

DAIRYING IN JAPAN AND THE
BENEFITS OF ADOPTING
NEW ZEALAND PASTURE GRAZING TECHNIQUES

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CONTENTS

	Page
LIST OF TABLES	(iii)
ACKNOWLEDGEMENTS	(v)
PREFACE	(vii)
SUMMARY	(ix)
CHAPTER 1. INTRODUCTION	1
1.1 A Recent History of Japanese Agriculture	2
CHAPTER 2. THE JAPANESE DAIRY INDUSTRY	5
2.1 The Growth of the Dairy Industry in Japan	5
2.2 Falling Demand for Dairy Products	9
2.3 Measures to Limit Milk Production	12
2.4 Imports of Dairy Products	14
CHAPTER 3. THE ADOPTION OF NEW ZEALAND PASTURE GRAZING TECHNIQUES BY DAIRY FARMERS IN EAST HOKKAIDO	17
3.1 The Present Situation on East Hokkaido Dairy Farms	17
3.2 New Zealand Dairy Pasture Grazing Techniques	20
3.3 Conclusion	24
3.4 Summary	25
LIST OF REFERENCES	27

LIST OF TABLES

Table		Page
1	Number of Dairy Farms, Dairy Cattle and Production in Japan	7
2	Milk Product Consumption per Capita by Country in 1983	10
3	Consumption of Milk and Dairy Products (g/head)	11
4	Retail and Farmers Prices for Drinking and Manufacturing Milk	12
5	Japanese Dairy Imports	15
6	Japanese Dairy Imports from New Zealand	16
7	Number of Dairy Farms, Dairy Cattle and Production in Hokkaido	18

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PREFACE

This Discussion Paper is the result of research undertaken by Mr Moffitt during his refresher leave at Chiba University near Tokyo, Japan late in 1986.

Japan is a major export destination for New Zealand dairy products. An understanding of the nature and workings of the Japanese dairy industry is needed to enable this export trade to be expanded.

The AERU has a continuing interest in the study of Japanese agricultural policy and its influence on the marketing of New Zealand exports.

J G Pryde
Director



SUMMARY

New Zealand is of little significance to Japan and does not feature amongst Japan's major trading partners. However Japan is one of New Zealand's biggest trading partners both as a buyer of exports and as a supplier of imports. It is seen to be important for New Zealand to seek ways of expanding our export trade with this wealthy, densely populated nation.

New Zealand's small size and lack of international bargaining strength makes it difficult to encourage Japan to reduce their import tariff barriers or quotas on agricultural product imports. Other strategies or policy changes must be sought which Japan could adopt with resultant benefits for New Zealand.

This paper describes and explains the dairy farming situation, the changing domestic demand and the changes in imports of dairy products that Japan is experiencing. Some of the problems the dairy farming industry is facing are also mentioned. The paper suggests a method of overcoming these problems by encouraging Japan to adopt some of New Zealand's dairy farming pasture management techniques. The adoption of these management practices applies especially to Hokkaido where 35 per cent of Japan's milk is produced. The suggested strategy fits in well with many of the goals of Japanese agricultural policy. The self-sufficiency level for dairy production will be maintained, less imported feed grains will be needed, an improvement in land productivity will occur, dairy farmer incomes will be maintained or enhanced and the growing problem of manufacturing milk surpluses will be reduced.

As Japan is now an important destination for a number of New Zealand's dairy products (especially skim milk powder, natural cheese and casein), any fall in the domestic milk surplus in Japan will help maintain and may promote New Zealand's market position as a low cost supplier of quality milk products.

CHAPTER 1

INTRODUCTION

The Japanese dairy industry has a continuing problem of surpluses of dairy products despite levels of price support for milk for manufacturing being held at a nearly constant level since 1977 to discourage production. The declining level of support payments for dairy farming is designed to encourage the restructuring of agricultural production, especially towards food grains and away from rice. This policy measure is somewhat contrary to the two primary goals of Japanese agricultural policy; that of achieving self-sufficiency in food and the provision of adequate income for farmers. In addition to excess supply the dairy industry also suffers from very high costs of production with a significant dependence on imported feed and grain. The small size of farms in Japan (1.2 hectares over all Japan and 9.5 hectares in Hokkaido) severely restricts the chance of achieving low cost feed grain production.

The argument for special assistance for agriculture to help achieve maximum self-sufficiency with the aim of food security seems to be selectively applied to different products in Japan (George, 1981). Agricultural trade liberalisation is applied to certain products such as feed grains which are imported in ever increasing quantities at world market prices. In 1960 Japan's grain self-sufficiency rate was 83 per cent but by 1984 the rate has fallen to 32 per cent. The desire to achieve a high degree of self-sufficiency in milk products (estimated at 86 per cent in 1983) increases Japan's dependency on the imports of feed grains. Pasture is a low cost substitute for the imported feed grains but only in areas such as Hokkaido (where 35 per cent of Japan's milk is produced) are there farms of sufficient size to allow the cows to graze pasture. In the 1985 Japanese Annual Report on Agriculture (MAFF, 1985 b) there is an acknowledgement of the growing importance of grass feed for dairy and cattle farming.

Any increase in the degree of pasture farming will lead to a fall in the quantity of imported feed grains needed and lowered production costs. As the cows' diet changes towards more grass and less feed grains, milk production per cow will fall. This will help reduce the milk surplus. Once the milk surplus is overcome, the government will be able to respond to pressures from consumers and some domestic dairy manufacturing companies to expand its imports of lower-priced dairy products. The domestic dairy manufacturing companies (notably cheese-blending companies) rely on a proportion of cheap imported products to blend with domestic products. Farmers' incomes will benefit from the reduced costs of feed needed although this will be partly offset against the fall in yield. In Hokkaido, where the government continues to finance the development of land for grassland dairy farming, this land resource could be more productively used if some of the pasture management techniques of New Zealand dairy farming are applied.

In New Zealand where the dairy farmers revenue from milk has been based on low world prices for milk products, they have received little or no government income support. This has forced the farmers to

find efficient low cost methods of milk production. While the average New Zealand dairy farm compared with Japan is large (64 effective hectares in 1984-85) with 151 milking cows, the pasture management techniques can easily be applied to smaller farms.

Before detailing methods of applying New Zealand pasture management on Hokkaido dairy farms, an explanation of the recent history of Japanese agriculture and the position of dairy farming follows. This analysis provides the background to understanding the current policy framework and objectives of the Japanese dairy industry.

1.1 A Recent History of Japanese Agriculture

Japan's postwar agriculture has been largely shaped by the land reform which took place in the late 1940's. This reform took away land from nonfarming landowners, divided it up and gave it to the many tenant farmers. The newly independent farmers on land of their own quickly increased production especially of rice. Another effect of the land reform was to reduce the average size of farms. Small scale farming (the average farm is 1.12 hectares in size) is a continuing characteristic of modern Japanese agriculture.

