial dairy farming and encourage production and productivity by extension and breed development • Enhance packaged milk distribution in more areas • Strengthen dairy farmer cooperatives to enable farmers to get a higher price for milk • Create rational export policy to enable farmers to take advantage of higher prices • Strictly implement quality regulations and improve infrastructure and training for quality • Strengthen the breed development programmes • Strengthen extension facilities • Create policy regulations to make mandatory testing as a basis for setting milk price • Increase access to credit through dairy farmer organizations and other agencies
Opportunities	How to pursue them
<ul style="list-style-type: none"> • Increased farmer income by exploiting the high demand • Increased consumer sophistication and awareness of quality reception of quality packaged products (though slowly) • Entry of large corporations in retailing, which can lead to more investment • Immense scope to enhance governance of dairy farmer organizations and thus enable dairy farmers to demand higher prices • Potential for exports due to low cost of production • Overall positive growth environment, which is triggering the Government to enhance infrastructure 	<ul style="list-style-type: none"> • Create policies and activities geared towards enhancing dairy farming activity by increasing, production, productivity and ensuring fair farmer price of milk • Establish enabling policy environment to enhance investment • Create policy support to enhance governance of producer companies • Focus on quality issues that are a barrier to exports • Encourage private sector to increase investment in dairying
Threats	How to avert them
<ul style="list-style-type: none"> • Large portion of the population does not care about quality issues in milk • Because of high price sensitivity for dairy products, people are not willing to pay for quality • Significant increase in maize prices can increase feed prices • Large informal markets that extend credit are constraining farmers • Low productivity and scattered production leading to high cost of transportation • Emphasis on milk fat and not on SNF content maintaining relatively lower prices of milk 	<ul style="list-style-type: none"> • Initiate consumer education about the negative health impacts of unpackaged products • Develop packaging in small quantities to meet the needs of the poor • Increase milk prices in accordance with feed prices • Support expansion of dairy farmer organizations • Enhance productivity by breed improvement and extension • Enforce price setting of milk based on fat and SNF content to encourage production of cow milk

Four dairy enterprise models

The following section presents analysis and comparisons of four dairy enterprise models in India. Chosen for the analysis: i) a private dairy operating in Andhra Pradesh, ii) the Orissa State Cooperative as an example of a weak functioning cooperative, iii) the Gujarat Cooperative Milk Marketing Federation as an example of a strong functioning cooperative and iv) a mutually aided cooperative society as an alternative model. Models such as producer companies (emerging as a new generation cooperative) are still in a developing stage.

Table 8: Model features	Private dairy	State cooperative	GCMMF	MACS
Number of farmers involved	150 000	224 000	2 700 000	
Average litres of milk procured per day	700 000	322 000		60 000
Litres of milk processed at dairy plant per day			10 200 000	
Number of primary cooperatives	3 500	3 800	13 141	

As previously noted, cooperatives have been successful only in some parts of the country. This is largely because the cooperative law falls under the state policy and is formulated differently in different states. In states such as Gujarat, where the model succeeds, the cooperative is headed by elected managers and managed by professionals. In many other states, civil servants manage the cooperative, which results in a lot of government interference in the day-to-day functioning and leads to a lack of democracy and hence no sense of ownership or responsibility at the village level.

Three key differences distinguish the Gujarat (GCMMF) cooperatives from the other states: i) an oversight board elected by farmer members; ii) professionals employed by the cooperatives to manage the cooperatives and iii) the cooperatives have autonomy and freedom in their operating policies from interference by government and politicians (Tushar Shah *et al.*).

To address the governance issues related to cooperative management, the MACS Act was passed in 1995. It de-linked the district level cooperative from the state level, giving autonomy to district and village mutually aided societies. However, only the state of Andhra Pradesh has implemented the legislation.

Changing from the cooperative model to the society model has many associated bureaucratic problems. To overcome the hassles, the concept of producer companies was introduced as a way of transforming cooperatives to work more efficiently as representatives of farmers. However, while promising, it is a relatively new idea that needs more time to develop. Meanwhile, with the liberalization of dairy sector, private sector dairies have emerged as prominent players in the dairy industry.

i) A private dairy

The private dairy selected for the comparative analysis is an ISO 9001-certified dairy headquartered in Andhra Pradesh. The company set up there in 1992 after the MMPO opened the door to private dairies, and it now trades on the Indian stock exchange. Milk collection is about 7 lakh litres per day from 150 000 households in 3 500 villages in 3 states, although the major operations are in Andhra Pradesh. The company serves three main metropolitan areas with fresh milk (Hyderabad, Chennai and Bangalore) and is about to enter Mumbai. It also markets a wide range of products, including milk, curd, butter milk, pedha and paneer as well as new items such as flavoured yoghurt and flavoured milk to cater to the changing tastes of the young generation. The company has several chilling and bulk cooling units across its collection region in Andhra Pradesh to ensure quality of milk through the chain.

The company obtains its milk supply through village agents who have personal relationships with the farmers; it does not get directly involved with farmers. Depending on the social structure of the village, there may be more than one agent per village. The agents collect the milk and deliver to the company. The two parties have negotiated a price, but the company is not involved with what price the agent pays the farmers (although it is slightly above what the cooperatives pay in the state). Agents often provide loans to farmers to maintain their loyalty; typically, the agent competes with agents of other private companies for a farmers'

milk supply. Company employees are previous dairy cooperative employees who have enormous experience in this area. Collection areas depend on milk density and areas in which the district cooperative is less active and access to markets is efficient.

ii) The Orissa State Cooperative

The state cooperative is a dairy cooperative society registered under the Cooperative Society Act (1962). Currently, milk collected from 3 800 village societies and 224 000 farmers within 12 district unions totals about 322 000 litres per day. There has not been much competition with the private sector in this region because of low productivity and little dairy development, although private sector investment in the dairy sector is on the rise.

iii) Gujarat Cooperative Milk Marketing Federation

The Anand Milk Union Limited (Amul) cooperative formed in 1946; but it has become a brand name managed by the Gujarat Cooperative Milk Marketing Federation (GCMMF). The GCMMF consists of 13 district unions, involving 13 141 village dairy cooperative societies and nearly 2.7 million farmer members. With an aggregate milk processing capacity of 10.2 million litres per day, it is Asia's biggest dairy business venture. The marketing network encompasses 3 000 wholesale distributors and over 500 000 retail outlets, giving GCMMF a national reach that very few fast-moving consumer goods companies can boast. GCMMF has been exporting UHT-processed milk, ghee, skimmed and whole milk powder, butter, cheese and indigenous milk products to the China, Hong Kong, Singapore and the USA, among others.

Structure

GCMMF's Amul model of dairy development is a three-tiered structure, with the dairy cooperative societies at the village level federated under a milk union at the district level and a federation of member unions at the state level. Farmer members milk their cows twice daily (morning and evening). GCMMF collects the milk twice a day, makes regular payments to the farmer members and provides them with cattle feed, fodder, animal breeding and veterinarian services.

Anyone who owns a cow or a buffalo and makes a one time payment of 11 rupees (10 rupees for the share certificate and 1 rupee for registration) can become a member of the village cooperative society. The applicant must agree to provide a set minimum quantity of milk, generally between 600 and 700 litres, to the society each year. The farmer members elect a managing committee that then chooses a chairman. The managing committee appoints a secretary to discharge the society's administrative functions.

At the second tier, there is a district level union that processes the milk procured from individual societies. Each of the 13 unions has a board of directors chosen by an electoral college drawn from the chairpersons of its affiliated societies. The union board in turn elects its chairman.

The final tier is constituted by the GCMMF, which is responsible for marketing the milk procured and processed into various value-added products at the union dairies. All the products are sold under the Sagar or Amul umbrella brands. The federation's board consists of the chairpersons of all 13 district unions. They elect the federation chairperson and appoint the managing director, who is accountable to the nearly 2.7 million strong Amul dairy society members.

Elected representatives of the farmer members make policy decisions at all three levels, which are then implemented by professional managers and skilled personnel employed by the farmer members. This structure eliminates all middlemen. By placing the farmer members in command, in essence, of the dairy cooperative involves them in the development process.

This cooperative structure is democratic, and the farmers are in control, from the milking of their animals to the final marketing by the federation. For every rupee that GCMMF earns, roughly 75 paise goes to the farmers. The mandate is clear – production by the masses, for the masses, at its efficient best.

The farmer members democratically govern the entire cooperative structure to ensure that the higher tier organizations are geared to serve the purpose of the lower levels and that the gains at all levels flow

ultimately back to the farmers in a significant measure. The core feature of this structure is farmer involvement in decision-making at all three stages – procurement, processing and marketing of milk and milk products. The value addition at procurement and processing stages can be realized only with effective marketing of products, thus making it an essential feature for success.

Services provided to farmer members

The dairy unions affiliated to GCMMF provide various inputs that contribute to enhancing the productivity and quality standards, such as:

- breed improvement and animal healthcare programmes;
- extension activities;
- supplies of balanced cattle feed on a no profit–no loss basis;
- quality fodder seed distribution at subsidized cost;
- a network of artificial insemination centres aimed at genetic upgrading of the animals using frozen semen of pedigree bulls; these centres are managed by educated unemployed rural youth who provide breeding services to the farmers;
- frozen semen, liquid nitrogen and other consumables;
- 24-hour mobile veterinary services for emergencies.

It is this integrated approach to dairying and addressing farmers' needs at all levels that gives the Amul model its uniqueness. And it is why every third litre of milk from a cow or buffalo in Gujarat is processed in a GCMMF union dairy.

iv) MACS in Andhra Pradesh (AP)

Dairy activities started at the district level in 1971. The originally chosen district union was registered under the Andhra Pradesh Cooperative Societies Act (1964). After the introduction of the MACS Act (1995), the district union opted for registration as a MACS to acquire better functional autonomy for servicing its farmer members. The union is currently collecting 60 000 litres of milk per day from 650 villages, though it likely to increase up to 100 000 litres in the next two to three years.

The MACS have a two-tier operation: at the village and district levels. A village society with elected officers manages operations at the lower level; an elected board of directors manages the district society. The village and district societies each registered separately, and each has the freedom to use its own profits.

The union provides its members with a range of services required for dairy development activity:

- organizing thrift and credit cooperative society to facilitate the financial assistance for buying milch cattle;
- organizing AI services through an NGO;
- making cross-breed or graded animals for farmers to purchase;
- providing inputs such as concentrate feed, fodder seed, fodder slips and mineral mixtures at subsidized rates to members;
- supplying breeding bulls to societies;
- providing veterinary health facility, de-worming and vaccination to the animals of members;
- compensating members in the event of the death of an animal with either a grant or loan;
- providing insurance coverage to members.

Comparative analysis of the four value chains

The following compares performance criteria for the four dairy value chains to determine how they are likely to endure against future competition.

Demand conditions

The GCMMF has a wide range of traditional products as well as several new products catering to the demands of the new generation, such as sugar-free ice cream. It is one of the largest selling brands of dairy products, with a presence in all parts of the country. The private dairy also has a range of modern products catering to the young generation, such as flavoured yoghurt. The Andhra Pradesh MACS largely sells traditional products, such as milk, to urban consumers as well as rural markets through village societies (small packets, 250 ml). The Orissa State Cooperative also largely sells milk and a few traditional products.

Market structure and governance

The competitive structure for the four models varies. Dairy is a regional industry with regional dairies serving the local market, especially in the case of packaged milk. There is more scope for inter-regional trade.

The GCMMF competes with other multinational companies, such as Nestlé and Britannia, with certain products but leads among dairy products in India. The private dairy is a leading brand in the city of Hyderabad. However, the state of Andhra Pradesh has a well-developed dairy industry with several private dairies present in the state and rigorous competition among them. The Andhra Pradesh MACS largely sells packaged milk to the nearby areas and thus encounters less competition in marketing its products. And as mentioned earlier, Orissa finds very little competition to its packaged dairy products because there are hardly any private players in the state.

The supply chain is closely linked to the governance structure of the chain. For instance, the GCMMF network is very strong, with farmer involvement at all levels in the chain. Thus it is difficult for private players to procure milk directly from farmers. It is a similar situation within the Andhra Pradesh MACS. In Orissa, however, the cooperative network is not very strong and the president of the village society wields a lot of power; farmer involvement in decision-making at all levels is virtually non-existent. This has created keen competition from milk vendors in milk procurement in that area. The private dairy in Andhra Pradesh experiences intense competition from several private dairies in milk collection. But most of these companies do not deal directly with farmers. Milk is collected through village agents. There is no involvement of any company in any dairy development activity, and thus the companies compete with each other for milk collection.

The GCMMF collects its milk through village societies, with the cooperative setting the price. But it pays one of the highest prices in the country; milk collection is done in a transparent manner (based on testing fat and SNF content). The MACS society also has similar norms (for testing fat and SNF content) for milk collection. The MACS has the freedom to decide the price paid to farmers for their milk because they have autonomy in setting prices. Societies making profits through the sale of milk products can give higher returns to farmers because they do not have to follow the cooperative price. The prices paid that the Andhra Pradesh MACS declares at the district union are higher than the cooperative prices.

The Orissa State Cooperative collects its milk supply through a village society run by the president who wields a lot of power; its farmers' price is relatively low compared with the GCMMF. In most cases, there is no testing for fat and SNF content on which prices should be based. Average prices are fixed for cow and buffalo milk; however, influential people in community get better prices. In the case of the private dairy, milk purchases are done through the agent, with prices based on competition with agents of other companies and the declared cooperative price. A large number of societies have electronic milk testing machines and more are acquiring them.

Factor conditions

Livestock assets are likely to be better where organizations serving the area are involved in dairy development activities. The GCMMF has been providing good AI services, which has enhanced the quality of buffalo in the area. The Andhra Pradesh MACS have created a good network of services by involving the State Department of Animal Husbandry, Dairying and Fisheries and NGOs working in its area. With

efficient services and involvement in breed development, the quality of herd is likely to improve in the near future.

The GCMMF as well as the Andhra Pradesh MACS provide their farmers with feed, animal medicines and vaccines and breeding services. In the Orissa State Cooperative, feed is made available at a subsidized rate through the village society. The society is also involved in providing health and breeding services; however, the farmers still need to largely rely on the state government to provide health and breeding services, which are somewhat inadequate. There is no facility for loans; however, medicines are available at cost, although supply tends to be a problem. Because the private dairy collects milk through agents, it is not directly involved with the farmers for service provision. The agents sometimes extend loans to farmers, which ensures marketing commitment by producers. These are general loans not specifically used for dairy activities, and the interest rate typically is quite high.

Milk productivity depends on the level of extension support provided to farmers. The GCMMF provides ongoing extension activities, including training sessions and exposure visits for women. The Andhra Pradesh MACS are also involved in extension to some extent. The Orissa State Cooperative offers hardly any extension activity; the private dairy does not involve itself in extension services at all.

Related and supporting industries

The GCMMF has created good processing and primary processing infrastructure. Its plants are ISO certified and meet all the quality requirements. The private dairy processing plant also is ISO certified; however, the primary processing at the village level is not very strong. The Andhra Pradesh MACS have developed adequate processing facilities and plan to expand significantly in the coming years. Milk quality was an issue previously for the Orissa State Cooperative, but the situation has improved in recent years.

Prospects

The GCMMF is the most organized in meeting future growth because of its investing in dairy development activities, such as ensuring the availability of feed and fodder and veterinary services. It is in a position to increase its procurement in the coming years. Also, in terms of development, the GCMMF leads the country in modern products, such as sugar-free ice cream.

The private dairy is not involved in dairy development activity and is only focusing on milk procurement. Faced with increasing competition, it will have to move to newer areas for expansion. Because of low involvement of farmers in the Orissa Cooperative, the private sector will find it easy to move into milk procurement in its area. The lack of variety and quality of its products will make it difficult for Orissa to compete with the private sector.

If the MACS model becomes popular, procurement will be affected. MACS involvement in dairy development activity will help the model grow and expand the milk procurement. It is geared to face competition from the private sector because of close links with farmers at the village level.

Conclusions

Dairy has a lot of potential to improve rural incomes, nutrition and women empowerment, and hence is a very critical area for investment. A well-developed industry will enable millions of farmers to capitalize on the emerging opportunities and make a significant impact on rural incomes. On the flip side, weak efforts towards dairy development also can have a significant but negative impact on the dairy industry. The growth rate has been sluggish over the past few years. With an increase in demand on one hand and sluggish supply on the other, there is a likely shortfall in demand in the coming years.

Major areas of intervention in the dairy sector have been highlighted in this review. Carrying out interventions requires resources and commitment from key actors – government, NGOs, development agencies and the National Dairy Development Board – to partner and work together.

A comprehensive policy addressing the critical issues is required for the robust growth of the sector. The following highlights those issues:

1. The first issue is defining and implementing a policy for dairy development. Though a livestock policy has been established at the national level, its implementation is at the state level because agriculture is a state responsibility in India. But state policies addressing critical needs in dairy development have yet to be clearly defined across the country. Some progressive states have a well-defined policy, but it is lacking in most of the others. But even where a policy is clearly developed, oftentimes implementation is a problem.
2. Lack of clarity between the roles of the State Livestock Development Agency and the State Department of Animal Husbandry, Dairying and Fisheries is an issue for effective policy implementation. For example, the National Cattle and Buffalo Breeding programme has not been well implemented in several states. Further, availability of funds is a major issue in implementing livestock activities. The Livestock Department is within the Department of Agriculture and thus the resources are biased towards agriculture. There is need to emphasize the importance of dairying to smallholder incomes to direct more resources towards dairy development.

Two very significant factors for the growth of the dairy sector are dairy development activities and milk prices paid to farmers. In the liberated policy environment, any player can procure milk in any region. This is a very different situation from the earlier concept of milk sheds, which limited the agency or organization procuring milk to a particular area. Hence, earlier it made sense for agencies and organizations to invest in dairy development activities.

But the freedom for procurement has thwarted the incentive for private companies to invest in dairy development activities. However, private sector investment in procurement is increasing. What is clear is that while the number of buyers is increasing, little is being done to develop the sector. In this situation, farmer-owned organizations (such as cooperatives, producer companies, common interest groups and women's self-help groups) have to be strengthened at the grassroots level and linked to service and input providers.

Dairy farmer organizations can be used as a platform to address issues regarding availability of all inputs, including feed, fodder, breeding, veterinarian services, medicines, vaccines, credit and insurance. As is evident from the examples presented previously, the GCMMF has been the most successful in meeting the input requirements of farmers. However, this model has not been successful in other states because of issues with the basic organization of cooperatives.

Dairy cooperatives in several states function as parastatals and lack the spirit of cooperative organization with farmer involvement in ownership and decision-making. Alternative models of dairy farmer organizations – such as the MACS, producer companies, women's self-help groups – also need to be explored. International agencies and donor groups need to be directed towards creating political will to strengthen dairy cooperatives and to set them up.

A very important aspect of dairy development is the price paid to farmers. Currently in many states, the milk price is set by the cooperatives; this price is used by all other players to set their prices, typically by paying 50 paise or 1 rupee more than the cooperative price in that area. The farmer's price for milk ranges from 9 to 11 rupees for cow milk and 13 to 14 rupees for buffalo milk (a key comparison is a litre of bottled water, which costs 10–12 rupees then why are milk prices so low? The GCMMF pays the highest prices in the country. In the areas where the Andhra Pradesh MACS have set up, their prices are higher than the cooperative prices (MACS have the freedom to declare their own prices). It is evident that where dairy farmer organizations are strong, farmer prices are higher.

Low productivity per animal is another factor hindering development of the dairy sector. Many issues related to low productivity have been discussed – an inadequate cattle and buffalo breeding programme, extension and management on dairy enterprise and feeding practices, and availability of quality feed and fodder. Another important aspect related to low productivity is the lack of quality animals for farmers to purchase. A major hindrance to the availability of quality animals in dairy developing areas is the policy regarding interstate movement of animals.

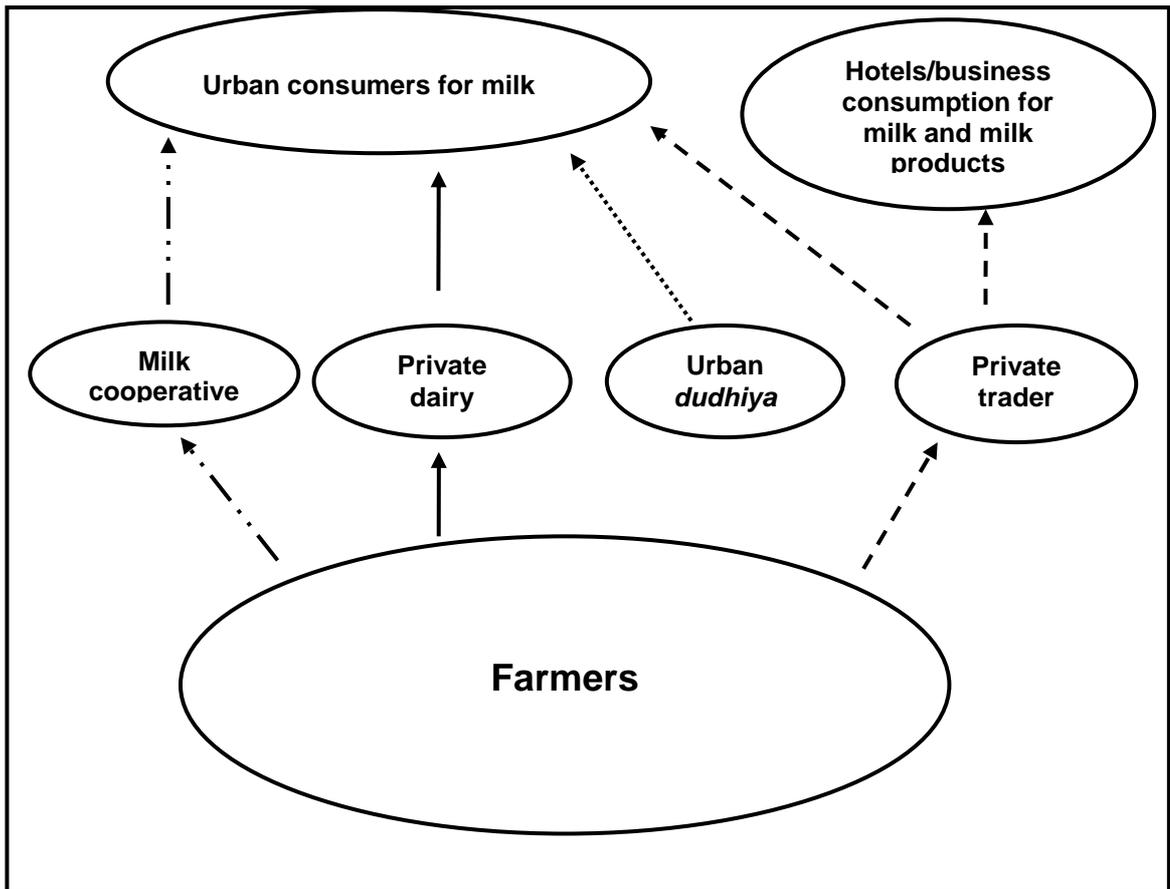
Finally, it is important to discuss the hygienic issues. Milk quality concerns go beyond the farm level and require assurance of safe milk at all stages, including within the informal sector. Through the formal channel, cooperatives, private dairies or any other form of dairy farmer organization, quality can be addressed through training and education on clean milk practices, including the use of bulk coolers. It is also important to develop diagnostic facilities for milk testing, including infrastructure and human resources, that enable constant monitoring for quality. At the processing level, plant certification will help to enhance consumer confidence.

Milk quality in the informal markets is an important issue. As noted, 70–85 percent (based on different estimates) of milk is obtained and sold through the informal channel. In recent years, initiatives have focused on working with and providing training to traders. In Kenya, for instance, licensing has been used to formalize the traditional sector. In India as well, the Capitalisation of Livestock Programme Experiences programme, along with the International Livestock Research Institute, have undertaken some initiatives in this direction.

In the current situation, traders collecting milk at the farm then deliver it and milk products to urban and peri-urban areas. Each trader buys only small amounts of milk. There is scope to organize the traders into groups and create joint facilities where they can test, process and store their milk supplies. These trader facilities could serve as wholesale or bulk suppliers for hotels, *chaiwalas* (tea sellers) and small sweetshops. These initiatives can help to address the quality issues in the informal sector and also create employment opportunities in the non-farm sector.

An argument against working with traders is that formal sector involvement in dairying is increasing and eventually there will be no room for informal players. However, looking at the current reality, it will be several years before this materializes. In the meantime, the informal sector should not be ignored and organizing informal traders should be pursued.

Annex I: Overview of dairy marketing channels in India



Annex II: Income from dairy enterprise

Income from dairy enterprise per month (two-animal farm)

	Economic analysis <i>(accounting for household labour and cost of green/dry fodder obtained for free from common resources or neighbour fields)</i>	Financial analysis <i>(Does not account for household labour and free fodder)</i>
Feed cost	2 000	1 400
Labour cost	750	
Medicine cost	60	60
Total cost	2 810	1 460
Total revenue (4 litre/animal/day @ 9 rupees cow milk or 14 rupees buffalo milk)	2 160–3 360	2 160–3 360
Net income	-(650)–550	700–1 900

Source: Punjabi

Annex III: Milk price chart

	GCMMF		Orissa State Coop		MACS		Private dairy (heritage)	
	COW	Buffalo	Cow	Buffalo	Cow	Buffalo	Cow	Buffalo
Farmer price			9–9.5			260/kg fat		225+ some amount (cooperative pricing)
Agent price			10			Get salary	92–105 + incentive	240+ incentive
Consumer price								

Source: Punjabi

Annex Table 1: Identifying critical issues in the dairy chain

Stage	Priority	Agent	Issues
Policy environment	Developing livestock policy Breed development	Dept. of Animal Husbandry, Dairying and Fisheries	Lack of a coherent livestock development policy Ineffective implementation of policy and projects due to lack of clarity in roles of different agencies Lack of resources Lack of clarity between roles of different departments Lack of regulation for quality of feed and medicines
Services	Disease control/health/breeding/extension services Support to dairy farmer organizations/women's self-help groups	Dept. of Animal Husbandry, Dairying and Fisheries Cooperatives NGOs Private dairies	Inadequate coverage of veterinarian and breeding services Non-existent extension services Scope to enhance activities of NGOs in these areas Lack of private sector involvement in dairy development services and activities
Inputs	Feed supply Fodder Medicines/vaccine supply	Cooperative Feed companies Medicine companies Medicine store	Quality/cost of feed Ineffective approach for management of common property resources Quality of medicines
	Formal credit for animal purchase	Banks/financial institution Cooperatives Self-help group	Very poor access to formal credit at the farm level
	Informal loans for animal purchase or other dairy needs	Trader Private company agent	Very high rate of interest; farmer has to sell milk at low price to the trader if he/she has borrowed money from the trader
Production	Dairy farming Selling milk cooperatives/traders/private dairy agents	Farmer	Poor management and feeding practices because of lack of information in the absence of extension activities. Low productivity because of poor genetic potential, poor feeding and management practices, poor access to health and breeding services, lack of good-quality animals Availability of milk per household very low Low profitability from dairy enterprise
Marketing/processing	Collection of milk from farmers through village society, processing and marketing of milk in cities and urban areas	Cooperative society	Lack of coverage of villages Lack of transparency in milk testing and pricing Lack of democracy in village societies Marketing only in peri-urban/urban areas Maintaining quality of milk/infrastructure Milk prices declared by cooperatives kept low and used as a benchmark price by other players
	Purchase milk from farmers and selling milk and processed products to consumers	Trader	No transparency in milk pricing Adulteration and quality of milk and milk products Unhygienic conditions for milk processing
	Purchase of milk from farmers through village agents, processing and selling milk	Private dairy	No transparency in pricing of milk Quality of milk
Retailing	Selling of milk and milk products processed by cooperatives and private dairies	Retailers	

Mongolia: Rebuilding the dairy industry

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Background

With a land area of 1.56 million sq km, Mongolia is more than three times the size of France; its population is only 2.5 million (2006), almost half of whom live in Ulaanbaatar, considered the coldest capital in the world. Broadly speaking, moving from the southern border with China to the northern border with Siberia, the country is separated equally into: i) desert, ii) desert-steppe and iii) steppe regions, each with mountain ranges, some rising to well over 4 000 m. Being so far from the sea, its climate is extreme continental, with temperatures ranging from as low as minus 45°C on the steppe in winter to plus 40°C in the Gobi desert in summer. The summer growing period is very short; the autumn-winter-spring period, when nothing grows, is very long. Less than 1 percent of the land is used for crop cultivation, although some 71 percent is grassland, used for extensive livestock raising, including hay-making and natural pastures.

The livelihoods and well-being of the majority of Mongolia's people still depend largely on livestock in general and on meat and milk in particular. Milk is both a sacred and a staple food. In the short warm summer season, it is produced in great abundance by some 30 million cattle, yaks, camels, horses, goats and sheep that are owned largely by small-scale producers (see the definitions in Box 5). Nomadic herding and traditional dairy product-making are at the core of Mongolian society, providing a significant share of national income and employment. Women have the leading role because they are the ones tending the animals and processing the milk into traditional products for winter food as well as for earning income from selling the surplus for other basic family needs.

Livestock contribute more than one-fifth of GDP and almost half of all employment in what was, until recently, a predominantly nomadic society. Dairying, in particular, provides much-needed nutrition, regular income and employment and is set to play a major role in helping the country become more food secure and, in so doing, supporting the UN Millennium Development Goal seeking to halve poverty and halve under-nutrition by 2015. In Mongolia, the latter goal means reducing the number of under-nourished people living below the poverty line from 800 000 to 400 000.

In the socialist period, Mongolia used to be self-sufficient in milk (Table 1). During the rapid transition to the market-based economy in the 1990s, the dairy industry, like other food industries, collapsed; sales of domestic processed milk fell from more than 65 million litres in 1990 (approximately 20 percent of milk production) to less than 3 million litres by 2002. As a result, overall food insecurity worsened, and many people lost their livelihoods. Imports of milk and dairy products surged to about 50 million litres of a liquid milk equivalent (LME) annually. The dairy industry by 2002 was hampered by obsolete infrastructure and technologies, a chronic shortage of trained people and consumer concern about the quality and safety of domestic milk and dairy products. Consequently, most of the processed milk sold in urban areas was imported, at considerable cost.

Like other countries in the East Asian region, Mongolia is rapidly urbanizing. Domestic products need to be tailored to modern market tastes, particularly to younger Mongolians. Half the population is younger than 20 and have drunk only imported milk. Even so, the huge wealth of traditional milk products remains an important part of the culture and for the livelihoods of nomadic herders, especially during the long harsh winters.

Since the move to the market economy in the 1990s, milk prices are no longer centrally set and fluctuate according to supply and demand. Farmgate and consumer prices vary considerably according to season and to how far milk producers are from the market (Annex II-a). A 5 percent tariff on milk powder imports was introduced in 2000, along with a 15 percent value-added tax (VAT). In 2006 the Ministry of Food and Agriculture proposed to increase tariffs to 15 percent on selected food imports, including the ultra-high temperature, or UHT, milk. The proposal is still under consideration. The VAT was reduced in January 2007 from 15 to 10 percent on all imported and domestic goods. Dairy plants with an annual turnover of more than 15 million tögrög (US\$13 000) now pay VAT in accordance with the new tax law, which allows payment to be offset against the cost of procuring domestic raw materials such as milk. This is a highly supportive measure, considering 70 percent of costs are for raw milk.

Table 1: Milk production in Mongolia ('000 tonnes)

Year	Total milk production	By species			
		Camel	Mare	Cow	Sheep/goat
1940	242.2	1.6	12.7	186.8	41.1
1950	240.8	2.4	12.1	183.4	42.9
1960	227.7	2.3	12.2	173.5	39.7
1970	220.6	1.2	12.1	177.3	30.0
1980	225.7	1.1	7.3	194.9	22.4
1990	315.7	1.0	26.1	260.2	28.4
1995	369.6	(X)	(X)	(X)	(X)
2000	375.6	(X)	(X)	(X)	(X)
2003	292.4	(X)	(X)	(X)	(X)
2005	425.8	3.7	41.5	259.5	121.1
2006	479.4	3.8	43.3	285.7	146.6

(X) Figures not available

Source: Mongolia Bureau of Statistics (2006)

At 134 kg of LME per person per year, milk availability is very high by Asian standards; for example, in neighbouring China it is only 10–20 kg, with imports currently increasing at an annual rate of 15 percent. A number of private dairy enterprises emerged during the 1990s, after the political and economic liberalization, including former food and dairy processing *combinats* (state-owned companies) acquired by the incumbent managers. Some failed; others experienced great difficulty in getting milk, a highly nutritious but highly perishable food, to market. Up to a reported one-third of available milk was “lost” in the post-harvest (after milking) food chain because it could not be moved to markets or could not be sold because consumers preferred imports. This encouraged the establishment of two dairy enterprises with business models based on importing subsidized milk powder from developed-country surpluses for recombination.

During the great *zuds*²³ at the turn of the century, more than 30 percent (10–12 million) of the livestock perished, including nearly all the dairy cows, which had been distributed to former state farm workers in the 1990s. Given the importance of dairying to the economy, the Government decided to re-stock and modernize the dairy industry to redress the imbalance between milk supply and demand. It promoted domestic milk production and marketing under its flagging national White (milk) Revolution Programme. Formulated in 1999, the programme never really took off, owing to lack of resources.

Then in 2002 the Government approached the FAO and the Japanese Government for project support to revive the dairy industry,²⁴ initially in the central *aimags* (provinces) where three-quarters of the urban population lived and the few remaining dairy cows were located. They wanted to link milk producers to the key urban centres of Ulaanbaatar, Darkhan and Erdenet, where about half of the population lived. To reduce post-harvest milk losses, the project would target small milk-producing households and farms (with 10–40 cows) adjoining the urban centres as well as more distant nomadic herders by organizing milk collection, initially for the under-used urban milk processing dairies.

²³ Zuds are any condition when animals cannot feed themselves by grazing – typically when ice or snow covers pastures.

²⁴ Mongolia-Japan-FAO/UN Special Programme for Food Security project: Increasing the supply of dairy products to urban centres in Mongolia by reducing post-harvest losses and re-stocking.

This case study report is based largely on the achievements and lessons learned during that regional project, which ran from October 2004 to September 2007. The Government mainstreamed the project's three intervention areas (milk-production enhancement, milk-marketing enhancement and dairy training/capacity-building) into a ten-year National Dairy Programme (NDP) for the period 2007–2016. The NDP target is that at least 90 percent of the milk used in the formal market will be produced locally by 2010, up from 2.5 percent in 2003 (Figure 1). The NDP, which replaced the White Revolution Programme, was approved by the Government in October 2006; it is coordinated by the Ministry of Food and Agriculture and implemented using a public–private sector partnership and investment modalities developed through the FAO/Japan project.

The current dairy situation: An overview

Dairy industry survey (2005)

Due to recent lifestyle changes from predominantly nomadic to predominantly sedentary, the country is urbanizing rapidly. A survey of dairying in the central *aimags* conducted in 2005 by the Mongolian Food Processors Association identified many shortcomings in the dairy food chain. Socio-economic data were collected and analysed from 84 small milk producers (nomadic herders and peri-urban households and farms), 14 dairy processors and 1 200 urban consumers. The findings (Box 1) characterize milk production and consumption as: i) a relatively small domestic market for processed milk and dairy products, ii) a huge disparity between rural (at 200 kg per year) and urban (at 58 kg per year) consumption of milk, iii) poor-quality milk and lack of consumer confidence in locally processed milk and dairy products, iv) over-reliance on imports for urban markets and v) a vast natural resource base for milk production from the 6 million or so animals owned by small milk producers that are potentially in milk at any one time.

Box 1: The socio-economic situation of the dairy industry in central *aimags* and urban markets

Selected findings (2005):

1. Annual milk consumption in urban centres is 58 kg LME per person, about one-quarter of the consumption in rural areas, at 200 kg;
2. 70 percent of processed milk consumed in urban areas is imported (approximately 40 kg LME per urban dweller per year), and milk quality is an important driver;
3. Post-harvest “losses” confirmed at one-third of milk production (approximately 40 kg LME per person per year);
4. Nearly all milk is produced by small producers, but quality is poor because of inadequate milk collection and primary treatment infrastructure;
5. A chronic lack of technical expertise and modern technologies and equipment among dairy operators (producers, collectors, processors) – training and capacity-building urgently needed;
6. Inadequate services for milk producers (health, breeding with artificial insemination, feed/fodder, management);
7. The number of more-intensive* dairy farms doubled to 110 since 2003; owners are inexperienced and lack skills and services;
8. Households selling milk have average incomes three times higher than households not selling milk;
9. Women head 30 percent of the dairy households;
10. No institutional body to represent the dairy industry.

*In the Mongolian livestock context, “intensive” means increased production using local resources – rather than tending towards a high input system.

Source: Baseline Survey-GCSP/MON/001/JPN Dairy Food Security Project by National Food Producers' Association, September 2005

After liberalization, the old state dairy system struggled with obsolete equipment and inexperienced management. Many of the new processors failed because their competitiveness with subsidized imports was constrained by overwhelming difficulties in obtaining: i) quality local milk from widely dispersed small milk producers, ii) modern equipment, iii) modern packaging materials and iv) low interest rates for investment finance and working capital (typically it was high at 18–30 percent). Two large food and beverage companies (one supermarket-based and the other the main producer of vodka) diversified into producing UHT milk and fruit juice. They based their business model on reconstituting imported full-cream milk powder (FCMP) marketed as “fresh” milk. At that time, the cheap milk powder from the West (often subsidized) was readily available at a LME cost of about 200 tögrög (\$.17) per litre, roughly the same price as locally produced milk in the summer (Annex II-a).

The 2005 survey found that the informal milk market was still important for the older generation, though product quality was invariably uncertain. Raw milk and traditional products still accounted for approximately half of urban consumption. The informal market was important not only as a supply of milk and dairy products but also as a source of regular income and jobs, especially for female-headed households.

Dairy industry-revival strategy

The revival strategy for the dairy sector has been linked to the current policies for national agricultural development. These focus on improved competitiveness in changing markets by: i) creating favourable business conditions, ii) improving and sustaining productivity leading to iii) improved availability of quality milk and dairy products that are safe, affordable and ecologically clean, and iv) application of new technologies for both extensive pastoral and higher-productivity farming systems.

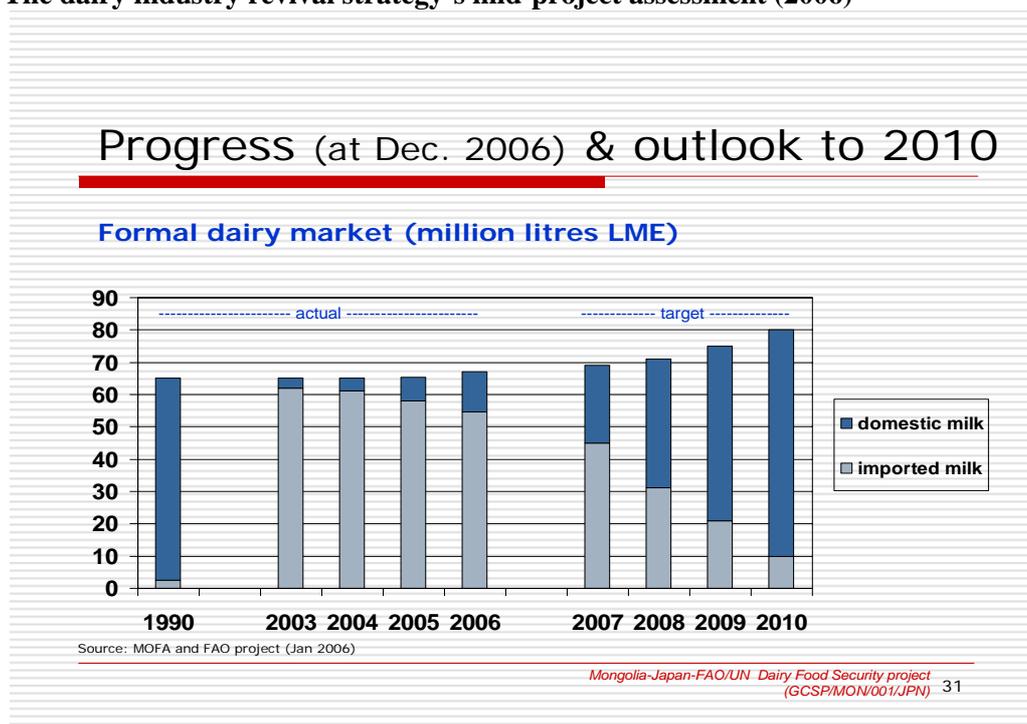
A National Dairy Task Force, representing all public- and private-sector stakeholders, was set up in 2005 to guide the industry’s re-building process. The revival strategy was based on an analysis of the dairy industry and approved by the stakeholders at a national workshop. It embraced a sector-wide, cow-to-consumer dairy food chain approach to be implemented under the following thematic programmes: i) milk-production enhancement, ii) milk-marketing enhancement and iii) capacity-building and training.

In line with government policy, the revival strategy is directed initially at the three central *aimags* where: i) the majority of the urban population live, ii) most cattle are found and iii) the main cropping areas are located and thus crop by-products are accessible for feeding. Initial interventions were based on matching modern technologies and know-how to local market needs in order to: i) persuade urban consumers to consume more domestic milk and milk products, ii) reduce post-harvest losses by linking milk producers with consumers through processors; and iii) substitute imported milk and dairy products with quality domestic products.

With public- and private-sector partners, the three thematic programmes have been operationalized through six commercial dairy modules (or investment packages) covering each link in the cow-to-consumer dairy chain. These have been backed up with supporting activities that include: i) a permanent National Dairy Training Centre at the Food Technology College in Ulaanbaatar, which provides practical, vocational and outreach/field training for each of the modules; ii) a pioneering animal genetic improvement scheme; iii) an innovative retailing concept in which processors collaborate to sell their products, including certified raw chilled milk and traditional products at the “one-stop” milk sales centres; iv) the first generic branding and advertising campaign in Mongolia; v) an innovative public–private sector partnership school lunch programme based on local milk, vi) working with the food standards and inspections authorities to train and certify milk traders; and vii) setting up the Dairy Steering Group under the Mongolian Food Processors Association to sustain the activities.

Initial results have been encouraging. By mid 2007, 16 commercial modules/units were in operation, with the National Dairy Programme sharing the investment risks with its partners by contributing up-to-date know-how and limited equipment (approximately \$350 000). The partners invested about \$1.3 million in equipment and buildings. The quantity of domestic milk entering the formal market in 2006 was 11.7 million litres, up from 2.5 million litres in 2003. This is expected to increase to 18 million litres in 2007. Private investors, including the two companies reconstituting imported FCMP, were expected to invest upwards of \$10 million in the modules in 2007 and 2008.

