Spring 2017
Sire Summary

Canadian Hereford Association
5160 Skyline Way NE
Calgary, Alberta, Canada
T2E 6V1

Phone: (403) 275-2662
Fax: (403) 295-1333
E-Mail: herefords@hereford.ca
Web Site: www.hereford.ca

Value $25.00 + GST

Table of Contents

Canadian Hereford Association
5160 Skyline Way NE, Calgary, Alberta, Canada T2E 6V1
Phone: 1(403)275-2662 Fax: 1(403)295-1333
E-mail: herefords@hereford.ca

CHA Directors

President
Doug Mann
Swift Current, SK

Vice President
Albert Rimke
Oak Lake, MB

Phillip Thorne
Glenvale, NB

Jean Tetrault
Bonsecours, PQ

Jill Corp
Omemee, ON

Leon Silk
Grafton, ON

Murray Andrews
Moose Jaw, SK

David Reid
Saskatoon, SK

Blaine Brost
Irvine, AB

Nels Nixdorff
Airdrie, AB

Bryan Latimer
Olds, AB

Daryl Kirton
Abbotsford, BC

Message from the General Manager

The Canadian Hereford Association is pleased to provide this Spring 2017 Sire Summary, resulting from data produced by the Pan American Cattle Evaluation. The Hereford Associations of Canada, the United States, Argentina and Uruguay collect data such as calving ease scores, birth weights, weaning weights, yearling weights, cow weights, ultrasound scores and even carcass data, which is then compared through very technical calculations at the Agricultural Business Research Institute in Australia to provide numbers (EPDs) useful in making breeding decisions on your farm or ranch.

Again this year in the Canadian Sire Summary some EPDs are Genomically Enhanced (GE-EPDs). These GE-EPDs increase the accuracy of the traditional EPD prediction, especially in younger animals where less progeny data has been recorded. For more information on GE-EPDs see the many articles that have been written on the science of GE-EPDs in the Canadian Hereford Digest over the past few years. Animals that have a GE-EPD will be marked with a special GE-EPD logo.

Two new EPDs have been included in the Sire Summary this year; Residual Feed Intake and Post-weaning Gain. Use these EPDs in combination to select for feed efficient breeding stock that still meets the industries need for growth and performance. More information on these traits can be found on our website (www.hereford.ca).

This Sire Summary is also available in a downloadable Excel format, which you can search at your convenience. For sires not listed here, the EPD Inquiry page on our website (www.hereford.ca) is also useful for searching for sires using alternate parameters.

Thanks is extended to the Hereford Breed Improvement Committee, who is always mindful of changes and improvements to be made, to Val Wells, who co-ordinates the Total Herd Evaluation (THE) performance program at the CHA, Brad Crook and the rest of the staff at ABRI and to Sean McGrath for his invaluable assistance in producing this Sire Summary.

Printed copies of the Sire Summary are available at a cost of $25.00/copy. Any comments or feedback is welcome.

Sincerely,
Stephen Scott

Executive Director
Canadian Hereford Association

Introduction

The Spring 2017 Canadian Hereford Association (CHA) Sire Summary presents results from the Pan American Hereford Cattle Evaluation (PACE). The evaluation was performed by the Agricultural Business Research Institute of Australia (ABRI) and incorporates many of the latest technologies and techniques into the evaluation. The evaluation is a true multiple trait evaluation, meaning that traits are evaluated simultaneously and relationships between the traits are considered at the same time. In this evaluation genomically enhanced EPD (GE EPDS) are also included. These results include both traditional pedigree and performance information, but also the addition of DNA high density test results. All of these enhancements result in improved accuracy of the evaluation, EPDs on more animals for more traits (including carcass traits in some cases) and should result in enhanced selection decisions. Conversely it may mean that the EPDs of some animals change outside the bounds of what may be expected.

CHA is again presenting a full suite of EPDs in the main section of the Sire Summary, with notable additions of a Residual Feed Intake (RFI) EPD calculated using Canadian data and a Post-Weaning Gain (PWG) EPD from the PACE evaluation. An updated Spring 2017 MPI evaluation is also presented using updated economic values and enhanced modelling developed by Dr. Mike MacNeil. In addition, the FMI evaluation is included in this Sire Summary. The Sire Summary lists any sire that has a calf recorded in the last 2 years and has accuracy for any EPD of 0.60 or greater. Colour coding of EPDs highlights those with 60% or higher accuracy that are in the top 10% (red) and top 20% (blue) of the breed. The Trait Leader Lists are active bulls, which are in the top 20% of the breed and have an accuracy of at least 0.60 in that particular trait.

Data is combined from the CHA, and the Hereford Associations in America, Argentina, and Uruguay in this analysis resulting in EPDs calculated using larger quantities of data and also in EPDs that are directly comparable between animals in all countries. Genetic proofs from Australia and New Zealand are used on imported sires to create a more accurate starting point in the evaluation for genetics imported from these countries. The EPD will change as progeny are added to the datasets in the participating PACE countries.

Several bulls have Genomically Enhanced EPD (GE EPD) in the Sire Summary. These are presented in the same way as traditional EPD values, however they include additional information obtained from high density DNA panel tests to add accuracy to the EPD of the tested sires. All of the EPD contained in this sire summary are directly comparable. Genomic testing simply adds information and thus accuracy to the evaluation of animals that are tested. Sires with genomic information included in their EPD are noted with a "**GE**" designation to the left of their EPD.

While the EPDs presented here are highly correlated with previous evaluations, there may be changes in some sires due to an enhanced evaluation procedure and the addition of more data to the evaluation. It is important to remember that EPDs from this evaluation cannot be compared with those from previous evaluations or with EPDs from other breeds.

An EPD is unquestionably the best estimate of an animal's true genetic merit given the information available for calculation. **Even for young animals, an EPD is up to 9 times more accurate than a rank or an index, and has the added benefit of allowing for unbiased across herd selection for genetics, rather than selection based on raw performance**.

Your Spring 2017 Sire Summary is the result of the work of many breeders who collect information on their cattle and submit it to their respective associations, the efforts of association staff who efficiently and accurately input the information, and researchers who utilise and interpret the information to the best of their abilities. It is also an important source of much of the knowledge you will require in the upcoming year to make informed breeding and selection decisions.

What's New

The Spring 2017 evaluation showcases some significant changes with the addition of 2 new EPD for Post-Weaning Gain and Residual Feed Intake. These traits represent differences in rate of gain on calves post-weaning and differences in feed consumption relative to expected performance levels. This allows for users of Hereford genetics to select for cattle that achieve optimal levels of performance with reduced inputs. Additionally, significant changes have been made to the Maternal Productivity Index to better reflect the economics of retaining females into the cowherd. Also, as with each new evaluation there has been a significant addition of new pedigree and performance data.

Maternal Productivity Project

The MPI is a selection index and is unique relative to other published values because it considers both raw production (income) and costs (cow replacement rate and maintenance). The MPI is based on profitability at a cow/calf level with a cowherd that retains its own replacements and markets calves at weaning. In many respects this reflects the bull customers of Hereford breeders. Through a biological simulation model each trait can be adjusted by a single unit and the effect on overall herd profitability can be mapped. This approach defines the relative economic importance of the traits involved and then combines them on this basis.

The MPI objectively assesses multiple traits that drive profit and combines them in an easy-to-use format so that producers can make effective selection decisions. It is important to note that the MPI is a robust index. This means that there can be significant market changes without changing the ranking of the animals in the index. For example, the price of weaned calves can change significantly, without affecting the ranking of animals included in the index calculation.

Relative Trait Weighting used in calculating the MPI

Calving Ease	0.22
Maternal Calving Ease	0.22
Weaning Weight	39.16
Milk	15.23
Cow Weight	34.41
Stayability	10.75
Total	100.0

Pan American EPDs as calculated by ABRI in the PACE, as well as the trait of Stayability calculated by ABRI using Canadian data are included. The MPI value also includes a price premium for "reputation" calves that uses a regression approach to incorporate the Feedlot Merit Index (FMI) into the calculation.

MATERNAL PRODUCTIVITY INDEX

Calving Ease (CE) – the Pan American Calving Ease EPD in % Unassisted. A larger EPD value represents fewer assisted births to first calf heifers.
Maternal Calving Ease (MCE) – the Pan American Maternal Calving Ease EPD in % Unassisted Births. A larger EPD represents fewer assisted births to a sire's daughters as first calf heifers.
Weaning Weight (WW) – the Pan American weaning weight EPD in pounds. A larger EPD value indicates a heavier offspring due to genes for pre-weaning growth.
Milk – the Pan American milk EPD in pounds. A larger EPD value indicates more ability of daughters to provide a good pre-weaning environment for their calves.
Cow Weight (CW) – the Pan American mature cow weight EPD in pounds at weaning. A larger EPD value indicates a larger mature weight of an animal's daughters as weighed at weaning.
*** Stayability (Stay)** – the stayability EPD and accuracy. Stayability is a probability value and a higher EPD value indicates that an animal's daughters are more likely to survive in the herd to produce 3 consecutive calves. It is calculated as the number of calves produced given that a female becomes a dam divided by the number of possible calves and is expressed as a percentage value.
Maternal Productivity Index (MPI) – this is the maternal productivity value calculated from the combination of traits and their relative weightings and then standardised to a mean of 100 and a standard deviation of 25. This allows for rapid comparison of animals and an understanding of where the animal fits within the Hereford population.
MPI is calculated in two steps:

1. The economic weighting is applied to the EPD from the genetic evaluations. Step 1 is calculated as follows: =(11.43*(CE+MCE)) + ((1.476+0.0018*FMI)*Wng WT) + ((0.869+0.00053*FMI)*Milk) + ((-0.192-0.00019*FMI)*Cow Wt) + ((37.807-0.000732*FMI)*Stay)
2. The MPI is expressed as a ratio and standardized to a mean of 100 and a standard deviation of 25 units. MPI is calculated as follows:

MPI = 25 x (Step 1 Result – 44.4) ÷ 80.4 + 100.

The mean or average from Step 1 (multiplying the economic values over the whole dataset) is 44.4 and the standard deviation of the entire dataset is 80.4.

Further explanation of Standardized Curves is located after the information on Feedlot Merit Index. MPI was calculated on a dataset of 843,951 animals. If selection were done strictly on the basis of MPI then selection emphasis on the component traits would occur as follows: 0.2% CE, 0.2% MCE, 39.2% Wng WT, 15.2% Milk, 34.4% Cow WT, 10.8% Stayability.

* - indicates those EPDs that were calculated by ABRI using a Canadian dataset only.

Feedlot Merit Index

To compliment the current Maternal Productivity Index (MPI), the CHA's Breed Improvement Committee enlisted the assistance of Dr. Mike MacNeil to develop a Feedlot Merit Index (FMI). Indices like our MPI and the FMI enable producers and commercial customers to use one number, which encompasses many traits, to aid in their selection decisions. This selection strategy also avoids the danger of single-trait selection. Like MPI, differences in FMI are standardized to a mean of 100, and a standard deviation of 25. A difference in FMI between bulls represents a difference between the **progeny** of those bulls to be more profitable feeder cattle.

