Understanding Expected Progeny Differences (EPDs)

Lesson 3

Introduction

The role of purebred breeders is to improve the genetic quality of the seedstock cattle they produce to sell to the commercial beef producers. Expected progeny differences (EPDs) are a valuable tool to aid purebred and commercial producers in the selection of potential breeding stock. Cattle producers must clearly define their breeding objectives and determine what sort of animal is needed to meet their production goals. The purpose of this educational lesson is to assist you in understanding EPDs and to utilize the information to select animals with the genetic transmitting ability to improve your calf crop, your cowherd and eventually your profits. The future of most cattle operations and the future of the beef industry are dependent on the ability to identify animals with superior genetics and use them wisely.

EPDs—What are they?

Expected Progeny Differences (EPDs) can indicate the genetic value of one specific animal compared to another specific animal of the same breed, regardless of the age or location of the herd. In other words, the EPD values for a Hereford bull may not be compared against the EPDs for an Angus or Limousin bull. Each individual member of a breed can have EPD values calculated for it. Purebred breeders report data to the National Herd Improvement Program for their breed to contribute to the breed's national database. Age and sex of a calf, or status as a parent are not limiting factors. EPDs are indicators of the relative genetic merit of beef cattle for various traits. Both purebred and commercial cattle producers can use this genetic merit comparison, but producers must first understand their implications and meanings. Expected Progeny Difference (EPDs) are calculated using performance record information, with a complex algebraic formula in the National Cattle Evaluation Computing Centers at the University of Georgia and Iowa State University.

An EPD value of +10 lb. for weaning weight in one breed may reflect an entirely different level of genetic merit than a +10 lb. weaning weight EPD in a different breed. EPDs are reported by each breed association as a plus (+) or minus (-) value in units consistent with the traits measured. Traits such as birth weight (BW), weaning weight (WW) and yearling weight (YW) are expressed in **pounds**, but EPDs for scrotal circumferences are in **centimeters**, EPDs for hip height are in **inches** and marbling is recorded in **degrees.** For example, a bull with an EPD

weaning weight of +25.0 would produce progeny that should average 25.0 more at 205 days of age than the progeny of a bull with an EPD for a weaning weight of 0.0.

What Expected Progeny Difference (EPDs) can do…

1. Use EPDs to compare two animals of the same breed in terms of their genetic merit for that trait. The actual measurement of an animal is controlled by many factors such as management, environment and genetics.

2. When comparing two animals, their EPD *differences* indicate the differences you would expect to see in their progeny, due to genetics.

3. EPDs can be used as a tool to increase, decrease or maintain any trait for which they are calculated. It is important to realize that maximum EPDs or minimum EPDs are not always the optimum selection choice.

4. EPDs can be used as one of several selection criteria. The first decision should be to decide which breed will be of the most benefit for your operation, then choose those animals within that particular breed that are physically and reproductively sound. Use EPDs in your selection decision only for those traits for which they are calculated. If you are concerned with other selection/production traits, then actual measurements and visual appraisals are still the best alternatives.

What Expected Progeny Differences (EPDs) can not do….

1. EPDs can not compare animals accurately that are from different breeds.

2. EPDs can not predict outcomes. For example a 40 weaning weight EPD does not mean that an additional 40 lbs. will be added to the weaning weight of your calves.

3. An EPD of zero does not necessarily mean the individual is average for the breed for that trait.

4. EPDs are not constant. As more information is obtained on an animal's EPD, the EPD may change, particularly as more progeny information is recorded. This does not mean that the bull's genetic make-up changes as he ages, but that ability to predict the bull's EPDs is improved, as more information becomes available. Therefore, it is impossible to predict whether an animal's EPDs will go up or down.

5. EPDs do not make up for poor management. Calves sired by a bull with a lower EPD for weaning weight can weigh heavier at weaning than calves sired by a bull with a higher weaning weight EPD if they are exposed to a more favorable environment (bred to a heavier milking cows, higher nutritional program, etc.).

What EPDs do you have to work with?

*__Birth Weight EPD__ expressed in pounds, is the expected birth weight deviation of calves from this individual, *excluding* maternal influence. This is the genetics passed on directly to progeny by this individual *only* for weight at birth.

__*Weaning Weight EPD__ is expressed in pounds. This is the weight at 205 days of age of calves sired by, or out of this individual *excluding* maternal influence (i.e. as if produced by and reared by the exact same cow under the exact same conditions).

