

FACILITATING GENOMIC DATA ADOPTION

Beef cattle producers in North Central Alberta have long been attempting to predict and select replacement heifers that will have long-term reproductive success. Many producers keep excellent records of parentage and physical traits and select bulls for herd productivity as a means of maintaining and improving calving ability and good mothering.

OBJECTIVE:

To explore whether genomics can help improve selection and retention decisions, Gateway Research Organization (GRO) has partnered with Livestock Gentec to facilitate a multi-year project focusing on increasing the use of genomic tools by beef producers across Alberta. The goal of this project is to help producers become more comfortable using genomic information as part of whole-herd genetic management, and to better understand how these tools can improve herd profitability and the long-term sustainability of Alberta's beef industry. GRO is working with regional producers, both on their own farm and those that are GRO Heifer Pasture patrons, to collect data for this project.

METHOD:

On GRO's pasture intake day, small ear tissue samples were collected from each heifer and sent to the Livestock Gentec lab for genetic testing. These samples allow researchers to generate several genomic tools and scores that producers could one day use when making breeding, replacement, and feeding decisions, including:

- Genomic breed composition (gBC)
- Hybrid Vigour Score (genomic retained heterozygosity or gRHET)
- Genomic Expected Progeny Differences (gEPDs) for traits such as growth, feed efficiency, fertility, and carcass quality
- Selection Indexes; Replacement Heifer Profit Index Score™ (RHPI Score™) and Feeder Profit Index™ (FPITM)
- Visual ranking of animals based on predicted profitability indexes
- Genomic breed composition and hybrid vigour predictions are based on comparisons with 14 beef breeds, including Black Angus, Red Angus, Charolais, Hereford, Simmental, and several others.

RESULTS:

Genomic analysis has been conducted and summarized using samples from over 250 GRO heifers belonging to both pasture patrons and producer members. These genomic scores are predictions at this point, and the phenotypic data is still being collected and submitted to the team at Livestock Gentec. It is a very comprehensive list that takes time to compile.

Collecting genomic and phenotypic data from a large population will hopefully improve the accuracy of the predicted scores. There was only a small percentage of phenotypic data collected and submitted at the time of this report, so only a sampling is shared.

A sample of the predicted scores and collected phenotypic data has been included as reference. The

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animals shown in the two charts below are not the same and were selected based on variation in their scores to demonstrate the possible range of data points.

GENOMIC TRAITS:

- **Hybrid Vigour Score:** also called Heterosis, Hybrid Vigour describes a crossbred animals improved performance over its parent's breeds. This score estimates how much heterosis an animal has based on its breed composition and how genetically different its parent's breeds are.
- **Replacement Heifer Profit Index (RHPI):** predicts the future profitability of females kept as replacements. A higher score reflects a female that is expected to be more profitable over her lifetime.
- **Feeder Profit Index (FPI):** estimated the profitability of an animal in a feedlot setting, considering feed efficiency and carcass traits. An animal with a higher score is expected to generate more profit as fed cattle.
- **Accuracy (Acc):** describes how accurate an EPD is, with higher numbers representing more confidence in the prediction as less likelihood of the EPD changing over time. This accuracy number goes up with the collection of performance and progeny data.

Animal ID	Hybrid Vigour Score	Replacement Heifer Profit Index Score	RHPI Accuracy	Feeder Profit Index (\$ net return/ animals slaughtered)	FPI Accuracy
A	0.82	81.66	0.30	13.37	0.32
B	0.45	45.88	0.44	-5.09	0.38
C	0.10	0.92	0.40	-14.01	0.40

PHENOTYPIC TRAITS:

Various types of data will be collected on the sampled heifers over a three-year period, including the following:

- **Bull** – birthdate, bull in/out date, breed
- **Preg Check/Cull** - cow birthdate, preg test date, preg test weight, preg or open, cull reason and date
- **Calve/Wean** - Udder score, calf birthdate, birth weight, sex, single or twin, condition, calving ease score, wean date and weight
- **Feeder/Carcass** - birthdate, weaning weight, average daily gain, slaughter weight, hot carcass weight, marbling score.

Animal ID	Birth Date	Birth Weight	Weaning Date	Weaning Weight	Udder Score (suspension/ teat size)
D	May 3	74 lbs	Oct 9	456 lbs	9/9
E	May 1	88 lbs	Oct 9	393 lbs	8/9
F	May 4	70 lbs	Oct 18	418 lbs	9/7

The collection of birth weights and weaning weights provides key performance data for evaluating calf growth. These records are used in calculating more accurate Expected Progeny Differences (EPDs). Recording of dates is important to allow weights to be calculated to a standard age, allowing them to be evaluated fairly. Other information, such as udder scoring, is taken from a more visual perspective and requires a scoring system. Udder score is broken down into two parts, udder suspension and teat size. A higher number means a tighter udder/smaller teats which is a more desirable trait when selecting replacement heifers.

DISCUSSION:

As the collection of phenotypic data has begun, the facilitation of this project requires more learning and conversations with the producers involved. The start of this project was relatively easy as the tissue sampling could occur during other processing activities (weighing, preg checking, vaccinations), and the submission process to the lab in Edmonton was straightforward. For some producers, their phenotypic data is stored in different databases and systems, or some traits are not recorded. This has required more hands-on work with the various sources, identification tag numbers and compiling the data into the templates provided to obtain as much data as possible on the heifers.

While there are no correlations to be made yet, there is promise in the potential of these genomic traits. The Livestock Gentec team is utilizing a large pool of heifers from different geographical areas, and cattle operations (purebred, commercial, feedlot, etc.) to have more genetic diversity utilized in developing the predictions. With a larger population sampled, and more diversity, the predictions can become more accurate and therefore a valuable tool for producers.

ACKNOWLEDGEMENTS:

GRO appreciates the opportunity to facilitate this trial with Livestock Gentec to provide our producers with access to emerging technologies. Livestock Gentec is a center for research and commercialization of genomics technologies for livestock competitiveness and sustainability. It represents the combined efforts of the University of Alberta (UofA) and Agriculture and Agri-Food Canada (AAFC). Funding for Livestock Gentec is provided by RDAR, governments of Alberta and Canada (S-CAP), Beef Cattle Research Council (BCRC), NSERC Alliance and many beef industry organizations, companies and producers.

