The Value of Measuring and Recording Cattle Performance

Performance testing offers those engaged in beef production a way of measuring heritable differences among animals so producers can select animals expected to transmit superior performance to their offspring. Differences in performance between individuals or groups of animals are due to either genetic or environmental factors. The observed or measured performance of each animal is the result of its heredity and the total environment in which it is produced. Genetically superior individuals can be more readily identified when the animals are managed similarly vs trying to account for all of the environmental influences and compare animals between herds. Progeny performance testing is primarily useful to provide a basis for comparing cattle handled alike within a herd. Large environmental differences due to location, management, health, and nutrition do exist between herds and these differences can also be notable among different management groups within herds. Our focus is currently on measuring the differences between individuals within a herd and the average of the herd or group from which they belong to and making those necessary adjustments (i.e. age of dam, gender) so that we can do our best to compare "apples to apples", so to speak.

In Herdtrax, we have recently converted our in-herd cow ranking system over to a 100 base ratio/index reporting. Most producers are familiar with the weaning weight indexing used by seedstock producers and we feel that this approach will make in herd comparisons much simpler and more intuitive for making selection and culling decisions. Our previous ranking reports placed an in herd rank on each cow and sire (if calves were assigned), but these ranks were sometimes misleading. An overall cow rank of 30 in a herd of 300 is much different than the same rank in a herd of 100. The other problem that we encountered was the continual adjustment of how certain traits were weighted to suit each ranchers ranking requirements. Some producers wanted more emphasis on maternal traits in the overall ranking calculations while others were more interested in those animals that produced the best carcasses. Lastly, these cow rank comparisons would need to be generated annually by the Herdtrax admin personnel and regretfully, they were not always provided in a timely manner.   Thus, we felt it was necessary to re-work the cattle performance reporting within Herdtrax so that cows and sires could be compared on the basis of their maternal merit, carcass performance of their progeny and overall contribution within the herd.   Lastly, this information will now be updated daily and accessible as soon as new performance data is entered.

There are 4 selection indexes:

- **Herdtrax Maternal Index (HMI)**
- **Herdtrax Terminal Index (HTI)**
- **Herdtrax All Purpose Index (HAPI)**
- **Cow Production Value (CPV)**

Note: these indexes can only be used to compare animals within each respective herd and have no merit for between herd comparisons.

Herdtrax Maternal Index (HMI)

The HMI is an index that shows which cows can consistently wean the fastest growing and oldest calves at weaning. This is largely based off a Most Probable Producing Ability (MPPA) for 205 day weaning weight index and we feel that this is the best method to compare dams with different numbers of calf records in their averages. MPPA differs from Maternal Breeding Value (MBV) (maternal equivalent to Estimated Breeding Values (EBV) for growth) in two respects: 1) it is calculated just for producing females based on the weaning weights of their own calves only, and 2) it estimates producing ability, which is not just maternal breeding value, but maternal breeding value plus the effects of any environmental factors which permanently influence a cows production. In summary, MPPA, estimates how well a cow will actually produce, while MBV estimates her value as a transmitter of genes for maternal ability. For example, suppose six cows have the following records of production:

	No. Calves	Ave 205WW Index	MPPA
Cow A	1	85	94.0
Cow B	2	88	93.2
Cow C	4	90	92.7
Cow D	3	110	106.7
Cow E	4	112	108.8
Cow F	1	115	106.0

In this example, cow A has the lowest average weaning weight index. However, this average weaning weight index for cow A is based on only a single calf for which environmental conditions or the calf's genetic potential for growth might have been below the average of what the cow would normally produce. One or more calves from cows B or C could also have had a record of 85 or less. All three cows are probably low producers, but use of MPPA enables more accurate selection and culling and, in this example, indicates that cow's B and C are slightly lower producing cows than Cow A. In conjunction with the averaging of a cows entire progeny, a repeatability factor of 0.4 (WW205 moderately heritable) is also used when calculating a cows MPPA. This is why Cow F who has 1 calf record with a WW205 index of 115 and an MPPA of only 106. Also worth noting is the WW205 uses the following adjustments:

- Each gender is only compared against itself within each respective herd. Heifers against heifers, steers/bulls against steers/bulls.
- There is an age of dam adjustment:
    - 2 yr olds (1st calvers) will have 45 lbs added to each calves WW when doing the WW205 index.
    - 3 yr olds (2nd calvers) will have 30 lbs added
    - 4 yr olds (3rd calves) will have 15 lbs added
- WW205 calculations require a birth weight. Since many of the commercial producers do not weigh their calves at birth we are using an 85 lb BW for steers and 80 lb BW for heifers. We realize that some herds will average less than this and some herds will average more, but the difference will not be enough that it would alter the final indexes.

