2

Tropical dairy systems

This chapter:

Introduces the major features of tropical dairy systems and quantifies the development of dairying in South-East Asia and some of the world's large dairy industries.

The main points in this chapter:

- dairying provides a regular income by converting low value forages and crop residues, and using family labour, into a valued market commodity
- unlike in other tropical and subtropical areas of the world, dairying has only become established recently in South-East Asia
- the emphasis in dairy production is changing from rural development to a business-minded approach to farm management
- by 2020, South-East Asia will supply only 25% of its total milk demand, requiring importations of 9 million MT milk/yr
- for fresh milk to remain competitive with the product reconstituted from imported ingredients, farmers should expect to receive no more than the equivalent of US 30 c/L milk
- small holder farmers in Malaysia and Thailand currently receive in excess of US 30 c/L as a base price, whereas those in Indonesia, the Philippines and Vietnam receive less than this threshold milk return.

Geographers have categorised the tropics into four climate zones, with all months warm or hot, and the zone varying with rainfall and evaporation, as follows:

1 rainy (or humid) tropics, with at most one or two dry months and no winter, with the coolest month above 18°C
2 wet and dry tropics, with a well-developed dry season, with one or two rainy seasons

3 semiarid tropical, with light rainfall and high evaporation
4 hot arid, with negligible rainfall and high evaporation.

The humid tropics include parts of equatorial South America and Africa, the Caribbean and virtually all of South-East Asia. The subcontinent of India is not classified as being in the humid tropics.

2.1 Features of tropical dairy systems

Milk is a cash crop for small holders, converting low value forages and crop residues, and using family labour, into a valued market commodity. The dairy industry occupies a unique position among other sectors of agriculture as milk is produced every day, giving a regular income to farmers. Furthermore, milk production is highly labour intensive, providing a lot of employment. Schelhaas (1999) lists four special features of tropical dairying:

1 Because fresh milk is bulky, and highly perishable it requires high-cost transportation which limits how far it can be profitably sold from its point of production. .
2 The vast majority of producers are small scale, with a weak and vulnerable position in the market place. Consequently in many countries, for its initial establishment, the dairy industry has required considerable market protection, for example as an integral part of the country's rural development policy.
3 Cooperatives play an important part in the dairy industry in developing countries where they are mainly responsible for processing and marketing dairy products. Cooperatives also closely involve producers in many aspects of their industry, such as reproductive and disease management.
4 Milk is invaluable as a source of high quality nutrients, particularly for children. Its high cost necessitates its use for making products with are high value added. Consequently the processing industry is far more important in dairying than in other sectors of agriculture, and such operations must satisfy high technical and quality standards.

Tropical dairy production is a biologically efficient system that converts large quantities of the most abundant feed in the tropics (forages) into the most nutritious of all human foods (milk). Forages are produced as a by-product of crop production or as a specific crop in itself. In return, cattle can improve soil fertility through recycling of nutrients (nitrogen, phosphorus, potassium) and organic matter.

The advantages of integrating dairy production in crop systems offers great potential because, compared to pastoralists and agro-pastoralists, these farmers have more control over feed inputs and are able to capture complementarities in feed resource use and nutrient recycling, which increase overall farm efficiency and reduce vulnerability to market shifts. These crop–livestock systems generally support high rural population densities. Intensification is characterised by increasing farm sizes, upgrading of local cattle and buffalo using more suitable dairy breeds and an increasing reliance on purchased fodders and concentrates. Most tropical dairy systems are small holder (with

Small holder farms usually have limited forage production areas. This farm has a well-managed Guinea grass (*Panicum maximum*) pasture (Binh Duong province, Vietnam).

herd sizes varying from 1 to 20 cows) rather than the larger scale operations commonly found in temperate areas.

