

# Dairy Herd Improvement: Meeting the Information Needs of the Dairy Industry Through a Totally Integrated Cooperative

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## ABSTRACT

The New Zealand dairy industry comprises 2.5 million dairy cows milked in 14,600 herds. Dairy herd improvement has been restructured over the past 8 yr into a single legal entity operating as a farmer cooperative company. The cooperative encompasses the national milk records operations; a single dairy records processing center with an associated national animal database; the development, management, and calculation of sire and cow evaluations; and the deployment of scientific and technical resources for research and development of products and services. Also included is 1) the operation of the country's largest progeny-testing program, an artificial breeding, semen, and inseminating service commanding 80% of the artificial insemination market, and 2) the management of the industry's farm extension service. The extension service and the marginal cost of developing and operating sire and cow evaluations are funded through an industry grant. All other operations, including farm management information, are fully funded by users. The totally integrated operation allows cost-effective utilization of personnel, facilities, and equipment. Industry management information is made available to the industry, universities, and research organizations without charge.

**Abbreviation key:** LIC = Livestock Improvement Corporation.

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## INTRODUCTION

This report addresses the philosophy, structure, and rationale behind the operation of the national farm management and DHI programs in New Zealand. To understand the process, a brief description of the international environment within which the New Zealand dairy industry must operate and the way that environment has shaped and continues to influence the industry's structure and strategic direction is necessary.

### The Nature of the Industry

New Zealand enjoys a temperate climate that has allowed the development of a pasture-based grazing management system; little or no concentrate is fed, and cattle are not housed at all. The objective is to maximize pasture growth for dry matter production and to manage the grazing of pasture to optimize the conversion of dry matter into total milk solids. This simple philosophy is based on low input costs.

The result is a system based on seasonal calving, total dependence on grazing of grass-based pasture, high stocking rates per hectare, and relatively high productivity per labor unit to achieve sustainable low cost production and viable net farm income.

### The New Zealand Dairy Industry

By international standards, New Zealand's dairy production of 7.9 million tonnes is small, being just 1.7% of world production. However, the 24% share of the exporter's international market (1991) makes New Zealand, after the European Commonwealth, the second largest international trader of milk products. The industry is also important to the New Zealand economy, contributing 20% of the country's export income.

Unlike many of their competitors, New Zealand's dairy farmers are totally reliant on

the income they receive from the market because no incentives or subsidies are available from the government. This situation required that dairy farmers learn to live with the widely fluctuating international prices for dairy products during periods when world market prices for milk products were depressed, usually because of overproduction and export subsidies. These major factors have been behind the determination of New Zealand industry to control production costs through the maintenance of the low cost, efficient production systems referred to earlier.

By way of comparison and based on the kilograms of milk fat produced, New Zealand dairy farmers receive 18% of the income paid to Japanese dairy farmers, 25% of the income paid to their Canadian counterparts, 32% of the European Community incomes, 49% of US incomes, and 80% of Australian incomes.

New Zealand has a vertically integrated cooperative dairy industry. The farmers own and operate the 16 dairy manufacturing cooperatives, which in turn own and operate the New Zealand Dairy Board. The New Zealand Dairy Board, on behalf of the industry, operates as the single seller of New Zealand dairy products, determines the mix of products required for the market, and acts as liaison to the manufacturing cooperatives to ensure the appropriate products are produced. The New Zealand Dairy Board then markets the products in the form of commodities, food ingredients, and consumer packages through subsidiaries, joint ventures, or agencies in approximately 60 countries around the world.

The New Zealand Dairy Board is aware of the need to plan ahead and, with little in the way of government funds available, invests significant sums into research in the areas of farm production, manufacturing processes, and product development. Most research is carried out by three organizations: the New Zealand Dairy Research Institute, which conducts research on manufacturing processes and production development; the Dairying Research Corporation, a 50:50 joint venture with government that focuses on farm management and animal production; and the Livestock Improvement Corporation (LIC), which concentrates on genetics, breeding schemes, reproduction, and information systems. Although the LIC receives grants to cover extension and

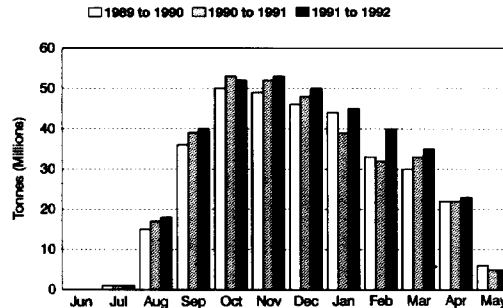


Figure 1. Seasonal milk flow in New Zealand. Data source: New Zealand Dairy Board annual statistics (unpublished data).

some research projects, LIC funds 90% of its research out of the DHI and AI fees charged to its members.