The goals of the FMI are to monitor and keep costs reasonable for the cow/calf and feedlot producer, while still deriving the best returns from carcasses, keeping in mind the price discrimination that occurs based upon carcass merit and the predominant breed composition of the Canadian commercial cow herd. This index is designed for use in terminal situations only (i.e. no replacements retained in a herd).

Dr. MacNeil is one of the leading experts on economic indices of this type. He identified the economically relevant traits affecting profitability as follows: calving ease, weaning weight, average daily gain, feed intake, yield grade, and marbling score. A number of simulations were run to arrive at the proper economic weightings which would place positive pressure on the traits that create profitable feeder cattle. Weaning, growing, and finishing phases, along with calf survival and related costs were all incorporated into the model. The genetic co-variances between the economically relevant traits listed above and the EPDs we currently publish were determined as well, to allow the weightings to be correctly applied to our published EPDs.

The FMI is an excellent tool to increase the carcass potential of the progeny of bulls that are sold into terminal sire programs. Moderate and balanced selection using both MPI & FMI will produce progeny with traits that are desirable for maternal and feeder cattle production.

Relative Economic Weights used in calculating the FMI		
Calving Ease	$0.879	11.5%
Weaning Weight	$0.716 / lb	20.4%
Average Daily Gain	$118.90 / lb	27.3%
Feed Intake	-$16.62 / lb	18.1%
Yield Grade	$-23.05 / %	11.8%
Marbling Score	$19.55	12.1%

Since not all of the traits of economic importance have readily available EPD for selection, the EPD are "mapped" onto the available traits for selection. The economic values applied to each EPD included in the FMI are as follows.

	CE	+	WWT	+	YWT	+	REA	+	Marb	+	Fat
Economic Value	0.879		-0.29		0.70		-2.17		27.44		-586.63

IT IS EXTREMELY IMPORTANT TO NOTE that the relative economic values may appear to vary dramatically in their overall scale, these values must be taken in context with the unit of measure and heritability of the trait. For example a change of 1 inch of backfat is proportionally a much larger difference than a change of 1 pound of yearling weight.

Calving Ease (CE) – the North American Calving Ease EPD in percent unassisted. A larger EPD value indicates calves that are born more easily.
Weaning Weight (Wng WT) – the North American weaning weight EPD in pounds. A larger EPD value indicates a heavier offspring due to genes for pre-weaning growth.
Yearling Weight (Ylg WT) – the North American yearling weight EPD in pounds. A larger EPD value indicates a heavier offspring at a year of age due to genes for pre-weaning growth and post-weaning gain.
Rib-Eye Area – the North American Rib-Eye Area EPD in square inches. A larger EPD value indicates offspring with a larger Rib-Eye Area at harvest.
Marbling (Marb) – the North American marbling EPD in marbling score units at harvest. A larger EPD value indicates higher marbling scores and more progeny grading AAA or higher.
Fat (Fat) – the North American fat EPD in inches. A larger value indicates more fat in offspring at harvest and thus a lower lean meat yield.
Feedlot Merit Index (FMI) – this is the Feedlot Merit value calculated from the combination of traits and their relative weightings and then standardised to a mean of 100 and a standard deviation of 25. This allows for rapid comparison of animals and an understanding of where the animal fits within the Hereford population.

1. The economic weighting is applied to the EPD from the genetic evaluations. Step 1 is calculated as follows:

0.879 x CE - 0.29 x Wng WT + 0.70 x Ylg WT - 2.17 x REA + 27.44 x Marb - 586.63 x Fat

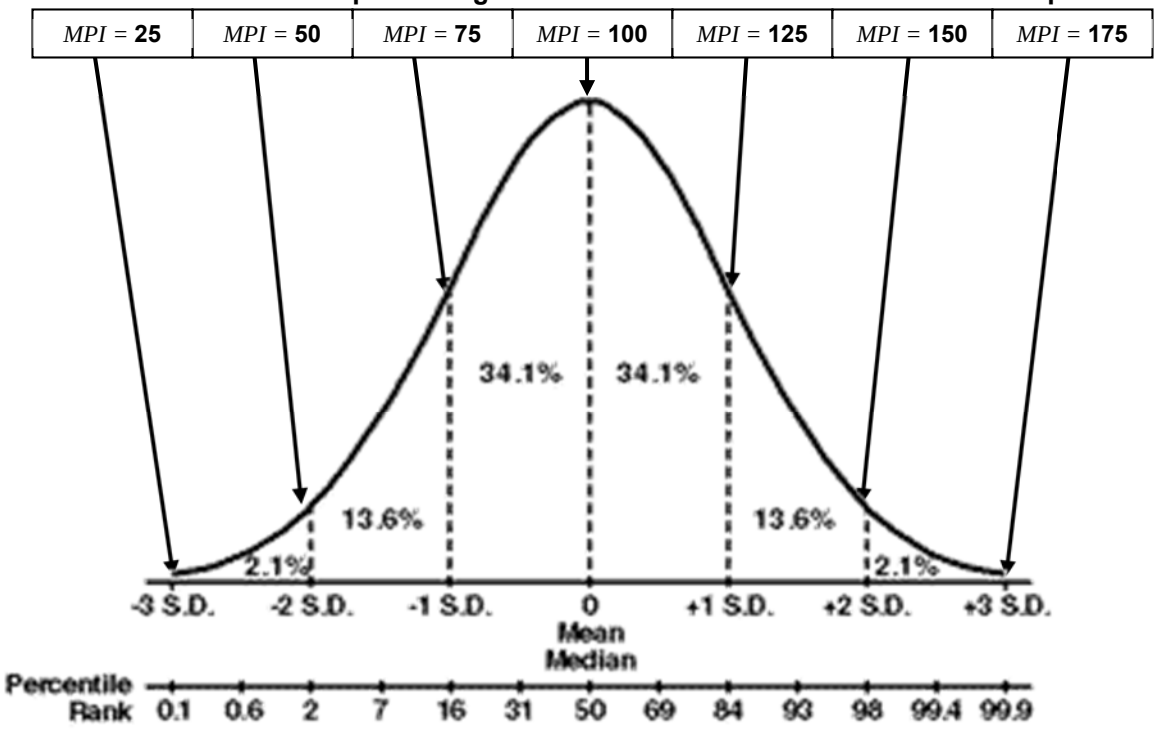
2. The FMI is expressed as a ratio and standardized to a mean of 100 and a standard deviation of 25 units. FMI is calculated as follows:

FMI = 25 x (Step 1 Result – 24.52) ÷ 15.30 + 100.

The mean or average from Step 1 (multiplying the economic values over the whole dataset) is 24.52 and the standard deviation of the entire dataset is 15.30. FMI was calculated on a dataset of 799,578 animals.

An Important Note on Standard Curves

A Standard Curve Representing Various MPI Values Across the Hereford Population



CHA Indexes (MPI and FMI) are expressed as standardised values. This means that the average MPI or FMI for all animals in the evaluation is 100. Using MPI as an example, a cow with an MPI of 125 would be 1 standard deviation above the mean and a cow with an MPI of 150 would be 2 standard deviations above the mean.

Figure 1 shown above represents a standard curve. 0 or the mean median represents an MPI of 100. +1 S.D. represents an MPI of 125, and so on. An animal with an MPI of 125 would rank in the 84th percentile.

The figure shows that 34.1% of the Hereford animals will have an MPI between 100 and 125, 13.6% will have a value from 125 to 150 and 2.1% will be over 150. The same applies to the FMI values as well.

Post-Weaning Gain and Residual Feed Intake

New traits of post-weaning gain (PWG) and Residual Feed Intake (RFI) have been added to the evaluation of Canadian Hereford cattle.

Residual Feed Intake (RFI)

RFI is a measure of feed efficiency, and is defined as the difference between an animal's actual feed intake and its expected feed intake based on its size and growth. The EPD is expressed as an RFI score, with a larger values equating to greater efficiency.

Interpreting the RFI score

The AVERAGE animal in the CHA dataset has an RFI score of 100. The current population average (calves born in the last 2 years) is 101.4. The average values for the EPD will change as data is collected and EPDs are updated, so remain aware of the EPD average for Hereford cattle. A one-point change in RFI score represents 10 pounds of feed per year, and a larger number on the scale indicates the animal is more efficient. For more efficient bulls whose progeny eat less than expected, their index values are larger. For example: a bull whose progeny will eat 10 lbs less over the year than we would expect would score 101, where the expected intake is based on growth and weight of the animal. A bull whose

progeny will eat 200 lbs less over the year than expected will have a score of 120. For less efficient bulls whose progeny eat more than expected, their index values are lower. Where a bull's progeny that eats 10 pounds more than expected over a year will have an index of 99 and a bull's progeny that eats 200 lbs more a year will score 80.

Post Weaning Gain (PWG)

As RFI is strictly a measure of efficiency it is important to balance this trait with gain. To ensure producers are able to select efficient cattle that still have the ability to gain, the CHA is introducing a Post Weaning Gain (PWG) EPD that is simply WW EPD subtracted from YW EPD. This value is expressed in expected post weaning pounds of gain; the difference between yearling and weaning. The current population (animals born in the last 2 years) average for PWG is 30.7.

The Sire Summary

What is an EPD?

An Expected Progeny Difference (EPD) is a measure of the genetic merit of an animal using relevant performance and pedigree information in a process called Best Linear Unbiased Prediction.

EPDs are expressed in the units of measure. For example, birth weight is expressed in pounds, and rib-eye area is expressed in square inches.

EPDs come from performance data. Producers submit data on their cattle. From this data, researchers look at the differences between animals raised in the same environment (contemporary groups) and ascertain the portion of that difference that is due to genetics (heritability). Also included in this is how the different traits relate to each other and interact together (correlations). They can then directly compare genetic differences among animals using the pedigree information contained in the CHA and AHA registries.

The result is a value that can be directly compared between animals and across environments, an EPD.

What is a GE EPD?

A GE or Genomically Enhanced EPD is simply an EPD that contains the added information of a high density DNA panel for an individual animal. This information augments the pedigree and performance information that is available and increases the accuracy of the evaluation.

How Do I Use EPDs and this Sire Summary?

EPDs are expressed as a relative value, not an absolute. A birth weight EPD of +5 pounds does not mean the calves will be 5 pounds heavier than the average Hereford calf. EPDs are a means of comparing animals.

Let's look at two bulls as an example:

	BW	WW	YW	Milk
Sire A	3.0	30.0	55.0	20.0
Sire B	8.0	42.0	75.0	15.0
Difference	5.0	12.0	20.0	5.0

We see that the birth weight EPD of Sire B is 5 pounds more than that of Sire A, the weaning weight EPD is 12 pounds greater, the yearling weight is 20 pounds greater and the milk EPD is 5 pounds less.

So what does this mean?

If we were to breed both sires to the same group of cows, we would expect the calves from Sire B to be 5 pounds heavier at birth than calves from Sire A due to their genetics for birth weight. They would also be 12 pounds heavier at weaning due to the genetics from Sire B and 20 pounds heavier at yearling. The daughters of Sire A if used in the same environment as those daughters of Sire B, would be expected to add 5 more pounds of weaning weight to their calves than those daughters of Sire B due to their milk production and maternal characteristics.

