Utilizing Performance and Production Records in Commercial Beef Cattle Operations

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Introduction

For a sound beef operation to function in the 90's performance and production data need to be collected and utilized on beef cattle operations. For many operations, the collection of data, such as birth date, weaning weight, etc., is a common event, however the utilization of the data may vary considerably from one beef producer to the next.

Beef data actually only comes in one form, but with two purposes. The purpose that most producers think of and relate too first, is performance data. Performance data is used within genetic evaluation programs to estimate the direction of genetic change and allows for accurate cow culling, heifer selection and buying bulls. The second purpose is the appraisal of overall cow herd productivity which allows a commercial producer to evaluate management decisions for the past year through changes in overall cow herd output. In other words, do the management regimes and selected individuals actually perform at the expected level.

Overview

A production record system needs to address both individual performance as well as overall herd productivity. On the individual performance portion the following evaluations need to be obtained. The calf output needs to be divided by sex an provide birth date, birth weight, calving ease, actual weaning weight, age in days, adjusted 205 day weight, adjusted 205 day weight ratio, frame score, average daily gain, weight per day of age, muscle grade and parentage information on each calf. Averages should be presented within sex and include an overall sex group average, individual sire averages and cow breed averages for all traits recorded.

A separate sire summary needs to be included to provide trait averages by sire for birth weight, calving ease, actual weaning weight, adjusted 205 day weight, average daily gain, weight per day of age, calf age and frame score. Most probable producing ability (MPPA) values need to be calculated for all cows within the herd. The cow summaries should include the cow ID, age of cow, cow breed, MPPA, number of calves born, number of calves weaned, calving interval, and sire of cow. All previous years individual calf records need to be available for review if needed.

The appraisal of overall cow herd productivity needs to be accomplished through summarizing the calf data. The herd summary needs to include a reproductive analysis of the herd, a calving distribution report, an overall growth report, herd uniformity score and a cow culling report. The last report should identify the factors which are critical to the operation of the beef business. These factors (critical success factors) should allow for the optimal performance associated with a given set of land and feed resources and include: 1.) total calf production time (nursing period), 2.) pounds of calf produced per day of age, 3.) the percentage of females calving within 42 days from the start of the mature cow calving season, and 4.) replacement rate.

The collection, processing and evaluation of cattle records is only accomplished within those herds that have a dedicated interest in herd improvement. There are no shortcuts. Ultimately, cattle producers establish goals for the growth and preservation of the operation. A good record system evaluates these goals annually and indicates how successful a producer has combined the herd's critical success factors with available nutritional and managerial resources.

Appraisal of Overall Cow Herd Productivity

Although a producer's natural instinct is to review individual performance data first, the first step should be to review herd productivity data followed by managerial evaluations and then use the individual performance data to correct or enhance herd genetic inventories. Accurate appraisal of overall cow herd productivity can only be achieved thorough the utilization of a carefully selected herd evaluation team. These teams are often referred to as Integrated Resource Management (IRM) teams since the teams job is to evaluate effective integration of all resources available to the producer. Individual team members will provide insight in alternative methods of handling ranch resources, but the producer will ultimately integrate the teams recommendations into the total operation.

The team must recognize the components of a successful beef operation. Figure 1 is a schematic drawing of the integration efforts of an IRM team utilizing the critical success factors of a beef operation. The team doesn't evaluate herd productivity individually for each trait within the operation, but must simultaneously manage the balance between critical success factors without changing the alignment of the four corner stones. In order to start the IRM effort and engage the critical success concept, initial bench mark values need to be obtained for each critical success factor. Then the team evaluates management, economic and genetic forces that cause any distortion between the key critical success factors since peak profitability and productivity of the beef herd are obtained when all critical success factors are in equilibrium.

