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An Overview of Trends and Developments in the Thai Dairy Industry

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Thomas D Murphy and Clem Tisdell

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'The overall goal of this project is to develop and evaluate the .necessary tools to provide decision-makers with reliable animal health information which is placed in context and analysed appropriately in both Thailand and Australia. This goal will be achieved by improving laboratory diagnostic procedures; undertaking research to obtain cost-effective population referenced data; integrating data sets using modern information management technology, namely a Geographical Information System (GIS); and providing a framework for the economic evaluation of the impact of animal diseases and their control.

A number of important diseases will be targeted in the project to test the systems being developed. In Thailand, the focus will be on smallholder livestock systems. In Australia, research will be directed at the northern beef industry as animal health information for this sector of livestock production is presently scarce.'

For more information on *Research Papers and Reports Animal Health Economics* write to Professor Clem Tisdell (c.tisdell@economics.uq.edu.au) or Dr Steve Harrison,(s.harrison@uq.edu.au) Department of Economics, University of Queensland, Brisbane, Australia, 4072.

An Overview of Trends and Developments in the Thai Dairy Industry

ABSTRACT

The remarkable growth of the dairy industry has been one of the more significant developments in the Thai livestock industry in recent years. Milk has never been an important product in traditional Thai society. Prior to the 1960s imports satisfied the small urban demand that existed for milk products in Thailand. However, over the last two decades, strong government support and increased growth in the economy, population and tourism has stimulated domestic demand for dairy products in Thailand. Commercial production of dairy products increased more than 500% between 1982-1992 and continues to be driven by high demand. While demand is strong, the ability of the Thai dairy industry to supply the growing levels of domestic demand for dairy products has been constrained by several factors. Improvements in the management, marketing, breeding and disease control practices of Thai dairy producers are necessary if the national objective of milk self-sufficiency is to be achieved.

Keyword: Thailand, livestock industry, dairy farming,

JEL Classification: Q16, Q12

An Overview of Trends and Developments in the Thai Dairy Industry

1. Introduction

A significant change in the Thai livestock industry in recent years has been the development of the domestic dairy industry in Thailand. The Thai dairy industry, assisted by strong levels of government support, has developed over the last ten years to help meet a growing consumer demand for milk products in Thailand. This recent growth in demand for dairy products is indicative of changing trends in Thai consumption patterns over the last two decades. Substantial economic growth and cultural change in the South- East Asian region has resulted in increased demand for income-elastic, non-traditional livestock products such as meat and milk (Instate1993). While expansion of the Thai dairy industry is expected to continue with the rapid economic and population growth of the country, Thailand's ability to supply rising national and regional demand is limited by several factors. Elements of traditional Thai culture, poor technical and marketing capabilities and endemic livestock disease, have all served to hinder progress toward the national objective of self-sufficiency in dairy products. This paper outlines the nature and development of the dairy industry in Thailand and reviews the factors that constrain Thailand’s ability to meet national and regional demand for dairy products.

2. Development of the Thai Dairy Industry

Milk was never an important product in traditional Thai society. Cattle and buffalo used in traditional Thai farming were not dairy breeds and were predominantly used for draught power. The small level of urban demand that did exist for milk products prior to the 1960s, was satisfied by imports. However since the 1960s, the Thai dairy industry gradually developed to become one of the fastest growing livestock sectors in the 1990s. Over the last thirty years, Thai government programs have helped to stimulate production of dairy products, while rapid economic, population and tourism growth have increased consumer demand for these products. This growth is expected to continue. The early development of the dairy industry in Thailand was hindered by traditional husbandry practices and consumption patterns. Consumption of dairy products in Thailand was low, particularly in

rural regions, because of culturally related dietary factors.

2.1 Milk consumption in Thai society.

Despite the recent growth in demand for dairy products in Thailand, the country's consumption of dairy products is still relatively low compared to other Asian countries. Thailand's comparatively low level of domestic consumption is highlighted further when compared to consumption levels in Western countries. Calder (1992) in discussing dietary statistics for Australian and Asian countries (listed in Table 1), points out that a large part of the protein levels for these countries is from red meat while the calcium levels are predominantly derived from dairy products. As Table 1 indicates, Thailand's relatively low intake of calcium compared with other countries of South-East Asia and the Pacific, reflects its traditionally low level of milk consumption.

