International Strain Trial

Trial confirms superior attributes of New Zealand Holstein genetics

Livestock Improvement

Strain Trial Summary

Introduction

Livestock Improvement as a company aims to constantly improve its products and welcomes comparisons with other types of genetics found around the world. In 1998 two trials were started to compare how New Zealand Holstein and North American Holstein cows performed in various environments. One trial was based in New Zealand under the supervision of Massey University and Dexcel, the other in Ireland at Moorepark, County Cork, under the supervision of Teagasc. (www.teagasc.ie).

In summary, the trials found that Holstein cows of (predominantly) New Zealand ancestry:

- Produced more milk in terms of both volume and milksolids under low-feed conditions
- Had superior fertility – measured by the 6 week in-calf rate and the overall empty rate
- Were more profitable when compared to cows of North American origin in pasture-based farming systems typical of those found in Ireland and New Zealand.

The animals involved in the Strain trials

In both the Moorepark and Dexcel trials there were New Zealand high genetic merit cows. These cows were generated by finding suitable parents from an extensive search of Livestock Improvement's national database in 1998. Potential dams that had pedigrees of predominantly New Zealand breeding were identified. These cows were mated to high Breeding Worth sires to generate a group of calves that had a genetic background of >87.5% New Zealand genetics. Breeding worth is an animal evaluation calculation performed 3 weekly in New Zealand using the following relative effective percentage weightings:

Milkfat 7%(+), Protein 38%(+), Milk volume 16% (-), Liveweight 18%(-), Cow fertility 9%(+), SCC 7% (-), Residual Survival 5%(+). More information can be found at www.aeu.org.nz.

The first daughters were born in 1999 and became the NZ90s strain in both the Irish and New Zealand trials. The animals that are identified as New Zealand strain cows in both trials are as related to their herd-mates within each country as they are to their opposite country counterparts allowing us to make realistic across country comparisons. A high production "overseas" strain (OS) was also generated in a similar manner in both countries. The selection policy here was to ensure that the genetic background of cows could be traced back to North America, although recent generations of ancestors might be from countries that have undergone Holsteinisation in recent years, such as the Netherlands and France.

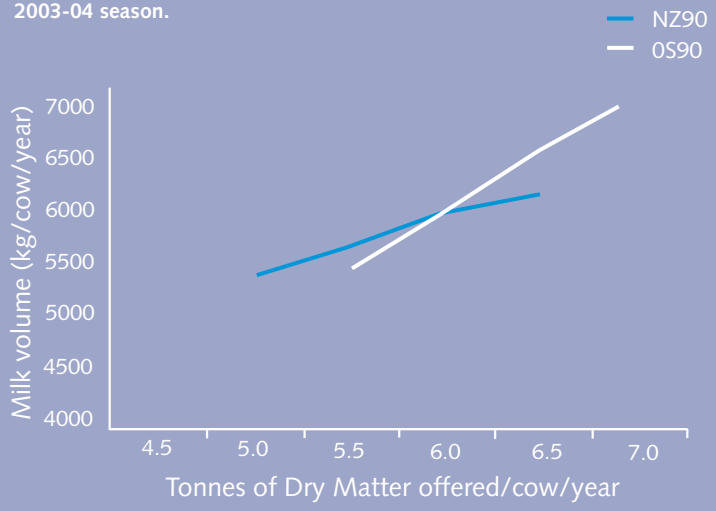
NZ90-A high Breeding Worth ($BW) Holstein of New Zealand origin.
OS-A high Breeding Worth ($BW) Holstein of overseas origin.

Production results

At the age of 23 months the heifers were put into farmlet trials in their respective countries, which was aimed at measuring the physical and financial performance of the strains of Holstein cows. Each strain was managed over a range of feed allowances, differing in stocking rate and use of supplementary feed.