2.2 Dairying in the humid tropics, specifically in South-East Asia

The humid tropics of America cover areas of Equatorial Central and South America where livestock production is expanding. However, because of difficult access to markets, dairying is less relevant than beef production in these areas. The opposite is true in the wet and dry tropics where dairy development is largely based on dual-purpose cattle production. Like Central America, milk production in Sub-Saharan Africa is considerably lower than production in Asia, due primarily to low human and cattle populations because of more limited irrigation.

There are continental-specific features of dairying in the tropics. In Sub-Saharan Africa, 75% of the milk comes from cattle, which generally graze communal native pastures. In Asia, only 50% of the milk is produced by cattle (the remainder from buffaloes), which are hand-fed grown forages and crop residues. In Latin America, virtually all the milk comes from cattle grazing privately owned improved pastures. The effects of markets override these features of production systems; with the exception of India and Latin America, market-orientated dairy farms are concentrated near or within urban consumption centres.

Although the principles of improved feeding management discussed in this manual can be profitably incorporated into dairying anywhere in the humid tropics, successful examples in this manual will be mainly those from South-East Asia.

Unlike in other tropical regions, milk from cows and goats is not a traditional component of diets in South-East Asia. Rather, the 'milk' people in South-East Asia consumed came from coconuts, not livestock. The origin of dairying lies in the Middle East, 7000 to 6000 BC, and from there, milk consumption spread to the Mediterranean (and Europe), Indian subcontinent, the savanna regions of West Africa, the highlands of East Africa and to some extent South and Central America. Dairy products were also important to the nomads of Africa and Asia.

Since the 1980s, there has been increasing interest in small holder dairying throughout South-East Asia. Higher population pressures and changes in eating habits have increased the demand for dairy products. Many countries now have school milk programs to encourage young children to drink more milk and hence to improve their health through increased consumption of the energy, protein and minerals (particularly calcium and phosphorus) contained in milk. In future, as these children grow and have families, milk consumption will increase at a faster rate. Consequently, many South-East Asian countries are striving towards self-sufficiency in dairy products, at least in drinking milk.

Throughout South-East Asia, small holder dairying was established as part of social welfare and rural development schemes, to provide a regular cash flow for poorly resourced and often landless farmers. Now it is an accepted rural industry and requires a more business-minded approach to farm management. As feed costs constitute 50% to 60% of the total production costs, one method of increasing the cash flow of small holder dairy farmers is to improve the efficiency of feeding management of their livestock. This is the goal of this manual.

The following tables (sourced from FAO data) presents relevant dairy cow data, up to 2004, on national herd sizes and levels of milk produced in eight countries in South-East Asia (Table 2.1) and for comparative purposes, six other countries with large dairy industries (Table 2.2). The average annual percentage change indicates the relative growth of the various domestic industries, while the milk produced annually per head of population indicates the degree of self-sufficiency (or export potential) for dairy products in each country.

The fastest growing dairy industry in South-East Asia is in Thailand (17% per annum) followed by Indonesia (10%), Vietnam (5%), Myanmar (4%), then Laos (3%) and Malaysia (2%). Myanmar has the largest dairy herd (although tropical dairy specialists often dispute this FAO derived data), while in terms of production, Thailand, Myanmar and Indonesia all produce in excess of 500 kt milk/yr. The dairy industry in Cambodia has hardly changed over the last 30 years whereas in Philippines, it has been in decline since 1985.

The largest dairy industry in the world is in India with 39 million dairy stock and milk production is increasing at over 4% per year. China's industry is also growing rapidly (10% per year), now producing more milk than New Zealand and Australia, the two major dairy export countries in the world. The major dairy industries in the world often have declining national herd sizes but still maintain a 1% to 3% per annum growth, through increases in per cow production. This can be largely attributed to improved feeding management practices, the principles of which are outlined in this manual.