Table 1 Daily intake of dietary components in Asian countries

Countries	Calories	Protein	Calcium
Australia	3226	100.7	1042
Japan	2858	88	559
Singapore	2854	79.2	536
South Korea	2875	78.4	431
Malaysia	2723	61.3	342
Indonesia	2513	53.4	229
Thailand	2328	48.9	219

Source: Calder (1993, p. 15)

Historical, cultural and dietary factors explain Thailand's traditionally low level of milk, consumption. Crotty (1980) described the absence of milk from the predominantly rice based diet of the South East Asians largely in historical and geographical terms. In his review of South East Asian livestock, Crotty (1980) noted that unlike the pastoralists of Africa and other Asian societies, the people of the Far East never acquired the genetic characteristics of lactose tolerance. The mass of China effectively excluded penetration by pastoralists from the north, the Himalayas barred penetration from the northwest, and India lay between the

pastoralists of South West Asia and the crop growers of the Far East (Crotty 1980). Limited pastoral resources therefore were used to produce draught power and meat, while milk was considered unwanted and an economically unimportant product.

For many South East Asian societies, exposure to milk products occurred with colonisation. Unlike countries such as Malaysia and Singapore, Thailand was one of the few Asian nations which was not colonised by western powers. The 'colonial legacy' in the domestic production and consumption of dairy products was therefore absent in Thailand (Instate 1993).

Given many of the traditional constraints on Thai milk consumption, Thai government programs over the last thirty years have been aimed at supporting a domestic dairy industry and promoting the production and consumption of milk commodities. Given this support and the substantial growth in the economy, population and tourism, a gradual expansion in the Thai dairy industry has occurred.

2.2 Development of milk production in Thailand.

As noted previously, prior to the 1960s domestic milk production in Thailand was negligible. However, in the last thirty years, a commercial dairy industry has developed in Thailand. The commercial production of dairy cattle in Thailand begun with the establishment of the Dairy Farm and Herd Training Centre, established with the aid of the Danish Government in 1962. Government promotion of milk consumption and self-sufficiency programs continued during this time, and this helped to generate a slow and steady increase in demand throughout the 1970s. The limited degree of success in these programs was due to the high cost of locally produced milk relative to recombined milk made from imported products (ADC 1993). Restrictions were therefore introduced in 1982 on the import of fresh milk and milk powders (ADC 1993).

Production was developed through the establishment in 1971 of the Dairy Farming Promotion Organisation (DFPO) of Thailand, a state owned enterprise under the Ministry of Agriculture and Cooperatives (O.A.E. 1992, p.l53). This organisation was charged with developing the local market for milk products and with promoting on-farm milk production (ADC 1993). The DFPO also acts as the major collection agency for local raw milk production and produces finished milk products for retail sales in competition with other suppliers (ADC, 1993 p. 3). Commercial production has developed mainly in the provinces of Chiangmai, Nakom Pathom, Ratchaburi and Saraburi.

2.2.1 Economic development, elasticity of demand and composition of demand

The commercial production of dairy products has been stimulated by dramatic economic and social changes in Thailand and the South-East Asian region over the last few decades. Between 1985 and 1992, Thailand's GDP rose on average by 9% p.a. This made Thailand one of the fastest growing economies in the Pacific Rim with the fastest growing industries in its economy being manufacturing and tourism. Foreign tourism in Thailand can be expected to influence Thai tastes in favour of western food.

Gradual changes in traditional diets in developing countries such as Thailand (see Murphy and Tisdell1995a) occur with rising levels of GDP and standards of living in. Normally foods such as grain, meat and dairy products are substituted in the diet for rice, vegetables and fish (Calder 1993, p. 14).[1]

"In developing countries, urban middle and upper classes will cause a certain growth in the demand for sophisticated foodstuffs. Much more important however will be the rise in demand for simple foodstuffs such as ...unsophisticated dairy products," (OECD 1992, p. 57 cited in Instate 1992).

In 1984, the US Department of Trade found high income elasticities for food between 0.5 and 0.6 in lower income countries (including Malaysia, Thailand and the Philippines) and very low elasticities in advanced developing countries (Instate,1992. p12).

Increased demand for dairy products is expected to continue, not just in Thailand but for Asia in general. The FAO has forecasted that in Asian countries, the converging forces of demand from high income groups and the general increase in demand arising from ordinary process of economic development will result in a sustained increase in food demand in the region. While the per capita consumption of meat has been forecast to increase form 5kg in 1983 to 9 kg in the year 2000, milk consumption per head has been forecasted to increase from 34 kg to 39 kg (OECD 1992 cited in Instate 1992). Therefore, similar to beef, demand for milk products in Thailand should continue to grow (albeit at a lower rate) given the continued economic growth of the region.

