



Selection for Improved Fertility and Calving Performance

The Canadian dairy cattle industry will soon see the fruit of years of research and development when the new Reproductive Performance genetic evaluation system is officially implemented in January 2008. The first phase of this major initiative was the November 2004 introduction of the genetic evaluation system for four female fertility traits but this final version to start in 2008 evaluates female fertility and calving performance traits simultaneously. A major advantage of this approach is that it considers the impact that calving difficulty can have on the subsequent fertility of the cow. In addition, the higher heritabilities of the calving performance traits helps improve the accuracy of the genetic evaluations for the correlated measures of female fertility.

The end product to producers and others interested in Canadian genetics is the publication by Canadian Dairy Network (CDN) of bull proofs for fifteen individual traits plus three overall selection indexes related to reproductive performance. The proper understanding of these indexes will assist in achieving genetic selection goals established by individual producers, their breed association and by A.I. organizations.

Daughter Fertility

The goal of the Daughter Fertility (DF) index is ***to improve conception rate in cows while decreasing the interval traits, namely from calving to first insemination and from first insemination to conception.*** While Daughter Fertility has existed since its inception in 2004, a new formula will be used to take advantage of the various measures of female fertility evaluated by the new Reproductive Performance genetic evaluation system. Table 1 shows the relative weights applied to the seven specific female fertility traits for which bull proofs will be published by CDN, as well as their resulting correlation with Daughter Fertility.

Table 1: Female Fertility Traits with Published Bull Proofs and their Relationship with Daughter Fertility		
Measure of Female Fertility	Weight in DF Formula	Correlation with DF
Heifers: <ul style="list-style-type: none"> • Age at First Service • Non-Return Rate • Interval from First Service to Conception 	10%	~0% 53% 68%
Cows: <ul style="list-style-type: none"> • Interval from Calving to First Service • Non-Return Rate • Interval from First Service to Conception • Days Open 	15% 50% 25%	34% 91% 95% 86%

Daughter Calving Ability

The goal of the Daughter Calving Ability (DCA) index is **to reduce calving problems and to increase the rate of calf survival, especially at first calving**. This trait replaces the use of Maternal Calving Ease in the past and reflects the sire's ability to produce daughters that will calve easily and produce a living calf. Table 2 shows the relative weights placed on the four detailed traits associated with maternal calving performance but, more importantly, the correlations show which traits are being improved by selection for DCA. While the focus of DCA is the improvement of calving ease and calf survival when a bull's daughters give birth for the first time, selection will also yield gains for calving performance at later calvings. In fact, DCA also has moderate correlations between 18% and 29% with the four measures of sire (i.e.: direct) calving performance so the two breeding goals are not competing with each other.

Table 2: Calving Performance Traits with Published Bull Proofs and their Relationship with Daughter Calving Ability (DCA)		
Measure of Calving Performance	Weight in DCA Formula	Correlation with DCA
Maternal Calving Performance:		
• Calving Ease at First Calving	24%	84%
• Calf Survival at First Calving	36%	88%
• Calving Ease at Later Calvings	16%	66%
• Calf Survival at Later Calvings	24%	70%
Sire (Direct) Calving Performance:		
• Calving Ease at First Calving		29%
• Calf Survival at First Calving		27%
• Calving Ease at Later Calvings		27%
• Calf Survival at Later Calvings		18%

Calving Ability

Contrary to Daughter Calving Ability, the Calving Ability (CA) index becomes the main trait of interest when selecting sires to mate to heifers and/or small cows to avoid subsequent problems at the birth of the resulting calf. The goal of Calving Ability proofs is **to identify sires that increase the likelihood that their progeny are born easily and alive** so CA replaces the current use of Calving Ease for sire mating selections. Similar to the previous table, Table 3 shows the relative weights placed on the four calving performance traits from a sire perspective within the CA index. Given these weights and the genetic relationships among the eight calving performance traits, CA is very closely related to Direct Calving Ease at First Calving (98% correlation) but it also incorporates the other traits associated with calving ease and calf survival.

Table 3: Calving Performance Traits with Published Bull Proofs and their Relationship with Calving Ability (CA)		
Measure of Calving Performance	Weight in CA Formula	Correlation with CA
Maternal Calving Performance:		
• Calving Ease at First Calving		38%
• Calf Survival at First Calving		16%
• Calving Ease at Later Calvings		33%
• Calf Survival at Later Calvings		16%
Sire (Direct) Calving Performance:		
• Calving Ease at First Calving	64%	98%
• Calf Survival at First Calving	16%	81%
• Calving Ease at Later Calvings	16%	86%
• Calf Survival at Later Calvings	4%	65%

Summary

Starting January 2008, Canadian producers will benefit from a world-class genetic evaluation system that evaluates both female fertility and calving performance traits while considering their genetic associations. Existing Daughter Fertility (DF) proofs will see significant changes due to this new evaluation system and a revised formula for the DF index. Also of importance is the introduction of two new indexes associated with calving performance, namely Daughter Calving Ability (DCA) and Calving Ability (CA). Bull proofs for DCA and CA, which consider both calving ease and calf survival, will replace the current use of Maternal Calving Ease and Calving Ease proofs, respectively. In addition to the proofs for the DF, DCA and CA indexes, the CDN web queries will provide access to the official bull evaluations for the seven female fertility and eight calving performance traits.

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