Before an overall evaluation of a commercial cattle producer's operation can be completed, the IRM team needs to evaluate the various forces effecting each critical success factor and compare the individual herd values to bench mark values to determine just how close or far away is the producer's operation. Initial bench mark values have been calculated for each critical success factor utilizing 46,455 North Dakota Beef Cattle Improvement Association calf records with birth dates from 1985 to 1989. Bench mark values for each critical success factor, including component traits, are as follows; 1.) Calf production time - 198 days, 2.) Weight per day of age - 2.72 lbs, component traits - birth weight - 84 lbs, average daily gain - 2.27 lbs, 3.) percentage of females calving within 42 days: heifers - 87%, mature cows - 83%, 4.) Replacement rate - 17.5%, component trait - average cow age - 5.2 years.

Calf Production Time

Minimizing total calf production time (number of days a calf nurses) reduces grazing pressure on pastures and ranges, as well as provides additional time for the mother cows to regain body condition. Increasing a body condition to optimal levels allows for fewer cows leaving the herd because of reproductive failure. Extending total

calf production time generally results in decreased energy and protein intake for calves, lowering calf gains and stressing the cows. Currently, calf production times of less than 185 days are achievable.

The producer should expect to get serious questions from the evaluation team when calf production time exceeds 210 days. Perhaps cheap feed resources may be available to justify greater calf production time, however the producer needs to assure that calves are not losing weight gained during summer grazing by staying with the cows through mature grass or crop residue feeding regimes.

Growth

Maximizing calf pounds per day of age provides for increased total output for a given herd size. A secondary component of calf gain is frame. For a given frame score, calves need to maximize lean growth. Producers maximize calf gain through proper sire selection and subsequent nutritional regimes. Effective sire selection sets the desired growth potential of calves. Additional selection pressure for milk production must be obtained for those sires required to produce replacement heifers. Calf gains will be maximized once milk production of the cow and additional feed stuffs are balanced. Maximizing calf pounds does not mean increased cow size or calving difficulty. Proper bull selection, heifer selection and crossbreeding programs will effectively control cow size and calving difficulty.

Calf weight per day of age of 2.7 lbs are achievable under present management systems. The IRM team should expect a producer to achieve 2.7 lbs of weight per day of age. However, if a producer fails to meet the baseline value, the team needs to evaluate both birth weight and average daily gain. Those herds that meet baseline birth weight averages (84 lbs.) but fail to meet baseline average daily gain values (2.27 lbs), need to address apparent nutritional or managerial restraints that are preventing calves with adequate genetics for growth (as measured by birth weight) from obtained suitable pre-weaning growth. A set of poor milking cows could also be the problem and a review of the herd sire pedigrees for maternal EPD values would be in order. If both the birth weight and average daily gain are low, the herd sire pedigrees also need to be reviewed for EPD values for growth. The most likely solution is that the bulls purchased as herd sires, simply do not carry adequate genetics for growth.

Reproduction

Although all critical success factors need to be improved simultaneously, reproduction generally receives considerable more attention. Poor reproductive rates erode pounds of beef from the cow herd as demonstrated in table 1. A producer can calculate the total pounds of lost beef within the herd by referring to the calving distribution table in the herd summary report. The average calf weight for each calving period should be calculated by the herd evaluation program. Compare the average actual weaning weight for calves born within each 21 day calving period. With a little quick multiplication, a producer can figure out total pounds lost due to calves born late in the calving season. Although the market place will offset some of the financial loss due to increased price per hundred weight, total income per cow is still reduced.

In contrast, maximizing the percentage of females calving within the first 42 days of the calving season (calving season starts when the second mature cow calves) assures that each cow can take full advantage of the time

provided to raise a calf. Reproduction is first evaluated by comparing herd values for the percentage of heifers calving early, first 21 days, first 42 days and percentage of cows calving first 21 days, first 42 days with the benchmark values for each trait. Those herds below the benchmark values need to justify to the evaluation team, the reasons why. Obvious solutions generally involve not enough feed for the number of cows or to many cows for the available feed. Before a producer purchases additional feed, placing additional economic concerns on the operation, additional efforts need to be made to identify the problem.

Several indicators of the source of the problem beyond the obvious are present. The IRM team and producer need to review the herd summary evaluation report. Start with the number of females aborted during the second and third trimesters. If greater than 2% of the cow herd aborted, a reproductive disease may be present within the herd and a thorough review of the herd health program needs to be done, followed by corrective measures. The percentage of females that are open in the spring of the year should be zero. If females are open in the spring, the evaluation team will ask if they were pregnancy checked in the fall, and if not why weren't they. If they were confirmed pregnant, then add the percentage back into the number of cows that aborted and re-evaluate percent aborted.