2.2.2 Recent production trends

Because of strong levels of government support and increased population, tourism and economic growth in Thailand, there has been a rapid expansion in local milk production since the early 1980s (See Table 2/Figure 1). The ADC (1993) reports that in 1982 Thailand had 13,700 cows producing 27,240 tonnes of milk By 1991, the amount of milk produced had risen more than six times to 178,000 tonnes, with domestic herd sizes also displaying similar growth (ADC, 1993, p.3). The ADC reports that around 60% of Thailand's drinking milk is sourced from local production. While considerable growth in production and herd numbers (see Table 2) has occurred in recent years, the average herd size on Thailand's 12,000 farms was reported to be only 6.3 cows in 1993 compared with 104 for Australian farms (ADC, 1993). Yields per milking cow are also relatively low averaging around 10 litres a day (ADC, 1993). Small farms (see Murphy and Tisdell 1995a) result in diseconomies of size for small producers and limited technical know-how and inappropriate dairy breeds contribute to low milk yields in Thailand.

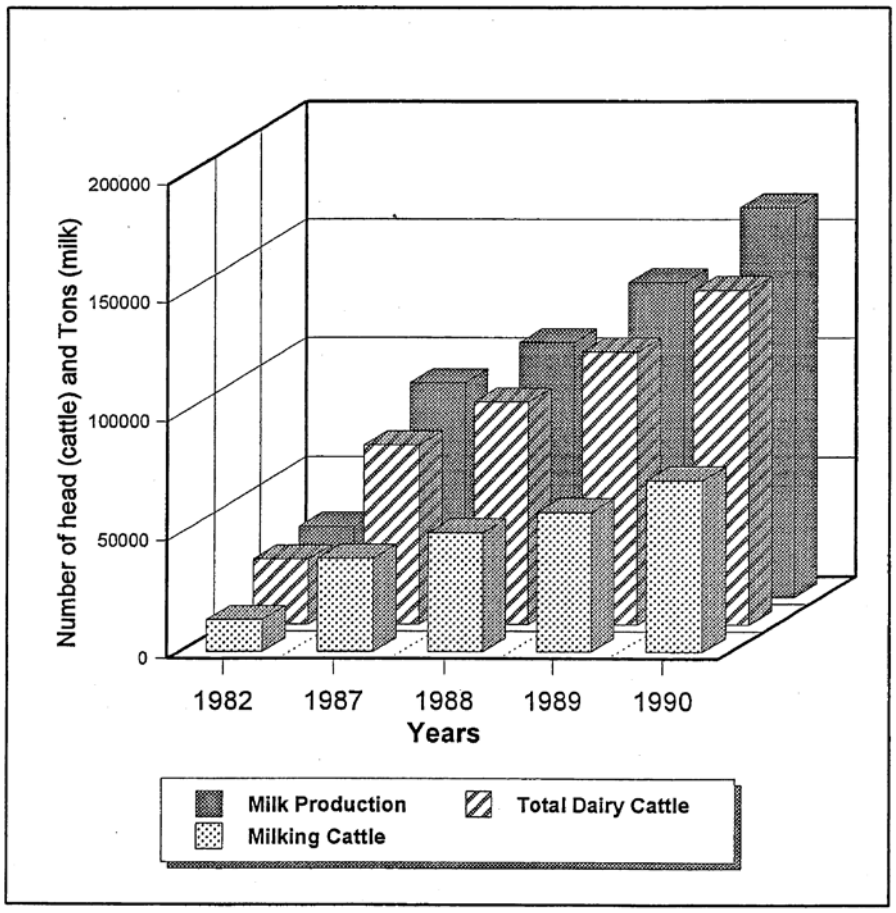
Table 2 Number of dairy cattle and milk production in Thailand: Plan 1 (1961)-1990

NATIONAL PLAN	DAIRY CATTLE (HEAD)		MILK PRODUCTION (Tonnes)
YEAR	TOTAL	MILKING CATTLE	
PLAN 1-4	Na	Na	Na
PLAN 5	27572	13697	29568.96
PLAN 6	75555	39656	89712.75
1988	93417	50353	106708.85
1989	114662	59022	132228.27
1990	140722	72437	163850.66

Source : Office of Agricultural Economics (1992, p. 156)