Figure 1: The dairy industry revival strategy's mid-project assessment (2006)



Source: Agricultural development strategy of Mongolia (2006–2015), Government of Mongolia, 2006

Small-scale dairy farmers

Characteristics

“Smallholder” is not a term that can be applied in Mongolia because all grazing land is communal – owned by the State (see the definitions in Box 5). By law, households in city areas are entitled to 0.5 acres of land and those in other areas to 0.7 acres. Since the collapse of the state collective dairy farms, small milk producers have dominated milk production. They comprise two main groups: i) traditional nomadic herder households with mixed herds of up to 200 or more animals and ii) peri-urban households with up to 20 milking cows. A growing group (currently 300-plus) of larger dairy farms, with 20–40 milking cows, have been established between 50 and 100 km from Ulaanbaatar and other urban centres.

Generally speaking, a dairy farm is classified as a small mixed-livestock farm within a 50–100-km radius around a centrally located area, provincial centre or city, which has winter shelters for cattle and the ability to make hay and fodder. According the 2006 livestock census, there were 8 012 dairy cattle kept on 395 dairy farms – an average of 20 animals per farm. Of them, more than 80 percent were located near Ulaanbaatar, the capital city, and in Tov and Selenge *aimags*, the main crop areas of the country. Small dairy farmers usually have their own market outlets and deliver raw milk to: i) milk processing units, ii) food/dairy markets, iii) small food stores or kiosks and institutions (canteens, hospitals, sanatoriums, schools, kindergartens).

Box 2: Jargalkhand, a nomadic herder, successfully transitions into dairying

Jargalkhand, a nomadic herder from Jargalant bag (village), lives in a remote area of Tov aimag, 200 km from Ulaanbaatar. A now-single mother with two teenage children, she used to be employed by a state cooperative farm but lost her job after privatization and was given three milk cows, a few goats and sheep as compensation. Since then she has struggled to provide for her family. In 2000 she started to sell milk to a middleman, T. Buuveibaatar, who was then collecting about 2 000 litres of milk daily from 60 households. In 2004, Mr Buuveibaatar worked with the Government's industry-revival project, setting up the model milk-collecting and milk-processing modules. Mr Buuveibaatar now runs a dairy company called Monkhiin Suu (Endless Milk) and collects 8 000–10 000 litres of milk daily in the summer from 280 herding households. Some of the milk he processes for sale in nearby Baganuur city, including for schools; some he sells chilled in Ulaanbaatar.

Because she now has an assured market for her surplus milk, Mrs Jargalkhand has been able to invest some of her earning from milk in buying more cows. She now has ten milking cows and sold 7 200 litres of milk to Monkhiin Suu in 2006 for a gross income of 1 440 000 tögrög (\$1 240). While it is too early to assess the impact of the milk production on her daily life, she likes the regular income that selling milk brings, which she uses for school fees and purchasing other family items, such as flour, rice and sugar, without borrowing money. Mrs Jargalkhand also appreciates having the Dairy Service Centre and veterinarian on call to attend to her livestock – her only assets.

Revival of the dairy industry in Mongolia depends on small producers and on their capacity to increase production of quality milk at prices that enable processors to compete with imports, both as finished products and as milk powder for reconstitution. Small milk producers are reported to be the most profitable type of farmers in Mongolia (World Bank, 2004). In 2007, milk producers linked to formal markets received between 150 and 300 tögrög (\$12–\$.25) per litre for milk in summer, when 80 percent of the milk supply is produced (depending on the distance from the market; Annex II-a). In winter they are paid between 350 and 500 tögrög (\$.29–\$.42) per litre. Winter prices were not competitive with subsidized imports from Europe until this year (2007) when the worldwide shortage of FCMP drove liquid milk-equivalent prices up to more than 600 tögrög (\$.50) per litre.

The 2006 livestock census reported that 225 400 households (36 percent of the total) owned on average 152 head of livestock; of them, 170 800 households (27 percent) were classified as herding families engaged in livestock raising, owning on average 204 animals. Rural families with less than 50 head of livestock are considered poor households. Herds consist of cattle, horses, camels, sheep and goats. After more than 15 years of market transition, herding families have started to form groups to work together in marketing their produce (such as wool, cashmere, hides and skins, meat and traditional dairy products). The formation of herding groups is largely based on family membership, seasonal pasture location or *bag* (smallest local administrative unit) location.

Traditional dairy food chain model

Traditional dairy products are hugely important. Along with meat, they were, until very recently, the main foods for nomadic families in the long, cold autumn-winter-spring period (October–May). All the milk is used. When the quantity of milk or by-products is too small to process, it is accumulated over a number of days, allowed to sour naturally and then processed.

Though more than 100 regional varieties are produced, traditional products are broadly classified as fat- or protein-based or fermented. Many are unique, such as *airag* (beer fermented from mare's milk), for which the mares are milked every two hours, night and day, during the short summer, and *shimiin arkhii* (vodka distilled from fermented milk). There is also the ubiquitous *suuthe tsai* (salted tea) offered by all households to visitors and restaurants to customers.

Fat-based products: *urum* (cream), *shar tos* (ghee or clarified butter), *tsagaan tos* (white butter from camel and goat milk), *airgiin tos* (cream wafers)

Fermented products: *airag*, *khoormog* (sour camel milk), *undaa* (fermented drink), *tarag* (yogurt), *tsegee* (sour milk)

Protein-based products: *byaslag* (cheese), *aarts and aaruul* (fermented dried curd), *khuruud*, *eezgii* (evaporated curd)

These foods are produced out on the steppe in summer and by peri-urban households for both domestic consumption and selling. Traders buy and gather the products and either sell directly or as wholesale to other retailers in the *suu* (milk) markets found in all trading centres and urban areas. Though no studies have been carried out and quality is often highly suspect, it is understood that producing and trading in traditional dairy products is highly profitable. Many of the larger processing dairies now produce and market their own traditional product brands.

Modern dairy-food chain model

The modern dairy-food chain model evolved from the lessons learned during food security analysis and consultations and is inclusive of all milk producers, irrespective of type and size (nomads, peri-urban households, small-scale dairy farms). The model links producers to small- and large-scale processors with a module for each link in the cow-to-consumer dairy-food chain. There are six vertically integrated modules, each capable of being adapted to the local situation and each of which must be profitable. The modules include: i) milk producer organizations (MPOs), ii) dairy service centres, operated on a full cost-recovery basis by private veterinarians, iii) milk-collecting packages, iv) milk-cooling centres, v) milk-processing units and vi) “one-stop” milk sales centres. The modules are supported by many innovative training and marketing features and have been mainstreamed into the National Dairy Programme for the period 2007–2016.

Box 3: A veterinarian survives the economic transition

Dr Chantu used to be a government veterinarian. He was made redundant when the state farming system collapsed in the 1990s during the abrupt change from a state-run to a market-led economy. He set up as a private vet and also leased land at Nomgon soum in Selenge aimag for growing wheat. His income rarely covered his expenses, so, like other farmers and herders in the area, he added milk production to his farm business. He uses crop residues to feed his cows. In 2005 he became a founder-member of the Nomgon Suu Milk Producers' Cooperative, set up with support from the Government's dairy industry-revival project. The project also provided the model milk producer organization (MPO) module along with a model milk-collecting module (3-tonne truck, milk cans, Lactoscan rapid milk analyzer, training). The MPO currently has 18 members who sell around 800 litres of milk and traditional products daily in nearby Darkhan City. The MPO has savings of some 300 000 tögrög, earned from various services provided to members.

In 2006 Dr Chantu was appointed manager of the new, model Dairy Service Centre, set up by the MPO to provide its members with support services. Dr Chantu attended four vocational courses organized by the National Dairy Training Centre (NDTC) on subjects such as dairy cow breeding, establishing MPOs and clean milk production. Today Dr Chantu provides MPO members and other farmers and herders in the area with animal health and diagnostic services and also breeding and other support, including training through the NDTC's outreach programme. Since 2006, he has inseminated more than 300 local cows with Simmental semen provided under the piloted dairy cow genetic-improvement scheme, which has produced some 240 calves. By spreading his risks, Dr Chantu now has a profitable business, driven mainly by earnings from his daily milk sales. He believes that his Simmental-crossed animals perform best under the harsh Mongolian climatic conditions.

The chart in Annex I shows the informal and dairy chains that link small herders and dairy farmers with consumers in large urban areas (populations of more than 25 000), such as Ulaanbaatar, Darkhan, Erdenet and Zuunhaara, and smaller *aimag* centres with populations from 5 000 to 25 000.

Box 4: A product of the revival strategy: Erdenet Khaan Suu Dairy Co. Ltd

Khaan Suu (King Milk) started business at the end of 2006 and currently processes up to 5 tonnes of milk per day. It is the only milk-processing facility in Erdenet City, now the second largest city in Mongolia. The owner, Ganbold Ariunbileg, invested 500 million tögrög (\$430 000) processing equipment from China and Russia to make ice cream and yogurt. The company employs 138 staff in its milk collection-processing-marketing operations – one employee for every 15 litres of milk. Eighty percent of the staff are women. The Government's dairy industry-revival project provided Mr Ariunbileg its milk-collecting module and training for key technicians to demonstrate and promote the buying of quality milk from Mongolian milk producers. The company currently buys about 2 tonnes of milk daily from 15 herders, at 200 tögrög per litre. Tos (sour cream) and aarts (curd) are purchased from another 25 herders. Khaan Suu's main products are yogurt and ice cream, which are sold in the cities of Erdenet (20 percent), Darkhan (20 percent) and Ulaanbaatar (60 percent), some 350 km away.

The natural and flavoured yogurt lines wholesale at 600 tögrög per 500 ml carton (1 200 tögrög per litre) and the ice cream lines at 100 tögrög per 50 ml cone (2 000 tögrög per litre). Sales are currently 50–60 million tögrög per month. The company had planned to double throughput to 4 tonnes daily in 2008 by investing in one of the low-cost model milk-cooling centre modules pioneered by the project. In September 2007, the company began supplying milk juices (made with natural Mongolia berries and fruits) to 10 000 children in Erdenet, through the national school lunch programme. The company also retails its products through a one-stop milk sales centre module in Ulaanbaatar. Due to rising demand, Khaan Suu will launch a range of fresh and flavoured pasteurized milk and milk-juice lines in the Erdenet market in 2008.

Prospects

The transition to the market economy in the early 1990s culminated in today's enterprise-oriented dairy industry, based largely on milk produced by small producers. The strategic lessons and prospects for dairying and small milk producers in Mongolia are listed below. These have been translated into a focused strategy – the National Dairy Programme (NDP), which involves a mix of government and (mainly) private sector investment over the period 2007–2016.

- **Small milk producers:** Re-building the milk collection-processing marketing infrastructure, with a focus on small milk producers, milk quality and training, has driven the dairy-revival process. More effort should now be placed on improving productivity at the farm level.
- **Modern dairying model:** The sector-wide, integrated industry re-building strategy aimed at ensuring that each link (module) in the dairy chain is profitable and is encouraging private-sector investment.
- **Dairy institutions:** Setting up the National Dairy Task Force (later re-named the NDP Working Group) to guide the overall programme and the enterprise-oriented Dairy Steering Group under the Mongolian Food Processors Association enhanced coordination, giving the industry a more powerful voice in promoting local milk by focusing on quality and safety; generic branding, labelling and advertising helped to re-build consumer confidence in local milk.
- **School milk:** Promoting local milk and dairy products through the school lunch programme has the dual impact of improving nutrition and providing a market for local milk producers.
- **Costs and competitiveness:** Milk production costs and farmgate prices are now competitive with imported FCMP, notwithstanding the current 5 percent import tariff. Farmgate prices in summer (\$.12–\$.25 per litre) for milk produced under the semi-intensive, peri-urban system are competitive with the most efficient Western countries, provided Western subsidies are discounted. Producer prices are even lower for milk produced by herders and small producers in more remote areas.
- **Traditional dairy products:** These items will continue to be important, high-value-added and profitable products. The potential to export Mongolia's unique mare milk-based and camel milk-based functional foods should be explored under a "green" ecological generic brand/label.

- **Legislation:** Updating domestic and import tax legislation has encouraged domestic milk processing; for example, the VAT paid by milk processors can now be offset against the cost of procuring domestic milk.
- **Future growth prospects:** Due to the already high degree of milk availability and consumption levels, at least by Asian standards, once imports are replaced and urban consumption increased, market growth is expected to stabilize around 2–3 percent per annum, assuming disposable incomes continue to grow. With the recent growth of the mining and tourism sectors' gross national income, while still low by Western standards, has been expanding at about 12 percent annually since 2002 and should be capable of sustaining this modest growth forecast.
- **Exports:** Given its small population and high per capita consumption of milk and dairy products, Mongolia will need to look increasingly to exporting clean, quality, niche dairy products to the rapidly growing markets of milk-deficit countries in the region to continue growing its dairy industry in the longer term. This need is recognized in the NDP. With its huge milking herds and vast grasslands, Mongolia has a clear international comparative advantage for producing and exporting clean milk to ecologically conscious markets; hardly any pesticides or animal drugs and no milk-stimulating hormones are used.
- **Investment:** In the short term, investment is most needed to continue the modernizing and expanding the milk-collecting infrastructure and to further improve the productivity and profitability of dairy cows. In the medium term, investments are required to process surplus milk into niche, value-added, easily transportable products, such as milk powder and processed cheese, for export to milk-deficit markets in the north and north-eastern Asia region.
- **Socio-economic benefits:** The extra regular income for small milk producers, the extra jobs created and the availability of affordable, safe domestic milk and dairy products for urban consumers should help improve livelihoods through better nutrition and reduced poverty. The impact of this on small milk producers and consumers and in helping Mongolia to achieve its Millennium Development Goals of halving poverty and halving under-nutrition by 2015 needs to be assessed.

Conclusions and lessons learned

The 2005 analysis of the Mongolian dairy subsector remains valid. The following is a summary of key lessons learned during the re-building process:

- **Revival strategy:** Adopting a sector-wide, cow-to-consumer strategy, inclusive of small milk producers, to revive the dairy industry that relies on practical demonstration modules to ensure each link in the dairy food chain is profitable.
- **Constraints into opportunities:** Basing the strategy on taking advantage of the key opportunities available to the Mongolian dairy industry: i) high per capita consumption, ii) huge milking herds, iii) vast grasslands, iv) imports to substitute, v) export potential for “clean” milk to nearby milk-deficit markets can overcome the present *constraints*: i) low milch animal productivity and poor-quality milk; ii) lack of market access for milk producers, iii) obsolete infrastructure and equipment, iv) lack of up-to-date technical know-how and skills.
- **Committed partners:** Careful selection of public- and private-sector partners and collaborators has led to cost-sharing and responsible ownership of the model dairy demonstration modules; divesting ownership of the old state dairy in Ulaanbaatar revitalized the company.
- **Policy:** The Government has ensured consistency between its food, agriculture and tax policies by mainstreaming activities into the new ten-year National Dairy Programme (2007–2016).
- **Increasing milch animal productivity:** Having more animals is less vital than each animal's productivity to sustainably increase small milk producers' incomes; priority should be placed on services that provide immediate impact, such as feeding, artificial insemination using appropriate dual-purpose breeds, and animal health, while concurrently introducing genetic improvement.
- **Capacity-building:** Placing priority on establishing a permanent vocational and outreach training facilities – the National Dairy Training Centre – at the Food Technology College in Ulaanbaatar have been prudent.

- **Traditional dairy products:** Of continuing importance, they provide good returns to small-scale milk producers and processors.
- **School lunch (and milk) programme:** Linking small-scale milk producers and processors as well as larger-scale processors to the programme has facilitated the dairy sector's revival process while introducing/re-introducing children and their parents to the nutritional benefits of local milk.
- **Earnings and employment:** Access to milk markets provides nomadic herders and rural households with regular earnings and the dairy food chain provides many rural and urban off-farm jobs, especially for women – up to one job for every 15 litres of milk collected, processed and marketed.
- **Dairy equipment and supplies:** These are only worthwhile if they are appropriate, affordable and available, such as made and maintained locally or imported from nearby counties through local agents.

Box 5: Key definitions

Small-scale milk producer: “Smallholder” is not really a term that can be applied in Mongolia because all land is owned by the State, so the term “small-scale milk producer” is used for this report. A small milk producer is a nomadic herder or peri-urban householder with up to 200 livestock (cows, yaks, camels, horses, sheep and goats). Rural families with less than 50 livestock are considered to be poor. After 10–15 years of market transition, herders have started to form herding groups due to the necessity to work together for the marketing of their agricultural products, such as wool, cashmere, hides and skins, meat and traditional dairy products. Membership of herding groups is usually based on: i) the family unit, ii) seasonal pasture location or iii) the *bag* (smallest administrative unit) location.

Small-scale dairy farmer: Someone who: i) possess 10–40 cows, ii) lives within a 50–100-km radius from the *soum* (district) centre, the *aimag* centre or a city, iii) possesses winter shelters for cattle and iv) can prepare hay and fodder for winter feeding. Small dairy farmers usually have their own market outlets and deliver raw milk to: i) milk processing units, ii) food/dairy markets, iii) small food stores or kiosks and iv) institutions (canteens, hospitals, sanatoriums, schools, kindergartens).

Informal milk market: Direct cash sale of raw milk and traditional dairy products at a food market or home delivery by farmers and herders themselves or by middlemen-milk collectors, who deliver milk to small family shops, stands, local kindergartens, canteens or hospitals, without any registration or license from local authorities.

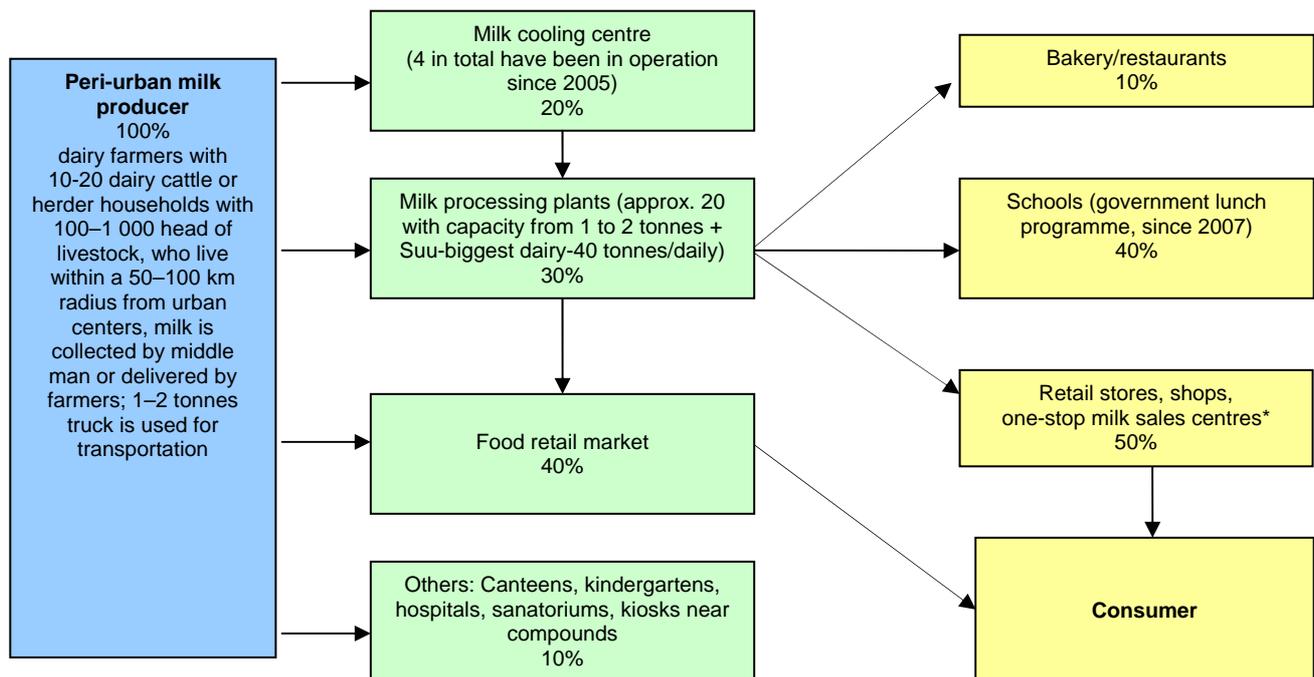
Formal milk market: Industrial use of milk by processing plants and units (milk collection, transportation, reception, processing with various equipment lines, packaging, ready products, distribution networks, returns and others). The quantities of raw milk sold as a raw material, which is processed and sold as a finished product, are registered and included in the official statistical monthly and annual bulletins.

Home retention: Milk that is spilled, spoiled, consumed because the farmers has no access to a market, a traditional dairy product with a long shelf life that is consumed in winter (such as *aaaruul*, *aarts*, *eezgii*, *shar*, *tsagaan tos* or is served to visitors is characterized as home retained. **Note:** In the traditional way of milk processing, the definition of *spoilage* cannot be used because the non-treated milk is collected gradually for natural fermentation in a bulk container (skin sack, wooden barrel, plastic drums) for further processing into products such as *aaaruul* (dry curd), *aarts* (semi-dried curd), *shimiin arkhii* (milk vodka), *eezgii* (evaporated curd in own whey), *shar*, *tsagaan* and *tos* (melted butter or ghee).

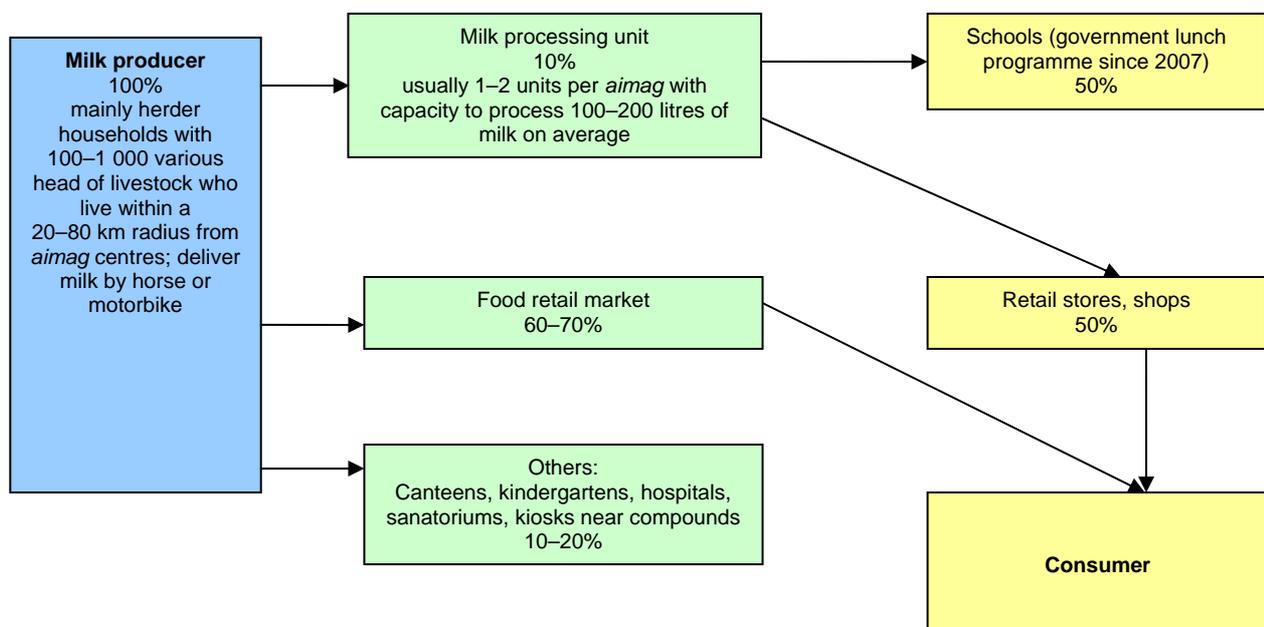
Post-harvest milk “losses”: Surplus milk that producers are unable to sell due to no access to market, which is retained and used at home.

Dairy value chain: The stages in the cow-to-consumer food chain (see the milk flow chart in Annex I).

Annex I: Milk flow chart for Ulaanbaatar, Darkhan, Erdenet, Zuunharaa – big urban centres



Milk flow chart at *aimag* provincial centres (residents are considered as urban dwellers)



Annex II-a: Consumer milk price (tögrög) by region and season* (2006–2007)

1. Arvayheer: Ovorkhangai *aimag* centre (central region)

	Jan-Feb	March-April	May-June	July-Aug	Sep-Oct	Nov-Dec
Sheep milk	-	-	700-600	500	-	-
Goat milk	-	-	700-600	500	-	-
Cow milk	-	1000	700-600	500	600	800
Yak milk	-	-	700-600	500	600	-
Mare milk	-	-	1 000-700	600-800	800-900	-

2. Ulaangom: Uvs *aimag* centre (western region) – 29 600 residents

	Jan-Feb	March-April	May-June	July-Aug	Sep-Oct	Nov-Dec
Goat milk	-	-	400	300	-	-
Cow milk	700	500	350	300	400	500
Mare fermented milk-airag	-	-	-	900-1000	1000	-

3. Dalanzadgad: Omnogobi *aimag* centre (south region) – 32 400 residents

	Jan-Feb	March-April	May-June	July-Aug	Sep-Oct	Nov-Dec
Sheep milk	-	-	-	500-800	-	-
Goat milk	-	-	-	800-1 000	-	-
Cow milk	-	-	700-600	600-700	600-700	600-700
Camel milk	-	-	1 200-1 000	-	1 000-1 200	1 000-1 200
Mare fermented milk-airag	-	-	-	1000-800	800-1 000	-

4. Choibalsan: Dornod *aimag* centre (eastern region) – 53 600 residents

	Jan-Feb	March-April	May-June	July-Aug	Sep-Oct	Nov-Dec
Cow milk	500	500	300	300-400	400-450	500

5. Ulaanbaatar: capital city – 965 300 inhabitants

	Jan-Feb	March-April	May-June	July-Aug	Sep-Oct	Nov-Dec
Cow milk	500-600	500	400-300	300-400	400	500
Fermented mare milk-airag	-	-	-	1 000-800	800-1 000	-

6. Darkhan: second city – 82 400 inhabitants

	Jan-Feb	March-April	May-June	July-Aug	Sep-Oct	Nov-Dec
Cow milk	500-600	500	400-300	200	300-400	450-500
Fermented mare milk-airag	-	-	-	1 000-800	800-1 000	-

* Average retail market price for 1 litre of milk; 100-150 tögrög is added to the farmgate price for informal market sales; milk processors pay 50-100 tögrög less, if they have permanent supplies or own farms.

Source: Provincial Food and Agriculture Agencies, August 2007 (data incomplete).

Annex II-b: Milk prices in Ulaanbaatar's main dairy market (1990–2007)

Year	Farmgate (tögrög/litre)			Consumer (tögrög/litre)			Local milk powder price (tögrög/kg)	Average exchange rate
	Low	High	Ave.	Raw	Past.	UHT*		
1990								
1991								
1992								50 tögrög
1993								200 tögrög
1994								400 tögrög
1995	150	400	250	300	400	-	1 500	400 tögrög
1996	150	400	250	300	400	-	1 500	700 tögrög
1997	150	400	280	300	400	-	1 800	800 tögrög
1998	150	400	280	300	400	-	1 800	800 tögrög
1999	200	400	285	300	400	-	1 800	800 tögrög
2000	200	400	290	300	400	-	2 000	1 000 tögrög
2001	200	400	330	400	500	-	2 000	1 000 tögrög
2002	200	400	350	400	500	-	2 000	1 000 tögrög
2003	200	400	350	400	500	700	2 200	1 160 tögrög
2004	200	400	385	400	500	700	2 500	1 170 tögrög
2005	200	450	390	400	600	800	2 800	1 190 tögrög
2006	200	450	395	500	600	850	3 000	1 160 tögrög
2007	250	450	395	500	650	900	3 500	1 180 tögrög

(US\$1= 1,187tögrög)

* First UHT plant with Tetra Pak packaging was started by a New Zealand-Mongolia joint company in January 2003.

Source: Suu Milk Shareholding Co., Monsuu Co. Ltd and GUM Co. Ltd, the main dairy companies operating in Ulaanbaatar; selected available data, August 2007.

Pakistan: A dairy sector at a crossroads

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Overview of the milk economy

Pakistan is the sixth most populous country in the world, with an estimated population of over 160 million,²⁵ growing at a rate of more than 1.8 percent per annum. Agriculture, being the mainstay of the economy, generates 20.9 percent of the total GDP and employs 43.4 percent of the total workforce.²⁶

With an almost 50 percent contribution, livestock is by far the most important subsector in agriculture. In the past ten years, the subsector grew by an average of 5.8 percent.²⁷ The share of livestock in agriculture growth jumped from 25.3 percent in 1996 to 49.6 percent in 2006.²⁸ The higher growth in the livestock sector has been mainly attributed to growth not only in the headcount of livestock, which is commercially important, but also in milk production. Within the livestock sector, milk is the largest and single most important commodity. Despite decades of oversight by the Government, Pakistan is the fifth-largest milk producer in the world.²⁹ According to the 2006 livestock census (Table 1),³⁰ milk production had increased by 36 percent since 1996.

Table 1: Relative increase in milk production over the past two decades

Type of animal	Gross annual production ** (billion litres)				% change between
	1986	1996	2006	1986 & 1996	1996 & 2006
Cows	7.07	9.36	13.33	32.4	42.4
Buffalo	14.82	18.90	25.04	27.5	32.5
Total	21.89	28.26	38.37	29.1	35.6
** Calculated using average annual lactation length of 250 for cows and 305 days for buffalo.					

Source: Economic survey of Pakistan 2007

Production base

Despite being the most lucrative livestock product, milk production is the least commercialized enterprise in the agricultural economy. The majority of the national livestock herd is distributed in small units throughout the country. About 55 million landless or smallholder farmers produce the bulk of the country's milk supply.

Buffalos and cows are the major milk-producing animals. According to a FAO study on milk marketing in Pakistan in 2003, 80 percent of the milk in the country was collectively produced by rural commercial and rural subsistence producers. The peri-urban producers account for 15 percent of the total production, whereas urban producers contribute 5 percent.³¹ Annex III shows the distribution of milk as it moves along the various links in the overall supply chain.

According to the 2006 livestock census (Table 2), 51 percent of the 8.4 million reported dairying households owned 1–4 animals, 28 percent of dairying households maintained herd sizes of 5–10 animals; another 14 percent had herds of 11–50 animals). Only 7 percent of the dairying farms in the country could be considered large, with more than 50 animals.

²⁵ Population Census Organization, 2007

²⁶ Economic survey of Pakistan 2007

²⁷ Economic survey of Pakistan 2006

²⁸ Pakistan livestock census 2006

²⁹ Husnain and Usmani, 2006

³⁰ A national livestock census is taken every decade. Thus, the 2006 census is of particular importance.

³¹ SSI-NARC, 2003

Table 2: Herd size by household

No. of animals	Ownership by household (%)
1–2	27.32
3–4	23.73
5–6	14.32
7–10	13.68
11–15	6.29
16–20	2.65
21–30	2.58
31–50	2.71
51 or more	6.72
TOTAL	100

Source: Pakistan Livestock Census, 2006

Supply and demand

As a food item, milk (both milk and liquid milk equivalents) is second only to cereals in the level of per capita consumption in Pakistan,³² which nationally is 190 litres.³³ Province-wise, per capita consumption stands at 246 kg in Sindh, 132 kg in Punjab, 86 kg in North-West Frontier (NWFP) and 108 kg in Baluchistan.

Due to rising inflation and high poverty levels, the majority of Pakistani consumers are price conscious. Therefore, demand for raw milk is large compared to processed milk. Hence, raw milk is the primary dairy product marketed in the country. More than 90 percent of the marketed milk is collected and sold unprocessed through the informal market by a multi-tiered layer of marketing agents.

The supply of milk to meet domestic demand has usually lagged. To fill the gap, powdered milk is imported every year. From July 2006 to November 2007, dairy products³⁴ worth 2 320 million rupees (US\$38.6 million)³⁵ were imported. The Statistics Division lists the products as “milk and milk food for infants”.

Milk markets and chains

Milk markets in Pakistan can be classified into three categories: rural, urban and international. Similarly, the three marketing chains in Pakistan are rural, urban and processed marketing chains, as the following explains.

Rural marketing chain

A significant proportion of the milk produced in rural areas is consumed at source within the hamlet or village, either through farmstead consumption or in some cases, direct sales by the farmer to the neighbourhood. The remaining 30–40 percent is marketed through an intricate marketing chain, consisting of multiple layers of intermediaries. Figure 1 elaborates the rural milk marketing chain and the price of milk at each node in the chain.

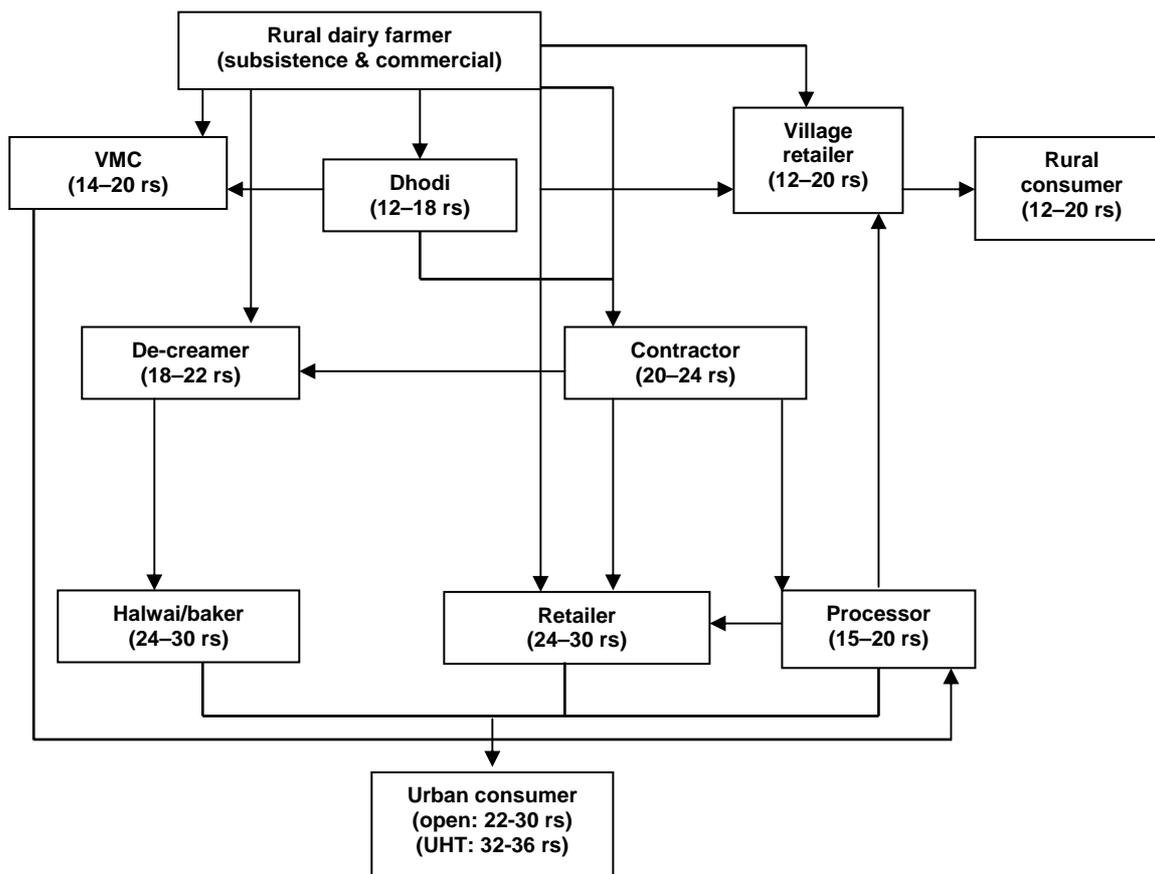
³² SSI-NARC, 2003

³³ Pakistan dairy development company, 2006

³⁴ Milk, cream and milk food for infants

³⁵ Statistics Division, 2007

Figure 1: Rural marketing chain (estimated procurement prices at rupees per litre)



Source: Market information, 2007

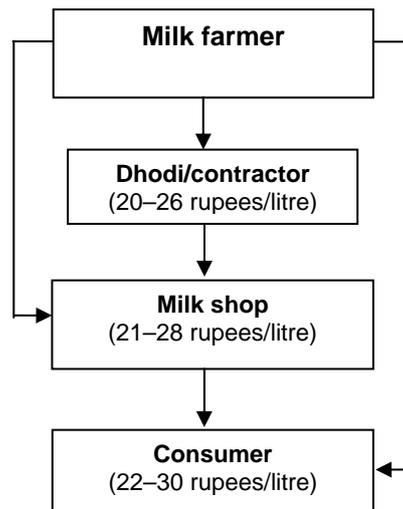
Urban marketing chain

Urban consumers in Pakistan consume an estimated 9–12 million litres of milk every year. To satisfy some of this demand, milk is produced in urban and peri-urban areas of the country, accounting for 5 percent and 15 percent of the total milk production, respectively. Because this quantity is not sufficient to meet the entire urban demand, the deficit is met by rural producers.

Peri-urban dairy farms are located on the outskirts of major cities. These are usually owned by market-oriented farmers and can be classified into two general groups, distinguished by herd size. Most operate on relatively small scale, owning 10–50 dairy animals. The larger farmers usually own up to 500 dairy cows. This latter category of farm is either owned and operated by a progressive farmer individually or is part of the peri-urban cattle colonies.

As depicted in Figure 2, the urban milk marketing chain, the producer has relatively more control over the supply because the consumer is easily accessible and is also willing to pay a high price for milk. Hence, in many instances, farmers in the urban milk marketing chain integrate production and marketing functions in their operations. Instead of relying on a middleman, they sell the milk directly.

Figure 2: Peri-urban marketing chain (estimated procurement prices at rupees per litre)

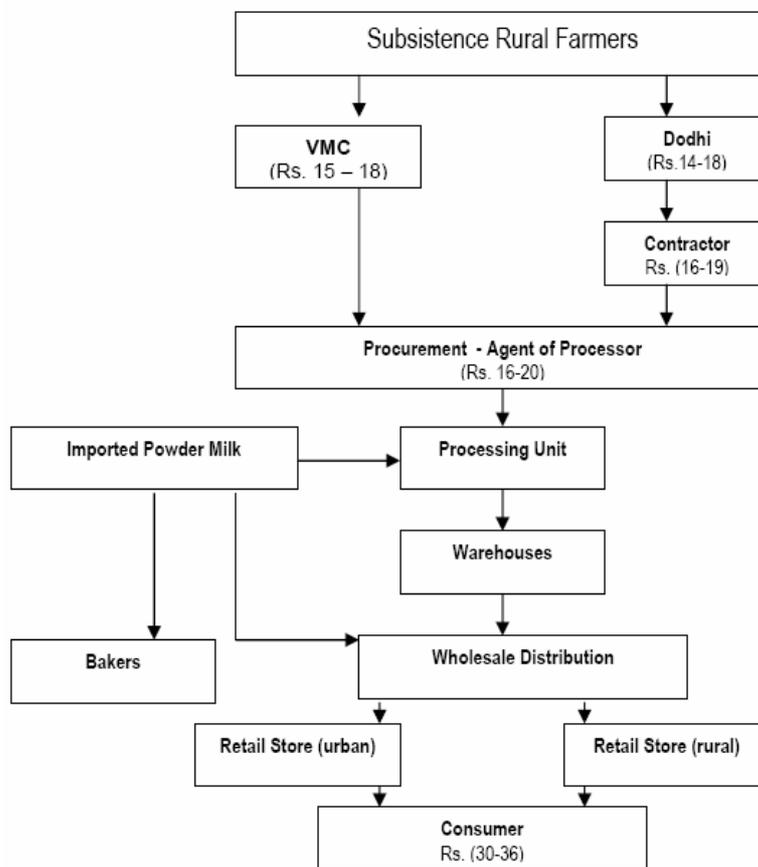


Source: FAO. 2006. Analysis of milk marketing chain, Pakistan

Processed marketing chain

Most of the milk in the country is marketed in raw form. According to industry estimates, only 3–5 percent of the milk is marketed through formal channels as processed milk. Currently, there are more than 20 dairy processing plants operating in the country. The major product produced by them is UHT or pasteurized milk. Other products include powdered milk, butter, cream and lassi. Figure 3 depicts the marketing chain for UHT milk.

Figure 3: Marketing chain of UHT milk (estimated procurement prices at rupees per litre)



Source: FAO. 2006. Analysis of milk marketing chain, Pakistan

Constraints

Milk production and marketing in Pakistan is exclusively dominated by the informal private sector, consisting of various agents, each performing a specialized role at the relative link in the supply chain. These consist of producers, collectors, middlemen, processors, traders and consumers.

As previously noted, only 3–5 percent of the country's total milk production is marketed through formal channels. The remaining 97 percent is produced and marketed in raw form by informal agents in the marketing chain. The following is an overview of the informal and formal channels as a way of imparting a description of the opportunities and problems associated with dairying enterprise in Pakistan.

Informal production and marketing channels

Subsistence farmers constitute the majority of dairy farmers in the country and are responsible for 70 percent³⁶ of the milk produced. They own one to five milk-producing animals. The following characteristics typically define the informal production and marketing channels.

Productivity

Due to lack of proper management practices and poor breeding, animal production tends to be very low. This results in low farm profitability and reduced national productivity. For instance, in comparison with, say, Germany, there are three times as many dairy animals in Pakistan but the milk yield is only one-fifth.³⁷

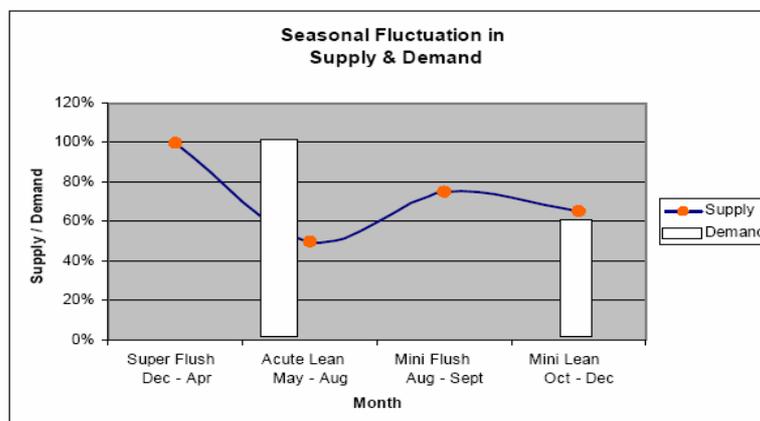
Seasonality

Production and consumption of milk in Pakistan are affected by seasonal fluctuations (Figure 4) that are at relative odds with each other. Milk production is associated with the availability of green fodder and is at its maximum between January and April, hitting a low from May to August. Alternatively, milk consumption is low during the winters and is at its peak during the summer due to heightened preference among consumers for products such as lassi, yogurt and ice cream.

Unorganized farmers

Smallholder dairy farmers in Pakistan are unorganized and mostly carry out production and marketing in isolation from each other. The highly fragmented production base particularly hampers farm profitability. Where it occurs, collective marketing enables individual farmers to reach more markets and results in increased revenue.

Figure 4: Seasonal fluctuation in supply and demand



Source: Umm E. Zia, 2006. *Analysis of milk marketing chain*

³⁶ R.H. Raja, 2003

³⁷ IFCN, 2003

Financial services

For smallholders, milk sales are a way of regular cash flow, and the livestock owned by them constitutes an invaluable asset.³⁸ But in the absence of financial services, such as insurance and credit, they do not have a financial recourse in times of emergency, such as livestock disease or mortality. Similarly, smallholders do not have ready access to credit that enables them to improve their enterprise, such as the addition of improved marketing infrastructure.

