

# **Balancing commercial and industry good in New Zealand dairy herd improvement**

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## **Abstract**

Livestock Improvement Corporation (LIC) is a New Zealand dairy farmer owned cooperative that had its original formation over 100 years ago. Over the last century LIC has evolved from herd testing business, to herd improvement and today is the largest integrated animal performance improvement business in the world, LIC is now widening its boundaries to assist farmers with a range of on-farm automation, and farm decision support tools.

LIC works collaboratively with a number of industry good organisations to deliver New Zealand's animal recording and genetic evaluation.

LIC has always been owned by New Zealand dairy farmers but this ownership underwent two significant evolutions, first in the 1980s when we transitioned from a collective of regional, Industry Good incorporated societies, to one national organisation which was a subsidiary of the New Zealand Dairy Board and again, in the early 2000s, when LIC became an independent farmer owned cooperative with dual cooperative shares and share market listed investment shares.

The presentation will outline how the New Zealand market operates, ensuring that commercial and industry good needs are met and share some insights on future evolutions.

*Keywords: agricultural cooperative, dairy herd improvement, innovation, public good*

## Introduction

In 1990 international market liberalisation for dairy products began to take effect. Since then, the New Zealand dairy industry has increased milk production output by 165% (Anon, 2011). World dairy production has increased by 25% over the same period (FAOSTAT, 2012).

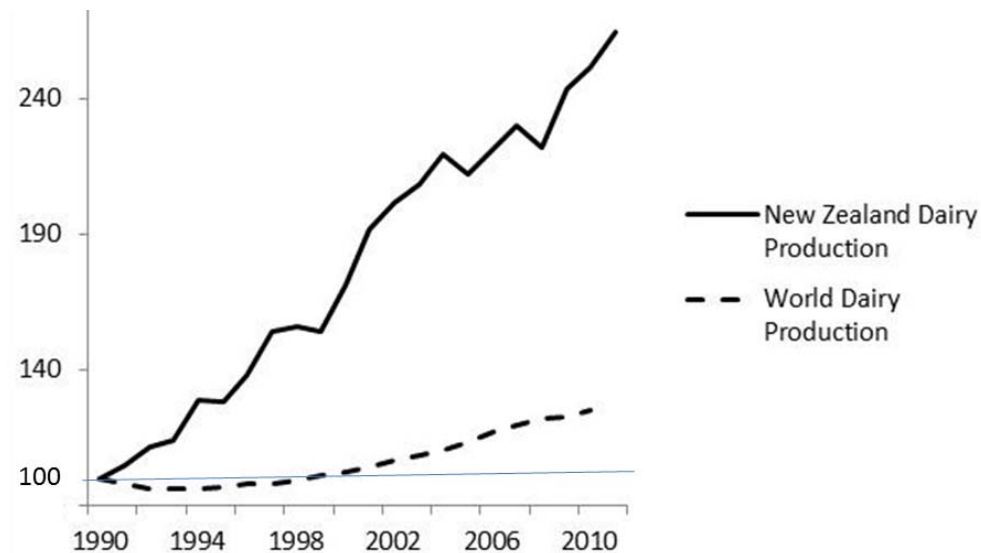


Figure 1. Annual output of New Zealand and world dairy industries since 1990

Twenty years ago herd managers were managing around 160 milking cows, while currently they manage around 400 milking cows on average — and the trend to much larger herds is accelerating. Their information services must be timely, succinct, and customised for personal requirements.