Throughout the 1950's the food supply situation improved, hastened by the formation of agricultural co-operatives and the steady mechanisation of farming operations. As the period of rapid economic growth developed, the rural population became an important source of labour for industry. In 1955 the farming population was 16.6 per cent of the total population but by 1985 it had fallen to less than 5.3 per cent of the total (MAFF, 1985b).

In 1961 the Japanese government introduced the Basic Agricultural Law and this, along with the amended policy guidelines of 1970, stressed the need to work towards modernisation, adequate farm incomes, rationalisation and increased agricultural productivity of livestock, vegetables and fruit (Kitson in Zwart and Wilson, 1979). Small scale livestock industries such as pigs and poultry developed rapidly but the small farm size has prevented the development of larger scale, viable farm units. The growing domestic demand for stock feeds led to a replacement of costly home grown wheat, barley and soybeans with cheap feed imports, especially from the United States.

Japanese agriculture today is facing a number of problems. There is a steady reduction in agricultural land area because of the demand for land from industry and urban growth. Japan's food self-sufficiency rate in grains and soybeans has been steadily declining. With some agricultural products including rice, mandarin oranges and milk there are problems of over-supply. Unlike other developed countries Japan's domestic agricultural production accounts for only 52 percent of the total calorie supply per capita per day. The rising price of farmland and the reluctance to sell or lease the family land has prevented the expansion of the scale of land-based farm operations. The farm product price gap has widened between Japan and overseas countries for products requiring a lot of land.

Consumer pressure for cheaper food imports is growing. A number of Japanese industries which have their exports restricted by voluntary export quotas support the concept of free trade. While trade liberalisation in all agricultural products is still a long way off, the Japanese government is slowly reducing the amount of money being spent on agricultural support. The agriculture-forestry budget, which peaked in fiscal 1982, has since been reduced each year. In fiscal 1986 the ratio of the agriculture-forestry budget to the government's general expenditure was 9.6 per cent. It is now second to the defense budget.

Japanese agriculture remains highly protected. For many land-extensive products, import restrictions create a substantial gap between the prices facing Japanese consumers, and those on the world market. Direct subsidies and monopolistic state trading arrangements often raise the price paid to domestic producers above the price paid by consumers. The ratio of government expenditure on agricultural support to gross agricultural output rose sharply during the 1960s and 1970s, from 7.2 in 1960 to 19.0 percent in 1970, and to 30.3 percent by 1980. This percentage fell to 29.3 in 1982 reflecting increased budgetary stringency (O.E.C.D. 1985).

Farmers in many sectors (including dairy farmers) are finding their farm incomes eroded by increasing costs and reductions in government support measures. Where opportunities exist, farmers are cutting costs and seeking new ways of increasing the productivity of their resources (including the land).

CHAPTER 2

THE JAPANESE DAIRY INDUSTRY

2.1 The Growth of the Dairy Industry in Japan

In Japan the consumption of milk products was very low in the earlier years of this century. Under the Buddhist religion the eating of meat and the consumption of milk products was forbidden until the end of the 19th century. After this ban was lifted it took a long time for the custom to change. In 1920 milk consumption was approximately one litre per capita per year. By 1948 production had slowly expanded to reach 2.3 litres per capita from 171,000 dairy cows.

Following World War II the US Government provided quantities of milk powder to help meet the nutritional deficiencies and food shortages which had developed. As noted by Saxon in Zwart and Wilson (1979) the milk powder became a valuable source of protein and other nutrients for children and mothers and helped establish a taste for milk among the younger population.

Throughout the 1950's demand for milk products increased as western culture and western food consumption patterns became popular. Scarce foreign exchange was used to continue the importation of selected foods such as milk powder after U.S. foreign aid ceased. This, along with the growing supply from the expanding domestic dairy industry, contributed towards meeting the growing demand for milk products. Dairy product prices remained high due to the high costs of production and the strong demand. The high prices being received for milk products led to a rapid expansion in the number of small farmers keeping one or more cows for milk production. In 1946 there were some 50,000 farmers producing milk but by 1963 the number reached a peak of nearly 420,000. Since then dairy farming has undergone continual structural change with fewer farms, larger herds and more specialisation.

In 1961 the law concerning Price Stabilisation of Livestock Products was introduced which helped the development of the dairy industry and stabilised the market prices of dairy products. This scheme set the market prices of major dairy and beef products within a certain price band by allowing for market intervention by a statutory body (the Livestock Industry Promotion Corporation - LIPC). The price support scheme led to substantial increases in the standard price levels for manufacturing milk to the farmer. A serious financial problem slowly developed for the milk manufacturing sector. The high price elasticity of demand for milk products and the existence of substitute products (e.g. margarine) prevented the manufacturers raising the market prices for raw milk. The LIPC would have been forced to intervene in the market and purchase huge surplus stockpiles of milk products, unless stabilisation price levels for milk products were allowed to rise parallel to those of manufacturing milk (O.E.C.D., 1976).

To overcome this problem the Government introduced a new law in 1966 (the Temporary Law on Deficiency Payment for Manufacturing Milk Producers). With the help of these deficiency payments made to

manufacturing milk farmers, along with increased demand, the dairy sector has continued to expand.

In 1965 nearly 60 per cent of dairy farms had only one to four milking cows with an average herd size per farm of 3.4 cows. In the next ten years to 1975 the number of dairy farms more than halved and the average herd size increased from 3.4 to 11.2 cows per farm (see Table 1). Since 1975 the speed of change has slowed with the number of producers continuing to fall although the scale of operations has continued to climb. By 1984 only 16.8 per cent of dairy farms were small in size (with one to four milking cows) and the average herd size had risen to 24.1 cows (in Hokkaido the average was 44.4 cows). An unusual feature of this rapid change in the scale of operation was the increase in productivity. Both total production and productivity per cow increased. In the ten years to 1975 production per cow increased 10.4 per cent to 2.801 tonnes. In the next nine years (to 1984) the increase had slowed slightly to 8.14 per cent (3.383 tonnes of milk per cow).

Although producer prices have remained nearly static since 1977, total production in recent years has continued to increase. Producer prices had been based on average costs of production and this encouraged farmers to expand their herd size and increase output. Two other key factors which influenced the increase in dairy output was the program in the late 1970's to divert rice lands to other crops (especially forage crops) and the expansion in the use of concentrated feeds. The rice paddy diversion program led to an increase in the pasture base of the industry (Roberts, Bain and Saxon, 1980). In the late 1970's falling real prices of feed grains and concentrates encouraged this feed use and boosted milk yields per cow (up 11.0 per cent in the five years to 1980).

