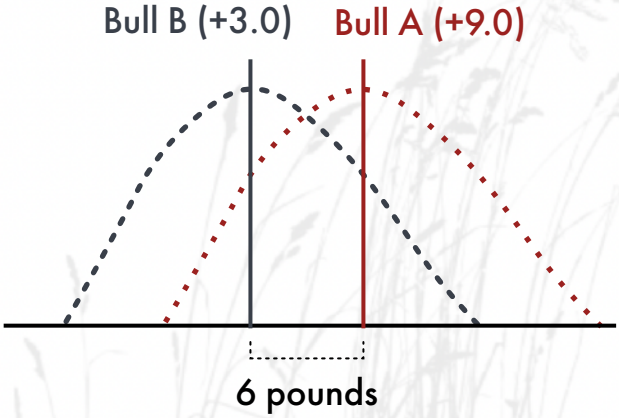
MAKING SENSE OF EXPECTED PROGENY DIFFERENCES (EPDS): A PRACTICAL GUIDE FOR CANADIAN BEEF PRODUCERS

What are Expected Progeny Differences?

Expected progeny differences (EPDs) estimate the genetic merit of that animal as a parent. At their core, EPDs are the difference between the predicted **average** performance of an animal's future progeny and the **average** performance of the progeny of another animal for specific traits. **They do not predict individual performance or weights.**

EPDs can help beef producers strategically select bulls or replacement heifers with traits that support operational goals.



Graph: Comparison of average calf birth weights from Bull A and Bull B.

Example EPD: Birth Weight

EPDs represent average differences between animals. For example, if Bull A has a birth weight (BW) EPD of +9.0 and Bull B has a BW EPD of +3.0, Bull A's calves are expected to be about 6 lbs heavier at birth, on average.

While the performance ranges of their calves may overlap—meaning some individual calves perform similarly—the overlapping curves illustrate that across many calves these small EPD differences add up.

At the herd level, Bull B's 6-lb advantage in average performance highlights how **even modest EPD differences can translate into meaningful, cumulative gains over time.**

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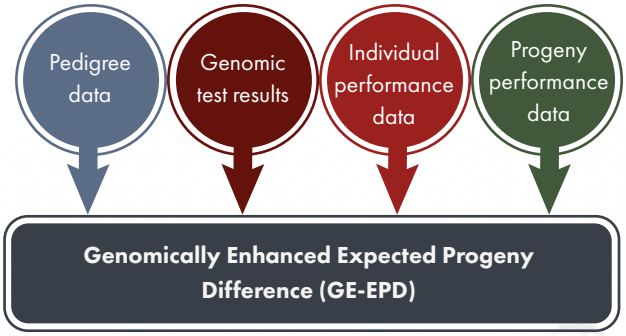
What Data Is Included in an EPD?

Information used in calculating EPDs include pedigree and performance data of the individual animal, all relatives and progeny. It is often assumed that EPDs are calculated in much the same way as 205-day adjusted weights, but this is not the case. To correctly calculate EPDs, many equations must be solved simultaneously.

Genomic tests can be used to achieve more accuracy on EPDs for younger animals and to characterize traits that are difficult or expensive to measure, such as feed efficiency, carcass traits or maternal traits. These are known as **Genomically Enhanced EPDs (GE-EPDs).**



Depicted above: The types of data that inform GE-EPDs.

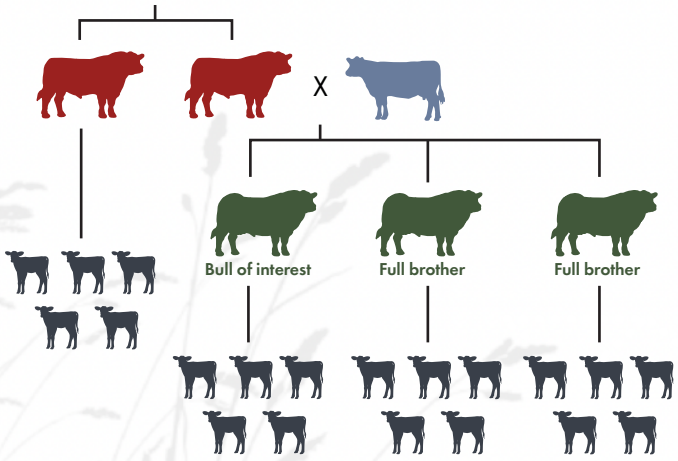
Genomics **is the study of how genes interact with each other and their environment, and how those interactions influence an animal's phenotype or the observable traits an animal expresses (e.g., coat colour, ribeye area, weaning weight).**

What Does Accuracy Mean?