Over 80% of the cows are bred to calve during August and September to coincide with the commencement of spring grass growth. Peak milk production occurs in October and November when grass growth is at its maximum (Figure 1). Surplus grass during this period is harvested into silage and hay. The seasonal milk flow within the New Zealand dairy industry has a major impact on the way industry capital is invested in farm production and on the way the servicing sectors must operate. One consequence of seasonal production is the necessity for the manufacturing sector to provide capital for manufacturing capacity to cope with peak milk flow in October and November. Servicing sector organizations, such as the LIC's DHI and AI operations, are geared to mobilize an army of milk samplers, laboratory analysts, and AI inseminators, who are employed seasonally for periods from 6 wk to 8 mo.

The number of herds, cows, and related statistics are described in Table 1. A typical New Zealand dairy farm milks a herd of 171 cows on 71.25 ha and produces 47,737 kg of milk solids (i.e., fat and protein). Labor consists of the farmer, spouse, and a young farm trainee.

Sixty-five percent of the enterprises are farmed by owner-operators, and 35% are operated by share milkers, as outlined in Table 2. The typical New Zealand dairy farmer has land, buildings, plant, and a herd with a value

TABLE 1. New Zealand dairy statistics 1992 to 1993.<sup>1</sup>

Herds, no.	14,700
Fluid milk, kg	1280
Manufacture, kg	13,420
Cows, no.	2,510,000
Average herd size, no.	171
Cows, no./ha.	2.4
Milk solids (fat and protein), kg/ha	670
Labor, units/herd plus farm	1.96

<sup>1</sup>Data source: Livestock Improvement Dairy Statistics, 1992-1993 (unpublished).

TABLE 2. Operating structures of manufacture dairy herds in New Zealand.<sup>1</sup>

	Farms	
	(no.)	(%)
Owner-operators	9220	65.3
Sharemilkers	4200	34.7

<sup>1</sup>Data source: Livestock Improvement Dairy Statistics, 1992-1993 (unpublished).

of \$740,000 to \$800,000. The most common share milking arrangement is a 50:50 agreement by which the farm owner provides an operational farm and house and the share milker provides the herd of cows and the farm equipment. Share milk operations tend to be larger units than the typical 71.25-ha farm.

**DHI POLICY STRUCTURE AND DECISIONS**

Dairy herd improvement and farm management in New Zealand is organized coopera-

tively through the LIC. The LIC policy is determined by a board of farmer directors elected by the users of LIC services. The LIC Board members are directly accountable to the shareholder, the New Zealand Dairy Board, and also to farmer members through district meetings and regional annual meetings. The structure of LIC (Figure 2) provides for input from all interested groups.

Farmer users of LIC services elect representatives to six regional advisory boards, and dairy manufacturing cooperatives also nomi-

