



ANR-822

ALABAMA A & M AND AUBURN UNIVERSITIES

Selection Guidelines for Commercial Pork Production

Today's commercial pork producers face an enormous challenge. For pork to remain competitive with other meat products, it must be profitable to produce and offer the consumer quality products at affordable prices. Efficient production of lean, high-quality pork depends on the combination of proper nutrition and management, a sound herd health program, and superior genetics.

To meet these demands, the producer must select commercial seedstock that perform efficiently in production traits of economic importance. The only way you can improve production efficiency for these traits is by selecting genetically superior breeding animals while providing the right levels of management, nutrition, and herd health.

Selecting To Achieve Heterosis And Breed Complementarity

The type of seedstock you select for commercial swine production depends on the mating system that you will use to produce offspring. Commercial swine breeding programs capitalize on **heterosis**, or hybrid vigor, which comes from mating different breeds or breed combinations in a planned order (crossbreeding). **Complementarity** means combining different breeds to take advantage of breed strengths in economically important production traits. For example, you could achieve complementarity by mating lean, heavy-muscled, fast-growing boars of one breed to sows of another breed that excel in reproductive performance.

Selection in any commercial crossbreeding program is nothing more than deciding which animals to mate to achieve the most heterosis and the best breed complementarity for performance traits. This combines heterosis and breed complementarity to produce large litters of fast-growing pigs that yield muscular carcasses.

Crossbreeding improves reproductive performance dramatically because of heterosis. For example, two-breed crossbred dams mated to

boars of another breed farrow larger litters and have heavier 21-day pig weights than purebred dams (28 percent improvement for the crossbred dams versus only 8 percent for the purebred dams). Because heterosis is moderate for growth rate and low for carcass traits, breed complementarity can provide benefits.

Matching Breeds To The Mating System

The ideal breeds and lines within breeds for commercial pork production depend on the crossbreeding program. Research shows the production advantages of mating different breeds and their combinations. Extension Circular ANR-617, "Swine Crossbreeding Systems," explains the use of several different types of crossbreeding systems and how much production efficiency can be improved through heterosis. Alabama Agricultural Experiment Station Bulletin 595, "A Summary of Swine Crossbreeding Research at Auburn University," presents information on the performance of different breeds and their combinations for economically important production traits. You can use both publications as guidelines for choosing crossbreeding systems and for selecting the breeds that work best when combined.

Rotational Systems. The most widely used crossbreeding systems are the two-breed and three-breed rotations. Rotational systems use complementary breeds to produce crossbred replacement females and market hogs. These systems use heterosis and breed complementarity to achieve outlined production goals.

Females selected for the first generation in a rotational system should excel in prolificacy (ability to produce large numbers of offspring) and mothering ability. Boar breeds should be chosen that complement sow lines to meet the performance criteria set forth by each commercial farm. With today's emphasis on lean growth, it is difficult to select boars for this system. In the traits for growth and backfat and the maternal traits, boars must excel in one and be above average in the other.

Terminal Cross Systems. Terminal cross systems are growing in popularity. Females for these systems can be selected from a two- or three-breed rotation, where the best sows are bred for gilt production. Some farms maintain some purebred sows to produce their own F1 (two-breed cross) gilts. Others purchase all replacement gilts.

Whatever the case, females selected to produce the terminal-cross pig should be superior in reproductive traits and mothering ability. Fertile, aggressive terminal boars should be selected to complement the sow herd. Breeds and lines within breeds selected to sire the terminal cross must excel in growth and backfat. Terminal offspring should come from large litters of lean, fast-growing pigs that yield USDA #1 carcasses.

Hybrid Seedstock. Some companies produce and sell hybrid seedstock, which is developed from specific line crosses developed for specific traits. Although several breeds are used in line development, this should not be confused with crossbreeding.

You can reach maximum heterosis only when you mate hybrid boars to specific cross-hybrid females. If you use hybrid breeding stock, be sure to follow the company plan for maximizing heterosis.