__*Yearling Weight EPD__ is expressed in pounds. This is the weight at 365 days of age with the maternal influence *excluded.*

__*Maternal Influence EPD (milk)__ Simply called *"Milk"*! This is the portion of daughter progeny weaning weight that can be attributed to nutrition or milk. It is an indirect contribution of a sire, through his daughters, to his grand progeny.

__*Mature daughter weight and height EPD__ is the difference in the transmitting ability for mature daughter size expressed in pounds and inches.

__*Scrotal circumference EPD__ expressed in centimeters, is the transmitting ability for scrotal size. It is related to fertility in bulls and age of puberty in females.

*__Direct Calving Ease EPD__ is an estimate of calving ease of calves sired by or out of the animal represented. For bulls this is the expected calving ease compared to other bulls when mated to *equal* cows. For females this is the relative calving ease with the maternal calving factors equalized.

*__Maternal Calving Ease EPD__ is the relative ease of calving experienced by daughters of this individual. Basically the size, internal structure, and uterine environment of the calving female. This is an estimate of the ease which the daughters of this individual would give birth compared to daughters of other individuals, as if all the daughters were mated to the same sire and managed equally.

__*Gestation Length EPD__ is measured in days and predicts the average difference in gestation length, related to calving difficulty and post-partum interval.

__*Yearling Height EPD__ is recorded in inches and is another estimate of genetic size (a predictor of mature size) along with weight traits.

__*Carcass Weight EPD__ is measured in pounds. In reality this is another measurement of basic growth and body size.

__*Marbling EPD__ is listed in USDA marbling degrees, the primary factor in USDA Quality Grade.
__*Ribeye Area EPD__ is measured in inches and is an estimator of overall amount of muscle.

***Fat Thickness EPD** is measured in inches and is the most important factor in USDA yield grade (percent boneless trimmed retail cuts).

***Percent Retail Cuts or Product EPD** is measured in percentage and estimates differences in cutability or USDA Yield Grade. It considers hot carcass weight, rib eye area, fat thickness, and the percent kidney, heart and pelvic fat.

***Stayability EPD** is measured in percent deviations that represents daughters remaining in the herd to at least 6 years of age. Stayability involves all factors in the culling of females, but is thought to be related to structural soundness, fleshing ability, and general fitness and reproduction efficiency.

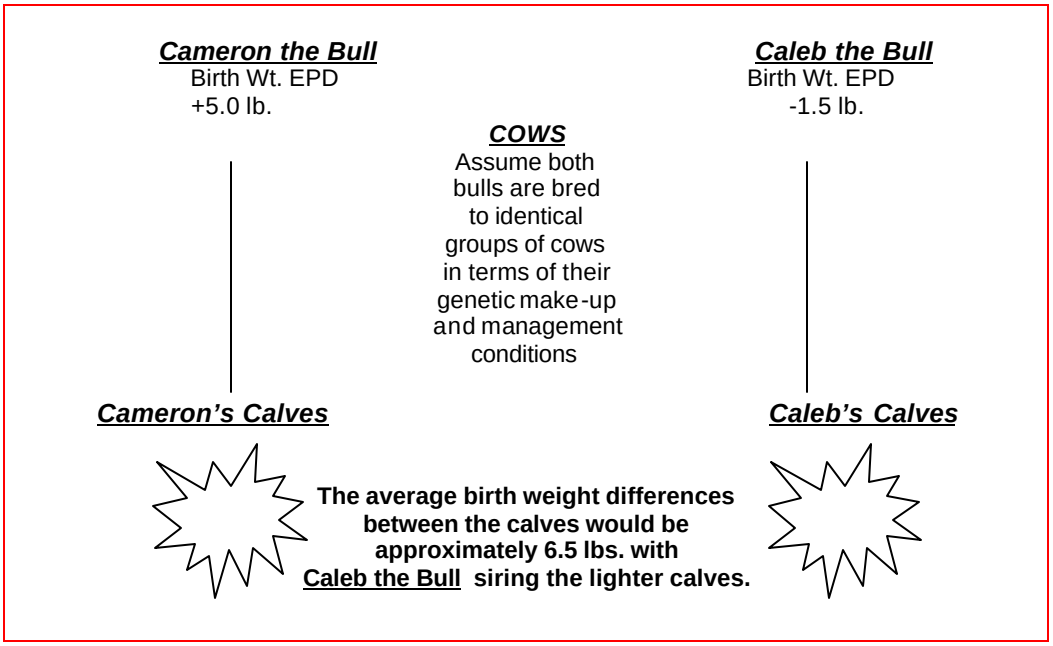
***Docility EPD** is based on a scoring system ranging from 1=Docile, 2=Restless *to* 5=Nervous, and 6=Very Aggressive. Expressed in "percentage deviation", this EPD represents whether an offspring of this individual will be either docile or restless.

