

Demonstrating the Impact of Genomics-Enhanced Whole Herd Genetic Management Platform on Reducing Beef Greenhouse Gas Emissions

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Background: Emissions from agriculture account for approximately 8.5% of total greenhouse gas (GHG) emissions in Canada and cattle are one of the major contributors from the agricultural production system. Cattle performance, including GHG emission, is partially determined by genetics, which involves genetics inherited directly from each parent and retained hybrid vigour or heterosis as a result of optimal combinations of parental genes. Based on previous work, more efficient cattle not only consume less feed for the same amount of beef produced, but also produce less GHG emissions than inefficient cattle. Cattle herds with enhanced retained hybrid vigour will not only improve reproductive performance but also contribute to reduction of GHG emissions. This offers an opportunity to reduce beef cattle GHG emissions via genetic selection. However, beef producers lack effective and easy access science-based tools to select and breed more efficient cattle with maximum hybrid vigour. Researchers at Livestock Gentec (AAFC, AAF and UAlberta) have developed various genomic prediction tools including a genomics enhanced whole herd genetic management platform.

Goal: to reduce beef cattle greenhouse gas emissions through an effective and accessible genomic selection and whole herd genetic management tool

Objectives: to demonstrate the genomics enhanced whole herd management platform to the beef industry

- 1) Genotype 10,000 beef cattle from participating beef producers
- 2) Use the platform to predict genetic merit of growth, feed efficiency, carcass quality, fertility and greenhouse gas emission traits, and construct multiple trait selection indexes
- 3) Use the platform to predict breed composition of each animal and select bulls via a mating selection tool to maximize genetic potential of a cattle herd.
- 4) Use the whole herd management portal to deliver genomic information to producers to aid in selection decisions and management of genetics

Benefit: genetic gains from improving beef production efficiency and reducing GHG emissions are cumulative and permanent and will last for the whole life cycle of the animals. This creates great potential for a wider application of the genomics enhanced whole herd management platform in the beef industry.