Selecting Within Breeds For Performance

Once you select a breeding system and specific breeds, the next step is to select seedstock within each breed. The seedstock supplier should provide the commercial pork producer with genetically superior animals that perform in the economically important traits of sow productivity, postweaning performance, and carcass cutability. Purchase commercial breeding animals only from suppliers using sound genetic improvement programs that put selection pressure on these traits.

Genetic improvement in any commercial swine operation depends on the breeding animals purchased from seedstock producers. This is why you should buy commercial seedstock only from seedstock producers who can supply valid performance records showing the genetic merit of their hogs.

Estimating Genetic Merit. There is no way to determine the actual genetic merit of seedstock. We can estimate genetic merit based on an animal's performance, the performance of its offspring, and the performance of its relatives. With the development of across-herd comparisons, we can now compare these estimates of genetic merit for animals in the same breed across the country.

The Expected Progeny Difference, commonly called the EPD, has become the most widely used predictor of genetic value. An EPD is just what its name implies. It is the expected difference in performance of offspring. Swine registries and some companies calculate EPDs from performance data collected by these organizations. The registries make updated EPDs available to breeders so they can make selection decisions for specific trait improvement. Four major breed associations are now publishing national sire summaries ranking boars on EPDs for growth, backfat, number born alive, and 21-day litter weight. Other associations are compiling data and will publish their summaries in the future.

Using EPDs. EPDs are the difference in units of measurement for performance traits such as the number of days to 230 pounds, inches of backfat, number born alive, etc. Using EPDs in a selection program is very simple.

To compare two boars based on the expected difference in backfat thickness of their offspring, you simply subtract one EPD from the other. For example, Boar A has a backfat EPD of -0.4 inches, and Boar B has an EPD of -0.1 inches. The expected difference between the progeny of these two boars is 0.3 inches. This means that Boar A is expected to produce pigs that have 0.3 inches less backfat than those produced by Boar B if both are bred to a comparable set of sows. It also means that Boar B is expected to sire pigs that have 0.3 inches more backfat than those sired by Boar A.

You can also compare two boars for the number of pigs born alive. For example, Boar A has an EPD of +0.2 pigs born alive, and Boar B has an EPD of 0.0 pigs born alive. Boar A is expected to sire 0.2 more live pigs at birth than Boar B. Conversely, Boar B is expected to produce 0.2 fewer live pigs at birth than Boar A. Simply subtract one EPD from another to calculate the expected difference in progeny performance.

EPDs In Commercial Operations. Commercial crossbreeding programs capitalize on heterosis and breed complementarity and not so much on individual EPDs of purchased or retained breeding animals. However, you can use EPD information to identify certain lines within breeds that excel in given traits.

Semen is available from many superior boars in the country. It is possible to produce, for example, replacement gilts sired by the top maternal boar within a breed for as little as \$60 per litter. Artificial insemination is a valuable tool for any commercial pork producer. It is especially valu-

able when considering boars from breeds with published sire summaries.

Using lines of boars with low EPDs for back-fat and fewer days to 230 pounds will improve the production of terminal-cross market hogs in commercial operations. Likewise, in rotational systems where replacement gilts are retained, select boar lines that excel in maternal traits such as number born alive and 21-day weight.

Selecting Boars

When crossbreeding systems, breeds, and lines within breeds have been chosen, the next step is to select the individual boars that fit into the breeding program. Choosing commercial boars is one of the most important selection decisions you make in your commercial swine operation.

Selecting terminal boars is not too difficult because selection pressure is on fewer traits. However, boars used in rotational crossbreeding systems must sire replacement gilts as well as market hogs. Because you will keep replacement gilts from these boars, your selection decisions will affect future generations in the sow herd.