Refer to breed sire evaluation (summary) publication for additional EPD definitions.

Using Expected Progeny Differences (EPDs)

Example

Assume **Cameron the Bull** has a birth weight (BW) EPD of +5 lbs. and **Caleb the Bull** has a birth weight (BW) EPD of –1.5 lbs. If these bulls were bred to an identical set of cows (in terms of genetics and environment) you would expect a difference of 6.5 lbs. in the average birth weight of their progeny. Therefore, from a practical standpoint, if selecting one of these bulls to breed to a set of heifers (with birth weight begin the major management concern) **Caleb the Bull** would be the sire of choice.



What does Accuracy *(ACC)* values of EPDs mean?

When EPDs are calculated there are some degree of probability that the estimate is correct and a chance that it is not. Don't panic! This is where Accuracy (ACC) values come into play. Each breed association reports an Accuracy figure (ACC) for each individual estimate, which is the amount of relative confidence you can place on the reliability of the EPD. The (ACC) value is the amount of relative information used to estimate the EPD. Accuracy (ACC) values can range from 0.0 to +1.0. Values closer to 1.0 represent greater reliability in the EPD represented.

Bulls without progeny will not have as high an Accuracy (ACC) value as bulls with progeny. As the number of progeny records are recorded, so will the reliability of the estimate. A young bull's EPD for weaning weight Accuracy (ACC) is around .35. As more progeny records become available, the Accuracy value will increase. Accuracy above 0.76 indicate that the EPDs for that particular animal are reliable with little change to be expected in the estimate. The accuracy values for EPDs (*for traits with moderate heritabilites*) can be classified into 3 basic categories.

(ACC) Values for EPDs

Low Reliability	**(ACC less than .65)**
Medium Reliability	**(.65 to .75)**
High Reliability	**(.76 or more)**

How important are Carcass EPDs and how do I use them?

Carcass EPDs are measures of genetic differences in carcass merit and are of vital importance if you would like to improve your end product. You can use carcass EPDs the same way you use any other EPDs.

For example, if you use a bull that is +. 30 for marbling, what percentage of my calves will grade USDA Choice? *The answer is nobody knows.* It depends upon the average marbling ability of your cowherd, and how the +.30 bull compares with the bull you used before.

So let's put the question another way. Suppose you have been using *John the Bull* who has a +.0 for marbling. *John the Bull's* steer calves have averaged a marbling score of 4.8. This is 80 points into the Select grade (a marbling score of 5 would be low Choice). Now suppose you like *Wayne the Bull* who has a marbling score of +. 30. If you bred *Wayne the Bull* to the same cows that were mated to *John the Bull*, the *Wayne*-sired steers should have an average marbling score of 5.10, which is .10 into the small marbling range or low Choice. In other words, by using *Wayne the Bull* rather than *John the Bull*, you should be able to move the average marbling score of your herd from 4.8 to 5.10, or from Select to Low Choice.

How do I utilize Sire Summaries?

Sire summaries are published by breed associations once a year and include samplings of the available genetic material in each breed. The summaries include EPDs, accuracy(ACC) values,

graphs of the average changes in EPDs for that particular breed, breed average EPDs, possible changes in values, and other useful information. The following chart demonstrates a basic format style and informational arrangement for Sire Summaries.

Sire Summary Listing and Trait Definition

Example

Sire	Birth Wt (2)		Weaning Wt(4)		Maternal Milk(5)	Weaning Wt(6)	Yearling Wt(7)		
Information (1)	EPD	Acc(3)	EPD	ACC	EPD	ACC	EPD	EPD	ACC
Bull Troy	+5.0	.95	+28.0	.90	+10.0	.70	+24.0	+46.0	.85
Bull Nico	+1.5	.70	+20.0	.60	+3.0	.15	+13.0	+34.0	.50