Market exploitation

Smallholders have to rely on middlemen to market their produce. Drawing on their monopolistic role, middlemen can exploit farmers by paying low prices, executing binding sales contracts and not passing on gains when prices are seasonally high in response to lower supply.

On the other hand, in their capacity, middlemen also fill the gap of essential support services, such as provision of credit and veterinary care.

Infrastructure

To ensure product quality, proper transportation of milk also requires a cold chain. But agents in the marketing chain in Pakistan rarely have access to cold storage facilities; consequently a major portion of their milk is lost. According to an Asian Development Bank report an estimated 15–20 percent of the total milk production in some areas is lost due to the unavailability of cold storage.

The primary reason behind the unavailability of cold chain facilities is the operating expense. For instance, the purchase cost of a 1 000-litre capacity cooling tank is approximately 300 000 rupees (\$5 000), a sum well beyond the reach of a small farmer. Also, cooling tanks are affected by the absence of electricity in rural areas. Where the Government supplies electric power, it is expensive because dairy farmers do not get subsidies similar to the ones given to agricultural farmers on equipment (such as tube wells).

Input–output price

By regulating the price of milk, the Government plays a significant role in milk marketing.³⁹ Because the law generally gives broad authority to the local government in setting foodstuff prices, the specific law followed can be different from one locality to another within a province (see Box 1 for a description of the two common laws used in regulating milk prices).

Under the law, the Provincial Food Department can declare various commodities, including milk, to be foodstuff. A District Price Review Committee regularly reviews milk prices; it can set different prices for different localities in the district. The committee consists of representatives from the livestock department, dairy farmers, milk retailers and consumers.

When the committee re-sets a price, a notice is circulated among various government agencies and other stakeholders, such as the provincial secretary, the district and town Nazims (mayors), district and session judges, the chief of police, the Information Department, the Food Department, the Agriculture Department, the rationing controller and the official gazette.

Interestingly, in some instances, the local government has used the wrong law while re-setting a price. For example, in the district of Narowal, the Punjab Essential Articles (Control) Act, 1973 is cited even though milk is not listed in its commodity schedule. The price set by districts studied for this case study report varied between 16 and 30 rupees per litre.

³⁸ The average price of a buffalo is about 50 000 rupees (US\$833.33) and of a cow is 35 000 rupees (\$583.33)

³⁹ The two most common laws in this regard are the Balochistan/N.W.F.P/ Punjab/ Sindh Foodstuff (Control) Act, 1958 and the Price Control and Prevention of Profiteering and Hoarding Act, 1977.

Box 1: Legislation affecting the dairy sector

- **The Balochistan/NWFP/Punjab/Sindh Foodstuff (Control) Act, 1958**

Preamble: Whereas it is expedient in the public interest to provide for the continuance of powers to control the supply, distribution and movement of and trade and commerce in foodstuffs in Balochistan/NWFP/Punjab/Sindh.

Application: Section 3 – The Government so far as it appears to be necessary or expedient for maintaining supplies of any foodstuffs or for securing its equitable distribution and availability or prohibiting storage, movement, transport, supply, distribution, disposal, acquisition, use or consumption thereof and trade and commerce therein....may provide...

(b) for controlling the prices at which any foodstuffs may be bought or sold.

Penalties: (i) imprisonment for a term that may extend to three years

(ii) or fine

(iii) or both (imprisonment and fine)

- **The Price Control and Prevention of Profiteering and Hoarding Act, 1977**

Preamble: Whereas, it is expedient to provide for price control and prevention of profiteering and hoarding.

Application: Section 3 – The Federal Government, so far as it appears to it to be necessary or expedient for securing equitable distribution of an essential commodity and its availability at fair price may, by notified order, provide for regulating the prices, production, movement, transport, supply, distribution, disposal, and sale of the essential commodity and for the price to be charged or paid for it at any stage of transaction therein...

- for controlling the price, at which any essential commodity may be bought or sold in any area.

Delegation of powers: The Federal Government may, by notified order, direct that any power conferred on it by or under this Act shall, in relation to such matters and subject to such conditions, if any, as may be specified in the direction, be exercisable also by:

- such officer or authority subordinate to the Federal Government, or
- such Provincial Government or such officer or authority subordinate to a Provincial Government, as may be specified in the direction.

Schedule: A schedule of “essential commodities” listed by the Act includes:

- milk
- powdered milk and
- milk food for infants

Penalties: (i) punishable with imprisonment for a term, which may extend to three years and

(ii) with fine, which may extend to one lakh rupees.

Provided that, if a person convicted for an offence punishable under this subsection is again convicted for such offence, the term of imprisonment awarded shall not be less than one year.

Source: Food laws manual, 2006

In contrast, prices of inputs used by farmers for dairy production are not regulated. On the contrary, the prices of some essential inputs have increased by 100–200 percent in the past five to six years (Table 3).

The imbalance between gains in production and output costs has an inverse affect on farm productivity because farmers are barely able to recover their production cost. With growing inflation, this price imbalance recently prompted many well-established large farmers to shut down operations; it also has discouraged new investment in dairy production.

Table 3: Comparison of prices for milk and basic inputs for a dairy farm

Input	Price (rupees) 2000	Price (rupees) 2007	Increase
Milch animal	20 000	60 000	200%
Cotton seed cake	270	560	107.4%
Wheat bran	170	380	123.5%
Maize cake	370	680	83.78%
Fresh milk	20	32	60%

Formal production and marketing channels

Formal marketing is carried out by corporations, which only control 3–5 percent of the county’s milk supply. In the past two to three years, the private sector has shown a keen interest in the dairy industry, leading to large-scale investment in refurbishing old plants and, in some instances, setting up new processing units.

Currently, there are more than 25 dairy processing plants, producing UHT milk (predominantly), butter, cream and lassi. Sind and Punjab are the major milk-producing provinces. However, with the exception of Engro Foods, all dairy processors are located in Punjab.⁴⁰

Supply constraints

Dairy processing units collect milk from smallholders situated in the far-flung rural areas of Punjab.⁴¹ This has led to a saturation of supply in the province. The competition has resulted in price wars in collection zones and the establishment of additional processing units by some of the major corporations, such as Nestlé.

Moreover, factors such as lack of cold chains, a fragmented farm base and distance to dairy farmers affect the processing operations. Consequently, none of the processing units is operating at optimal capacity. Hence, many processors have been eyeing options to reduce or eliminate their reliance on individual smallholders for their supply. Two of the favoured options being considered are i) vertical integration of activities by piloting corporate farming, an idea new to the national dairy practices; and ii) providing additional support services to medium- and large-sized farmers in return for selling bulk quantities of fresh milk to the processors.

Government support

The Government and international donors have been very supportive of the processing industry. This is evident in the 2006–2007 budget in which the Government announced numerous subsidies and tax breaks for the dairy-processing industry, including exemption of sales tax on packaged milk and the subsidized import of processing and other equipment.

Other examples of government and donor championing are the mega projects initiated to improve dairy development; however, almost all of them were designed to immediately benefit medium- to large-scale farmers with minimal practical interventions for smallholders. These include projects such as the Pakistan Dairy Development Company and the Livestock and Dairy Development Board.

Expected future developments

Despite the extensive government support in the form of loans,⁴² subsidies, tax breaks and project assistance, many fear the renewed interest in corporate dairy may be short lived. This apprehension is based on several

⁴⁰ Collection operations in Sind are problematic due to socio-economic constraints, such as security and road conditions. This has even led Engro to also shift its operations to Punjab by setting up an additional processing unit in the province.

⁴¹ To ensure profitability, the processing industry is forced to purchase milk at low prices from far-flung areas. In these areas, farmers do not have access to the urban fresh milk retail market, which tends to be more profitable for the farmstead.

⁴² Most local investors have borrowed heavily from state-run banks to set up dairy processing. This also was the practice during the 1970s and led to the failure of most dairy processors, leading to massive defaults and closures.

underlying factors: i) scarcity of supply and increasing prices of input for smallholders, ii) inability of processors to collect milk required due to transport and cold chain problems, iii) reliance of processors on limited and undiversified products,⁴³ iv) lack of sustainable farmer-development policies and v) the history of dairy processing in Pakistan (in the 1970s and with the help of the Asian Development Bank, as many as 22 processing units were initiated but failed in a few years due to similar problems).

Smallholder dairy farmers

Currently, the dairy sector has received unprecedented investment from the Government and international donors. However, apart from a few exceptions, most of the programmes are geared towards the development of medium- and large-scale dairy farmers. The following two case studies assess the impact of recent support programmes on smallholder dairy farmers.

Case study 1 – Milk packaging project

The project titled Milk Packaging Project in Central and Southern Districts of the Northwest Frontier Province (NWFP) is an innovative initiative of NWFP's Livestock and Dairy Development Department. It is a four-year effort (2005–2009) with an investment of 13.367 million rupees (\$222 783) and adopts a bottom-up approach to develop the province's dairy industry through cooperation between the public and private sectors.

The project was designed to create groups of smallholders, with the ultimate objective of sustainably reducing poverty in remote areas of central and southern districts through increased livestock productivity via the provision or establishment of milk-marketing channels. Project activities include technical and management support services in the form of breed improvement, animal health, feed enhancement, management training for women, training of village extension workers and farmers, establishment of milk collection and processing units, and developing marketing links.

Within the project, dairy farmer groups have been formed in selected villages with the purpose of promoting organized milk production and marketing (see Box 2 for terms of membership). Upon formation of a farmer association in a targeted village, a small milk-collection centre equipped with a cooling tank is set up.

The project was initiated with three partially operational associations collecting an average of 550 litres of milk per day. These initial associations received four cooling tanks and two power generators, which they operate and manage.

However, in a period of just two years, intensified farmer interest in the area led to an expansion of the project and resulted in the number of associations increasing to 36, with a total representation of 873 members and daily collection of 7 275 litres. The number of cooling tanks received has increased to 12.

Box 2: Terms of membership in farmer associations

- *Every farmer must sell at least 2 litres of milk per day to the milk collection centre.*
- *The membership fee for each member is 100 rupees per year.*
- *A compulsory 50 paisas per litre of profit must go into the association's savings fund.*
- *The purchase price of milk by the association will be based on mutual recommendation of the farmer association and the Livestock Department.*

The project is to provide support services, including veterinary care, breed improvement, training of member farmers on livestock management and introduction of improved fodder variety and feed supplements.

⁴³ Experience shows that large-scale dairy processing, not a very cost-effective enterprise, is only profitable if the company has investments in other lucrative yet low-cost products, such as Nestlé, whose biggest source of cash flow in Pakistan is its bottled mineral water.

The project also has resulted in exponentially increased incomes for farmers because they can market their produce outside the village for 30–32 rupees per litre, in contrast to the village price of 26–28 rupees per litre.

Based on this tremendous success, the provincial government is planning to build a milk-processing plant near these localities. Additionally, there are plans to expand project activities to neighbouring districts.

Lessons learned: A critical lesson is that organizing local farmers around a profitable initiative is a possible goal to achieve within the current context of the Pakistani dairy industry. However, such an initiative requires comprehensive measures instead of a limited focus on production. These measures range from encouraging farmers to form groups by providing support in the areas of technology transfer, market links and enterprise management.

Case study 2 – UNDP Community Empowerment Through Livestock Development and Credit project

The UNDP-initiated project, Community Empowerment Through Livestock Development and Credit (CELDAC), is a three-year, \$6.1 million intervention aimed at smallholders, in partnership with two major private dairy processing corporations, Nestlé and Engro. UNDP is bearing 82 percent of the project cost, with the private partners providing the remainder in the form of cash and kind.

The project objective is to promote women's role in livestock development by creating a cadre of community livestock health workers. The University of Veterinary Animal Science, a leading public sector institute, provides technical support in training the master trainers and 3 600 women livestock health workers. The project area is limited to the milk-collection zones of each of the two private companies involved.

Although it is a heavily funded effort, the project is rather limited in scope. Moreover, it tends to be biased in favour of the large corporations: animal productivity will be enhanced in the milk sheds accessed by the two corporate partners, thereby increasing the supply available only to them. Hence, they will enjoy the major long-term economic benefits through a minimal investment in an otherwise social sector initiative.

Lessons learned: It is possible to develop the dairy sector through successful public–private partnerships (in this case, a partnership between the project, corporations and a public university). Women in dairying households are responsible for most activities related to animal management, including feed, shelter and some veterinary care. However, developing their capacity is often overlooked. The CELDAC project has trained a cadre of women extension livestock workers despite the stereotypical belief that women cannot be formally trained due to the social barriers imposed on them.

In addition to training women livestock extension workers, the other major component in the project design was the provision of credit for enterprise development through links with financial institutions. However, the project thus far has had difficulties in finding a partner in the finance industry for such support. This implies that new and innovative ways to tap into credit facilities need to be identified, particularly those that link the timing for repayment of loans with the biological cycle of the specific animal species, in this case dairy cows and buffalo.

The project is relatively new, limiting the lessons until it is further along in implementation. A large criticism so far has been the negligible contribution provided by the corporate partners, despite the long-term economic benefits headed their way.

National dairy strategy: Issues and opportunities

Smallholder dairying in Pakistan has inherent weaknesses and is confronted with various threats. However, the sector can build on its strengths and use opportunities to satisfy the increasing demand. Based on the current situation and an analysis of smallholder dairy producers in Pakistan, the following national and regional strategic initiatives for public and private stakeholders are recommended.

At the national level, the following issues will need a concerted response from both the Government and the private sector to enable the participation of smallholder dairy farmers in dairy markets and to help them competitively supply expanding consumer markets.

Issue 1: Lack of proper livestock management practices and inaccessibility to support services leads to low animal productivity.

To enhance productivity, the following measures are recommended:

- strengthen extension services to reach and educate the maximum number of farmers;
- launch mass-scale awareness campaigns on management and production issues;
- improve farmers' access to financial services;
- initiate sustainable long-term breed improvement programmes.

Issue 2: In the absence of an integrated cold chain, adulteration is rampant and access to markets is hampered.

To improve the provision of quality milk as well as enhanced market access for small holders, the following measures are recommended:

- provide equipment and facilities related to a cold chain at subsidized rates;
- provide credit to improve access to infrastructure, such as cold chains;
- adjust utility fees to dairy farmers to equal with what other farmers are charged; currently, most peri-urban and commercial farms are charged the industrial or residential rate for electricity and water consumption. This is in stark contrast to the main agricultural sector in which farm use of electricity and water is determined on the basis of subsidized agricultural rates. This can be a discouraging factor for many farmers to upgrade their farms, and policies governing the supply of public utilities to the dairy sector must be revised;
- promote local manufacturing of storage and processing equipment;
- encourage the establishment of integrated cold chains instead of piecemeal approaches in which the focus is only on cooling tanks.

Issue 3: Smallholder dairy farmers need to coordinate their marketing activities.

To further organize smallholder farmers into groups that can reap maximum market benefits, the following measures are recommended:

- create a policy environment conducive to the formation of milk producer organizations (MPOs); laws governing MPOs should be drafted with an approach that encourages their formation. This includes tax incentives for collective marketing and a subsidized provision of inputs, such as veterinary services, feed and electricity.
- ensure MPOs can access financial services, such as credit;
- link various groups to organizations like the Small and Medium Enterprise Development Authority to provide guidance in designing an MPO; there are no practical examples currently;
- provide management training to MPOs in various areas, including production, marketing, value addition, and financial and business management techniques;
- guide MPOs in forming market links by ensuring a sound marketing infrastructure;
- encourage middlemen to integrate their operations with MPOs; there can be many modalities for this. For instance, in milk-deficit areas, middlemen can have exclusive contracts with MPOs. In other instances, MPO members can play the role of middlemen by linking producers to markets in return for fees and trade concessions.

Issue 4: The local government is authorized to fix the price of milk on the pretext that it is an essential commodity. However, the prices of inputs are not regulated in the same manner and keep increasing with the growing inflation.

To ensure parity between input and output prices towards profitable dairying, the following measures are recommended:

- review of laws governing price control and their implementation in regards to milk;
- explore alternative measures, such as setting a control price and incentives for increased production to meet demand;
- provide a level playing field by applying similar pricing regulations to both packaged and non-packaged milk.

Issue 5: Data on the dairy sector is often outdated and/or unreliable. Improved market information is a must to facilitate effective planning and investment by all stakeholders.

- To improve information-based planning and decision-making, the following measures are recommended:
- conduct the national livestock census more often and/or devise reliable ways of providing updated interim information;
- conduct detailed analytical studies to guide improved decision-making at macro and micro levels; for example, assess the production of milk in various systems, the proportion of milk hauled by various intermediaries and the actual urban and rural forecasted demand for raw and processed milk; also needed are reliable economic and technical feasibility studies on dairy farming and marketing;
- develop a central repository of information on the dairy sector;
- consider the innovative use of modern information technology, such as mobile phones, to improve access to market information.

Issue 6: Despite proximity to milk-deficit regions, including Central Asia and the Middle East, Pakistani producers do not export their products.

To promote exports of Pakistani dairy products, the following measures are recommended:

- promote exports within the region because the quality standards are at par with those in the international markets;
- enhance animal and enterprise productivity to satisfy the domestic and international demand;
- make cold chains an integral part of the dairy sector (to improve milk quality);
- introduce economical small-scale processing.

Issue 7: Currently, most equipment for storage and processing is imported from Western countries. This leads to greater need for in-country expertise for operations and maintenance.

To promote production independence, the following measures are recommended:

- facilitate technology transfer options within the region, especially between countries where operational standards as well as pricing and affordability are comparable;
- where livestock imports are required to improve the domestic seed stock, import animals from countries with similar climate and ecology.

Issue 8: Learning the lessons

Often, lessons learned from countries with different socio-economic environments are presented for replication in Pakistan, resulting in unanticipated outcomes. For example, an international corporation recently mobilized medium- to large-scale farmers to buy high-yielding cattle from Australia. Due to the heat and climate stress, many of the animals perished, which resulted in a loss of over 100 000 rupees (\$1 666) per animal. Because the initiative was not insured, the farmers had to bear the loss directly. Similarly, an international donor promoted the use of automated milking without considering the almost impossible break-even numbers on equipment costs because cheap labour is readily available for such operations.

To succeed in applying models or measures that were successful in other countries, it is more than recommended – it is crucial – to embrace those that worked in countries with a similar socio-politico-economic profile.

Box 3: Key definitions

Marketing: All the activities that are involved in moving products from producers to consumers. This includes product-exchange activities, physical activities and auxiliary activities. The functions of marketing can be further divided into buying and selling as exchange activities; storage, transport, processing and standardizing as physical activities; and financing, risk-bearing and market intelligence as auxiliary activities.

Marketing chain: The flow of commodities from producers to consumers that brings in economic agents who perform complementary functions with the aim of satisfying both producers and consumers.

Marketing node: Any point in the marketing chain where an exchange and/or transformation of a dairy product takes place. A marketing chain may link both formal and informal market agents.

Marketing agents: Individuals, groups of individuals or organizations that facilitate the flow of dairy products from producers to consumers through various activities, such as production, purchasing, processing and selling. Examples of market agents include farmers selling dairy products, retailers, wholesalers, dairy cooperatives, importers and exporters.

Milk producers: Rural subsistence farmers, rural market-oriented farmers, commercial dairy farmers and city and peri-urban milk producers.

Milk collectors: *Dhodhis*, contractors, village milk collection centres and dairy cooperatives (MPOs).

Dairy processors: Large-scale private dairy processing corporations.

Retailers: Milk shops, peri-urban farmers-cum-*dhodhis*, traditional *dodhis*, rural subsistence and market-oriented farmers and retail shops.

Cooling tank: A refrigerated unit used for milk storage; also known as a “chiller”.

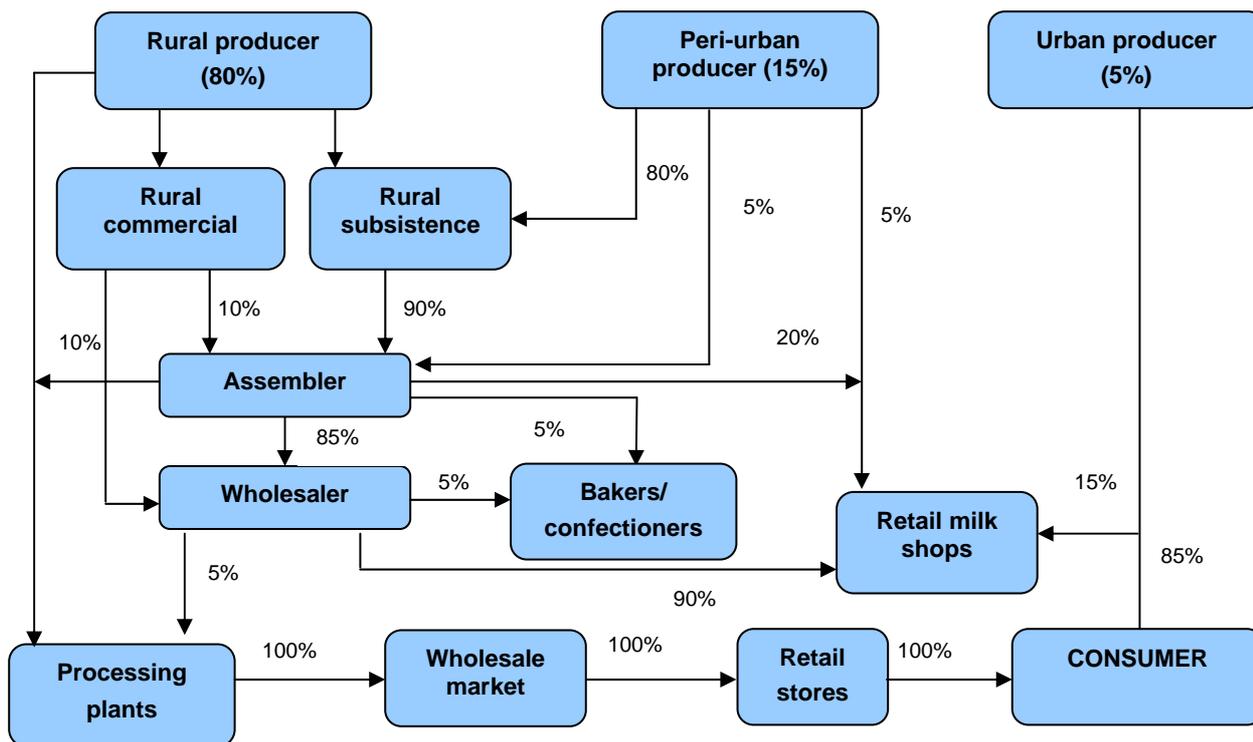
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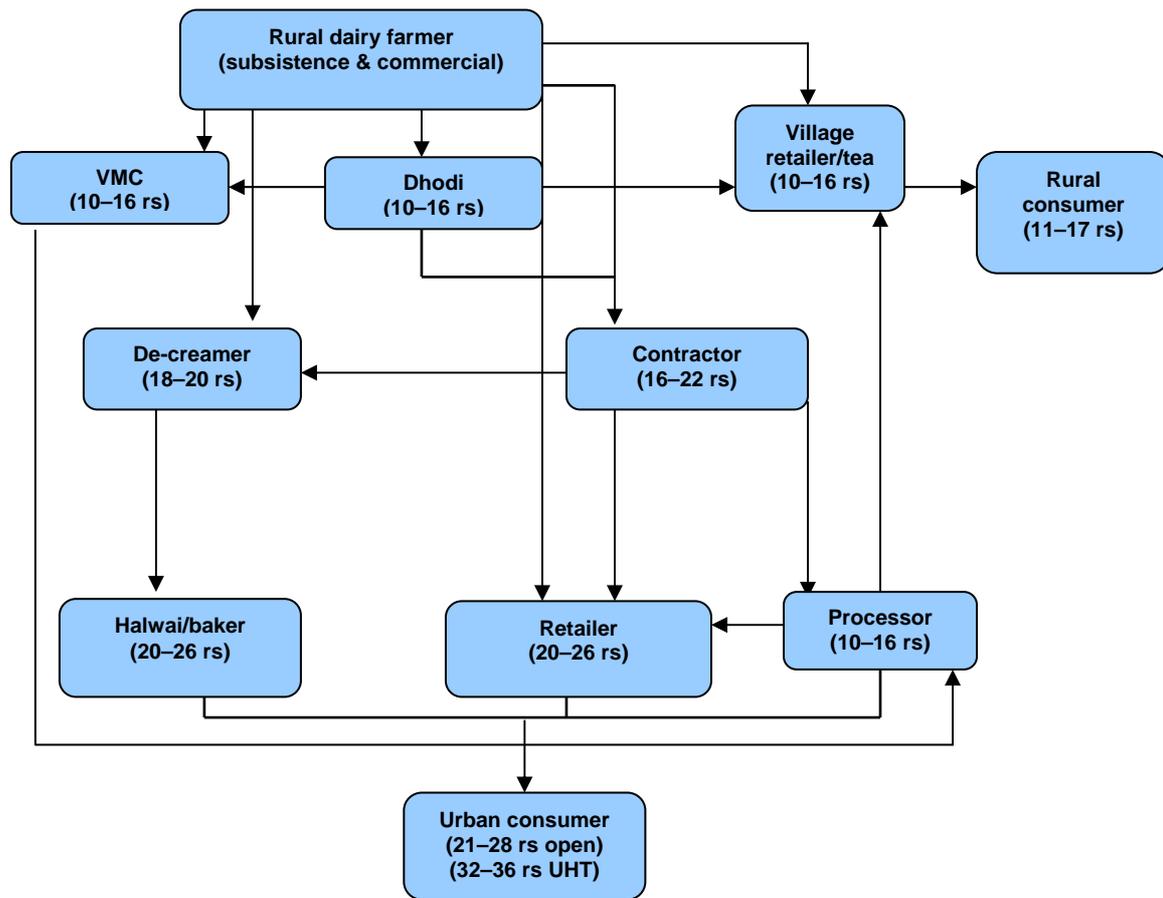
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Annex I: Milk flow chart example



Source: Pakistan livestock marketing action plan 2003. From Analysis of the milk marketing chain, report prepared for FAO TCP/PAK/3004 technical cooperation programme project: Assistance in Up-Scaling Dairy Development in Pakistan by Umm E. Zia, August 2006.

Annex II: Milk price chart (rupees)



Source: Pakistan livestock marketing action plan 2003. From Analysis of the milk marketing chain, report prepared for FAO TCP/PAK/3004 technical cooperation programme project: Assistance in Up-Scaling Dairy Development in Pakistan by Umm E. Zia, August 2006.

Sri Lanka: Opportunities for dairy sector growth

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Background

Sri Lanka is largely self-sufficient in most animal products – apart from dairy. However, the consumption of dairy products has increased dramatically since the 1970s when the Government adopted open economic policies. Currently, Sri Lanka is about 15–20 percent self-sufficient with its milk products, though that level has been achieved mostly with imported milk powder.

The dairy industry has potential to contribute considerably to Sri Lanka's economic development. A traditional industry surviving thousands of years, milk production also plays an important role in alleviating nutritional poverty in all age groups. And it is a source of extensive employment opportunities.

The Government's ambitious target for growth in dairy production is an increase towards 50 percent self-sufficiency in milk products by 2015. At the current growth rate of 1–2 percent, the sector will need to grow at about 15 percent annually for the next eight years, with no increase in total consumption. This is a challenging task, given the current state of the industry, which only supplies approximately 20 percent of the domestic requirements. This contrasts with two decades ago when, prior to the economy's opening in 1977, domestic sources of milk provided nearly 80 percent of Sri Lanka's consumption needs. Given the current levels of malnutrition, particularly among pre-school children and pregnant mothers, milk production is an important activity for improving the nutrition situation.

Sector review

The contribution of the agriculture sector, including plantation crops, livestock, forestry and fisheries to GDP was 16.8 percent in 2006, having dropped from 21.3 percent in 1998 (Central Bank of Sri Lanka, 2007). With almost 90 percent of the population considered rural (Central Bank of Sri Lanka, 2006), 2005 data show that agriculture provided employment to 30.7 percent of the population. Livestock accounts for only about 1.2 percent of GDP, but it is an integral part of many other agricultural enterprises providing draught power, transport and dung for fertilizer.

Total milk production in 2005 was an estimated 162 million litres, up 3 percent from the previous year, with approximately 13.6 million litres supplied by dairy cows. Of this growth, 98.9 million litres (47 percent) of local milk entered the formal market. However, the total consumption of milk (funnelled through the formal milk market) was 528.2 million litres of liquid milk equivalent (LME), down from 76 million litres in 2003 (Table 1). FAO estimates for milk production in Sri Lanka in 2007 reached 174 million litres.

By 2004, an estimated 429.3 million litres of LME products were imported (provisional data), valued at 12.26 billion rupees. Imports are estimated to account for approximately 80 percent of domestic consumption.

Table 1: Production and availability of milk, 1998–2005

Year	Fresh milk			
	Cow milk (‘000 tonnes)	Buffalo milk (‘000 tonnes)	Total milk (‘000 tonnes)	Per capita availability (kg/yr)
1988	124.48	25.09	149.57	4.80
1999	126.42	25.50	151.92	4.99
2000	127.74	25.52	153.26	4.96
2001	129.02	25.58	154.58	4.90
2002	129.09	25.64	14.73	5.3
2003	132.22	25.56	157.78	5.47
2004	134.88	25.84	160.72	5.34
2005	136.67	26.12	162.79	5.37

Source: Department of Census and Statistics, Sri Lanka

Production areas

Milk is produced in all districts, with the lowest in the conflict-affected northern districts. According to the 2002 agriculture census, the largest cattle populations are found in the country’s dry and intermediate zones. The wet mid- and up-country areas are often perceived as the main dairy-producing areas (Table 2). The dry and dry intermediate zones produce 50 percent more milk than the wet and wet intermediate zones.

Table 2: Milk production zones in Sri Lanka

Zone features	Dry zone	Coconut triangle	Mid-country	Upcountry & estate	Wet zone & urban
Location	Dry zone districts in the NC, Northern and Eastern Provinces and parts of Central, Southern and NW Provinces	Intermediate and wet zone areas of the NW Province, and Gampaha district of the Western Province	Wet zone areas in the Central Province –Kandy and Matale districts	Nuwaraeliya district in the Central Province and Badulla district in the Uva Province	Districts in the Western, Southern and Sabaragamuwa Provinces and cities
Animal types	Indigenous cattle, Zebu cattle and crosses, buffalo	Crosses of exotic breeds, Zebu types, crosses of indigenous animals and buffalo	Pure exotic animals and crosses, and Zebu crosses	Pure exotic animals and crosses	Crosses of exotic breeds and Zebu type and indigenous animals and buffalo
Husbandry	Free grazing, or nomadic-type Large herds or sedentary small/medium-sized herds	Medium-sized herds, limited grazing tethered under coconut palms	Small herds, some tethering, stall feeding	Small herds, zero grazing	Limited grazing, medium-sized herds or small herds, zero grazing
Herd size	Few: 25	5 cows	2–3 cows	1–2 cows	2–3 cows
Average yield	2.1 litres/cow/day Total 300–400 litres/cow over 180–200-day lactation	3–4 litres/cow/day Total 500–800 litres/cow over 200-day lactation	2–4 litres/cow/day Total 1 300 litre/cow	6 or more litres/cow/day Total 1 700 litres/cow	3 litres/cow/day Total 1 500–1 600 litres/cow

Source: Ranaweera and Attapattu 2006

Cattle

The average cattle or buffalo farm has around five head of stock, with significantly larger herds in the dry zones. In the wet and intermediate zones, there are two to three head per farm. Only about 12 percent of the cattle are found in the wet zone, with the majority of the better dairy breed stock found in that area. The rest of the cattle are spread equally between the dry and intermediate zones. Some 32 percent of the total cattle population is in the four dry intermediate zone districts, and more than three-quarters of cattle are in either the dry or dry intermediate zones. The 2.2 million cattle and 0.98 million buffalo reported in 1989 decreased to a combined 1.2 million in 2006 (Table 3). There is now an increasing trend in the percentage of upgraded dairy animals, including dairy buffalo.

Table 3: Number of dairy cattle

		Year			
		2003	2004	2005	2006
Milk cows	Milking at present	211 800	216 050	222 300	229 230
	Milking not at present	277 400	284 420	288 570	295 840
	Other cows	207 600	211 640	215 620	220 990
	Bulls	178 800	182 290	185 720	189 110
	Calves	263 100	266 500	272 810	279 480
	Total cattle	1 138 700	1 160 900	1 185 020	1 214 650

Source: Agriculture and Environmental Statistics Division, Department of Census and Statistics, Colombo

Nuwara Eliya district has the highest average production per head, and the wet zone average production of 278 litres per head is more than double that achieved in the intermediate zone (130 litres per head) and two and a half times that of the dry zone (102 litres per head). Per-head productivity reflects the proportion of improved dairy genetics and the proportion of adult female stock in the herd.

Location and scale of livestock operations

The majority of livestock are reared in small-scale operations. Many factors influence the distribution of livestock in Sri Lanka; dominant among them are agro-ecological zoning and proximity to markets and feed resources. Tables 4 and 5 present some of the important topographical and climate information regarding dairying systems.

Table 4: Main dairy production systems in Sri Lanka

Production systems	Average daily milk production per cow (litres)	Popular management system
Hill country	6–8	Intensive
Mid country	4–5	Semi-intensive
Coconut triangle	3–3.5	Tethered
Low country dry zone	1–1.5	Extensive
Low country wet zone	3–3.5	Tethered

Source: Bandara, 2007

Table 5: Cattle and buffalo systems: Topography, climate and animal types

Production system	Rainfall (mm)	Temperature range (°C)	Animal species
Hill country	>2 000	10–32	Pure exotic and crosses
Mid country	>2 000	10–32	Pure exotic and crosses; some Zebu crosses
Coconut triangle	1 500–2 500	21–38	Crosses of exotic breeds, Zebu types, indigenous animals, buffalo
Low country dry zone	1 000–1 750	21–38	Zebu types, indigenous animals and their crosses, buffalo
Low country wet zone	1 875–2 500	24–35	Crosses of exotic breeds, Zebu types, indigenous animals, buffalo

Source: Ibrahim *et al.* (1999a and b)

Marketing

The marketing of milk in Sri Lanka is complex and varied. There are individual farmers who sell direct to processors, consumers, hotels, cafeterias and canteens. Cooperatives are organized primarily for the purpose of collecting and selling milk to either hotels or processors. The formal, or processed dairy, market consists of small dairy cooperatives, larger local cooperatives, district dairy cooperatives, dairy cooperative unions and networks of collection points and milk chilling centres operated by cooperatives or the main dairy processors. Most farmers are not members of cooperatives or farmer societies. There are a few large-scale processors who have organized farmers to sell their milk to them.

Contributing to the informal market are small private milk collectors, small local processors of traditional dairy products, retailers and dairy producers who sell directly to hotels and restaurants or to consumers. Small local processors of modern dairy products also contribute to the supply.

Marketing institutions

Milk is currently sold through a combination of private and public organizations working in tandem with each other. Until 1981, farmers sold their milk to the National Milk Board (NMB), which was created in 1957 as the main outlet for milk purchases. Through the policy of liberalization and privatization introduced in 1981, Nestlé bought 80 percent of its shares and has since been operating in the country as a major player. Nestlé's milk collection network currently involves more than 25 000 farms and represents an estimated 40 percent of the total fresh milk collected nationwide.

Also in 1981 through the government-owned Cooperative Wholesale Establishment (CWE), Lanka Milk Foods (LMF) Ltd was established to package and distribute imported milk powder. Currently, LMF maintains an important market position in the milk-food industry, with its key brand of full cream milk powder Lakspray and a capacity of 48 000 million tonnes per year. In 1991, the Stassen Group of Companies, one of the largest conglomerates in Sri Lanka, bought 51 percent of the LMF shares; currently, LMF achieves an annual turnover of around 2 billion rupees.

Fonterra, another private company with New Zealand investment that sells a range of Anchor brand products, has been in Sri Lanka for many years. When first introduced, the only product in Anchor's portfolio was Anchor Full Cream Milk.

The Government has a major involvement in the state-owned milk processing company MILCO, which engages in milk collection from farming areas. It also processes fresh milk, marketing it under the Highland brand.

The primary business of the formal private sector stakeholders are milk powder and other processed milk product imports. Nestlé is an exception, which runs a substantial milk powder-processing operation based on locally procured milk. In theory, all of the businesses extended their operations to procure fresh milk locally to cater to the developing market segments, such as liquid milk, pasteurized and sterilized milk, flavoured milks and yogurt. Locally procured milk is used for making ice cream and mixed-flavoured fruit drinks.

Over time, however, there have been changes in the composition of the milk-processing organizations, with collaboration through Indian investment as well as World Bank assistance. A number of other private sector processors, some of them extremely small, are involved in the milk-processing industry. The private sector is also engaged in milk collection and processing, but due to the low volumes in the production areas, there is wasteful competition by the different collecting agencies fighting for the available milk in a given area. In addition, lack of other marketing infrastructure, such as chilling tanks and transport vehicles, compound the problem.

According to a study by Ranaweera and Attapattu (2006), total milk collection increased by 13 percent in 2004 because of the increased price paid for milk (from 15 rupees per litre to 16 rupees per litre and then 18 rupees per litre), along with an improved collection network. This encouraged dairy farmers to produce more milk.

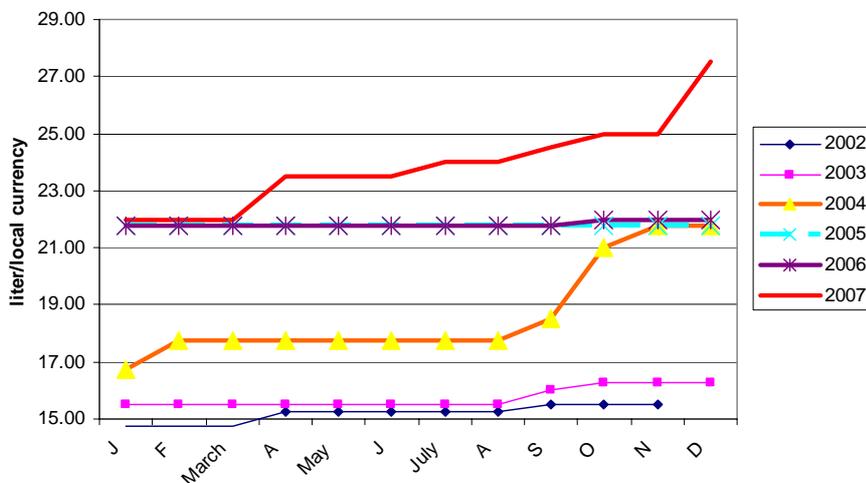
In 2004, there were 245 active dairy cooperatives along with six cooperative unions that had a total membership of around 57 000 members, of which some 30 000 were members (including the dairy federation). However, the number of dairy cooperatives declined from 2001 to 2004.

Most processors use imported milk powder for their products, except Nestlé, which purchases significant quantities of milk powder using locally procured milk. Imported milk powder has been quite controversial because it is subjected to low tariff measures in order to keep consumer prices low. The only way to increase dairy productivity is for the Government to increase the tariff on imported milk powders from the present 10–30 percent, which is unlikely due to World Trade Organization commitments. However, high international dairy commodity prices appear set to push powder prices even higher than such tariff increases would deliver.

The informal milk market plays a larger role than assumed. It is an important outlet for many smallholder farms and is critical for ensuring economic viability of dairy production for many producers because it typically provides higher prices. It also delivers many viable income-generating opportunities for small entrepreneurs. The public health risks in informal market channels, however, are uncertain, and will depend on consumer practices, such as boiling of milk before consumption. Growth in the informal market is likely when retail powder prices increase and fresh liquid milk becomes more competitive. That growth will probably continue, partly at the expense of the formal sector, until the formal market of liquid milk is better able to reach consumers.

Significantly, even after 25 years of activities within the dairy sector, there is no fresh milk available in the market. And the entire milk food industry is in the hands of just two or three large companies, namely Nestlé, Fonterra and Maliban, which primarily market only imported and locally processed milk powders.

Figure 1: Sri Lankan fluid milk prices



Pricing systems prevailing in the country are biased towards satisfying millions of consumers rather than producers of milk and milk products. The high opportunity cost of labour relative to the farmgate price of milk discourages farmers from intensive dairy farming. A rough estimate of the current farmgate price of milk to wage ratio is 1:13. Consequently, the value of one litre of milk sold at the farmgate is only one-thirteenth of a daily casual wage.

Unlike milk powder, the consumption of fresh milk appears to increase with income, suggesting that as incomes increase over time, demand could shift towards liquid milk. This presents good opportunities for smallholders who are involved in domestic dairy production. Domestic producers have a comparative advantage in the liquid milk market because reconstituted milk is not a good substitute. Awareness on increasing the market for such sales needs to be considered.

World market prices for milk powders have increased dramatically over the past year and are now more than double what they were in June 2006. This is already being felt in the wholesale market and in the cost of raw materials used by some companies to recombine for manufacturing “fresh” products, such as yogurt and flavoured milk. These companies also are struggling to increase local milk procurement as milk becomes more cost competitive. Payment of premiums to secure that milk is likely to become more common.

Because the profit margin is very low, there have not been adequate incentives offered to the producers to invest in dairy herds. Adequate recognition has not been given in the past to the important role played by

smallholders, despite the difficulties they experience in operating at near subsistence level. Due to the limited economic opportunities, many of them will continue to remain in dairy farming for more years to come (SLVA, 1995).

Farmgate milk price is largely determined by MILCO's processing and marketing costs, both of which are reputed to be relatively high. The Government uses the farmgate price as a political tool because it needs MILCO to cover its costs. Reducing the amount of milk diverted to powder production at MILCO will reduce the downward pressure on farmgate prices caused by relatively inefficient processing and marketing. The large private firms engaged in milk product manufacturing follow the purchasing prices offered by MILCO. They do pay a premium above MILCO's price, depending on the competition in the local market where they operate. While this appears to serve the interests of the suppliers favourably, there is little inclination for them to buy the surpluses available during months of high milk production due to capacity constraints. In such instances, MILCO has to step in to buy the excess milk.

Till now, the milk price increases have not been reflected in increased local retail market prices. Consequently, there has not been any financial incentive for consumers to favour liquid or fresh milk products made from local milk. When the retail price of powder reflects the changes in international commodity prices, it is likely that the retail market price for fresh products will increase, also fuelling the upward pressure on the farmgate price. This scenario may provide a unique opportunity for further development of the dairy sector.

Table 6: Average cost of milk production and producer price, 2006 (rupees/litre)

Zone	Wet lowland		Mid country	
	Village 1	Village 2	Village 1	Village 2
Excluding family labour	5.56	4.10	4.97	4.10
Including family labour	16.77	12.67	13.99	11.47
Announced purchase price	11.29		11.29	

Source: Ranaweera and Attapattu 2006

Smallholder dairy farmers

Smallholders dominate the livestock industry, with an estimated 3.5 million people (including dependants) finding livelihood within the sector. The sector contributed 22.5 billion rupees to the GDP (0.8 percent of the national GDP and 8.5 percent of the agricultural GDP) in 2004. Some 17.9 percent of households own livestock and approximately 70 percent of them own cattle (SLIS, 1999–2000). The dairy animal population consists of 1.21 million cows (Department of Census and Statistics, 2006).

