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Boar Selection —— Using Expected Progeny Differences (EPDs)

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Selecting boars to use within a swine herd is one of the most important decisions a producer must make. This decision is vital to the long-term performance of the herd and should be based on the true genetic merit of the boar, rather than just the eye appeal of the animal.

Introduction

In the past, genetic improvements in the swine herd were made primarily through purchasing superior boars from off-farm sources. These superior boars were then used to produce replacement gilts on the farm. The basis for selection of these superior boars was their performance relative to other animals within their contemporary group. With this approach, however, it was impossible to know if a boar from source A had more genetic worth than a boar from source B. This was due to the fact that boars raised on different farms were subjected to different environmental conditions (such as health, nutrition, housing, etc.) and management. Another limitation of this selection process was that performance records could not be compared from one year to the next. Because of this, a producer never knew if the boar purchased this year was better than one purchased in previous years.

In order to make across-herd comparisons, centralized boar tests were heavily promoted and used for a number of years. These tests allowed comparisons to be made across herds, but only for the traits directly measured during the test period (primarily rate and efficiency of gain and estimates of backfat and loin eye area). Because these traits are moderately to highly heritable, purchasing the top performance-tested boars would result in genetic progress. However, it was not possible to evaluate any of the economically important reproductive traits through these centralized testing programs.

Only in recent years have procedures been developed that allow a comparison of all traits across herds and years. These procedures use high-tech computers and various statistical formulas to predict the genetic merit of boars. The values derived from these procedures are called expected progeny differences (EPDs).

What Are EPDs?

EPDs are an estimate of the genetic worth of an individual animal as a parent when compared to another individual animal of the same breed or line. For a given trait, the difference in EPD values between two boars of the same breed or line represents the actual difference in performance a producer can expect from future offspring.

The most commonly reported EPDs for swine are Number Born Alive, 21-Day Litter Weight, Days to 230 (pounds), and 10th Rib Backfat Depth. The EPDs for these traits are easy to interpret because they are always reported in the same unit of measurement as the trait. For example, the EPD for Number Born Alive is expressed as number of pigs, the EPD for 21-Day Litter Weight is expressed in pounds, the EPD for Days to 230 is expressed in days, and the EPD for 10th Rib Backfat Depth is expressed in inches.

EPDs are also expressed as pluses (positive EPDs) or minuses (negative EPDs). Depending on the particular trait, a positive or negative EPD will be the most desirable. For example, a positive EPD is desirable for Number Born Alive and 21-Day Litter Weight because we would like to increase these traits. Conversely, a negative EPD is desirable for Days to 230 and 10th Rib Backfat Depth because we would like to reduce these traits.

What Information Is Used to Calculate EPDs?

The procedures for estimating EPDs for an individual animal take into account information from several different sources, including:

. The individual animal's own records.

. Records from ancestors in the individual animal's pedigree.

. All recorded information from collateral relatives (i.e., littermates, half-sibs, etc.).

. Records of any offspring from the individual animal being evaluated.

These procedures also eliminate the effects of environment and allow animals grown under different conditions to be compared, even if they were born in different years. For these reasons, EPDs provide producers a much more powerful selection tool when comparing animals than simply evaluating the animal's individual performance.

What EPDs CAN Do

. **EPDs can be used to compare two or more animals of the same breed or line in terms of their genetic merit for that trait.** An animal's actual measurement for a given trait is controlled by several factors, such as management, environment, and genetics. The EPD differences between two animals for a given trait indicate the difference a producer would expect to see in their progeny due strictly to genetics.

. **EPDs can be used as a tool to increase, decrease, or maintain any trait for which they are calculated.** However, it is extremely important to realize that maximum and minimum values are not always the best choice when making selection decisions.

. **EPDs can be used as one of several selection criteria.** First, decide which breed or line will provide the most benefit to your breeding program, and select a reputable supplier with a sound health program. Then, choose animals of the breed or line from that herd that are physically and reproductively sound. Use EPDs only in your selection decision for

those traits for which they are calculated. If you are concerned about other traits, then actual measurements and visual appraisal are still the best alternatives.

What EPDs CANNOT Do

. **EPDs cannot be used to compare animals of different breeds or lines,** unless the different breeds or lines have been compared in an unbiased assessment.