It is important to remember that these values are not relative to a breed average birth weight, it is relative to the production system the bulls would be used in. If, for example, Sire B was throwing calves with a 100 pound average birth weight in your cowherd, you would expect calves from Sire A to weigh on average 95 pounds, when used across the same group of cows.

A producer may wish to use Sire A on heifers and sacrifice a little bit of weaning weight in the interest of reducing birth weights. On his mature cows, he may select Sire B, in order to increase his weaning weights.

The CHA Sire Summary contains information on EPDs, pedigree, and ownership of various sires in use in the Canadian Hereford population today. It is important to remember that there is no "perfect" set of unchangeable EPDs. EPDs are a valuable tool to help producers find outliers or curve benders. These are animals that combine growth, calving ease and desirable carcass characteristics. The more traits in a selection program, the more difficult it will be to find the bull that meets all of your needs.

Managers are encouraged to balance their selection among traits, without selecting for extremes in just one trait of interest. Because of the relationship between genes, selection for a single trait will inadvertently affect another. For example selection strictly on the basis of weaning weight, will tend to result in increased birth

weights, as many of the genes affecting weaning weight, also affect birth weight.

Producers can use the Sire Summary to identify potentially overlooked bloodlines on the basis of EPDs, identify particular genetics within a bloodline of interest, and identify potential sires from which they may wish to purchase sons or daughters.

It is important to remember that EPDs are a tool in the toolbox of profitable beef production, and that visual appraisal, reputation, customer service and other factors such as price are also vital parts of making profitable selection decisions.

Comparability of EPDs

Expected Progeny Differences (EPDs) from animals included in the Spring 2016 evaluation are directly comparable. Due to the inclusion of American, Canadian, Argentinean & Uruguayan data in the analysis, EPDs from animals born in any of those countries can be directly compared.

EPDs cannot be compared between this evaluation and previous PACE evaluations. As well, EPDs produced by different breeds, such as Angus or Gelbvieh, are not directly comparable to Pan American Hereford EPDs.

In the past, some Hereford cattle may have had more than one set of EPDs, if transferred between Canada and the United States. The EPDs were different because different performance information was utilized to calculate the genetic predictions. While we know that this may still occur to a limited extent, with the PACE, this problem is being eliminated. Many man-hours have been spent between PACE countries and ABRI to identify animals that are represented across associations. The efforts to match animals, and their progeny, on either side of the border have been extremely beneficial in identifying nearly all duplicated animals, but understandably not perfect when dealing with millions of cattle. Some cattle with different registration numbers in either Association; those that have been recently transferred or whose progeny have recently been transferred may not have been identified. These cattle may still have more than one set of EPDs because they are thought to be different animals. If Hereford breeders discover different EPDs for an animal they should notify the Records & Performance Department at the CHA.

Statistics

The statistics printed in this Sire Summary are derived from the Canadian, American, Argentinean, and Uruguayan databases. All averages, trends, and distributions are calculated from North American subset of the analysis, rather than just one association's performance records. All averages in the Sire Summary are North American Hereford averages not just CHA averages, except for Stayability, Residual Feed Intake, the Maternal Productivity Index & the Feedlot Merit Index which use only CHA data. Each Association establishes their own criteria for listing bulls in their respective Sire Summaries.

Evaluation Details

The ABRI Breedplan evaluation uses several techniques to best utilise the reported data and better reflect the genetic merit of Hereford cattle included in the evaluation. Among these techniques are: the use of a multi-trait model to evaluate all traits simultaneously and better account for the relationships between the various traits, use of the best available estimates of heritability derived from work done by AGBU looking at the merits of the Canadian and American Hereford populations, and incorporation of an age slicing technique allowing incorporation of more data. The Spring 2017 evaluation includes a several changes since the last published Sire Summary including revision of MPI calculations and the addition of RFI and PWG EPD. This is above the additional information submitted by producers over the past year.

Totals & Criteria

A total of **858** sires used in Canada are listed in the 2016 CHA Sire Summary. In order to be listed in this edition of the Sire Summary a bull must have met the following criteria:

Sire Summary (n = 858)

- Have an EPD for any trait with an accuracy of 0.60 or greater and:
- Have had at least one (1) progeny recorded over the last two (2) years (2015 & 2016)

Trait Leaders

Trait Leaders are defined as active sires in the top 20 percent of the breed, with at least 60% accuracy for that trait. The Trait Leader tables are located at the end of the Sire Summary and indicated by colour throughout the body of the Sire Summary. The top 10% are red, while the top 20% are blue. Trait leaders are presented for:

Calving Ease
Birth Weight
Weaning Weight
Yearling Weight
Milk
Total Maternal
Maternal Calving Ease
Scrotal Circumference
Stayability
MPI
FMI
Rib-Eye Area
Marbling

While the trait leader lists are presented to help breeders sort through potential sires, it is **strongly advised to avoid single trait selection.** In each trait leader list, all of the available EPD are presented. **Balanced selection based on specific production goals is strongly encouraged.**

Accuracy and Possible Change of an EPD (Why do EPDs Change?)

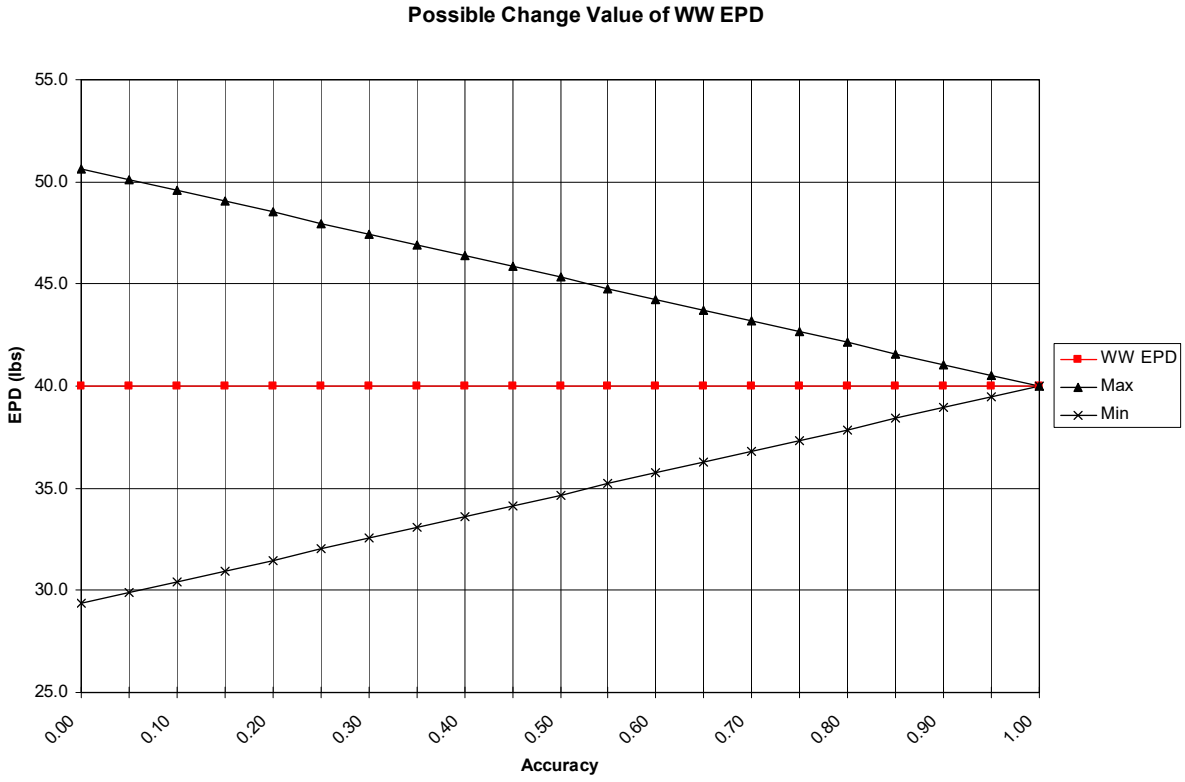
EPDs change because we are continually collecting more information on Hereford cattle. As well, researchers continue to find ways to better describe genetic relationships resulting in model improvements, such as the multi-trait analysis performed by ABRI.

Accuracy is a description of the amount of information available in the calculation of an animal's EPD. A higher accuracy means that an EPD is less subject to change as more information becomes available. While the animal's genetic merit will never change (it has exactly the same DNA throughout its' entire lifetime), our ability to predict its' genetic merit may change. As we obtain more information on an animal, its' contemporaries, progeny and other relatives we are able to do a better job of predicting the animal's true merit. This is reflected by accuracy.

While an EPD is still a better measure of an animal's genetic merit than a rank or an index, it is important to be aware of the potential risks associated with using low accuracy sires. As EPDs are used for improving accuracy of selection, it is important to consider the accuracy value associated with the EPD value.

The graph shows the potential range of EPDs for WW for an animal with increasing accuracy. Consider each point ■ as a different animal. Every animal has a WW EPD of 40.0 lbs. As more information is added from progeny and relatives the EPD may change to any point between the maximum ▲and the minimum **x** values. As the accuracy increases the potential change in the EPD is reduced. This is what is referred to as risk. A sire with a low accuracy EPD, faces a higher risk that the EPD may change because the EPD is based on less information than an EPD with higher accuracy.

The table of possible change values shows the expected range of change that can occur in an EPD as more information is collected (accuracy increases). While a few animals may experience changes outside of this range, it is not likely. If we look at the example of Yearling Weight an animal may have a YW EPD of +40 and an ACC of 0.40. The possible change value is ±13.5. This means that as more information is added to the evaluation the EPD may change, but should remain within the range of 26.5 and 53.5 (40 – 13.5 and 40 + 13.5) 95 times out of 100.