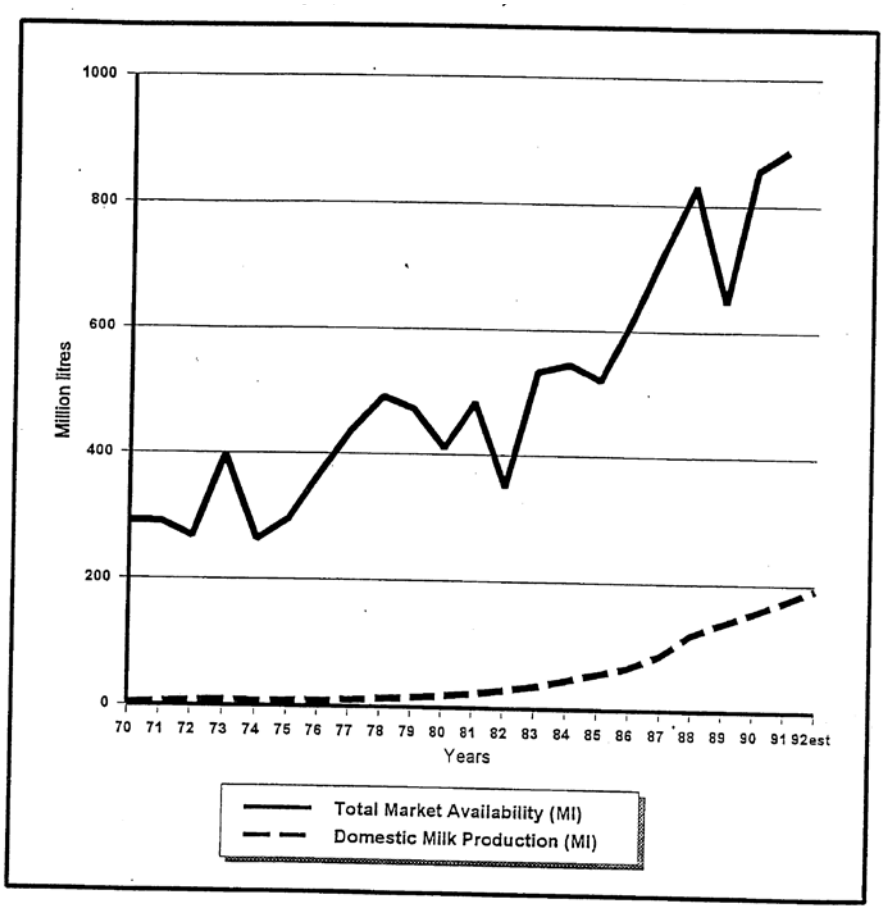
Therefore Thai dairy producers find it difficult to meet rising levels of consumer demand. Approximately half of Thailand’s liquid milk is as fresh milk while the rest is ‘recombined milk’. Milk powder is imported into the country as milk production is currently unable to meet the rising demand for milk generated by the increased population levels and higher standards of living. The statistics recorded in Table 3 and graphed in Figure 2, give a clear indication of the gap between total milk availability and domestic production. Figure 2 provides a graphical illustration of the discrepancy between domestic milk production and total market sales from 1970 -1992.

Figure 1: Number of dairy cattle and milk production unit: cattle (hd) milk (ton)



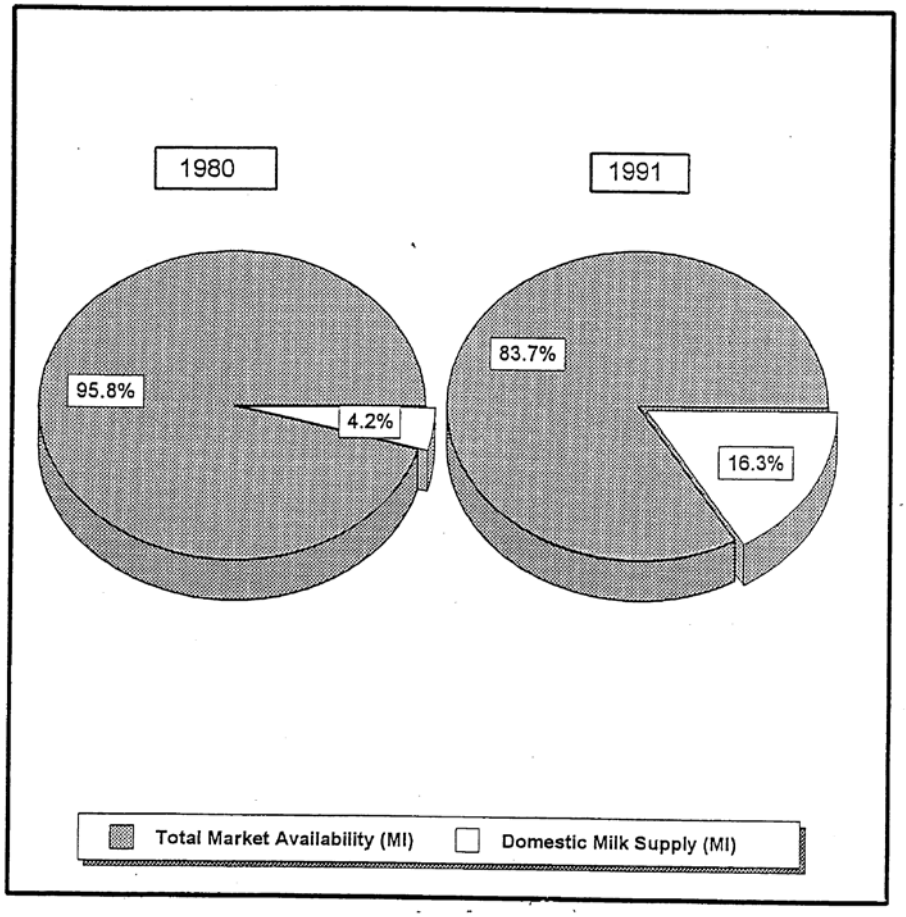
Source: Based on Office of Agricultural Economics, 1992

Figure 2 Domestic milk production relative to total market availability (million litres) in Thailand



Source: Based on Australian Dairy Corporation (1993)

Figure 3 Domestic milk production relative to total market availability (million litres) in Thailand



Source: Based on Australian Dairy Corporation (1993).

