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# UTILIZING AI AND CARCASS TRAITS IN A BREEDING PROGRAM

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Consumers have a huge impact on our markets. Their choices of brands, cuts and price signal back all the way to seedstock, and we can expect the opportunities and clarity of consumer preferences to strengthen and affect our lives. It's not my assignment to justify current fed cattle, carcass or endproduct price signals, or predict future preferences; however, we can expect the intensity of consumers' economic pressure on our industry to grow. That's why every herd in this nation should have a carcass value strategy. Nearly every genetic and management decision affects carcass traits, and even with the advantages of high trait heritabilities, mediocre long-term selection could become a serious liability.

The American Society of Animal Science has designated semen storage and artificial insemination as one of the most important scientific developments in food animal production history. Even though the availability of outstanding frozen semen has now come to blur the line between seedstock and commercial animal production, the following comments are directed toward commercial cowherds and their attention to the genetic inputs of carcass traits.

Please note ignoring carcass value genetic selection is not wise – I am not saying every non-seedstock farm and ranch should use AI to achieve their carcass goals. Of course, the reason to utilize AI is to plan for greater profit. The costs of equipment, facilities, labor and materials certainly should deliver appropriate return on investment, just as wisely selected natural herdsires must.

Previous speakers will certainly cover the potential costs I list above, so this presentation will focus on the consequences of sire selection for carcass traits and profit. There are several pertinent issues relating to sire selection and carcass traits, but these are the most compelling:

- Adding value to production
- Production cost reduction

## Adding Value, it's Reach and Accuracy

The surefire way to get genetic, and ultimately phenotypic, results is to select sires with significant genetic reach (expressed by within breed percentile rank) and high accuracy of the EPD. For example, focus on a target such as improving USDA Quality Grade, which is essentially, completely influenced by marbling. There are numerous bulls in many breeds fully proven through progeny testing and rank in the top percentile of one to several traits.

Many if not most of them are highly accurate, high percentile rank bulls and available only through purchasing semen. Moreover, a significant portion of these are priced lower than young, unproven AI sires. If the method of marketing fed cattle and carcasses

demands compliance to specifications of carcass quality, then producers will have to strongly consider utilizing these unique sires.

Some marketing grids require a minimum level of percentage Choice or higher (for example, the pen/load must meet or exceed plant average, recently in the mid-50s), or, perhaps, some higher level of percentage Choice to qualify for premium payments. In order to receive full credit for the grid agreement, utilizing an exceedingly high accuracy, high percentile rank sire for marbling would add value and ensure grid compliance.

The application of selecting superior genetic value (choosing higher percentile rank, coupled with risk-proof accuracy) is reasonably simple if benchmark records are available to document the needed change. For example, a herd may be using Charolais semen as terminal sires on baldy cows. I've noticed many semen companies' Charolais average just above zero for Marbling EPD, so let's assume this example herd is sampling Charolais bulls near zero for Marbling EPD. If the resulting fed steers have been averaging 55% Choice, and the grid these cattle have sold on sets 70% Choice as the required threshold, this producer should consider purchasing more genetic reach, perhaps Marbling EPD 0.15 or higher (this would be in the top ten percentile for Charolais).

Using highly accurate sires (usually available exclusively through AI) is also an excellent opportunity to compare breeds. It is easy to sample highly proven sires of different breeds with similar percentile rank. This herd could sample high accuracy Simmental sires that match the Marbling percentile rank of the Charolais bulls and compare percentage Choice. The U.S. Meat Animal Research Center (MARC) indicates many breed differences exist when breeds are compared on a percentile rank basis, so don't be surprised when it might require top 20 percentile continental bulls to match average (top 50 percentile) Angus bulls.

Most commercial herds using either Charolais or Simmental semen would logically choose on semen availability, semen price, and progeny outcome. These potential comparisons, by AI, between breeds are an excellent opportunity to make decisions on specifications for clean up bulls. As an example, if both Charolais and Simmental bulls in the top 25th percentile work equally well at producing carcass value; then other factors such as price, seedstock supplier guarantee, growth performance and disposition may become important selection factors.

I'm not implying use of single-trait-selection to add value. I'm only reminding you high accuracy (at least 0.70 or higher), high percentile rank sires will deliver genetic results with a minimum of distracting variation. AI sires almost always reach high accuracy soonest (of course, they get used across many herds and produce many progeny), so AI sires that prove to rank high in value adding trait percentile rank normally get very large banks of semen collected and stored. Consequently, these bulls will sire progeny years, even decades after they die, and they are often available at reasonable prices.

These comments were limited to adding value; I did not say there was any guarantee these sires could reduce cost of production.

More than 50% of all fed cattle once passed through an auction and logically changed ownership. *The urgency to select for carcass traits in herds producing these feeder cattle could be less than the immediate rewards of reducing production costs.*

## Reducing Cost of Production, it's Heterosis and Complementarity

There is significant evidence the best and most effective method of reducing cost of production in beef systems (perhaps all biological systems) is to use crossbreeding combined with functional complementarity. Cost of production is just as important, but often ignored, as strategies to add value when evaluating carcass traits in a breeding program.