TABLE 1
Number of Dairy Farms, Dairy Cattle and Production in Japan

	1965	1970	1975	1980	1981	1982	1983	1984	1985
No. of Farms with Dairy Cows (000)	381.6	307.6	160.1	115.4	106.0	98.9	92.6	87.4	82.0
Total Dairy Cows (000) - excluding Heifers	1,289	1,804	1,787	2,091	2,104	2,103	2,098	2,110	2,111
Dairy Head per Farm (All Japan)	3.4	5.9	11.2	18.1	19.8	21.3	22.7	24.1	25.7
Dairy Head per Farm (Hokkaido only)	6.5	12.5	22.5	35.1	38.2	40.2	42.5	44.4	46.4
Total Milk Produced - All Japan (000 tonnes)	3,271	4,789	5,006	6,498	6,611	6,848	7,088	7,140	n.a
Total Milk Used for Drinking Milk (000 tonnes)	n.a	2,623	3,130	3,988	4,121	4,215	4,272	4,320	n.a
Total Milk Produced - Hokkaido (000 tonnes)	674	1,192	1,463	2,116	2,137	2,290	2,401	2,461	2,461
Proportion of Total Milk Produced in Hokkaido (%)	20.6	24.9	29.2	32.6	32.3	33.4	33.9	34.5	n.a
Production per Cow - All Japan (tonnes)	2.538	2.665	2.801	3.108	3.142	3.256	3.378	3.384	n.a

Source: Japan Ministry of Agriculture, Forestry and Fisheries (MAFF), 1985a; MAFF, 1986

From 1975 to 1980 dairy farming had been increasingly profitable rising to a peak of ¥80,000 per cow in 1979 (in 1979 ¥80,000 = NZ\$358). However in 1981 and 1982 the trend reversed and net losses were recorded. By 1983 the effects of restructuring in the industry led to some recovery occurring with the average dairy farm recording a small profit per milking cow of ¥2,500 (NZ \$16).

The falling profitability of dairy production especially for the smaller farmers led to many leaving the industry. In 1979 profitability peaked, with 27 percent of farms milking less than four cows but by 1984 the percentage of small farms had fallen to 17. During the five year period the average number of cows per farm increased from 16.8 to 24.1, due in part to the expansion in the number of larger herds (with more than 20 cows) from 20 percent to 35 percent by 1984. In Hokkaido dairy farms expanded rapidly and by 1984 nearly one out of every two herds had more than 30 cows.

By 1983 the pressure of rising costs and a continuing static payout per litre continued to erode the viability of the smaller farms. In that year a net loss per cow was estimated (MAFF, 1985a) for the smaller average dairy farm (farms with less than 14 cows). As the farm size grew larger total costs (including family labour and interest) fell and profitability per cow increased. For farms with 15 to 19 cows the profit per cow was about ¥2,000 (approximately NZ\$13) and for herds of over 30 cows the profit per head increased to ¥27,000 (NZ\$171).

Along with the continuing trend towards fewer and larger herds, there has been a gradual relocation of dairy farms. In the 1960's about half the milk produced was from farms close to the major cities. These farms produced fresh milk from concentrate feeds. Since then land demand from urban and industrial expansion has reduced the number of dairy farms close to the cities. In the more remote areas (especially Hokkaido, Tohoku and Kyushu) dairy farm production has continued to rise. These farms tend to be larger in size with more cows, have access to pasture feed and usually produce milk for processing. Hokkaido now produces 35 percent of all milk compared with less than 19 percent in 1960. Most milk in Hokkaido is processed although some is shipped south to be sold at a higher producer price to the population centres of Tokyo and Osaka (18.1 percent in 1984). There has been a gradual increase in the quantity of fresh milk shipped south from the larger more efficient farms in Hokkaido and this loss of market share is creating some concern among the smaller dairy farmers in the central regions.

Although the number of dairy farms has declined (from 160,100 in 1975 to 87,400 in 1984) total production has continued to climb. The number of cows increased until 1981 but since then numbers have remained nearly static; the continual rise in production has been due to increases in per cow performance. This production increase in recent years has not been matched by the same increase in consumer demand.

2.2 Falling Demand for Dairy Products

As demand for milk products slowed in the late 1970's production continued to climb with the result that surpluses of manufactured dairy products developed. In an effort to discourage overproduction producer prices were fixed in 1977 and have changed little since then. While this move results in falling incomes for the small farmers, dairying has still remained profitable for the owners of large herds who have been able to achieve economies of scale.

In the late 1970s as supplies of milk products built up (especially butter and skim milk powder), market prices fell below the stabilisation guide prices. The LIPC were forced to buy in stocks and the manufacturers also accumulated stockpiles. The LIPC restricted imports of a number of milk products and producers introduced a voluntary production adjustment plan in 1979 (OECD, 1986). In the five years between 1977 and 1981 the guaranteed producer price for manufacturing milk was pegged at 88.87 Yen per litre. Gradually these measures led to a recovery of the balance between demand and supply by 1981 although supply became tight in 1982. The dairy product stockpile accumulated by the LIPC was gradually released into the domestic market in 1982 and 1983.

Consumption per head of dairy products in Japan is amongst the lowest of all the OECD countries. Butter consumption per head in Japan was 0.6 kilograms per year (1983) compared with 12.6 kilograms per head in New Zealand (Table 2). Cheese consumption is also low (0.8 kilograms per head in Japan compared with 7.7 kilograms in New Zealand). Total food consumption per person in Japan is considerably below that in industrialised countries due partly to differences in traditional food consumption habits and partly because the average body size of Japanese people is smaller (Saxon, 1978). High retail prices have also limited the growth in consumption. Older Japanese cannot drink milk because of a shortage of the lactose digesting enzymes and this too has influenced demand.

The drinking milk market utilises about 60 percent of total production. Hokkaido produces one third of Japan's milk but because of its distance from the main population areas, approximately 80 percent is processed.

TABLE 2

Milk Product Consumption per Capita by Country in 1983

	Fresh Milk (kg)	Butter (kg)	Cheese (kg)
England	123.3	5.3	6.7
(Percentage of Japan)	(348%)	(883%)	(838%)
Denmark	77.0	7.7	10.7
	(218%)	(1,283%)	(1,338%)
West Germany	54.0	6.5	14.7
	(153%)	(1,080%)	(1,838%)
Canada	109.4	4.5	7.9
	(309%)	(750%)	(988%)
USA	58.5	2.3	11.2
	(165%)	(383%)	(1,400%)
Australia	102.3	3.9	7.7
	(289%)	(650%)	(963%)
New Zealand	146.5	12.6	7.7
	(414%)	(2,100%)	(963%)
Japan	35.4	0.6	0.8
	(100%)	(100%)	(100%)

Source: MAFF, 1985 a

In the early 1960's there was a very rapid increase in fresh milk consumption (from 1,070 grams per head in 1960 to 1,840 grams in 1965 - see table 3). A similar dramatic increase in the consumption of butter and cheese also occurred during this period.