. **EPDs cannot provide a guaranteed prediction of final outcome.** An EPD for 21-Day Litter Weight of 6 pounds does not necessarily mean that an additional 6 pounds will be added to the 21-day litter weight of your pigs.

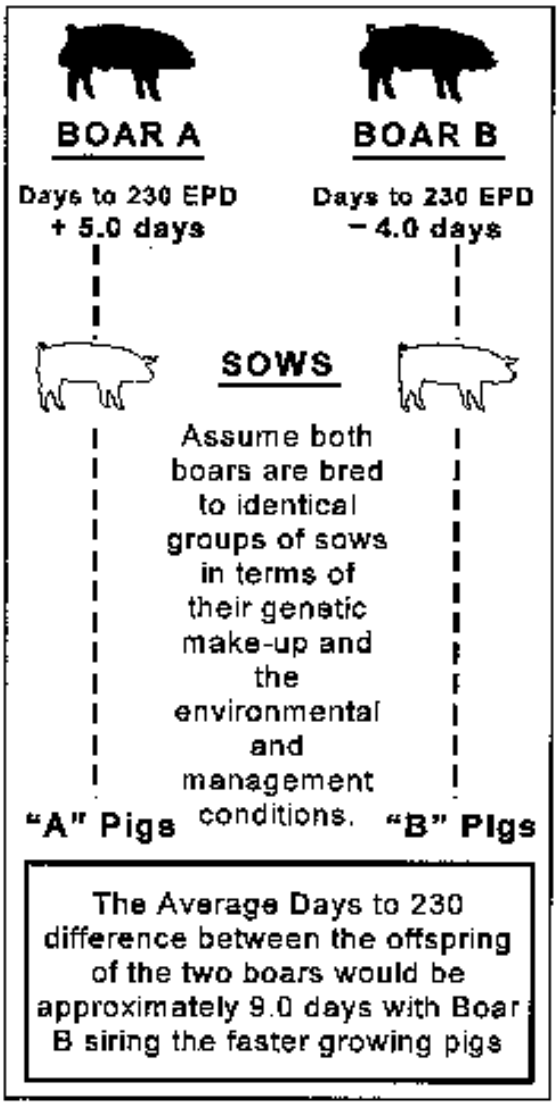
. **An EPD of zero does not mean the animal is average for the breed or line.** All EPDs calculated for animals within a breed or line use an arbitrarily selected year as their base; a zero EPD is the breed or line average for the base year. For example, if Breed A uses 1992 as its base year, a boar born today with a zero EPD for 10th Rib Backfat Depth has the same genetic potential for 10th rib backfat depth as the average boar from Breed A in 1992.

. **EPDs are not constant.** As more information is obtained on an animal, the EPDs may change, especially as progeny information is recorded. This does not mean that the genetic make-up of the boar changes as it ages, but that the ability to predict the boar'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 as additional information is recorded.

. **EPDs cannot make up for poor management.** Pigs sired by a boar with a lower 21-Day Litter Weight EPD can have a higher weight at 21 days post-farrowing than pigs sired by a boar with a higher 21-Day Litter Weight EPD if they are exposed to a more favorable environment (i.e., more environmentally controlled farrowing house, more sanitary environment, better nutritional program for lactating sows, etc.). Just because you use a boar that has higher EPDs, but your neighbor's pigs perform better does not mean the EPDs are wrong.

How to Use EPDs —— An Example

Assume Boar A has a Days to 230 EPD of +5 days and Boar B has a Days to 230 EPD of 4 days. If these boars were bred to an identical set of sows (in terms of genetics, environment, and management), you would expect a difference of 9 days in the average number of days to 230 pounds for their progeny. Therefore, if growth rate is a major priority in selecting one of these boars to breed to a set of sows, Boar B would be the best choice.