Possible Change Values for EPD by Accuracy Values (95% Confidence Interval)											
ACC	**CE (%)**	**BW (lbs)**	**WW (lbs)**	**YW (lbs)**	**Milk (lbs)**	**MCE (%)**	**SC (cm)**	**REA (in^2)**	**Fat (in)**	**MARB (units)**	**ACC**
0.00	±12.6	±5.4	±25.5	±42.6	±18.4	±12.6	±1.22	±0.69	±0.091	±0.48	**0.00**
0.05	12.0	5.1	24.3	40.4	17.5	12.0	1.16	0.65	0.086	0.46	**0.05**
0.10	11.3	4.8	23.0	38.3	16.6	11.3	1.10	0.62	0.082	0.43	**0.10**
0.15	10.6	4.6	21.7	36.2	15.7	10.6	1.04	0.58	0.077	0.41	**0.15**
0.20	10.0	4.3	20.4	34.0	14.8	10.0	0.98	0.55	0.073	0.38	**0.20**
0.25	9.3	4.0	19.2	31.9	13.8	9.3	0.92	0.51	0.068	0.36	**0.25**
0.30	8.7	3.8	17.9	29.8	12.9	8.7	0.86	0.48	0.064	0.34	**0.30**
0.35	8.0	3.5	16.6	27.7	12.0	8.0	0.80	0.45	0.059	0.31	**0.35**
0.40	7.4	3.2	15.3	25.5	11.1	7.4	0.73	0.41	0.055	0.29	**0.40**
0.45	6.7	3.0	14.0	23.4	10.1	6.7	0.67	0.38	0.050	0.26	**0.45**
0.50	6.1	2.7	12.8	21.3	9.2	6.1	0.61	0.34	0.045	0.24	**0.50**
0.55	5.5	2.4	11.5	19.2	8.3	5.5	0.55	0.31	0.041	0.22	**0.55**
0.60	4.9	2.1	10.2	17.0	7.4	4.9	0.49	0.27	0.036	0.19	**0.60**
0.65	4.2	1.9	8.9	14.9	6.5	4.2	0.43	0.24	0.032	0.17	**0.65**
0.70	3.6	1.6	7.7	12.8	5.5	3.6	0.37	0.21	0.027	0.14	**0.70**
0.75	3.0	1.3	6.4	10.6	4.6	3.0	0.31	0.17	0.023	0.12	**0.75**
0.80	2.4	1.1	5.1	8.5	3.7	2.4	0.24	0.14	0.018	0.10	**0.80**
0.85	1.8	0.8	3.8	6.4	2.8	1.8	0.18	0.10	0.014	0.07	**0.85**
0.90	1.2	0.5	2.6	4.3	1.8	1.2	0.12	0.07	0.009	0.05	**0.90**
0.95	0.6	0.3	1.3	2.1	0.9	0.6	0.06	0.03	0.005	0.02	**0.95**
1.00	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.000	0.00	**1.00**

Accuracy is based on the amount of performance information available on the animal and its' close relatives – particularly the number of progeny analysed. Accuracy is also based on the heritability of the trait and the genetic correlations with other recorded traits. Hence accuracy indicates the "confidence level" of the EPD. The higher the accuracy value the lower the likelihood of change in the animal's EPD as more information is analyzed for that animal and its' relatives. Even though an EPD with a low accuracy may change in the future, it is still the best estimate of an animal's genetic merit for that trait. As more information becomes available, an EPD is just as likely to increase in value as it is to decrease.

Accuracy values range from 0 to .99. The following table is provided for interpreting accuracy.

Accuracy	**Interpretation**
PE - < 0.10	Very low accuracy. EPDs should be considered a preliminary estimate. They could change substantially as more performance information becomes available.
0.10 to 0.25	Low accuracy, usually based on the animal's own records and pedigree. Useful for screening "best bet" animals. Still subject to substantial changes with more information, particularly when the performance of progeny are analysed.
0.25 to 0.40	Medium accuracy and includes some progeny information. Becoming a more reliable indicator of the animal's value as a parent.
0.40 to 0.70	High accuracy. Some progeny information included. Unlikely that the EPD will change very much with the addition of more progeny data.
> 0.70	Very high accuracy estimate of the animal's true breeding value.

As a rule animals should be compared using EPD regardless of accuracy. However, when two animals have similar EPDs the one with the higher accuracy could be the safer choice, assuming other factors are equal. A buyer is always advised to use more than just the EPDs, regardless of accuracy when making purchase decisions.

Heritability and Correlations

Heritability is the term used to describe the observed variation in a trait that can be explained by genetic factors.

Heritability estimates have been incorporated based on recent work done at AGBU, and represent variation in the Canadian U.S., Argentinean, and Uruguayan Hereford populations. These heritability estimates, are the best representation of genetic variation in the Hereford breed available today. Heritabilities used in the current evaluation are shown in the table.

Correlations are used to describe the relationships between traits. Correlations may range from -1.0 to 1.0. Correlations occur for a couple of reasons. Some genes may influence more than one trait, for example some of the genes that increase weaning weight may also result in higher yearling weights. This means that we can use weaning weight information to better predict the yearling weight EPD of an animal. A positive correlation means that as one trait increases the other does as well. A negative correlation means that when one trait increases the other decreases. Correlations of 0 mean that the traits have no relationship to each other. Some of the correlations used in the evaluation are shown in the table.

Heritabilities and Correlations used in the Joint Hereford PACE

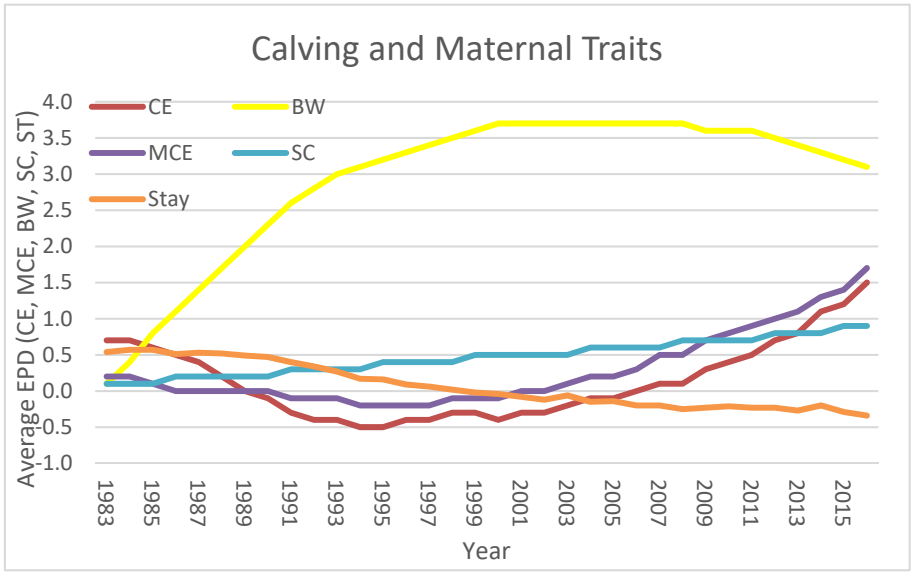
(**Heritabilities are on the Diagonal** / Genetic Correlations are above the Diagonal)															
	CE	**BW**	**WW**	**YW**	**MILK**	**MCE**	**SC**	**Cow Wt**	**Stay**	**Scan REA**	**Scan FAT**	**Scan % IMF**	**REA**	**FAT**	**MARB**
CE	**0.10**	-0.40	0.00	0.00	0.00	-0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BW		**0.43**	0.53	0.54	0.00	-0.13	0.03	0.60	-0.23	0.18	-0.15	-0.07	0.16	-0.21	-0.20
WW			**0.20**	0.80	0.00	0.00	0.19	0.77	-0.22	0.59	0.28	0.02	0.10	0.10	-0.18
YW				**0.36**	0.00	0.00	0.24	0.00	0.00	0.55	0.23	-0.09	0.10	0.004	0.08
MILK					**0.10**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MCE						**0.10**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SC							**0.37**	0.00	0.00	0.05	0.05	0.05	0.05	0.05	0.05
Cow Wt								**0.55**	-0.22	0.00	0.00	0.00	0.00	0.00	0.00
Stay									**0.11**	0.00	0.00	0.00	0.00	0.00	0.00
Scan REA										**0.26**	0.18	0.00	0.75	-0.05	0.02
Scan FAT											**0.30**	0.39	-0.09	0.85	0.30
Scan% IMF												**0.26**	-0.16	0.25	0.70
REA													**0.36**	-0.30	-0.10
FAT														**0.30**	0.30
Marb															**0.53**

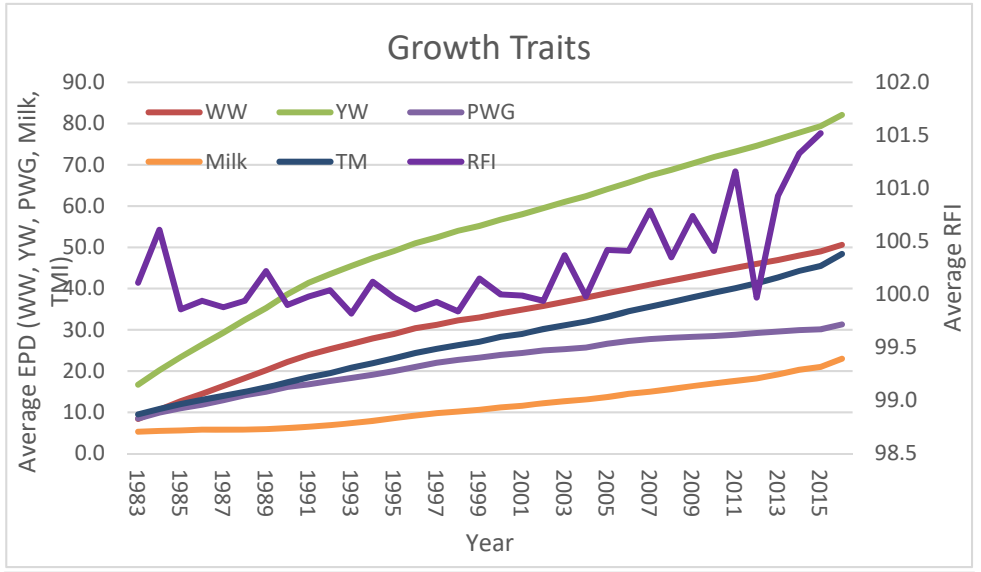
Genetic Trend

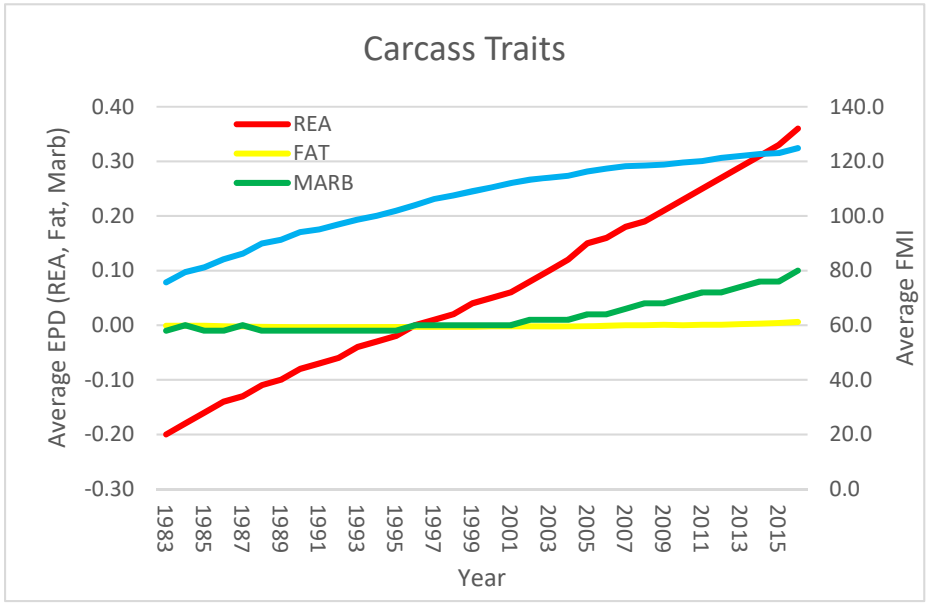
EPDs express relative genetic differences between animals. Because of the use of pedigree information, we are able to calculate the relative change in genetic merit of Hereford cattle over time. Looking at the graph on the next page we can see that BW has stabilized over the last several years, while WW, YW, Milk and Total Maternal traits are increasing at a relatively rapid pace. This reflects the selection emphasis of North American producers on growth. BW has maintained its current level for the last several years, WW has been increasing at around 1 pound per year, and YW has been increasing from 1.5 to 2 pounds per year for the last several years. Milk has been increasing at roughly 1 pound per year for the last several years. SC has also increased over the last several years, as has REA. Marb and FAT show small increases over the past few years.