Figure 3 indicates the percentage change in the contribution of domestic milk production to total market availability from 1980 to 1991. As can be noted, while the• contribution of local milk production has increased markedly (over 400%) during the last decade and a half, imports still supply the major share to the Thai market (around 80%). While Thailand produces up to 450 tons of milk daily, this is still not enough for domestic consumption. Despite this deficit, Thailand does manage to export a small amount of milk products to Laos, Singapore and Burma.

Table 3 Domestic milk production relative to total market availability in Thailand: 1980-1992. units: million litres (Ml)

Thai Milk: 1980-1992	80	81	82	83	84	85	86	87	88	89	90	91	92*
Total Market Supply (ML)	411	483	350	533	546	521	618	729	831	646	856	887	*
Domestic Supply (ML)	18	22	28	35	45	56	67	87	120	138	155	173	193

Source: ADC(1993)

3. Export and Import of Dairy Products

Thailand's imports of dairy products have risen markedly in recent times to help meet the country's growing level of milk consumption (See Table 4). In 1977, Thailand imported 45,541 tons of dairy products and exported 8,016 tons. By 1990, its imports had risen to 80,586 tons and its exports had increased only marginally to 9,922 tons. Nevertheless, the number of Thailand's dairy cattle has increased more than fivefold since 1982 (from 13,697 head to 72,437 head) and its milk production by a similar margin (see Table 2).

The figures indicate that development of Thailand's dairy industry has as yet been unable to keep pace with its rising demand for milk. The importance of upgrading the quality of Thai domestic stock has resulted in the importation of foreign dairy breeds and breeding technology. In 1988, Thailand imported 4,750 head of dairy cattle of which most were Sahiwal-Fresian crosses from New Zealand with the remainder being Fresians and Holsteins from the United States, Australia and New Zealand. Thailand's semen imports have risen 500% in recent years, reflecting producer interest in upgrading local stock. The main countries from which semen is imported are the United States, United Kingdom and Canada (Beeghly 1990, p. 18).

Table 4 Dairy products: import/export statistics for Thailand 1977-1990

Year	EXPORT		IMPORT	
	Volume (ton)	Value (ml baht)	Volume (ton)	Value (ml baht)
1977	8016	68.29	45541	845.15
1982	10674	207.26	34296	1649.73
1987	25523	457.81	69469	2442.54
1988	13322	258.77	79450	3267.12
1989	8524	231.29	62950	3286.77
1990	9922	285.42	80586	4180.15

Source: Office of Agricultural Economics (1992, p. 156)

3.1 Thailand's dairy import policy

Given the threat that cheaper imports pose for the development of the Thai domestic industry, quantitative and tariff restrictions have been imposed by the Thai government in order to support the growth of the local industry. Imported dairy products are subject to a range of customs duties and other taxes (ADC 1993). Customs duties range from 10% of CIF value for milk powders for infant formulas to 60% for cheese. Such duties have successfully raised prices for local consumers and inhibit growth in demand and sales in particular market segments.

Aside from business taxes levied on imported dairy products, the major factor influencing the dairy trade with Thailand is the local content provision applying to imports of milk and milk substitutes. Importers are bound to purchase a certain percentage of local milk with every import - essentially increasing overall costs for importers. However given the difficulty which Thai producers have in meeting demand for Thai milk products, such restrictions have had to be eased in order to prevent substantial price rises in milk products in Thailand.

4. Constraints on Thai Dairy Development

Despite the dramatic rise in demand for dairy products in Thailand, several factors have constrained the domestic industry's ability to satisfy demand. Currently the Thai dairy industry supplies only 20% of national demand for milk (see Figure 3). Problems associated with marketing, breed and local tradition have hindered the development of the Thai dairy industry in recent years.

4.1 Marketing of dairy products.

A major problem for promotion and development of the dairy industry in Thailand is the economic viability of small-scale dairy producers entering the industry. While dairy cattle and dairy buffalo receive a price premium on average market sales[12] over non-dairy livestock (see Tables 5 and 6), are valuable and can make a worthwhile contribution to household income of livestock owners (see Table 7) (Thurnmabood and Morathop 1993, p. 34), it is claimed that returns 'at the farm gate' are not encouraging small scale livestock producers to invest in or diversify into dairy production. The Department of Livestock and Development in Thailand stated that up to 75% of annual income from cow milk and milk products goes to middlemen. The returns to small scale dairy producers in Thailand have also been reduced by high transport costs associated with the large distances from farms to milk processing plants. Because distribution and particularly refrigerated distribution systems are poorly developed in Thailand, it is difficult to successfully market milk products outside urban regions.