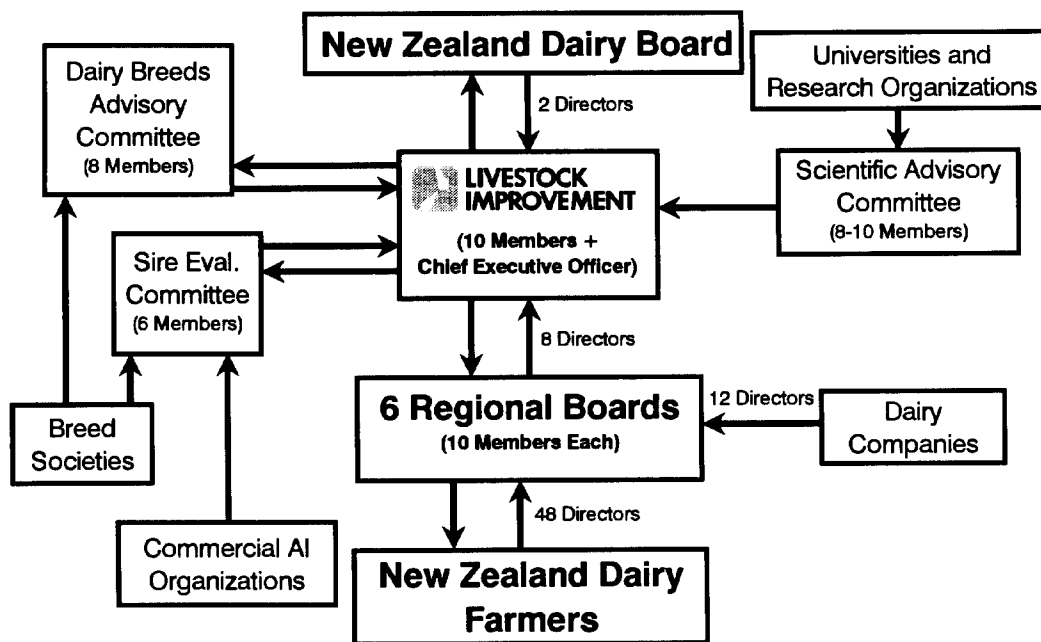


Figure 2. Livestock Improvement Corporation structure. Eval = Evaluation.

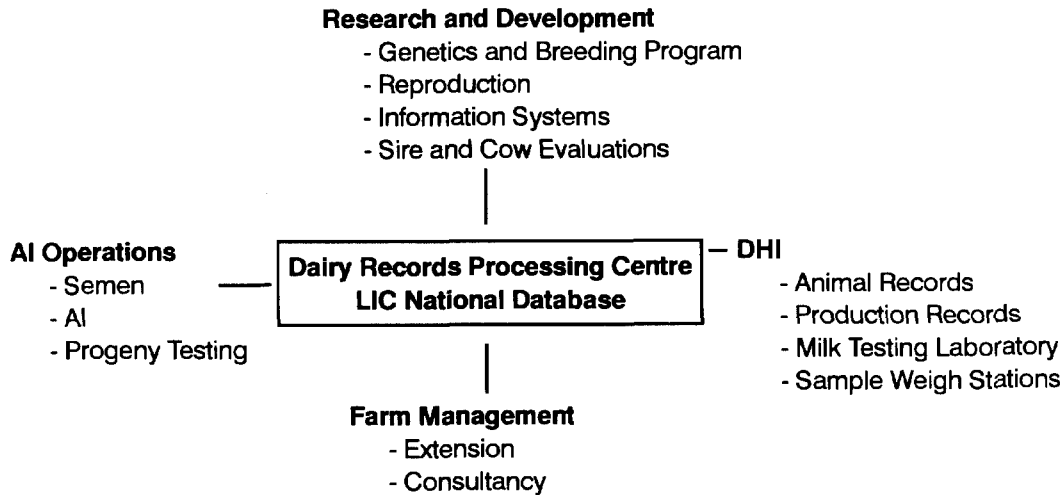


Figure 3. Dairy Herd Improvement and Farm Management in New Zealand. LIC = Livestock Improvement Corporation.

nate two of their directors to each board. The six regional boards maintain liaison with farmers in their respective areas, monitor the delivery and farmer satisfaction with LIC services, consider issues referred to them by the LIC Board, and recommend to the LIC Board matters for consideration. The regional boards nominate one of their number, usually the chairperson, to represent them on the LIC Board. The New Zealand Dairy Board, the shareholder, then appoints the nominees, including two of its own directors, to the LIC Board.

To retain close links with the universities and research organizations, a scientific advisory committee, composed of scientists with skills relevant to LIC operations, is retained to advise the LIC Board on scientific and technical issues.

A Dairy Breeds Advisory Committee, which sits outside the LIC Board, advises the LIC Board on matters related to breed societies and pedigree cattle. In addition, a separate committee with breed society and commercial AI interests makes recommendations to the LIC Board on recording issues relating to sire evaluation and traits other than production.

#### HERD RECORDS COLLECTION, PROCESSING, AND STORAGE

The operational structure (Figure 3) incorporates the national Dairy Records Processing

Centre and National Database, the national DHI operation, a research and development department, the national sire and cow evaluation unit, the industry-funded extension service with an attached self-funded consultancy service, and the largest AI program and AI service in the country.

Data flow through the Dairy Records Processing Centre into the National Database (LIC Database) is delivered from five main sources (Figure 4):

1. The LIC annual sales program, through which part-time sales representatives visit by appointment every dairy farmer in the country over a 6-wk period. Details including farm size and location, farmer's name, herd size, AI, and DHI requirements are obtained.
2. The dairy farmer, who records animal identification and annual animal events (e.g. calving and mating dates, new cows, culled cows). The farmer also responds to surveys on animal health, farm practices, costs, and attitudes.
3. The LIC AI operation, which records every detail of the 2.1 million AI carried out annually.
4. The DHI records for the 2.1 million cows in the service (1992 to 1993). The DHI rules require that every cow in the herd under DHI service has milk

recorded and has a representative milk sample tested for fat and protein percentage. From 1992 to 1993, SCC became an integral part of DHI; SCC were recorded for every cow at every test.