Dairy farming is predominantly a smallholder, mixed crop–livestock operation. Animals are mostly fed on natural grasses available in common lands, such as roadsides, railway banks, fallow paddy fields, tank beds and other vacant lots, all maintained under rain-fed conditions (Presidential Sub-Committee Report, 1997).

Currently, hundreds of thousands of smallholders operating at near-subsistence levels dominate the local milk production in these systems. The number of dairy farmers is estimated to be about 400 000, of which 200 000 provide milk to the formal sector.

Dairying is part of a partially closed, mixed farming system at the smallholder level. Some of the waste of the dairy unit, such as dung, urine and wasted-feeding materials, are used as manure for crop farming; some of the crops and crop wastes are fed to the animals. In addition, the cultivation of forages has helped to control soil erosion and improve soil fertility. Hence, dairying at the smallholder level is an environmentally friendly activity when it is properly managed within the farming system (SAEC, 1998). The production system can be classified into five main subsystems, as shown in Table 2.

A minimum of 15 litres daily production is needed to earn a reasonable income from dairy farming at the smallholder level. Three-cow equivalents of upgraded dairy animals with an adequate cattle shed and a fodder plot of more than 20 perches are needed to allow a smallholder to make this profit.

However, the majority of smallholders do not have these minimum requirements. There is a need to improve their dairy farms. On average, a minimum of 50 000 rupees (\$500) of new investment is needed for each smallholder. This is beyond the capacity of most farmers, due to their subsistence living conditions. Although credit programmes are available in commercial banks, farmers have to pay back the loans within three to four years, with an annual interest of 18–20 percent. More concessionary credit programmes are needed that take into account the prevailing returns and profit margins of smallholder farmers.

Furthermore, dairying is not the main source of income for most of the smallholders and, in most instances, is not the activity of the husband in the family. In fact, housewives do most of the dairy-related activities while also attending to their other family obligations. Although nearly 40 percent of the members of registered dairy cooperatives are women, they are rarely represented in the management or executive committees of these organizations. However, when housewives do have a role in managing household dairy activities and their dairy cooperative, a substantial improvement can be seen in the economy of the family.

Validating constraints to the sector: A stakeholder survey

Ranaweera and Atapattu carried out a limited stakeholder survey in 2006 with the objectives of i) validating the continued relevance of the constraints frequently cited in various sector studies and ii) assessing the strength of the current service infrastructure to serve the needs of smallholder dairy farmers.

The survey covered 25 dairy farmers from the Badulla district in the upcountry, which is a highly productive area. Most farmers in the region are smallholder, commercial dairy producers who supply milk to collectors. The sample for the survey was selected from a dairy cow record-keeping in a the Department of Animal Production and Health (DAPH) project to identify superior animals for use in the calf-supply programmes and to monitor responses to changing conditions. The 25 respondents were selected randomly and interviewed during home visits. Data collected focused primarily on the cost of milk production and delivery of services by the State and other parastatals.

The results of that small survey are summarized as follows:

1. The dairy farmers in the sample, being participants of a milk yield-monitoring programme, received closer attention from veterinary services maintained by the State and hence were more privileged than the average farmer. Except for two farmers who did not have a single visit by a veterinarian surgeon during the year, others were well served.
2. Nearly 90 percent of the farmers were keen to expand their dairy operations and 45 percent cited difficulty in obtaining young animals as the major constraint.
3. Another 40 percent identified financial constraints, part of which was due to the cost of animals.
4. Only 24 percent of the farmers had made any significant investment in the previous year in the form of buying new animals or improving sheds. In all these instances, they had participated in a sponsored programme with funds made available as a grant.
5. Twenty-eight percent of the farmers were located within 2 km of a veterinarian's office, with 64 percent located within 5 km. All the farmers who had new calves born in the previous year had used AI services.
6. Only 36 percent of the farmers were members in a dairy cooperative. Sixty-two percent of them not belonging to a dairy cooperative cited management problems, whereas 18 percent considered it a hassle, while another 18 percent cited poor pricing.
7. Milk marketing appeared to be happening in an orderly manner, with the production of 52 percent collected by a local collector and another 40 percent supplying MILCO. Forty-four percent had their milk collected at the farm, with another 36 percent transporting it less than 1 km. Only one farmer transported milk more than 5 km.
8. Around 60 percent of the farmers complained that the price paid for their milk was too low. An increase in price would encourage them to invest in more animals.

Case studies of nine farmers

Another survey conducted in 2007 among a sample of nine farmers from three districts, representing a cross-section of the dairy farming community, looked to assess the production and marketing structure in the field and to identify issues challenging dairy farmers. Essentially, they were case studies of dairy farmers representing two groups of farmers: one that sold their milk to Nestlé (a private processor) and one that sold to the informal sector.

Table 7: Survey results on the dairy industry: Cost of fluid milk production, 2007

A. Resources base

Informal farmer	No. of animals					Grazing (perches)	Pasture land (perches)	Grass land (perches)
	Cows in milk	Pregnant	Heifers	Bull calves	Female calves			
1	07	05	03	02	02	-	40	10
2	14	10	05	06	02	-	-	-
3	03	04	02	01	01	20	20	-
4	09	05	02	02	02	20	20	-
5	20	17	06	08	07	20	-	-
Nestlé farmer								
6	03	01	-	01	02	-	08	20
7	02	01	01	01	01	-	04	14
8	02	-	01	01	01	-	04	26
9	04	01	01	01	03	-	20	100

B. Production

Informal farmer	Milk litres per day	Total litres per year	Home consumption spoilt (litre) per day	Quantity of milk sold-litres	Price per litre rupees	Income from milk rupees	Income from sale of fertilizer rupees	Income from sale of animal rupees	Income from sale of manure rupees	Total income rupees
1	47	16 920	360	16 560	50	828 000	12 000	-	-	840 000
2	75	27 000	108	26 920	50	1 344 600	25 000	-	65 000	1 434 600
3	16	5 760	360	3 600	22	118 800	-	-	-	118 800
4	40	14 400	360	14 040	45	631 800	-	-	8 000	639 800
5	100 *	36 000	11 160	24 840	32	794 880	-	-	20 000	814 800
Nestlé farmer										
6	21	7 560	360	7 200	21	151 200	-	22 000	-	173 200
7	12	4 320	-	4 320	20	86 240	-	-	-	86 240
8	10	3 650	360	3 285	19	62 415	-	-	-	62 415
9	26	9 490	360	9 130	20	183 600	-	27 000	-	209 600

* Buffalo

C. Operational costs (rupees)

Informal farmer	Concentrates	Minerals	Drug fees	Stud fees	Labour costs	Total cost
1	51 000	2 400	6 000	3 300	109 500	172 200
2	87 600	2 400	6 000	3 800	10 800	110 600
3	10 080	960	-	2 500	7 200	20 740
4	63 510	3 240	12 000	2 000	39 000	119 740
5	255 500	32 400	24 000	-	328 000	639 400
Nestlé farmer						
6	16 200	1 200	3 400	1 050	6 000	20 670
7	14 400	1 200	3 000	800	6 000	25 400
8	10 800	600	-	600	3 500	15 500
9	21 900	2 400	-	1 000	6 000	31 300

D. Income/expenditure (rupees)

Informal farmer	Operational cost	Capital cost	Total cost	Gross Income	Net income
1	172 200	75 000	247 000	840 000	593 000
2	110 600	55 000	165 600	1 434 600	1 269 000
3	20 740	72 500	93 240	118 800	25 560
4	119 740	95 000	214 740	639 800	425 060
5	639 400	75 000	714 400	814 800	103 400
Nestlé farmer					
6	20 670	60 000	80 670	173 200	92 330
7	25 400	40 000	65 400	86 240	20 840
8	15 500	23 000	38 500	62 415	23 915
9	31 300	75 000	106 300	209 600	103 300

Survey highlights

- The sample farmers owned significant numbers of animals (except those who sold to Nestlé), although they were smallholder farmers, with most having grazing land or pasture land.
- Milk production was reasonable, varying from 10 to 75 litres per day.
- Very little milk was consumed at home – on average, 1 litre per day, and the rest was sold in the open market or with Nestlé.
- The respondents reported obtaining a reasonably high price for their milk, varying from 15 to 22 rupees per litre. In addition, a few farmers earned income from selling fertilizer and manure.
- Most of the respondents' operational costs were for concentrated feed and labour; the average daily wage rate was 500 rupees.

Incomes

The net income of most of the farmer respondents was reasonably high and met all costs that were incurred, indicating that smallholder dairy farming was profitable. However, it was not adequate enough to improve and expand their operation because the capital costs, including the cost of animals, were quite high.

Farmer perceptions on increasing herd size

1. The majority of farmer respondents wanted to increase their herd size. However, due to the shortage of grazing land (three of nine respondents) and difficulty in obtaining good animals (Five of nine respondents), they did not think it was a good idea.
2. Another constraining factor was the lack of private capital (three of nine respondents) and availability of credit facilities, particularly soft loans.

Veterinary services

All respondents commented that the veterinary services were useful and available on time. Four of the nine farmers had more than three visits, while three of them visited the veterinarian twice a year. The distance to the veterinarian office was in close proximity to their farms (1–5 km).

Financial services

- Most of the farmer respondents were self-financing and kept their operational costs low. Two of them have not incurred any significant capital cost.
- All the farmers complained that the financial services were difficult to obtain, with soft loans unavailable and thus a major constraint to increasing the herd size and also maintaining the nutritional requirements.

- All attempts to convince the authorities, including the processors, to provide credit facilities had not been successful.

Marketing

- Most of the farmers sold to private consumers, hotels and canteens, enabling them a better price. The farmer respondents did not have any difficulty in marketing their milk as they had a variety of opportunities that included private processors (Nestlé) and hotels, small-time canteens and cafeterias in the village or nearby cities. The Nestlé farmers also did not have any difficulty in selling their milk.
- The farmers had to take their milk to the collection point of the agent, which was about 1–2 km from their farm; the agent did not collect the milk at the farmgate.
- The prices received were reasonable enough to enable them to cover their costs. However, there were no opportunities for significant profits, which would allow them to expand their livestock operation.

Joining a cooperative

- Eight of the nine farmer respondents were not members of any cooperative.
- The reason given varied, but they unanimously believed it is not useful, primarily due to office bearers being corrupt and no gainful benefit is obtained through the society.
- Because selling their milk was not a problem, they did not see any need for a cooperative.

Stakeholder perceptions on the industry's future

- All the farmers agreed that they would continue with milk production – but at a subsistence level.
- They did not see much scope for expanding their operation primarily due to the low milk prices that were set by Government, which the processing agents followed.
- They believed that if the farmgate price was higher, their productivity would improve because they could invest in their farm.
- Unless there was a significant policy of the Government to encourage investment in the dairy industry, the farmers felt comfortable with their scope of current operations.
- With the increase in dependence on powdered milk, the farmers saw little scope for the consumption of fresh milk.
- With the current government emphasis on moving towards consumption of fresh milk, the farmers allowed they could have a change in attitude.

Key constraints to development

Considering the results from the two Ranaweera and Atapattu surveys (previously mentioned) and the problems and key constraints identified repeatedly over time in other studies, the following is a summary of the primary factors affecting the development of the sector:

- inconsistent policies for the industry;
- low productivity of animals;
- low farmgate price of milk;
- high cost of milk production;
- poor extension services and inadequate education on animal health among dairy farmers;
- absence of new investments in the livestock sector due primarily to a lack of state support and financial services;
- poor marketing options available and inadequate milk-processing facilities;

- failure to update the technologies, including the development of a proper collection and distribution network in the sector;
- absence of proper consumer education to appreciate the value of fresh milk and milk products.

Low farmgate prices are a function of relatively inefficient collection and processing systems, partly caused by low volumes and a market that is distorted by government influence. The large number of smallholder farmers with no economies of scale is in itself a major constraint because this increases the complexity and difficulty of service provision, the cost of input supplies and the cost of milk collection, which decreases farmgate milk value.

One of the key reasons for low productivity in the dairy sector is the poor feeding of stock, primarily due to low levels of farmer knowledge and understanding of basic animal husbandry or nutrition issues.

The cost of milk collection systems escalates with the number of smallholder farmers and is exacerbated by the different enterprises competing for the milk supply. Milk quality is always difficult to maintain in smallholder dairy farms and reliance on hand milking and with no effective cooling available. The sheer number of farmers creates major difficulties with extension effectiveness and farmer training. The ineffective cattle marketing system is also largely a result of the number of smallholder farms.

Stock availability

The productivity of cows is limited, in most cases, by nutrition rather than any genetic limitation for milk production. There is, however, a significant opportunity to improve both the productivity and the profitability of many smallholders by motivating and facilitating them to use improved breeds. This necessarily implies a simultaneous, or prior, improvement in nutritional management. The generally poor level of young stock feeding and associated late maturity has a major impact on herd output of surplus animals, as does the prolonged calving interval. If the nutritional limitations are minimized and farmer knowledge on feeding and breeding is improved, breeding efficiency will, in the long-term, help to increase the number of superior quality animals available as well as improve productive efficiency in the medium term.

Animal health management

Overall, the constraints to dairy production from disease threats are less severe than some other factors, such as nutrition and marketing. While many bovine diseases are prevalent in the areas of current and potential dairy production, there are well-documented health management practices for minimizing the risk of infection and productivity loss. Disease constraints to dairy productivity are thus associated with the need to improve the delivery of veterinary services to dairy farmers and to improve the quality of those services, especially for preventive medicine. Clearly these are policy and institutional rather than technical issues.

The major issues in animal health management are:

- improper approaches for animal disease control;
- lack of a clear strategy for control of diseases, such as foot-and-mouth disease;
- inadequate attention paid to disease prevention and bio-security aspects;
- high cost of veterinary pharmaceuticals;
- lack of strategy to harness the private veterinary practitioners to help the animal health management functions of the State.

Land availability

Limited land ownership by many dairy farmers constrains their ability to grow quality fodder for their cattle. Access to land for production of livestock forage and fodder is a critical issue if productivity gains in the sector are to be achieved. Land-growing grass is generally considered to be a waste of land because there is little appreciation of the potential value of quality grass or fodder for dairy stock feed.

There is a serious problem in exploiting the genetic potential of improved dairy animals due to the lack of good quality year-round feed at the farm level. This is primarily the result of pressure on agricultural land and competing opportunities for labour. There is significant seasonality of fodder supplies and prices, especially in hill and mid-country areas, which is where most of the upgraded dairy animals are found and where farmers depend on purchased concentrated feed to meet some of their maintenance requirements during the driest months of the year. Management of common grasslands, such as communal grazing land, public land and roadsides is weak.

According to the Ten-Year Development Framework, an estimated 44 percent of agricultural land (about 20 percent of the total land area) is “sparsely used, which means there remains a great potential for these lands to be properly developed/used”. It also notes that “land vested in state authorities, which are not utilized, will be made available for proper development purpose”. It stops short of stating that this land will be made available to the private sector, but the Livestock Development Policy paper acknowledges that “State lands will be made available to the private sector to promote superior planting materials for feeds and fodder and to demonstrate appropriate cultural practices of production and harvesting”. It also states that “while no land resources of NLDB will be privatized, allocation of state lands for the promotion of the private and corporate sector for organized programmes for livestock development will be actively encouraged”.

Farmer knowledge and skills

Hardly anything worthwhile has happened in the fodder development in the country. Land is not specifically allocated for forage, and grasses are not accepted as a “crop”, even though farmers do not fully use available local feed resources. As a result, large quantities of available local feed resources are currently wasted.

Compound cattle feed is not popular among most smallholders. Instead, they use feed ingredients such as coconut cake and rice bran. A few large-scale feed millers control the feed industry in the country. Rapid growth has been seen in the production of poultry feeds. However, more than 80 percent of the ingredients are imported, and production of compound feeds is an externally dependent system and vulnerable to changes in world market prices.

Previous studies have stressed the importance of increasing the use of quality forages to improve the nutritional status, productivity and profitability of the herds. Currently, few farmers are taking advantage of opportunities to produce and use quality feeds. The production cost (fertilizer) of good-quality fodder is between an estimated 2 and 4 rupees (excluding any land costs), compared to poonac at an average of about 17 rupees. The nutritional value of good quality pasture is sufficient to allow it to substitute for poonac.

Significant improvements in technical efficiency could be achieved through the introduction and adoption of simple changes in husbandry and the way stock is managed. Water is an essential component in any diet and especially critical for a lactating cow, which has additional losses in milk that need to be met. Increased use of low-cost, high-quality grass and forage as a substitute for high-priced concentrated feeds and poonac should improve the profitability of dairying. In many areas, smallholder dairy farmers do not have adequate land to grow grass or do not have secure access or rights to use existing grasslands.

Extension system limitations

The number of veterinary surgeons employed by the DAPH has risen markedly in recent years, but the cadre of livestock officers and livestock development inspectors has stagnated. It is the inspectors who are primarily responsible for providing extension and AI services to farmers. While these two roles are somewhat synergistic, it is apparent that the lack of inspectors dictates that the breeding service is prioritized and extension services are provided on an ad hoc basis. This lack of an extensive extension programme affects the development of the industry.

Other constraints

The key constraint to further developing the dairy industry is low profitability stemming from a relatively low farmgate price for milk, low productivity and the high cost of production. Stakeholders in both the

public and private sector agree that the greatest constraint in the short-term expansion of the dairy sector by commercial medium- and large-scale farmers is the availability of good-quality dairy stock.

1. easing stock availability through improved breeding will be a slow process. If there is no substantial investment in commercial medium- and large-scale dairy farming in the short term, there will be a serious shortage of quality dairy stock.
2. There is no effective market for dairy stock. Also, no organized system exists for interested buyers to contact agents or for agents to contact each other to broker deals. Farmers sometimes resort to selling stock to butchers.
3. Access to land for the production of livestock forage and fodder is critical if productivity gains in the sector are to be achieved. However, access to land alone will have little impact on dairy productivity and profitability unless there is a change in attitude to deliberately grow pasture or fodder for stock.
4. extension service provided by the Government to farmers is largely ineffective because the training provided to the frontline agents is insufficient. Although commercial milk processors provide services to their clients (farmers), they focus on milk collection. There is a need to train extension providers in methodology as well as on various aspects of animal husbandry.
5. Growth in the informal market is likely when retail powder prices increase and fresh liquid milk becomes more competitive. Growth will probably continue, partly at the expense of the formal sector, until the formal market of liquid milk is better able to reach consumers. There is a lack of small-scale processing, which constrains farmers' opportunities for obtaining higher prices for their milk.
6. The Government controls the retail price of milk powder. This constrains the price that locally produced milk powder can be sold for as well as imported powder. Farmgate milk price paid by MILCO is therefore largely determined by their collecting, processing and marketing costs – all of which are reputed to be relatively high. Because the retail price of powder reflects the changes in international commodity prices, it is likely that the retail market price for fresh products will increase also, fuelling the upward pressure on farmgate prices.

Conclusions

The dairy sector is regarded as the priority sector in livestock development for public investment. Promoting a liquid milk market, expanded to the regions outside the traditional centres of milk consumption, is a precondition for increasing the competitiveness of domestic milk.

The policy goal in developing the livestock sector is to achieve sustained and equitable economic and social benefits to livestock farmers while increasing the supply of domestic livestock produce at competitive prices for consumers.

To achieve this objective, the strategic approach for promoting livestock production for food security is planned as follows:

- promote a liquid milk market, expanded to the regions outside the traditional centres of milk consumption, as a precondition for increasing the competitiveness of domestic milk;
- upgrade the native herd as a fundamental necessity for dairy development, while encouraging the active involvement of the private sector;
- transform the current subsistence-level dairy production into a viable commercially oriented activity;
- focus import policy and fiscal policy on dairy products to provide a conducive environment for the domestic dairy industry, with market forces governing the pricing of domestic milk;
- strengthen development of a viable, medium-to-large scale, commercially oriented private sector engaged in dairy production, which is crucial for the long-term sustenance of the domestic dairy industry;
- empower dairy farmers and facilitate their participation and that of the processors in the value chain of dairy products;
- promote livestock production among vulnerable groups and increase the protein intake by livelihood diversification in rural areas.

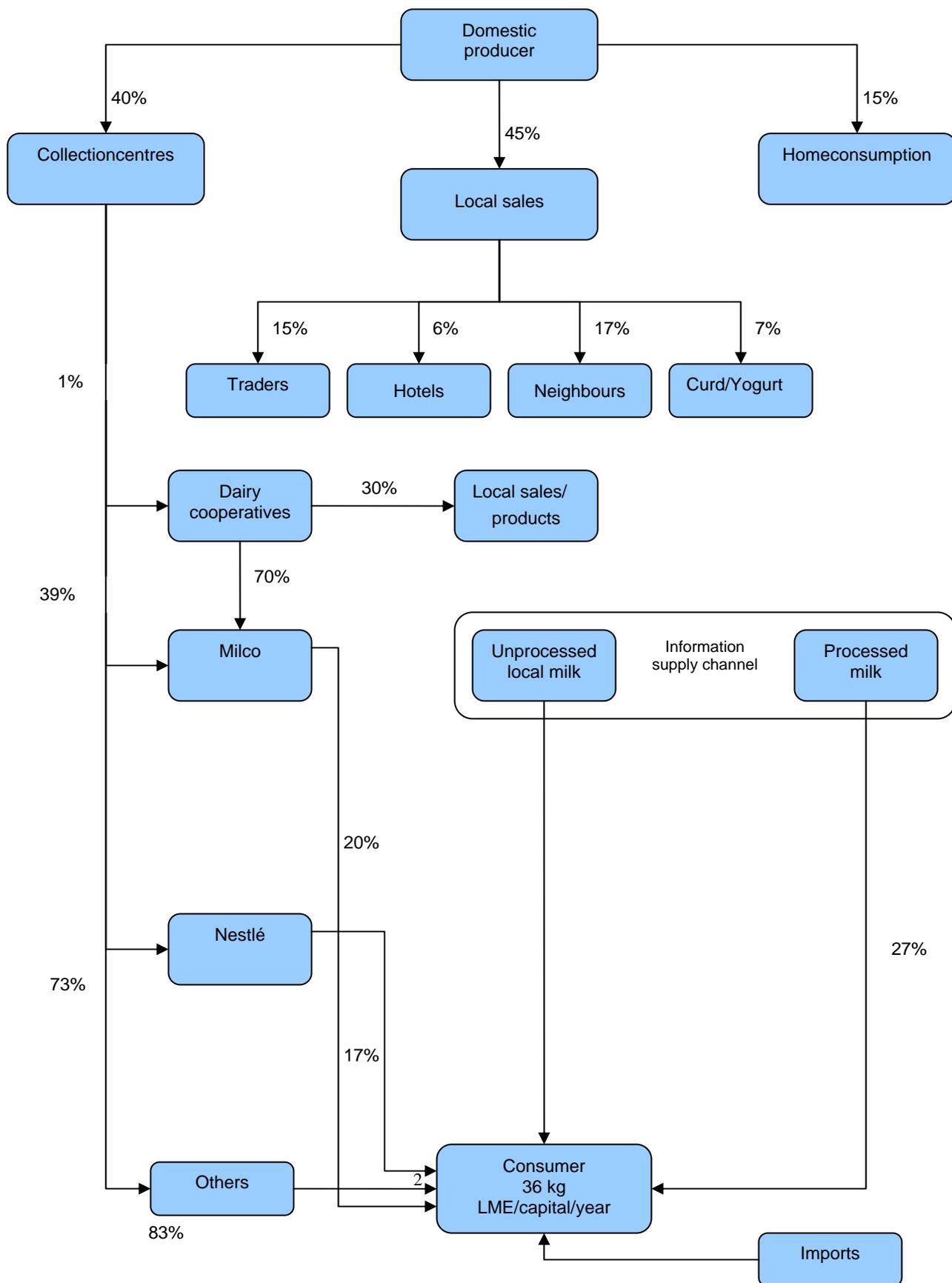
From a technical perspective, dairy farmers and processors can be empowered to further participate in the value chain of dairy products by:

- strengthening artificial insemination delivery and breed-improvement programmes;
- institutional improvements for delivery of veterinarian care services and animal health management;
- stronger extension services and human capital development;
- value addition at the village level.

Of paramount importance in developing the livestock sector is the feed resource base, including pasture and other natural forages as well as coarse grains, agricultural waste and by-products:

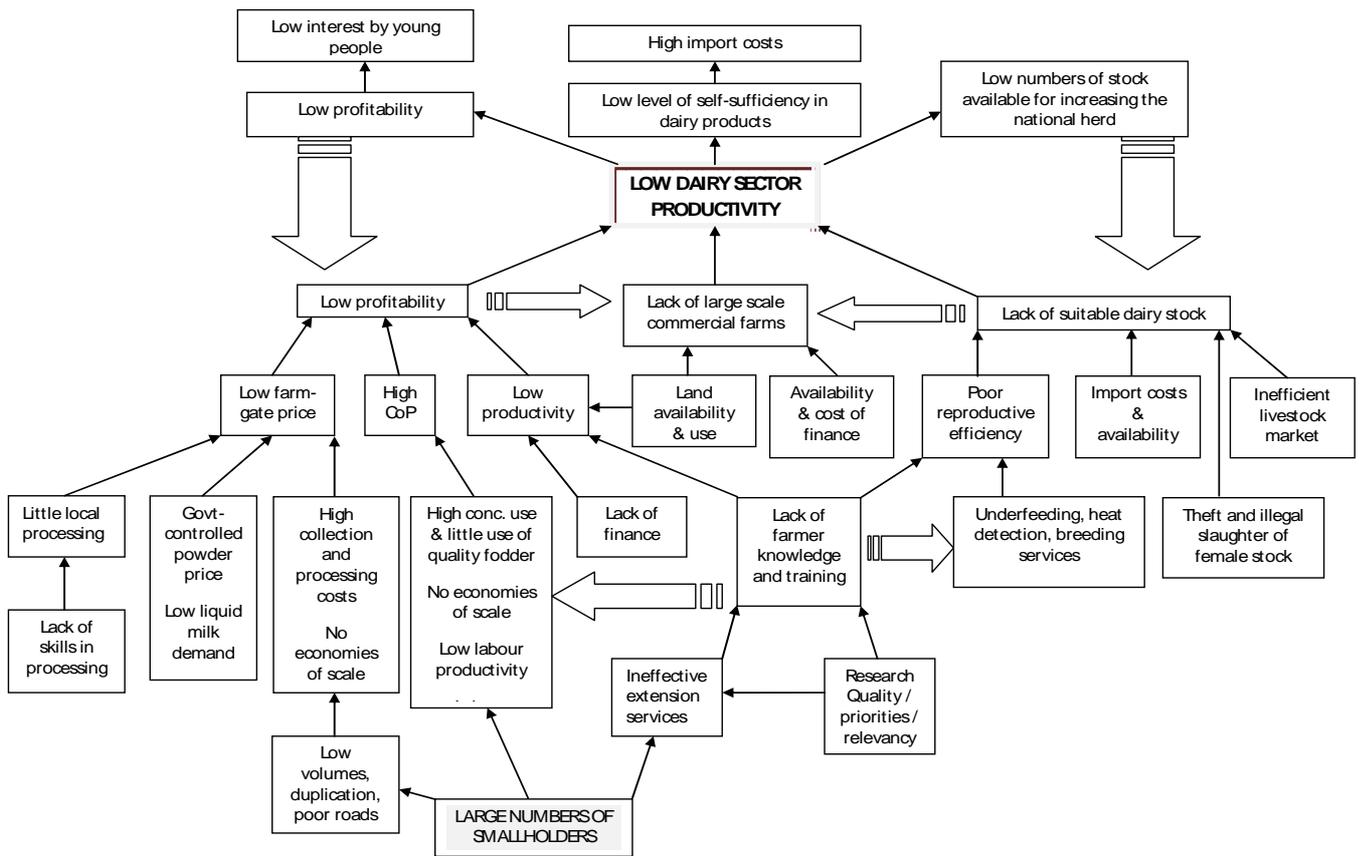
- Government can facilitate the trading of feed ingredients for the livestock industry while providing adequate protection and incentives for the growing and local production of feed resources.
- To develop a viable commercial dairy industry, an efficient corporate sector for the manufacturing of compounded feed for dairy farming is essential.

Annex I: Supply chain for milk



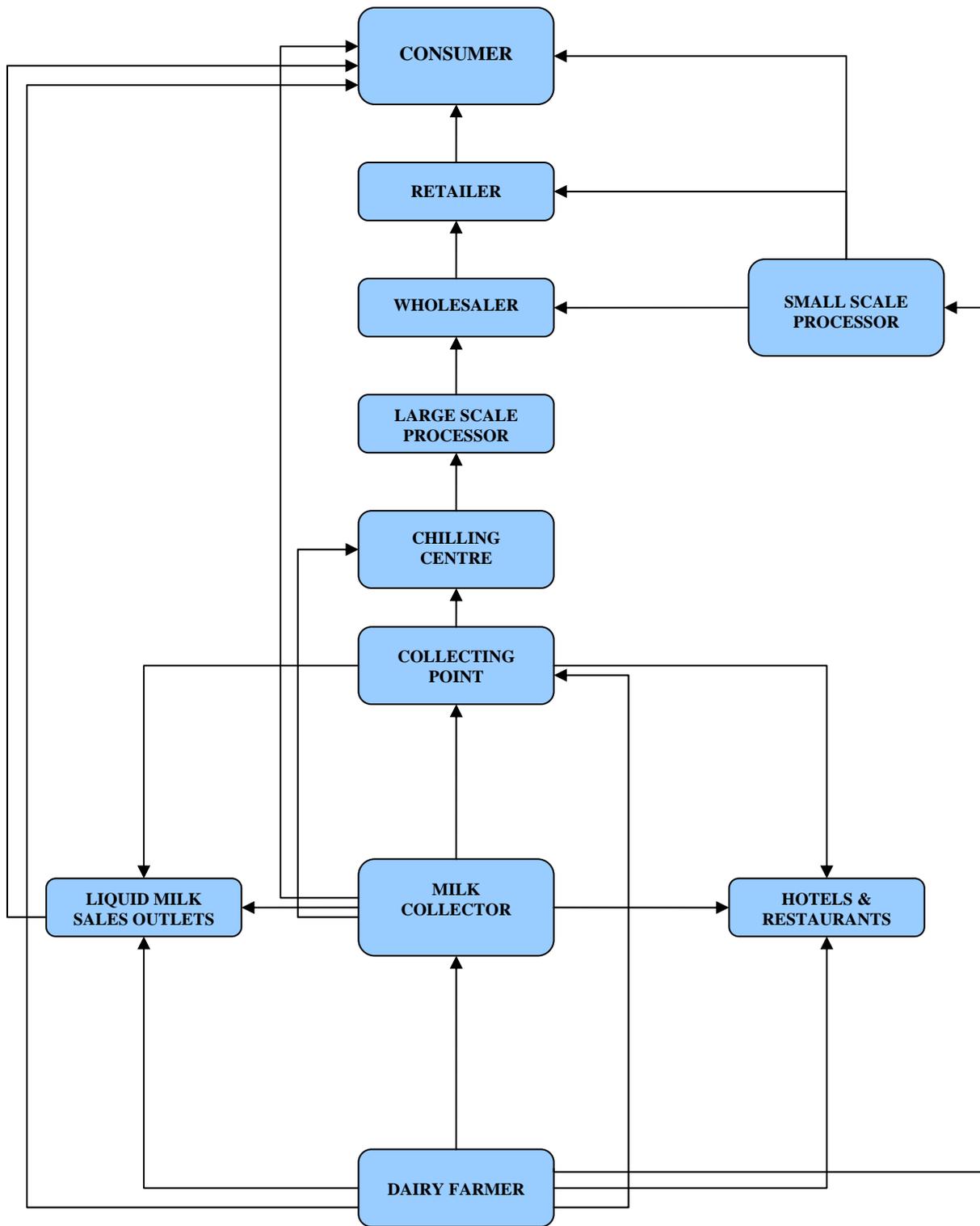
Source: Adapted from Ibrahim M.N.M *et al.* October 1999. Appraisal of the Sri Lanka Dairy Industry. Dairy Sector Problem Web site.

Annex II: A constraint analysis



Source: Kerry Straight. 2007. Working paper on dairy and livestock. PPTA 4800, Interim Report, Agribusiness Development Project, Ministry of Agriculture and Agrarian Services. Sri Lanka.

Annex III: Flow chart of the dairy industry in Sri Lanka



Philippines: Promoting dairy entrepreneurship through enterprise zones

Sally Bulatao

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Manila

Background

A Medium-Term Development Plan for Dairy (1989–1993) and its accompanying dairy industry development model (DIDM)⁴⁴ signalled a new era for the dairy industry – after its near-termination in 1986. The Department of Agriculture at that time had declared that all support for dairy activities would stop and that the Philippines would simply import its dairy requirements. The government agency involved in dairy development, the Philippine Dairy Corporation, began the process of dissolution and its assets were being prepared for public auction. But then a new agriculture secretary (Carlos G. Dominguez) met with dairy farmers in 1988 and reconsidered the department’s previous position. It was this second chance that initiated the new dairy plan.

The most distinct component of the new plan was a strategy initially called the “zero-base approach” – the Department of Agriculture was not going to support dairying nationwide. Instead, it would be introduced and assisted only in areas found suitable, based on pre-determined parameters. It would also address weaknesses in the previous dairying efforts (identified in an assessment): Dairy production sites were too dispersed, selection of farmer participants was arbitrary and often based on political considerations, the few existing processing facilities were either too old or too big for the current production volumes and the cooperatives were not functioning as enterprises.

These insights guided the designing of the DIDM, also called the dairy zone model. The plan defined each component of the system, which then became the content of orientation seminars for prospective farmers. Only areas that passed the set criteria were considered as dairy development sites. As shown in Annex V containing the detailed criteria, the model provided “musts” for the production unit (at least four adjacent villages, access to forage area, water, etc.), the collection centre (quality testing capacity, handling and delivery equipment), the processing facility (appropriate capacity specified), a market base (located within a 35-km radius of an urban centre) and the appropriate dairy enterprise or cooperative.

In the early 1990s, three zones were established: in Davao and Cebu in areas where no dairy activity had ever taken place and in Cagayan de Oro/Misamis Oriental, where there were some dairy farmers from an earlier programme. There were existing dairy operations in Laguna and Bulacan, both geared to supply the Metro Manila market. Although there are other visibly more profitable dairy enterprises in the area, they are private commercial ventures that don’t make information about their operations regularly accessible and thus are not included in this case study report.

In 1992, the Philippine Carabao Center (PCC) was created through legislation to pursue the conservation, propagation and promotion of the water buffalo as a source of milk and meat, in addition to draught power and hide leather.⁴⁵

In 1993, the Dairy Confederation of the Philippines (Dairycon) became the first national organization of smallholder dairy farmers.⁴⁶ The Dairycon organized its first National Dairy Congress in Cagayan de Oro City, attended by its five founding dairy federations. Since then, the Dairy Congress meets regularly (every two years initially and now annually) as a forum for various dairy groups to come together to see the latest in dairy equipment and products and discuss technical and other issues.

⁴⁴ Attached as Annex I is a description of the dairy industry development model.

⁴⁵ Sosimo Ma. Pablico. 2006. *Changing lives: Beyond the draft carabao*. Philippine Carabao Center.

⁴⁶ *Doing their dairy best in Davao*, Dairy Development Foundation of the Philippines, Inc., 1994.

In 1995, the newly enacted National Dairy Development Act created the National Dairy Authority – a sure sign that dairying would be pursued as a matter of national policy. Table 1 captures the transition of the local industry since the enactment of that legislation. In dominantly carabao-based dairy areas, the PCC assists dairy farmers. In areas served by the NDA, farmers with all types of dairy animals receive technical support.

Table 1: Philippine dairy industry indicators

Indicators	1995	2000	2005	2006
Annual milk production in million litres	12.11	10.21	12.34	12.87
Total dairy herd	21 054	21 100	26 344	28 395
Cattle	11 145	7 780	11 733	13 092
Carabao (buffalo)	8 134	11 943	13 606	13 648
Goat	1 775	1 377	1 005	1 655
Total dams and does	9 687	10 254	12 679	13 255
Cattle	5 543	3 550	5 210	5 669
Carabao (buffalo)	3 360	5 950	6 820	6 879
Goat	784	754	649	707
Dairy import cost (CIF – in US\$ million)	438.29	402.17	421.33	457.30
Dairy import volume ¹ in LME (in million litres)	1 605.14	1 853.16	1 353.39	1 510.68
Per capita milk intake in litres per year	16	16	19	19
Number of farm families engaged ²	4 066	8 197	13 077	14 347
Total employment in the dairy industry	4 066	8 197	17 020	19 583
Number of dairy enterprises	58	118	289	315
Number of children supplied in milk feeding programmes	12 750	20 932	96 167	29 843

¹ Import volumes are net of re-exports by importer/processors.

² Source: The Bureau of Agriculture Statistics (the first survey of farmers engaged in dairying was conducted in 1960).

In the mid 1990s, the Government experimented with big commercial farms by establishing three of them in different parts of the country. Each one was stocked with some 200 animals, provided with milk processing facilities and managed by cooperatives. By 2000, all three projects had been dismantled. Each commercial farm had failed to sustain operations; they had been unable to amortize loans used to set up the facilities and had run out of funds to cover overhead costs, including the farm personnel. This failure underlined the lesson that small producers maintain a competitive edge, based on the low overhead incurred per farm. Today, bigger private commercial farms that raise dairy stocks maintain raw milk supply arrangements with small producers.

In 2001, the NDA returned to the dairy zone model. There are now 15 zones throughout the country.⁴⁷ A profile of these zones is attached as Annex II. More information on the dairy zones and emerging zones is contained in *Philippine Dairy Zones* (2007), a booklet published by the National Dairy Authority.

There were also dairy federations in place in those five dairy zones; after a stall in the programme's approach in the mid 1990s, the federations took prominence and now run the business of the cooperative using their own capital, pay a monthly lease to the NDA for the use of the plant, hire their own staff, cover the maintenance and repair of the facilities and pay dividends to members.

The history of the Philippine dairy industry is marked with failed government and private ventures in big farms going on their own. Somehow, a cluster of smallholders that fill the capacity of the core farm has improved the viability of the bigger farms. In turn, smallholders have benefitted through dividends received as members of the cooperative federation or through higher milk procurement prices offered by private farms during dry periods.

⁴⁷ < <http://nda.da.gov.ph/dairyzones.htm>>. This site contains maps and profiles of the zones.

Industry overview

The Philippines' dairy industry consists of two distinct sectors: One is the milk powder-based sector that imports, re-processes and repacks milk and milk products. The other is the liquid milk sector that has an imported UHT milk component and a locally produced fresh milk component.

Although Filipinos are generally considered non-milk drinkers, with consumption at 19 kg per person per year, the Philippine dairy market, including the market for imported milk, generates more than US\$1 billion in revenues annually. Some 44 percent of the demand for milk is concentrated in Metro Manila.

The two players in the dairy market (Table 2) – the importer/re-processors and the local producer/processors – are very distinct from each other. The importing sector is dominated by three importer/re-processors that accounted for 55 percent of total imports in 2006. More than 80 percent of milk product imports is in powder form. The importer/processors also import ready-to-drink milk. Local milk producers supply barely 1 percent of the total supply in LME, or about 30 percent of the liquid milk supply. In 2006, local milk production was about 13 million kg. In gross weight, this represented 5 percent of total supply. In terms of liquid milk equivalent, local production barely accounted for 1 percent. In the liquid milk category, local milk accounted for about 30 percent of supply. Although liquid milk continues to account for a small portion in the big dairy scheme, it started to gain significance when imports of ready-to-drink milk in Tetra Pak cartons doubled from 2000 to 2005.⁴⁸

Table 2: Market shares in the liquid milk market

	Market shares		
		Importers/re-processors	Local milk producers/processors
Total milk and milk products market	100	99%	1%
Liquid milk market	3	70	30
Powder and other milk products	97	100	0

The industry structure can be seen in the milk price chart in Annex III, with the liquid milk moving through a simple trading route, compared to the local milk production-processing-distribution system that involves many stages and thereby generates more employment and rural incomes. The milk flow chart (Annex IV) illustrates the movement and links between various types of producers, processors and final consumers. It is complemented by a table of imports in Annex V. The actual product mix of the commercial players can only be deduced from import figures.

The local dairy farm sector is small, comprising 13 000 families and some 300 dairy enterprises. The total dairy herd consists of some 28 000 head, of a total livestock population of 9.6 million. The single biggest obstacle to dairy development is the shortage of dairy animals. Hence, programmes to upgrade local animals to dairy breeds are dominant livestock interventions. Recent pronouncements from the Department of Agriculture have indicated the intent to concentrate on the upgrading of native carabao.

Located within dairy zones, smallholder dairy farmers (with 2–10 cows) and bigger producers (with 20–400 cows) operate side by side. Annex VI provides the findings of a 2002 survey by the Bureau of Agriculture Statistics indicating that 4 194, or 85 percent, of 4 957 farmers surveyed owned 1–5 dairy animals. Including the farmers owning 5–10 dairy animals, the percentage of smallholder dairy farmers rises to 96 percent.

Coffee shops, hotels, restaurants, supermarkets and small grocery shops make up the commercial outlets for local milk and absorb about 60 percent of production. Local government units that sponsor milk feeding programmes consume about 40 percent. As provided by law⁴⁹ and implemented by the National Dairy

⁴⁸ Import volume of ready-to-drink milk increased to 45 710 tonnes in 2005 from 22 080 tonnes in 2000. Over the same period, the cost of these imports tripled to US\$33.95 million from \$11.65 million.

⁴⁹The National Dairy Development Law (Republic Act 7884) provides: "SEC. 16. Nutrition Programmes – The Government's nutrition programmes requiring milk and dairy products shall be sourced from small farmers and dairy cooperatives in coordination with the Authority."

Authority, smallholder dairies have priority as suppliers of government-sponsored milk feeding programmes. The significant impact of milk feeding on decreasing the incidence of malnutrition encourages local governments to support these programmes. For social and political reasons, the local officials greatly appreciate the concept of nutrition for the children and income for the farmers.

Important trends contributing to dairy development

From 2001 to present time, a number of trends in the local dairy sector have helped to accelerate development. These factors indicate that collaborative efforts among national and local governments and dairy enterprises and support through official development assistance have been important growth drivers. Operating in a trade regime of liberalization, the local dairy sector of the Philippines hardly enjoys any protection, with tariffs on dairy imports down in the range of 0–3 percent. Quality assurance has received a big boost in recent years, highlighted by the introduction of milk payments based on quality in some zones.

The law and the national development plan promote smallholder dairying, as contained in the following relevant provisions:

Section 3. Objectives:

1. to give support and assistance in the production, processing and marketing activities of all those engaged in the business of producing milk and other dairy products, particularly rural-based small dairy farmers, through the provision of necessary support systems;
2. to encourage and promote the active participation of farm families, rural cooperatives and the private sector, recognizing them as principal agents in the development of the Philippine dairy industry;
3. to develop and disseminate appropriate smallholder-based dairy technology.