As nutrition levels improved food consumption as a whole continued to rise until 1973 when it stabilised. At this time growth in household incomes and expenditure was interrupted by a recession. Up until 1973 during the period of rapid economic growth, the Engel co-efficient (i.e. the percentage of total consumption expenditure spent on food) "declined steadily from more than 50 percent in the early 1950's to 40 percent in 1959, 36 percent in 1965 and 30 percent in 1973" (Saxon, 1978). Since then it has been relatively stable. Increased consumption of milk products since the early 1970's, while showing some advances, has been generally slow (see Table 3).

TABLE 3

Consumption of Milk and Dairy Products (grams/head)

	1955	1960	1965	1970	1975	1980	1981	1982	1983	1984
Fresh Milk	n.a	1070	1840	2530	2810	3391	3478	3544	3533	n.a
Butter	80	146	256	402	485	578	609	625	618	653
Cheese	10	73	183	402	566	785	820	817	869	909
Skim Milk Powder	210	440	810	820	957	1180	1294	1370	1514	1508

Source: MAFF, 1985a; Roberts, Bain and Saxon, 1980; and Saxon, 1978

From 1955 to the early 1980's the income elasticity for fresh milk fell steadily from more than 2.0 to 0.34 in 1981 (MAFF, 1982). This change reflects the increases in consumer incomes which have occurred during rapid economic expansion of the Japanese economy during this period. Milk consumption per head was 10.7 kg in 1960 and it rose quickly until the early 1970's. Since then consumption levels have slowed and by 1983 it had reached 35.3 kg.

In the early 1960's both butter and cheese income elasticities were close to 3.0 but they fell to their lowest levels in 1975 (with values of 0.83 for butter and 0.69 for cheese). Since then they have increased in value and by 1981 they had reached 1.42 for butter and 1.08 for cheese. As real incomes continue to rise demand per person for selected dairy products (especially those perceived as luxury goods) is expected to increase slowly.

During the two decades since 1965 the average daily calorie intake has slowly increased from 2,457 to 2,594 kilocalories per capita (Zenchu, 1986b). Over this period there has been a marked change in the dietary pattern of Japanese. The contribution of starchy foods (cereals and rice) has fallen from 63.2 percent to 48.1 percent, while the level of livestock products and fats and oils have increased. Milk and milk products made up 2.5 percent of total calorie intake (62 Kcals) in 1965. By 1984 it had increased to 4.3 percent (112 Kcals) of the total. The steady build up of stocks of dairy products which occurred following the slowdown in demand led to the introduction of a number of measures to limit milk production.

The slowdown in the increase in food consumption (including dairy products) is influenced by taste, tradition, relative prices and the degree of substitution available. For some food products it is likely that a level of saturation has been reached and it is unlikely that future consumption will increase at the rate it has in the past (Saxon, 1978). However as tastes change there is scope for increased consumption of some foods (eg, natural cheese) at the expense of others.

The steady build up of stocks of dairy products which occurred following the slowdown in demand led to the introduction of a number of measures to limit milk production.

2.3 Measures to Limit Milk Production

As rice surpluses developed following the fall in domestic demand, various agricultural policy measures were introduced to encourage the diversion of land away from rice production. This, along with substantial dairy product price support measures and protection, encouraged the increase in dairying and dairy beef production.

Prior to 1977 there had been a continual increase in the support price for manufacturing milk paid to producers. Developing surpluses of dairy products in the late 1970's as the per capita consumption of milk and milk products fell led to a freezing of producer support prices. In 1982 and 1983 in response to pressure from farming interests there was a marginal increase (less than one percent) in the support price (see Table 4).

TABLE 4

Retail and Farmer's Prices for Drinking and Manufacturing Milk

	1966	1970	1975	1980	1981	1982	1983	1984
Retail Price for Drinking Milk, Yen/l - Tokyo Area	107	133	199	212	209	209	208	209
N.Z. \$/litre		0.33	0.57	1.00	1.11	1.12	1.32	1.54
Farmer's Price for Drinking Milk, Yen/l - All Japan	39.9	48.3	92.0	99.5	99.0	99.5	100.1	99.9
N.Z. \$/litre		0.12	0.26	0.47	0.52	0.53	0.63	0.73
Farmers Price* for Manufacturing Milk (Guaranteed Price), Yen/l	37.03	43.73	80.29	88.87	88.87	89.37	90.07	90.07
N.Z. \$/litre		0.11	0.23	0.42	0.47	0.48	0.57	0.66
Exchange Rate (Yen per NZ \$1.00)		400	352	213	189	186	158	136

* Manufacturing milk is for processing. This is the delivery price to factories at a fat content of 3.2 percent.

Source: Prime Minister's Office - Retail Price Survey: MAFF (1985a), and Saxon (1978)

Since 1977 the real prices or returns to dairy producers have declined because of inflation and the increasing costs of imported feed grain and protein meal. This cost squeeze has put increasing pressure on the smaller farmers to leave the industry. In the period 1977 (when producer milk prices were first frozen) to 1984 the size of the average dairy farm increased from 13.8 cows to 24.1 cows per farm and the number of dairy farms declined from 136,500 to 87,400 (down 64 percent).

A further policy strategy was to impose voluntary quotas to limit the increase in milk production. These production controls are part of a system known as "Administrative Guidance". Production quantities are decided at provincial, local and individual levels by the co-operative producer organisations without the need for government-administered penalties for over-production (Zwart, 1981). Milk which is surplus to the voluntary quota is coloured with a harmless dye and is diverted to feed calves for the beef industry. The dairy industry in 1984 supplied 63.3 percent of domestic cattle for the beef industry (Zenchu, 1986a).

The expansion which has occurred in the past in the dairy industry has helped provide stock for the beef industry. Until the mid 1960's, male calves born on dairy farms were killed soon after birth. Since then the rearing and feeding of dairy Holstein steers has become an important source of extra income for dairy farmers. This has been especially true since the late 1970's as milk production expansion has been limited to the slow growth in demand for milk and milk products.

The total number of dairy cows in 1986 was 2,103,000. This represented a drop of 8,000 from the 2,111,000 cows in 1985. Since 1979 there has been a special policy of slaughtering at least 20,000 dairy cows (usually cull cows) a year. The object is two-fold, first as a contribution towards the demand for domestic beef and secondly to help curb raw milk production (Zenchu, 1986a). In the 1986 fiscal year a record 60,000 head of dairy cows were slaughtered throughout the country. In 1986 the government granted a subsidy of Y25,000 per head (NZ\$294) for 38,000 head. For the other slaughtered dairy cows under this policy the farmers agree to slaughter the cows under a voluntary arrangement and they receive the beef selling price only.

In 1984 there were 1,483,000 domestic cattle slaughtered for beef. Of the 63.6 percent (939,000 animals) which came from dairy farms, 459,000 were fattened Holstein steers and 480,000 were cull cows and heifers (Zenchu, 1986b). The sale of surplus or culled dairy stock for beef has been an important additional source of farm revenue for dairy farmers. The slow but steady increases in farm costs in the last ten years have not been matched by increases in the milk payouts. Dairy farmers have also been facing mounting pressure from consumers and importers for increased liberalisation of imports of lower priced dairy products.