Table 2.1 Changes in the number of dairy stock (000 head), annual milk production (kt or million L/yr) and milk produced annually per capita (or head of human population) (000 L/hd per yr) for eight countries in South-East Asia

Data are for 1970, 1985 and 2004 and the average annual percentage change was calculated over the 34 years (for dairy stock and annual milk produced only). (Source: FAO data)

Country	Parameter	1970	1985	2004	% Change/yr
Cambodia	Stock (000)	115	96	120	0.5
	Milk (kt/yr)	20	16	20	0.4
	Milk/hd (000 L/hd per yr)	2.8	2.0	1.5	–
Indonesia	Stock (000)	59	208	368	6.2
	Milk (kt/yr)	29	191	580	9.7
	Milk/hd (000 L/hd per yr)	0.2	1.1	2.5	–
Laos	Stock (000)	12	20	30	3.1
	Milk (kt/yr)	2	5	6	3.0
	Milk/hd (000 L/hd per yr)	0.9	1.1	1.1	–
Malaysia	Stock (000)	32	37	83	3.4
	Milk (Kt/yr)	17	19	37	2.4
	Milk/hd (000 L/hd per yr)	1.6	1.2	1.6	–
Myanmar	Stock (000)	495	1,127	1,360	2.4
	Milk (kt/yr)	121	575	543	4.0
	Milk/hd (000 L/hd per yr)	4.5	15.5	10.7	–
Philippines	Stock (000)	5	7	5	–1.2
	Milk (Kt/yr)	12	15	12	–0.4
	Milk/hd (000 L/hd per yr)	0.3	0.3	0.1	–
Thailand	Stock (000)	3	26	240	15.8
	Milk (kt/yr)	3	57	825	16.8
	Milk/hd (000 L/hd per yr)	0.1	1.1	9.0	–
Vietnam	Stock (000)	14	42	61	4.5
	Milk (kt/yr)	11	34	78	5.4
	Milk/hd (000 L/hd per yr)	0.3	0.6	1.0	–

Table 2.2 Changes in the number of dairy stock (000 head), annual milk production (Mt or billion L/yr) and milk produced per capita [or head of human population] (000 L/hd per yr) for six large dairy industries

Data are for 1970, 1985 and 2004 and the average annual percentage change over the 34 years (for dairy stock and annual milk produced only). (Source: FAO data)

Country	Parameter	1970	1985	2004	% Change/yr
Australia	Stock (000)	2,673	1,809	2,052	–0.6
	Milk (Mt/yr)	7,756	6,225	10,377	1.4
	Milk/hd (000 L/hd per yr)	618.7	398.0	594.3	–
China	Stock (000)	511	1,680	6,873	8.4
	Milk (Mt/yr)	0.7	2,589	18,850	10.2
	Milk/hd (000 L/hd per yr)	0.8	2.4	6.7	–
India	Stock (000)	18,575	27,700	38,800	2.1
	Milk (Mt/yr)	8,736	17,500	37,800	4.5
	Milk/hd (000 L/hd per yr)	15.7	22.9	34.3	–
New Zealand	Stock (000)	2,320	2,546	3,841	1.7
	Milk (Mt/yr)	5,986	7,884	14,780	2.6
	Milk/hd (000 L/hd/yr)	2,122.8	2,428.1	3,669.1	–
United Kingdom	Stock (000)	3,304	3,312	2,200	–1.4
	Milk (Mt/yr)	12,971	16,022	14,600	0.2
	Milk/hd (000 L/hd/yr)	232.4	281.7	249.1	–
United States	Stock (000)	12,000	10,981	9,084	–0.8
	Milk (Mt/yr)	53,073	64,930	77,565	1.2
	Milk/hd (000 L/hd/yr)	252.6	267.7	266.9	–

Tropical dairy farming : feeding management for small holder dairy farmers in the humid tropics
By John Moran, 312 pp., Landlinks Press, 2005

Forage maize harvested to feed dairy cows in Guizhou province, China.

2.3 Future demands for milk and milk products in South-East Asia

The demand for milk in South-East Asia is expected to continue increasing, driven by population growth and affluence. Per capita consumption is rising fastest in regions where rapid income growth and urbanisation result in people adding variety to their diets. Because of the relatively high cost of handling perishable final products and taste factors, most of this milk will be produced where it is consumed, aided by increasing imports of feed grains.