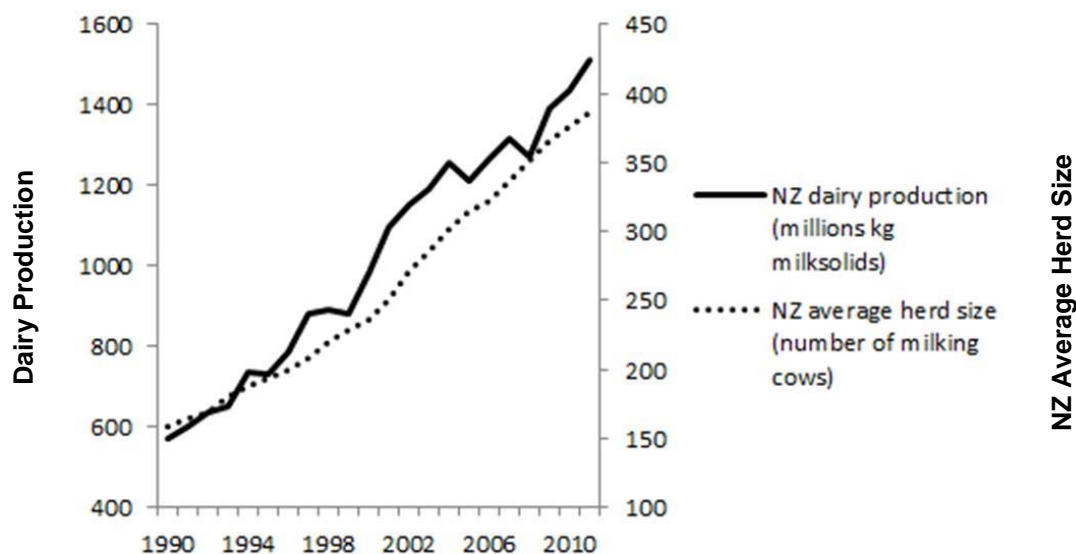


Figure 2. Trends for national dairy production and herd size in New Zealand.

This dynamic expansion of the New Zealand industry has been driven by farmers, supported by a number of successful service organisations, whose primary focus was on continuously meeting their farmers' needs. As a consequence of industry growth, and their own success, these organisations have been able to generate sufficient profits to undertake a wide range of research and product development innovation to meet these rapidly changing farmer needs.

LIC has always been one of the leading service providers to New Zealand dairy farmers. Throughout the period of rapid industry development, LIC's commercial delivery of services included all aspects of successful operation of dairy farm businesses from dairy genetics to farm management advice, animal testing and animal recording services. The provision of a wide range of products and services enabled LIC to maintain close links with farmers, enabling continuous innovation to answer, and often exceed, changing farmers' needs.

LIC record over 90% of NZ dairy cows on its MINDA system. Approximately 75% of NZ cows are inseminated with semen from LIC's daughter proven and genomically selected semen. Approximately 70% of cows are herd tested. New innovations are gaining market acceptance with approximately 10% of NZ cowsheds running an LIC automation system, over 40% carrying out BVD bulk milk tank monitoring, and approximately 150 new herds signing on for dna parentage verification each year.

LIC's commercial relationships reveal more about farmer preferences than public good organisations can discover from surveys. As a herd improvement cooperative LIC is closely aligned with the New Zealand dairy farmers; its shareholding members are also the cooperative's own customers. This unique structure minimises the tensions between the interests of shareholders and customers that often compromise other forms of corporation — for example, where shareholders prefer high prices for services while customers prefer lower prices.

LIC's dynamic expansion also created significant opportunity for investment in innovation and continuous operational improvement aided by the Cooperative's commercial nature - profitability providing LIC with investment funds for these purposes. This aspect of LIC's operations has been emphasised previously at ICAR (Howse & Montgomerie, 2007), and profitability has continued to drive innovation since that time. LIC revenue for 2010-2011 was NZ\$166 million; earnings before interest and tax were NZ\$24.3 million. Return on capital was 9.25%.

It is critical for LIC to deliver strong annual profit performances because the Cooperative expects to invest between NZ\$20 million and NZ\$40 million (12-20% of revenue) per year in capital development and other major research or development projects. Quite simply, if we cannot generate annual profits of \$20 - \$40M we will not be able to sustain the reinvestment required into the cooperative.

## **Commercial, Industry Good and Public Good**

For the purposes of this paper, "Commercial" refers to goods and services provided to customers, where the customers' fee for service is sufficient incentive for the organisation to

bring the goods and services to market. “Industry Good” refers to services that are beneficial to farmers, but are affected by market failures so cannot be provided commercially. A national genetic evaluation system is a classic case of an industry good service. In economists’ language, commercial provision would fail because non-payers cannot be excluded from the benefits. “Public Good” refers to government interventions aimed at promoting the welfare of society at large by, for example, encouraging fundamental research that is anticipated to provide long term benefits but are too risky for commercial enterprise to undertake. Other interventions can be justified to remedy situations where commercial costs to the producers differ from the total social costs — which can arise, for example, if wastes from production are disposed of in ways that degrade water supplies for the wider community.

The distinction between *industry good* and *public good* services is that industry levies are used to fund or co-fund remedies for market failures in the *industry good* case, whereas taxpayers fund or co-fund remedies in the *public good* case.

## **Structure of the commercial market in New Zealand**

The market for herd improvement services can be conveniently described in three categories: (1) herd recording such as calving dates, AI events, parentage, and animal health; (2) herd testing for test-day yields and somatic cell counts for individual cows; (3) provision of AI bull semen for genetic improvement.