2.4 Imports of Dairy Products

Since the late 1940's Japan has had a history of importing dairy products but as domestic milk surpluses developed in the 1970's imports of some dairy products were restricted. The Livestock Industry Promotion Corporation (LIPC), handles the importation, purchase and sale of meat products and certain dairy products including butter and skim milk powder. Prices of these imported dairy products are kept high by the LIPC and this helps preserve the high domestic prices to consumers. These high prices have resulted in consumption levels well below those in other developed countries (see Table 2).

Japan imports around 25 percent of its dairy product needs. This figure appears to be in conflict with its assessed self sufficiency of 86 percent for dairy products. However MAFF excludes a number of dairy imports from its self-sufficiency analysis. In 1983 the "official" import quantity was 1,092 million tonnes (this is different from the actual figure of 2,388 million tonnes of Table 5). Domestic production was 7,088 million tonnes and domestic consumption was 8,234 million tonnes. The difference was obtained from stored stocks.

As stocks of some dairy products, notably butter, have accumulated in the past few years, the LIPC has imposed controls on selected imports. Within Japan the costs of producing dairy products is very high and is well above the landed cost of imported products. The Ministry of Finance encourages the LIPC to import cheaper skim milk powder for use in the school lunch program and for stock feed. This gives rise to the "apparently anomalous situation of large surpluses co-existing with substantial imports" (Roberts, Bain and Saxon, 1980).

TABLE 5
Japanese Dairy Imports
Calendar Year (Tonnes)

	1970	1975	1980	1981	1982	1983	1984	1985
Skim Milk Powder								
- School Lunch	12,693	13,297	9,933	9,007	10,712	10,496	9,393	9,395
- Feed	43,911	22,374	79,476	60,248	68,848	72,469	70,052	76,374
- Commercial	13,493	25,706	30,927	32,298	13,157	35,073	37,913	n.a
Butter	1,083	2,202	1,860	1,734	5,453	1,576	1,779	1,703
Cheese								
- Processed	443	286	175	132	81	73	73	n.a
- Natural	33,752	48,438	74,488	71,145	74,061	71,727	79,098	81,593
Milk Sugar	44,560	50,374	61,190	66,394	72,801	69,885	74,707	71,839
Casein	26,577	9,575	22,265	18,689	22,377	23,253	22,649	24,440
Milk Products								
- with Cocoa Added	7,745	17,285	19,823	23,606	27,232	27,527	27,495	28,641
- Prepared Edible Fats	983	2,078	17,008	14,424	16,532	16,155	15,178	16,344
Condensed Milk	381	1,157	633	629	535	479	557	n.a
Total Volume Converted into Milk Equivalents (000t)	1,231	1,403	2,381	2,220	2,475	2,388	2,483	n.a

Source: MAFF, 1985a and NZDB (1986)

There is a combined tariff and quota arrangement for the import of natural cheese. For every one tonne of unprocessed cheese made from domestic milk, two tonnes of unprocessed cheese can be imported duty free. It was hoped that this blend of local and imported cheese would be competitive with other imports (which attract a duty of 35 percent). However the scheme has not led to an expansion of the domestic cheese industry. Many processors prefer to import the unprocessed cheese and pay the duty.

New Zealand supplied over 28,000 tonnes (or 35 percent of the total imports) of natural cheese to Japan in 1985. Japan is also a significant market for a number of other New Zealand dairy products. In the June 1986 year the FOB value of our dairy exports to Japan was \$179.9 million, third in value behind unwrought aluminium and forest products. The other main dairy products exported from New Zealand were skim milk powder (47,000 tonnes), casein (12,000 tonnes) and prepared edible fats (9,000 tonnes). While the demand for the latter two products has been stable, there has been marked variation in the quantity imported from New Zealand of skim milk powder for feed (see Table 6).

TABLE 6
Japanese Dairy Imports from New Zealand
Calendar Year (tonnes)

	1979	1980	1981	1982	1983	1984	1985
Skim Milk Powder							
- School	10,626	8,937	9,007	7,878	9,340	6,702	7,091
- Feed	9,493	1,617	1,233	12,466	46,665	28,737	34,379
- Commercial	2,449	1,540	2,079	1,871	1,185	1,525	5,791
Butter	752	402	232	2,429	186	337	331
Cheese							
- Natural	25,484	24,757	24,710	23,261	25,586	29,669	28,327
Milk Sugar	4,014	1,745	2,009	2,353	4,232	3,129	3,668
Casein	13,656	13,537	11,894	12,280	12,223	10,991	12,291
Milk Products							
- with Cocoa Added	5,481	5,764	6,119	7,217	7,435	7,746	8,276
- Prepared Edible Fats	6,261	10,210	7,556	8,925	9,128	8,216	8,854
Whey Powder	655	446	350	185	-	205	1,263
Milk and Cream Others	3,735	2,503	2,368	2,771	2,320	1,610	1,289

Source: NZDB, 1986

In 1985 New Zealand supplied 76 percent of the skim milk powder imported for the school lunch program and 45 percent of the skim milk powder used for feed. Half the casein imported into Japan came from New Zealand as well as half the prepared edible fats and a third of the natural cheese.

In the second half of the 1970's the EEC gradually overtook New Zealand to become the leading supplier of skim milk powder used for feed and other uses in Japan. The EEC also acquired a larger share of the Japanese cheese import market at the expense of Australia. EEC dairy export subsidies reduced the export price of many EEC dairy products. (George, 1983).

Although the future growth of demand for dairy products in Japan is likely to be slow, Japan should remain an important market for New Zealand dairy products.

The next chapter discusses the advantages of adopting New Zealand pasture grazing techniques on dairy farms in the Japanese Island of Hokkaido. If the larger dairy farms adopted New Zealand pasture grazing techniques during the summer, less costly imported feed would be needed, and production costs and milk yields are likely to fall. Once the problem of milk surpluses is overcome Japan would be in a stronger position to expand imports of low cost dairy products from New Zealand.

CHAPTER 3

THE ADOPTION OF NEW ZEALAND PASTURE GRAZING TECHNIQUES BY

DAIRY FARMERS IN EAST HOKKAIDO

3.1 The Present Situation on East Hokkaido Dairy Farms

In recent years the Japanese Government has helped finance the conversion of marginal scrub-covered land to pasture in East Hokkaido. In this district the winter climate is severe with snow remaining on the ground for more than five or six months each winter. The annual mean temperature is between five and nine degrees Celcius. These low temperatures along with low rainfall (less than 1,000 mm per year) has led to the development of a pasture-based dairy industry. The climate is too cold to grow grain or corn.

The development of land in this region was part of the Hokkaido General Development Plan. This land development project is part of the Japanese Government's plan to increase domestic food production to help reduce Japan's vulnerability to world commodity price fluctuations (Bale and Greenshields, 1978). Japan is the world's largest net importer of stockfeed products. The object of the land development was to replace the sparse natural scrub-land with pasture, build a network of roads and provide irrigation and drainage systems to encourage dairy pasture farming. Traditionally dairy farming has existed for some years in this region but only in a few scattered districts. These older dairy farms were small in scale and lacked the capital equipment and management ability to expand.