Between 1983 and 1997, annual milk consumption per capita in South-East Asia increased from 10 to 12 kg/hd and this is predicted to increase to 19 kg/hd by 2020. This 3% per annum growth will lead to a total milk consumption of 12 million MT/yr by 2020, which Delgardo *et al.* (2003) predicts will require 9 million MT milk/yr net imports to satisfy; this is up from 4.7 million MT milk/yr imported in 1997. Therefore, by 2020, South-East Asia will be producing only 25% of its milk requirements. For these figures, 'milk' is the sum of liquid milk plus milk products in liquid milk equivalent, while the actual consumption of milk as food is less than the total demand for milk because of its use for feeding calves.

This gloomy prediction is magnified by a predicted importation of 8 million MT/yr of cereal grains in 2020 (up from 6.7 million MT/yr in 1997); these cereal grains will be used for all livestock feed, not just dairy stock. Despite this dramatic increase in imports, Delgardo *et al.* (2003) predict that milk prices will actually decrease by 8% between 1997 and 2020. However, it is likely that demands for livestock products will push feed grain prices beyond the reach of many small holder farmers.

2.4 Current farmer returns for fresh local milk in South-East Asia

Unless required to do otherwise for the reasons of good economics, protectionist policies, government support programs and import quotas and tariffs, domestic milk production would need to compete with international milk prices. In the absence of any government support or import restrictions and tariffs (practices which are increasingly being considered by world trade organisations as inappropriate) the benchmark for the value of domestic milk at the factory door is the cost at which it can be produced from imported ingredients at international prices. Sanderson (2004) considers this to be US 28 to 30 c/L, but it could dip as low as US 20 c/L when international prices are their lowest. Therefore in a free market situation, milk processors would not wish to pay more than this for fresh local milk.

What do small holder dairy farmers in South-East Asia currently receive for their product? Table 2.3 compares the current milk returns in local currency units with its equivalent to US 20 and 30 c/L, the range of milk prices suggested by Sanderson (2004). Appendix 3 summarises the currencies of various South-East Asian countries in February 2005. The current milk returns are base prices for fresh milk in each country, prior to the inclusion of premiums or penalties for milk composition and quality. The final column presents current milk returns in US c/L.

Table 2.3 Fresh milk prices in February 2005 in local currency units (from Appendix 3) for various South-East Asian countries and their equivalent for US 20 and 30 cents/L

Country	Currency unit	Current milk price	Equivalent to US 20 c/L	Equivalent to US 30 c/L	Current milk price (US c/L)
Indonesia	Rupiah (Rp)	1720	1840	2763	18.7
Malaysia	Ringgit (MR)	1.23	0.76	1.14	32.3
Philippines	Peso (Ps)	14.0	11.0	16.4	25.6
Thailand	Baht (Bt)	12.0	7.9	11.9	30.3
Vietnam	Dong (VND)	3200	3170	4740	20.2
Australia	Aust cents	28.0	26.0	39.0	21.5

Only in Malaysia and Thailand are milk prices above the US 30 c/L threshold whereas all countries in Table 2.3, except Indonesia, have local fresh milk returning at least US 20 c/L.

The evolution of free trade policies between South-East Asian countries and those from which they import dairy products means that producers may have to expect unit price milk returns to fall even further as removal of trade barriers reduce the price of imported dairy products. Unfortunately since there is little difference in the nutritional or sensory properties of the various milk products made from either fresh or recombined milk, milk processors are unlikely to pay high premiums for fresh raw milk.

Milk prices are usually set by processors with some input from government and after lobbying from producers. Farmers are rarely happy with the milk price and consumers complain about the high cost of dairy products. However, in each country the industry continues to develop, often with the impetus of government school milk programs. There are always some dairy farmers leaving the industry and there may be temporary downturns in milk supplies, such as during the 1997/98 Asian economic crisis. However, as shown in Table 2.1, dairy farming is a growth industry in most South-East Asian countries.