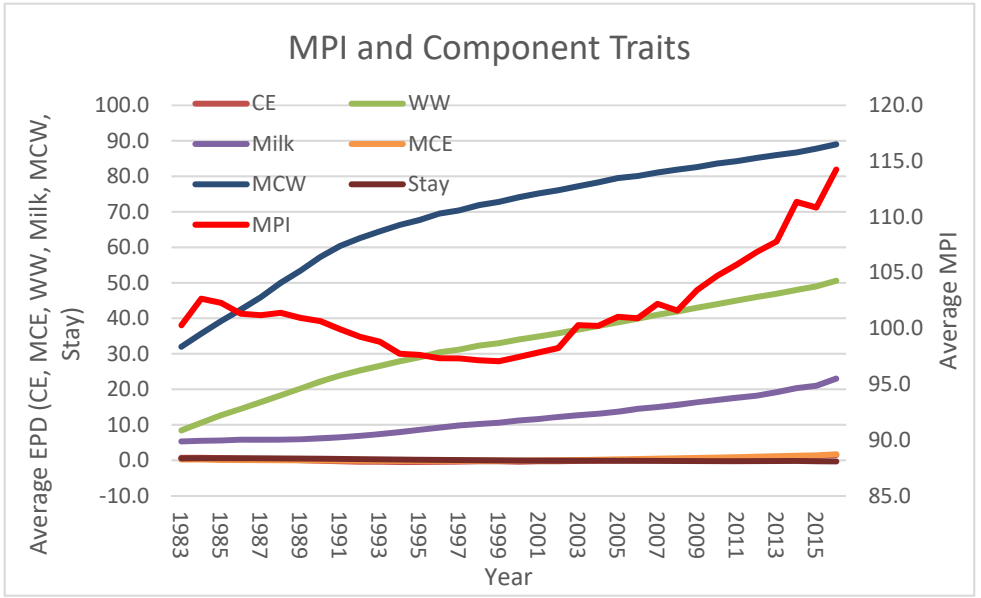
Year	CE (%)	BW (lbs)	WW (lbs)	YW (lbs)	PWG (lbs)	RFI	Milk (lbs)	TM (lbs)	MCE (%)	SC (cm)	CW (lbs)	Stay (%)	MPI	FMI	REA (in^2)	FAT (in)	MARB (units)	Year
2016	1.5	3.1	50.6	82.1	31.3		23.0	48.4	1.7	0.9	89.0	-0.3	114.2	124.9	0.36	0.006	0.10	**2016**
2015	1.2	3.2	49.0	79.4	30.1	101.5	21.0	45.5	1.4	0.9	87.8	-0.3	110.8	123.0	0.33	0.004	0.08	**2015**
2014	1.1	3.3	48.0	77.8	29.9	101.3	20.3	44.3	1.3	0.8	86.7	-0.2	111.3	122.7	0.31	0.003	0.08	**2014**
2013	0.8	3.4	46.9	76.2	29.6	100.9	19.2	42.7	1.1	0.8	86.0	-0.3	107.8	122.0	0.29	0.002	0.07	**2013**
2012	0.7	3.5	46.0	74.6	29.2	100.0	18.2	41.3	1.0	0.8	85.2	-0.2	106.9	121.3	0.27	0.001	0.06	**2012**
2011	0.5	3.6	45.0	73.2	28.8	101.2	17.6	40.1	0.9	0.7	84.3	-0.2	105.7	120.1	0.25	0.001	0.06	**2011**
2010	0.4	3.6	44.0	71.9	28.5	100.4	17.0	39.0	0.8	0.7	83.6	-0.2	104.7	119.6	0.23	0.000	0.05	**2010**
2009	0.3	3.6	43.0	70.3	28.3	100.7	16.4	37.9	0.7	0.7	82.6	-0.2	103.5	118.8	0.21	0.001	0.04	**2009**
2008	0.1	3.7	41.9	68.8	28.1	100.4	15.6	36.7	0.5	0.7	81.9	-0.3	101.6	118.4	0.19	0.000	0.04	**2008**
2007	0.1	3.7	41.0	67.4	27.7	100.8	15.0	35.6	0.5	0.6	81.1	-0.2	102.2	118.2	0.18	0.000	0.03	**2007**
2006	0.0	3.7	39.9	65.7	27.3	100.4	14.5	34.5	0.3	0.6	80.1	-0.2	100.9	117.3	0.16	-0.001	0.02	**2006**
2005	-0.1	3.7	38.9	64.1	26.6	100.4	13.7	33.2	0.2	0.6	79.5	-0.1	101.1	116.3	0.15	-0.002	0.02	**2005**
2004	-0.1	3.7	37.8	62.4	25.7	100.0	13.1	32.0	0.2	0.6	78.3	-0.2	100.2	114.7	0.12	-0.002	0.01	**2004**
2003	-0.2	3.7	36.8	61.0	25.3	100.4	12.7	31.1	0.1	0.5	77.2	-0.1	100.3	114.0	0.10	-0.002	0.01	**2003**
2002	-0.3	3.7	35.8	59.5	25.0	99.9	12.2	30.2	0.0	0.5	76.1	-0.1	98.2	113.3	0.08	-0.002	0.01	**2002**
2001	-0.3	3.7	34.9	58.0	24.4	100.0	11.6	29.0	0.0	0.5	75.2	-0.1	97.8	112.0	0.06	-0.002	0.00	**2001**
2000	-0.4	3.7	34.0	56.7	23.9	100.0	11.2	28.3	-0.1	0.5	74.1	0.0	97.5	110.4	0.05	-0.002	0.00	**2000**
1999	-0.3	3.6	33.0	55.2	23.3	100.2	10.6	27.1	-0.1	0.5	72.8	0.0	97.1	109.1	0.04	-0.003	0.00	**1999**
1998	-0.3	3.5	32.3	54.0	22.7	99.8	10.2	26.3	-0.1	0.4	71.9	0.0	97.1	107.5	0.02	-0.003	0.00	**1998**
1997	-0.4	3.4	31.2	52.4	22.0	99.9	9.8	25.4	-0.2	0.4	70.4	0.1	97.3	106.2	0.01	-0.003	0.00	**1997**
1996	-0.4	3.3	30.4	51.0	21.0	99.9	9.2	24.4	-0.2	0.4	69.5	0.1	97.3	104.0	0.00	-0.003	0.00	**1996**
1995	-0.5	3.2	29.0	49.1	20.0	100.0	8.6	23.1	-0.2	0.4	67.7	0.2	97.6	101.9	-0.02	-0.003	-0.01	**1995**
1994	-0.5	3.1	27.9	47.4	19.1	100.1	7.9	21.9	-0.2	0.3	66.3	0.2	97.7	100.1	-0.03	-0.003	-0.01	**1994**
1993	-0.4	3.0	26.6	45.5	18.4	99.8	7.4	20.8	-0.1	0.3	64.5	0.3	98.8	98.7	-0.04	-0.004	-0.01	**1993**
1992	-0.4	2.8	25.3	43.5	17.6	100.0	6.9	19.5	-0.1	0.3	62.6	0.3	99.3	96.9	-0.06	-0.004	-0.01	**1992**
1991	-0.3	2.6	23.9	41.4	16.8	100.0	6.5	18.5	-0.1	0.3	60.4	0.4	99.9	95.1	-0.07	-0.004	-0.01	**1991**
1990	-0.1	2.3	22.2	38.6	16.1	99.9	6.2	17.3	0.0	0.2	57.3	0.5	100.7	94.1	-0.08	-0.004	-0.01	**1990**
1989	0.0	2.0	20.2	35.3	15.0	100.2	5.9	16.0	0.0	0.2	53.4	0.5	100.9	91.3	-0.10	-0.003	-0.01	**1989**
1988	0.2	1.7	18.3	32.4	14.2	99.9	5.8	15.0	0.0	0.2	50.0	0.5	101.4	89.9	-0.11	-0.003	-0.01	**1988**
1987	0.4	1.4	16.4	29.3	12.9	99.9	5.8	14.0	0.0	0.2	45.9	0.5	101.2	86.2	-0.13	-0.002	0.00	**1987**
1986	0.5	1.1	14.5	26.4	11.9	99.9	5.8	13.0	0.0	0.2	42.5	0.5	101.3	84.1	-0.14	-0.002	-0.01	**1986**
1985	0.6	0.8	12.7	23.4	11.0	99.9	5.6	12.0	0.1	0.1	39.2	0.6	102.3	81.2	-0.16	-0.001	-0.01	**1985**
1984	0.7	0.4	10.6	20.2	10.0	100.6	5.5	10.8	0.2	0.1	35.7	0.6	102.7	79.4	-0.18	-0.001	0.00	**1984**
1983	0.7	0.1	8.4	16.7	8.5	100.1	5.3	9.5	0.2	0.1	32.0	0.5	100.3	75.7	-0.20	-0.001	-0.01	**1983**

Genetic Trend – All Animals (Spring 2017 Analysis)









Averages & Percentile Breakdown of EPDs

A Percentile table is used to show the relative ranking of an animal within the Hereford breed. Three broad categories are presented for comparison. Active Sires are those bulls that have sired at least 1 calf recorded in the last 2 years. Active Dams are those cows with calves in the last 2 years and provide a comparison for females in use in your cowherd. Calves are those animals born in the last 2 years and allow for comparison of yearling and 2 year old animals to the population. For animals with EPDs that fall between the published ranges, use the lower value. For example: An active Sire with a YW EPD of 91.0 would rank in the top 30% of the breed for YW.