The development project's aim was to expand the scale of dairy farms to approximately 50 hectares. Experienced farmers from other districts were selected and given the opportunity to borrow money from the government to buy farms in the newly reclaimed areas. Established local farmers were also encouraged to join the project and expand their existing farms.

In 1973, when a 10-year development project started, the average number of milking cows per farm in this area was 45. By 1986 the number of cows per farm was nearly 100 and the average farm size had increased to 50 hectares. The total farmland area in the Kushiro-Nemuro region of East Hokkaido had increased to 188,600 hectares. There were 246,000 head of dairy cows producing 32 percent of Hokkaido's milk needs and 11 percent of the national milk requirement. Total milk production in 1984 over all the Island of Hokkaido provided 34.5 percent of the national milk needs (Table 7).

TABLE 7
Number of Dairy Farms, Dairy Cattle and Production in Hokkaido

	1966	1970	1975	1980	1981	1982	1983	1984	1985
No. of farms with Dairy Cows	43,800	39,300	27,400	21,400	20,200	19,400	18,500	17,900	17,400
Hokkaido Farms as % of all Japan	13.0%	12.8%	17.1%	19.3%	19.1%	19.6%	20.0%	20.5%	21.2%
Total Dairy Cows (000) - excluding Heifers	337.7	489.2	614.8	751.6	771.0	779.2	785.4	794.8	807.8
Hokkaido Cows as % of all Japan	24.6%	27.1%	34.4%	38.3%	36.3%	37.1%	37.4%	37.7%	38.3%
Dairy Head per Farm	7.7	12.4	22.4	35.1	38.2	40.2	42.5	44.4	46.4
Total Milk Produced (000 tonnes)	710.6	1,205.2	1,462.8	2,115.8	2,136.7	2,289.6	2,400.9	2,460.8	2,461.3
Hokkaido Milk as % of all Japan	20.6%	24.9%	29.2%	32.5%	32.3%	33.1%	33.8%	34.5%	n.a

Source: MAFF (1985a) MAFF, 1986

Another of the aims of the farm-land expansion project was to reduce the amount of concentrate stockfeed used by encouraging the farmers to graze their cows on pasture. Hokkaido farmers graze their cattle in the warmer months but the pasture feed is still supplemented each day with costly concentrate feed in the milking shed and in the cow barn.

The Bureau of Livestock of the Ministry of Agriculture, Forestry and Fisheries conducts a survey to measure 12 different stock feeds fed to dairy cows (including cereals, mixed concentrate feed, hay, silage, grazing and cut green feed, straw etc). The feed components are measured as a percentage of total digestive nutrition (TDN) for all Japan, Hokkaido and Mainland (the rest of Japan). The results for Hokkaido are the average for all the Island including the larger farms of the East Hokkaido region (MAFF, 1985b). In 1983 the average Hokkaido dairy farmer obtained 10.4 percent of his dairy herd's TDN from grazing and cutting green feed. In the rest of Japan only 0.6 percent of TDN was obtained from grazing and cutting green feed. The Hokkaido dairy farmer also used more hay (27.0 percent of TDN compared with 11.3 percent in the rest of Japan), and more silage (30.6 percent compared with 18.0 percent elsewhere). Total forage feed provided 69.9 percent of TDN on the larger Hokkaido dairy farm whereas forage feed for the dairy farms in the rest of Japan supplied only 43.7 percent of total digestive nutrition.

In Hokkaido there are less condensed or concentrated feeds purchased. In 1983 only one percent of TDN was from cereals (compared with 8.2 percent in the rest of Japan), rice residual feed supplied 0.9 percent (compared with 6.6 percent elsewhere), and beet and bean residual feed supplied 6.5 percent of TDN (15.8 percent in the rest of Japan). Mixed concentrate feeds supplied 21.2 percent of TDN. This was only a little below the quantity supplied for the rest of Japan (25.3 percent).

A comparison based on the costs of feed highlights the advantages the larger pasture-based Hokkaido dairy farms have compared with the rest of Japan (MAFF 1985a). In 1984 self-supplied grazing and pasture feed was estimated to be worth ¥163,032 (NZ\$1,199) per milking cow in Hokkaido. This was 83 percent higher than the cost of self-supplied grazing and pasture feed for the rest of Japan (¥88,952 or NZ\$654 per cow). In the rest of Japan dairy farmers spend nearly 70 percent more on concentrated marketed feeds (¥237,694 or NZ\$1,758 per cow) compared with the Hokkaido farmer.

Hokkaido dairy farmers produce more than one third of Japan's milk (up from 21 percent in 1966) and dairy cow production averages 5,586 kilograms of liquid milk a year. It is amongst the highest in the world, exceeded only by USA (5,709 kilograms per cow).

The grazing of stock which now occurs in the warmer months in Hokkaido is based on low density set stocking where each cow has a large area of land to graze. The milk produced from this inefficient system of grazing is far less than can be achieved by adopting the New Zealand techniques of rotational grazing combined with a high stocking rate. A further advantage of this concentrated grazing is that farmers feed expenses will fall because of the lower quantities of animal concentrates needed during the warmer months, although it is possible that a fall in milk yield due to the all grass diet will also reduce revenue.

The small reduction in milk yield during the warmer months will help achieve the Government's policy of limiting milk production. There would also be a reduction in the quantity of imported concentrate animal feeds needed. By changing the management direction on the dairy farms towards concentrated pasture grazing, a more efficient use of the farm-land, labour and capital resources is achieved. There are further benefits also, such as the reduction of dung accumulation in the cow-barn and the need to cut and harvest grass for summer feed.

In New Zealand the predominant source of feed for dairy cows is grazed pasture. It is uncommon for New Zealand farmers to feed expensive concentrate feeds to their dairy cows. The production per cow from this all grass diet is low (3,315 litres or 3,414 kilograms per cow) compared to the average production per cow in Hokkaido (5,586 kilograms). However the cost of pasture grazed by the cows in New Zealand is very low whereas in Hokkaido compound concentrate feeds in 1983 cost ¥70,300 per tonne, (NZ\$445 in 1983).

3.2 New Zealand Dairy Pasture Grazing Techniques

The New Zealand dairy farmer has a large farm with many dairy cows (an average in 1984-85 of 64 effective hectares and an average herd size of 151 milking cows - NZ Dairy Board, 1985). The total average production per farm in one year (1985) was 22,952 kilograms of milkfat (at a 4.77 percent milkfat test) or 481,174 kilograms of liquid milk. This production is achieved at a low cost (in 1983-84 the average dairy farm expenditure was NZ\$0.1509/kilogram of liquid milk or ¥10 per litre or per kilogram at an exchange rate in December 1983 of ¥151 = NZ\$1.00). In Hokkaido in 1983 the primary production cost per one kilogram of milk was ¥82.39, (over eight times greater than the New Zealand cost). The low cost of milk production in New Zealand has been due to a number of reasons - both financial and technical. High stocking rates combined with rotational grazing of the pasture and 100 percent spring calving of the milking herd have contributed to the New Zealand farmer's reduction in costs. These techniques could be partly or wholly adopted in the East Hokkaido region.