Cow that were confirmed open in the fall or were not pregnancy checked and simply failed to calve need to be accounted for. Although those cows that were culled in the fall were replaced with productive heifers, the reason cows are open must be explained. If feed supplies were unlimited and vaccination and health programs were maintained, the percentage of open cows should be negligible. Unfortunately, economic constraints limit the purchase of feed. The cattle must be evaluated to demonstrate that the current cow type can successfully produce under selected ranch or farm conditions.

The key indicator that the current cow type does not match the local ranch or farm settings is provided within the calving distribution table. Write down the average calving date for each cow age. Under normal conditions, the three year old cows will calf later than the 2 year old first calf heifers, but the four year old or older cows should calf on similar dates. When environmental conditions are influencing reproduction, as the cows get older, the average calving date for each cow age gets progressively later until five to seven years of age. At which time the average calving age returns to normal. These cows can be identified as those cows with increasing calving intervals. Those cows unsuited to the environment eventually come up open and are culled. If this scenario is occurring within the herd, the producer must pencil out the economics of either slowly changing cow type or improve the basic forage base of the operation. Usually, gradually changing cow type is more economical.

The percentage of assumed pregnant females that wean a calf should be greater than 95 percent. Herds that account for a lower percentage based on open or aborted cows, need to receive consultation from a veterinarian on keeping newborn calves alive. Calf death losses greater than 3 percent of calves born are generally management related. Once the obvious reproductive problems are accounted for, go back and re-evaluate the calving distribution table and critical success factors for reproduction.

Check to see that first calf heifers are breeding and conceiving on time. Is the average calving date where you want your first calf heifers to calf? Do you need to increase the percentage of first calf heifers that breed early to give your heifers more time to recoup from calving before the bull goes out? Don't forget to see how the three year old cows are doing. Are the three year old cows maintaining the proper average calving date? Check the

critical success factors and make sure that a greater percentage of heifers are calving within 42 days than the older cows. Natural selection tends to favor an average calving interval of greater than 365 days, therefore the heifers need to calve before the mature cows. Fewer economic inputs are required to start breeding heifers early and allow for future delays in conception, versus starting the breeding of heifers late and providing the extra energy to move the late heifers up in the calving cycle. Unfortunately, more labor maybe required to extend the calving season, resulting in a labor/feed trade off.

Monitoring reproduction provides the checks and balances to prevent the development of a cow herd that is not suitable to the environment or will require excessive nutritional inputs.

Replacement Rate

Accurate appraisal of cow herd productivity must account for all aspects of the beef operation and properly identify managerial mistakes. One potential and often used cover-up is to simply sell the mistakes and start over. Unfortunately, many producers can not afford to cull cows and bring in replacement stock when the transaction decreases the producer's equity within the cow herd. Raising or purchasing replacement stock, next to feed costs, is one of the largest expenses within a cow herd.

Therefore, producers need to be constantly aware of the differential in value between a replacement heifer and cull cows. The differential will decrease during increasing cattle prices and the salvage value of a cow will equal the remaining income generating potential of a cow at a younger age. As the differential increases during decreasing cattle prices, a cow will generally have greater income producing potential than salvage value. Therefore, replacement rate should not be held constant, but increased or decreased according to the current and projected markets. Over time, replacement rates have averaged 17 to 18 percent. Greater replacement rates need to be justified with a superior genetic improvement program with a definitive end point. Initially, as goal change, increased genetic potential of incoming replacements may offset the loss of actual weight from mature cows. However, a well planned genetic program reaches a point where the replacements can no longer offset mature cow actual weaning weights. At this point, the producer needs to select a replacement rate that compliments the current and projected markets.