Accuracy is scored from 0 to 1 (0%-100%) and shows how close an EPD is to an animal's true breeding value. The more data that is available, the higher the accuracy.

- **A high accuracy** means that an EPD is less likely to change as more data is available, so there is greater confidence an animal will pass those traits to its calves. Proven and artificial insemination (A.I.) sires with high numbers of progeny and/or genomic data will have higher accuracy values.
- **Low accuracy** values are common for younger animals, where progeny performance data is unavailable. These EPDs have a greater likelihood of changing over time.

Accuracy values can differ for each trait for the same animals, since not all traits are measured equally. For example, carcass traits often have lower accuracy due to fewer records analyzed.



Depicted above: As a family tree expands more data is available, leading to a higher accuracy value for an EPD.

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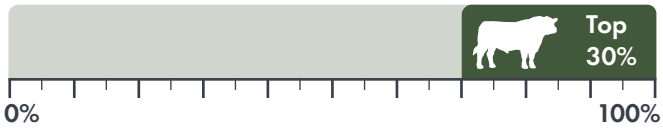
How Do I Use Percentile Rank?

Percentile rank shows where an **animal ranks for a trait compared to all animals within that breed and is expressed as a percentage.** A lower percentile means an animal ranks higher. For example, an animal with a percentile rank of 30% for weaning weight (WW) means they are in the top 30% of that breed for weaning weight EPD and that their calves are expected to wean heavier than the remaining 70% of the breed.

These rankings translate raw EPD numbers into an easy-to-understand scale that can quickly be used to compare animals within the breed.



How Do I Use The Breed Average?

Breed averages are the average EPD values for all animals in each breed for a particular trait. They provide a benchmark to identify if an animal is above or below average for that trait within its breed. When looking to purchase a new animal, always compare an animal's EPDs to that breed's average.

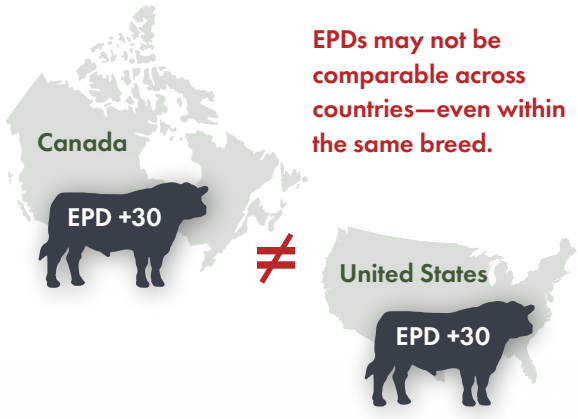
Breed averages for individual EPDs will be listed on breed association websites and may also be listed in sale catalogues.

Breed averages will change over time, so use updated values when selecting an animal.

Can I Compare EPDs Across Breeds?

Expected progeny differences are typically breed and country specific. Therefore, they are often not comparable between breeds. Beef producers can check with the breed associations to know for sure.

To make meaningful comparisons, EPDs should only be compared within the same breed, or across-breed adjustment factors can be used.



EPDs may not be comparable across countries—even within the same breed.

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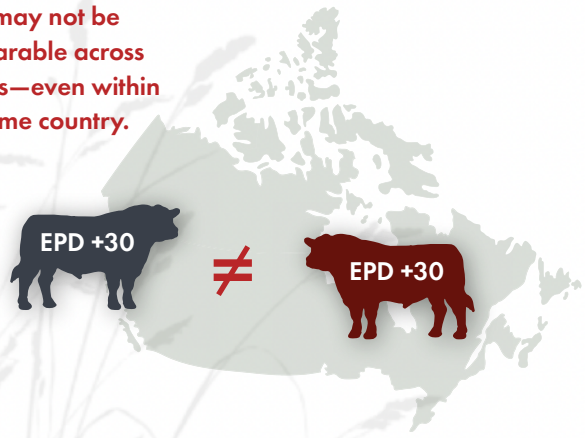

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What Are Selection Indexes?