Table 5 Buffalo inventory- breed, number, price and total value of Thai farm buffalo 1992

TOTAL BUFFALO	Percent of farm	BREED (%)		NUMBER OF ANIMALS (Hd) Per Farm average		PRICE (US $) per head	VALUE (US $)
		Local	Improved				
YOUNG STOCK							
Males	19	100	0	2	0.31	170.2	262. 2
Females	20	100	0	2	0.37	178.3	319. 24
ADULT STOCK							
Breeder Bulls	15. 9	100	0	2	0.34	364. 7	709. 4
Draught males	14. 9	94	6	2	0.23	373. 8	620. 0
Dairy cows	5. 6	17	83	2	0.10	396. 6	733. 3
Dry cows	1. 0	100	0	1	0.001	320. 0	320. 0
Draught cows	24. 3	100	-	2	0.50	30. 06	582. 2
Average	100	88	12	2	1.85	276. 0	499. 6

Source: Thummabood and Morathop 1993, pp. 34-35

[2] The average market price for dairy buffalo (cows) is $396,6 and that for dairy cattle (cows) is $791.1

Table 6 Cattle inventory: breed, number, price and total value of Thai farm cattle, 1992

TYPES OF BOVINES	Percent of Farm	BREED (%)		NUMBER OF ANIMALS Per Farm average		PRICE (US$) Per head	VALUE (US$)
		Local	Improved				
YOUNG STOCK							
Males	22.8	16	84	3	0.69	171. 4	691.1
Females	33.7	13	87	3	1.12	237. 4	898.6
ADULT STOCK							
Breeder Bulls	16.8	24	76	4	0.64	416. 9	1702. 9
Draught males	2.3	29	71	8	0.19	232. 0	2152. 0
Dairy cows	14.2	0	100	5	0.78	791. 9	4202. 7
Dry cows	6.6	0	100	3	0.20	814. 1	3625. 9
Draught cows	3.6	30	70	4	0.14	407. 6	1512
Average	100	16	84	4	3.76	375. 3	1686. 5

Source: Thummabood and Morathop 1993, pp. 34-35

Table 7 Annual income from cow milk and milk products of small farmers who raise dairy cows in the rural villages

Items	Dairy cow product
Milk Production	
Dairy Cows (hd)	5
Days in Milk	248
Milk (litre/day)	34
Total Milk	8,432
Milk fed to calves	422
Milk consumption and sale	
Home consumption (litres)	60
Sales (litres)	7590
Price ($/litres)	000.28
Total Income ($)	2,226

Source: Thummabood and Morathop 1993,

Furthermore, Thummabood and Morathop (1993) state that Thai dairy farmers often report lower than expected prices for their milk due to what is claimed to be inaccurate assessments of milk weight and quality by milk collectors. In addition, milk collection is expensive. The high marketing costs incurred by Thai dairy producers makes it difficult for small dairy producers to get adequate returns from investment. Most small farmers do not have enough property or credit to guarantee the-bank loans (Thummabood and Morathop 1993). Government programs implemented by the Department of Livestock and Development (DLD) have attempted to remedy this.

4.2 Traditional breeding practices and technology

The development of dairying in Thailand has been difficult, given that local cattle produce little milk and that Thai fanners have no tradition in keeping milk or in using it in their normal diet. Any milk produced needs to be sold because there is no demand for village consumption. Inherent problems in the Thai dairy industry such as the low level of local dairy management skills and continued ambivalence about the adaptability of purebreds to Thailand's hot, humid climate mean that the country depends on foreign firms and governments to offer technical support (Beeghly 1990, p. 18). Genetic importation (eg.of semen) has been considered a low cost option for Thai farmers to improve their herd capabilities. However, as Beeghly (1990, p. 18) notes, production increases much more slowly than high producing animals are imported, an important consideration for a country in a hurry to remedy its dairy deficit (Beeghly 1990, p. 18).

In order to overcome problems associated with the lack of adaptability of imported dairy breeds to Thailand's tropical climate, livestock institutes in Thailand and South East Asia have undertaken programs for cross breeding buffalo from Indo-China (*riverine* breed) with the native *swamp* buffalo from South East Asia. While the *riverine* buffalo have been selected for milk production for centuries in the Indo-China region, the native South East Asian *swamp* buffalo are predominantly draught animals of little value for milk production. Anon (1995) reported that these cross-breeding programs have resulted in both weight gains and increased milk production.