Cattle operations capable of selecting superior sires while maintaining a high level of heterosis, and most perfectly matching the parent-lines' strengths and weaknesses (the art of complementarity) are apt to be the winners of the economic race of producing beef. Since my charge here is to reason-out the potential to combine AI and carcass traits in a breeding program, the question arises; Does AI enable cowherds to reduce costs through better utilization of crossbreeding and complementarity?

The issue here is the ability of herds to sustain heterosis. Most often, this hinges on the number of herd sires needed. The utilization of AI may be extremely beneficial to small herds. Unless ideal breed composition replacement females are purchased, small herds have huge difficulty maintaining stabile percentages of complementary breeds with purebred bulls. The simplest example I can think of is that a small herd (30 Angus cows) wants to develop and maintain crossbred cows 50% Simmental (Sm) and 50% Angus (An). Start with 30 An cows and use a Sm bull for two years. Then return with an An bull for two years, and repeat. This is assuming every cow has a calf every year, you replace 20% of the mature females each year, and the calf crop is 50:50 (steers and heifers). The following table describes the potential progress:

| Year | bull | cows | heifer calves | yrlg heifers |
|---|---|---|---|---|
| 1 | Sm #1 | 30 An | 15 SmAn | none |
| 2 | Sm #1 | 30 An | 15 SmAn | 6 SmAn |
| 3 | An #1 | 24An+6SmAn | 12An+3 (3/4An) | 6 SmAn |
| 4 | An #1 | 19An+11SmAn | 9An+6 (3/4an) | 5An+(1)3/4An |
| 5 | Sm #2 | 20An+9SmAn+(1)3/4An | | |
| 6 | Sm #2 | 21An+8SmAn+(1)3/4An | | |
| 7 | An #3 | 21An+7SmAn+(1)3/4An+(1)5/8Sm | | |
| 8 | Etc. | | | |
| 9 | Etc. | | | |
| 10 | Etc. | | | |
| 11 | An #4 | 19An+8SmAn+(1)3/4An+(1)5/8Sm+(1)5/8An | | |

After 11 years, hasn't this cowherd become a classical mess? Purebred bulls just don't work for small herds trying to optimize percentages of breeds. Even in the example above, if the magical day were ever to arrive where all the females were 50:50, the next purebred mating alters them to ¾ bloods. Could AI enable cowherds to better utilize crossbreeding and complementarity?

For small herds, the answer is "only if composite breed semen is available" (in this case, SimAngus). Many, if not most, of the semen companies now market Brangus, Balancer and SimAngus sires. These combinations are potentially viable to reduce production costs and optimize reproductive, growth and endproduct complementarity.

It's easy to AI the heifers and SmXAn cows to a composite sire and follow up with the purebred bull. Let's see how this idea would work out assuming 25 days of AI would get 90% pregnant.

| Year | bull | cows | heifer calves | yrlg heifers |
|---|---|---|---|---|
| 1 | Sm #1 | 30 An | 15 SmAn | none |
| 2 | Sm #1 | 30 An | 15 SmAn | 6 SmAn |
| 3 | Sm #1 | 24An | 12 SmAn | |
| 3 | AI SmAn | 6 SmAn | 3 SmAn | 6 SmAn |
| 4 | Sm #2 | 18 An | 9 SmAn | |
| 4 | AI SmAn | 12 SmAn | 6 SmAn | 6 SmAn |
| 5 | Sm #2 | 12 An | 6 SmAn | |
| 5 | AI SmAn | 18 SmAn | 9 SmAn | 6 SmAn |
| Etc. | SmAn | | | |
| Etc. | SmAn | | | |
| Etc. | SmAn | | | |

Just like any other management scheme, there are pluses and minuses to the above system. Here's the way I see some of them:

1. Cow herd stays reasonably uniform in terms of breed composition.
2. AI requirements start small and build.
3. Initially, most heifers are AI bred allowing selection of high accuracy calving ease sires.
4. Allows 5 years or more to locate composite bull (clean up) supplier.
5. Some heifers get exposed to the Sm clean up bull, so requires high percentile rank in Simmental Calving Ease EPD.
6. Depends on semen companies stocking a selection of composite bulls.

## Conclusions

Utilizing AI and carcass trait selection in a breeding program is most dependent on the need and inclination to either add value to the calf crop, or decrease production costs. Consumers will demand more and more compliance to well defined endproduct specifications. Even producers not maintaining ownership in fed cattle will feel market pressure to assure value in their feeder cattle.

Because semen companies offer highly proven sires at competitive prices, producers will need to consider the economics of utilizing AI for genetic improvement and product compliance reasons. An important component of beef production economics is cost control. Crossbreeding is often the best solution.

Single bull herds have great difficulty maintaining optimum breed composition using purebred sires either naturally or by AI The relatively new phenomena of composite bull and semen marketing open the door for small herds to utilize both genetic selection and heterosis.