Does Production Worth and Breeding Worth reflect cow profitability?

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Abstract

Production worth (PW) is an economic index estimating the efficiency that a cow converts feed into farm profit. Breeding worth (BW) is another economic index that estimates a cow's or sire's ability to breed profitable replacements. This study evaluates how well PW and BW are correlated with net income (NI) per 4.5 tonnes (t) of dry matter (DM) consumed on a pasture based New Zealand dairy farm. During the 2009/10 season at Massey Number 4 Dairy Farm, cow milk yield and composition were determined at monthly herd tests, and live weight data was automatically collected twice daily using a walk-over-weigh system. The results show that this herd is achieving a genetic gain of $6.74 BW per year. Correlations of 0.52 and 0.31 ($P < 0.001$) were found between NI per 4.5 t DM and PW and BW, respectively. The NI per 4.5 t DM was higher in cows between 3- to 9-years-old than first lactation cows. The NI per 4.5 t DM was also strongly correlated with the milk, fat and protein yields ($P < 0.001$). This study confirms that PW, rather than BW, better reflects the genetic capability of a cow to convert feed into farm profit.

Keywords: Breeding Worth; Production Worth; farm profit

Introduction

New Zealand dairy cattle are genetically evaluated using an across-breed animal model (Harris et al. 1996). Breeding worth (BW) ranks the efficiency at which a bull's or cow's heifer replacements can convert feed into farm profit. Breeding worth is the aggregate economic merit calculated as the sum of the estimated breeding values (EBV) for lactation yields of milk (MY), fat (FY), protein (PY), live weight (LWT), fertility, somatic cell score and residual survival, multiplied by the corresponding economic value (EV) (NZAEL 2013).

Production worth (PW) is another way to assess a cows' individual genetic merit. Production worth is calculated as the sum of the estimated production values (EPV) for MY, PY, FY and LWT, each multiplied by its corresponding EV. Production values are estimated as the sum of EBV plus heterosis effects and permanent environmental effects. Production worth differs from BW because the economic values used for each index are different: the EV used in BW encompass a timeframe where the genes of a cow or sire are passed to its progeny and the progeny expresses its potential to generate farm profit, whereas the EV used in PW encompass a timeframe where a cow expresses its potential to generate profit during its productive life (Harris 2005).

Ramsbottom et al. (2012) sought to find correlations between cow performance and genetic merit in Irish dairy cattle, but LWT data was not included in the estimation of cow profitability. Furthermore, the authors of this paper are not aware of any New Zealand data published that provide evidence that the genetic merit of the cow is associated with cow performance and profitability. The measures of cow profitability in this study were net income (NI) per cow and NI per 4.5 tonne (t) of dry matter (DM) intake.

The objective of this study was to analyse the relationships between cow performance, NI and genetic merit in a New Zealand dairy herd. Results from this study are used to evaluate whether PW and BW are accurate measurements of cow profitability.

Materials and methods

Data from 468 cows present in the Massey Number 4 Dairy Farm herd during the 2009-10 production season were used for this study. The cows were predominantly Holstein-Friesian x Jersey cross-bred and the herd mean BW was $63.7.

The cows were grazed on ryegrass–white clover pasture with maize silage and turnips fed during periods of feed restriction. Cows were milked twice daily at approximately 0530 and 1430 hours with milk yield measured using in-line meters. Individual milk samples from monthly herd-tests were analysed for composition of fat and protein on an infrared milk analyser (FT120, Foss Electric, Hillerød, Denmark) for 9 samplings between September 2009 to May 2010 at Livestock Improvement Corporation (Hamilton, New Zealand). Somatic cell count (SCC) in each milk sample was determined using an automated cell counter (Fossomatic 5000, Foss Electric, Hillerød, Denmark). Live weight was measured twice daily after milking.

Calculations

For each cow, average cell count score (SCS) was calculated by averaging the $\log_2$ of each SCC measurement recorded. Likewise, an average LWT for each cow was obtained as the average LWT during the production season.