Comparison of in-line milk meters to herd testing for management and genetic evaluation

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Abstract

In-line milk meters allow us to derive milk volume, fat and protein yield for each cow at every milking, but produce less accurate measurements than meters used for monthly herd testing. As the use of in-line milk meters increases, it is important to quantify how the data from in-line meters compares to the more accurate but less frequent data obtained from herd test meters, when used for genetic evaluation and farm management decisions such as culling poor producers.

A simulation study was used to compare in-line and herd-test meters. The study used simulated daily production records on a population of cows. The herd-test record was the production record. The in-line milk meter reading was the production record with adjustments that mimicked the inaccuracies associated with the in-line meter. The structure (ancestry and herd) of the cow population was based on 100 randomly selected New Zealand (NZ) dairy herds (total of 27,071 cows). The milk, fat and protein genotypes (i.e. true BVs) and phenotypes of each cow were simulated using the ancestry information and the genetic, permanent and temporary variances that are used in the New Zealand national genetic evaluation. Each lactation was 268 days (spanning 3 to 270 days in milk as is used in NZ). A cow had up to six lactations.

Parameters for in-line meter error (meter imprecision, sensor bias and cow-specific bias) were estimated from a dataset of 64 herd tests and corresponding in-line milk meter records for the herd at the Livestock Improvement Corporation Innovation Farm. Using these estimations as a baseline, high and low levels for these parameters were determined; given three possible values for each parameter, 27 scenarios were developed: one for each possible combination of parameter values.

Estimated BVs (EBVs) for cows were obtained using the random regression test-day model that is used in the NZ national genetic evaluation. The phenotype within each analysis was either the in-line meter record (38 weekly phenotypes per lactation) or the herd test record (four, seven or ten herd tests per lactation). The simulation was replicated 100 times.

The purpose of this study was to compare the EBVs from the different simulations to the TBVs to compare the accuracy of in-line and herd-test meters.

Keywords: in-line milk meters, genetic evaluation, simulation