Active Sires – Averages & Percentile Breakdown

	CE (%)	BW (lbs)	WW (lbs)	YW (lbs)	PWG (lbs)	RFI	Milk (lbs)	TM (lbs)	MCE (%)	SC (cm)	CW (lbs)	Stay (%)	MPI	FMI	REA (in^2)	FAT (in)	MARB (units)	
Avg	**1.2**	**3.1**	**50.0**	**82.0**	**31.8**	**100.2**	**22.0**	**47.0**	**1.5**	**0.9**	**89.0**	**-0.3**	**112.3**	**126.6**	**0.36**	**0.005**	**0.09**	**Avg**
Min	-17.7	-7.7	-10.0	-19.0	-8.1	83.0	-10.0	-10.0	-7.9	-1.0	-12.0	-7.8	10.0	11.7	-0.62	-0.099	-0.48	**Min**
Max	13.9	15.2	92.0	144.0	65.1	120.0	58.0	86.0	8.8	2.7	172.0	5.8	212.7	239.9	1.53	0.172	0.92	**Max**
Percentile Breakdown																		
1%	8.4	-2.3	74.0	121.0	53.6	115.0	41.0	70.0	6.3	2.0	36.0	3.3	176.5	189.8	1.01	-0.058	0.53	**1%**
2%	7.6	-1.4	71.0	116.0	49.6	112.0	38.0	67.0	5.8	1.8	43.0	2.8	169.7	182.7	0.92	-0.051	0.46	**2%**
3%	7.0	-1.0	69.0	113.0	48.2	111.3	37.0	66.0	5.4	1.7	48.0	2.3	162.9	176.0	0.88	-0.045	0.41	**3%**
4%	6.7	-0.7	67.0	110.0	47.1	110.1	36.0	64.0	5.2	1.6	51.0	2.1	160.1	172.5	0.84	-0.042	0.38	**4%**
5%	6.2	-0.4	66.0	108.0	46.2	109.0	35.0	64.0	4.9	1.6	53.0	2.0	157.1	170.2	0.81	-0.039	0.36	**5%**
10%	5.1	0.5	63.0	103.0	43.3	107.0	31.0	60.0	4.2	1.4	62.0	1.5	146.0	159.5	0.70	-0.029	0.28	**10%**
15%	4.4	1.0	61.0	99.0	40.8	105.0	29.0	57.0	3.7	1.3	67.0	1.1	139.2	152.5	0.62	-0.022	0.23	**15%**
20%	3.8	1.5	59.0	96.0	38.9	104.0	28.0	56.0	3.2	1.2	71.0	0.8	133.9	147.0	0.57	-0.017	0.19	**20%**
25%	3.3	1.8	57.0	93.0	37.5	103.0	27.0	54.0	2.9	1.1	75.0	0.6	129.4	142.2	0.52	-0.013	0.17	**25%**
30%	2.8	2.1	56.0	91.0	36.4	102.0	26.0	52.0	2.6	1.1	78.0	0.4	125.6	138.4	0.48	-0.010	0.14	**30%**
35%	2.5	2.4	55.0	89.0	35.2	101.0	25.0	51.0	2.3	1.0	81.0	0.2	121.9	135.1	0.44	-0.007	0.12	**35%**
40%	2.0	2.7	53.0	86.0	34.0	101.0	24.0	50.0	2.0	1.0	84.0	0.0	118.5	131.6	0.41	-0.003	0.10	**40%**
45%	1.6	2.9	52.0	84.0	32.8	100.0	23.0	49.0	1.8	0.9	86.0	-0.2	114.9	128.4	0.38	-0.001	0.09	**45%**
50%	1.3	3.1	51.0	82.0	31.7	100.0	22.0	48.0	1.5	0.9	89.0	-0.3	111.9	125.8	0.35	0.002	0.07	**50%**
55%	0.9	3.4	50.0	80.0	30.6	100.0	21.0	46.0	1.2	0.8	91.0	-0.5	108.5	122.9	0.32	0.005	0.05	**55%**
60%	0.6	3.6	48.0	78.0	29.5	99.0	20.0	45.0	0.9	0.8	94.0	-0.6	105.5	119.9	0.28	0.009	0.03	**60%**
65%	0.2	3.9	47.0	76.0	28.5	99.0	19.0	44.0	0.6	0.7	97.0	-0.9	102.5	117.4	0.25	0.012	0.02	**65%**
70%	-0.3	4.2	46.0	74.0	27.4	98.0	18.0	42.0	0.3	0.7	99.0	-1.1	98.8	113.9	0.22	0.016	0.00	**70%**
75%	-0.8	4.5	44.0	71.0	25.9	97.0	17.0	41.0	0.0	0.6	103.0	-1.3	94.9	110.5	0.18	0.020	-0.01	**75%**
80%	-1.3	4.8	42.0	68.0	24.6	97.0	16.0	39.0	-0.3	0.6	106.0	-1.5	90.3	106.6	0.14	0.026	-0.03	**80%**
85%	-1.9	5.2	40.0	65.0	23.2	96.0	14.0	36.0	-0.7	0.5	111.0	-1.8	86.4	102.2	0.09	0.032	-0.05	**85%**
90%	-2.7	5.7	37.0	60.0	20.7	95.0	12.0	33.0	-1.2	0.4	116.0	-2.1	80.0	96.1	0.03	0.040	-0.08	**90%**
95%	-4.1	6.5	33.0	53.0	16.6	93.0	8.0	28.0	-2.1	0.3	124.0	-2.8	69.2	86.9	-0.05	0.055	-0.12	**95%**
100%	-17.7	15.2	-11.0	-19.0	-8.1	83.0	-11.0	-10.0	-7.9	-1.0	172.0	-7.8	10.0	11.7	-0.62	0.172	-0.48	**100%**
Num	**6531**	**6584**	**6584**	**6584**	**1812**	**522**	**6576**	**6576**	**6531**	**6577**	**6584**	**1703**	**1700**	**1809**	**6582**	**6582**	**6582**	**Num**

Num – the number of Active Hereford Sires that were evaluated for each trait.

Note on Using the Tables: For comparison purposes EPDs should be compared to the appropriate Average & Percentile Breakdown table rather than being compared to zero or the genetic base. For example, yearling and two year old bulls should be compared using the table: **Calves – Averages & Percentile Breakdown**

Active Dams – Averages & Percentile Breakdown

	CE (%)	BW (lbs)	WW (lbs)	YW (lbs)	PWG (lbs)	RFI	Milk (lbs)	TM (lbs)	MCE (%)	SC (cm)	CW (lbs)	Stay (%)	MPI	FMI	REA (in^2)	FAT (in)	MARB (units)	
Avg	**0.6**	**3.5**	**46.0**	**75.0**	**29.8**	**100.8**	**19.0**	**42.0**	**1.0**	**0.8**	**85.0**	**-0.3**	**105.8**	**120.9**	**0.27**	**0.003**	**0.06**	**Avg**
Min	-15.7	-9.2	-32.0	-53.0	-6.1	85.0	-24.0	-28.0	-11.2	-0.7	-43.0	-8.3	0.0	0.4	-0.77	-0.125	-0.48	**Min**
Max	12.6	14.3	84.0	143.0	72.1	119.0	55.0	80.0	9.0	2.8	199.0	5.7	199.4	219.2	1.44	0.165	0.88	**Max**
	Percentile Breakdown																	
1%	6.8	-1.0	66.0	109.0	47.4	111.0	36.0	64.0	5.6	1.6	37.0	3.5	167.5	170.8	0.84	-0.050	0.41	**1%**
2%	5.9	-0.4	64.0	105.0	45.3	110.0	34.0	62.0	5.1	1.5	44.0	3.1	159.0	163.7	0.77	-0.043	0.35	**2%**
3%	5.4	0.0	62.0	102.0	44.0	109.0	33.0	60.0	4.7	1.4	48.0	2.7	154.4	159.4	0.72	-0.038	0.32	**3%**
4%	5.1	0.3	61.0	101.0	42.9	108.0	32.0	59.0	4.4	1.4	51.0	2.5	150.7	156.0	0.69	-0.035	0.29	**4%**
5%	4.8	0.5	60.0	99.0	42.1	108.0	31.0	58.0	4.2	1.3	54.0	2.3	148.2	153.7	0.66	-0.032	0.27	**5%**
10%	3.7	1.2	57.0	94.0	39.4	106.0	28.0	55.0	3.5	1.2	61.0	1.7	138.0	145.2	0.56	-0.024	0.21	**10%**
15%	3.1	1.7	55.0	90.0	37.6	105.0	27.0	52.0	3.0	1.1	66.0	1.3	131.8	140.2	0.50	-0.019	0.17	**15%**
20%	2.6	2.0	54.0	87.0	36.1	104.0	25.0	51.0	2.6	1.0	70.0	1.0	127.1	136.0	0.45	-0.015	0.15	**20%**
25%	2.2	2.4	52.0	85.0	34.9	103.0	24.0	49.0	2.2	1.0	73.0	0.7	122.8	132.7	0.41	-0.011	0.12	**25%**
30%	1.8	2.6	51.0	83.0	33.8	103.0	23.0	48.0	2.0	0.9	76.0	0.5	119.1	129.9	0.38	-0.009	0.11	**30%**
35%	1.5	2.9	50.0	81.0	32.8	102.0	22.0	46.0	1.7	0.9	79.0	0.3	115.6	127.1	0.35	-0.006	0.09	**35%**
40%	1.2	3.1	49.0	79.0	31.8	101.0	21.0	45.0	1.5	0.8	81.0	0.1	112.4	124.8	0.32	-0.004	0.07	**40%**
45%	0.9	3.3	47.0	77.0	30.9	101.0	20.0	44.0	1.2	0.8	83.0	-0.1	109.3	122.4	0.29	-0.001	0.06	**45%**
50%	0.6	3.5	46.0	75.0	29.9	100.0	20.0	43.0	1.0	0.8	85.0	-0.3	106.1	120.3	0.26	0.001	0.05	**50%**
55%	0.3	3.7	45.0	73.0	29.0	100.0	19.0	42.0	0.7	0.7	88.0	-0.5	103.0	118.2	0.23	0.003	0.03	**55%**
60%	0.0	4.0	44.0	72.0	28.0	100.0	18.0	40.0	0.5	0.7	90.0	-0.7	99.8	115.9	0.21	0.006	0.02	**60%**
65%	-0.3	4.2	43.0	70.0	26.9	99.0	17.0	39.0	0.3	0.6	92.0	-0.9	96.5	113.6	0.18	0.009	0.01	**65%**
70%	-0.6	4.4	42.0	68.0	25.9	99.0	16.0	37.0	0.1	0.6	95.0	-1.1	92.9	111.2	0.15	0.012	0.00	**70%**
75%	-1.0	4.7	41.0	65.0	24.8	99.0	15.0	36.0	-0.2	0.6	97.0	-1.3	89.0	108.5	0.12	0.015	-0.02	**75%**
80%	-1.4	5.0	39.0	63.0	23.5	98.0	13.0	34.0	-0.5	0.5	100.0	-1.6	84.5	105.5	0.09	0.020	-0.03	**80%**
85%	-1.9	5.3	37.0	60.0	21.9	97.0	11.0	32.0	-0.9	0.5	104.0	-1.9	79.4	102.2	0.05	0.025	-0.05	**85%**
90%	-2.5	5.7	35.0	57.0	19.9	96.0	9.0	29.0	-1.4	0.4	109.0	-2.4	72.7	98.0	0.00	0.032	-0.07	**90%**
95%	-3.6	6.4	32.0	51.0	17.0	94.0	6.0	25.0	-2.2	0.3	116.0	-3.1	63.5	90.6	-0.07	0.043	-0.11	**95%**
100%	-15.7	14.3	-32.0	-53.0	-6.1	85.0	-24.0	-28.0	-11.2	-0.7	199.0	-8.3	0.0	0.4	-0.77	0.165	-0.48	**100%**
Num	**120443**	**121778**	**121787**	**121804**	**20342**	**2404**	**121683**	**121683**	**120443**	**120334**	**121748**	**18960**	**18955**	**20324**	**120675**	**120675**	**120675**	**Num**

Num – the number of Active Hereford Dams that were evaluated for each trait.

