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Beef Cattle Genetics Value-Added Programs

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The genetic superiority of bulls drive the majority of genetic progress in commercial beef cattle herds. Operations that accurately identify bulls with superior genetics produce calf crops with favorable phenotypic performance. In cases where calves are marketed immediately after weaning, an improvement in weaning weight is the primary area where commercial operations capture the added value from superior sires. However, as a result cow-calf producers miss opportunities to capture the value associated with purchasing bulls that improve feedlot performance or carcass merit.

Source verification and added-value marketing programs have been excellent tools for helping producers capture additional profit as a result of implementing improved health protocols and record keeping. Dozens of programs exist that validate to buyers that a group of calves has been exposed to some sort of best management practices. Calves with verifiable health protocols that are managed by a Beef Quality Assurance (BQA) certified producer carry significantly less risk of both disease and the resulting decreased performance in the feedlot. As such, buyers are willing to pay premiums for these cattle.

While management plays an essential role in a calf crop's performance post-weaning, understanding a calf's genetic potential for feedlot and carcass performance is invaluable information for buyers. Recent developments across the industry are creating opportunities to add further value to feeder calves based on the genetic merit of their sires or through genomic testing of the commercial feeder calves themselves.

Many breed associations also offer tags or marketing programs that help market feeder calves sired by bulls from their registered population. These are often tied to other age and source verification programs. While these verification programs may add value to enrolled calves, we focus our attention in this fact sheet on programs that have a genetic or genomic component beyond simple breed verification.

We can divide these programs into two main classes: Individual sire genetic merit verification and genomic testing of commercial cattle. Both aim to provide buyers with more information on the genetic makeup of the calves they are purchasing. This additional information about the genetic potential of the calf lot to perform in the feedlot and on the rail is invaluable to buyers that often operate with limited information, sometimes only coat color and average weights.

Sire-Focused Programs

Sire-focused verification programs take advantage of the fact that, on average, 75% of a calf crop's genetics come from bulls used in the last two generations (50% from the current sire, 25% from the maternal grandsire). Assuming that members of an operation's bull battery, past and present, each have EPDs from a national/international genetic evaluation, we can, with some reliability, estimate the average genetic merit for the calf crop across economically-relevant traits. Many breed associations have sire-focused verification programs (Table 1). Like other programs, many of these additionally require specific health protocols and producer Beef Quality Assurance certification. Often these programs are partnered with an independent third-party verifier. The pricing of genetic verification varies among programs. Some are complimentary resources provided by breed associations, while others may carry a minimal (<$5) cost.

The genetic information in these programs that verify sire genetic merit are delivered either as a continuous genetic score for a load lot of cattle, or as a certification that the sires of a load reached a certain EPD or index threshold. Continuous scores are often based on the breed's terminal index(es). For example, the American Angus Association's AngusLink program provides three scores based on their combined terminal ($B), feedlot ($F), and carcass ($G) economic selection indexes. These continuous scores vary from 0-200, where 100 is the population's average, allowing buyers to contextualize the relative genetic potential of a lot. Similarly, genetic-verified programs from the American International Charolais Association and American Hereford Association require that calf groups be sired by bulls in the top 50% of the breeds for their terminal indexes (TSI and $CHB, respectively).

Other programs like the International Genetic Solutions (IGS) Feeder Profit Calculator report lot values in dollars and cents based on their terminal economic selection index (TI), and the real-world values of BRD vaccines and preconditioning protocols. Other programs like Integrity Beef or Top Dollar Angus use an EPD or index percentile threshold for sires to determine qualification.

With minimal additional record keeping, operations can enroll their calf crops in these value-added genetics programs. For herds that already implement best practices for preconditioning and vaccination, adding information on genetically-superior sire purchases can further increase a calf crop's value.

Genomic Programs

While sire-focused programs provide an estimates of the genetic merit of feeder calves, genomic testing of the feeder calves themselves promises to deliver even more accurate estimates of the genetic makeup of a calf crop. The declining cost of genotyping assays has made testing feeder calves more practical from a cost perspective. Opportunities also exist that allow producers to use genomic test results from replacement heifers to help market steer calves. This is possible because the average genetic potential across a calf crop should be the same for male and female animals. This means that the average terminal genomic scores for genomically-tested replacement heifers can provide some level of genetic information about the potential of untested steers.

Genomic tests provide continuous scores for the genetic potential for various traits and indexes based on the program and genotyping provider. Generally, scores for individual traits are calculated based on marker effects estimated in a training dataset.

Table 1. A summary of existing genetics value-added marketing programs available as of Spring 2023.