Structural Soundness. Select only boars that appear structurally sound. Structural soundness is especially important to the function and longevity of any commercial boar. Total-confinement operations with concrete flooring can place tremendous stress on the feet and leg structure of breeding boars. Pain and lameness caused by long-term exposure to hard flooring can make a boar unable to mate. A boar's semen quality can also be affected, so that infertile semen will be produced. Lameness usually prevents boars from mating. And even if they do mate, smaller litters can occur.

To improve the longevity of purchased boars, find a source with both superior genetics and facilities similar to your own. Many soundness problems found in breeding barns and pens can be avoided if the boar is accustomed to concrete or dirt. This may limit the boars you can choose from, but it will improve the returns on your investment.

Good feet are especially important to breeding boars. Toes should be large and balanced so that future wear will be even all around. Short inside toes, especially on the rear feet, can eventually wear down, causing lameness. As a boar becomes heavier, more stress will be placed on the feet and leg joints.

Good pastern structure is essential as well. Pasterns on both the front and the rear feet should

be cushioned and flexible enough to absorb shock as the boar moves.

The rear leg structure should be angled and not straight. Straight- or post-legged boars usually become lame, especially on concrete.

Flexible feet and leg joints are also important. The front leg and pastern structure should also be flexible enough that the boar can get up and down easily.

Underline Quality. You should definitely consider the boar's underline if he is to sire replacement females. Although a boar will not, of course, nurse pigs, he will influence the makeup of his daughters' underlines. Select boars with no less than twelve evenly spaced teats. Teat quality should also be considered: do not choose a boar with large, inverted nipples.

Disposition. Disposition, or temperament, is also important, especially for boars used in hand-mating systems. Handle sexually mature boars that become very aggressive breeders with extreme caution. Because hand-mating systems call for close contact with breeding animals, it is important to select lines of boars that are easy to handle but aggressive enough to find a sow in heat.

Age. Most young boars should not be used for breeding until they reach 8 months of age. Even then, a boar's use should be limited. For this reason, you should purchase young boars 60 days before you plan to use them. This will allow young boars to be isolated and watched for health problems. It also allows for them to become accustomed to farm conditions and to be test-mated for reproductive performance.

Selecting Gilts

Most of the selection guidelines for boars apply to the selection of replacement gilts as well. Select the fastest-growing gilts from the largest litters within the top 50 percent of a contemporary group. They must be structurally sound to survive the rigors of confinement in farrowing crates, gestation pens, and lots.

If you purchase gilts, ask for their sows' records to obtain ages, breed composition, and sow line history. If you raise your own gilts, select only those that come from sow lines with good reproductive performance. Identifying productive sow lines can increase the chances that your selection decisions will be valid. It is especially important for replacement gilts to have twelve evenly spaced teats of high quality. Do not select gilts with inverted nipples, because some will never

function. Once the baby pigs are born, the sow's underline is her pigs' lifeline.

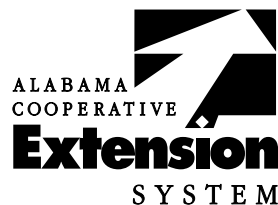
Retain or purchase 10 percent more replacements than you need. Some replacements will not breed, while others may become sick or farrowing house crates remain full.

Review

Selecting efficient breeding stock for commercial pork production is a challenge. You should use every available selection tool to ensure that your decisions will be valid. However, you must use selection in a breeding program that capitalizes on heterosis, breed complementarity, and breed performance to produce pork that is profitable for the producer and affordable to the consumer.

Use the following guidelines to develop your commercial breeding programs for more efficient pork production:

1. Choose crossbreeding systems that maximize heterosis for economically important production traits.
2. Choose breeds or lines that are complementary for traits.
3. Match breeds or lines to the chosen mating system.
4. Select breeding animals that perform at desired levels:
 - terminal-cross boars that excel in growth and leanness.
 - maternal-line boars that are average in growth and leanness and that excel in the maternal traits.
 - boars for rotational crosses that are above average in all economically important traits.
5. Purchase breeding animals from farms with environments similar to your own.
6. Select only boars and gilts that are structurally sound and have functional underlines.



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