In Hokkaido farmers graze their dairy cows on pasture but the grazing is uneven with few farmers subdividing their farm to allow the cows to graze a different part of the farm each day. In New Zealand the average dairy farm consists of 20 to 40 permanently fenced paddocks, each two or three hectares in size. Each paddock has its own permanent concrete water trough. Each day the milking herd is densely stocked and grazes a different grass paddock. In the early spring approximately 1/30 of the total farm area is grazed each day. After 20 to 30 days, depending on the weather conditions the milking herd will again return to the first paddock. This technique allows sufficient time (20 to 30 days) for grass growth to recover after grazing.

If adverse weather occurs, or the grass growth is too rapid for optimum grazing, then the rotation is changed or some paddocks set aside for hay or silage production.

An increase in stocking rate reduces the wastage of pasture and improves the quality of pasture. If the stock rate increase is from a low level it may cause increases in milk production per cow and per hectare (Holmes and McMillan, 1982). Concentrated stocking of the herd in a small two or three hectare paddock each day will result in uniform close grazing by the cows. Close grazing prevents the accumulation of long, rank mature pasture which has less nutrient value. Dry matter production and nutrient value of the pasture varies during the year according to stocking rate, grazing interval, severity of grazing and topping. (Bryant and Trigg, 1982). In the Manawatu region of New Zealand total annual pasture production varies between 9,000 and 12,000 kg dry matter per hectare. Daily pasture growth rates can be as low as five to 10 kg dry matter per day during the cold winter months, or in the hot dry summer months. (Holmes and Wilson, 1984). The average milking Friesian cow (weighing 450 kg) requires up to 15 kg dry matter of leafy pasture per day. After the cow has been dried off the feed requirements drop to six to eight kg dry matter of pasture per day.

In Eastern Hokkaido grazing is available for five or six months of the year. For the rest of the year snow covers the ground. In the dairy areas of the North Island of New Zealand the climatic problems are a lack of late summer and autumn rainfall. At the Ruakura Research Centre dairy farm for instance in the six months peak pasture growing season between calving in late July and January some 80 percent of total milk production is produced. (Cambell and Bryant, 1978). Milk production from February to May in the Auckland region is variable and very dependent on rainfall (O'Conner, 1982).

The adoption of a high stocking rate and rotational pasture grazing helps achieve a fairly uniform spreading of manure by the cows; however the land will require more fertilizer to achieve maximum grass growth. Additional strong permanent fencing may also be needed although a movable electric fence (of one or two wires) can be used. With such intense grazing the fences need to be strong to prevent the cows pushing through to the taller grass in neighbouring paddocks. Often in New Zealand the farmer will use a one wire electric fence to further subdivide his small paddocks. The farmer will shift or remove the electric fence during the day depending on the cows need for more grass.

In the milder New Zealand climate it is unusual for dairy cows to be housed at night or during the winter months.

The average New Zealand dairy farm has the 20 to 30 grass paddocks arranged around a central track or race leading to the milking shed. Usually all the paddocks have gates opening to this track. The track allows the easy shifting of the milking herd to and from the milking shed each day. It avoids the need to shift the cows across other paddocks and helps contain and direct the herd. It also helps prevent pasture damage caused by the herd's movement during wet weather. A small water supply pipeline is often buried along this access track. Each paddock has a concrete water drinking trough connected to this water supply.

The average New Zealand dairy farm also rears 34 heifer calves and often a similar number of young beef calves. These young stock are either grazed ahead or behind the main milking herd. The young stock may be grazing a paddock which is a few days in front or behind the paddock being rotationally grazed by the milking herd.

Another major reason why New Zealand milk production can be obtained at such a low cost is due to the concentration of calving in early spring. The feed value of pasture is at its highest in the spring (Bryant and Trigg, 1982). The farmer calves all his herd in July and August usually within a ten to twelve week period. Following the mild New Zealand North Island winter the grass growth quickly responds to the warmer temperatures and spring rains. The cows' lactation curve closely follows the grass growth curve. Maximum milk production occurs in October. Grass growth during the hotter summer months is more irregular and is dependent on irregular rainfall and wind flow.

In New Zealand there is always a problem to supply adequate feed to the milking cows in early spring. If adverse weather conditions occur and grass growth is slow on autumn or winter-saved

pasture then supplementary feed such as hay and/or silage has to be fed in the spring. The maximum milk production per cow can only be achieved if the cow is fed to full appetite with quality feed during the first few months after calving. "Unquestionably underfeeding in early lactation reduces cow performance" (Bryant and Trigg, 1982). A few farmers use nitrogen fertiliser to boost spring pasture growth while others sometimes feed dairy meal concentrates during this critical period of the lactation cycle. Once adequate pasture growth occurs the cows are fed on grass only.

By late spring, grass growth is very rapid and the length of grazing rotation is often shortened to 15 to 20 days. Some of the farm is closed to grazing and this grass is saved for silage and/or hay. These supplementary feeds are later fed out to the cows during the winter months.

The lactation cycle takes eight or nine months and by mid-autumn the milking herd is progressively dried off. Grass growth during this season is very dependent on rainfall and sometimes a dry autumn results in the cows having to be dried off earlier with a consequent loss of milk production. The farmers must also save some grass paddocks for feeding in early spring (called 'autumn-saved pasture'). It is often more efficient and cost effective to dry the herd off early in the autumn (when the cows are approaching the end of their lactation cycle) in order to save some pasture for later feeding in the early spring to the freshly calved cows.

Another critical management feature which influences the date of drying off is the body condition of the cows in the autumn. If the cows have been well fed during the summer and autumn they will be all in a very good or fat body condition. When this group of cows calve in the next spring, provided there is adequate feed available, they will produce the maximum quantity of milk. If, however the summer and autumn grass growth has been irregular or poor and the cows have lost body weight and are in a thin condition at the end of lactation, their next season's milk production (even with plenty of feed) will be less. The body condition of cows at calving is a very important factor influencing milk production (Rogers et al, 1981). In New Zealand the farmers rank their cows according to their body condition. The scale ranges from one to 10 with an average cow ranked as five and a thin cow ranked 2 or 3.

After drying off, the feed requirements of the cows are low. This period coincides with the winter period when grass growth is very slow. The cows graze a little pasture (1/80 of the farm may be grazed each day) and are also fed hay each day to supplement their diet.

Many of these management techniques which result in low-cost milk production could be transferred to East Hokkaido dairy farms; however some adjustment would be needed to fit in with the difficult cold northern climate.