Section 11. Dairy cooperative and farmers' organizations – The Authority [NDA] shall help organize small producers and processors of milk into cooperatives or other forms of organizations to achieve the purposes of this Act, including:

- to facilitate collective arrangements that will enable cooperatives to acquire dairy animals, feeds, veterinary and other supplies, materials, equipment, services of all kinds and other dairy inputs under favourable terms;
- to provide a forum for the members of cooperatives to discuss common problems affecting production, marketing and the cooperatives' relationships with the Authority;
- to help design credit systems that will provide loans, grants and such services as may be required, to dairy cooperatives and duly accredited people's organizations;
- to assist cooperatives in developing market channels and in negotiations for bulk outlets of milk output.

Section 16. Nutrition programmes – The Government's nutrition programmes requiring milk and dairy products shall be sourced from small farmers and dairy cooperatives in coordination with the Authority.

The official plans before and after the passage of the law, likewise, supported the development of smallholder dairy as contained in the Medium-Term Dairy Development Plan of 1989–1993 and the Dairy Road Map for 2004–2007. As dairy enterprises progressed over the years, private producer/processors and the cooperative enterprises found ways to work with one another.

Critical factors influencing dairy development

Participation of local government. Local government engagement has expanded to involve provincial governors and provincial boards, a marked improvement from the time when only village and town or city officials supported dairying efforts. In particular, four provincial governments have become active partners in the installation of dairy zones in their provinces. With ample explanation, provincial governors have agreed to follow the specifications of a dairy zone, foregoing the traditional way of distributing animals to all areas, a practice that resulted in dispersed stocks and non-sustaining enterprises. Under such partnerships, the

provincial government provides land for a processing plant and capital loans for dairy enterprises, sponsors milk feeding programmes and deploys provincial dairy programme staff for services and other forms of assistance.

Breakthroughs in appropriate technology for long-life milk. In the absence of guaranteed public or private demand for milk products, milk producers in the Philippines have no guaranteed market. As such, the burden of managing the product mix is on the enterprises at all levels, from farm to retail outlets. In this context, the design and fabrication of a water retort facility⁵⁰ made possible the production of long-life sterilized milk in pouches for commercial distribution and for feeding programmes in remote areas. It was a breakthrough in marketing.

The first facility was set up in Davao City, Mindanao, in 2002, a second one followed in Cebu City in the Visayas in 2006 and a third one has been commissioned for installation in Lanao del Norte, also in Mindanao. The Dairy Development Foundation of the Philippines sponsored the feasibility study and initial test runs of the retort facility. Subsequently, the National Dairy Authority funded construction of the first unit, although the dairy federation that operates the plant repaid the expenditure after it was installed. The facility requires a fill-seal machine, which the federation obtained a private loan to buy. The cooperative federations also invested the necessary funds to build the second and third units. Other milk products in stand-up aluminium pouches, including evaporated milk and condensed milk, which are widely consumed items in the Philippine market, are in product development.

Availability of smaller processing facilities. With the training of local engineers and fabricators and access to Chinese, Indian, Thai and Taiwanese dairy equipment suppliers, the old practice of commissioning dairy plants on a turn-key basis has been abandoned. In fact, even old plants have been reconfigured to suit the needs of smaller production sites. Some of these are privately financed like the processing plants of two popular brands in the market: Milk Joy and Gatas ng Kalabaw. Other plant-redesign projects were initiated by the Government and covered with lease agreements with cooperative federations. The capability and confidence established in designing appropriate capacities of processing plants have greatly reduced the investment required for plant installation.

Technical support for milk-quality assurance. For many years, local industry relied on academia-based technical support. This meant following the prescriptions of the Dairy Training and Research Institute on all aspects of dairying, from farm to plant. While such support was scientifically sound, it was not always grounded on commercial realities. For example, some products that were developed failed to succeed in penetrating commercial markets, sometimes due to poor packaging, untested shelf life or omissions in product costing. The breakthrough for the local dairy industry came sometime in 1997 when a group of technical people from Nestlé and Magnolia (leading food companies in the Philippines), upon their retirement, organized a technical cooperative that made their services available to other cooperatives, including dairy. The technical cooperative established a commercial laboratory to which milk samples were sent for microbiological tests, milk-composition analysis and commercial sterility and shelf-life tests.

The experience with an independent group doing the tests has greatly motivated producers and processors to upgrade quality and to strive for consistency in the quality. With help from the group, other technicians were also trained and deployed as quality-control staff in different processing plants.

Enterprise orientation and market-oriented financing packages. Transforming dairy farmers to dairy entrepreneurs has been the theme and pre-occupation of the industry movers, both in Government and the private sector. The transformation process includes training farmers in business skills as well as value-adding in terms of standardized quality testing at the collection centres and the processing plants, assisting in

⁵⁰ A water retort facility passes hot water instead of steam, preventing the scorching of milk and greatly minimizing the cooked taste. Designed by the Philippines' Science and Technology Department, although patterned after some versions made in other countries, it processes sterilized milk in stand-up aluminium pouches. The product has a shelf life of six months or more. It allows dairy processors to produce milk that can be delivered to remote areas in cardboard boxes and stored in ambient temperature. The product has the shelf life of UHT milk in Tetra Pak cartons and the delightful taste of flavoured milk. The equipment is suitable for processing smaller volumes (1 000 litres) of milk in batches, unlike UHT plants that require some 10 000 litres per run.

obtaining product licenses and plant accreditation and enforcing product standards for suppliers in milk-feeding programmes. In this approach, smallholder farmers essentially become smallholder enterprises.

That process was based originally on the recognition of several requisites: the need to break from the traditional reliance on government subsidies and freebies; that cooperatives had to operate on their own capital and to pay for facilities, even if established by the Government; that farmers needed to learn that milk price is determined on both sides of the plant: the farm and the market; and that a farm operation had to run like an enterprise. These requirements continue to permeate all training programmes and financing packages for the industry. One indicator of the effectiveness of that orientation: a farmer who talks about the need to produce at least at break-even volume with three animals and who smiles when the day's milk exceeds that level.

Financing packages have been negotiated with financing agencies to reflect the dairy production cycle. This entails technicians certifying that an animal is in its dry period and a farmer resuming loan payment upon the animal's calving. The financing agencies have agreed to not penalize non-payment during the dry period but do expect balloon payments with the sale of male calves.

Island dairies for local milk supply. Even Manila-based bureaucrats could not believe that small islands could operate viable dairy enterprises. When dairy zones were established on the islands of Siquijor, Iloilo and Negros Occidental and the enterprises managed to penetrate local markets, it proved credible. Supplying the local urban markets requires appropriate packaging, quality assurance and a distribution system. Local teams were trained to handle these aspects. In the immediate communities of the dairy producers, milk also became affordable to farm workers and households. For example, in Negros Occidental, sugar farm workers can buy farm-pasteurized milk at 20 pesos per litre, which is about one-third the price of milk at a supermarket. Although the processing plant campaigns for the delivery of the maximum volume of milk to the plant, an amount of community sales is tolerated.

Dairy zones and the clustering of big and small farms. In previous years, there were strong sentiments on whether support should emphasize big or small farms. The dairy zone model provides a structure for the participation of smallholder farmers. Over time and as dairy cooperatives and their counterpart big farms gained confidence in their capacities, they started to do business with one another. Their transactions demonstrated that they could gain bigger market shares by stabilizing the supply – if those who had more milk made it available to those who did not have enough. In the end, it was good business for big and small farms to collaborate. In the area of credit sales, the processors also soon learned that their outlets that had unpaid accounts with one supplier sometimes merely shifted to another supplier and delayed the payment to the previous supplier. Soon enough, the processors learned that it was not always because they were better that an outlet dropped one supplier in their favour. In transactions with one another, processors learned that customers were simply hopping from one supplier to another.

Commercial farm module. When smallholder producers began growing into medium- and bigger-sized farms (of 20–100 animals), the National Dairy Authority started to design commercial farm modules that would suit the emerging crop of dairy farmers. Farm size is a very fluid figure, but there are stages of growth: Farmers first engage in dairy on a part-time basis; then one member of the family goes into it full time, with about three other family members assisting in forage gathering, milking, milk delivery to the collection centre and selling some of the milk to the immediate community.

The NDA's latest farm count includes 77 private commercial enterprises that are not cooperatives and 38 government stock farms and institutions engaged in dairying. Another indication of the trend towards private endeavours that are not structured as cooperatives is the creation, in Mindanao, of the Mindanao Dairy Alliance, even though there are two dairy cooperative federations operating to accommodate the private enterprises. Some examples of private dairy farms are: the Del Monte dairy in Bukidnon, the farm of the Benedictine monks and farms run by non-government institutions and foundations.

The role of the NDA is critical for ensuring the participation of smallholder dairy farmers in the industry. This is done by supporting the massive upgrading of local animals that eventually provides the cheapest source of dairy stock. Interventions in quality assurance are also a significant contribution by the NDA's technical staff. Further, in designing loan facilities and enterprise contracts, the NDA can calibrate its levels

of support. In some zones where land is limited, dairy farmers have had to give up their cows by selling or passing them on to relatives with farms in other areas. While that mode of natural dispersal is acceptable, a more structured and organized mode of expansion can be encouraged systematically. It is along this rationale that bigger loan packages and other types of technical support are being designed to enable dairy farm growth. The packages include the loaning of tractors, breeding farm aid and pasture development loans. Financing agencies are also being tapped to open lending windows that will allow larger farms to procure more cows or to invest in other facilities, such as milking parlours and farm cooling equipment.

Philippine Carabao Center. The PCC is a world-class research centre for buffalo. Its studies and research on genetic improvement are directed towards making the Philippine carabao a major milk supplier for the country. Today, 36 percent of national milk production comes from carabao, 63 percent from cattle and less than 1 percent from goats. The emphasis on carabao is based on climate suitability and the huge number of animals on the ground that may potentially be upgraded to a dairy buffalo breed. Aside from the research focus, PCC also supports buffalo-based dairy enterprises in various parts of the country. Nueva Ecija province is its main area of intervention, with 13 other centres throughout the country that are connected with local state universities.

Dairy Training and Research Institute. With its core staff of dairy specialists, the DTRI continues to be a resource for the industry although its facilities are in need of improvement. Training courses for cooperative-based dairy technicians are conducted in coordination with the DTRI. It also maintains a semen-collection facility that supplies dairy farms in Luzon.

Official development assistance. With very limited resources channelled to the smallholder dairy sector, support through official development assistance significantly has accelerated dairy zone expansion in the past six years. Specifically, official development assistance from the US Government's Section 416(b) facility and the Food for Progress programme has been a significant source of investment in smallholder dairy. In partnerships with the US Department of Agriculture, the National Dairy Authority and the American Land O'Lakes (LOL), local capacity-building has been undertaken in four new dairy zones, with four more in progress. Even a LOL milk feeding programme in one region had a dairy capacity-building component with smallholder farmers. That site now is being scaled up to a dairy zone. Assistance from the FAO for improving milk quality and from the Japanese and Australian Governments for improved milk quality and breeding has provided valuable support to the smallholder dairy sector.

The success of the foreign-funded programmes may be attributed, to a large extent, to the high degree of collaboration achieved between the foreign donor and the local partners. Other foreign-assisted programmes have been installed but did not succeed due, in part, to the lack of recognition of the smallholders' role in the success of dairying and the desire to go big and establish huge communal farms.

Smallholder dairy farmers

The Government's focus on smallholder dairy farmers has generated the following modes of inclusion:

A strong dairy enterprise is the most important requisite for smallholder inclusion. At the present stage of dairy development in the Philippines, the dairy enterprise has taken many forms. The most dominant is the cooperative, of which there are two distinct categories: There are dairy cooperatives with only dairy farmers as members, and there are existing multipurpose or credit cooperatives that have opted to include dairy as one of its business enterprises. Both types can exist within dairy zones, although the first is simpler in terms of management. The advantage of the second type is typically the use of its previous business experience in the dairy business. It has yet to be established which type ultimately allows broader inclusion of smallholder farmers. The organization of dairy farm producers is usually the primary cooperative that operates the collection centre. The primaries are members of a second-tier cooperative, which is the federation. The dairy federation operates the milk processing plant and undertakes marketing operations. The federations in the Philippines are members of the Dairy Confederation of the Philippines, the national organization of dairy cooperatives. The Dairy Confederation is independent of the National Dairy Authority. It is the apex organization of the various dairy federations.

Other forms of dairy enterprise are single proprietorships for which some farmers have opted, such as those growing faster than others. These are typically farmers who have a little more capital to procure stocks rather than waiting for the natural calving of their initial herd. They also own or have access to bigger parcels of land for pasture. The dairy zone profiles (Annex II) shows that in the most developed zone in Laguna-Quezon, there is an equal number of cooperatives and non-cooperative enterprises.

There are also public-private partnerships in dairy enterprises. This has emerged in some instances when the federation is unable to manage a viable business enterprise. This would likely be due to some weakness of the cooperative, such as abuse by members in the management staff, delay in payments to farmers or the inability of the plant to impose quality standards. In earlier years, the National Dairy Authority assumed control of a flailing enterprise in the form of a management contract with the federation. Under that arrangement, the NDA took over operations until problems were straightened out and then it exited. More recently, the public-private equity partnership has been formalized. Under this arrangement, the NDA takes equity in the business, which then becomes open to equity participation by the federation or other private entities.

Collaboration among big and small enterprises, once they have achieved some level of stability, is important for a stronger market presence. Big and small dairy enterprises operating side by side are a phenomenon of recent years. It emerged as a natural recourse for enterprises to take advantage of market opportunities and to address some common problems. Its most dominant form is the collaboration between a processing facility that owns a farm and produces its base milk requirement but also maintains several small groups that supply milk to the plant. This type of collaboration has resulted in dairy producers shifting from one processing facility to another, especially around the Metro Manila area. In general, there exists a healthy competition for the best benefits given to the small producers. The cooperative-run facility, for example, pays regular dividends to members while non-cooperative enterprises do not.

On the other hand, the non-cooperatives usually attract producers by offering higher prices for raw milk. The competition leads to a market-determined price for the milk, which ultimately benefits the small producers. (Of course, there are also instances when the big processors drop small suppliers.) In this case, the members have a better guarantee from their cooperative federation that their produce will be procured.

The money realized from dairying is the single biggest incentive for smallholder dairy producers. As soon as smallholder farmers begin to make money from dairying activity, they are likely to stay with it. In dairy zones where small and big farmers operate, the big farmers who have other options and who can afford other investments are the first to quit while the smallholders continue. This reality justifies focusing interventions in smallholder dairy programmes on enterprise strengthening to ensure the broadest inclusion of small-scale farmers.

Technical assistance along the entire value chain is critical. Production support is important but not enough. Enterprises with broad smallholder participation have succeeded where the technical assistance extends beyond the farms to include quality control, product development, packaging, market positioning and enterprise management. Making these forms of assistance accessible and affordable is a challenge to any support mechanism for smallholders.

Dairy Development Foundation-supported smallholder inclusion. A strategy of inclusion of smallholders requires a deliberate and creative development vehicle that is sensitive to the impact of policies, programmes and activities. Because the smallholders are the most vulnerable, the Dairy Development Foundation of the Philippines (DDF)⁵¹ provided assistance when government support faltered; an outstanding example is when the Government set aside the dairy zone model to pursue the communal farm model. Until its demise in early 2007 (due to lack of funds), the DDF explicitly supported the dairy zone concept, which emphasized the inclusion of smallholders in dairy development. Established in 1992, the DDF assisted in organizing

⁵¹ The Dairy Development Foundation of the Philippines (DDF) was an NGO established purposely to fill the gaps and temper the swings in government support for smallholder dairy farmers. It had a Board of Trustees composed of respected members of society (including a former agriculture secretary, former ambassador and vice president of the Philippines, a bishop, a former senator, a former congressman and others). Funding was sourced from international agencies. However, in early 2007, the DDF stopped operations due to lack of funds. Some former members of the foundation continue to assist in dairy development in a private capacity.

smallholder dairy farmers into the Dairy Confederation of the Philippines. It was only in 2000 that big enterprises were admitted for membership in the Dairy Confederation once they recognized the important role of smallholders. At the present stage in which the robust collaboration of big and small dairy entrepreneurs is deemed important, the DDF facilitated the process by helping configure collaborations, such as public–private partnerships in breeding programmes and market matching.

Milk-feeding programmes as a kick-starter. It is critical to manage the product mix so that dairy enterprises do not lose commercial markets when there is a surge of sponsored milk feeding programmes. At the National Dairy Authority, at one point, there was an attempt to keep the ratio of milk that goes to milk feeding to no more than 40 percent. But as public programmes go, there are times when the demand outpaces the planned allotment for school feeding. It appears that the processing plants with the most stable commercial markets keep their commitments to school feeding to a minimum. In areas outside the major cities, dairy enterprises in the start-up stage benefit from school milk programme contracts. This coincides with the desire of local government units to prioritize local farmers to supply milk for local nutrition programmes.

Indigenous products provide the highest returns. There are areas in the Philippines that have a tradition of producing buffalo milk and processing it into indigenous milk-based products, such as candies and cheese. For example, different regions are known for particular types of *pastillas*, and the recipe for *keseo* in one region is said to have been handed down from ancestors of 400 years ago. When smallholder dairy farmers engage in indigenous product processing, they realize the highest returns, based simply on the principle that value adding leads to gains. The prospects for expanding their markets that have not yet been maximized, such as the overseas Filipinos who look for *keseo*, even ordering it from abroad.

Prospects

The following strategic tactics have been important for the local dairy sector to competitively supply growing markets in the future:

1. **Invest in quality assurance and product development.** This involves investments in facilities, in personnel and in process documentation – all important factors for achieving consistent milk product quality. While these are taken for granted within bigger companies, smallholder-operated enterprises may not have sufficient capital to invest. These areas may be considered as preferred points of intervention for smallholder operations. Fortunately, the dividing line between appropriate development/public support and private sector investment is fairly clear. Enterprises are usually able and ready to hire their in-house quality control person. They would also have their basic testing equipment and a simple laboratory. The setting of product quality standards is certainly the domain of government or development assistance. But the sharing of costs in product development is usually tricky. Without some public support, only the bigger processors can pursue all stages of product development, from production of samples through the testing regimen, product registration, appropriate packaging, filling equipment, etc. For smallholders to have significant benefits from advancing along the value chain, support in these aspects would be appropriate. Assistance in the standardizing of product procedures has been tried with some local funding sources and has worked occasionally (the manual for gouda cheese production is one example.)
2. **Target processing efficiencies by localizing supply and firming up the product mix.** With the high cost of transportation and maintaining a cold chain, the approach to supplying local demand with local production has significant cost advantages. Stabilizing enterprise operations includes managing a product mix that suits a local market and achieves maximum cost efficiencies.
3. **Maximize the parallel and collaborative operation of big and small farms.** Where mutual interest is sufficiently safeguarded, more collaborative transactions could be encouraged. In the Philippines, smallholder producers who are growing faster than others sometimes opt to partner with a big processor in the area. In one case, a big farm in Mindanao has brought many producers together to supply milk in bulk to a processor.

4. **Invest in breeding and herd improvement.** Accelerated expansion can only take place if the supply of stock is assured. In the Philippines, investment in animal procurement and breeding requires infrastructure support, including the reliable supply of liquid nitrogen to all livestock areas. Configuring public–private partnerships for breeding farms has yet to be fully developed. Because of the emphasis on carabao, the Philippine Carabao Center is more advanced in the field of breeding. Nonetheless, upgrading of local cattle is also promoted. Government still provides semen for free, conducts training of artificial insemination technicians and has bull loan programmes for some areas. More recently, the NDA has gone into a public–private arrangement to operate a cattle breeding farm that the NDA owned but managed by a successful dairy farmer who started small and has grown into a farm with 75 milking cows. The Dairy Confederation is also studying the possibility of engaging in breeding-related ventures. The designing of more public–private ventures, with the participation of groups that understand the dynamics of smallholder dairying, will be helpful in ensuring the inclusion of smallholders in these arrangements.
5. **Design suitable financing schemes for dairy animal procurement.** *Palit-baka*, or repayment in kind, has always been the preferred mode of animal procurement for smallholders. It is considered least burdensome and takes away the anxiety over committing to pay regular financial obligations for animals whose performance cannot be predicted accurately. However, the scheme has a low potential for attracting commercial financing because the step of monetizing collection in kind involves other costs. The NDA has developed various financing schemes to make lending for animal procurement more affordable through a cycle that corresponds to the productivity of the dairy animal. The packages have provided more comfortable incentives for early repayment through the sale of bull calves and have implemented sanctions, such as removing animals from negligent farmers. Tapping more suitable financing agencies prepared to administer dairy-oriented loan packages is still in progress.

The following three opportunities would facilitate smallholder dairy farmers in accessing the expanding local dairy markets:

1. **Dairying for agrarian reform communities and families of overseas contract workers.** A number of existing dairy zones are located in agrarian reform communities, including those in Bulacan, Quezon, Negros Occidental, Iloilo and Zamboanga del Norte. Authorities have seen the benefits of dairying on families of agrarian reform beneficiaries. As a result, the Department of Agrarian Reform is currently considering introducing dairying in suitable areas among the 1 500 agrarian-reform communities throughout the country. This initiative could potentially accelerate the participation of more smallholders. Likewise, overseas contract workers looking for investment opportunities have considered dairying as an option for their families in their home villages. Contract workers whose families live along milk-collection routes have been among the early start-ups, due to ease of entry. A dairy enterprise also offers a scheme in which a contract worker invests in dairy animals; the company offers to take care of the animals and buy all the milk produced by the animal. The boarding fee of the animal is deducted from milk proceeds while the investor's share is deposited in his/her bank account. The investor receives a regular report on the milk produced by the animal and an occasional photo of the farmer-caretaker and the dairy animal. Both prospects require sound implementing plans and effective monitoring to deter unscrupulous parties from taking advantage of new players.
2. **Mainstreaming of widely consumed dairy products, such as evaporated and condensed milk, and other products.** With the facilities available currently, dairy enterprises already are capable of producing popular dairy products, such as evaporated and condensed milk. Some support could be used for product development for more competitive pricing. This could be done even as other products are continually introduced, particularly yogurt and cheese. The growing interest in consuming local products always includes dairy products that seem to symbolize modern agriculture in some rural areas.
3. **Institutionalized local government-sponsored milk feeding for day-care centres and schools.** Smallholder dairy producers in the Philippines do not enjoy the security that all milk produced will be procured by a central milk-buying station backed by a nationally legislated milk procurement fund. Instead, some milk feeding programmes (either nationally or locally sponsored) have yet to be

institutionalized so that they can be more predictable and less affected by policy swings. One recent example is when the Government switched to rice distribution as a school feeding programme instead of milk. In a few municipalities and provinces, the school milk programme has been embodied in local ordinance, which makes it more permanent. In most areas, however, farmers and their cooperatives have to make appeals every year to continue supplying milk for the programme. When big companies donate milk powder to local governments or offer rock-bottom prices, the local suppliers are sometimes dropped. Although the law, the National Dairy Development Act, provides that government-sponsored nutrition programmes shall be supplied by local producers, its implementation has yet to be strictly followed.

The following suggests approaches for focused, actionable, national and regional dairy strategies:

1. **Propose livestock and dairy as a major poverty-reduction strategy and prepare the necessary supporting documentation.** While livestock support and dairying development as pro-poor strategies are found in existing FAO programmes, there is room to more effectively capture the imagination and support of policy-makers and development practitioners. Specifically for the Philippines, the good socio-economic impact of livestock and dairy programmes in other countries can serve as stimulus for a more systematic promotion of smallholder livestock and dairying programmes. For decision-makers, more comprehensive research and documentation would be required, particularly those that undertake comparative impact studies among various poverty-reduction options, such as comparing pure crop and crop-livestock programmes or the distributive impact of smallholder farmers supplying nutrition programmes.
2. **Transform the lessons-learned studies into programme templates.** This would include models for installing dairy capacity, dairy financing packages, breeding farm modules, milk quality-based pricing systems and dairy plant-management fundamentals. Making these available to regional industry players and assist in adapting the templates to local settings should include grassroots-level exchanges among successful smallholder dairy producers and enterprise managers. This could include a programme to identify one or two successful smallholder-based dairy enterprises in each country and conduct on-site training for two or three participants, covering various aspects of enterprise operations allowing for maximum discussion of comparative methods or approaches. The course can be configured so that every training day starts with actual observation of the process to be studied: quality control at farm and plant to include milk tests, temperature control and clean in-place procedures or milk allocation to various products or deliveries for school milk feeding. Such a programme could stimulate greater systematization among participating processing plants and farms.

Conclusions

Smallholder dairy farmers' enterprises participating in the Philippines' local dairy sector have hurdled the test of enterprise viability. While profit levels are modest, the sustained operations of these enterprises ensure that producers' milk are collected and paid for. Operating on their own resources, paying rent for facilities to the local government and paying farmers regularly for raw milk are the minimum indicators of enterprise viability.

It was not an easy task, considering that the dominant thinking of the Government and business has been that smallholder dairying cannot work. In fact, some individuals still think this way. However, there are enough successful enterprises run by individual smallholder dairy farmers, primary cooperatives and cooperative federations to prove that the broad-based model of clustered producers can take advantage of distinct economies of scale using farm labour and marginal lands. The cost efficiencies will continue to be a subject of closer scrutiny, but the staying power shown by smallholder dairy producers and their enterprises is traced to the single, most powerful incentive: profitability. Many more have not crossed the finish line, but those who have achieved sustainability serve as models for what is possible.

An interesting window of opportunity is the clustering of big and small farm enterprises. In particular, some of the bigger ones are farms that started small and have achieved a bigger scale of operation over time. These collaborative ventures of small and bigger dairy entrepreneurs as well as public-private ventures are accelerating and opening new opportunities for all players.

The entry of NGOs and foundations is also interesting because they provide greater attention to the social preparation of smallholders, which is often overlooked by government-initiated projects that tend to focus on the technical aspects.

Overall, smallholder dairy enterprises in the Philippines can run on their own resources and are realizing comparatively satisfactory returns. There will always be attempts to “fast track” and downplay the role of smallholders, but the history of dairying in the Philippines has produced enough lessons to validate their significance to the local dairy industry.

Box 1: Key definitions

Smallholder dairy farmer: Someone with one to three dairy animals, often not belonging to an organized milk-collection system.

Smallholder milk producer: Someone who may start with one to three dairy animals but with a perspective of growing the herd to 5–20 head. This producer belongs to a village association or primary producers’ cooperative that undertakes the pooling of milk through a collection system. In the field, the distinction between smallholder dairy farmer and smallholder milk producer is negligible.

Formal markets: The dairy federation that operates the processing facility in a dairy zone that usually buys the milk from the primary cooperatives. It also refers to commercial dairy farms that own a farm and processing facility but also buy raw milk from other milk producers. The formal market includes the final consumers of the milk products, including the institutional buyers (supermarkets, hotels, restaurants, coffee shops) and the final consumers.

Informal markets: Milk sellers and buyers in a neighbourhood or village. It includes smallholder dairy farmers and smallholder milk producers who sell some of the farm produce to the local market.

Dairy value chain: The various stages through which milk and milk products pass from farm to the final consumer.

Dairy zone: Consists of 100 farmers with 300 dairy animals located in adjacent villages served by a processing plant located within a 30-km radius of an urban centre and capable of absorbing at least 300–500 litres of milk per day.

Annex I: Description of a Philippine dairy development model

The dairy development model, evolving from the vision presented in the Medium-Term Dairy Development Plan (1989–1993), consists of three main parts: a broad foundation, a basic structure or module, and infrastructure support, as the following explains:

Foundation: Massive backyard dairying

- This component proceeds from the basic inventory of animals as of 1988: 2.788 million carabao, 1.634 million cattle and 2.046 million goats. Laying the foundation for an indigenous, smallholder-based dairy industry requires the milking of all milkable animals on the ground.
- Animal infusion at this level is very minimal and will be left, primarily, to local initiatives that may include projects of NGOs, of the Dairy Authority's local offices, the Philippine Coconut Authority in coconut areas, the Department of Agrarian Reform in agrarian reform areas, etc.
- A proposed National Milk Campaign shall include the promotion of this component.

A structural support could be established through the creation of community livestock management units in *barangays* (smallest administrative unit) with experience in organized activities. Such a unit could handle inventory-taking, planning of breeding schemes, forage improvement, complementary dairying and fattening schemes.

1. The NDA's network of technicians shall be the main agents for promoting the National Milk Campaign. This will entail matching the suitable dairy areas with trained dairy technicians.
2. Dairy farmers' training will be a major activity at this level to include the training of paraveterinarians and community dairy officers as well as training in indigenous feed sourcing, home-based or community-based dairy processing and others.
3. This stage shall be primarily focused on improving rural nutrition. Any marketing activity at this level will be limited to the producers' communities.
4. From this level may emerge potential dairy zones.

Basic structure: Network of dairy modules

- The dairy module shall have four basic components: a dairy market base, a production unit, a collection system and a processing facility.
- Dairy market base. The dairy module, from inception, shall be market oriented. As such, the following elements shall be present at the prospective module site:
 - a city centre and 5–6 contiguous municipalities as target market;
 - an assured market for a daily base volume of 300 litres and the capability to develop a dealer network to absorb 500–700 litres and to supply 200 litres to a dairy facility outside the module;
 - a market for 700 litres daily translates to about 2 800 households in the prospective site, with at least four household members consuming a glass of milk (250 ml) each about twice a week;
 - the market shall be located within a 35-km radius of the processing facility;
 - one insulated delivery vehicle and a telephone are basic requirements of the marketing unit.
- Production unit. The dairy module's production unit shall consist of:
 - a herd of 300 dairy animals owned by 100 dairy farmers;
 - with at least two pregnant animals in each three-cow herd;
 - located in four clusters of 25 members and 75 animals each;
 - each cluster located within two adjacent *barangays*;
 - each cluster accessible to a four-wheeled vehicle;
 - each dairy farmer should supply at least 100 kg of grass per day, which requires access to an aggregate area of 3 000 sq m of grassland each month for cut-and-carry feeding;
 - each farmer should have access to an adequate supply of water to provide at least 111 litres of water each day for three animals.

- The technical support for the dairy module shall include:
 - Breeding services: free semen, AI equipment and services for five years;
 - Animal health services: free veterinary and paraveterinary services, free hemosept and foot-and-mouth vaccines and available drugs for emergencies, to be sold to farmers at cost; technical assistance provided for preparation of silage.
- The dairy module requires the infusion of dairy animals to the unit. However, the dispersal scheme and credit design have yet to be drawn. Some concepts suggested so far are:
 - A government animal loan fund, deposited with the bank; farmers can borrow from that fund; the bank evaluates each applying farmer's qualifications; the bank receives repayment of the loan.
 - A cooperative undertakes the preparation of production module, including preparing the readiness of farmer participants; the cooperative borrows from a bank; the cooperative administers the individual farmer loans; the bank collects from the cooperative; cooperative collects from farmers through deductions from milk sales. (This concept is highly recommended by the dairy committee.)
 - A cooperative production unit is required to have counterpart animals to qualify, say, 100 head (this may be put together from animals on the ground, from small grants or from local projects). The National Dairy Authority provides an equal number of dairy animals; farmers repay with one female yearling, which is dispersed to new dairy farmers. This scheme involves no loan fund and no loan amortization.
- Collection system. The smallholder-based production unit requires a systematic collection system, which should have the following elements:
 - milk tanks identified with every farmer or group of farmers who supply the raw milk;
 - collection station designed for each cluster;
 - testing capability at the collection station, preferably by a cooperative's quality control officer;
 - collection vehicle/s controlled by the cooperative (vehicles may have to be leased from the government initially).

Processing facility. The processing plant is the centre of the module. This will consist of a pasteurizer and homogenizer with a capacity of 200 litres per hour or less (this is the smallest capacity available currently). The plant will also have to be leased from the Government by the cooperative. In addition, assistance in plant operations and product quality control will be needed by the cooperatives. This assistance may be provided by the Government for not more than two years for each dairy unit.

Infrastructure: Support network

Establishment of a cooperative-based industry in dairy requires a support network that corresponds to the structure of the modules. This will include the following:

- The National Dairy Authority which will uphold the industry rationale at all phases of development support.
- Production support will consist of the maintenance of a breeding centre and stock farm to handle animal movement and breed upgrading.
- Processing support will consist of providing a second-level processing of surplus milk, either by setting up facilities for cheese making, UHT processing or spray drying that could eventually be run by more advanced cooperatives or by requiring commercial processors to absorb the excess milk production; this includes product development, which the dairy modules cannot realistically be expected to undertake.
- Further integration would include support for fabrication of cheese pressers, filling machines, churners and other processing equipment and for the development of improved but affordable packaging materials.

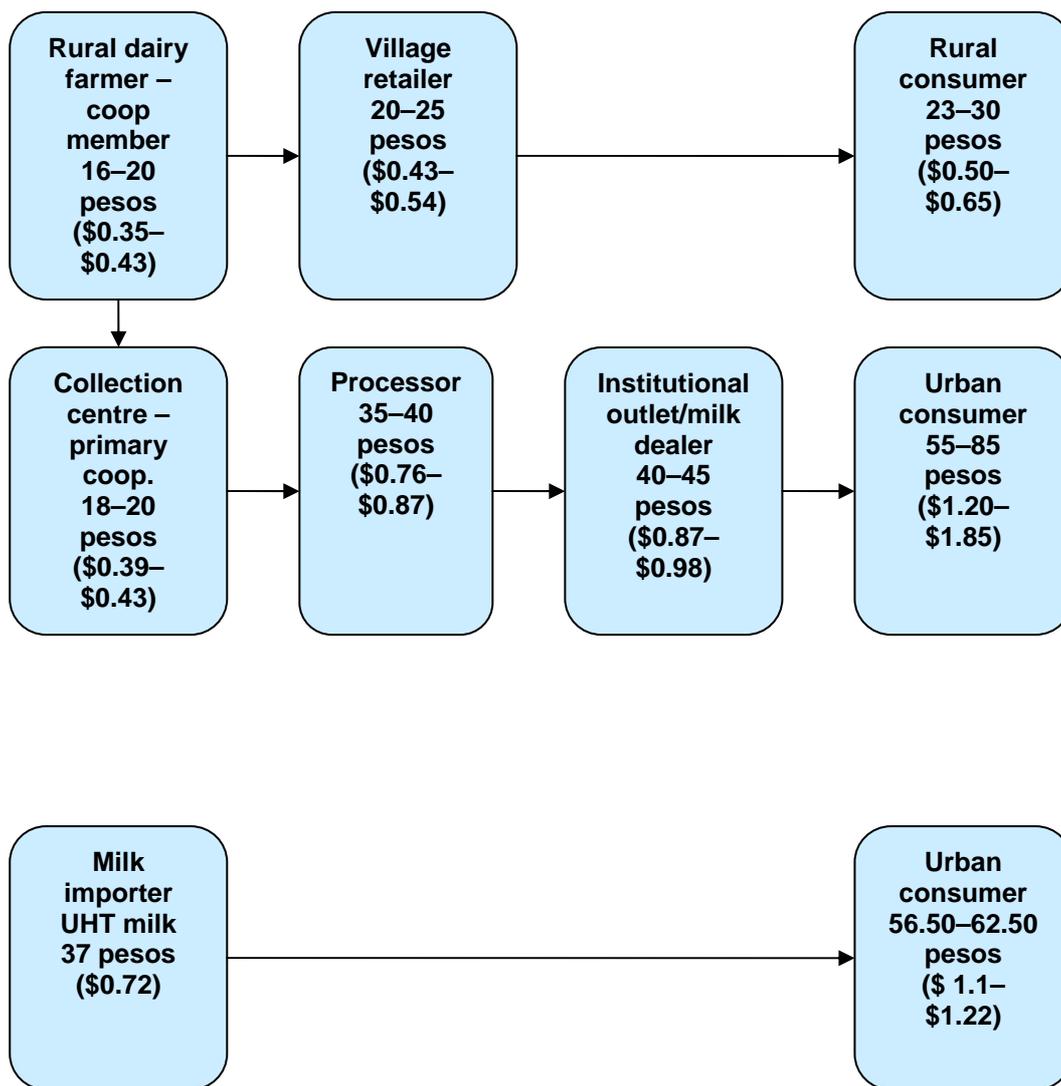
- Market support shall include the identifying of markets to absorb the base volume of 300 litres per dairy unit per day and the brokering for institutional markets for the dairy units.
- Dairy training and research should be anchored on the needs of dairy units, particularly in herd and breed improvement, indigenous feed sourcing, animal care, quality control, product improvement and others. Training should include direct farmer education. Even training in other countries should consider farmer-technician trainees rather than government technicians only.

Annex II: Profile of dairy development zones in the Philippines

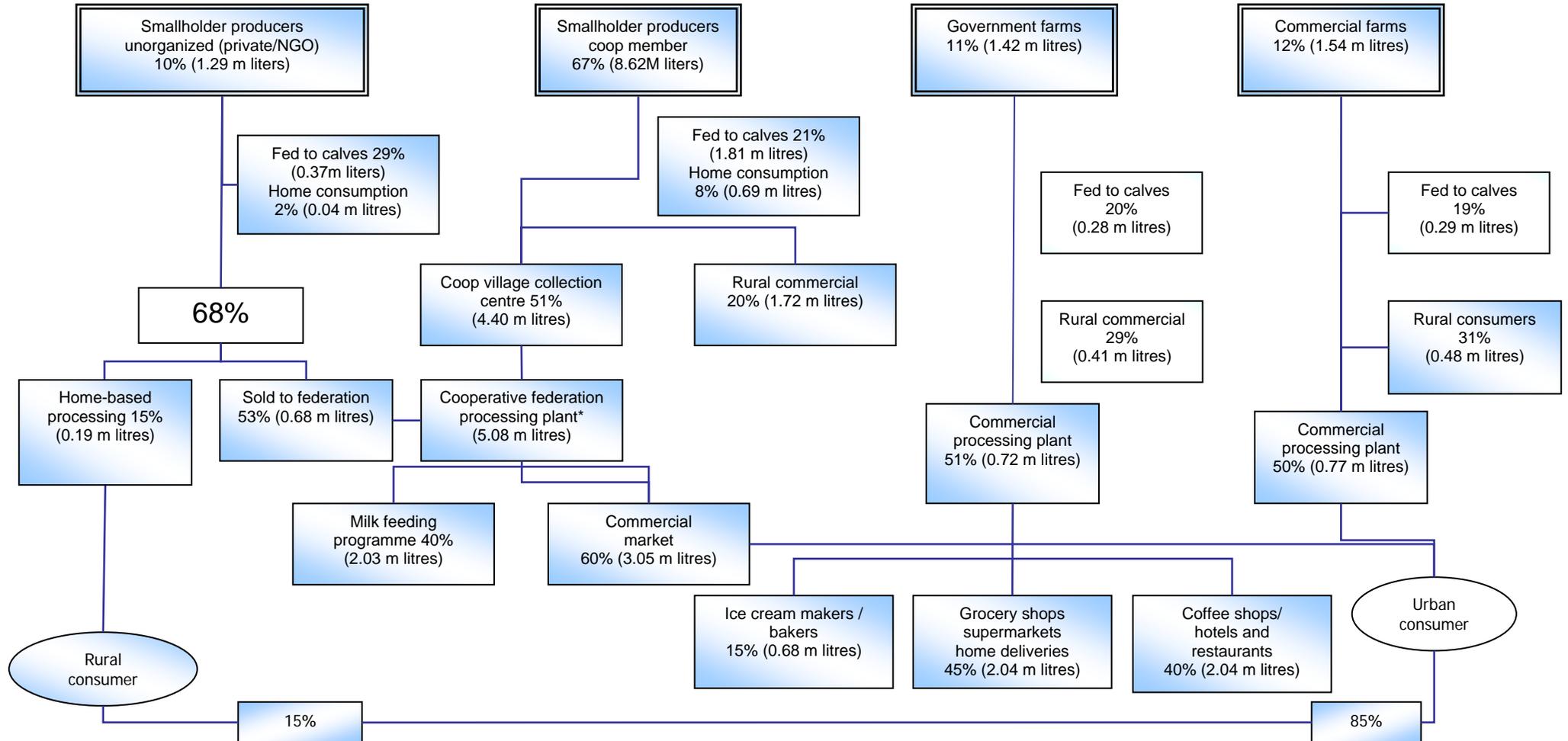
Dairy zones	Dairy animals	Milk production (in '000 litres)		Annual sales (in '000 pesos)		Dairy farmers	Primary coops	Govt & private farms	Children in feeding programs
		2005	2006	2005	2006				
Bulacan	1 379	62.53	1 080.78	11 400	9 891	1 520	8	1	955
Nueva Ecija	498	400.09	667.08	-	-	45	3	-	-
Zambales	274	49.08	67.76	-	-	98	4	-	-
Batangas	726	794.97	870.50	-	-	318	5	4	584
Laguna - Quezon	1 926	1 340.12	1 440.37	22 264	23 620	1 359	10	9	880
Albay	115	51.58	43.20	-	-	162	2	2	550
Camarines Sur	220	33.45	57.10	-	-	41	2	1	-
Sorsogon	75	42.21	19.18	-	-	41	1	1	250
Iloilo	696	149.49	190.41	3 460	3 715	310	10	2	2 762
Negros Occ.	883	443.82	388.02	-	7 602	3 191	21	6	3 433
Cebu	1 036	671.36	567.50	17 314	19 579	1 827	24	2	2 468
Zamboanga Norte	483	150.21	200.95	1 010	3 675	130	2	3	604
Mis Or/Bukidnon	3 412	1 099.46	1 197.10	31 254	17 864	854	14	14	-
Lanao Del Norte	1 863	220.31	475.36	-	-	23	1	2	1 045
Davao Del Sur	1 477	770.40	750.05	12 129	12 783	292	13	2	-

Source: The Bureau of Agriculture Statistics

Annex III: Milk price chart (pesos/litre)



Annex IV: Milk flow chart (12.87m litres)



Note: *Total volume of 5.08 million litres sold to federations are from private farms; 53 percent, or 0.68 million litres, and cooperative–CVCC 51 percent, or 4.4 million litres. The percentages in the given indicators are based on the NDA-assisted /monitored projects (indicative), but the total production of 12.87 million litres is based on national figures.