Minimizing the difference between average age of the cow herd and optimal cow age regulates replacement rate and associated costs. In a typical herd, cows do not reach maximum production until age seven. Excessive replacement rate will increase the total cost of replacing cows and may even lower actual output of weaned calf if the genetic superiority of the replacement heifers do not offset by decreased production levels of younger cows. The goal of most producers should be to minimize replacement rate except during periods when little price differential exists between culled cows and replacement heifers.

Utilization of Individual Performance Data

Once the total operation has been evaluated, the producer makes changes to the operation by changing management and/or changing cattle. Making change to the cattle inventory is accomplished thorough the use of individual performance data to cull cows, select replacement heifers and evaluate herd sires.

Cow Culling

Utilizing performance data for culling purposes allows the producer to keep or cull based on predicted performance. A recommended culling procedure involves several steps. First do the obvious, eliminate all open cows, cows that lost calves due to excessive calving difficulty, structurally unsound cows and emaciated cows. Second, once done, turn to the calving distribution table in the herd summary section of the performance print out and identify the starting date of the third calving cycle. Identify the cows that calved after that date and designate them as sale cows. These cows should be culled in the fall. They may work as replacements for another producer that manages his cows different or is calving later.

Thirdly, sort your cows based on their most probable producing ability (MPPA) estimate. The MPPA rating provides an estimate of the weaning performance of the cow's next calf. The MPPA figure already takes into account the age of the cow and the number of calves that the cow has weaned. Therefore, a cow with an MPPA of 103 would be anticipated to produce a calf that is approximately three percent heavier than the average calf in the herd next year. Like wise, a cow with an MPPA of 93 would be anticipated to produce a calf that is approximately seven percent lighter than the average calf next year. Cull the cows with the lowest MPPA values.

The last step is to sort off the oldest cows in the herd. Only cull the poor conditioned broken mouth cows that will not withstand and compete for another winter. Typically, herds maintain approximately ten percent 10 year old or older cows. For those herds that have an extended calving season, not much selection pressure can be placed on cow performance or age since the majority of culls are reproductive failures or calved late.

Heifer Selection

The second function is for selecting heifers. Heifer selection does not have to be a complicated process at weaning. Set the weight, frame and body type of the heifer desired, select 20% excess and continue growing the heifers until breeding. If the projected value of cull non-pregnant heifers is high and feed costs low, the excess heifers will generate income. Let the bull select the heifers you will actually keep. Maintain a short breeding season for the heifers (21-42 days) and sell open heifers and heifers with the smallest pelvic measurements as long yearlings or fats. If more heifers are pregnant than expected, increase the initial selection criteria.

Keep in mind that adjusted 205-day weights and ratios provide a better estimate of true genetic differences in preweaning growth rate of the calves and milking ability of the cows than do actual weaning weights. However, it should be remembered that young calves with light, actual weaning weights can still have excellent adjusted 205-day weights and ratios. Although these calves may have excellent growth potential or their dams may have excellent milk production potential, these potentials are not being translated into additional pounds of beef because of the late calving dates.

As a word of caution, some heavy milking cows may not meet their nutritional requirements through the available forage. The calving intervals for these cows will generally exceed 370 days. Selecting replacement heifers out of these cows could eventually cause an increase in open cows. In addition, research has shown that heifers with the heaviest actual weaning weight (regardless of whether it is due to age or growth rate) are more likely to cycle

early and calve early as two-year-old heifers and therefore produce more total pounds of calf during their lifetime. Therefore, actual weaning weights may do a better job of identifying the heifers and cows that will be the most productive on the ranch. Seldom should heifers be selected as replacements that have low actual weaning weights, but high adjusted weights and ratios.

Evaluation of Herd Sires

Commercial beef records are utilized to determine if the purchased sire is producing the desired product. Once a producer selects the bulls that appear to complement or improve the existing cow herd, they must then be evaluated under ranch conditions. The within herd sire summary reports the average performance of calves for each individual herd sire. Knowing this information allows the producer to relate a specific level of performance within the herd to a specific EPD value published by the bull's breed association.