LIC and CRV AmBreed both provide herd recording and herd testing services. LIC is required by legislation to maintain the national dairy database with records provided by LIC and CRV AmBreed. This database underpins the national genetic evaluation system.

LIC and CRV AmBreed are the major providers of bull semen for AI, but the bull semen market also includes participation by breed societies, semen importers and local independent providers.

LIC has approximately 75% share of the bull semen market, and over 90% market share in dairy based herd recording and milk testing. The presence in the local market of two competing companies that are innovative and fully resourced for each category of service guarantees that the New Zealand herd improvement market is vigorously contested. This is a satisfactory configuration for economic efficiency demanding continuous improvement as a necessary condition for business survival.

## **Importance of innovations**

A large amount of evidence supports the theory that entrepreneurship and innovation are the key drivers of economic growth (Baumol, 2010). Taken together entrepreneurship and innovation summarise the activities of risk-taking enterprises that introduce something new into the world — new techniques that revolutionise the group of products in which the service providers compete. There are two key observations about the economic impacts of entrepreneurship and innovation. The first is that a business enterprise ignores innovation at its peril. History is littered with the failed enterprises that became obsolete because they were out-run by innovative competitors. The second is that the welfare benefits of the successful innovations accrue in the long run to consumers. In the context of herd improvement the

immediate consumers are dairy farmers. The ultimate consumers are the people around the world who buy dairy products.

Entrepreneurship is inherently risky, so there are many unsuccessful innovations. Since incorporation in 2001, LIC has introduced successful innovations to the benefit of its immediate consumers, New Zealand farmers. These include electronic data capture on farm and automatic transfer to the national dairy database, use of SNPs for parentage identification removing the need for farm staff to observe calving events, and genomic selection of young sires and dams to increase rates of genetic gain in farmers' herds. Other product innovations include: Herd Testing automation; Sire Proving; AB with frozen and fresh semen; EZ Heat; electronic mating management and in-breeding control; mobile from data capture; Genomic Selection; Protrack farm automation systems; once-a-day herd testing; electronic herd testing; parentage testing; milk BVD testing; herd recording software; animal database; sexed semen; Short Gestation Length semen, Once-a-Day index; Breeding Worth, Production Worth and genomically selected sires.

## **Industry good**

While direct commercial service is the most efficient way to deliver many technology improvements, there are some economic circumstances that work against optimal outcomes if services are solely provided in response to companies' reactions to profit signals. For example, economists identify cases where socially desirable activities cannot be conducted by profit-seeking businesses because the benefits accrue in ways that cannot be built into the organisation's pricing of products. Some herd improvement services have these industry good or public good characteristics.

The national genetic evaluation system and the national dairy database are both examples of industry good service provision that enhances the welfare of dairy farmers, but which would probably not exist if they were left entirely to commercial enterprise.

In the New Zealand context, the national genetic evaluation system is provided by LIC under contract to DairyNZ. DairyNZ is funded by a levy on all New Zealand dairy farmers. LIC and DairyNZ co-fund the national genetic evaluation system, with supplementary funding from owners of bulls registered for AI use. The public face of this industry good service provision is that all the outputs of the national genetic evaluation system for the registered AI bulls are available in the public domain free of charge to users of the system. For animals other than the registered AI bulls, the outputs of the national genetic evaluation system are LIC's commercial property to be shared with other parties on agreed commercial terms. The national dairy database is recognised by the New Zealand Government as an industry asset that must be preserved into the future, and LIC has the responsibility under legislation of maintaining and continuously updating it (Anon, 2001).

In the future it is highly likely that DairyNZ will create a new, independent database to hold designated Industry Good data collected from herd testing and other sources. LIC will continue to provide the designated core data to the DairyNZ Core Database. In parallel with this move, the management of the national genetic evaluation service for bulls will also move from LIC to a new independent entity. LIC and other companies involved in genetics and

herd testing will be required to provide data to the new entity to allow the calculation and publishing of progeny test based proofs for all sires registered in New Zealand.

LIC has been shown to operate the national dairy database and national genetic evaluation system with a high degree of integrity, however, the Co-operative's commercial motivation creates some distrust amongst competitors. An important part of the overall industry structure is that DairyNZ has a vital monitoring role as a co-funder of these activities — behaving, in part, as the representative of dairy farmers who are not part of the Co-operative.

## **Public good**

The ultimate beneficiary of herd improvement services is the general public as the consumer of dairy products. Public good considerations arise where economic “externalities” or transaction spill-overs affect the public's welfare. These externalities are costs or benefits that are not transmitted through prices.