Calves – Averages & Percentile Breakdown

	CE (%)	BW (lbs)	WW (lbs)	YW (lbs)	PWG (lbs)	RFI	Milk (lbs)	TM (lbs)	MCE (%)	SC (cm)	CW (lbs)	Stay (%)	MPI	FMI	REA (in^2)	FAT (in)	MARB (units)	
Avg	**1.3**	**3.2**	**50.0**	**80.0**	**30.7**	**101.4**	**22.0**	**46.0**	**1.5**	**0.9**	**88.0**	**-0.3**	**111.4**	**124.0**	**0.34**	**0.005**	**0.09**	**Avg**
Min	-15.2	-9.3	-28.0	-43.0	0.8	81.0	-10.0	-23.0	-6.9	-0.7	-30.0	-5.7	18.6	13.7	-0.72	-0.098	-0.37	**Min**
Max	12.8	14.3	91.0	144.0	66.9	126.0	52.0	78.0	8.4	2.7	170.0	5.4	207.6	235.1	1.36	0.146	1.03	**Max**
	Percentile Breakdown																	
1%	7.8	-1.5	69.0	112.0	47.3	114.0	37.0	66.0	5.4	1.7	46.0	2.6	166.2	173.6	0.86	-0.043	0.45	**1%**
2%	6.8	-0.9	66.0	108.0	45.3	112.0	35.0	63.0	5.0	1.6	53.0	2.3	159.6	166.8	0.79	-0.037	0.39	**2%**
3%	6.3	-0.5	65.0	106.0	44.1	111.0	34.0	62.0	4.7	1.5	56.0	2.0	155.2	162.7	0.74	-0.034	0.36	**3%**
4%	5.9	-0.2	64.0	104.0	43.1	110.0	33.0	61.0	4.5	1.4	58.0	1.8	151.6	159.7	0.71	-0.031	0.33	**4%**
5%	5.6	0.1	63.0	103.0	42.3	109.0	32.0	60.0	4.3	1.4	60.0	1.7	148.5	157.3	0.68	-0.028	0.31	**5%**
10%	4.6	0.8	60.0	98.0	39.7	108.0	30.0	57.0	3.7	1.3	67.0	1.2	139.4	148.9	0.60	-0.021	0.24	**10%**
15%	3.9	1.3	58.0	94.0	38.1	107.0	28.0	56.0	3.3	1.2	71.0	0.9	133.6	143.5	0.55	-0.016	0.20	**15%**
20%	3.4	1.7	57.0	92.0	36.8	105.0	27.0	54.0	2.9	1.1	74.0	0.7	129.2	139.4	0.51	-0.012	0.18	**20%**
25%	3.0	2.0	55.0	90.0	35.7	105.0	26.0	53.0	2.7	1.1	77.0	0.5	125.4	136.1	0.47	-0.009	0.15	**25%**
30%	2.6	2.3	54.0	88.0	34.7	104.0	25.0	51.0	2.4	1.0	80.0	0.3	122.3	133.0	0.44	-0.006	0.13	**30%**
35%	2.2	2.5	53.0	86.0	33.7	103.0	24.0	50.0	2.2	1.0	82.0	0.1	119.2	130.3	0.41	-0.004	0.12	**35%**
40%	1.9	2.8	52.0	84.0	32.8	103.0	23.0	49.0	1.9	0.9	84.0	0.0	116.4	127.8	0.38	-0.001	0.10	**40%**
45%	1.6	3.0	51.0	82.0	31.9	102.0	23.0	48.0	1.7	0.9	86.0	-0.2	113.6	125.5	0.36	0.001	0.09	**45%**
50%	1.3	3.2	50.0	81.0	31.1	101.0	22.0	47.0	1.5	0.9	88.0	-0.3	111.1	123.3	0.33	0.003	0.07	**50%**
55%	1.0	3.4	49.0	79.0	30.2	101.0	21.0	46.0	1.3	0.8	90.0	-0.5	108.4	121.1	0.31	0.006	0.06	**55%**
60%	0.7	3.6	48.0	77.0	29.3	100.0	21.0	45.0	1.1	0.8	92.0	-0.6	105.9	118.9	0.28	0.008	0.05	**60%**
65%	0.4	3.8	47.0	76.0	28.3	99.0	20.0	44.0	0.9	0.8	95.0	-0.8	102.9	116.5	0.26	0.011	0.04	**65%**
70%	0.1	4.1	46.0	74.0	27.3	99.0	19.0	43.0	0.6	0.7	97.0	-1.0	100.0	114.2	0.23	0.014	0.02	**70%**
75%	-0.3	4.3	44.0	72.0	26.1	98.0	18.0	41.0	0.4	0.7	99.0	-1.2	97.0	111.6	0.20	0.017	0.01	**75%**
80%	-0.7	4.6	43.0	69.0	24.8	98.0	17.0	40.0	0.1	0.6	102.0	-1.4	93.4	108.8	0.17	0.021	0.00	**80%**
85%	-1.2	5.0	41.0	67.0	23.1	97.0	15.0	37.0	-0.2	0.6	105.0	-1.6	89.0	105.5	0.13	0.026	-0.02	**85%**
90%	-1.8	5.4	39.0	63.0	20.9	96.0	13.0	35.0	-0.6	0.5	109.0	-2.0	83.6	100.8	0.08	0.033	-0.04	**90%**
95%	-2.8	6.1	36.0	57.0	17.5	93.0	10.0	30.0	-1.2	0.4	115.0	-2.5	75.7	94.0	0.01	0.043	-0.07	**95%**
100%	-15.2	14.3	-28.0	-43.0	0.8	81.0	-10.0	-23.0	-6.9	-0.7	170.0	-5.7	18.6	13.7	-0.72	0.146	-0.37	**100%**
Num	**160685**	**167132**	**167126**	**167126**	**28943**	**1651**	**166939**	**166939**	**160685**	**166614**	**167118**	**24416**	**23979**	**28097**	**167000**	**167000**	**167000**	**Num**

Num – the number of Hereford calves born within the last two years that were evaluated for each trait.

How to Read the EPD Tables

Name Of Bull Reg No Tattoo Date of Birth Owner(s)	Sire Sire of Sire Sire of Dam	GE EPD	Cvg Ease EPD ACC %	Birth WT EPD ACC %	Wng WT EPD ACC %	No. Herds Prog Daug	Ylg WT EPD ACC %	Milk EPD ACC %	Tot Mat EPD %	Mat CE EPD ACC %	Scrot EPD ACC %	Cow WT EPD ACC %	Stay EPD ACC %	MPI ACC %	FMI EPD ACC %	RFI EPD ACC %	PWG EPD ACC %	FAT EPD ACC %	REA EPD ACC %	MARB EPD ACC %
MR HEREFORD 123E	MR HEREFORD 123B	**GE**	**6.2**	**2.3**	**59.0**	11	**96.0**	**8.0**	**45.5**	**5.2**	**1.4**	**90.0**	**3.5**	**139.2**	**137.2**	**103.0**	**37.0**	**0.008**	**0.50**	**0.46**
C01234567 HRFD 123E	MR HEREFORD BULL 321X		.38	.85	.80	355	.78	.65		.33	.31	.85	.76	.76	.45	0.15	0.78	.66	.66	.62
January 15, 1979	OLD HEREFORD BULL 456S		*5*	*35*	*20*	105	*20*	*95*	*60*	*4*	*10*	*55*	*1*	*15*	*30*	*25*	*30*	*60*	*30*	*2*
HEREFORD BREEDER SOMETOWN, SK (123)4567890																				

Sire Information
Sires are listed in alphabetical order, according to their registered names. Below the name appears the Canadian registration number, followed by the tattoo and the animal's date of birth. The registration number is prefixed by "P" to identify polled cattle.

Ownership Information
This field contains information on the current ownership of the sire as it appears in the CHA registry and prints on the registration paper at the time of production, where they live and a contact phone number. Every effort possible has been made to ensure that all ownership and contact information is correct. However, the nearly 900 sires listed in this sire summary have over 1,900 ownership records. Accordingly, some ownership information may have been edited incorrectly. The Canadian Hereford Association apologizes for any instance where this may have occurred.

Pedigree Information
The registered name of the Sire of the bull is shown, followed by the Sire of the Sire (paternal grandsire) and the Sire of the Dam (maternal grandsire) of the bull.

Genomically Enhanced EPD
MR HEREFORD has Genomically Enhanced EPD that include information from a high density DNA panel, as designated by the "GE" in the GE EPD column.

Calving Ease EPD and Accuracy
Calving Ease EPDs are calculated using birth weight and calving ease score information. Calving ease EPDs represent the ease with which progeny of an animal are born to first calf heifers. The EPD is expressed as a percent probability, with a higher value representing calves with a higher probability of being born unassisted. In the above example, MR HEREFORD 123E has a CE EPD of 6.0 with an accuracy of 0.38. The breed ***average and percentile breakdown*** table for active sires, indicates that this sire is 5.0% above the breed average for calving ease, or his calves from first calf heifers can be expected to require 5.0% fewer assists than those from a sire with a CE EPD of 1.2. Also, shown below the EPD is that the sire is in the top 5% of the breed for calving ease. If we refer to the table of ***possible change values by accuracy level***, we see that MR HEREFORD's CE EPD has a low accuracy and may change by plus or minus 8.0% (-2.0 to 14.0 %) in future evaluations.

Birth Weight EPD and Accuracy
Birth weight is an indicator of calving ease. Higher birth weight EPDs usually indicates more calving difficulty. In the example above, MR HEREFORD has a BW EPD of 2.3 with an accuracy of 0.85. Referring to the breed ***average and percentile breakdown*** table for ***active sires*** on page 13, this bull is 0.8 lbs. below the breed average for the BW EPD for active sires and/or his progeny can be expected to weigh on average 0.8 lbs. less at birth than progeny sired by a bull with an EPD of 3.1 (2.3 minus 3.1 = -0.8 lbs.). More specifically, this bull is in the top 35 percent of the breed in North America for low progeny birth weights. This sire's BW EPD has a high accuracy. With the assistance of the table ***possible change values by accuracy level*** page 10 you can also determine that MR HEREFORD's BW EPD should not change by more than plus or minus 0.8 lbs. (1.5 to 3.1 lbs.) in subsequent evaluations as new data is added.

Weaning Weight EPD and Accuracy
The weaning EPD reflects progeny growth differences up to 205-days. In the example above MR HEREFORD has a WW EPD of 59.0 and an accuracy of 0.80. Referring to the breed ***average and percentile breakdown*** table for ***active sires*** on the bottom of page 13, this bull is 9.0 lbs. above the breed average for the WW EPD for active sires and/or his progeny can be expected to weigh on average 9.0 lbs. more at 205-days than progeny sired by a bull with an EPD of 50.0 (59.0 minus 50.0 = 9.0 lbs.). More specifically, this bull is in the top 20 percent of all active sires in North America for progeny weaning weights. This sire's WW EPD has a high accuracy. With the assistance of the table ***possible change values by accuracy level*** on page 10 you can also determine that MR HEREFORD's WW EPD should not change by more than plus or minus 2.1 lbs. (56.9 to 61.1 lbs.) in subsequent evalations as new data is added. The EPD is highlighted in BLUE since the accuracy of the trait is greater than 0.60 and ranks in the top 20% of the breed.

Number of Herds, Progeny and Daughters
This indicates both the number of herds providing weaning data on the sire's progeny and the total number of weaning records used in the analysis from those herds. Both herds and progeny may include performance information from the Canadian, American, and Argentinean & Uruguayan Associations. In this example the sire was used in 11 herds and had 355 progeny included in the weaning weight evaluation. As well, there are 105 daughters of the bull, with progeny included in the evaluation.