4.3 Disease control

In Thailand, limited control of endemic diseases such as FMD and mastitis threatened the productive efficiency of the domestic dairy industry. Outbreaks of livestock diseases such as

Foot and Mouth (FMD) in rural Thailand are common. As noted in Murphy and Tisdell (1995a), Leidl (1989) identified some of the major bovine disease problems in Northern Thailand such as haemorrhagic septicaemia, foot-and-mouth disease, trypanosome evansi infection, mineral deficiencies, fasciolosis in swamp buffalo (to a lesser exent cattle) and gastrointestinal parasitism in buffalo calves. The knowledge and methods of diagnosis and treatment of such diseases among local communities and dairy units is still limited, despite developments in the structure and efficiency of animal health control programs in recent times. The loss in stock numbers, milk productivity and potential export markets is the result of ineffective disease control and hygiene conditions. Table 8 provides a qualitative outline of the potential economic losses caused by foot-and-mouth disease.

Table 8 Economic impact of FMD on production

Mortality	Very low in adults in enzootic areas, may approach 50% but very rare and usually with animals no immunity and those stressed from high productivity- it is usually calf mortality that is severe in enzootic areas.
Direct effect on meat and milk production	Effect on meat varies as it delays finishing off fattened animals or delays maturity in dairy animals. Even with compensatory growth there are deterious effects on food conversion efficiency - effects aggravated by mouth lesions which make eating painful, and foot lesions which reduce range of grazing animals. Both of these effects reduce feed intake. Effect on milk is similar and secondary mastitis infections cause more loss of milk then do direct effects.
Indirect effect of FMD on meat and milk production	There is an indirect effect on meat and milk due to infertility ie dairy cows have longer calving to conception interval results in less lactation per year and therefore less milk produced. Production of calves is lower and meat production is reduced.
Restrictions on world trade in meat and meat products	Loss of potential export markets for meat and meat products is an important economic impact of disease. Disease restrictions are used as barriers to imports by countries who import from infected areas. These barriers have led to instability in world beef markets therefore eradication of FMD in exporting countries would lead to more stable export markets in these countries. This would further allow importing countries an opportunity to import an assured quantity of beef at relatively stable prices. Risk and uncertainty is another economic effect as farmers deviate from optimal i.e. closed herd rather than include herds fun outside.
Impact of FMD on development	Disease impacts on the efficiency of livestock production systems that are important for both agricultural development and the general development of most countries. The control of the disease enables other improvements in livestock production to be carried out and their important benefits are attributable to the control of FMD. Control of FMD is often seen as an essential link in the chain of overall economic development. (pg. 51).

Source: James and Ellis (1993)

As disease transmission is more rapid in intensive stocking systems, cattle in large dairy units are more susceptible to outbreaks. As the size and production capacity of dairy units expand in Thailand so too do the risks of large and costly outbreaks of livestock diseases such as FMD. There is likely to be greater economic loss from FMD in dairy cattle than in beef cattle. This is more the case in Thailand because beef cattle consist of a high proportion of local breeds which are FMD resistant. This highlights the important role of cross-breeding with resilient- native livestock, such as the riverine-swamp buffalo program mentioned earlier.

According to Donaldson (1993), major FMD outbreaks occur sporadically in the large dairy units in other disease endemic countries such as Saudi Arabia. Large herds there contain several thousand milking animals penned alongside younger replacement stock. Even after multiple vaccinations, a high attack rate amongst in-calf heifers and first- lactation cows occurs. As referred to in Donaldson (1993 p. 12), an important feature of FMD is that virus excretion occurs before infected animals manifest clinical signs. Therefore excretion into milk can occur for up to 4 days before the clinical phase. This means that the movement of incubating animals can be a real concern for the management of control programs in dairy cattle. As dairy units and local trade in dairy stock expand, particularly into more remote rural regions, Thailand increasingly needs to develop a more comprehensive and effective disease control program.

4.4 Land

As indicated in Murphy and Tisdell (1995b), land availability directly influences the livestock economy. The size of landholdings in Thailand has been determined by historical and institutional factors. The Thai government's ongoing land reform and tenancy restrictions have limited the options available to Thai farmers to increase their land holdings (eg. via the clearing of forest) (Murphy and Tisdell 1995b). The expansion of crop land into upland areas has also reduced available grazing lands (Tokrisna and Panayotou 1985, p.199). Therefore the access of farmers to pastures other than their own is localised and limited to a few overgrazed communal pastures, scrub forests, roadsides and verges of waterways (Murphy and Tisdell1995b, p. 13). Such overgrazing leads to low breeding rates, slow growth rates, and results in low levels of milk production by buffalo and cattle with poor nutrition thereby increasing the susceptibility of animals to disease. Past attempts to increase agronomic productivity have met with only limited success. As with the beef industry, expansion of

dairy cattle production in Thailand may depend on increased feedlotting of cattle. This option however, as with the beef industry, is presently limited in Thailand. As Murphy and Tisdell (1995b) indicated, while adequate supplies of carbohydrate are available, high protein cattle meal is in short supply and cattle feedlotting must compete with other users of animal meal such as the commercial poultry and pig industries.