An example of a positive externality is the spill-overs that arise from investment in fundamental research into mouse genetics, which provide positive benefits for understanding of human inheritance. On its own the commercial market would under-provide research into mouse genetics, so governments intervene with funding to increase investment in this area. In general, entrepreneurship provides massive positive spill-overs in the cases of the successful innovations. Left only to the operations of commercial markets, society would provide too little investment in fundamental research — so governments intervene to boost the public good.

LIC is currently committed to co-funding research of this type in the area of metabolic efficiency of dairy cows (Pryce *et al.*, 2012).

The New Zealand Government is also committed to fundamental research into environmental impacts of ruminants – with negative spill-overs, for example in methane emissions to the planets atmosphere. In this context LIC is a research provider for the Pastoral Greenhouse Gas Research Consortium established under a memorandum of understanding with the New Zealand government.

## **Strengths and weaknesses**

### **Commercial service**

A key strength of LIC's commercial service provision is the very close association between LIC and our farmer customers. We know that our survival or failure depends on our ability to simultaneously control our costs and continuously improve staff performance and operational practices — but even more importantly success depends on our ability to anticipate our customers' future needs. Anticipation of future needs enables LIC to develop solutions in our innovation pipeline, even before many customers have fully comprehended the threats and opportunities that will confront them.

A secondary, but essential strength of herd improvement in New Zealand is the integrated nature of LIC’s product and services range. Farmers are able to meet all of their herd improvement requirements through LIC. One customer representative will service the farmers’ needs, all data from all products is captured and stored within LIC’s database systems, and one contact centre services all ongoing requirements. The leverage achieved by having milk performance testing, disease testing, DNA testing results all automatically updating into the farmers MINDA records system is enormous. One this data is captured, the farmer can utilise it on a daily basis through their in shed farm automation system, or farm software that is accessible via their office PC or the internet. There are no time delays from having to transfer data between separate organisations and no need to have multiple service providers. We believe that LIC is the largest fully integrated herd improvement company in the World.

A third strength is the commercial efficiency that arises from the financial disciplines embedded in profit-motivated organisations. These, in the case of LIC’s dual shareholding, include market pricing of investment shares via trading amongst members of the cooperative. This trading is restricted to practising farmers, but it is carried out on the New Zealand stock exchange, so as a listed stock exchange company, LIC is subject to all the public reporting disciplines of a listed company.

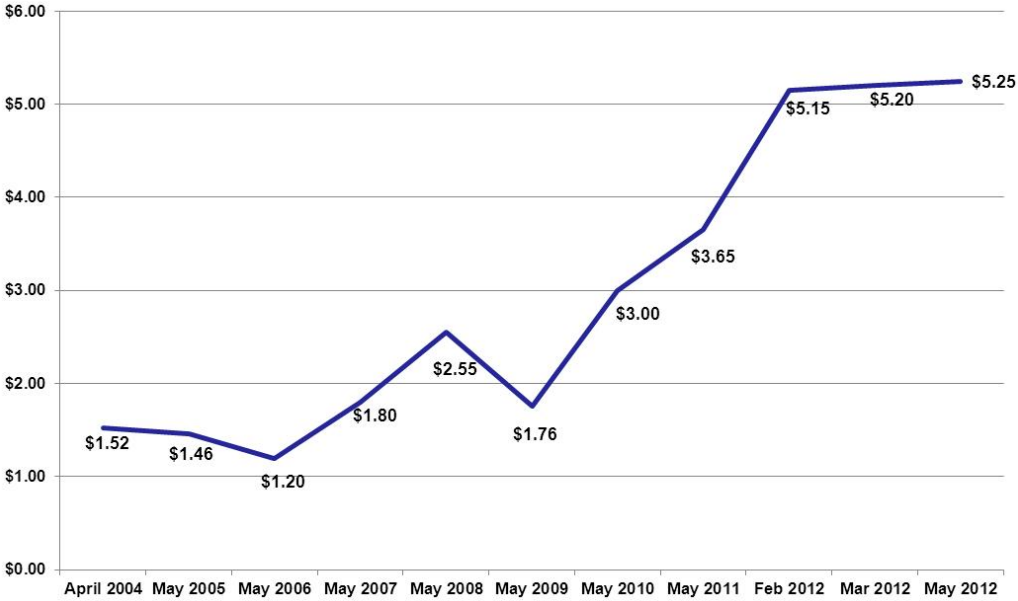


Figure 3. Share Values since 2004

**Industry Good**

DairyNZ is the major industry good provider for New Zealand dairy farmers. A strength of DairyNZ in the herd improvement area is the fact that it represents all farmers, whether or not they are members of the LIC Co-operative. An associated strength is that it is independent from any commercial investment in genetic material. This is an important factor when breeding goals for the industry are under consideration. Prior commercial investments in

selection of parents for breeding plans potentially disrupt objectivity when discussing the best ways to arrange industry breeding goals.