Yearling Weight EPD and Accuracy
The yearling EPD reflects progeny growth differences through to 365-days. In the example above MR HEREFORD has a YW EPD of 96.0 and an accuracy of 0.78. Referring to the breed ***average and percentile breakdown*** table for ***active sires*** on the bottom of page 13, this bull is 14.0 lbs. above the breed average for the YW EPD for active sires and/or his progeny can be expected to weigh on average 14.0 lb more at 365-days than progeny sired by a bull with an EPD of 82.0 (96.0 minus 82.0 = 14.0 lb.). More specifically, this bull is in the top 20 percent of all the breed in North America for progeny yearling weights. This sire's YW EPD has a high accuracy. With the assistance of the table of ***possible change values by accuracy level*** on page 10 you can also determine that MR HEREFORD's YW EPD should not change by more than plus or minus 5.6 lbs. (90.4 to 101.6 lbs.) in subsequent evaluations as new data is added. The EPD is highlighted in BLUE since the accuracy of the trait is greater than 0.60 and ranks in the top 20% of the breed.

Milk EPD and Accuracy
The milk EPD indicates the ability of a sire's daughters to provide their calves with an environment that encourages growth from birth to weaning, through mothering ability and milk production. This EPD is expressed in the expected difference in pounds of calf at weaning. In the example above MR HEREFORD has a Milk EPD of 8.0 and an accuracy of 0.65. Referring to the breed ***average and percentile breakdown*** table for ***active sires*** on the bottom of page 13, this bull is 14.0 lb. below the breed average for the Milk EPD for active sires and/or the progeny of his daughters can be expected to weigh on average 14.0 lb. less at 205-days than progeny sired by a bull with an EPD of 22 (8.0 minus 22 = -14.0 lb.). More specifically, this bull is in the top 95 percent of the breed in North America for progeny milk or stated another way, the bottom 5%. This sire's Milk EPD has a high accuracy. With the assistance of the table ***possible change values by accuracy level*** page 10 you can also determine that MR HEREFORD's Milk EPD should not change by more than plus or minus 3.3 lbs. (4.7 to 11.3 lbs.) in subsequent evaluations as new data is added.

Total Maternal EPD
Also known as Milk + Growth, this EPD combines the milk EPD plus ½ the weaning weight EPD. It is expressed in pounds of calf weaned at 205-days and combines the genetics for pre-weaning growth and the influence of the maternal environment on the weaning weight of the daughter's progeny. In the example MR HEREFORD has a TM EPD of 45.5. Referring to the breed ***average and percentile breakdown*** table for ***active sires*** on the bottom of the page 11, this bull is 1.5 lbs. below the breed average for the TM EPD for active sires and/or the progeny of his daughters can be expected to weigh on average 1.5 lbs. less at 205-days than progeny sired by a bull with an EPD of 47 (45.5 minus 47 = -1.5 lb.). More specifically, this bull is in the top 60 percent of all active sires in North America for progeny total maternal weights.

Maternal Calving Ease EPD and Accuracy
Maternal Calving Ease EPD represents the ease with which a sire's daughters will calve as first calf heifers, when compared to daughters of other sires. The EPD is expressed as a percent probability, with a higher value representing daughters with a higher probability of unassisted calving. MR HEREFORD has an MCE EPD of 5.2 with an accuracy of 0.33. We expect the daughters of MR HEREFORD to calve with 3.7% fewer assists as first calf heifers than a daughters of a bull with a MCE EPD of 1.5 (5.2 – 1.5 = 3.7). MR HEREFORD is in the top 4% of active sires in the Hereford breed for maternal calving ease. MR HEREFORD has a low accuracy on his MCE EPD, and by looking at the ***possible change values by accuracy level*** table, we can see that MR HEREFORD's MCE EPD may change by up to plus or minus 8.7% (-3.5 to 13.9 %) as we collect more information on his daughters.

Scrotal Circumference EPD and Accuracy
The Scrotal Circumference EPD reflects differences in scrotal measurements, taken in centimetres and adjusted to 365 days of age. The SC EPD is positively associated with age at puberty of progeny. In this case MR HEREFORD has a SC EPD of 1.4 with an accuracy of 0.31. We would expect the average yearling scrotal size of MR HEREFORD's progeny to be 0.5 cm more than those of a sire with an SC EPD of 0.9 (1.4 – 0.9 = 0.5) when bred to the same cows. In addition, we would expect the progeny of MR HEREFORD to be slightly older at puberty. MR HEREFORD is in the 10th percentile of the breed, however the EPD is not highlighted due to accuracy below 0.60. With his SC EPD accuracy, MR HEREFORDs SC EPD is should be unlikely to change more than plus or minus 0.86cm (0.54 to 2.26) as is shown in the ***possible change values by accuracy level*** table. It is highly recommended that all sires used, meet the minimum recommended scrotal requirements and pass a semen test prior to breeding.

Cow WT EPD and Accuracy
The Cow WT EPD reflects differences in the mature weight of a sire's daughters. This is important as it is related to maintenance energy requirements. In the example, MR HEREFORD has a Cow WT EPD of 90.0 and an accuracy of 0.85. We would expect the daughters of MR HEREFORD to be 1.0 pounds heavier when fully grown than daughters of a bull with a Cow WT EPD of 89, when used on the same group of cows (90.0 minus 89.0 = 1.0 pounds). MR HEREFORD is in the 55th percentile for Cow WT, meaning his daughters are predicted to be very slightly heavier than breed average.

Stayability EPD and Accuracy
The Stay EPD reflects differences in the probability that a sire's daughters will remain in production to produce 3 consecutive calves when retained as breeding heifers. In the example MR HEREFORD has a Stayability EPD of 3.5 with an accuracy of 0.76. This means that daughters from MR HEREFORD are 3.8% more likely to remain in the herd than daughters from a Hereford sire with a Stay EPD of -0.3 (3.5% minus -0.3% = 3.8%). MR HEREFORD is in the top 1% of active sires for Stayability, and his EPD is highlighted in RED since the accuracy of the trait is greater than 0.60 and ranks in the top 10% of the breed.

Residual Feed Intake EPD and Accuracy
The RFI EPD shows differences between expected feed intake and actual feed intake. A higher index value indicates lower than expected feed intake by progeny, with each point representing 10 pounds of feed. MR HEREFORD has an RFI EPD of 103.0 with an accuracy of 0.15. Referring to the breed ***average and percentile breakdown*** table for ***active sires*** on the bottom of page 13, this bull is 2.8 lbs. above the breed average for the RFI EPD for active sires and/or his progeny can be expected to eat 28 pounds less per year than calves from a sire with a 100.2 RFI EPD (103.0 minus 100.2 = 2.8 x10 = 28lb.).The accuracy of the trait is quite low at 0.15, however there is not a lot of RFI data available as of yet. MR HEREFORD is in the top 25% of the breed for residual feed intake.

Post Weaning Gain EPD and Accuracy
The PWG EPD reflects differences in the rate of gain of a sire's calves post-weaning. A higher value, represents a more rapid rate of gain. MR HEREFORD has a PWG EPD of 37.0 with an accuracy of 0.78. Referring to the breed ***average and percentile breakdown*** table for ***active sires*** on the bottom of page 13, this bull is 5.2 lbs. above the breed average for the PWG EPD for active sires and/or his progeny can be expected to gain on average 5.2 lb more between 205 and 365-days than progeny sired by a bull with an EPD of 31.8 (37.0 minus 31.8 = 5.2 lb.). More specifically, this bull is in the top 30 percent of all the breed in North America for progeny yearling weights. This sire's PWG EPD has a high accuracy.

Maternal Productivity Index and Accuracy
MPI combines the traits of direct and maternal calving ease, weaning weight, milk, cow weight and stayability based on their relative economic importance, and then ranks animals within the population. Based on this example, MR HEREFORD has an MPI of 139.2 and an accuracy of 0.76. MR HEREFORD is in the 15th percentile. Additionally, by knowing that MPI is a standardised value, we know that MR HEREFORD is more than 2 standard deviations above the average of the entire population. When compared to a sire with an MPI of 100, we know that MR HEREFORD should combine the traits of mature weight, milking ability, growth genetics and daughter longevity in a more profitable package. The MPI is highlighted in BLUE since the accuracy of the trait is greater than 0.60 and ranks in the top 20% of the breed.

Feedlot Merit Index and Accuracy
FMI combines the traits of calving ease, weaning weight, yearling weight, rib-eye area, marbling and fat based on their relative economic importance, and then ranks animals within the population. Based on this example, MR HEREFORD has a FMI of 137.2 and an accuracy of 0.45. MR HEREFORD is in the 35th percentile. Additionally, by knowing that FMI is a standardized value, we know that MR HEREFORD is roughly 1.5 standard deviations above the average of the entire population. When compared to a sire with a FMI of 100, we know that MR HEREFORD should combine the traits of calving ease, weaning weight, yearling weight, rib-eye area, marbling, and fat depth in a more profitable package for feeder cattle.

Fat EPD and Accuracy
The Fat EPD reflects differences in carcass backfat measures in feeder progeny. In the above example MR HEREFORD has a Fat EPD of 0.008 and an accuracy of 0.66. We would expect the average backfat of MR HEREFORD's progeny to be 0.003 inches more than progeny of a bull with a Fat EPD of 0.005 when used across the same group of cows. Using the table of ***possible change values by accuracy level*** we can see that MR HEREFORD's Fat EPD should not change by more than plus or minus 0.011in (-0.003 to 0.019 in).

REA EPD and Accuracy
The REA EPD reflects differences in rib-eye area carcass measures in feeder progeny. In the above example MR HEREFORD has a REA EPD of 0.50 and an accuracy of 0.66. We would expect the average REA of MR HEREFORD's progeny to be 0.14 in^2 larger than progeny of a bull with an REA EPD of 0.36, when used across the same group of cows. Using the table of ***possible change values by accuracy level*** we can see that MR HEREFORD's REA EPD should not change by more than plus or minus 0.16 in^2 (0.34 to 0.66 in^2). MR HEREFORD ranks in the top 30% of the breed.

Marbling Fat EPD and Accuracy
The MARB EPD reflects differences in carcass measures of marbling in feeder progeny, using USDA marbling scores. In the above example, MR HEREFORD has a MARB EPD of 0.46 and an accuracy of 0.62. We would expect the average intramuscular fat of MR HEREFORD's progeny to have 0.37 more units of intramuscular fat than progeny of a bull with an MARB EPD of 0.09 when used across the same group of cows. Using the table of *possible change values by accuracy level* we can see that MR HEREFORD's MARB EPD should not change by more than plus or minus 0.12 (0.34 to 0.58 units). The MARB EPD is highlighted in RED since the accuracy of the trait is greater than 0.60 and the EPD ranks in the top 10% of the breed. The table below demonstrates the relationship between USDA marbling scores and Canadian Quality Grades.

Marbling Description	USDA Score	Cdn Quality Grade
Abundant	10-10.9	Prime
Moderately Abundant	9-9.9	Prime
Slightly Abundant	8-8.9	Prime
Moderate	7-7.9	AAA
Modest	6-6.9	AAA
Small	5-5.9	AAA
Slight	4-4.9	AA
Traces	3-3.9	A
Practically Devoid	2-2.9	B1