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Total Herd Reporting

Unlocking Opportunities for Female Selection Tools and More Accurate EPDs

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Accurately predicting the genetic merit of individuals in beef cattle populations relies on three major factors:

1) Accurate measurements of economically relevant traits (or indicator traits that are genetically correlated to economically relevant traits)

2) Accurate pedigrees (and/or genomic information) that account for relationships between individuals in a genetic evaluation

3) Records on animals with a shared environment and management (contemporary groups)

Historically, breed associations running genetic evaluations only required records from the animals that were being registered. This means that when poorly performing calves are not registered, their dam lacks a record for a year of successful reproduction. Breed associations have responded with initiatives where every year, records are generated for each cow in a herd and her calf, regardless of registration status. This practice is referred to as **total herd reporting (THR), total herd enrollment (THE), or whole herd reporting (WHR).** In practice, total herd reporting has multiple benefits: the ability to calculate EPDs for heifer pregnancy and cow longevity, complete (unbiased) contemporary groups for traits such as weaning weight, and the ability to account for sequential culling for traits like yearling weight (i.e., lighter calves at weaning are culled before yearling weight is recorded). All of these result in more accurate EPDs that can be used as selection tools for use in both seedstock and commercial herds.

Total Herd Reporting in Practice

Total herd reporting relies on maintaining an up-to-date animal "inventory" where every female in an operation is accounted for annually. Programs are designed to incentivize unbiased phenotypic recording on all individuals, not just those that will go on to be registered. The fee structures of total herd reporting programs reflect this. Instead of paying a registration fee for each calf that is registered, participants pay an enrollment fee for each female in their inventory (Usually approximately half the cost of a typical registration). Calves born from inventoried females are then eligible for registration at no additional cost, provided all required performance reporting obligations are met.

Most breed associations and the Beef Improvement Federation (BIF) guidelines (http://guidelines.beefimprovement.org/index.php/Whole_Herd_Reporting) suggest that herds with both spring and fall calving cows divide the two into separate inventories (spring calving from January 1 to June 30 and fall calving from July 1 to December 31).

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Cows can move between inventories, an action that typically takes place after the previous season's calf crop is weaned and pregnancy checks are complete, but before the subsequent calving season begins.

For spring calving cows an annual reporting period occurs prior to calving, typically in late December or early January. Here, the breeder accounts for all of the animals on which they will be reporting performance over the next 12 months. Animal disposals (culls, sales, etc.) and purchases from the previous 12 months are reported at this time. During the subsequent 12 months, each cow in inventory must report either a calf weaning weight or a reason why collecting a calf weaning weight was not possible (loss of calf, loss of dam, failure to produce a calf). This unbiased reporting of cow reproductive status allows us to begin quantifying cow reproductive status and longevity.

These are the absolute minimum requirements of total herd reporting programs industry-wide, but BIF Guidelines recommend that producers collect additional performance data on the herd. These include breeding dates (AI dates or natural service exposure date range), pregnancy status at inventory reporting, calving date, and calving ease score for each inventoried female. The total herd reporting initiatives for major U.S. beef breeds and their associated requirements are reported in Table 1.

Selection tools enabled and improved by total herd reporting

Total herd reporting may require slightly more record-keeping than traditional registration. It is likely that many producers are already collecting these records on the full calf crop but are simply not reporting these values for each calf.

An increased uptake in total herd reporting will enable the creation of more accurate EPDs for economically important traits such a fertility than current methods allow.

EPDs rely on the ability to routinely measure economically relevant phenotypes or correlated indicator traits. This is straightforward to do for phenotypes like weights (birth, weaning, yearling), but measuring fertility or cow longevity has proven more difficult. Heifer pregnancy rate (the probability that a bull's daughter will conceive as a heifer) and stayability or sustained cow fertility (related to sustained productivity of females) are two valuable phenotypes that can be measured and predicted using THR data. The EPD calculations of all traits benefit from total herd reporting, but it is absolutely required for stayability and heifer pregnancy.

Due to its low heritability (0.10-0.15) and the timescales on which phenotypes are collected), EPD-based selection tools are critical for making genetic progress on cow longevity. A lack of selection tools has resulted in genetic progress on cow fertility and longevity lagging most performance traits. Selecting for long-lived females will also likely influence other traits that contribute to sustained cow production but remain difficult to measure (e.g. health/immune function, rebreeding efficiency, structural soundness).

Total herd reporting and contemporary groups

Total herd reporting also affects the accuracy of performance trait EPDs. By reporting records on an entire calf crop, contemporary group size can be maximized. Larger contemporary groups allow us to better account for shared environment and management when calculating EPDs.

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This makes it easier to determine the variation in performance that is due to genetics as opposed to an animal's production environment. Further, when reporting only registered animals, top-performing animals appear less superior when compared with their peers. By selectively registering higher-performing animals, the contemporary group's reported average weaning weight will be larger than the true average for the entire group. This makes top animals appear closer to average than they actually are, and average animals appear below average. Under selective registration schemes, top calves do not receive the recognition that they deserve for their genetic superiority.

This can be demonstrated by using a simulated calf crop and changing which calves make up the contemporary group (Figure 1). In the example illustrated below, the average weaning weight of the Total Herd's crop (blue distribution) is 500 lbs. To represent biased reporting, ¾ of the animals with weaning weights below 500 lbs. were assumed not to be registered. This shifts the average weight of the registered calves up to 512 lbs. For a calf with a superior weaning weight (550 lbs.), his weaning weight ratio (individual performance expressed as a percentage of the herd average) actually decreases by 3 percentage points when he's compared to only the registered animals instead of the whole herd.