Annex V: Volume of milk and milk product imports, 2000–2006
('000 million tonnes or million litres, in liquid milk equivalent)

Dairy products	2000	2001	2002	2003	2004	2005	2006
Skim milk powder	869.53	742.65	798.24	849.25	935.77	685.12	750.81
Whole milk powder	413.66	363.51	308.19	329.83	389.14	267.99	307.05
Evaporated milk	2.39	17.85	12.27	16.80	16.27	14.69	19.21
Buttermilk/ buttermilk powder	203.57	163.80	172.13	129.17	134.34	148.43	157.34
Whey powder	223.03	245.33	279.40	293.50	371.99	284.04	341.72
Liquid (RTD) milk)	22.08	38.45	42.25	37.81	43.42	45.71	37.74
Cream	2.54	16.53	15.83	51.91	34.57	9.91	11.16
Condensed	0.19	4.50	17.55	20.96	4.56	3.70	7.11
Others	3.21	4.80	3.07	5.92	8.31	5.13	12.59
Milk and cream	1 740.20	1 597.42	1 648.93	1 735.15	1 938.37	1 464.72	1 644.73
Butter/ butterfat	92.10	60.87	67.79	84.30	93.40	85.50	71.89
Cheese	17.70	23.31	21.92	21.33	27.78	24.34	30.35
Curd	54.26	53.82	46.22	48.86	51.27	30.05	26.35
Milk imports	1 904.26	1 735.42	1 784.86	1 889.64	2 110.82	1 604.61	1 773.32

Source: The Bureau of Agriculture Statistics

Annex VI: A profile of dairy farm types,⁵² as of July 2002

Animal/farm type	Dairy farmers by animal inventory						Total
	1-4	5-10	11-15	16-50	51-100	Over 100	
Cattle	706	250	34	65	11	8	1 074
Single proprietors	124	37	-	10	1	2	174
Corporations	-	-	-	3	2	2	7
Cooperatives	582	202	32	40	5	2	863
Government owned/SCUs	-	8	1	11	3	2	25
Private institutions/NGOs	-	3	1	1	-	-	5
Carabao	3 484	310	24	24	4	9	3 855
Single proprietors	2 536	275	18	7	-	-	2 836
Corporations	-	-	-	-	-	1	1
Cooperatives	948	26	4	8	1	-	987
Government owned/SCUs	-	7	2	9	3	8	29
Private institutions/NGOs	-	2	-	-	-	-	2
Goat	4	4	2	11	3	4	28
Single proprietors	4	4	2	4	3	1	18
Corporations	-	-	-	-	-	2	2
Government owned/SCUs	-	-	-	1	-	1	2
Private institutions/NGOs	-	-	-	6	-	-	6
Total	4 194	564	60	100	18	21	4 957

Source: The Bureau of Agriculture Statistics

⁵² Based on Bureau of Statistics Survey conducted in July 2002. Since the last survey, private farms have increased due to the entry of new players and the natural expansion of smaller farms.

Thailand: An industry shaped by government support

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Background

India immigrants introduced dairy farming to Thailand around 1910. For much of the first half of the century, farming operations remained scattered near the Bangkok urban centre. Milk yields per dairy buffalo or cow were low, at 2–3 kg per day. Commercial operations, including milk processing, became only significant after a royal visit of the King and the Queen of Thailand to Denmark in 1960. Consequently, cooperative regulations were enacted and, with assistance from the Government of Denmark, a dairy farm cooperative project was launched in Saraburi province. The Dutch Government also participated in the effort, providing a grant of 23.5 million baht and a technical supervisor.

The Thai-Danish Dairy Farm was inaugurated and began operating on 17 January 1962 (later designated as National Dairy Cow Day). In 1971, the Thai-Danish Dairy Farm was handed over to the Ministry of Agriculture and Cooperatives (MOAC) and became a state enterprise called the Dairy Promotion Organization of Thailand (DPO). The DPO operated then as now with four objectives: i) train farmers on dairy farming techniques, feed management and diseases of dairy animals; ii) develop and produce cross-breed dairy cows suitable for the Thai environment; iii) produce dairy products from raw milk; and iv) promote greater milk consumption in Thailand.

The Department of Livestock Development (DLD) had also launched many projects to promote dairy farming. These included the establishment, in 1957, of two artificial insemination (AI) centres: one in Huay Kaew, Chiang Mai province, and the other in Potharam district, Ratchaburi province. Breeding stock from pure-bred Holstein-Friesian and Brown Swiss were used for the artificial insemination. The United States Government provided the Brown Swiss dairy sires for the project.

By the end of the 1960s, government support to the sector resulted in over-supply problems. A group of farmers petitioned the King in 1969 for help. In response, a trial milk powder production plant was initiated on the premise of the King's palace (Chitralada Villa, Dusit Palace) in Bangkok. Following that experiment, various authorities were invited for discussions on establishing a milk powder factory at Nongpho Dairy Cooperative in Potharam district, Ratchaburi province (currently not operational). And so began the first dairy cooperative scheme.

In 1970, Parliament member from Ratchaburi province bestowed 50 *rais* (around 8 ha) of land at Nongpho subdistrict, along with 1 million baht, for the construction of a milk powder plant. A project committee was established, with the King providing more than 1 million baht to the project. During construction, the farmer leaders in Nongpho and nearby areas requested help from another Parliament member in securing buyers for their raw milk. Kasetsart University agreed to be the main purchaser. The farmers then organized together and formed the Nongpho Milk Centre in August 1970. They obtained additional funding from a government support budget and from among themselves. Eight months later, 185 members of the Nongpho Milk Center joined together to register as a cooperative under the name Nongpho Ratchaburi Dairy Cooperative Ltd (under His Majesty's Patronage). Currently, the Nongpho Cooperative is the biggest dairy cooperative in the country, receiving about 200 tonnes of raw milk per day from 4 569 member farmers. The cooperative can produce pasteurized and UHT milk and supply products countrywide. It has production capacity to handle the amount of raw milk produced by the farmers in Nongpho and nearby areas.

Periodically during the 1960s and the 1980s, the quantity of locally produced raw milk was low and government policies looked to promote dairy husbandry. The National Milk Drinking Campaign Board (NMDCB) was established in 1985. The NMDCB's efforts successfully boosted milk consumption and dairy husbandry. In 1987, dairy farms began to boom in many provinces, such as Srakaew, Petchaburi, Prachuab-

Kirikan, Pattalung, Udonthani, Khon Kaen and Mahasarakam. A number of dairy cooperatives followed, set up as milk collecting centres to deliver raw milk to the processors. These successes contributed to socio-economic improvements in the rural areas, bringing dairy farmers a regular income and reducing the migration of workers to cities.

Dairy promotion in Thailand runs parallel with the establishment of dairy cooperatives (since 1971 with the registration of the first one). Currently (end 2007), there are 97 cooperatives. Six cooperatives recently shut down because they were too small and had a very low capacity to manage their raw milk. Sixteen cooperatives have their own processing plant; the biggest is the Nongpho Ratchaburi Dairy Cooperative.

The FAO implemented a two-year training programme for the small-scale dairy sector, from September 2002 to October 2004, in cooperation with the Department of Livestock Development. The project's objectives were to develop short training courses for dairy farmers and milk-processing personnel. The courses, organized at the Dairy Training Centre in Chiang Mai province, focused on milk collection techniques, milk processing, marketing and quality control.

The training project addressed a lingering problem with milk quality among dairy farmers. At that time, consumers in the rural communities lacked trust in the quality of locally produced milk. Hygienic milk processing needs modern machines and other equipment that are too costly for small-scale processing units or cooperatives. Aware of these constraints, the FAO project looked to provide appropriate technology for small-scale producers with which they could produce safe and hygienic milk products with low investment. The small-scale processing units would then become the primary providers of safe milk to consumers in the rural communities.

The Bann Patung Huaymor Cooperative was selected to be the pilot site. The cooperative now produces ice cream and drinking yoghurt – in response to the diverse demand of consumers. The milk products are well accepted in terms of price and quality. The Dairy Training Centre continues offering three training courses per year, accommodating 20 participants per course. And the DLD continues to provide technical support on milk hygiene and other quality issues.

Milk powder and cheese imports have increased significantly over the past decade, both in terms of quantity and value, and continue to be a huge drain on foreign exchange (Annex III). Milk powder imports are governed by the recent Free Trade Agreements (FTAs) with Australia (January 2005) and New Zealand (July 2005). These are described in more detail in Annex III. Milk powder imports declined in volume substantially in 2007, but values were much higher, reflecting both the shortages and higher global prices.

Due to relatively high producer prices (US\$.50 per kg) in the past, it has not been economical to produce milk powder in Thailand. However, the economics are now changing due to the higher price of imported milk powder (currently equal to \$.50–\$.60 per kg of milk equivalent) and Thailand may reconsider the possibility of investing in milk powder production infrastructure, notwithstanding the current FTAs.

More recent programmes supporting dairy development

Between 1994 and 1996, the Thai Government implemented two projects to promote milk production. The projects aimed to help rice farmers as well as cassava farmers who faced low farmgate price problems by switching their crops to grass for cows. The following describes the seven primary activities of the recent support for dairy development:

- 1. Successful dairy farms were selected to be demonstration farms under a Government dairy promotion programme.** Mobile training units were set up to provide information on technology and techniques, such as artificial insemination, disease control and feed management. The projects succeeded, again to a problematic level – dairy husbandry began to boom in various parts of Ratchaburi and Nakorn Pathom provinces, resulting in another period of over-production of raw fresh milk. Most of the dairy farmers were smallholders, owning three to five cows. Under the programme (1994–1996), farmers received five pregnant cows. These farmers then formed milk-collecting cooperatives or centres and delivered milk to

processing plants. To construct a collection centre, they took a loan from the Bank of Agricultural and Agricultural Cooperatives.

The dairy cooperatives provide members with training, technical advice on artificial insemination, dairy farming tools and equipment. Some cooperatives have started other operations as well, such as a feed mill to supply low-price feed to members. The Department of Livestock Development (DLD), the Cooperatives Promotion Department (CPD) and the Dairy Promotion Organization of Thailand (DPO), along with private companies in the milk processing industry, also assist in milk production technology, farm management and milk processing facilities; for example, Nestlé Thailand supported its raw milk suppliers and cooperatives to produce raw milk free from antibiotic and antimicrobial drugs.

The improvement of feeds, roughage and concentrates as well as farm management and health care have played important roles in developing the Thai dairy sector, improving the milk yield from 6–7 kg per cow per day in 1992 to 10–15 kg per day in 2006. Meanwhile, the average dairy herd per farm expanded to 18–22 animals, including milking cows heifers and calves (smallholder = fewer than 10 cows, medium scale = 11–20 cows and the large own more than 20 cows).

2. The introduction of Holstein-Friesian cross-breeds, which are well adapted to local conditions, also helped develop the dairy sector through the **continued government support for dairy breeding programmes**. Thai Holstein breed development was initiated in 1969 under a Thai-Netherlands Project, with AI recording, milk recording, progeny testing and semen production established at the Pathum Thani AI Research Centre, which was set up by the DLD and the Bureau of Biotechnology in Livestock Production (BBLP). The project was designed to develop a 75 percent Holstein-Friesian dairy cross-bred population through selection and breeding in the open herd system (under field conditions).

As farmers gained experience, the breeding plan shifted from 75 percent Holstein-Friesian to 87.5 percent Holstein-Friesian crosses. The increase sought to exploit more additive genes for milk production from the Holstein-Friesian, using more advanced technology of quantitative genetics through a sire evaluation system. A genetic evaluation is routinely conducted annually now. Sire summary is released every year in September and distributed to the involved organizations, such as AI units, AI research centres and dairy cooperatives.

Thai milking Zebu and Thai Friesian were also developed and tested by the DLD's Animal Breeding Division under favourable conditions on government farms. The Thai milking Zebu are a cross-bred between the Holstein-Friesian and Zebu cattle, particularly American Brahman. The Thai milking Zebu development aimed to maintain the Holstein-Friesian blood at 75 percent. The Thai Friesian is an upgraded breed, with more than 87.5 percent Holstein-Friesian blood. . Both the Thai milking Zebu and the Thai Friesian projects remain ongoing.

3. The **Government's Milk Board**⁵³ **began sets the pricing policy** for milk. Other responsibilities include administration of the pricing policy, managing the country's school milk programme and importing milk powder for the school milk programme. The President of the Milk Board is the Permanent Secretary of Agriculture and Cooperatives Ministry and the Director of the DPO is its Secretary.

4. Interlinked with the NMDCB's efforts to promote milk drinking for health, Thailand's Seventh National Economic and Social Development Plan (1992–1996), which targeted malnutrition in children among many issues, sought to encourage milk drinking among school children. In 1992, the Government allocated 278.6 million baht to the Ministry of Education for a **school milk programme** to provide milk for pre-primary school children and later extended it to primary school children. Currently, some 7 million baht is budgeted to provide milk to more than 6 million school children over the course of 230 days in a year.

⁵³ Members of the Milk Board represent officials from the Ministries of Commerce, Interior, Industry, Education, Public Health, Agriculture and Cooperatives. In addition, there are representatives from the Dairy Cooperatives Federation of Thailand, the Thai Holstein-Friesian Association, the Skimmed Milk Powder Processing Association, the Thai Dairy Industry Association and the Pasteurized Milk Producers Association.

The importance of the school milk programme is two-fold. First, it is creating a milk-consumption habit among a younger Thai generation – the school milk programme has played an important role in the increase of per capita dairy consumption in Thailand over the past decade. Second, processors supplying the school milk programme are only allowed to use local raw milk to produce pasteurized and UHT milk. Thus, the programme is an essential outlet for local raw milk, absorbing a volume of 275 000 tonnes per year, or more than 30 percent of local milk production, according to official government figures.

The milk that children drink at school is largely from local milk – not recombined skimmed milk powder. Thus, the school milk programme is the largest consumer of local milk, buying about one-third of the local production. The government policy emphasizes daily milk consumption among school children up to age 14 years to promote good health and decrease malnutrition.

In 1992, the Government provided its first allocation for the school milk programme, with two primary goals:

- school children to drink 200 cc milk per day (for 200–230 school days in a year);
- the growth rate for these targeted children should exceed 80 percent.

In 1993, the Government increased the school milk budget to 4 million baht and thereafter the budget was increased to cover all pre-primary and primary school children. Each child receives at least 200 ml of milk per day throughout their school days (200 days in one academic year). In 2008, the annual budget of 7 000 million baht (\$205 million) was allocated to cover 6 million school children. The distribution of milk for school children is now under the jurisdiction of local administrations throughout the country. The Provincial Administrative Organization and Community Development, under the Ministry of the Interior, and the Office of the Basic Education Commission, under the Ministry of Education, oversee the programme. The milk is distributed in pasteurized sachets for most schools and in UHT packages in remote areas.

The Government sets the school milk price and provides 5 baht per student per day. Currently, the school milk is produced by:

- large cooperatives: 157 tonnes per day (13.08 percent);
- small cooperatives: 105 tonnes per day (8.75 percent);
- private dairy factories: 938 tonnes per day (78.17 percent).

5. During its dairy promotion programme (1994–1996), the Thai Government worked with financial institutions to make **loans and credit available to producers** for farming inputs, such as housing and buying milking cows. The programme offered capital of 200 000–250 000 baht (\$5,000–\$6,500) to a farmer willing to raise five cows. The farmer received the loan from the Bank of Agricultural and Agricultural Cooperatives at a 5 percent interest rate. Between 1994 and 1996, some 3 873 farmers received loans to purchase 19 365 cows. The Cooperative Development Fund currently offers loans to dairy cooperatives for development and business expansion.

6. The Department of Livestock Development, the Cooperatives Promotion Department and the Dairy Promotion Organization of Thailand and other educational institutes have remained the primary agencies concerned with **dairy research and development** (R&D), primarily in the following areas:

- breeding development (to study and select cross-breed animals that produce good milk and are well adapted to local conditions);
- artificial insemination;
- animal feeding;
- animal health management;
- cooperative management;
- farm management;
- dairy processing technology.

7. In addition, many agencies and organizations are involved in development of the dairy industry:

- Dairy Cooperatives Federation of Thailand Ltd, an organization that coordinates dairy cooperatives and their members as well as promoting cooperation among cooperatives;
- Thai Holstein-Friesian Association, which provides information on Holstein-Friesian varieties to dairy farmers;
- Skimmed Milk Powder Processing Association, which was established by private sector companies to promote cooperation among skimmed milk dairy processors;
- Thai Dairy Industry Association, which was established by private dairy companies that use milk powder in their dairy products;
- Pasteurized Milk Producer Association, which was established by local milk producers who use locally produced milk for processing pasteurized milk;
- Thai Dairy Board, established by the Thai Government for issuing policies and coordinating all government dairy committees and private associations.

The current dairy situation

The total amount of raw milk production in 2007 was 770 000 tonnes. About 95–97 percent of this production was processed for drinking milk. The remaining 3–5 percent was processed for cheese. Thailand also imports other milk products, especially milk powder, which in 2006 was valued at 7.961 million baht (\$230 million) for a volume of 95 053 tonnes (2.426 million baht for whole milk powder and 5.535 baht for skimmed milk powder). Thailand also exports milk products, such as sweetened condensed milk, sterilized drinking milk and evaporated milk, to Cambodia, Indonesia, Philippines, Malaysia, Myanmar and other neighbouring countries.

In 2007, there was a total dairy cow population of 297 135. This is a decline from 310 085 cows and 888 220 tonnes of milk in 2005. There are currently 91 dairy cooperatives. The decline over the two-year period (at a rate of 2.1 percent per year of cows and 6.8 percent per year in milk production) has mostly affected smallholder farms. The decline began with the rising price of gasoline, at more than 100 percent over the past three years, which directly and indirectly increased the costs of production by affecting the price of feed, labour and operation costs. Directly, farmers who do not grow forage crop but harvest grass from public places or collect agricultural by-products, such as corn stover, sugarcane tops and straw for dairy feeding, are experiencing higher transportation costs. Likewise, the transportation costs for delivering raw milk from farms to cooperatives and/or to milk processing factories have increased. The increases have affected the profit margins for both the smallholder farmers and the small dairy cooperatives.

The decrease in animal numbers and production may also be linked to an agreement that Thailand signed in 1983 in a World Trade Organization scheme requiring local producers of ready-to-drink milk to use at least 50 percent of local raw milk. The policy helped promote dairy farming in Thailand and boosted farmers' revenues. But the regulation was lifted in 2004 because milk processors were using more imported powder milk, which was cheaper than the raw milk locally produced.

As a result, some farmers have been unable to remain in dairy farming. Although there are many dairy farms scattered around the country, most farms are located in provinces of the central, northeastern and northern regions (Lopburi, Saraburi, Ratchaburi, Nakorn Pathom, Srakaew, Nakorn Ratchasima and Chiang Mai). To respond to the changing profitability of dairy farming, in 2008 the Dairy Cooperatives Federation of Thailand requested the Milk Board (within the Ministry of Agriculture and Cooperatives) to raise the raw milk price (at the processing plant) from 12.50 baht to 14.50 baht per kg (\$.37 to \$.43) in recognition of the rising costs of production. In April 2007, the Milk Board increased the price to 13.75 baht per kg. Five months later, it issued a second adjustment, raising the fixed price to 14.50 baht per kg.

Prospects

Over the past 20 years, the Thai dairy sector has been supported and promoted by the Thai Government. As a result, dairy farms have been well dispersed into rural areas around the country. However, the increased

gasoline prices of over 100 percent during the past three years have forced some smallholder dairy farmers and cooperatives to either scale down or close operations altogether.

Mainly, farmers and cooperatives sell their products to the big processing plants located in the central region, such as CP-Meiji, Foremost, Thai Dairy Industry, Nestlé and DPO. In the North and the South, there are only small-scale plants with a low capacity for processing. Milk products from these areas have to be transported to distant plants, with a higher cost of transportation and risk of spoiling the milk. In addition, the cost of milk production is increasing dramatically because of the higher labour and feed costs.

It is necessary to support the dairy industry by increasing production efficiency at the farm and cooperative levels and by encouraging R&D for new milk products – supporting processing technology as well as research in the marketing of dairy products.

The following strategies are recommended for further developing the dairy sector in Thailand:

- increase the production potential at the farm and cooperative levels;
- develop simple but efficient methods and formats for farmers to compile and record information on their farm activities and promote the advantages of good record-keeping to encourage farmers; the farm records are essential for farmers to analyse the costs of their inputs versus expenditures, which is an important element to improve farm efficiency;
- research the breeding line of dairy cows (to find those best adapted to local conditions and yet still produce high yields);
- research the optimal size of farm (land area and number of animals) to maximize farmers' resources;
- strengthen the cooperatives; most of the small dairy cooperatives scope their activity in collecting milk from the members, quality control and delivering raw milk to the processing plant. Some cooperatives have their own plants (currently there are 16), but they process only drinking milk. These cooperatives have experienced occasional “market fluctuations”, such as surpluses or inadequate supplies of raw milk. Marketing is another problem that challenges cooperatives. Dairy cooperative managers need to be trained on how to develop proper plans to reduce risks, with a focus on processing for local markets and using low-cost technology. They should also encourage local consumers to drink more milk that is locally produced and thus lower priced than from the big producers;
- develop innovative dairy products and marketing; product technologies for processing various dairy products are mainly “imported” or introduced from abroad and are expensive or require expensive equipment. The Government and relevant dairy agencies and organizations should strongly promote R&D on cheaper technologies (using simple and cheaper equipment) for dairy products for both the domestic and export markets;
- research and develop “local lines or strains” of culture for many products, such as yoghurt and cheese, that need a “starter culture”, which have to be imported and thus are expensive;
- strengthen training centres for dairy production technology and processing to be fully functional and able to conduct R&D on product technology, marketing and training in all aspects related to dairy;
- introduce mobile units to assess farm efficiency from the farm records and thus further improve and support production;
- research and develop simpler and cheaper dairy processing equipment for small-scale plants.

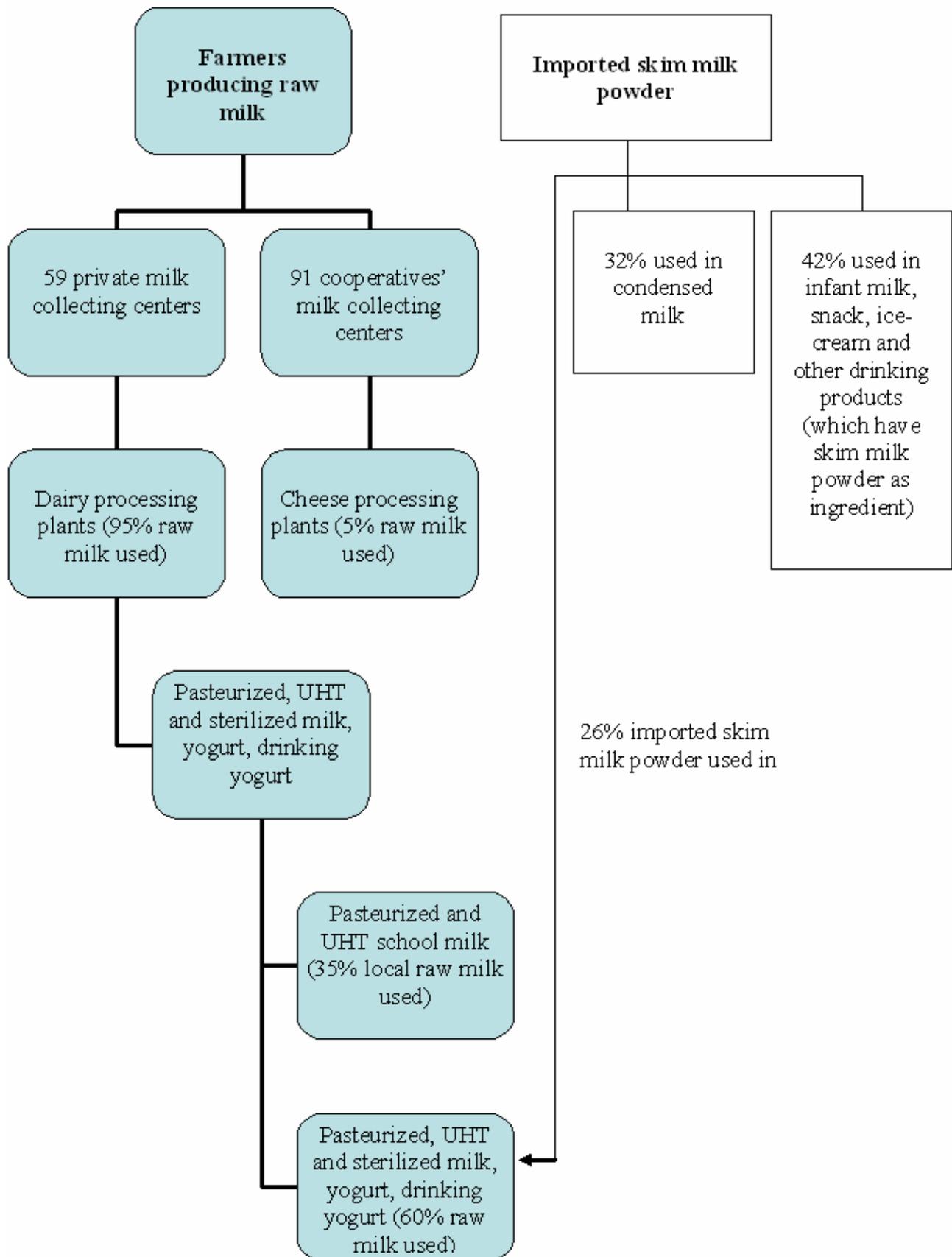
Table 1: Number of dairy cattle and raw milk yields, 1992–2007

Year	Cows in milk (head)	Dairy cows (head)	Raw milk (tonnes)
1992	121 279	222 499	227 784
1993	121 190	237 188	293 255
1994	139 425	265 776	326 381
1995	167 187	287 247	350 196
1996	162 706	276 345	380 622
1997	171 238	288 240	385 477
1998	179 366	335 689	437 116
1999	186 366	349 319	464 514
2000	194 003	361 632	520 115
2001	199 417	373 567	587 700
2002	207 444	386 645	660 297
2003	265 827	441 487	731 923
2004	296 472	492 856	842 611
2005	310 085	517 995	888 220
2006	299 473	501 464	775 976
2007*	297 135	500 335	770 000

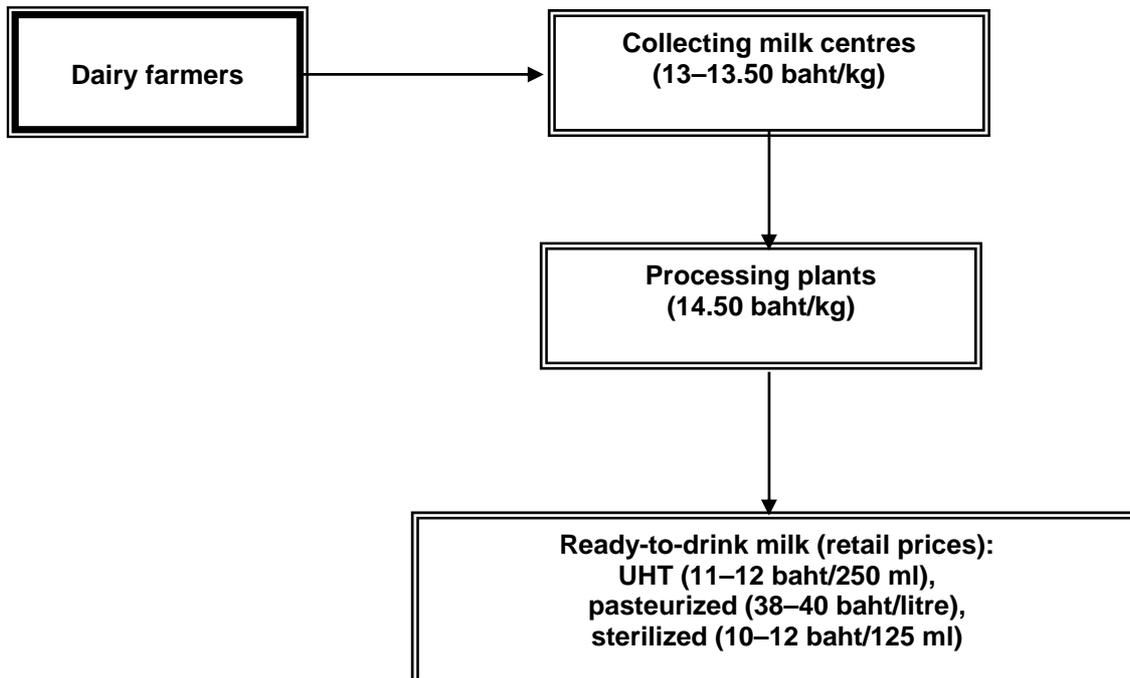
Source: Department of Livestock Development (1992–1997) and the Office of Agricultural Economics (1998–2007)

Note: * is the 2007 forecast

Annex 1: Volumes of local raw milk and imported skim milk powder used in Thai dairy products.



Annex II: Milk price chart



Annex III: Imported dairy products (volumes and values) during 1998-2007

Years	SMP		WMP		Cheese	
	Volume	Value	Volume	Value	Volume	Value
	(tonnes)	(million baht)	(tonnes)	(million baht)	(tonnes)	(million baht)
1998	53 041	4 073.96	34 775	3 823.96	1 313	176.73
1999	56 036	3 313.96	31 984.25	2 953.40	1 370.52	166.32
2000	53 024	3 661.54	34 495.24	2 750.59	1 666.38	181.79
2001	58 823	5 824.16	28 028.52	2 592.30	2 542.78	311.22
2002	76 466	4 928.54	31 605.76	2 294.81	2 385.44	288.24
2003	73 657	5 038.79	31 595.13	2 301.27	2 928.70	348.01
2004	68 020	5 445.34	32 142.13	2 618.95	3 174.26	421.20
2005	69 671	6 380.42	29 116.40	2 540.16	2 876.21	436.55
2006	66 835	5 535.03	28 319.76	2 433.94	3 909.80	560.26
2007	56 940	7 458.66	22 616.89	2 197.43	4 846	699

Annex IV: Dairy free trade agreements and MOAC offsetting measures

1. World Trade Organization

Thailand has to comply with an agreement on trade of agricultural products under the Uruguay Round of WTO trade talks. In that agreement, the ratio on raw domestic dairy product(s) to imported dairy product(s) is applicable. In the case of skimmed milk powder, Thailand is committed to open its market and allow imports of skimmed milk as per the following volumes and tariffs (1995–2004):

Year	Skimmed milk powder		
	Volume (tonnes)	Tariff (%) Within quota	Tariff (%) Outside quota
1995	45,000.00	20	237.6
1996	46,111.11	20	235.5
1997	47,222.22	20	232.8
1998	48,333.33	20	230.4
1999	49,444.44	20	228.0
2000	50,555.55	20	225.6
2001	51,666.67	20	223.2
2002	52,577.78	20	220.8
2003	53,888.89	20	218.4
2004	55,000.00	20	216.0

Source: Department of International Trade

There has been no progress made on the WTO agreement on trade of agricultural products since 2005; thus, the figures remain unchanged since 2004.

2. TAFTA – Thai-Australian FTA

Entered into force on 1 January 2005, this agreement allows a 4 percent quota on the binding quota to the WTO agreement. In 2004, it was 2 200 tonnes, which will increase to 3 523.55 tonnes in 2024, with the initial tariff (in 2004) not exceeding 20 percent in 2005. This tariff will be reduced at 1 percent per annum until it reaches 0 percent in 2025; thereafter, no measurement on the import quota is applicable.

3. TNZCEP – Thai-New Zealand Closer Economic Partnership

Entered into force on 1 July 2005, this agreement states that there will be no additional quota within 20 years – until the free trade on skimmed milk is applicable in 2025.

4. Measures undertaken/to be undertaken

The Thai Ministry of Agriculture and Cooperatives (MOAC) raised funds for the diversification of agricultural production in 2004 to: i) diversify agricultural production and agricultural products, ii) strengthen production capacity, iii) raise quality of agricultural products, iii) enhance processing of products and iv) promote the expanded processing of value-added products.

So far, this fund has allocated budgets for two projects, as the follows:

- Project to lower production costs and improve dairy raising capability and efficiency. The budget of 43 764 000 baht was allotted for a six-year project (starting in 2008).
- Project to improve production capability and efficiency and to expand markets for dairy cattle and dairy products. A budget of 12 560 000 baht for a three-year project was allocated (starting in 2008).

Annex IV: SWOT analysis of the dairy sector

Strengths	How to build on them
<p>Dairy farmers earn from selling their milk year around.</p> <p>Agricultural by-products and wastes, such as sugarcane tops, paddy straws, pineapple peel, corn stover, etc., are available as feed for dairy cattle.</p> <p>There are suitable dairy cattle breeds for hot and humid environment in Thailand.</p> <p>Modern dairy technologies are well adapted in Thailand.</p>	<p>Research on the optimum farm size under the limited land, labour, feed resources, etc. (environmentally friendly dairy farms).</p> <p>The nutritional value of straw needs to be improved: Under small farm conditions during the dry summer season, cows lack both quality and quantity of roughage; the crop by-products, mainly paddy straw, do not provide sufficient nutritional needs.</p> <p>Research should be expanded to include the improvement of animal management and housing systems in hot and humid environment.</p> <p>R&D on new dairy products from raw milk should be strengthened to create more value-added dairy products.</p>
Weaknesses	How to correct them
<p>The main product from raw milk is drinking milk and there is a lack of R&D on new dairy products.</p> <p>The weak farmer institutions, such as cooperatives, farmer groups or associations, weaken delivery of services and technology transfer to their members or smallholder farmers.</p> <p>Local raw milk prices are not competitive with other imported dairy products.</p>	<p>R&D on new dairy products is needed, plus marketing research to meet cultural and traditional needs of Thai consumers.</p> <p>The farmer institutions need strong support from the Government (attention and supportive policies on R&D to promote the use of local resources and technologies).</p> <p>In developed countries, especially in the European Union and the United States, domestic and export subsidies are given directly or indirectly to dairy farmers. The Thai Government and other developing country governments need to raise this issue at the World Trade Organization forum.</p>
Opportunities	How to pursue them
<p>Milk consumption in Asia is on a rising trend due to the rapidly expanding populations. Hence, there is good opportunity for Thai enterprises to export their dairy products.</p> <p>Thailand has established cross-breed dairy cows that are suitable for hot and humid environment.</p> <p>The Thai Government, recognizing the existing rural malnutrition in children, launched a unique school milk programme to promote milk drinking among school children and thus improve the health and welfare of the young generation.</p>	<p>Promotion of R&D on new dairy products.</p> <p>Good planning and management on animal health and product hygiene to secure quality of Thai dairy products (for both domestic and export markets).</p> <p>Continue to promote milk drinking campaigns and educate people on the nutritional value of milk (and other dairy products).</p>
Threats	How to avert them
<p>Free-trade agreements between Thailand and Australia as well as New Zealand opened up markets for milk imports (mainly for cheap milk powder) that, since 2004, have threatened local dairy farms and industries.</p> <p>Per capita milk drinking of Thai people is still low (Thais are not milk drinkers by habit).</p>	<p>Pursue negotiations at national and international fora on the unfair agreements and subsidies on milk products in developed countries</p> <p>Promote milk-drinking campaigns to educate people on the nutritional value of milk (and milk products).</p>

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Viet Nam: The emergence of a rapidly growing industry

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Background

There is no historical tradition in Viet Nam for the production or consumption of dairy products. For centuries, cattle were used for draught power, manure and meat production. Colonials brought the first dairy cows to Viet Nam at the end of the eighteenth century, with scattered imports of animals from various sources (Australia, China, Cuba, France and the United States). After the wars and during the nationalization and collectivization period, there emerged large state-owned dairy farms, mainly in the North and central region.

The Doi Moi (economic reform) in 1986 initiated a new era of dairying in Viet Nam, with the privatization of the production (smallholder private farms) and marketing sector (emergence of the informal sector as well as the private and semi-private formal sector), accelerating a rapid development. The current dairy development in the country is rooted in the National Dairy Development Plan (NDDP) and reinforced by Government Decision No.167, with provincial authorities providing follow-up support.

Decision No.167 (October 2001) is a policy to develop milch cow husbandry to a production target of 350 000 tonnes of fresh milk by 2010, or about 40 percent of domestic demand, to reduce the dependence on the world milk market but also to save foreign exchange.

Through the NDDP, the total dairy cattle herd population increased from only 35 000 head in 2000 to 113 200 head in 2006 and some 19 800 dairy farms, with an average of 5.3 head per household (Ministry of Agriculture and Rural Development, 2007).

National milk production has been significantly growing as a result, from 12 000 tonnes in 1990 to 215 900 tonnes in 2006, with annual milk gains variable. The largest jump in production was in 2002, with output rising over 60 percent, attributed to gains in both dairy cow numbers and productivity. High demand for fresh dairy products, particularly in Viet Nam's big cities, drives production. In 2005, per capita fresh milk production reached 9 kg, a 29 percent increase over the year before, though it is still low in comparison with other countries in the region (FAO, 2006).

By region, the average number of dairy cows per household is 3.7 in the North, 6.3 in the South and 3.6 in the central area. Each region has one zone, set up by provincial governments with provisional support for initial phases of development, for concentrated industrial farms (with 1 000–2 000 head), such as Tuyen Quang in the North, Thanh Hoa in the Central area and Ho Chi Minh City in the South. There are two main dairy production systems in Viet Nam:

- Private production, which includes small- and medium-scale producers who are mostly private farms, private domestic or joint venture companies. This system generates 95 percent of the total milk production in the country.
- State-owned farms/stations generating the remaining 5 percent of the total milk production in the country.

Despite recent achievements, milk production remains significantly below consumption – domestic dairies met only about 22 percent of domestic demand in 2005. Imports of dairy products, mainly in the form of skim and whole milk powder, currently supply 80–85 percent of the domestic demand. In 2005, Viet Nam's dairy product imports increased to more than US\$300 million and further accelerated in 2006, with imports of \$168 million only in the first six months.

Viet Nam imports dairy products from various countries, including Australia, the Republic of Korea, the Netherlands and the US. The import volume from the US for milk and milk products has increased sharply, from 5 516 tonnes in 2001 to 39 934 tonnes in 2005, and continued to rise into 2006. Viet Nam's dairy product import growth is forecasted to continue in line with increasing living standards, especially in big cities. However, demand still exceeds domestic production capacity.

In Viet Nam, dairy companies play a dominant role in the dairy sector, focusing primarily on milk procurement. Currently, approximately 20 companies collect and process milk and dairy products, of which the three most relevant companies are VINAMILK, Dutch Lady and Nestlé. According to the Ministry of Agriculture and Rural Development (MARD), VINAMILK collects more than 60 percent of milk production, Dutch Lady takes 18 percent, Nestlé and the other 17 companies gather the remaining 22 percent.

Trade policy in the context of WTO integration

Viet Nam protects its indigenous dairy industry with tariffs on imports of dairy products and duty quotas. According to an early International Research Centre study on the Vietnamese level of trade protection, the dairy sector enjoyed "considerable benefits from governmental interventions" with a nominal rate of protection calculated at 22.6 percent and an effective rate of protection⁵⁴ at 36.6 percent (Sullivan, 2002).

During the negotiations for Viet Nam's membership into the World Trade Organization (WTO) and its ensuing accession in early 2007, there was considerable pressure on the Government to reduce its current import tariffs on dairy products. These tariff pressures were preceded by ASEAN Free Trade Area (AFTA) tariff negotiations and reductions, which were agreed upon in 2005.

The main area of concern was linked to import tariffs on skim milk powder and whole milk powder. Tariff levels on other dairy products were also important, such as UHT milk and butter oil, which were products that could be produced in Viet Nam. But a lowering of the import tariffs potentially jeopardizes the ambitious plan of the Government to substitute imported dairy products with locally produced raw material. There is, therefore, a tangible risk that the Government's plans to expand the dairy sector will not be fulfilled if the tariff rate falls below its existing level.

Exporting countries to Viet Nam are grouped into two categories:

1. 1) WTO members with whom Viet Nam applies the most favoured nation (MFN) tariffs, with tariffs on manufactured dairy products currently that 30 percent, while tariffs on raw material and pre-manufactured products (among others, skim and whole powder) currently at 10–15 percent, depending on the kind of product and on its fat and sugar content.
2. 2) AFTA members, for whom common effective preferential tariffs (CEPT) apply. In 2005, the CEPT tariffs for dry skim and whole milk powder were subjected to a 10 percent tariff and were reduced to 5 percent for both categories by 2006. CEPT tariffs also depend on the kind of product imported and on its fat and sugar content.

Recent trends and expected future developments in the dairy sector

High growth rates slow in recent years

The average milk production growth between 2000 and 2006 was 27.2 percent, with the growth peak in 2003 at 61.6 percent (Table 1) The quality of the dairy cattle also has increased, depicted by milk production figures, which reveal a higher growth rate than that of dairy cattle numbers. However, since 2003, the pace of growth has been slowing down, reflecting several problems in the dairy sector, as discussed later in this case study.

⁵⁴ The nominal rate of protection and the effective rate of protection are usually employed to measure the protection awarded to local industries.

Table 1: Dairy cattle and milk production, 2000–2006

Product	2000	2001	2002	2003	2004	2005	2006
Dairy cattle (million head)	35	41	55	79	95	104	113
Growth rate (%)		17.14	34.15	43.64	20.25	9.47	8.72
Milk production ('000 tonnes)	51.4	64.7	78.4	126.7	151.3	197.7	215.9
Growth rate (%)		25.88	21.17	61.61	19.42	30.67	9.21

Source: MARD, 2007.

Strong support from government and local authorities

Strong government commitment to the development of the dairy sector has greatly contributed to a rapid expansion of dairy activities throughout the country. The NDDP aims to: i) replace imports, ii) generate rural employment and iii) increase rural incomes.

In 2005, the Ministry of Industry issued Government Decision No. 22 on “approving the master plan on development of the milk industry in Viet Nam till 2010 and planning to 2020”. It targets an increase of indigenous milk production to meet per capita consumption of 10 kg in 2010 and 20 kg in 2020, with a self-sufficiency proportion of 40 percent by 2010 (300 000 million tonnes).

Provincial governments also have generated dairy development policies that include provisions such as:⁵⁵ free or subsidized artificial insemination and vaccine services;

- compensation of 200 000 dong per male calf born (in the first three years of a provincial dairy project);
- subsidy (2–3 million dong) for the purchase of Laisind cows for artificial insemination with the dairy breed;
- subsidy (5–7 million dong) for the purchase of exotic dairy cows;
- interest-free (1–3 years) bank loan for the purchase of dairy cows;
- support for costs for cow shed improvements;
- support for grass production costs;
- support for milk collection and transportation.

In addition, some provinces have:

- exempted taxes on agricultural land;
- prioritized land availability for fodder production.

Milk productivity is increasing steadily with an appropriate breed strategy

From 2000 to 2006, the average milk productivity of cross-bred Holstein-Friesian (HF) cattle increased from 3.8 tonnes to 4.7 tonnes (in a 305-day period; MARD, 2007). This productivity is comparatively higher than that of other countries in the region (China at 3.4 tonnes, Thailand at 3.2 tonnes, Indonesia at 3.1 tonnes).

The increase of Holstein-Friesian cross-bred cattle (through an artificial insemination programme) is considered the backbone of the NDDP and the main booster of milk production in Viet Nam. The breeding programme benefits farmers by increasing the body size and growth rate of local cattle and thus improving their productivity. The dairy breeding programme is then implemented by inseminating local improved cows with pure Holstein-Friesian bull semen to produce the cross-bred cows.

⁵⁵ Nancy, B.L. et.al, 2006

As result, 14 percent of total dairy cattle population currently is pure Holstein-Friesian cows, 85 percent is cross-bred (with a cross-bred proportion growing from 50 percent to 75 percent to 87.5 percent); only 1 percent is some other breed. Some 47 000 (41.5 percent) of the total 113 200 dairy cattle were carefully selected and recorded in the national cattle breed book, which can be accessed freely via the Internet. All the semen for inseminating is also selected from potential bulls, which can ensure greater milk productivity.