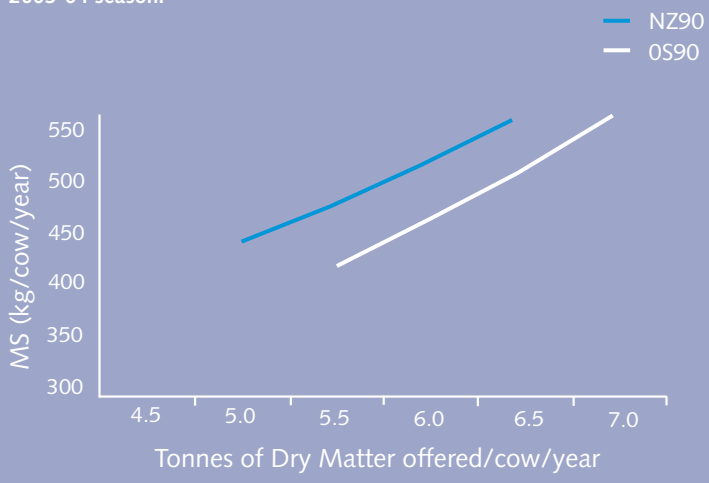
In New Zealand the NZ90s strain produced the most milk yield up to the 6 tonne Dry Matter (DM) per cow per year level of feeding. It was only at the extreme feeding level of 7 tonnes DM per cow per year level of feeding that the OS strain edged ahead. At the levels of feeding regarded as normal in both China and New Zealand, the NZ90s strain was superior.

Figure 1: Per cow milk yield of Dexcel strain trial farmlets for 2003-04 season.



In New Zealand the NZ90s strain produced the most in total lactation yield of milksolids regardless of the level of feeding. In Ireland the OS strain yielded the most on all levels of feeding and showed an increased response to production corresponding to higher levels of feeding. The results of both trials show that the NZ90s strain is more productive at lower levels of feeding, while the OS strain becomes more competitive at higher levels of feed supplementation with concentrates. The New Zealand strain trial showed that the response to an extra tonne of Dry Matter/cow/year of feed offered was 66 kg of milksolids/cow/year for the NZ90s strain, while the response of the OS strain was 82 kg of milksolids/cow/year. The steeper gradient of the OS90s line in Figure 2, demonstrates the increased response to feeding level. Increasing the level of feed offered was manipulated by altering the amount of concentrates offered and by altering the stocking rate.

Figure 2: Per cow milksolids production of Dexcel strain trial farmlets for 2003-04 season.



In the New Zealand strain trial, the daily yield of milksolids production was very similar for both NZ90s and OS strains of cows. The achievement of superior total lactation yield of the NZ90s strain, as shown in Figure 2, was mainly due to a difference in lactation days. In New Zealand, management rules of when to dry off are often guided by level of body condition score. The OS cows tended to be of lower BCS throughout lactation. The same trend was seen in the Irish trial with the NZ90 strain being consistently higher in body condition score throughout lactation (Figure 3). A plot of BCS through lactation using data from the Irish trial is shown in Figure 4.

Figure 3: Per cow lactation length of Dexcel strain trial farmlets for 2003-04 season.

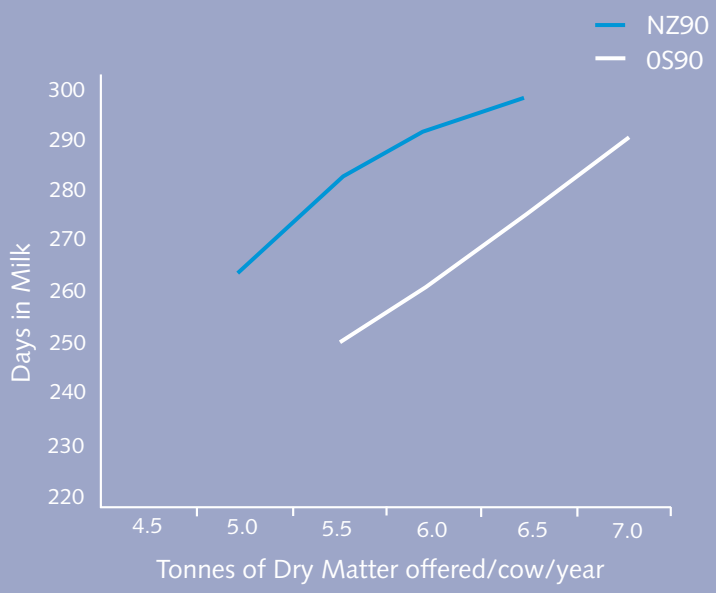
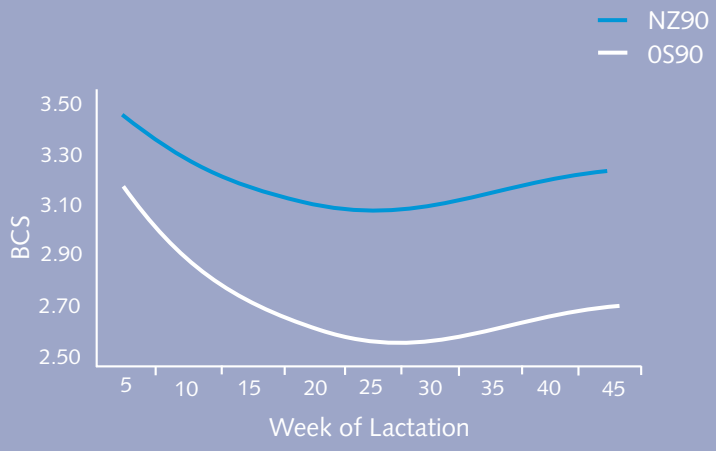