If calving of all the herd can be timed to occur soon after the snows melt and grass growth has started, the cows can begin pasture grazing during the day. Grazing can continue for the next five or six months until the cold weather and snows of autumn. For the first one or two months after calving the pasture diet will need to be

supplemented with other concentrate feeds. After the lactation peak has been reached, an all-grass grazing routine should be adopted. As the colder weather starts in the autumn, milk production for cows which calved in the spring is slowing down. Milking can continue for a few more months after the cows are permanently housed for winter. Feeding during the final few months of lactation should also be aimed at sustaining and building up the body condition of the parent cow prior to next year's calving. After drying off, the cow's feed requirements are very low during the winter months. As less is spent on concentrate feeds at this time farmers' incomes will rise.

The quality of milk varies for a few weeks at the beginning and at the end of lactation. In order to obtain good average quality milk for the cheese and other processing dairy industries, milk from the 100 percent spring calving farms must be mixed with milk available from the traditional dairy farmer, during these few weeks in the spring and autumn. For this reason the 100 percent spring calving management scheme will work best if adopted by some of the farmers in the Hokkaido area while others maintain year-round calving.

This proposed emphasis on dense stocking and rotational grazing combined with 100 percent spring calving will result in much lower feed costs for the farmer. There would also be a reduction in mowing and harvesting costs, and a probable reduction in labour hours. However there may be some additional capital expenditure required for strong permanent fencing and more water troughs. While milk production will fall (especially in the summer months on the all-grass diet) the farmers' incomes should be maintained because their expenditure on supplementary feed is reduced. Even though each individual farmer will experience a fall in summer milk production, if many Hokkaido farmers decide to adopt these management changes. There will be an overall increase in milk production during the summer (with a consequent drop in winter production). This uneven flow of milk throughout the year may require some adjustment by the processing industries.

An attractive feature of this proposal is that a farmer can adopt these techniques slowly over some years. The scheme's advantages can be judged over time. With a simple movable one or two-strand electric fence plus a movable water trough, a small grazing paddock can be established. Each day the fence (and the water trough) is moved to a different part of the farm.

The New Zealand dairy farmer's primary objective is to maximise output per hectare of land. He manages his resources to obtain the maximum amount of grass growth under conditions of intensive stocking. In mainland Japan the efficient Japanese farmer however aims at maximising the production per cow. In the Eastern Hokkaido region where land is not the primary limiting factor, farmers' incomes will increase if they can reduce their feed costs by adopting land management techniques to help them use their low-cost pasture efficiently for milk production.

3.3 Conclusion

For some years the Japanese government has been helping to finance the development of pasture land from the unproductive scrub-covered land in parts of Eastern Hokkaido. This new pasture farm land was sold to dairy farmers with the object of expanding the scale of the average dairy farm in the district to 50 hectares.

Another aim of this farmland expansion project was to encourage the farmers to reduce the quantity of imported concentrate dairy feed by substituting dairy pasture grazing in the warmer months. Compared with the rest of Japan which uses almost no grazing green feed, dairy farmers in Hokkaido obtain 10.6 percent of the dairy herd's total digestive nutrition from grazing and cutting green feed. The Hokkaido farmers also use more hay and silage. In the mainland area of Japan, dairy farmers spend nearly 70 percent more on concentrated dairy feeds compared with the Hokkaido farmer.

In Hokkaido in the warmer months each dairy cow grazes a large area of land. If the stocking rate was increased and a system of rotational grazing was introduced lower cost milk production would result. This all-grass diet would mean less feed concentrates would be needed. Farmers incomes would benefit from the reduction in the concentrate feeds although there will be a fall in milk yield.

The average New Zealand dairy farmer has a large farm (64 effective hectares) and milks 151 cows (in 1984-85). While production per cow is low (3,187 kilograms of liquid milk compared with 5,586 kg in Hokkaido), the costs of producing milk on an all-grass diet is also low (NZ\$0.15 per kg of milk compared with NZ\$0.55 per kg in Hokkaido). Various management techniques are followed on New Zealand dairy farms including high stocking rates, rotational grazing and 100 percent spring calving. Rotational grazing involves subdividing the farm into many two or three hectare size paddocks. Each day the milking herd grazes a different grass paddock. Strong permanent or electric fencing is needed to contain the densely stocked cows. A central race or track across the farm allows for the easy shifting of cows to and from the cowshed. By concentrating calving of all the herd to early spring, milk production follows the pattern of rapid spring grass growth. To achieve maximum milk production the cows must be fed to full appetite with quality feed early in lactation. The date of drying off the cows in the autumn is influenced by the quantity of pasture still available and the body condition of the cows.

While these New Zealand dairy management techniques could be adopted by East Hokkaido farmers, some adjustment may be needed due to the colder climate. The calving date for all the herd needs to be timed to coincide with the Hokkaido spring grass growth. Grazing can continue for five or six months or until the snows of autumn. The milk processing industry must have good average quality milk and, as milk quality varies at the beginning and at the end of lactation, milk from the 100 percent spring calving herds would need to be mixed with milk from cows which calved in other seasons.

The change to dense stocking, rotational grazing and 100 percent spring calving will result in lower supplementary feed costs for the farmer. While milk production in the summer months will fall, farm incomes will be maintained or may increase because of the fall in expenditure.

The New Zealand dairy farmer's objective is to maximise milk production per hectare of land. The emphasis in New Zealand is on maximizing the efficiency with which low cost feed (i.e. pasture) can be converted to milk products. In mainland Japan the dairy farmer's objective is to maximise output per cow. In the Eastern Hokkaido region, where land is not a limiting factor, farmers' incomes will increase if they can reduce their feed costs by managing their land resource more efficiently during the warmer months.

In the Hokkaido farming regions during the warmer months concentrated stocking and rotational grazing will mean that less expensive imported stock feeds and costly hay and grass silage will be needed. Farmers incomes are likely to rise although milk yields would fall due to the cows all-grass summer diet. However the fall in milk yields will help overcome the problem of surplus milk production. Once the problem of milk surpluses are contained, the government is in a stronger position to respond to growing consumer pressure to expand its imports of low price dairy products. There is a need for more work to be done to identify what the trade-offs are between these various interlinked measures but if the dairy farmers from Hokkaido (who supply one third of Japan's milk) can become more efficient at pasture grazing, the resulting fall in milk yields could lead to increased imports of dairy products from New Zealand.

3.4 Summary

1. During the warmer weather Hokkaido dairy farmers need to adopt concentrated stocking and rotational pasture grazing.
2. This will reduce the need for expensive imported concentrate dairy feeds.
3. As feed costs fall farmers incomes will rise although the fall in production per cow (due to the all grass diet) will reduce revenue.
4. The fall in milk production will help reduce the problem of over-production of milk.
5. If domestic milk yields fall then increased imports of low cost dairy products from New Zealand could be expanded.

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