Many genetic evaluations offer **selection indexes** in addition to individual EPDs. They are calculated by placing an economic weighting on individual EPDs to create a multi-trait selection model for different types of broad production systems (generally maternal or terminal). These provide a way to objectively categorize a set of animals using the same criteria throughout.

Indexes are breed-specific, so they cannot be compared across breeds, unless the genetic evaluation contains information from several breeds. Knowing which indexes fit your operation can make selection decisions more profitable and will depend on your operational goals.

Interpreting EPD Values

Breed association websites will include information on EPDs for a particular breed as well as available selection indexes.

The table below provides a detailed description of common EPDs.

Overview of Common EPDs

EPD	Definition	Unit	Description
CED	Calving Ease Direct	Percent (%)	Predicts the average difference in ease with which a sire's calves will be born from first-calf heifers. **A higher number indicates easier calving.**
MCE	Maternal Calving Ease	Percent (%)	On average, how easily a sire's daughter will calve at two years of age. **A larger number indicates easier calving.**
BW	Birth Weight	Pounds (lb)	Average pounds of difference in birth weight of offspring. **A higher number indicates heavier calves at birth.**
WW	Weaning Weight	Pounds (lb)	Average pounds of difference in weaning weight of offspring. **A higher number indicates heavier calves at weaning.**
YW	Yearling Weight	Pounds (lb)	Average pounds of difference in yearling weight of offspring. **A higher number indicates heavier calves at 1 year of age.**
DMI	Dry Matter Intake	Pounds (lb)	**Average feed intake potential** for a weaned calf (pounds per day).
RADG	Residual Average Daily Gain	Pounds (lb)	**Average pounds per day of post-weaning growth** on a constant amount of feed.

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EPD	Definition	Unit	Description
SC	Scrotal Circumference	Centimeters (Cent)	**Average adjusted yearling scrotal circumference** of an animal's sons when compared to breed average.
STAY	Stayability	Percent (%)	**Average probability of daughters staying productive** past a specified age.
MM	Maternal Milk	Pounds (lb)	**Average pounds of daughters' calves weaning weight** attributed to milk production.
DOC	Docility	Percent (%)	Predicted average yearling cattle temperament. **A higher value is more docile.**
MWW	Maternal Weaning Weight	Pounds (lb)	**Estimate of daughters' calves average weaning weight** (combination of milk and weaning weight EPDs).
MCW	Mature Cow Weight	Pounds (lb)	**Average difference in weight of sire's daughters.**
MH	Mature Height	Inches (In)	**Average difference in height of daughters** compared to daughters of other sires.
UDDR	Udder Suspension	1-9 score	Predicts the average difference in sires' daughters' udder characteristics when managed in the same environment, **with 9 being very tight and 1 being very pendulous.**
TEAT	Teat Size	1-9 score	Predicts the average difference in sires' daughters' udder characteristics when managed in the same environment, **with 9 being very small and 1 being very large.**
CW	Carcass Weight	Pounds (lb)	Average adjusted carcass weight of a sire's progeny. **A larger number indicates heavier carcasses.**
FAT	Rib Fat	Inches (In)	Average adjusted 12th rib fat thickness of a sire's progeny. **A larger value indicates fatter carcasses**.
REA	Ribeye Area	Square Inches (In^2)	Average adjusted ribeye area of a sire's progeny. **A larger number indicates bigger ribeye muscle.**
MARB	Marbling	Grade score	Average difference in an animal's progeny percent marbling score or percent intramuscular fat in the ribeye muscle compared to other sires, given the same management. **A larger number indicates more marbling.**

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EPD	Definition	Unit	Description
YG	Yield Grade	Grade score	**Predicts average differences in an animal's yield grade units where lower values are desirable.** Usually calculated using ribeye area and fat EPDs.
CLAW	Claw Set	1-9 score	Units of claw-set score; **an ideal score is 5.**
ANGLE	Foot Angle	1-9 score	Units of foot angle score; **an ideal score is 5.**
HPG	Heifer Pregnancy	Percent (%)	**Average probability of an animal's daughter conceiving** as first-calf heifers at first exposure.