Figure 4. Body condition score of OS and NZ90s strains plotted against week of lactation using data from Moorepark, Ireland



Fertility

- The NZ90s strain had better reproductive performance than the OS strains in both the New Zealand and Irish strain trials.
- Six week pregnancy rates were between 29% and 37% higher in NZ90s cows (Table 2)
- Overall calving rates were better in NZ90s cows than OS.
- Offering higher levels of concentrate supplementation did not improve the reproductive performance of OS cows.

Table 2. Effect of strain on reproductive performance

	New Zealand		Ireland	
Strain	**NZ90**	**OS**	**NZ90**	**OS**
6 week pregnancy rate	74	54	70	54
Calving rate	93	87	93	74

Financial performance

The NZ90s strain was most profitable in both Ireland and New Zealand and at all feeding levels tested in the strain trials. In Ireland, the advantage of the NZ90s strain over the OS strain under a 100,000 gallon scenario was in the region of 40% more profit.

The economic assumptions used in the two countries are sufficiently different that the economic analyses are not directly comparable, but the results of the New Zealand trial tell the same story – that the NZ90s strain is most profitable regardless of feeding level, showing an average of 12% economic advantage of the NZ90s strain over the OS strain.

The greater advantage of the NZ90s strain in Irish conditions could have been because of the cost of fertility, in particular, the replacement cost associated with culling infertile cows.

Summary

Comparing NZ90 to OS

- OS90 cows were bigger and later maturing.
- In New Zealand: Daily milksolids production was similar although the NZ90s strain had superior total lactation solids yield because of more days in milk. The OS strain did poorly at moderate feeding levels.
- The NZ90s strain has superior reproductive performance.
- Concentrate supplementation does not improve fertility of OS cows where grass supply is adequate.
- Selecting sires should be based on merit rather than strain. Within the OS strain there were still sires that did a good job.
- Overall, NZ90s strain is more profitable under systems tested in NZ and Ireland.

Acknowledgements:

The research team includes:
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APPENDIX 1.

Breeding Worth

Breeding Worth (BW) ranks bulls and cows on their expected ability to breed replacements which wil be efficient converters of feed into farmer profit. It is used as a guide to making breeding decisions.

