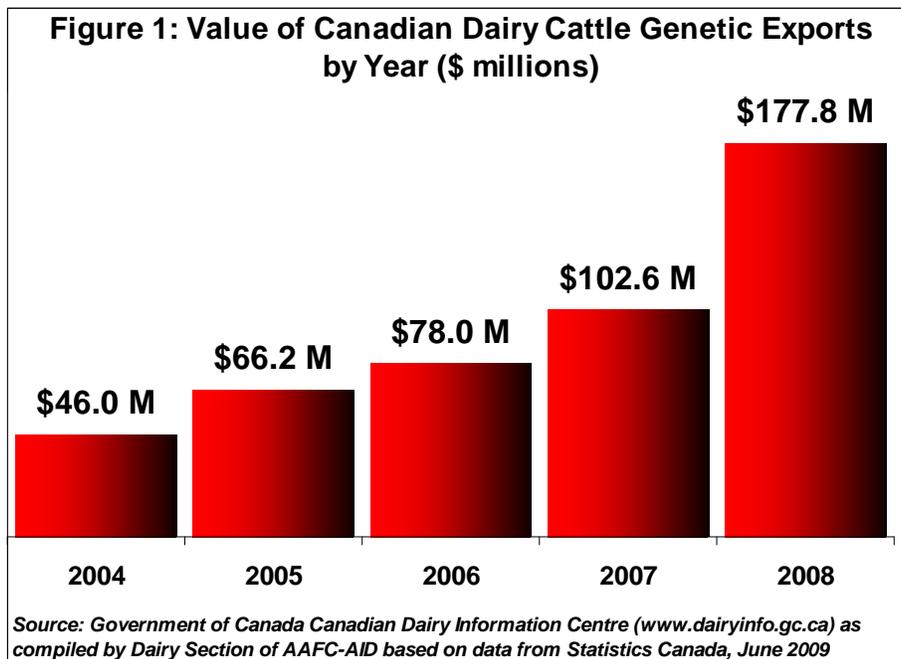# Genetic Evaluations:
Past, Present and Future

There has always been a strong demand for Canadian dairy cattle genetics, both domestically and internationally. While it is possible for essentially any country to be an important global contributor of genetics for a short time period, the sustained demand for Canadian genetics over many decades is the clear result of excellence and quality of all genetic material offered, namely live cattle, semen or embryos. Figure 1 shows the growth in value of dairy cattle genetic exports from 2004 to 2008, which includes the period with closed borders for live cattle exports, starting May 2003 and ending in 2008. The total export value of $177.8 million in 2008 consists of 55.8% from live cattle, 39.9% from semen and 4.3% from embryo exports. There is no doubt that the single most important factor contributing to the success of Canadian genetics nationally and around the world has been its genetic evaluation systems and the integrity of the various data collection systems that feed into genetic evaluations.

Figure 1: Value of Canadian Dairy Cattle Genetic Exports by Year ($ millions)

Source: Government of Canada Canadian Dairy Information Centre (www.dairyinfo.gc.ca) as compiled by Dairy Section of AAFC-AID based on data from Statistics Canada, June 2009

Successes of the Past

Many of the "cornerstone" programs required for traditional genetic evaluation systems have existed for several decades. These include milk recording and lactation calculations, breed association services in herdbook registration and type classification, A.I. young sire testing programs and national genetic evaluation systems. The simple existence of these programs is not sufficient, however, for the long-term sustainability and growth of an international demand for superior quality genetics. In retrospect, there were several key ingredients leading to Canada's past successes related to the genetic improvement of all dairy breeds. Perhaps the primary of these has been the willingness

of Canadian producers to participant in the various programs and services offered. Linked to this, however, has been the continuous effort of the industry players to evolve over time, both in terms of services provided and the organizational structure of the industry itself, in order to meet the changing needs of producers. The numerous milk-recording agencies of the 1980s and '90s have now reduced to only two that, in fact, are partners in Canadian DHI. Similarly, the number of independent players in the A.I. business has also been streamlined due to partnerships and alliances. Breed associations are working closer and closer together and in recent years established a single, common type classification program for all evaluated breeds.

A second major strength of the Canadian industry is the high level of collaboration demonstrated by all organizations involved with genetic improvement of dairy cattle. The positive attitude and willingness to work together has been facilitated and fostered by the creation of Canadian Dairy Network (CDN) in 1995, which acts as an industry umbrella organization and is the national genetic evaluation centre for dairy cattle.

Another important factor leading to Canada's success has been the industry desire to continually invest in research to maintain state-of-the-art genetic evaluation systems. Canadian research has led to the implementation of the "Animal Model" for calculating genetic evaluations for cows as well as sires, the Canadian Test Day Model for production traits, MACE methodology for international bull evaluations, a Reproduction Performance genetic evaluation system for female fertility and calving performance, and several other significant advancements.

Present Genetic Evaluations

CDN provides genetic evaluations for nearly 80 traits in each of seven dairy breeds. It maintains a national database of all pedigree and performance data required for its six genetic evaluation systems including production, type, longevity, reproductive performance, milking speed and milking temperament. All publishable data and genetic evaluations are freely available for worldwide access via its web site at www.cdn.ca. The most recent success story resulting from a major collaborative research and development initiative has been the establishment of the new Genomic Evaluation System at CDN. In fact, the first official release of genomic evaluations in Canada, planned for August 2009, will represent the 50th official genetic evaluation release by CDN since its creation in 1995.

The Future

While genomic evaluations will be expanded from Holsteins to other dairy breeds in the upcoming years, research will continue to improve methods for using pedigree, performance and DNA information simultaneously to estimate each animal's genetic merit with even greater accuracy. In addition, current research efforts supported by industry funds through CDN are expected to translate into national genetic evaluations for new traits such as Body Condition Score and resistance to mastitis, lameness and metabolic diseases as well as selection opportunities for new milk components known to promote human health including CLA, DHA and other desirable fatty acids. There is no doubt that novel traits such as these will gain importance in domestic and global dairy cattle selection programs and Canada will surely continue to be world leading.

Summary

The exceptional demand for Canadian dairy cattle genetics has a long history thanks to superior quality of its genetic evaluations and genetic material in the form of live animals, semen and embryos. Canadian industry partners collaborate well for the benefit of the dairy producers they serve and continually evolve to achieve greater efficiency and value of breed improvement programs and services. Industry-supported research has driven genetic evaluation methods forward, having a major impact on systems currently used in many countries around the world. The history-making official implementation of Canadian genomic evaluations in August 2009 represents the 50th genetic evaluation release by CDN since its creation in 1995.

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