Accuracy Values for EPDs

EPDs are never perfect, and as more information is obtained for an animal the EPD value may change, either up or down. The accuracy value associated with an EPD is an indicator of the precision of the EPD, or the level of confidence that the predicted value of the EPD is near the true genetic value for that trait. Accuracy values also indicate how much the EPD may change as new information is obtained. As additional information is obtained, an EPD with a low accuracy value is likely to change more than an EPD with a high accuracy value. Regardless of their accuracy values, EPDs are the best available estimate of an animal's genetic merit. Accuracy values range from 0.01 to 0.99 and can be classified into three basic categories:

Low accuracy (0.01 - 0.50)
Moderate accuracy (0.51 - 0.70)
High accuracy (0.71 - 0.99)

If a sire with a high accuracy for the EPD is used, a producer can be confident that the average offspring performance will be nearer the predicted value. If the accuracy is lower, the average offspring performance may vary more from the predicted value. The relationship between accuracy and possible change in offspring performance is shown in Table 1. It is very important to understand that the error of prediction of EPDs is unbiased, meaning that the EPD has an equal chance of over- or under-predicting the actual performance, but on average it is correct.

Table 1. Possible Changes (±±) in Actual Performance Associated with Accuracies for Growth and Maternal Traits.

	Trait			
Accuracy	**Number Born Alive**	**21-Day Litter Weight**	**Days to 230**	**10th Rib Backfat**
0.10	0.52	5.54	3.38	0.034
0.20	0.51	5.46	3.33	0.033
0.30	0.50	5.31	3.24	0.032
0.40	0.48	5.10	3.12	0.031
0.50	0.45	4.82	2.94	0.029
0.60	0.42	4.45	2.72	0.027
0.70	0.37	3.98	2.43	0.024
0.80	0.31	3.34	2.04	0.020
0.90	0.23	2.43	1.48	0.015

Accuracy is best used as a risk management tool. In deciding between two sires with similar EPDs, if you want very little risk, then select the sire with the higher accuracy. By doing so, you can be confident that the average offspring performance will be near the estimate. You have avoided the possibility of selecting a sire whose offspring will perform much poorer than predicted. However, you have also removed the chance of selecting a sire whose offspring may be much better than expected. If, on the other hand, you are willing to take a little risk in an attempt to select an outstanding sire, select the sire with the lower accuracy; this sire has a greater chance of producing offspring that will perform substantially better than expected. However, you should keep in mind that this sire has the same chance of producing offspring that will perform substantially poorer than expected.

Selection decisions should be based first on EPDs, with accuracy values being used to decide among those animals with similar EPDs.

Implications of Selection Based on EPDs

Because several economically important traits are unfavorable correlated, you must know your production goals before trying to make selection decisions. Often, too much effort is spent trying to find the complete sire: one that combines maternal ability, reproductive efficiency, growth, and high carcass quality. Because it is virtually impossible to find this complete package, it may be more advantageous to make improvements in one or more key areas.

Recommendations for Seedstock Producers

Seedstock producers, whose primary objective is to supply seedstock for commercial producers, have several options available depending on their consumers' demand. They can supply boars that are reasonably balanced (typically not excelling in any trait), or they can provide boars that excel in certain specific traits (i.e., maternal traits or terminal traits). Regardless of the approach, EPDs can be used to help achieve these objectives. For example, if the production of genetically balanced boars is desired, then sires with a good balance of all EPDs should be mated to sows with a good balance of all EPDs. The offspring from such a mating would also be expected to have a good balance of all EPDs. If, on the other hand, you want to provide boars to fit a specific purpose, then mate boars and sows with desirable EPDs for the trait of concern (i.e., mate boars and sows with high 21-Day Litter Weight EPDs). You would expect the offspring from specific matings to be very close to the average of the parents for all traits.

Recommendations for Commercial Producers

Commercial producers should decide which breed or line of boar is going to best suit their production and long- term goals, and EPDs within that breed or line should be used to compare boars for the traits of concern. For example, if production of replacement gilts is a major emphasis, a breed or line excelling in maternal traits should be used. If growth rate is a major concern, a breed or line excelling in growth should be used.

Once a breed or line has been chosen, the selection process can be fine-tuned using EPDs. For example, if replacement gilt production is the goal, Number Born Alive and 21-Day Litter Weight EPDs will be of importance. If strictly market hog production is the objective, Days to 230 and 10th Rib Backfat EPDs will be the primary concern.

It is very important not to take selection decisions lightly. When you are considering a breeding plan within your herd, **it is imperative to have your long-term goals in mind and make selections toward those goals.** Understanding and using EPDs can be an extremely valuable tool in this process.