5. The Extension Service collects economic information on farm performance, farm trends, and practices.

Once the data have been recorded into the LIC National Database, they are utilized by a wide range of users. The farmer clearly has priority and receives a variety of management reports, some automatically, and others upon request.

#### Use of Information

The LIC utilizes the information and the database to operate its business, including the allocation of sample dates for DHI; semen allocation, conception rate results on bulls, semen batch, inseminator, and management of the progeny testing program for the AI operations; and summarized information on production, conception rates, and submission rates for extension officers. Data are made available to scientists for research and development and to sire selection personnel for the screening and subsequent mating of bull dams.

Information is available to other research organizations and universities for research and development; dairy manufacturing cooperatives and the New Zealand Dairy Board can obtain information on expected and actual cow numbers, projected milk flow, and estimated monthly and seasonal milk solids yield.

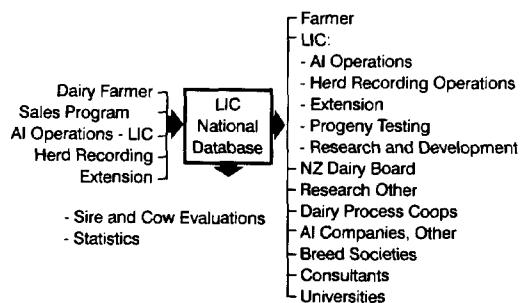


Figure 4. Flow of data from farm through database to users. LIC = Livestock Improvement Corporation.

TABLE 3. Dairy herd recording in New Zealand.

	Herds	Cows
	———— (%) ————	
Animal identification and events	85	91
DHI Production records (includes SCC)	74	78
Sampling officer option	23	22
Farmer sampling option	77	78

<sup>1</sup>Data source: Livestock Improvement Dairy Statistics, 1992–1993 (unpublished).

Records of breed societies are held in the database, and their annual production registers are printed from the files.

Sire and cow evaluations are available on an interim basis and final basis to all AI companies and other interested parties, including farmers. Statistics on farm production activities and trends are published and are widely used by industry organizations, universities, and research organizations.

A list of proposed additional reports are scheduled for development and implementation as soon as the resource and type of data collected becomes available.

#### Systems in Use

Use of the DHI program in New Zealand has grown steadily over the past 10 yr. In 1992 to 1993, 74% of herds and 78% of cows were enrolled in the program that includes SCC (Table 3).

A basic herd information recording service, which is incorporated into the DHI program, is made available to non-DHI farmers. The program records the identification with full ancestry of all animals in the herd and all annual events (e.g., calving and mating dates, including sire, new cows, culled cows, and fate codes). Eighty-five percent of herds and 91% of cows were enrolled in the program.

The DHI program is offered in two basic forms, either a sampling officer provided by LIC or farmer sampling. For farmer sampling, LIC delivers milk meters, sample flasks, and sampling sheets to the farm for the farmer or helper to take the samples. Otherwise, the samples are collected by an LIC staff member following the morning milking. The samples

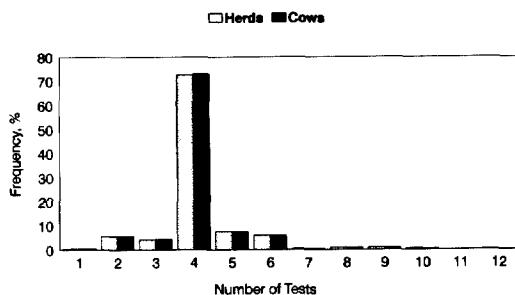


Figure 5. The DHI options and frequency: farmer sampling. Data source: Livestock Improvement Corporation annual statistics (unpublished).

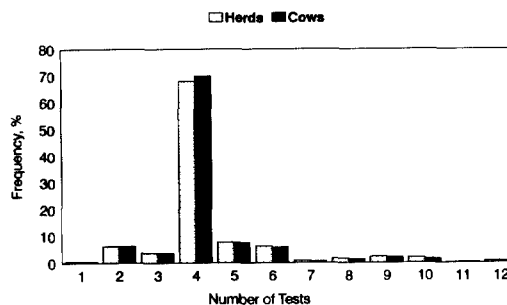


Figure 6. The DHI testing frequencies selected: sampling officer. Data source: Livestock Improvement Corporation (unpublished).

are then electronically weighed at a regional depot, and milk yields are calculated prior to a testing of a composite sample for milk fat and protein percentages and for somatic cells at a single national milk analysis center.