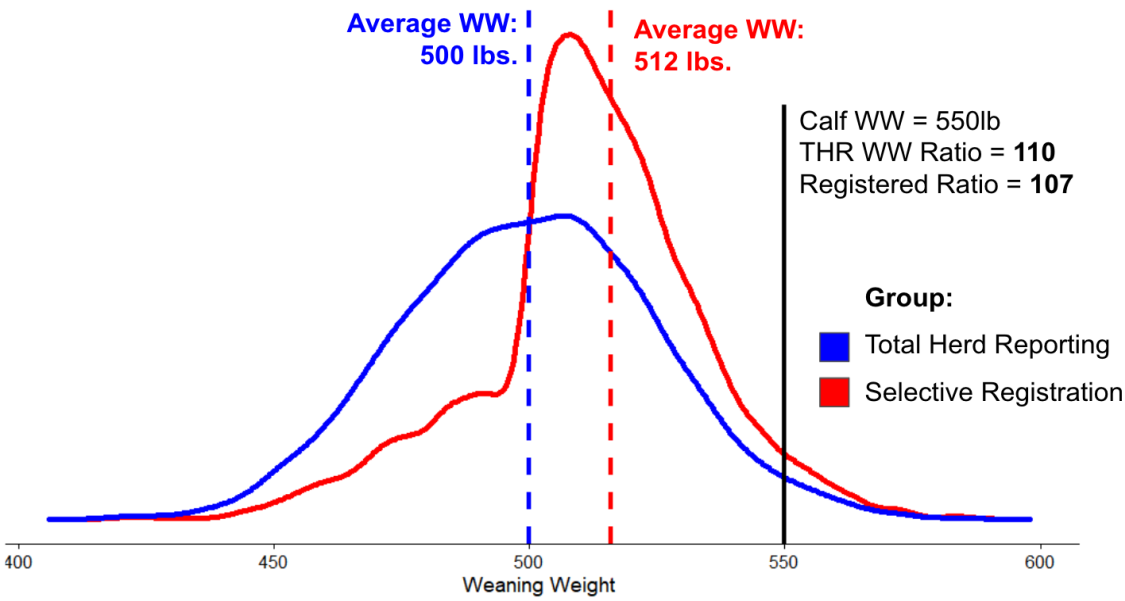

Figure 1. An example of how incomplete reporting affects weaning weight ratios. Distributions of weaning weights from the same herd representing either the whole calf crop (blue) or only registered animals (red). Mean weaning weights are indicated with vertical dashed lines. The black line illustrates the impact of selective reporting on the weaning weight ratio of an example superior calf under both reporting schemes

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Total herd reporting: A tool for breed improvement

Most major beef breeds in the US offer or require a total herd reporting program that incentivizes or requires unbiased data reporting (Table 1). By changing the registration cost structure, breeders can participate in total herd reporting without additional cost and minimal additional work. For growth and performance traits, total herd reporting generates larger, more accurate contemporary groups. This further increases EPD accuracy, reduces bias in EPD, and gives genetically superior calves the recognition that they deserve for superior performance.

Total herd reporting helps accelerate genetic progress throughout the breed with more accurate genetic predictions.

As the beef industry continues to place more emphasis on maternal traits like cow longevity, selection tools like stayability and sustained cow fertility EPDs are essential. Selection for these lowly-heritability traits is virtually impossible without total herd reporting. With more complete record-keeping on all animals, breeds and breeders can further accelerate genetic progress using total herd reporting.

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Table 1. Total herd reporting programs for U.S. beef breed associations.

Breed	Program Name	Enrollment	Requirements	EPDs Impacted by THR	THR Web Resources
Angus	Maternal Plus	Optional	Heifer breeding record, Annual female inventory, calf weaning weight (or failure report)	Heifer Pregnancy	www.angus.org/Performance/MaternalPlusInformation
Brangus	Total Herd Reporting	Optional	Annual female inventory, calf weaning weight (or failure report)	Heifer Pregnancy, Stayability, Age at First Calf	www.gobrangus.com/breeders/total-herd-reporting-thr/
Gelbvieh	Total Herd Reporting	Mandatory	Annual female inventory, calf weaning weight (or failure report)	Heifer Pregnancy, 30-month pregnancy, Stayability	www.gelbvieh.org/wp/wp-content/uploads/2021/03/Gelbvieh-Rules_December-2020.pdf
Hereford	Whole Herd Total Performance Records	Optional	Annual female inventory, calf weaning weight (or failure report)	Sustained Cow Fertility	www.hereford.org/genetics/recognition-programs/tpr-awards/
Limousin	Limousin Inventory Management System	Optional	Annual female inventory, calf weaning weight, weaning date, and docility score	Stayability	www.nalf.org/management/lims
Red Angus	Total Herd Reporting	Mandatory	Annual female inventory, calf weaning weight (or failure report)	Heifer Pregnancy, Stayability	www.redangus.org/wp-content/uploads/2021/04/Rules-and-Regulations4_26_21current.pdf
Simmental	Total Herd Enrollment	Optional	Annual female inventory, calf weaning weight (or failure report)	Heifer Pregnancy, Stayability	www.simmental.org/site/index.php/learning-library/asa-programs/90-total-herd-enrollment-requirements