In the future, the producer can direct genetic change within the herd more accurately. The EPD values of the current herd bulls define the expected genetic merit of the current calves in the herd. Prediction of how future progeny of new sires will perform can be conveniently calculated. If herd bull A's average calf weaning weight within the herd was 550 lbs. And his EPD was +15 lbs, then a producer could increase the weaning weight average to 555 lbs by buying a bull from the same breed with an EPD for weaning weight of +20 lbs. Therefore, bull B is expected to produce calves that have the genetic potential to grow 5 lbs heavier than calves produced by bull A. Although not every bull purchased will produce as expected, over time, a producer should anticipate the average increase in calf weights at weaning to correspond to the selected increase in EPDs. The speed at which actual change occurs will depend on the associated level of accuracy for the EPD value on a purchased bull. Purchasing bulls with lower accuracy values will produce less predictable results. While EPDs indicate which bull to use, more cows will need to be mated to bulls with lower accuracy values to increase the chances of obtaining the desired calves.

Production record stumbling blocks

More often then not, the major factor that prevents a producer from incorporating efficient record keeping programs into the cattle operation is cattle identification. Frustration with tag retention or trying to embed a cows lifetime history and pedigree on one tag are two key factors. KEEP CATTLE NUMBERING AND TAGGING SYSTEMS SIMPLE. No perfect ear tag or number system exists. Keep two identification numbers on all cows at all times. Perhaps, cows carry a tattoo and ear tag, or simply two ear tags. The recommended cow tagging system would be numeric, however, numbers may start with the year letter code if a producer wishes. All cow Id numbers need to be unique for cows over all years that the herd is in production. This can be achieved by starting the number with either the letter code for the year the cow was born or the last two digits of the year the cow was born. For example, a first calf heifer born in 1990 may be entered as Z0001 or 90001. The letter designations for specific years are:

F-1974,	G-1975,	H-1976,	J-1977,	K-1978,	L-1979,	M-1980,
N-1981,	P-1982,	R-1983,	S-1984,	T-1985,	U-1986,	W-1987
X-1988,	Y-1989,	Z-1990,	A-1991,	B-1992,	C-1993,	D-1994,

E-1995, F-1996, G-1997, H-1998 J- 1999, K-2000 L-2001.

The use of blanks, dashes or multiple letters within cow Ids may make the cow Ids impossible to sort within your computer program. Calf Ids are simpler, since they should be a numeric number, either sequential according to both date or a repeat of the dam's number. A recommended sequential numbering system would include a year designation, such as starting 1991's first calf with either A001 (A is the letter code for 1991) or 9101 or 1001. Official bull numbers should be available and correspond to the National Association of Animal Breeder's numbering system. Individuals can then code bulls to meet individuals needs, but always keep the official registration or NAAB number of the bull in the permanent files.

Example Herd Evaluations

The North Dakota Beef Cattle Improvement Association has processed beef cattle records since 1963. Evaluation of those records within the critical success frame work helps developing IRM teams understand the interpretation of beef records. Four actual herds are presented in table 2. These herds are real beef herds that were presented for review by their owners to an IRM team. Herds one and two represent contrasting reproductive data, while herds three and four represent contrasting growth data.

Herd one has attained a 96% calving rate of first calf heifers within 42 days of the calving season. Subsequently, 90% of the mature cows have been maintained over the same calving period. In contrast, herd two has only 53% of the heifers and 63% of the mature cows calved within 42 days. A good IRM team would recognize the economic inputs that herd two needs to put into the cow nutritional program to have the mature cows calf sooner than the heifers. Since even the mature cows do not reach the bench mark value for reproduction, herd two has serious problems that need to be overcome. Average cow age of herd one and two are similar. The growth traits were above average for herd one, a herd that has tremendous reproductive performance, while herd two has neither excelled in overall growth or reproductive performance. Not only was herd two's calves lighter, but they were 15 days older.

Interestingly, herd two actually starts calving almost a month sooner than the finely tuned herd one and delays weaning by almost two weeks. Speculation would suggest that herd two may have fewer of the cows calving early due to the stress of calving late winter and the inability of the producer to supply the needed energy for the cow to conceive on time. These points plus more would need to be asked to the manager of herd two by the IRM team to help herd two get a handle on herd productivity.

