

Increasing The Effectiveness of ASA's Genetic-Evaluation System

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Part 1: Economically—Relevant Traits

There has been a dramatic increase in the number of traits quantified by EPDs since the early years of genetic evaluation. The ASA currently publishes EPDs on 15 traits and more are in the hopper. This wide array of EPDs provides seed for significant genetic improvement—improvement like we have not seen before. That said, sifting through the EPD stockpile can be a mind-boggling experience. Even the most astute cattlemen must admit to being a bit perplexed about how best to utilize all the information. A major concern at the ASA is that the complexity hampers utilization of our state-of-the-art genetic-evaluation system, which ultimately dampens genetic progress. Therefore, we are embarking on an effort to decrease the complexity of our system by: 1) moving toward developing and focusing on EPDs for economically-relevant traits (ERTs) and 2) developing and integrating economic selection indices. These initiatives will make ASA's system easier to use, as well as provide direction, for our breeders and their customers. Over the next couple of months, I'll provide background and details about our new proposals. This month we'll focus on ERTs.

Economically-relevant traits are nothing more than traits that directly affect profitability. One of the nice things about ERTs is that there aren't that many of them—not nearly as many as the number of EPDs most breed associations currently calculate. In fact, the whole gamut of ERTs is limited to the handful of EPDs that predict genetic merit in the following five categories: 1) nutritional requirements, 2) survival, 3) fertility/longevity,

4) sale weight and 5) product quality/yield. You may be thinking that, even within a single category, there are numerous EPDs that have influence. Yes, that is true. But an ERT is an EPD that is the trait, not one that just influences it.

With this in mind, we can conclude that traits such as birth weight, scrotal circumference, milk and mature size (except for deriving salvage value) aren't ERTs. That's not to say they don't influence the bottom line, they just don't directly influence it. For example, there is no question that mature size and milk tend to influence energy requirements. However, it is the requirements, through their cost, that directly impact profit—not size and milk. Therefore, to address cow requirements directly (i.e. to get at the ERT), we need a requirement (REQ) EPD.

An appropriate question here would be, "how do we get at genetic differences in requirements to calculate a REQ EPD?" Obviously, we can't keep track of each cow's individual intake—it's just not feasible. However, we can utilize the large body of nutritional research in combination with mature weight (MW) and milk (MLK) EPDs to predict genetic differences in requirements.

To illustrate how we would combine existing research with our MW and MLK EPDs to come up with a REQ EPD, let's take two highly-evaluated bulls: Signal and 600U. Signal is a large-mature-size (+57 MW EPD), high-milk (+12 MLK EPD) sire, while 600U is a more moderate-size (+2 MW EPD) and -milk (+5 MLK EPD) bull. Clearly

one would expect Signal daughters to require more feed than 600U daughters, but how much more? Is it close enough to conclude—a bunch?

By digging into the experimental literature, we can come up with parameters that allow us to get much more descriptive than "a bunch". For example, we know that by adjusting weight to the .75 power and multiplying by .128 we get a reasonable estimate of a cow's daily Mcal requirements for maintenance. We also know that heavier-milking cows have greater maintenance requirements than lighter-milking cows of the same size. And of course, heavier-milking cows require more feed to produce the extra milk. By putting numbers to these known relationships and using MW and MLK EPDs, I have calculated REQ EPDs for Signal and 600U of +565 and +121 Mcal/year, respectively. Assuming .86 Mcal/lb of dry matter (the energy in average-quality range forage), this translates into 516 pounds more dry matter required annually for Signal daughters. Isn't that information more useful than "a bunch"?

That's not to say this method of calculating EPDs is perfect. It would be ideal to calculate REQ EPD directly, i.e., through individual cow intakes. This would allow us to identify exceptions to the rule, e.g., large, heavy-milking cows that don't eat you out of house and home.

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Until we can devise feasible means of getting at intake directly, however, this is the best we can do. Even with direct measures of intake, we still would utilize mature weight and milk to help predict requirements, in much the same manner we use birth weights to enhance the prediction of calving ease and ultrasound measurements to shore up carcass EPDs. Indeed, we may even want to include additional traits (e.g. hip height and/or body condition) or gene markers to improve the prediction of our REQ EPD if research indicates the inclusion to be warranted.



“Economically Relevant Traits (ERTs) are traits that directly affect profitability.”

Though our REQ EPD will necessarily be predicted through related traits for the time being, most ERTs can be calculated directly. In fact, there are several ERTs on the list of EPDs we already calculate. For example, if you sell your calves at weaning, weaning weight EPD is certainly an ERT, as is maternal weaning weight EPD if you keep replacement females. If you're selling finished cattle, however, ERTs of concern are carcass weight, marbling and retail cuts EPDs. (To make it easier to use by aligning it with what the industry actually pays on, we will be converting our retail cuts EPD to a yield grade EPD. This will be a simple alteration, as one is just a linear function of the other.)

To provide a sample of what a set of ERTs may look like, I put together the following list:

ERT by Category	Signal	600U
Energy Requirements:		
* Cow Requirements (Mcal/yr)	+565	+121
•° Growing Requirements (Mcal/d)	+1	+04
Survival:		
• Direct Survival (%)	-.6	+2.2
• Maternal Survival (%)	+.7	+.9
Fertility/Longevity:		
*° Heifer Pregnancy (%)	+5	-5
*° Stayability (%)	-5	+5
Sale Weight:		
* Direct Weaning Weight (lb)	+26	+36
* Maternal Weaning Weight (lb)	+26	+24
* Post Weaning Gain (lb/d)	+.17	+.19
* Carcass Weight (lb)	+22	+1
Product Yield/Quality:		
* Quality Grade (-,0,+)	-.24	+.16
* Yield Grade (1,2,3,4,5)	-.06	+.01

*traits we currently calculate EPDs for or plan on doing so in the near future

•°traits that will require more data collection and/or technological development before EPDs will be available

*°EPDs for these traits are mock examples (were not derived from calculation)

As you can see, the entire array of ERTs is relatively small and the ASA already calculates, or will soon, most of them. Granted, I may have overlooked a few traits; e.g., you may be surprised that calving ease isn't on the list. Technically, survivability is the ERT and calving ease is a component of it. As a matter of fact, I calculated direct and maternal survival by assuming that calving difficulty results in calf death 20% of the time. (E.g., 600U's CE EPD is 11; 20% of 11 = 2.2). An argument could be made that calving ease belongs on the list from the standpoint that it directly affects labor/vet cost. Actually, one could envision a labor/vet category that may be predicted by an ERT comprised of traits such as calving ease, horned vs. polled and disease resistance.

Another thing to garner from the list is that a complete set of ERTs encompasses both input and output. This balance is welcome and a long time in coming. It is fair to say that EPDs, to this point, have focused on output. That makes sense. Output is easier to measure—and it's more alluring. I've seen many a seedstock producer swell up with pride when talking about their heavy-milking cows weaning big-strapping calves. Never mind that those heavy-milking cows may very well be less profitable than lesser milkers due to the extra nutrition they require.

Finally, the list illustrates that ERTs provide information in a form that is conducive to economic decision-making. As discussed earlier, MW and MLK EPDs, by themselves, don't provide much economic insight. When combined into a REQ EPD, however, you have information that greatly enhances your ability to make decisions. This characteristic leads to ERTs dovetailing nicely into economic selection indices—the topic of next month's discussion. ♦