(1) Sire Information	Sires are listed according to their registered name. Other information such as registration number, birth date, sire, dam's sire, breeder and current owner are also present.
(2) Birth Weight	Birth weight is related to calving ease. Larger birth weight EPDs generally indicate more calving difficulty. Progeny of **Bull Troy** can be expected to weigh 3.5 lbs. more than progeny of **Bull Nico**.
(3) Accuracy	Accuracy is an indication of the reliability of the EPD. **Bull Troy's** higher accuracy indicates more progeny records have been collected.
(4) Weaning Weight	Weaning weight EPD reflects preweaning growth. Progeny of **Bull Troy** can be expected to average 8.0 lbs. more at weaning time than progeny of **Bull Nico**.
(5) Milk (Pure milk) (Maternal milk)	Milk EPD reflects the milking ability of the sire's daughters expressed in pounds of calf weaned. The milking ability of daughters of **Bull Troy** should contribute 7 lbs. more to the weaning weight of their calves (Maternal milk) when compared to daughters of **Bull Nico.**
(6) Maternal Weaning Wt	Maternal weaning weight EPD predicts the difference in the weaning weight of the sire's daughters' progeny due to the combination of growth genetics and milking ability. It is equal to one half of the weaning weight EPD plus the milk EPD. Calves from daughters of **Bull Troy** can be expected to average 11 lbs. heavier at weaning than calves from daughters of **Bull Nico** (4 lbs. from growth and 7 lbs. from milk).
(5) Yearling Weight	Yearling weight EPDs reflect differences in adjusted 365-day weights for progeny and is the best estimate of total growth. Progeny of **Bull Troy** can be expected to average 12 lbs. more as yearlings than of progeny from **Bull Nico**.

Source: Beef Improvement Federation Fact Sheet, FS3

To inquire about Sire Summaries, please refer to Appendix A (listing of breed association's addresses, phone numbers and websites).

Are EPDs different from Performance Records?

Yes! Expected Progency Differences are a highly accurate means of predicting transmitting ability of animals as parents. Expected Progeny Differences (EPDs) allow the prediction of performance *DIFFERENCES*, not the actual performance. Performance records, on the other hand track the individual weights and measurements taken at various times in an animal's life with in a herd or contemporary group. (*Performance Record Example*: *Average Daily Gain-the gain per day of age during a specific period of time.)*

Summary

Purebred and commercial cow-calf producers have EPDs available to use as a powerful selection tool. Expected Progeny Differences allow comparisons between individuals within a breed for

performance traits. The purebred breeder may obtain EPDs on members of their herd by participating in cattle evaluation services available through their respective breed associations. Commercial producers may use EPDs provided in sire summaries, bull sale catalogs and other sources in order to make changes in the genetics of their beef herds.

Additional References and Readings

*****Angus Herd Improvement Records Publication, American Angus Association, St.Joseph, MO. To obtain this publication please contact the **"American Angus Association", 3201 Frederick Blvd. St. Joseph, Missouri 64506, Phone: (660) 383-5100, Web Site: www.angus.org**

*Beef Improvement Federation Fact Sheet, "Use of EPDs", Mark V. Bogges, FS5. Website: **www.beefimprovement.org**

*Beef Improvement Federation Fact Sheet "Understanding and Using Sire Summaries", Don Boggs, 1992. Website: **www.beefimprovement.org**

*Maternal Traits EPDs", Oklahoma Cooperative Extension Service Division of Agricultural Sciences and Natural Resources, N0.3161, 1997. Website: **okstate.edu/ag/media.htm.**

*Commercial Beef Sire Selection, Ronnie Silcox, Extension Animal Scientist, Florida Cooperative Extension Service Cattle Producer's Library, CL 1038. Website: **www.ifas.ufl.edu/www/extension/ces.htm**

This lesson prepared by:

Lori (Weddle) Schott, Extension Educator
Mille Lacs County
620 Central Avenue North
Milaca, Minnesota 56353
(320)983-8317
1(888)680-8317 (toll free)

in association with the

American Angus Association
3201 Frederick Blvd.
St. Joseph, Missouri 64506
(660)383-5100