5. Recent Market Trends in Consumption

The ADC (l993) noted that Thailand's aggregate consumption of milk (on a milk equivalent basis) grew from 400,000 tonnes in 1985 to 700,000 in 1990, an increase of 75%. While its rate of growth in more recent years has slowed, within the drinking milk sector it still exceeds 5% per annum (ADC 1993).

Promotional programs by government and private companies to increase public awareness of the dietary and nutritional benefits of milk and dairy products have helped stimulate this growth in demand. Such programs have been focussed upon school children for whom milk products are sold at reduced margins to stimulate demand.

Within the dairy industry the drinking milk sector is one of the fastest growing sectors. Between 1986 and 1992 sales have increased by over 300%, with sales of UHT and pasteurised milk growing very rapidly (see Table 9). As for concentrated milk, the mainstay of Thai dairy consumption, the market has been dominated by condensed milk sales. With the expansion in the fresh UHT milk sector the growth in the condensed milk sector is expected to decline in relative terms. Dairy products such as ice cream and yogurt are predicted to be one of the fastest growing areas of dairy food consumption in Thailand, with yogurt sales expected to increase substantially over the next few years (ADC 1993). Sales of products such as cheese and butter depend almost exclusively on the tourism market.

Table 9 Sales of milk and milk products in Thailand 1986-1992 (units: Tonnes)

Product (tonnes)	1986	1988	1990	1992
Liquid Milk				
- UHT	53,000	107,000	160,000	182,500
- Pasteurised	24,000	35,000	60,000	66,000
- Sterilised	7,500	8,000	9,500	11,500
Concentrated Milk				
- Condensed	76,000	83,000	90,000	105,000
- Evaporated	12,000	13,000	13,000	16,000
Retail Milk Powder	9,100	9,800	10,500	12,000
Yogurt				
- Cup	1,000	1,400	2,000	3,000
- Drinking	9,000	15,000	24,000	30,000
Butter	1,300	2,000	2,400	2,800
Cheese	475	800	1,250	1,400
Ice cream	9,000	11,500	20,000	28,000

Source: Based on Industry estimates (ADC 1993, p.5)

6. Conclusion

In the 1990s, expansion of Thailand's fledgling dairy industry has continued to be driven by strong demand. However, despite the significant increases in production (almost 60% increase in two years over 1988-1990), the local industry still fails to meet domestic requirements. Beeghly (1990) reported that in 1990 Thailand barely met 20% of domestic requirements – as illustrated in Figure 3. This paper has highlighted the several factors that have contributed to this: 1) traditional Thai culture, 2) poor management marketing and technical knowledge of small dairy producers, 3) local breeds and breeding programs, 4) endemic livestock disease and 5) limited availability of pasture land and high feed costs.

Obviously such factors limit the short-term ability of Thailand to be self-sufficient in milk production. Thailand requires a substantially larger national herd with improved productivity in order to attain its national goal of milk self-sufficiency. In accordance with Thailand's official policy of increasing local milk production (indicated in Thailand's seventh plan), Thailand plans to increase its herd from 73,000 in 1990 to 117,000 milking cows by 1996 (ADC 1993) and to raise its raw milk production from 153,000 tonnes to 300,000 tonnes over the same period. Given consumption estimates of over I million tonnes by 1996 (ADC 1993), on past output figures an increase in the national milking herd to around 500,000 cows would be necessary to help meet self-sufficient levels of production. Therefore, as the Australian Dairy Corporation (1993) estimated, that while Thai milk production is expected to grow

during the mid-1990s it is not expected to match the rate of growth in overall demand. As a result, it is predicted (ADC 1993) that import opportunities for dried milk and finished milk products will remain firm in the foreseeable future.

Demand for UHT and pasteurised milk, and finished products such as drinking yogurt and ice cream is expected to increase substantially in the next few years. Sales of concentrated milk, powdered milk and products such as butter, cheese and set yogurt sales may rise slowly as population growth slows and demand for fresh milk increases (ADC 1993). Nevertheless, Thai production of concentrated milk sales may expand, given export opportunities to Laos, Burma and South China. The ADC (1993) reports that for the finished product markets (i.e., cheese, butter), the expansion in refrigerated storage and distribution facilities (particularly into more remote rural regions) and the expansion in western style food outlets, will have a major influence on upward market trends for these products.

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