Progam Name	Breed(s)	Genetic Verification Method	Score Interpretation/ Qualification	Other Requirements
Angus Link[1]	Angus	Sire verification	0-200 based on $-indexes	Add-on for other source verification programs through IMI
Charolais Advantage[2]	Charolais	Sire verification	Average Terminal Sire Index value for calf sires	Age & source verification, approved health and management protocols
Hereford Advantage[3]	Hereford	Sire verification	Sired by bulls in top 50% for $CHB	Age & source verification, approved vaccination program, BQA certification
Integrity Beef[4]	Angus, Beefmaster, Brangus, Charolais, Gelbvieh, Hereford and Red Angus	Sire verification	Sired by bulls WW & YW in top 20% of breed	BVDV-PI negative, BQA certification, tagged, <90-day calving season, approved health program, approved preconditioning protocol
IGS Feeder Profit Calculator[5]	All Breeds	Sire verification	Dollar value of predicted genetic potential and preconditioning/health practices	None, voluntary health/preconditioning information can be added
Top Dollar Angus[6]	Angus and Red Angus-based	Sire verification	Sired by bulls in the top 25% of breed for growth & carcass indexes	None, use in conjnction with other verification programs
Igenity®[7]	Angus, Gelbvieh, Hereford, Limousin, Maine-Anjou, Red Angus, Shorthorn, Simmental	Genomic Tests	Continuous Igenity Terminal Index Score	None
Zoetis Inherit Select + Blockyard[8]	Non *Bos indicus* breeds	Genomic Tests	Continuous Zoetis Feedlot and Carcass Index	None, integrates with BLOCKYARD (Zoetis' blockchain-based solution for transferring and verifying calf information)

[1] https://www.angus.org/AngusLink/GMS
[2] https://charolaisusa.com/char-advantage.php
[3] https://hereford.org/commercial/programs/hereford-advantage/
[4] http://integritybeef.org/terminal-calf-program/
[5] https://www.internationalgeneticsolutions.com/site/index.php/fpc
[6] https://topdollarangus.com/
[7] https://www.neogen.com/categories/igenity-profiles/igenity-feeder/
[8] https://welcome.blockyard.com/

The training datasets used to calculate commercial genomic scores are often based on large, genotyped populations of seedstock animals. The accuracy of genomic tests rely on the tested feeder calves being sufficiently related to the training population. Feeder cattle with high proportions of ancestry from breeds not adequately represented in the training set are likely to have less accurate predictions.

For example, the Igenity® Feeder Calf Test by Neogen uses marker effect information from the IGS genetic evaluation to create scores for various economically relevant traits. These traits are then combined into a terminal index that is used to classify cattle as either Elite (top 25%), Premier (top 50%), or Choice (tested, but not in top percentiles). Neogen reports significant differences between high (top 25%) and low (bottom 25%) scoring calves across traits related to feedlot performance and carcass merit. That said, accuracies of genomic tests are likely to vary depending on the breed makeup of tested calves. At present, large, third-party validations do not exist for feeder calf genomic panels.

Genomically testing feeder calves is an exciting development in the industry, but the technology is still evolving and improving. Despite using large training datasets to estimate the marker effects, genetic potential estimates for feeder calves are not as accurate as EPDs from a national/international genetic evaluation as would be conducted by a breed association. Feeder calf genomic tests are typically more expensive than sire-verification programs. However, costs can be reduced by only testing a portion of the calf crop (over 35% of a calf crop must be tested to qualify for the Igenity® program).

Then, the average genetic scores of this portion of the calf crop are extrapolated to the entire group. This decrease in genotyping cost comes at the cost of less accurate representations of the calf crop's genetic makeup.

Summary

Most commercial operations do not opt to retain ownership of their calf crops. When calves are marketed as commodities, weaned calf pounds are the chief driver of revenue. As such, incentives do not exist to select sires with the genetic potential for exceptional feedlot performance and end-product merit. Genetics value-added programs incentivize commercial producers to purchase genetically-superior bulls for the full suite of economically-important traits. These programs focus on predicting calf crop genetic potential using either sire EPDs or results from commercial genomic tests. Any extra knowledge about a calf crop's genetic potential is invaluable to buyers, who often operate with limited information. This drives premium prices for animals with verified genetic potential.

As we continue to find ways to connect decision-making and value throughout the beef industry, verified genetics programs will become increasingly important. Current programs are a starting place, focused on marketing the products of matings that have already been made. Future programs would benefit from using performance and carcass information from these genotyped or sire-verified commercial animals to improve the predictions for future generations. Improved prediction accuracies and lower genotyping costs will be essential for producers to see returns on investment in feeder calf genomic testing.