Twenty-two percent of cows are enrolled in the officer sampling program, and 78% are enrolled in the farmer sampling program (Table 3).

In addition to the two basic DHI programs, New Zealand dairy farmers can select from 1 to 12 tests each year. Farmer priority is to obtain a within-herd ranking for the cows in order to identify the groups for culling and breeding; however, an extensive range of additional management reports are widely used. These reports include expected calving, SCC, cow listings in various options, and a guide to drying off cows.

Because of the seasonal nature of the dairy industry from all cows being at a similar stage of lactation and because of an acute interest in containing costs, only a small percentage of farmers enroll for the monthly sampling frequency. Testing at 8-wk intervals is the most popular option for both the farmer sampling and the sampling officer systems; 70 and 76% of cows, respectively, are enrolled in each option (Figures 5 and 6).

The LIC AI program is utilized by 72% of herds; 69% of cows are inseminated artificially (Table 4). Of the 1.73 million cows inseminated in the 1992 mating season, 1.41 million (82%) were bred under a system in which the farmer did not select the individual sire. Instead, the LIC sire selection program identified a small team of the highest breeding index sires available, and semen from them was col-

lected and distributed on a rotational basis. The system utilized ambient temperature liquid semen with dilution rates down to 2 million sperm per straw. This system enabled optimal utilization of the best sires; AI totals of over 250,000 were achieved for individual bulls during the 12-wk mating period. The objective of the system is to optimize the average breeding index in the inseminated group of cows. Another significant feature is low cost; semen are transferred at NZ\$4.60 per straw.

The DHI costs under the LIC cooperative program are held as low as is practical. In common with DHI organizations all around the world, source costs are highly sensitive to volume, and every effort is made to maximize utilization. The costs per cow for the DHI program for the 1992 to 1993 season for AI and for combined semen charges are shown in Table 5.

**EXTENSION**

The LIC extension service employs 33 specialist dairy farm extension officers at a ratio of 1:445 officer:farmers. The annual contact

TABLE 4. Livestock Improvement Corporation (LIC) AI service, 1992.<sup>1</sup>

Cows inseminated, no.	1.73 million
Bull not selected by farmer, no.	1.41 million (82%)
AI to highest use sire, no.	274,000
Cost per semen dose used, NZ\$	4.60

<sup>1</sup>Data source: LIC annual statistics (unpublished). The LIC AI program is utilized by 72% of herds; 69% of cows are bred by AI service.

TABLE 5. The DHI cost per cow.

	Average cost per cow
DHI (full recording) 8-wk option	(NZ\$)
Farmer sampling	8.47
Sampling officer	12.07
Cost per AI <sup>1</sup>	
Technician AI	9.68
Farmer AI	7.36

<sup>1</sup>Data source: Livestock Improvement Dairy Statistics, 1992-1993 (unpublished).

<sup>2</sup>Insemination charge includes semen.

rate with the 14,700 farmers is 60%, or just under 9000 farmers. The group focuses on coordinating and promoting the development, understanding, and application of efficient farm management practices on dairy farms. The LIC extension service operates as the vital link between research and the farmer and is invariably required to convert research findings into practical farm applications.

The extension group adopts a whole farm approach to profitability, and the focus is on the joint needs of the farmers and the industry.

Twenty to 30% of the extension officer's time is spent on individual consultancy, which, in New Zealand, is thought to be essential in order to establish new farmers and share milkers on their farms and simultaneously to ensure that the extension officer is fully aware of the impact of extension programs on farm costs.

### CONCLUSIONS

In summary, the totally integrated approach to farm management, extension, and DHI in New Zealand, including applied research and development, industry statistics, sire and cow evaluations, and the major AI operation, allows extremely cost-effective utilization of personnel, facilities, and equipment. Because of the clear focus on industry needs, information from the LIC database is made available to sectors within the industry, universities, and research organizations. The close collaboration within the industry ensures that all of the participants are aware of the information available and that each is encouraged to identify individual uses for it. Dairy herd improvement in the traditional sense is but a small part of the program to improve the productive efficiency of New Zealand's dairy farms.