Potential weaknesses include the distance of the organisation from adequate funding to support the parts of herd improvement where market failures arise. Also, funding constraints make it very difficult for the industry good organisation to arrange fully effective communications programs on the vital role of animal improvement in ensuring long term competitiveness of the farming enterprise.

## **The Future**

We expect dairy cow numbers to grow by 2-3% pa over the next decade, driven by strong pricing for milk, and a further shift in land from beef and sheep or cropping to dairy. This will create an environment where LIC will be able to continue to grow and invest in research and product innovation.

We expect that genomics will continue to progress, and as customers see the benefits and gain confidence in it, the use of genomic sires will increase. We predict that the proportion of genomic semen sold will increase from approx 35% today to in excess of 80% in a decade's time.

We expect an explosion of technology on farm, focused around automatic capture of data from devices located around the farm and in the cowshed. This data will be transferred back to LIC's database where advanced analytics will be used to derive insights into the day to day performance of the farm. These insights will be turned into decision support aids and passed back to farmers through a range of mobile devices.

We expect large growth in animal sensors that will detect and monitor a wide range of health and functional characteristics, such as oestrus state, health, condition score. All of this data will be integrated back into our information systems which will use a range of advanced analytics techniques to provide key insights and predictions / decisions back to farmers.

We expect over 50% of replacement heifers will be genotyped at birth for the purposes of parentage verification and prediction of performance of key traits.

We expect that Industry Good will primarily focus on research, education and advocacy. An important additional role of Industry Good will be monitoring the claims and product performance of herd improvement service providers, particularly in the area of technology. We see no future potential for market failure in the provision of products and services, and therefore no role for Industry Good in the actual supply of products or services.

To succeed in the future, herd improvement companies must be highly profitable to keep up with the investments required, and highly responsive to their customers, to keep up with their changing needs.

For those who can keep up it will be an exciting time.



## Summary

International competitiveness in the absence of subsidies or tariff protections has characterised the New Zealand dairy industry for twenty-five years. Farmers have developed profitable practises that feature high numbers of cows per farm worker. These developments have created opportunities for herd improvement providers to bring new technologies to market that help farmers improve productivity and profitability of their farms. The future will be characterised by the need for continuous improvement to protect the competitiveness of the industry. Competitiveness will need to be achieved with proper regard to environmental sustainability. Technologies supporting farmers in the challenging occupation of providing stock feeds and efficiently converting them to dairy production will need continuous upgrading.

The balance between commercial, industry good and public good providers will be sensitive to changes in society's perceptions of dairy farming and dairy products. Whatever readjustments to the balancing of these responsibilities takes place, the role of innovative herd improvement cooperatives is likely to be crucial in achieving best outcomes for farmers and consumers.

## Acknowledgements

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## References

- Anon, 2001. Dairy Industry Restructuring Act 2001.  
<http://www.legislation.govt.nz/act/public/2001/0051/latest/DLM106751.html>. Accessed 25 April 2012.
- Anon, 2011. New Zealand Dairy Statistics 2010-11. DairyNZ Limited, Private bag 3221, Hamilton 3240, New Zealand.
- Baumol, W., 2010. The Micro Theory of Innovative Entrepreneurship. Princeton University Press, 41 William Street, Princeton, New Jersey 08540.
- FAOSTAT. 2012. Food and Agricultural commodities production.  
<http://faostat.fao.org/site/339/default.aspx>. Accessed 25 April 2012.
- S. Howse & B. Montgomerie. 2007. Innovation in New Zealand herd improvement practices: how Livestock Improvement is responding to a changing world. In: Proceedings of the 35th Biennial Session of ICAR, Kuopio, Finland, June 6-10, 2006, J. Kyntaja, K. Lampinen, A. Rosati & C. Mosconi (editors), Wageningen Academic Publishers, The Netherlands, p 147-152.
- J. Pryce, J. Arias, P. Bowman, S. Davis *et al.* 2012. Accuracy of genomic predictions of residual feed intake and 250-day body weight in growing heifers using 625,000 single nucleotide polymorphism markers. *J. Dairy Sci.* 95, 2108-2119.