Dairy development lessons accompanied by failures in unfavourable regions

In its Decision No. 167, the Government approved only 12 provinces for participation in its dairy development plan. However, 33 provinces ended up in the final plan due to direct request from the People's Committee in the other provinces.

In 2006, those 33 provinces maintained a dairy cattle sector. However, according to the MARD, within the first six months of 2006, the dairy cattle population decreased sharply in 12 provinces (Department of Livestock Production, 2006). The proportion of unqualified heifers increased, with calves and even milking cows left for slaughter in those provinces. In the North, cattle numbers declined in Thai Nguyen province by 45 percent, in Phu Tho by 68 percent, in Thai Binh by 37 percent, in Ha Nam by 18.5 percent; in the South, they decreased in Tra Vinh by 80 percent, in Vinh Long by 34 percent, and so on.

The decline was attributed to insufficient preparation of the dairy cows for milk production and the lack of fodder supply, due to unfavourable natural conditions or the lack of production zone planning. Pure Holstein-Friesian cows were imported but proved not so appropriate with the local climate and more difficult for farmers lacking experience than cross-bred cows. Also, many dairy farms were distant from a dairy company, a situation compounded by the lack of collection and storage facilities.

Box 1: Failures of dairy development plan in inappropriate provinces

Tuyen Quang became the first province to announce its failure with the National Dairy Development Plan. Over a four-year period (2003–2006), the province imported 3 279 pure Holstein-Friesian cows. But by September 2006 only around 1 000 of them were alive. The loss was attributed to insufficient infrastructure, lack of efficient management and that the plan was an exercise in “central planning” rather than an economic development plan.

In 2000, the Department of Agriculture and Rural Development (DARD) of Son La province requested the Provincial People's Committee to import 100 dairy cows in order to set up pilot demonstrations at potential dairy farm households. However, the People's Committee approved a plan to import 6 000 dairy cows. The DARD later recorded that of those 6 000 cows, only 945 cows were in lactation, 222 had died and the rest could not conceive.

Source: *Rural Economy Newspaper*, September 2006

Scale of production at the household level is increasing

The average number of head per dairy cattle herd is increasing, and the proportion of herds with less than five heads is decreasing. The typical herd now consists of five to ten head. Economies of scale are considered the most important reason for this change, with capital availability the biggest constraint to increasing the scale of their production, especially among the smallholders.

Dairy companies depend on imported milk powder rather than domestic fresh milk production

Import dependency has resulted in a value-chain segmentation among the milk producers, milk processors and milk consumers, each of whom have different priorities. Because domestic production meets only 22 percent of the total demand of dairy companies, international market developments influence the Vietnamese dairy sector. For instance, domestic milk powder price decreased in Viet Nam after its WTO accession in

2007. By importing milk powder to process “fresh milk”, milk companies have had greater profits than when using domestic fresh milk. And it partially explains why the price of fresh milk, which was mostly procured by the large-scale milk companies, remained constant (at least from 2002 to 2006) while the input costs rapidly increased.

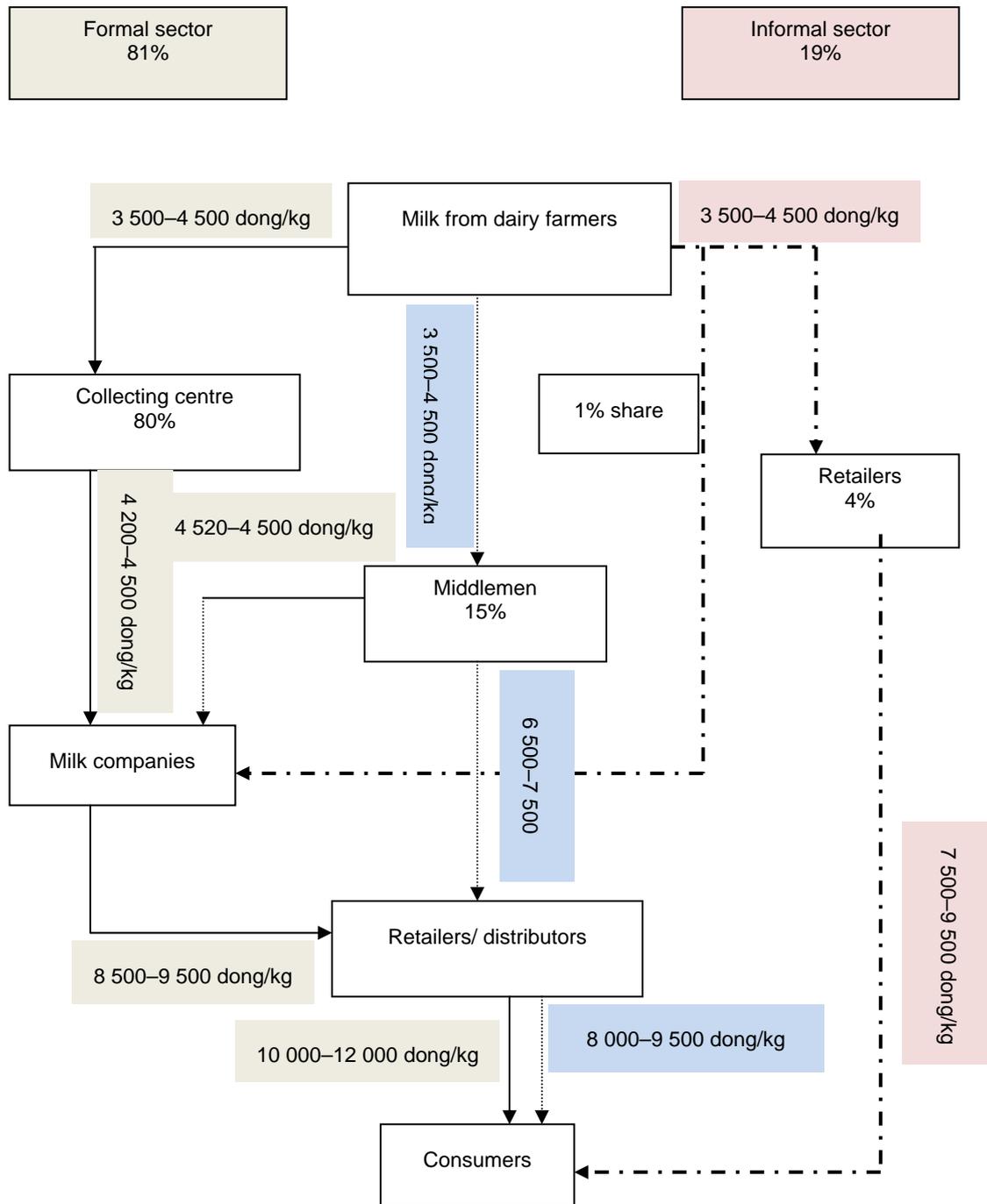
On the consumption side, fresh milk supplies are not highly appreciated by Vietnamese consumers, who seem to consider the short shelf life of pasteurized milk as an indication of inferior quality. In addition, the low prevalence of home refrigeration, especially in rural areas, makes UHT milk more convenient for consumers. However, as average income increases in Viet Nam, processors are expecting some shift of consumption habits, from UHT milk to pasteurized milk. Changes in habits are helped along by marketing and improving awareness on the quality of pasteurized milk in contrast to UHT milk, as Nestlé has discovered.

World price increases translate to opportunity for Viet Nam dairy farmers

From June 2007, two of the main dairy companies, VINAMILK and Dutch Lady, increased the farmgate price from 4 600 dong per kg to, first, 5 000 dong per kg and then to 6 400–6 800 dong per kg at the end of June 2007. The world demand for milk in 2007 increased sharply (by 35–100 percent), pushing up prices, particularly in a context of drought and reduced-fodder availability. Additionally, some European Union countries cut the subsidies in the dairy sector, making the milk price rise closer to the real value of products.

This is a real opportunity for dairy farmers in Viet Nam. The price gives farmers a profit of 3 000–3 500 dong per kg, or 45 000–52 000 dong per day (\$2.8–\$3.25 per day) for 15 kg of average daily yield per dairy cow, a very valuable income for rural households. The cost of dairy calves also has decreased, from 24 million dong per head (as a result of the high demand at the peak period of the NDDP) to 17–19 million dong per head (considered the “real” price of a calf).

Figure 1: Milk flow and dairy price charts



Smallholder farmers move into dairy production

Success of the NDDP and other support programmes/projects

Box 2: A smallholder farmer finds success in Dong Nai province

Like many other farmers in Long Thanh, Dong Nai province, Lam Quang Tri lived a hard life cultivating primarily cashews and rice, although he owned some goats and sold their milk. In 1982 he recognized that the goat milk was limited, with one goat producing only 1 litre of milk a day. So he looked into dairying, in which one cow produces 10 litres of milk a day. He sold the family's jewelry and borrowed from relatives to buy six Sind cows. He then set aside 1 ha (most of his land at that time) for planting grass as feed for his cows.

Each time a cow became sick, he turned to a veterinary technician at the An Phuoc Cow Factory for help. Eventually he began reading books on cattle husbandry and found ways to treat his cows on his own. Although he also sought out professors at the Agricultural University and the Southern Institute of Agricultural Science on disease treatment, raising techniques and cow-development methods.

In 1985, his cows began producing milk. At first he tried selling it locally, but people were not familiar with such fresh cow's milk. He then learned how to treat it by cooking it in a two-layer bain-marie and then distilling it into clean glass bottles. The locals were still reluctant to even try it. So he made yogurt and offered it plus the milk for free, at least to people he knew. The approach worked, and after just a short time, his customer base increased quickly. His sterile fresh milk is now famous in the region.

In 2003, Mr Lam Quang Tri's herd grew to more than 100 cows and his grassland expanded to 5 ha. He signed a contract to sell a portion of his milk to the An Phuoc Milk Company, which sells processed milk to VINAMILK.

Mr Lam Quang Tri's success is largely a tribute to his creativeness and responsiveness to the market. That he achieved a stability of input from his own grass and feed provided through contracts with a local animal feed company also helped. And the technical and extension agents he sought out at scientific institutions also played a crucial role. However, in 2004 the farmer encountered several difficulties, especially increased prices for feed, labour and transportation and decreased milk prices. This led to a reduction of his herd to 80 cows and a loss of revenue by 30–35 percent.

Most smallholders took up dairying as a result of government support, such as Government Decision No. 167, a policy that sought to increase domestic production and reduce dependence on the world market. The Government's nationwide initiative encouraged provincial leaders to produce ways to help establish and expand dairy cow production, especially among smallholder farmers, as the example in Box 3 describes.

Box 3: Dairy development plan implemented in many provinces

After the declaration of Government Decision No. 167, the Thai Nguyen provincial leader initiated a dairy development production project in October 2003, with an investment of 21 billion dong. The project provides a household with 4 million dong to buy an exotic breed of cattle or 3 millions dong for a domestic breed, 200 000 dong for each male calf and 70 000 dong for each 360 sq m of grassland for feeding the herd. This plan proved to be a good incentive to shift farmers in Thai Nguyen from a solely crop production to one that includes dairy cattle husbandry.

As the story in Box 4 illustrates, rural development projects and programmes have played a crucial role in the development of smallholder milk production.

Box 4: An integrating farm success with CIDA support

Seven years ago, Lieu Van Do and his family, members of the Kho Me ethnic minority in Soc Trang province, had a tough life with poor living standards despite their hard work on 1.5 ha of paddy field. In 2002, Mr Lieu Van Do participated in the a programme called Improving Rural Household Living Standards that was funded by the Canadian International Development Agency. The family received a dairy cow and training in breeding experiences from a dairy production model developed in Binh Duong. Five years later, the family's herd had grown to seven cows. In 2006, two of their cows produced 3.5 tonnes of milk in a ten-month period, netting them more than 20 million dong in profit. Two more cows are of breeding age and will likely milk soon. The family built a new house and Mr Liew Van Do is looking to expand his herd.

While the Government has provided support for entering the sector, the processors set the pricing and payment systems. Box 5 describes the payment scheme of one of the biggest dairy companies.

Box 5: Dutch Lady Viet Nam's payment system

According to 2005 information from Dutch Lady Viet Nam (DLV), the company has an elaborate but transparent pricing system, based on strict quality standards and results: minimal standards are 3.5 percent fat, 12 percent total solids and a 4 Rezasurin grade on a scale of 6 as the top quality. (In 2004, records indicate that the DLV had an overall quality rating of 3.8 percent fat, 12.3 percent total solids and a 4.1 Rezasurin grade.)

DLV operates various quality check-ups, the first at the collection point and the other at the milk-chilling centre. If milk is rejected at the milk collection centre, it is returned to the collection point so that other farmers do not have to bear the responsibility for bad quality.

Milk payment is made every 15 days and based on the daily average results of the collection points and on random individual quality checks (one per payment period). If individual farmers have a lower quality than the group's average, they are penalized; if they have a higher quality, they are rewarded. Specialized farmers receive individual payment.

In 2005, DLV developed a software program for making its payments. Results from weighing and quality checks are registered; farmers receive a payslip that they can check against their own production records. Upon presentation of their bi-monthly payslip, farmers receive payment from the bank.

The impact of NDDP slows

Smallholder dairy farmers can only enter the sector with financial support. Dairy production demands large capital input (high initial investment for cows and a shed) and technical capacity. In particular, prices for a dairy cow are high, usually exceeding the capital available to a smallholder farmer. Too often, credit schemes proposed by the banks and supported by the Government do not match people's situation, such as the high transaction costs, strict collateral on land titles and other assets. Thus, smallholder farmers who typically lack liquidity capital took up dairying because of the supporting programmes and projects of the Government or dairy companies.

But the support has been problematic at times. In fact, it threatened the involvement of smallholder farmers in several provinces at one point due to the "fever" on prices of breeding stock and inputs. The strong support from provincial governments through subsidies for the purchase of cows/heifers "sparked a race

between farmers to buy profitable imported breeds”. “...The buying spree guaranteed profits because the farmers were supported by their provincial and municipal officials to obtain fodder and diseases resistant stock.” (Viet Nam News, 17 September 2005). Consequently, provincial decisions and their “facilitating conditions” created a “fever” on prices of breeding stock and other inputs. In particular, the price for a dairy cow doubled or even tripled in 2003, to as high as 30 million dong.

In addition, although provincial and district subsidy and encouragement measures are important, they are often issued in haphazard ways. In Tien Du district, Bac Ninh province, for example, some farmers received subsidies twice to purchase two batches of cows, while theoretically only the first batch can be subsidized (to encourage farmers to raise their own progenies). One farmer even reported having raised his own calves but declared them as purchased from a third party in order to receive a subsidy of 3 million dong. The policy of subsidizing cows/heifer/calves purchased had further perverse effect on the quality of breeding stock. In the value chain of dairy production, as many studies have pointed out, the smallholder farmer is the segment that bears all the increased costs but gains less in the increase of benefit (Figure 1).

Economies of scale helped exclude smallholder dairy farmers. According to Professor Le Viet Ly (2006), the optimal scale for dairy production is more than ten head, meaning that most smallholder farmers cannot meet the requirement for the most efficient production.

Smallholder farmers are not experienced and knowledgeable about dairy production. Small-scale dairy producers receive government support, most of them lack the necessary information and technologies (such as breeding, feed supply sources, technology in storage and marketing skills). According to the MARD (2006), 22 provinces of the total 33 provinces with dairy production reported unsuccessful results with their dairy development plans. The NDDP rightly points out that the country lacks experience in dairy, the absence of any tradition common to most of the Southeast Asian countries. It would have been prudent for Viet Nam to learn early on from experiences of neighbouring countries – to avoid similar mistakes.

Insufficient veterinary services. Despite the Government’s strong support for breeding, the veterinary services have remained inadequate to serve the requirements of the dairy sector. In Viet Nam, the state veterinary service network spreads down to the district level, with the District Veterinary Station. However, at the commune level, there are mostly private veterinary paraprofessionals, so called “paravets”. Even though dairy cattle are prone to various health hazards, the state veterinary services are not systematically used or available to dairy farmers. Overall, the deficit of veterinary practitioners with sufficient knowledge in dairy production is a critical problem for dairy development in Viet Nam.

Milk quality is considered a major bottleneck in the absence of any standardized milk-quality testing scheme for the country and with no independent quality-control agency carrying out regular checks at farms, collection centres and processing factories. This situation causes more difficulties for smallholder farmers. Usually, smallholder farmers are paid a lower price for their output due to untested quality of their milk at the collection centre.

In most provinces where the NDDP failed, **milk basins were set far from the market, which requires larger expenditures for transportation** as well as directly affecting the milk quality. As a result, it makes domestic dairy products non-competitive with imported milk products.

Last but not least, the **low procurement price** of output was the most common driver of smallholder farmers out of the dairy sector during the 2004–2006 period. During that time, the farmgate price, which was set mainly by large-scale milk companies, was 3 200–4 100 dong, which did allow farmers to recoup their expenditure – but not to make a profit. Milk companies do not depend on fresh milk but on imported milk powder, while the dairy farmers depend on the companies. And with the milk procurement price set by those companies, not by the farmers, the dairy producers, especially the smallholders, bear all the risk of production.

In addition to the success stories of small dairy farmers, there are now many unsuccessful cases, as Box 6 describes. They at least offer useful lessons for the development of dairy production in the future.

Box 6: A struggling dairy development plan in Thai Nguyen province

Despite favourable policies and intervention mechanisms, two years after the Thai Nguyen provincial government began its support, the total dairy herd in the province attained only 20 percent of the planned targets. In that time, the government had distributed only 491 milk cows and 816 million dong subsidies to 199 households and enterprises. Among them, only 74 milk cows could be milked (accounting for 9 percent of the planned target). The dairy herd did not increase, leading to a reduction in grassland each year (although grassland can double in profit compared with the same area for farm production). In 2003, a total of 147 ha was planted as grass feed; only 82 ha was planted a year later but then dropping to 9.7 ha in 2005.

There are many reasons for this failure in dairy development. The most obvious one is that a comprehensive market study was not completed initially. Also, Thai Nguyen developed the dairy sector too fast, mostly as a movement – creating a “herd-effect” kind of activity.

In fact, when the project was implemented, almost every Thai Nguyen farmer did not understand that raising dairy cows is very different from raising other livestock. Even the authorities could not imagine the overall picture of the sector to properly prepare for it. In addition, the quality of breeding animals was not well chosen. To meet the demand for breeding, many agencies and enterprises hastily imported cow breeds, many of which were of good quality but not suitable to the region.

Breeding dairy cows requires considerable investment, with much more time needed to recoup costs and an output market difficult to control. Because of this, many farmers believed that the work was less profitable than expected, and thus gave up and sold their cows. At yet, initially they felt highly enthusiastic; they borrowed money to build facilities, to buy breeding animals, to shift to grass cultivation, to grow or purchase maize for feeding. Now, the “dream” of making money from raising dairy cows has disappeared, replaced by anxiety over selling produce and repaying the debts.

Contract farming and a vertical integration usually have positive effects on capacity-building and technical know-how development. The greatest danger is to “firmly bind” farmers (in certain cases, farmers lose their land if they give up dairying) and leave them virtually helpless and without advocacy rights. There are many reasons for the failure of contracts, usually caused by the lack of awareness and experience, as the following two examples (Boxes 7 and 8) explain.

Box 7: An unsuccessful contract in Thai Nguyen

Thai Nguyen provincial authorities expected dairy companies and farmers to sign contracts. Based on the contracts, a company would provide investment for milk-storage systems, facilitating the preservation of milk for purchase. However, up to now, there are no signed contracts. A company only invests when it is ensured that the farmers will provide enough milk for their production needs. Generally, one milk storage facility can hold at least 2 000 litres of milk a day. However, the current production level only fills 15–20 percent of that capacity. But many farmers have been waiting for a company to sign a contract before buying their dairy cows. This circle of reluctance has considerably impeded the project’s progression.

Box 8: Contract farming with Nestlé in Ha Tay province

In 1998, Nestlé cooperated with the Ha Tay People's Committee to encourage farmers to convert from rice growing to cow raising. With careful training, technology subsidies and inexpensive credit, many farmers made the switch and signed annual contracts with Nestlé. The company also provided other facilities, such as milk-collection terminals, complementary equipment and cleaning chemicals. By 2004, Nestlé was collecting 93 percent of the milk.

Under the contract, Nestlé buys milk from groups of farmers, and, in return, the group is obliged to sell all their milk to Nestlé. The farmers are responsible for building up their farms and paying for most inputs, such as feed, electricity, water and labour. Prices, which are determined solely by Nestlé, barely reflect the market price. However, Nestlé wants to ensure a stable price throughout the year under the contract, even if prices harshly fluctuate across a year.

Nestlé has a bonus and fine system to control the milk quality. Random samples of milk from each village are tested every month. Among the different issues, Nestlé is most careful about the proportion of antibiotic, which is only allowed to be less than one-billionth. To achieve such a small proportion, Nestlé trained the farmers and provided a gradual scale of qualifications.

The Nestlé contract system has produced a variety of experiences:

- Initially as contracted, Nestlé provided feed for households for dairy cows. The quality of feed was good at first but then became not so good. The farmers had no way of maintaining the expected milk yield and quality with the poor-quality feed. The farmers wanted more transparency and responsibility in this part of the contract.*
- Nestlé's quality control was one of the main barriers to the farmers maximizing their profit. Despite skill improvements across time, the farmers still complained about the low level of accepted antibiotic. It limited the incentive to sell to Nestlé because the final price after bonuses and fines was unpredictable. It also raised doubts among the farmers about the quality control system; consequently, the farmers started to question the company's integrity.*
- According to the farmers, the procurement price was low for a long time. The price used to be 2 700 dong per kg in 1998, typically providing a profit of 7–8 million dong a month from ten head of dairy cows. Farmers could then take good care of their cows so that they provided more and better milk. In 2006, the price lifted to 3 200 dong per kg, which was higher than in 1998 but barely profitable, considering the significant increase of input costs. One farmer, who had to reduce his herd to four cows due to the maintenance costs, reported earning only 400 000 dong per month, after subtracting for all the costs.*

The low prices resulted not only in a lower quality but also a lower quantity of milk; the amount of milk produced by each dairy cow decreased to only 10–12 kg per day, compared to 18–20 kg per day in the 2004–2005 period. Deep in the milk-price crisis, the farmers were trapped in a frustrating cycle in which a small income from milk provides insufficient nutrition for the cows. The cows, in return, provide low milk quality and quantity, thus producers earn even less money. Many of contracted farmers coped with the crisis by slaughtering the cows that didn't provide enough milk and changed to other businesses.

Nestlé offered no solution for the contract violations. There was no legal system that the company could rely on nor could it bind the farmers economically. Further, there was little threat of the company's refusal to renew the contract because it lacked milk and needed as much milk as it could obtain. The company now has resorted to powdered milk as an alternative input for production.

As an attempt to target the problem of reduced milk quantity, Nestlé decided to buy milk by cluster. Each cluster had a leader, elected by the members, and then trained by the company. The cluster leader ensure that the farmers supply the contracted amount of milk and distribute the company's payment to everyone. In an attempt to strengthen the contract system, Nestlé offered the leader a fixed salary and payment for his/her electricity bill. As more farmers started to break the contract arrangements, the company decided to award the cluster leader with 200 dong for each kg of milk collected to increase his/her incentive.

Buying milk by cluster also helps Nestlé better control the quality of the milk because the milk from many households is now stored in one container. If one household has antibiotic in the milk, it will affect others economically and lead to social costs. The households will, hence, monitor one another to ensure mutual benefit.

Unfortunately, having the cluster leader as the mediator has caused occasional conflicts within each cluster. Even though he/she was elected by the farmers, the leader is sometimes non-transparent in distributing payments. For example, a leader might receive payment from the company but delay the distribution. The company has yet to find a way to tackle this conflict. At the end of 2006, the rate of contract violations, estimated by the company's business director, was approximately 50 percent, though the real rate could actually be higher.

Prospects

The following outlines important strategic lessons for the local dairy sector to competitively supply growing markets in the future:

- The National Dairy Development Plan and subsequently Decision No. 167 (amended), concentrated technical and financial efforts in the “dairy priority zones”, identified in a manner similar to what has been used for priority “economic zones”. However, the criteria for such zones should be: i) a tradition in dairying, ii) an existing level of technical know-how, iii) availability of processing facilities and current access to markets, iv) climate and natural constraints/strengths, v) land availability for fodder cultivation and vi) availability of industry by-products.
- Smallholders tend to disappear from dairy production in crisis periods. Typically, smallholders are more vulnerable because they are relatively new to dairying and did not have enough time to gather sufficient resources to pay back their debts and enlarge their herd.
- All efforts should be made to strengthen the capacity of existing small- and medium-scale farmers who show a potential to enlarge their herd (enough land, interest, technical know-how) smallholders should, whenever possible, be encouraged into interest groups in order to lower their production costs. The organizational approach should be addressed step by step (primarily by forming interest groups or clubs rather than cooperatives). Active exchange of experiences should be promoted by study tours to private farms and existing interest groups.
- Developing very large farms with the latest technology might, at this stage, not be sustainable in Viet Nam. Large estates should not be artificially created by the central or provincial governments (exceptions might be joint ventures, drawing foreign capital and technical inputs) but should naturally evolve from existing large private structures.
- To resolve limitations imposed by farmers' lack of dairy experience, extension agents and veterinary staff, it is necessary to have financial and technical efforts to tackle the human resources constraint. Technical staff with existing knowledge in dairy (veterinarians, extension agents) should be used as trainers in the areas identified as priority dairy zones. Extension agents in priority dairy zones should be specifically trained on dairy issues, not only on theoretical matters but on practical topics (hand milking, feeding, heat detection, deliveries, management of animals, etc.).
- In each zone, successful farmers with sound technical knowledge should be identified as possible farmer-to-farmer trainers. Farmers should be intensively trained on relevant topics (heat detection, calf raising, feeding, hygienic milking, basic detection of health disorders, etc.), possibly on their farm rather than at a station (exchange of experience with successful farmers).
- Regarding the situation of breeding policy and breed selection, Viet Nam should emphasize improving the management of the various types rather than on the appropriate level of exotic blood.

- For feed and fodder availability, significant efforts are needed to establish “priority fodder-growing areas” in communes with dairy production. Villages, communes and districts of priority dairy zones should elaborate a plan for fodder-growing suitable to existing conditions (Taking into account irrigation facilities and constraints, seasonality and land quality).
- Smallholder farmers should be encouraged to buy feed, industrial by-products (brewery waste) and crop residues (rice straw) in bulk to short-cut several layers of middlemen. This can be achieved by encouraging farmers to form interest groups or clubs (rather than cooperatives, which often have a negative connotation).
- To give more incentives for the smallholder dairy farmers, a new pricing system should be set up, based on a basic milk quality (fat, protein, total solid, bacterial count and absence of antibiotics). The basic payment system should be similar throughout the country, with private processors free to establish their own payment schemes.
- To overcome higher prices for bad quality paid by private agents and middlemen, a quality-based payment system should be implemented, similar to the Dutch Lady system: The higher the quality, the higher the price.
- At present, the economic viability and the competitiveness of Viet Nam’s dairy sector is biased by the factor of “heifer sales”. The purchase of cross-bred heifers or cows should not be subsidized or encouraged by loans or other incentives. The raising costs of heifers should be assessed on a large scale, depending on the production area (urban, peri-urban and rural). Ideally, the sales price of heifers should cover the raising costs and allow for a reasonable margin.
- To reduce the initial investment costs, farmers should be encouraged to produce their own cross-bred progenies, knowing that they run the risk of producing male calves and that dairy production takes more time to develop.
- Proper guidelines on contract conditions (such as no firm binding of dairy production and land use rights) should be issued by the national authorities. Contract dairy farming should be discussed with the major processors and the relevant ministries in order to create a general framework.

Box 9: Key definitions

Smallholder dairy farmer: Someone who has one to three cross-bred cows, typically occupies less than 0.5 ha of land and represents the less-commercially managed dairy systems in the area.

Smallholder milk producer: A smallholder dairy farmer is also a smallholder milk producer. The family consumes 8 percent of the milk produced; the surplus is sold to the local milk collection centre. The main source of income is own-farm employment (dairy and cash crops).

Formal markets: Dairy companies that operate the processing facility in a dairy zone (such as collection centres set up at the commune level) and typically buy their milk either directly from farmers or via a middleman.

Informal markets: Milk sellers and buyers in a neighbourhood or village. It includes smallholder dairy farmers and smallholder milk producers who sell some of their farm produce to the local market.

Dairy value chain: The various stages through which milk and milk products pass from farm to the final consumer.

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Models and opportunities for smallholder dairy producers in Asia: lessons learned

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It is clear that the demand prospects for dairy products are expected to remain strong in Asia. But the ability of smallholder dairy producers to benefit from the growing demand could be compromised in the rapidly globalizing market for milk products. Studies have shown that smallholder dairy producers remain competitive in many areas in developing countries (Stahl *et al.*, 2003). However, their competitiveness amid the diversity of production and marketing systems for dairy in Asia is shaped by a myriad of factors that are largely contextual and influenced by geography, relative natural resource bases, socio-cultural factors, demand growth, demographics, economics and the status of an individual country's economic growth and development.

These same influences also affect the variability of a country-specific dairy-development growth path, whether it is dominated by investments in large processing units, such as in China, cooperative systems, such as in India, or smallholder links, such as in South Asia where the informal market supplies a large amount of the fluid milk/artisanal products produced. Public policies and incentives fostering private-sector investment decisions also play an instrumental role in shaping the outlook for the sector and determining the role played by smallholders.

Identifying the lessons

Drawing from the previously presented FAO-commissioned case studies on dairy development, this chapter examines the critical factors influencing the success of various interventions to support dairy systems, with a focus on smallholders. It outlines country-specific responses to constraints and reviews the models and interventions in the region that have been influential in fostering dairy development.

Addressing the challenges related to dairy development in any country requires reviewing the factors that can be detrimental or conducive. Given the diverse nature of dairy demand, production systems and market structures across the Asian region, no broad summation is possible. However, the following observations and analysis of some of the regional lessons learned may be of relevance when considering action to support sector development.

In only a few countries have carefully targeted smallholder interventions been effective in supporting dairy development. This is particularly true because in many countries most smallholder production is channelled into traditional markets, which are largely neglected by policy interventions. In formal markets, market access is challenged by the fact that dairy product supply channels are rapidly changing, with supermarkets playing an increasingly important role in all countries. Specifically identifying entry points for smallholders is difficult. However, the following examples illustrate successful interventions:

- Supportive national and regional policies have been crucial, such as in China where more than 1 million smallholders were incorporated into the dairy sector through enabling systems of milk collection.
- In some countries, governments successfully set up dairy development zones (Philippines, Viet Nam, China). In the Philippines, the zones (which necessitate at least 300 farmers) proved most beneficial when linked to public-private partnerships (such as private sector breeding operations and initial support by the National Dairy Authority).

- Interventions that target the scaling up of dairy activities (Mongolia) proved advantageous when focusing on demand areas where there are many cattle and links to the main cropping area, thus providing access to crop by-products for feeding.
- Sustainable pro-poor social dairy programmes are those that have been linked to remunerative markets and were carefully targeted (Bangladesh, cooperatives in India, Philippines).
- Graduation from subsistence to commercial smallholder and/or larger-scale milk production occurs when the right policies and strategies are adopted (Bangladesh, India, Philippines, Thailand, Mongolia).
- School milk programmes using locally produced milk (as opposed to imported milk powder) have served as a catalyst for growth (Thailand, China, the Philippines)
- Almost all of the successful examples, such as the Anand model and project based initiatives in Bangladesh and Mongolia, have involved some type of donor involvement at the early on that was followed by country-specific commitment and support. The main exception is China, where the private sector and national/regional governments worked in tandem to support sector growth.
- Key to long-term balanced growth for smallholders in many countries lies in cultivating and supporting milk consumption in rural households (Bangladesh, India, Pakistan, and China). In China, despite strong growth in demand, per capita milk consumption of rural resident averages only 17 percent of that of urban residents (Hu, 2008).

Models that link smallholders to formal markets

In general, those models effective for engaging smallholders are those which: i) provide good economic returns; ii) have policy/institutional support from governments, either national or regional; and iii) are supported by active involvement from private sector milk-processing enterprises. In a globalizing economy characterized by cross-border movement of products, information, technology and financing, it is critical that all models be governed by supportive and enforceable standards and regulations to ensure basic adherence to modern food safety standards.

Cooperatives are often cited as one of the most effective way of grouping small dairy farmers to deal with the challenges of producing and marketing milk. The unique characteristics of milk require special considerations in terms of linking producers to markets. These characteristics include its perishability, the daily nature of production, the lack of synchronization between demand and supply, and the inability to quickly adjust supply to changes in demand. Even in countries such as the United States, dairy cooperatives handle a significant proportion of production: in 2002, for instance, cooperatives in the US accounted for an estimated 86 percent of farm sales (Kraenzle and Eversull, 2003; Ling, 2004).

In India, the dairy cooperative model has been perceived to be central to the development of its dairy industry, the largest in the world and one that has been based on integrating small and marginal farmers into a business environment. However, while successful in numerous states, in particular the Amul cooperative⁵⁶ in Gujarat, not all have flourished. In many other areas of India, the cooperative movement has been less successful in empowering farmers and transforming dairying into a means of development for rural people. The challenges include: i) cultural, socio-economic constraints in replicating the model; ii) the critical need for democratically elected management and, in particular, the need to avoid state-management; and iii) difficulties in ensuring competitiveness with the private sector. Another example is the Milk Vita Cooperative in Bangladesh where periodic state involvement in the day-to-day management of the cooperative has limited growth and delayed dividend payments to members and suppliers, acting as serious disincentive to participation.

⁵⁶ The Amul cooperative involves an estimated 2.7 million farmers in Gujarat and processes 10.2 million liters of milk per day. It is considered by some to be Asia's biggest dairy business venture.

These shortcomings of cooperatives in many parts of India generated the concept of **mutually aided cooperative societies** (MACS). A MACS Act was enacted⁵⁷ in 1995 to respond to governance issues related to cooperative organization. The law gives autonomy to district and village cooperatives to set up societies that are profit-making but function like cooperatives in terms of services provided to farmers, without the involvement of state management.

Collective farms, such as those in Sichuan province in China, are supported by the township and county governments. Farmers are grouped into a farm model in which all the cows are milked by machine. A local investor/builder constructs the dairy facility, supplying all the capital. After construction, in the Sichuan example, the village director settled the debt with the builder by identifying individual producers to purchase stall space within the barn. While the operation is run by a village committee, individuals own the stall space and assume full management of their cows, including feeding. Milking machines, however, are owned by the company, in the China case, the New Hope Dairy Cattle Company. A member of the collective supervises the milking and keeps records of the amount of milk produced by each cow. A local company collects the milk. One of the obvious constraints to extending this type of operation is geographical access to facilities.

In **milking stations**, similar to the collective farm, operations revolve around the construction of mechanical milking facilities linked to households. However, in this case, the producers bring their dairy cows to the station for milking. In some areas, one milking station services about 200 dairy cow-raising households. The governance of these stations can differ; a processing company owns some of them and leases to the township or the producers, or there are private and cooperative owners. According to Hu (2008), benefits of the stations reduce labour requirements by farmers and ensure the provision of a stable market and access to technical training, while the processors benefit the stable supply of high-quality milk and limited opportunities for milk adulteration.

Private dairies reflect one of the numerous opportunities for linking processors to producers. The institutional links with the producers, however, can differ depending on the circumstances. Typically, processing companies procure milk through village agents who have a personal connection with producers. The processor occasionally has direct interaction with the producers; however, usually the milk price is negotiated directly with the agent. This limits price transparency to producers and reduces their market power as well as incentive to provide quality, unadulterated milk. Some processing companies, such as Dutch Lady in Viet Nam, operate a payment scheme that is transparent with various check points, including random individual quality checks. This more direct contact with producers provides incentive for ensuring milk quality at the farm level.

The **contract farming model** is a variation of the private dairy in which producers are given contracts for their milk supply (Halla and Habel Foods in Pakistan). However, in Pakistan, only 3–5 percent of the total milk production is sold through formal channels. Informal rural or peri-urban-based agents in the marketing chain sell the bulk of the supply.

Farmer-managed **milk collection stations** in some areas of China are preferred to the milking stations owned and managed by processors because farmers are less at risk from monopsony pressures, such as the power of relatively few processors to control prices. In cases such as China, increased competition between processors results in lower prices to producers; management and control of some of the dairy infrastructure provides producers with more market power.

Dairy development zones (in the Philippines and China) regroup dairy producers in a designated area, with processors or a local government constructing the infrastructure. Typically the zone requires at least 200–300 cows, with some in China reaching 500–1 000 cows. The advantage of the zones is the technical assistance and supervision that is provided, while the separation between production and residential areas benefits disease control. In the Philippines, many of the zones are public–private partnerships with the National Dairy Authority, which provides development support, while in China financial assistance is available through government supportive policies.

⁵⁷ To date, only in Andhra Pradesh.

Joint venture operations (Shanghai area of China) have linked ex-state-owned companies and independent farmers. The company owns the dairy animals typically, with farmers providing the land, labour and cattle barns. The company owns 40 percent of the equity in the farms (and the farmers own the remainder) and provide technical assistance for improving feeding practices and disease control.

Pastoral parks (implemented in Northern China) are suitable in pastoral regions where households with large herds join together with assistance from dairy-processing enterprises or other organizations. In China, the processing company invests in the construction while the households raise the cows. However, other organizational structures are possible, such as a cooperative one where the infrastructure is owned by the households.

Mobile-dispersed milk-collecting systems:, for use in geographically dispersed milk production units. Used in the 1980s in China, these units went from household to household with milk-tank trucks. One serious constraint to this model is its inability to guarantee that quality of the raw milk.

State-owned milk processing companies still exist in many countries in Asia. For example, MILCO in Sri Lanka engages in milk collection and largely determines the farmgate milk price – based on its processing and marketing costs, both of which are reputed to be relatively high. The large private firms follow the purchasing price offered by MILCO, although they do pay a premium, depending on the competition in the local market where they operate. Unfortunately, this system limits price increases (even in times of high international prices), thus disadvantaging smallholders who currently supply the majority of milk production.

The **pro-poor social/business community dairying model** (Bangladesh) adds livestock activities to ongoing community development programmes that provide training, vaccination, veterinary care and other support services to help poor women become dairy farmers and assist others to improve and expand dairy operations. In Bangladesh, project participants have become suppliers of milk to private dairies, including the Grameen Danone yoghurt plant. Today, this programme and others are administered by a not-for-profit organization called the Grameen Motsho O Pashusampad (Fisheries and Livestock) Foundation.

Factors affecting model selection and overall dairy development

While international dairy product prices have declined from their record levels in 2007, the current market environment offers opportunities for dairy development and for smallholder producers, particularly those linked to traditional milk products and fluid milk markets. As retail powder prices increase, fresh liquid milk becomes more competitive. This was evident in most of the case study countries, particularly those where domestic markets were linked to international price fluctuations.

One of the challenges for regional stakeholders is the identification of specific factors that support or fail to support model adoption suitable to smallholder dairy development in a local context. Smallholder participation in markets is influenced economic incentives and shaped by institutional and policy initiatives; as well as by cultural and social practices that allow them to participate in the prospective growth. This could be through increased links with larger operations that are expanding investment in the local markets as prices for imports remain high or through continued participation of smallholders in traditional markets. The following section draws out some basic generalizations from the country case studies.

The economic considerations

- Price fixing, combined with inefficient processing by the leading processors, results in many cases in low profit margins for dairy producers (Sri Lanka). This, combined with a lack of a clear dairy development plan, constrains incentives to invest in or expand dairy operations.
- Investment and promotion of the sector can be supported through favourable tax policies that reduce local income tax or land-use taxation required for production, dairy product processing and feed-processing enterprises (China). In Mongolia, legislation was adjusted so that the VAT (value-added tax) paid by milk processors could be offset against the cost of procuring domestic milk.

- Limits on supply availability (China) often lead to a consolidation in the processing sector. However, once consolidation occurs, increased competition between larger processors leads to a proliferation of product varieties but also occasionally to lower prices paid to producers. Ownership of the chilling facilities by producers could enhance their market power.
- In some countries, such as Pakistan, large-scale dairy processing is only profitable if the company has invested in other lucrative, yet low-cost non-dairy products.
- In some cases, pasteurization and packaging nearly double the price of milk to consumers, thus reducing the farmgate price and limiting consumption among the urban poor. Giving the formal sector the exclusive right to distribute milk and milk products introduces one of the few economies of scale in dairy production, thus imposing a disadvantage on those selling to the traditional sector. Legislation related to milk distribution channels needs to be evaluated in terms of its economic impact on different stakeholders.
- More discerning requirements among modern consumers result in better milk quality and attractive product branding; even the presentation is becoming a prerequisite for modern urban consumers to switch from imported products to milk produced by local smallholders (China, India, Mongolia, Philippines, Viet Nam).
- In most countries of the region, quality-based pricing mechanisms for milk have yet to be implemented. This is despite new technical and cost-effective innovations in electronic milk analysers that can facilitate payment based on quality characteristics.
- The success of smallholder dairy operations and opportunities for scaling up are influenced by the high opportunity cost of labour relative to the farmgate price. In Sri Lanka, the break-even ratio of the farm gate price to wages in 2008 was 1:13, implying that the value of 1 litre of milk sold at the farmgate equated to only one-thirteenth of local wage rates. This discourages intensive dairy farming and should be a critical factor to assess when evaluating opportunities for smallholder engagement in dairying.
- In many countries, dairying holds more favourable economic returns than other agricultural activities. This is the case in China where, in 2007, the net profit from raising one dairy cow was 14 times larger than growing 1 mu of maize and 3.6 times larger than growing 1 mu of potatoes (Hu, 2008).
- To enhance returns to dairy producers, selected smallholders close to likely markets should seek out value-added opportunities, such as with the production of ready-to-drink milk and yoghurts, sweetened condensed milk, indigenous products and also processed cheese for burgeoning fast food outlets, such as pizza and larger restaurants. (China, Mongolia, Philippines).
- Investment needs to be accompanied by technical and management training for entrepreneurial dairy producers. This ensures that each link in the dairy chain is profitable and encourages private sector investment, particularly in dairy development activities focused on smallholders.
- In some countries, such as Mongolia, there are opportunities to expand the export market, particularly by focusing on the country's unique mare milk-based and camel milk-based functional foods that could be shipped under a "green" ecological generic label.

Institutional considerations

- Commodity or industry institutions and smallholder groups (associations, boards, cooperatives) can play a pivotal role in supporting dairy development (India, Philippines, Mongolia). Careful attention needs to be paid to the role, function and structure of the organization to ensure advocacy for the sector. In Mongolia, the milk processors' association promotes local milk and generic milk

marketing campaigns. These campaigns fostered a differentiation of local from imported milk useful in promoting domestic milk consumption and production.