Herds three and four represent a similar set of data, only the herds contrast different achievements based on calf weight per day of age (WDA). Therefore, herd three has attained excellent WDA while herd four has not. For the reproductive traits both herd three and herd four have maintained above average numbers of mature cows calving within 42 days of the start of the calving seasons. Herd four, however, has a below bench mark value for number of heifers calving within 42 days of the start of calving. Again the IRM team needs to ask for justification why the heifers are calving late.

Herd three is calving 5 days earlier and also weaning almost three weeks earlier than herd four. And yet the difference in WDA between herd three and herd four is .92 lbs which accounts for over 144 lbs of calf per cow in the fall. Not only does herd three excel in growth, but fewer days on the ranch for the greater weight should lead to more efficient beef production. A possible problem with the low gaining calves of herd four is that the calves are simply remaining on pasture too long and no longer gaining. Another indication is birth weight. Herd three averaged 84 lbs at birth while herd four averaged 77 lbs. The greater birth weights would indicate that sires with increased growth potential were utilized within herd three. The combination of proper sire selection and grass management has made herd three a very productive herd.

Conclusion

The beef business is entering a new decade. Poorly managed beef programs will not be assured a profit. Accurate, simple and efficient record keeping systems will pay dividends. The utilization of the previously mentioned information depends largely on a producers ability to collect data and learn how to make proper managerial decisions. The incorporation of an IRM team may greatly improve the overall utilization of performance and production records and allow for the individual attention needed for each herd evaluation. No absolute rules apply to beef performance, however the benchmark values functions as a guide to initiate a critical review of any beef herd. Herd performance changes gradually. The sooner a producer can note an overall change in the direction of herd performance, the sooner proper changes or alterations can enhance, maintain or correct the direction.

Table 1

Distribution of Calving (Defined by Breeding Cycle) for 66,606 Calves and Associated Actual Weaning Weights

Breeding Calves	**Actual Weaning Wt**	**WDA[a]**	**Weight Loss[b]**	**Number of Calves**	**Percentage of total**
Early [c]	531 lbs.	2.35		2901	4.3%
Cycle 1	520 lbs.	2.48	-11 lbs.	28627	43.0%
Cycle 2	496 lbs.	2.53	-24 lbs.	23356	35.1%
Cycle 3	458 lbs.	2.53	-38 lbs.	7761	11.7%
Cycle 4	424 lbs.	2.53	-34 lbs.	2856	4.3%
Late	395 lbs.	2.56	-29 lbs.	1105	1.6%

[a]Weight per day of age (lbs.)

[b]Weight lost calculated by subtracting previous cycle weight from current cycle weight ie (Cycle 1 minus Cycle 2 = 24 lbs.).

[c]Defined as any cow that calved before the 2nd three year old or older cow calved within the herd.

Table 2

Average Performance of Four North Dakota Beef Herds

	First Calf Heifer Calving		Mature Cow Calving			
Herd class	**early**	**1st 21 days**	**2nd 21 days**	**1st 21 days**	**2nd 21 days**	**Average Cow Age**
Herd 1	36%	82%	96%	54%	90%	5.5 yrs.
Herd 2	5%	29%	53%	32%	63%	5.5 yrs.
Herd 3	20%	66%	89%	48%	85%	5.2 yrs.
Herd 4	10%	58%	81%	51%	85%	5.5 yrs.

Herd Class	**Calving Start Date**	**Wean Date**	**Ave. Calf Wt. at Birth**	**Ave. Calf Wt. at Weaning**	**Ave. Calf Wt. at 205-days**	**Actual Weaning Age**	**Weight Per Day of Age**
Herd 1	Mar. 18	Oct. 18	85 lbs	510 lbs.	567 lbs.	194 days	2.64 lbs.
Herd 2	Feb. 26	Nov. 01	85 lbs.	494 lbs.	510 lbs.	209 days	2.37 lbs.
Herd 3	Mar. 10	Oct. 17	84 lbs.	556 lbs.	605 lbs.	198 days	2.82 lbs.
Herd 4	Mar. 15	Nov. 08	77 lbs.	448 lbs.	461 lbs.	214 days	2.10 lbs.