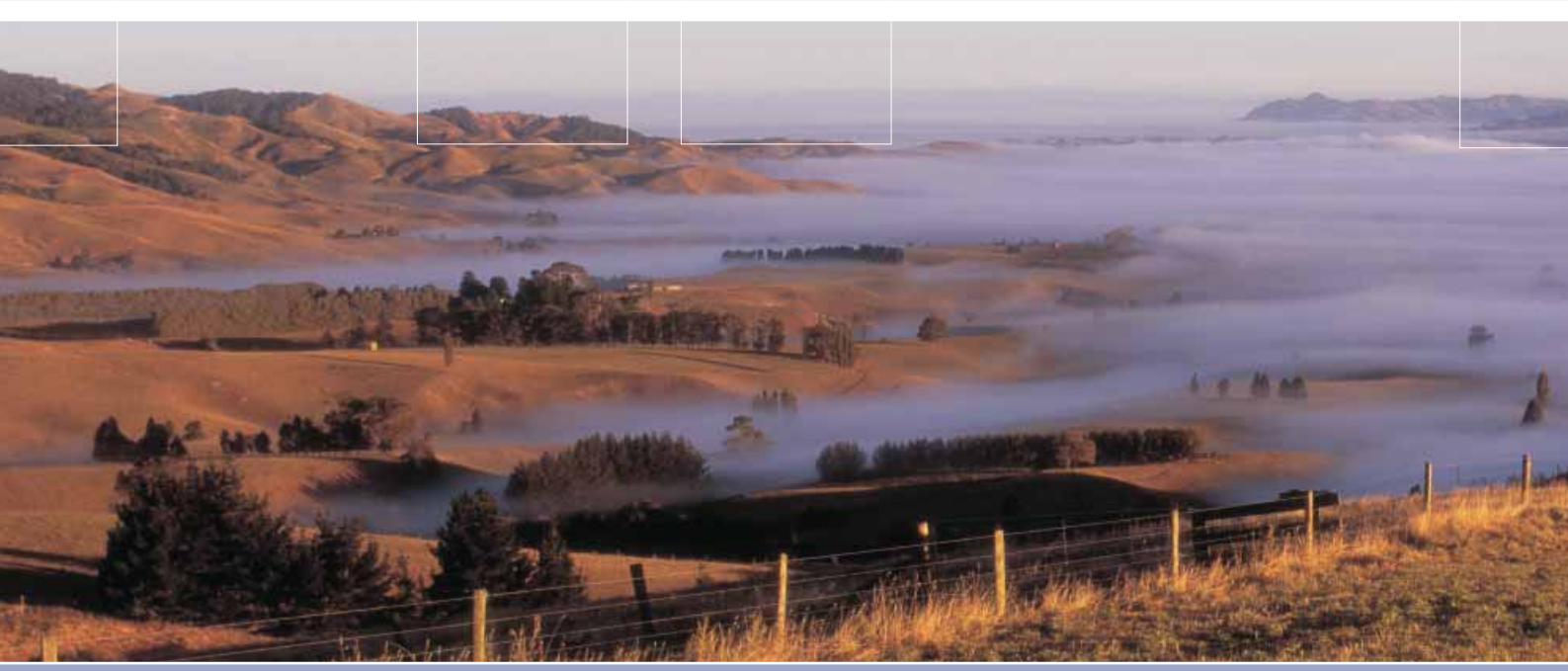
A estimate Breeding Worth of +$100 indicates that using this animal as a parent of a replacement is expected to generate an extra $100 net present value per 4.5tonnies of dry matter consumed, compared to using a parent with a BW of zero.

Fertility

The objective for herd reproductive performance in most New Zealand herds is to achieve high pregnancy rates in a short time period following the planned start of mating, and to maintain calving intervals very close to 365 days. In this system successful reproduction depends on two factors which display genetic variation. The first factor is the ability of the cow to resume cycling soon after calving, and to be mated early in the herd's mating period. The second factor is the cow's ability to conceive, sustain a pregnancy and calve early in the herd's subsequent calving period. The Fertility Breeding Value refers to the expected percentage extra likelihood of a cow to calve in the herd's AI calving period. A Fertility BV of 8% indicates that 4% more daughters are expected to calve in the herd's AI Calving period compared to a bull with a BV of 0%. A bull passes 50% of its genetic merit on average to offspring.

Trait Evaluations

Trait Evaluations are an estimate of an animal's genetic merit (Breeding Value) for individual traits, including milkfat (kg), protein (kg), volume (litres), liveweight (kg), fertility (%), somatic cell (score) and residual survival (days).



Livestock Improvement

Private Bag 3016, Corner Ruakura and Morrinsville Roads, Newstead, Hamilton, New Zealand

Telephone +64 7 856 0700, **Fax** +64 7 858 2741, **Website** www.lic.co.nz