Appendix A

Breed Association Offices to Contact for Sire Summaries

American Angus Association 3201 Frederick Blvd. St. Joseph MO 64506 Phone: (816) 383-5100 Fax: (816) 233-9703 Web Site: www.angus.org	**American Salers Association** 7383 S. Alton Way #103 Englewood CO 80112 Phone: (303) 770-9292 Fax: (303) 770-9302 Web site: www.salersUSA.org
American Belgian Blue Breeders, Inc. P.O. Box 35264 Tulsa, OK 74153-0264 Phone: (918) 477-3251 Fax: (918) 477-3232 Email: belgianblue.org	**American Shorthorn Association** 8288 Hascall Street Omaha NE 68124 Phone: (402) 393-7200 Fax: (402) 393-7203 Web Site: www.beefshorthornusa.com
American Blonde d'Aquitaine Association P.O. Box 12341, 1912 Clay Street N. Kansas City MO 64116 Phone: (816) 421-1305 Fax: (816) 421-1991 Web site:	**American Simmental Association** 1 Simmental Way Bozeman MT 59718 Phone: (406) 587-4531 Fax: (406) 587-9301 Web Site: www.simmgene.com
American Brahman Breeders Association 3003 South Loop West, Suite 140 Houston TX 77054 Phone: (713) 349-0854 Fax: (713) 349-9795 Web Site: www.brahman.org	**American Tarentaise Association** P.O. Box 34705 N. Kansas City MO 64116 Phone: (816) 421-1993 Fax: (816) 421-1991 Web Site:: www.usa-tarentaise.com
American Chianina Association P.O. Box 890, 1708 N. Prairie View Road Platte City MO 64079 Phone: (816) 431-2808 Fax: (816) 431-5381 Web Site: www.chicattle.org	**Beefmaster Breeders United** 6800 Park Ten Blvd. Suite 290 West San Antonio TX 78213-4211 Phone: (210) 732-3132 Fax: (210) 732-7711 Web Site: www.beefmasters.org/
American Gelbvieh Association 10900 Dover Street Westminister CO 80021 Phone: (303) 465-2333 Fax: (303) 465-2339 Web Site: www.gelbvieh.org/~aga	**Braunvieh Association of America** P.O. Box 6396 Lincoln NE 68506 Phone: (402) 421-2960 Fax: (402) 321-2994 Web Site: www.braunvieh.org
American Hereford Association P.O. Box 014059 Kansas City MO 64101-0059 Phone: (816) 842-3757 Web Site: www.hereford.org	**International Brangus Breeders Association** P.O. Box 696020 San Antonio TX 78269-6020 Phone: (210) 696-8231 Fax: (210) 696-8718 Web site: www.int-brangus.org
American International Charolais Association 11700 N.W. Plaza Circle, P.O. Box 20247 Kansas City MO 64195 Phone: (816) 464-5977 Fax: (816) 464-5759 Web Site: www.charolaisusa.com	**North American Limousin Foundation** Box 4467, 7383 S. Alton Way Englewood CO 80155 Phone: (303) 220-1693 Fax: (303) 220-1884 Web Site: www.nalf.org
American Maine Anjou Association 760 Livestock Exchange Building Kansas City MO 64102 Phone: (816) 474-9555 Fax: (816) 474-9556 Web Site: www.maine~anjou.org	**North American South Devon Association** Box 68 Lynnville IA 50153 Phone: NA Fax: NA Web Site: NA
American Pinzgauer Association 21555 State Route 698 Jenera OH 45841-8964 Phone: (419) 326-8711 Fax: (419) 326-5501 Web Site: www.afn.org/~greatcow/	**Red Angus Association of America** 4201 Interstate 35 Denton TX 76207-3415 Phone: (940) 387-3502 Fax: (940) 383-4036 Web Site: www.redangus1.org
Texas Longhorn Breeders Association of America 2315 N Main, Suite 402 Ft. Worth TX 76106 Phone: (817) 625-6241 Fax: (817) 625-1388 Web Site: www.tlbaa.org	**Santa Gertrudis Breeders International** P.O. Box 1257 Kingsville TX 78364-1257 Phone: (361) 592-9357 Fax: (361) 592-8572 Web Site: www.sgbi.org
Compiled by: University of Minnesota Extension Service Mille Lacs County 12-15-00	

Lesson 3 –Quiz Understanding Expected Progeny Differences

1. True or False An EPD of +.10 Weaning Weight (WW) in the Angus breed has the same genetic merit of a +.10 Weaning Weight (WW) in the Hereford breed.

2. Birth Weight (BW) and Weaning Weight (WW) are expressed in _____

3. Scrotal Circumferences EPDs are expressed in _____.

4. Height EPDs are expressed in _____.

5. Marbling EPDs are expressed in _____.

6. What 4 factors are evaluated when calculating Percent Retail Product EPD's?

7. True or False The Accuracy (ACC) values range from 1 to 10.0.

8. True or False 0.9 Accuracy (ACC) value represents a greater reliability of EPD genetics compared to a ***.45 (ACC).***

9. True or False Birth Weight EPD's are related to calving ease.

10. True or False A 30 lb. Weaning Weight EPD means you can expect additional 30 lbs. added to the weaning weight of your calves.

Please list any questions you may have that weren't answered in this lesson:

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Name_____Phone_____

Address_____

(Optional) Fax_____E-mail_____