

Farm performance from Holstein-Friesian cows of three genetic strains on grazed pasture

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Introduction Dairy selection objectives and farm production systems in USA and Europe are different from those in New Zealand (NZ). The use of overseas semen in NZ in the last 20 years has changed the genetics of the former NZ Holstein-Friesian (HF) strain. This trial was designed to demonstrate the genetic progress in the NZ HF dairy herd in the last 25 years and how high production potential North American HF cows perform under pasture-based feeding systems.

Materials and methods Three strains of Holstein-Friesians were farmed in a range of feeding systems for 3 years. These included two high breeding worth (\$BW; year 1999) strains of either North American origin (OS90; \$BW 84) or NZ origin (NZ90; \$BW 86), and a low \$BW strain of 1970 NZ Friesians (NZ70; \$BW 10). Systems were designed to provide feed allowances of 4.5 to 7.0 t DM/cow per year, based on different stocking rates and supplement inputs. When feed allowance was higher than 5.5 t DM/cow, additional feed above pasture grown was brought in. The trial started in 2001 with all the cows being first lactation animals. An annual replacement rate of 25% with 1st calving heifers was used. This paper reports on the third year in which there were 15 cows in each NZ70 farmlet and 20 in the NZ90 and OS90 farmlets. In this year the age structure was 55% (4 year), 20% (3 year) and 25% (2 year old) cows. Data were analysed using ASReml. The model used included the effects of age at first calving, strain, parity and feed offered (in t as a linear and quadratic covariate within strain). Farmlet and cow were fitted as random effects. As the variance of farmlet was difficult to estimate it was fixed to 0.10 of the cow variance.

Results Per lactation, NZ90 produced the greatest milk volume, with the highest concentrations of fat and protein, while OS90 had the shortest lactation, were the heaviest, and had the lowest body condition score (BCS; using the NZ 10 point BCS scale). However, OS90 produced slightly higher daily fat and protein (milk solids; MS) yields than NZ90 (1.75 versus 1.71 kg MS per day of lactation), while NZ70 produced only 1.42 kg MS per day. Although all cows calved at close to the optimum BCS of 5.5 the OS90 cows were at less than 4.0 during most of lactation (Fig 1). This lower BCS was a major determinant for their shorter lactations. Figure 1 presents the average BCS for the season and indicates that feeding level had no effect on OS90 whereas for the other 2 strains, BCS increased with increased feeding levels. Reproduction as defined by incalf rate was similar for all strains in the first 2 lactations (data not shown). In the third lactation 7, 15 and 24% of NZ70, NZ90 and OS90 cows, respectively, failed to get in calf. Days from planned start of calving to mean calving date for years 2 and 3 of the trial were 20, 21 and 27 for NZ70, NZ90 and OS90, respectively, indicating later conception dates for OS90 cows.

Table 1 Production data, bodyweight (BW) and BCS of three strains of Holstein-Friesian (2003/04)

	NZ7 0	NZ9 0	OS90	SED
Milk (kg/cow)	4812	5593	5479	209.1
Milk fat (%)	4.65	4.86	4.26	0.124
Protein (%)	3.41	3.71	3.43	0.066
Milk solids (kg/cow)	380	468	415	15.7
BW (kg)	473	487	503	10.5
BCS	5.06	4.51	4.13	0.101
Lactation length (days)	286	286	252	5.6

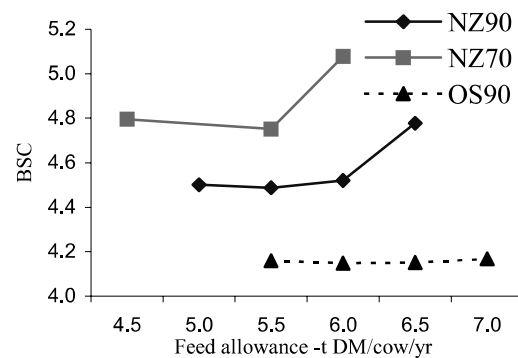


Figure 1 Average body condition score (BCS) of three strains of Holstein-Friesian (2003/04)

Discussion Compared with the 1970's, the 1990's NZ Holstein-Friesian cow produced 21 % more milk fat and 26 % more milk protein. An economic analysis of the data has shown that the productive gains made in the last 25 years of selective breeding are equivalent to an increase in Economic Farm Surplus of over \$500/ha at the same feed allowance. The use of OS semen in NZ has increased the potential for milk production per day of lactation at a rate similar to selection within NZ, but because of the reduction in BCS and the associated shorter lactation length and lowered fertility, this is not expressed in production or profit.