The second component of the HMI uses an index of the age of the calf at weaning. Adjusting the weaning weight to a standard age (205 days) is the best way to compare the calf's performance, but sometimes the top WW205 calves are born later in the calving season and calves born late are not desirable.   All herds would like to have most of their calves born early on in the calving season and this is an indirect measure of fertility or first service conception. We do an index of the calves age at weaning and the older calves receive a higher index vs the younger calves and this is factored into the final HMI.

HMI = cows MPPA (65%) + calf age index (35%)

Herdtrax Terminal Index (HTI)

The HTI is an index that shows which cows are able to consistently produce calves with desirable carcass traits. Just like the MPPA calculation, the HTI will compare dams with different numbers of calf records in their averages. Carcass traits are also moderately heritable and a repeatability factor of 0.4 is also used when producing the HTI. There are 3 main carcass parameters that are indexed and utilized:

- Carcass-ADG Index – this is the carcass weight divided by the age in days at harvest and indexed against all other animals that have carcass data within the herd for that given year. This is a true measure of overall performance and is a combination of the gain pre-weaning and post-weaning and reflects solely the production of muscle and bone. This trait is weighted at 50% in the HTI.
- Rib Eye Area (REA) as a ratio against carcass weight/100 Index– REA can be a very good proxy for muscling or yield when compared against carcass weight. An average REA is around 1.7 sq in/100 lbs of carcass. So for example, an animal with a REA of 16 sq in and a carcass weight of 725 lbs would be considered to have above average muscling and likely higher yielding. This trait is weighted at 25% of the HTI.
- Marbling Score Index– this is a computer generated numerical grade for marbling. Canadian grades tend to correlate as follows: A (200-250), AA (250-350), AAA (350-600). This trait is weighted at 25%.

HTI = Carcass-ADG Index (50%) + REA Index (25%) + Marbling Score Index (25%)

Direct Replacements

You will see this label in each cow's profile view and this refers to the number of direct progeny that have gone on to be producing cows or breeding bulls within Herdtrax. This is most often the herd of origin, but may also be another Herdtrax herd that purchased these animals for breeding purposes. Have several herds with 11 yr old cows that have up to 6 daughters producing calves in the herd. Regardless of the selection criteria used to keep these females, it is a testament to the overall quality and value of the producing dam.

Secondary Replacements

This refers to the number of secondary progeny (granddaughters and grandsons) that have been produced and retained as active breeding animals within the herd of origin or a transferred herd.

Herdtrax All Purpose Index (HAPI)

The HAPI index or "Happy" index is meant to compare cows (in herd) based on their ability to be strong maternally and terminally. This is analogous to our previous all-purpose ranking of cows where they were classified as Elite , Platinum, Gold, Silver, Bronze and Standard. We will retain these classification names as they relate to the distribution of the HAPI indexes.

HAPI = HMI (50%) + HTI (50%) + Total Replacement Count (Direct and Secondary)

Sample Cow Profile with Indexes

Rank Category: Elite

Credentials: Natural

Progeny: 12

Direct Replacements: 6

Secondary Replacements: 4

HMI: 109.5

HTI: 105.6

HAPI: 117.6

Dead: 0

Status: Active

Cow Production Value (CPV)

We have added a new metric "Cow Production Value" or "CPV". This parameter is visible in your cow's profile view. The calculation is simple; total lbs of all progeny weaned divided by the current age of the cow in days starting from the date her first calf was born. The resulting ratio is weaned lbs/day of dam age. Below is an example record; this particular cow is averaging 1.81 lbs/day of weaned calf production since her first calf was born. This translates into an average wean weight of 661 lbs. This can be used as an economic indicator on your cows; example, say you estimate it costs you $600/yr for every cow. This pro rates into $1.64/day cost. In the example shown below; this cow is producing on average 1.81 lbs of weaned calf a day and if the average fall $/lb is $1.85 then this cow (est) is adding a net annual value at a rate of (365*(1.81*$1.85)-$600) = $622.20/yr. This is an example of a great cow and keep in mind that her production value start date was the date of her first calf. Does not account for the rearing or purchasing of replacements etc... but these are upfront costs that everyone incurs regardless of the production model. Moving forward, to better reflect the annual cost of a cow we need to take into account the size/weight of each cow. Bigger the cow the higher the annual cost. Maybe??

Progeny: 4

Direct Replacements: 1

Secondary Replacements: 0

HMI: 104.6

HTI: 102.0

HAPI: 104.3

CPV: 1.81

Dead: 0

Status: Active