- Commercial banks in many countries generally offer loans with a high annual interest rate, making smallholder access to capital difficult. Innovative credit-in-kind systems have proven to be effective in encouraging dairying operations, such as the one in the Philippines in which producers received cows on the condition that some offspring are passed on to other members of the community. Credit and insurance programmes need to consider the barriers to setting up or scaling up and create incentives for interested dairy entrepreneurs. Meanwhile, cooperatives can offer important services that are critical to scaling up smallholder operations. However, if marketing is not a problem, there is usually no need for a cooperative (China, Pakistan, Sri Lanka, Viet Nam).
- Contracting with processors is an alternative institutional arrangement that supports the scaling up of operations among smallholders. In one model in China, producers entered into a five-year contract with processor, with the contract specifying the purchase price, quality standards and associated premium, and the payment schedule. The producers were paid three times a month. The processor transported any amount and quality of milk from the farms to the processing plant.

Socio-cultural-environmental considerations

- Urban populations in countries that were traditionally non-milk drinking and/or lactose intolerant are increasing consumption of ready-to-drink processed and cultured milks (Philippines, Sri Lanka, Thailand, Viet Nam). Consequently, there are new opportunities for sector development even in countries that don't have a tradition or seem to be less competitive in dairy production.
- Women in many countries do most of the dairy-related activities. For example, in Sri Lanka, women are the majority members of registered dairy cooperatives but they aren't represented in management or executive committees. This implies that dairy development planning needs to include a gender focus. In Mongolia, households selling milk have estimated average incomes three times higher than the households not selling milk. With 30 percent of dairy households headed by women, this transforms dairy production into an important livelihood opportunity for rural households. Recognizing this, some banks, such as the Grameen Bank in Bangladesh, specifically target the lending programmes, which lend at reduced rates, at women and port households.

Technical considerations

- Smallholders need an accessible and affordable but complete package of support services (animal health, AI, breeding, etc.) to produce milk competitively (Bangladesh, India, Mongolia). Cooperatives provide these services. However, in increasingly competitive market environments, the private sector often collects the milk but doesn't actively backward invest in dairy development activities. Smaller companies, such as Dutch Lady in Viet Nam, have expanded their competitiveness and operations by providing extension services. Clear economic incentives from the government, through tax rebates or other economic stimulus options, could motivate the private sector to invest in enhancing the on-farm productivity of suppliers.
- Technical know-how and skills delivered through practical and accessible vaccination and outreach training organized by the government are equally important (India, Mongolia). This includes business management skills that are critical to ensuring the development of the dairy activities as a dairy enterprise (Philippines).
- In most countries, simple changes in husbandry practices and the way stock is managed would result in significant improvement in technical efficiency. This includes feeding as well as access to water and simple technologies for cooling animals in tropical climates. Feeding, in particular, is the key to enhanced productivity because feed accounts for up to 70 percent of the cost of milk production.

- Breed enhancement also can lead to increased productivity among producers. However, the means of accessing improved animals needs to be considered, both in terms of market distortions (if subsidies are provided) and in terms of private versus public services, such as those for artificial insemination. In many countries, such as Sri Lanka and the Philippines, markets can be created for dairy stock by encouraging the specialization of production (operations focused on breeding). In the Philippines, the National Dairy Authority collaborated with privately owned cattle breeding farmers, linking suitable financing schemes for dairy animal production.
- Lack of small-scale cooling and processing units constrain farmers' opportunity for obtaining higher prices for their milk. In some cases, the units may be available but ownership issues limit the power of the producers to receive a fair price.

The role of government and policies in dairy development

Governments, through policies and programmes, can provide a catalyst to sector development. However, interventions and support have to be carefully orchestrated to ensure balanced growth. In many countries, sector development flourished through a policy of non-involvement by the government in production, processing and marketing. The design of a clear road map for dairy development needs to include incentives for private sector investment.

When undertaking sector planning, it is useful to consider the following:

1. Government investments in large operations usually fail (Pakistan, Philippines, Viet Nam). **Public sector involvement is best restricted** to selected co-financing arrangements and public-private partnerships that encourage private sector investment.
2. **School milk programmes**, when implemented with a focus on smallholders, can support dairy development (as well as generating long-term demand for dairy products (China, Mongolia, Philippines, Thailand). They can, when linked to local milk consumption, support smallholder dairy development. However, they necessitate a long-term financial commitment by (either national or regional) governments (China, Mongolia, Thailand). In most cases, school milk feeding schemes based on imported pre-packed milk have been counter-productive to smallholder dairy development.
3. In China, investments in school milk programmes, financial support for industry expansion and **favourable credit and taxation policies to support breeding stock** purchased by farm households supported a double-digit expansion in milk production over the past decade. The central Government used national debt funds to effectively mobilize resources from banks, with local governments providing tax rebates to assist the sector, particularly with processing.
4. **Working with financial institutions** is a role that governments can take on to ensure accessible credit for smallholders' housing and livestock needs. Governments should ensure that concessionary loan programmes take into account the prevailing returns and profit margins of smallholder farmers; credit schemes need to be long term to account for the biological nature of the investment. Ideally, an insurance system should accompany the loans to mitigate animal loss risks.
5. Limited **land ownership** constrains the ability of many dairy farmers to grow quality fodder for cattle. Governments should look for innovative ways to support pasture or fodder development and better use of public land. This could include options for leasing communal grazing land or public land.
6. A critical government support to industry development is the **reduction of barriers to trade**, in particular import tariffs on equipment, animals, raw materials and other inputs. In addition, it is important to eliminate subsidies on inputs, including veterinary drugs, vaccines and AI services, to avoid market distortions. The private sector has difficulty engaging in milk collection and processing in areas with low volumes. To resolve this issue, many countries, through private sector or government-supported economic incentives (tax concessions, etc.), have set up **dairy enterprise or development zones** (China, Pakistan, Philippines).

7. **Pricing policies** that fix milk prices based on the cost of production or other calculations can be detrimental to sector development. This includes price setting by national agencies, cooperatives or municipalities (India, Pakistan, Sri Lanka). In some cases, such as Thailand, high administered prices supported industry profitability. However, with the proliferation of bilateral and regional trade agreements and increased market access for dairy products from competitive suppliers, these policies may not be sustainable.

Conclusions

There are many successful models, businesses and institutional arrangements in which smallholder milk producers have gained sustainable access to markets and some that are less successful. The challenge is to identify models that allow smallholders to compete with other forms of milk supply, in particular from larger national operations and imports. Selected successful smallholder dairy chain business models in the case study countries presented in this publication include:

1) Cooperative dairying model: the world-renowned Anand Pattern model from India and more recent cooperative company models, such as in Bangladesh, India and Thailand.

2) Contract farming model: essentially a private sector–smallholder incentive model, such as in Pakistan (Halla and Haleeb models), Sri Lanka and Viet Nam.

3) China dairy park model: collective/community dairy cow raising in an investment-driven growth environment.

4) Philippines dairy zone model: public–private sector equity partnerships.

5) Mongolia dairy chain model: involving six enterprise modules for liquid milk and cheese for each link in the farm-to-consumer food chain.

5) Bangladesh social and community dairying models:

- Grameen Bank poor people’s community livestock and dairying model, part of the environmentally sustainable, integrated crop-fish-livestock model.
- Bangladesh: Grameen-Danone Foods NGO-private sector social model.

The major factors influencing smallholder dairy chain models drawn from the case studies are summarized as follows:

- Smallholder participation in dairy value chains is straightforward in concept but complex in execution.
- Smallholder milk producers must be competitive to access markets; for example, they must produce top-quality milk at affordable prices. In achieving this status, most subsistence smallholder milk producers have progressed to become small commercial dairy farmers.
- Appropriate technical interventions, either on-farm or post-farm, need to be supported by an enabling environment that is characterized by pro-smallholder policies and institutional support as well as a market structure that ensures fair pricing for quality products.
- A strategy of including smallholders requires a deliberate and creative development vehicle that is sensitive to the impact of policies, programmes and activities to smallholders.
- The private sector must be fully engaged in the development of a dairy strategy and in carrying out the strategy at the country level.
- Smallholder dairy action plans are the vehicles to transform strategies into national action, recognizing that the impact of appropriate policies, programmes and activities depends on the local context and, most importantly, the people involved.

The appropriateness of a specific model is largely contextual. However, in general, smallholder dairy chain models have not been so successful: i) where centrally planned approaches are used; ii) when governments

intervene by establishing large public sector-managed dairy processing enterprises; iii) where producers have limited leverage over resources or governance of the chain; and iv) where low tariffs facilitated the importation of cheap dairy commodities used as raw materials rather than fresh local milk.

It is important to have the right mix of supporting factors in place to promote smallholder dairying (see the section on dairy policies in the next chapter). An enabling environment is a vital ingredient, with clear, focused and implementable policies and well-thought-out strategies designed to translate policy into bankable output. It is in this context that careful selection of appropriate and contextually designed models need to be considered and evaluated.

Dairy policies and sector planning

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The primary drivers in dairy sector development include changes in demand, advances in production, transportation and communication technology, enhanced on-farm productivity due to improved management, and the expanding scope of dairy product marketing. However, a creative mix of sector policies and programmes that provide an enabling environment for sector development and private sector engagement can favourably influence the rate and shape of growth.

The financial resources commonly deployed by developed countries to support their heavily subsidized dairy industries are not available in developing countries. This absence of significant resources highlights the necessity for forging an enabling environment that is supportive of sector development through carefully crafted and focused policy interventions. These interventions should ensure engagement of the private sector through innovative partnerships, cost-sharing arrangements and meaningful participation of smallholders. In Asia, where the majority of milk is sourced from smallholders with two to five cows, this requires a deliberate and creative development vehicle generated and endorsed through a carefully organized planning process.

This chapter reviews the general guidelines suggested for dairy development planning during an FAO-organized technical meeting in 2008.⁵⁸ It includes discussion on possible policy objectives identified during that same meeting and a review of tools and implementing mechanisms that can provide a road map for action. Table 1 outlines the pillars of support for dairy development documented in FAO's Strategy and Investment Plan for Smallholder Dairy Development in Asia;⁵⁹ these include the technical interventions that should enhance capacity and knowledge, productivity and competitiveness, and market access.

Table 1: The pillars supporting dairy development

Human resource development and knowledge management	Improving productivity and competitiveness of smallholder milk producers	Strengthening linkages between farmers and consumers to deliver a quality product at a fair prices through:
<ol style="list-style-type: none"> 1) Skills training 2) Effective M&E of sectoral development 3) Support for regional collaboration in knowledge management through a smallholder dairy network. 	<ol style="list-style-type: none"> 1) "Menu of options" for dairy development models 2) Selecting dairy development models appropriate for local conditions; 3) Assist smallholder dairy sector to compete for resources 	<ol style="list-style-type: none"> 1) Improving farmer access to marketing channels; 2) Strengthening price incentives to deliver quality milk; 3) Creating competitive supply chain conditions; 4) Creating fair and transparent pricing systems; diversifying the range of products on offer; 5) Educating consumers on the nutritional benefits of dairy products; 6) Stimulating consumer demand; and 7) Reducing loses in the supply chain.
<p>Government & Business Enabling Environment</p> <ul style="list-style-type: none"> •Supporting a smallholder inclusive policy framework; •Creating a legal and regulatory framework conducive for smallholder development; •Supporting the development of a favourable macro-economic framework. 		

⁵⁸ The meeting took place in Bangkok in November 2008 and was attended by approximately 40 experts from the region. Further documentation on the meeting and participants can be found on the APHCA website: http://www.aphca.org/workshops/Dairy_Workshop/Strategy.html. More details can also be found in the workshop publication, "Practical Considerations in Designing Strategies and Policies for Dairy Sector Development".

⁵⁹ See website above.

But the identification of specific supportive activities shaping the broader context for intervention should be preceded by a development process that identifies the vision, goals, policy objectives and means of achieving these objectives. While commodity development can occur in a policy vacuum, driven primarily by economic, social and cultural factors, the broader development issues related to balanced growth, in particular smallholder inclusion in the process, and poverty alleviation through dairy development necessitates a very strategic planning process.

Implementing an effective dairy development planning process

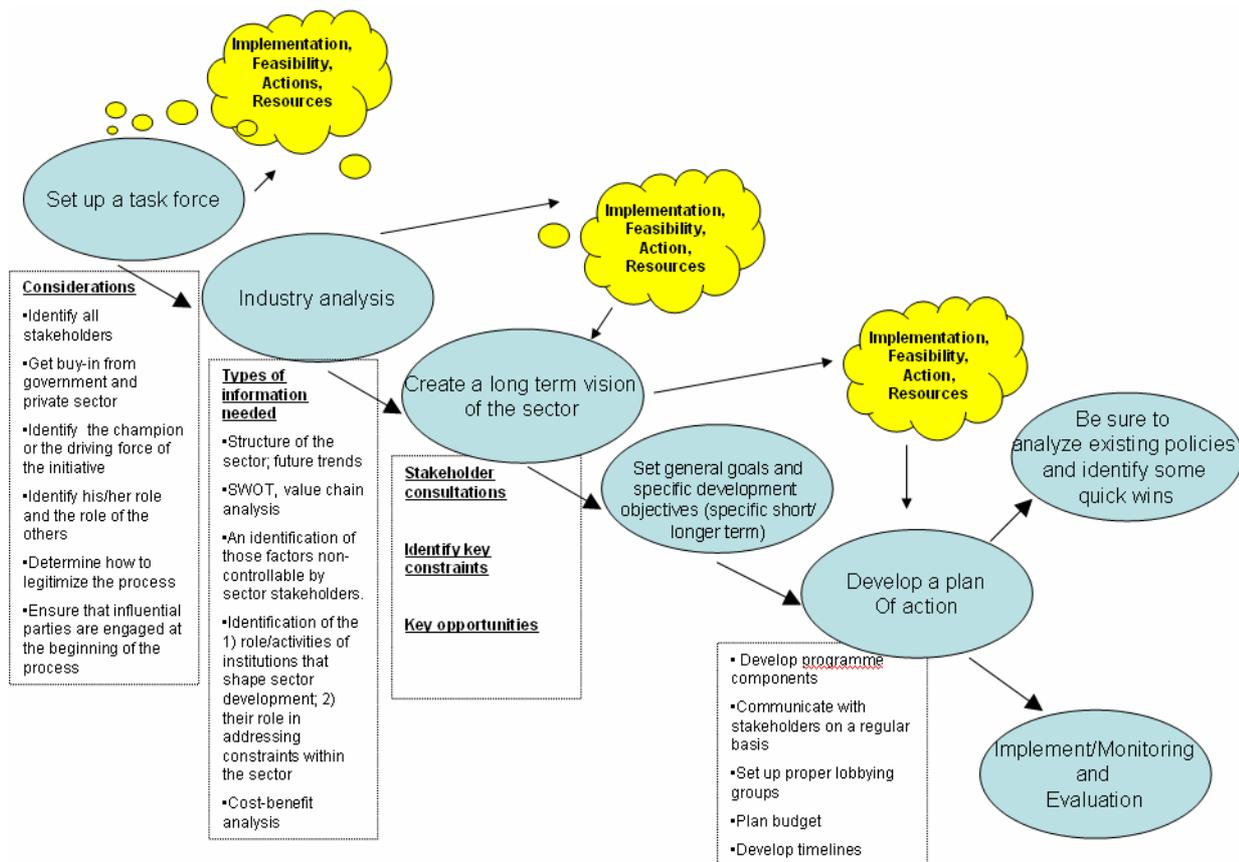
Many countries around the region have designed dairy development plans and strategies with many including a dairy focus within a broader livestock sector plan, such as Bangladesh (2007), Nepal (2007), Pakistan (2007) and Sri Lanka (2007). Some had designed dairy-specific plans, including the Philippines (2008) and Assam, India (2008). While some are operational, others, despite good intentions, are not being implemented because of a lack of strategic planning in the development process and a lack of consistent focus on implementation requirements, such as financing.

To provide better policy guidance to governments and dairy stakeholders in the region, participants at the 2008 technical meeting identified the following good practices in sector planning:

1. **A stakeholder driven process** that involves consultation and political dialogue and engagement. The diverse nature of stakeholders along the dairy chain and their differing priorities needs to be considered when identifying and prioritizing strategic goals and objectives for sector development.
2. **The setting of clearly articulated measurable objectives** within the longer-term vision and goals for the sector. While the vision in many countries is focused on the development of an enterprise-based sector, it can also, depending on the context, recognize different production and marketing systems and include a pro-poor focus. Strategic objectives need to be prioritized and identified as those focused on short-term outcomes and those that require long-term planning.
3. **Private sector-led orientation** that encompasses a focus on the entire value chain. This builds private sector buy-in to the process, thus ensuring viability and sustainability. But it also necessitates a good public perspective that draws into the process development priorities such as poverty reduction and environmental sustainability.
4. **Consistency** with previously agreed national plans and policies.
5. **A clear focus on implementation challenges**, with mechanisms built into the process to identify quick wins and to ensure that adequate resources are attached to various objectives. It also builds in a clearly articulated and time-based monitoring and evaluation system.
6. **A recognition that many of the specific solutions to constraints to sector development are outside the mandate of stakeholders**, including policy-makers, in the livestock sector. This includes policies influencing international trade flows, banking regulations, allocation of research and development funds, etc. These policies and regulations need to be analysed in terms of their impact on stakeholders in the dairy sector and advocacy needs to be developed to influence those policies.

Participants in the 2008 technical meeting also devised a generic approach for sector planning (Figure 1). They agreed that broad stakeholder participation, including input from smallholders, was needed to identify a sector vision and goals that are credible and achievable and generate support among the private sector.

Figure 1: A generic approach for dairy development planning



A key priority in the strategic planning process is to identify and revisit the opportunities and constraints to implementation. The effectiveness of the plan needs to be linked to a clear recognition of resource availabilities/constraints (both human and financial), to demonstrated stakeholder commitment, particularly on the policy level and by private sector, and to an action plan accompanied by a specific time frame. Under the dynamic efforts of a respected champion⁶⁰, it needs to be integrated into broader planning initiatives of the government.

⁶⁰ A champion is someone who provides leadership and ownership of the planning process. It can be a person or an institution but should, most likely, be part of the political process.

Box 1: Factors critical to strategy implementation

- *A prioritized action plan that clearly articulates responsibilities, time frame and benefits of the plan.*
- *The plan has to be realistic and practical – not a wish list of programmes and projects.*
- *Quick wins of the plan are identified and publicized, such as activities that can be successfully implemented in the short term. This could possibly consist of quickly piloted local (rather than national) interventions.*
- *Champions at different levels. Perhaps the chief champion is the head of a dairy board; she/he must then identify and set up a multisector, multilevel champion network that is characterized by partnership and commitment.*

The dos:

- *Ensure flexibility to adopt the strategy to changing market conditions. This requires considerable research and understanding of the sector and necessitates a feedback mechanism for stakeholders and an active monitoring and evaluation system.*
- *The strategy should be widely communicated to the general public, through Web sites and advertising.*
- *Ensure that an executive summary of the plan is available that includes an assessment of actions to be undertaken, with costs and potential impact (both qualitative and quantitative). This summary should include a comprehensive budget as well as a hypothetical impact analysis of interventions.*

The don'ts:

1. *Rely only on public sector or individual ownership.*
2. *Assume that the development of the strategy document is the end of the process.*

What can go wrong:

- *Changes in the implementation environment, such as a shift in government, changing priorities or loss of a champion.*
- *Price instability, animal disease, food safety scares that change the competitiveness of the market.*
- *Policy changes that have a detrimental impact on the sector, such as regional trade agreements, with specific provisions that disadvantage the sector. If, however, the strategy is well developed with strong support by champions, this provides the sector with more leverage in terms of advocacy.*

The need for effective monitoring and evaluation:

- *A baseline of indicators needs to be set up, generated through the analysis stage of the planning process. Bottom-up monitoring needs to be undertaken, with the specific objective of capturing the impact of interventions.*
- *Monitoring needs to be undertaken periodically, measuring pre-determined indicators, and should be done at the programme/project level (see Box 2).*
- *A specific time frame for monitoring needs to be agreed upon and supported by the network of champions.*

Policy objectives, the mechanisms for implementation and their impact

Participants along the dairy chain often have conflicting interests and objectives. Consequently, the planning process needs to be supported by considerable knowledge about stakeholder concerns as well as a broad understanding of available tools and their ability to achieve policy objectives.

An assessment of stakeholder priorities generates a series of policy objectives. These are specific statements detailing the desired accomplishments or outcomes of a development plan. Whereas the goal of a dairy development plan might be to “contribute to national economic development by commercially, qualitatively

and competitively developing the dairy sector for employment generation and poverty reduction with the participation of government, cooperatives and private sector” (Nepal, 2007), the development objectives would be more specific.

Specific examples of development objectives for the dairy sector could include: i) a reduction of imports; ii) increasing on-farm productivity and ensuring food safety; iii) enhancing nutritional status of children through milk consumption; iv) raising on-farm incomes; v) reducing post-harvest losses; and vi) ensuring fair prices for quality milk products. The effectiveness of plans that incorporate these types of objectives, assuming the availability of well-designed baseline studies, can be measured. This contrasts to more vaguely worded goal statements, such as enhanced food security, sustainable development, poverty alleviation, etc.

The key distinction: the goal is a statement of intent and an objective describes an achievable and quantifiable target or deliverable. Good objectives should:

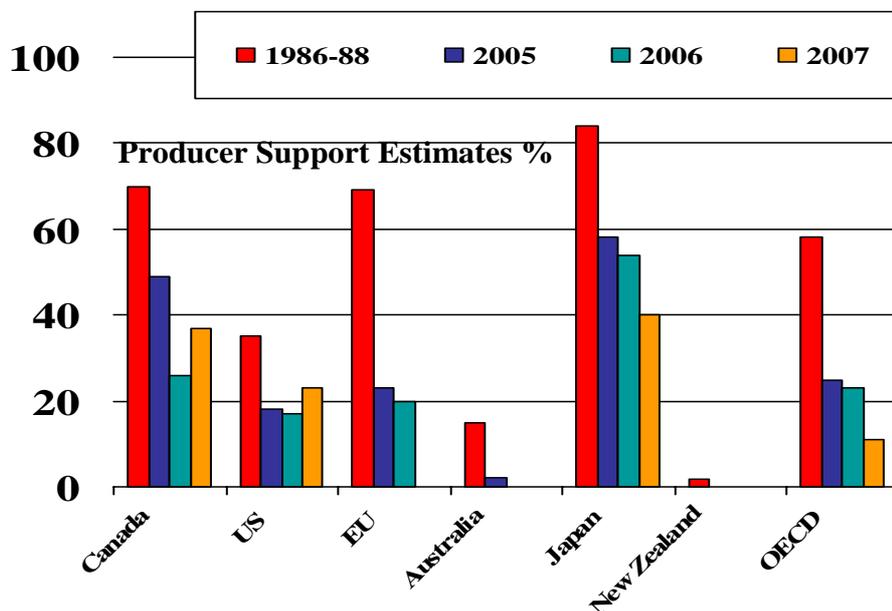
- be impact-oriented, measurable, time-defined, specific and practical;
- relate to the expectations and requirements of all major stakeholders;
- cover a balanced variety of expectations – economic, social, cultural and environmental.

When assessing the objectives to be achieved through a dairy plan, the menu of options for implementation or the policy tools/measures need to be considered. In most developed countries, the policy objectives of very complex programmes and plans are quite simple: to support milk producer prices and/or incomes. The mechanisms for achieving these objectives, however, can be extremely diverse, with the selection of policy measures having i) differential impacts on the many stakeholders along a chain; and ii) cost implications, particularly as consumers and the government typically finance these interventions.

Examples from developed countries: Achieving dairy policy objectives

Developed countries have a long history of supporting local dairy industries through policy tools that include regulated or administered prices, high tariffs or production controls/quotas, such as those in the EU and Canada that limit production increases. All of these policy interventions are designed to ensure objectives of stable and high producer incomes. The significant support for this sector, relative to other sectors, may be related to the characteristics of the product, such as the perishability of milk and dairy products, seasonable production patterns and need for further processing. In addition, dairy farms in developed countries (and in some developing countries) tend to be less diversified and more dependent on farm income than other farm operations (Economic Research Service, 2004).

Figure 2: The dairy sector in OECD countries is heavily supported



The larger degree of support can be best assessed through measurements of sector inputs, as calculated by the OECD⁶¹ (Figure 2). These producer-support estimates (PSEs) reflect the total value of production from government interventions, such as the use of price supports, trade measures (Tariffs/export subsidies) and more generalized government input, such as direct payments. The total value of support afforded dairy sectors in OECD countries two decades ago totalled almost 40 billion euros, approximately 20 percent of the total agricultural support of 217 billion euros. At that time, the PSE, estimated at 58 percent, exceeded all other commodities except rice (80 percent).

Since then, support has declined, mainly in the EU, which accounted for transfers of almost 20 billion euros to their sector in 1986. OECD estimates for 2006 and 2007 indicated that support dropped to 18 billion euros in 2006 and to only 10 billion euros by 2007. High prices in global markets led to policy changes in the EU, which reduced government support to the sector, particularly with the use of interventions stocks and export subsidies as a means to stabilize prices. As global prices in 2008 move down, this trend of not supporting the sector may reverse itself.

In the EU, government stock-holding linked to dairy export subsidies allows for an assurance of relatively stable prices. However, as the structure of the dairy sector evolves, as milk markets become national in scope (driven by advances in transportation and processing technologies) and as dairy farms become more specialized, the impact and cost of policy tools need to be evaluated against their original objectives.

The case of North America

The dairy sector in the United States benefits from policy support through interventions including complicated price supports for milk used for manufactured dairy products, classified prices, marketing orders, income compensation and export subsidies. The Canadian system adds supply management, high tariffs and direct subsidies to producers. In the case of the United States, a study (Economic Research Service, 2004) evaluating the impact of dairy programmes on markets indicated that the effects are modest, and dairy programmes, while increasing costs for consumers and government, had only a limited impact on enhancing long-term viability of the sector or producers.

Australia's dairy deregulation process

In Australia in the late 1990s, the Government and the industry recognized that sector development was constrained by support policies put in place in the 1970s (Harris, 2008). Consequently, an industry reform plan was proposed with the objectives of: i) ensuring competitiveness in international markets; and, ii) avoiding a WTO challenge to the legality of policies. A system of policy measures, such as price pooling and underwriting of guaranteed returns, government controlled marketing arrangements, restrictions on interstate trading of milk and producer-subsidized exports, was abandoned. The consultative process consequently subjected all dairy-supporting policies to a regulatory review process and, eventually with the support of a A\$2 billion (US\$1.6 billion) industry-restructuring package, moved towards full deregulation of the sector. A clear result of these policy reversals was an increase in the scale and productivity of Australian dairy farms and a more competitive, export-oriented industry.

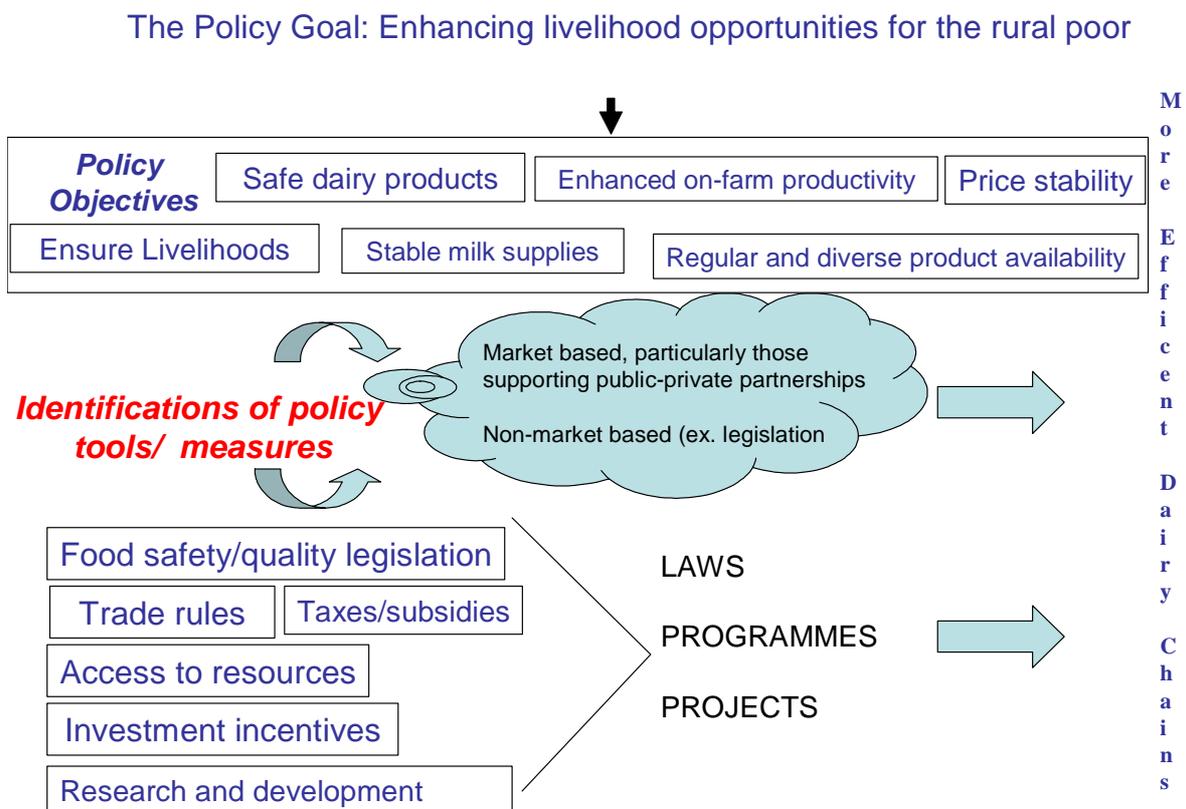
This cursory review of dairy policies in developed countries shows that sector-specific policy objectives and the measures employed to achieve them need to be clearly formulated and periodically reviewed. As sectors transform and witness structural adjustment in production and marketing systems, this process ensures that policies foster the transformation of the industry. Adhering to decade-long policies can limit the ability of sectors to enhance their competitiveness through restructuring, thus penalizing producers who are innovative at the expense of those who maintain high cost-inefficient operations.

⁶¹ The Organization of Economic Cooperation and Development

Evaluating dairy policy objectives and possible responses in developing countries

Successfully achieving ambitious policy objectives, as in the case of developed countries, can be hugely expensive – depending on how measures and programmes are implemented. In developing countries, given financial constraints, dairy policies that involve direct support to industries are not so prevalent. The nature of government interventions varies significantly across the Asia region, as revealed in the lessons learned studies. There is strong government support in China and Viet Nam, which have used government-financed credit schemes to encourage the distribution of improved breeds. This has had a significant impact on sector development. However, the success stories are complicated and not widespread. The nature of dairy production provides important sources of daily cash and nutrition to a large proportion of rural producers; in addition, the sector offers important opportunities for employment creation in rural communities. This implies that governments need to be careful and strategic in their intervention selection.

Figure 3: Dairy development planning



Stakeholders along the dairy value chain have very diverse priorities. Table 2 refers to the broad categories of stakeholders; the contextual nature of dairy, particularly in Asia because of its diversity, generates a multitude of different categories of consumers, and producers have different priorities. Whereas a landless owner of a cow in India prioritizes dairy access to milk for his family, a more commercialized farmer in the same region may be concerned about getting a fair price for a quality product.

Table 2: Priority objectives of different stakeholders along the dairy value chain

Consumers	Processor	Trader	Producer
Safe dairy products	Better milk quality	Reduced cost of transport Protection of the raw milk market	Access to quality services (either publically or privately provided)
Product value for money	Increased access to markets (domestic and export)	Minimize competition with imports	Fair pricing for quality products
Variety of products	Input into policy/advocacy	Input into policy/advocacy	Stable farm income/and reduced income risks
Nutritional products	Optimizing plant capacity	Expand and diversify operations	Access to milk for home consumption
Readily available	Stable milk supplies	Stable milk supplies, regular access	Increased productivity of animals
Properly labelling and packaged	Assured access to quality inputs	More formalized market role	Availability to quality inputs

While there are some commonalities in the objectives of the stakeholders, in many cases the policy instruments used to achieve the objectives can differ in terms of their impact on the stakeholder. For example, a fair price is defined very differently by different stakeholders. Pricing policies that favour one stakeholder over another, such as setting the price of milk without consideration for costs of production for producers, has both short-term implications (farmers will reduce or stop new investments) and long-term impacts (the prices will go up because of supply constraints and shortages of cattle in the long run). This was the case in Pakistan in 2007 when, in the context of rising food price inflation, a milk price ceiling was enforced in Karachi.

The policy instruments

The enabling environment for dairy sector development, particularly one focused on scaling up operations, hinges on clearly articulating policy objectives and on identifying the appropriate tools for achieving them. In developed countries, the use of certain policy instruments has had a differential impact on different stakeholders. Direct support to producers involves government/taxpayer costs, high tariffs on imports raise costs to consumers and supply restrictions limit industries' ability to respond to changing global demand for dairy products. Similarly, the Karachi case highlights the importance that decisions by governments, in particular the choice of measures or tools that they use to achieve their sector objectives, be implemented with a broader understanding of their direct and indirect impact on stakeholders.

Policy measures can be broken down into three broad groupings: i) those that require legislation and regulatory follow-up; ii) those that facilitate institutional strengthening. These include the development of commodity associations or boards,⁶² targeted grants for research and development, facilitation of credit to dairy chain stakeholders, etc. And iii) those that are classified as market-based incentives provided by government through public-private partnerships. These could include government-financed grants for private sector research, pro-poor start-up costs for private sector veterinarians interested in working in remote areas, and co-financing of animal insurance schemes.

⁶² A board is occasionally a parastatal organization linked to government that assumes some type of regulatory, oversight role in industry development whereas a commodity association is more representative of broader stakeholder interests and serves more of an advocacy role for the sector. The establishment of commodity bodies requires a clear legal basis recognizing their existence, role and authority.

Table 3: Linking policy instruments to direct impact⁶³ on various chain stakeholder

Policy instruments/impact on	Consumers	Processors	Traders	Producers	Controlled by livestock stakeholders
Food safety/quality legislation					
Dairy product hygiene	++	+/x	?	+	No
Feed safety	+	+/x	+	+	No
Labelling/packing regulations (which includes product definitions)	++	+/x	x/+	-	No
Licensing (plants, traders)	-	+/x	x/+	+	No
Certification of product standards (such as HACCP)		+/x	x/+	-	No
Trade legislation					
Competition policies (anti-monopoly rules)	-	+/x	?	?	No
Tariffs on dairy products (lower)	++	x/+	x	x	No
Tariffs on inputs (lower)	-	+	-	+	No
Special safeguard mechanisms	x	+/x	+	+	No
Other legislation					
Restrictions on inter-regional trade	x	x	+	+	No
Tax rebates/credits on investment (foreign/domestic)	-	+	-	+	No
Subsidies on inputs, other factors of production	-	+	-	+	No
Land tenure, access to water and other resources	-	+	-	+	No
Food vouchers for the poor	++	+	-	-	No
Legal recognition of supply/marketing contracts	-	+	-	+	No
Legal recognition of commodity associations	-	+	+	+	No
Decentralization of livestock services		-	+/x	+/x	No
Institutional support					
Trade/export facilitation	-	+	+	+	Yes
Cost-sharing on generic promotion of milk	-	+	+	+	Yes
Credit guarantees for market participants	-	+	+	+	No
Research and development; this could include one-off grants to private sector	-	+	+	+	No
Establishment of commodity bodies	-	x	+	+	Yes
Financial support to school milk programmes	++	+	+	+	
Market-based incentives provided by government					
Tax credits/or concessional payments to processors/private sector for services provided by in the areas of: 1. extension 2. artificial insemination 3. animal insurance 4. establishment of milk traceability systems	-	+	+	+	No
Government-financed start-up grants for private veterinary practices in rural areas.	-	+	-	+	Yes

++= very position, += positive, x = negative, - = no impact, x+= negative or positive

A review of possible measures for achieving policy objectives is presented in Table 3. While mainly illustrative and not comprehensive, the table includes possible policy measures as options for achieving the objectives identified by workshop participants as supportive of sector development. The table reveals that some policy instruments are more favourable to the interests of various stakeholders. For examples, food safety or quality legislation that sets milk hygiene standards, which are enforced by ordinances and regulatory inspection at the level of plants and traders, is favourable for consumers concerned about food

⁶³ "To affect or influence, especially in a significant or undesirable manner"; some interventions can have indirect impacts as the policy feeds through the chain, particularly through impact on prices. However, this table addresses the direct impact of the policy measure.

safety of milk products. However, for poor consumers, both in urban areas and those consuming raw milk supplied by traditional markets in rural areas, legislation and the way that it is enforced could have a negative impact on incomes (as milk becomes more expensive because of higher processing costs) and nutrition (if milk becomes less accessible).

Similarly, the impact of this food safety legislation example will have differential impact on processors, assuming that the larger ones who have higher standards will be impacted differently than those who have higher relative costs of compliance to ensure adherence to the new standards. In fact, as indicated in studies in the United States, the introduction and enforcement of higher standards (such as making Hazard Analysis and Critical Control Points-HACCP, mandatory) potentially leads to a consolidation of the industry as smaller firms opt to sell their operations to those with larger operations and larger economies of scale.

Policy responses that seek to control markets through ceiling prices, forcible procurement or direct government involvement in production or marketing activities (in order to ensure food security and access to food) will, in most cases, lower prices and constrain potential output gains. And thus, they will adversely affect producers' livelihoods. Any policy instrument that affects price levels along the chain, from retail price ceilings to supply management systems in Canada and those that link producer prices to the costs of production, have ripple effects along the dairy value chain and affect the long term competitiveness and viability of the industry.

It is also clear that the key role played by government is mainly legislative and regulatory, although government can strategically engage the private sector in market-based solutions that are tailored as a cost-effective alternatives or complements to legislation. Constructively engaging the private sector early in the process through the provision of attractive financial incentives, such as tax rebates and cost-sharing arrangements, is crucial for ensuring the development of the sector. Government should be aware of the private sector's role in addressing many of the problems affecting efficiencies of dairy chains. Supportive private services include targeted extension, animal health, AI services, the facilitation of chain-based financing/credit guarantee schemes, the establishment of traceability and quality assurance services, etc.

**Box 2: “The score card” approach
A monitoring and evaluation system
for the Philippines’ dairy development programme**

Sally Bulatao, Former Chairperson, National Dairy Authority

Monitoring and evaluation (M&E) systems identify the efficiency and effectiveness of a project or a programme. The National Dairy Authority (NDA) of the Philippines adapted a “score card” approach in which there are monthly reports on indicators that address final outputs (milk production, number of dairy animals, etc.) as well as measures of performance based on the Dairy Development Plan (breeding and calving numbers, volume of milk processed, milk sales, etc.).

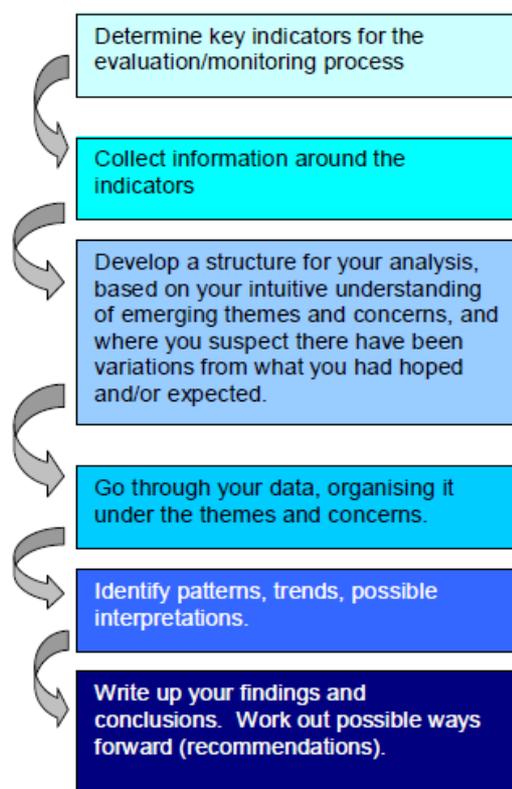
Together with the managers and technical people in the National Dairy Authority, indicators were identified that best capture the results of operations. The indicators had to correspond to the main programme components: herd build-up, business enhancement, quality assurance and school milk provision. The final score card had to fit one page to be readily available for public use. Each of the indicators on the final score card has corresponding subindicators monitored at the field offices. For example, milk production for the month would be on the final one-page score card, but this indicator is supported by subindicators of milk production in different types of farms and linked to areas covered by assigned extension workers.

The M&E system aims to help the agency: i) review progress; ii) identify problems and causes of slack in achieving targets; and iii) make necessary adjustments as needed by resource availability and ground-level feasibility of planned activities. Annual targets are set in a year-end planning conference and reviewed in a mid-year planning meeting. Based on the unit scores, the NDA presents its top-ten achievements in its annual report. Other achievements at the field level are documented in each programme, such as keeping the number of non-milking animals low, ensuring timely payment of animal loans, increasing the number of children covered by the school milk provision through contracts with local governments. On an annual basis, the benefits realized per peso of government funds invested in dairy development are reported.

The subelements of the programme components generate the achieved dynamism. For example, while herd build-up is a mainstay component of the dairy programme, the subprogrammes that tailor animal loans to the industry context drive better performance. One example is the Save-the-Herd (STH) Programme to save dairy animals from being sold outside the dairy zone. This allows dairy farmers who want to sell their animals to pass on the animal to another dairy farmer who enters into a caretaker arrangement with the cooperative or an NDA field office. In the monitoring system, the number of animals under the STH is tracked.

While having consistent programme components, the dairy plan is subject to performance checks through the score card so that annual adjustments may be made to ensure reality-based goals. This process spurs the conceptualizing, designing and packaging of better targeted activities.

Figure 4: Steps involved in monitoring and evaluation (Shapiro, Janet)



Conclusions

Despite declines in 2008, dairy prices remain higher than historical levels. This has induced renewed interest in dairy development in the Asia, particularly in recognition of the nutritional and livelihood importance of milk in rural communities. Nearly 80 percent of the 247 million tonnes produced in Asia in 2007 was supplied by smallholders.

The test for stakeholders in the region is to foster sector growth, one that is inclusive of smallholders, through the development of an enabling environment. This requires generating a sector-planning process that provides a road map for sector development that has buy-in from the private sector and is representative of the priority concerns of stakeholders, large and small.

Most of the policy measures that could support dairy development are not under the control of a ministry or department of livestock. Rather, they are the responsibilities of other ministries, such as commerce, trade, health or industry. This implies that in the development planning process, other stakeholders need to be brought early on into the planning process. As well, a host of other considerations need to play into the decisions on how to support sector development. While socio-equity issues can be reviewed, recognizing that there is a diverse set of consumers and producers, the impact of policies on the environment also needs to be considered.

The challenge is to translate the planning process and final strategy document into a vehicle for action. This requires a comprehensive process that explicitly relates implementation modalities to clear action plans with identified responsibilities of selected champions. The more difficult challenge is to identify policy measures that can effectively respond to policy objectives. Limited by financial constraints, dairy stakeholders need to critically evaluate the potential impact (both human and economic) of policy combinations to determine which are acceptable along the chain – while recognizing the overall vision for sector development. Private sector engagement and endorsement of the process is one of the essential ingredients for success in this process.



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