

Production Records for Commercial Cow-Calf Operations

If you are involved in cattle production, you recognize the importance of records for making management decisions. Some producers know what information they need to collect and how to use it to make decisions. Others are unsure where to start or may not know what to do with the information they have. The purpose of this publication is to introduce the use of cow-calf production records, with an emphasis on basic metrics to consider monitoring and how to interpret the results.

Getting started

Several things need to be considered when beginning to collect and manage production records.

Identify who will manage the records

The success or failure of ranch record-keeping is determined by the individual responsible for the task. Therefore, it is important to identify someone in the operation that is organized, enjoys data management and has time they can devote to keeping records.

Record-keeping system

According to the 2007 USDA National Animal Health Monitoring System Beef survey, greater than three-fourths of cow-calf operations use handwritten records exclusively. However, records maintained in this format are often difficult and time-consuming to analyze, even with small herds. Options for electronic record-keeping systems include commercial software, spreadsheets such as Excel from Microsoft or Numbers from Apple, or custom databases. Keep in mind, spreadsheets require a certain skill level and may pose a challenge over the long term. Likewise, development and maintenance of a custom database can be costly. For many producers, a commercial software package is a simple solution. When choosing a software package, take advantage of free trial versions if available, and, most importantly, choose a system that you will use.

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Individual animal identification

In order to calculate some of the metrics described in this article, individual animal records are required. Therefore, both cows and calves will need to be individually identified. This is often done with ear tags and/or brands, but any identification system will suffice as long as animals can be uniquely identified. If identification is not feasible, you will find that records will still be of value. Something as simple as collecting calf birthdates and creating a calving distribution (described later) can provide valuable insight into the reproductive performance of the herd.

Cow birth date or age

Age is required for calculating certain metrics discussed in this publication. Having an actual birthdate is ideal however the year of birth or an age estimate from “mouthing” a cow will suffice. Consider incorporating birth year in the individual animal ID by using either the Beef Improvement Federation (BIF) international year/letter designations or birth year as the first number.

Scales

Several of the metrics require weight data, so access to scales will be necessary to calculate those metrics. If you do not have scales, consider investing in a set, borrowing from a neighbor, or renting locally.

Information to collect

The following is a summary of information to collect throughout the year, organized by key timepoints in the production cycle:

Breeding

- At the beginning of the breeding season, record the number of females (cows and heifers) that will be exposed to a bull and/or artificially inseminated. For the purposes of most calculations, females you intend to cull and not calve out will **not** be included in the number of females exposed, regardless of whether they are exposed during the breeding season. An example would be older cows that are

nursing a calf and will be culled when the calf is weaned regardless of pregnancy status.

- Dates of bull turn-in and removal and any dates of artificial insemination should be recorded for each breeding group. If multiple breeding groups are used, a list of animals in each group should be maintained.

Pregnancy examination

- Cow ID
- Pregnancy status — open, days bred, etc.
- Date of pregnancy examination

Calving

- Calf ID
- Dam ID of calf
- Calf birthdate
- Sex
- Birthweight (if available)
- Any losses or issues — calves born dead, weak born calves, calving complications, etc.

Weaning

- Calf ID
- Weaning date
- Weaning weight
- Cow ID
- Cow weight

General

- Health events — record ID of animal(s) that have health issues and specify what the issue was – abortion, scours, pneumonia, etc. Also, record the date of the health event and any treatments administered.
- Herd additions and disposal events
 - Record ID of animals purchased and date of purchase. For breeding females, specify whether they are pregnant, open, have been exposed to bull/artificial insemination, or status is unknown.

- Record ID of animals that are sold/transferred out of the herd and the date of transfer. For breeding females specify if they are open, pregnant or were sold/transferred out without pregnancy examination.
- For animals that die, record cause and date of death.

Using your data

Table 1 provides a list of key events that occur during the production cycle and the metrics often used to assess performance. The following is a description of each metric and how to interpret the results.

Pregnancy percentage

Individual animal pregnancy status is valuable information. Females identified as open or having other reproductive problems can be sold or managed accordingly. With pregnancy records, you can also calculate the pregnancy percentage or pregnancy rate, which is an indicator of breeding performance. The following is the formula for pregnancy percentage on an exposed female basis:

$$\text{Pregnancy Percentage} = \left(\frac{\text{Number of females exposed diagnosed as pregnant}}{\text{Number of females exposed}} \right) \times 100\%$$

“Number of females exposed diagnosed as pregnant” is total females in the exposed herd confirmed pregnant, including any pregnant females that were purchased and added to the herd between breeding and pregnancy examination. If you do not have the information to calculate females exposed, use the number of females currently in inventory.

For “Number of females exposed,” use the number of females you recorded at the beginning of the breeding season and make the following adjustment:

Table 1. Key events during the production cycle and associated metrics.

Pregnancy examination	Calving	Weaning
Pregnancy percentage*	Calving percentage*	Weaning percentage*
	Pregnancy loss percentage*	Pounds of calf weaned per cow exposed*
	Calving distribution*	Pounds of calf weaned per acre*
		Most probable producing ability (MPPA)
		Percent of cow body weight weaned

*Performance measures included in Beef Cattle Standardized Performance Analysis (SPA)

- Subtract the number of exposed pregnant females that were sold or removed from the herd between *breeding* and *pregnancy examination*.
- Add the number of exposed females or pairs purchased between *breeding* and *pregnancy examination* that have been confirmed pregnant or exposed. Do **not** count females that are open at time of purchase and added to the herd between breeding and pregnancy examination.

Note: To clarify, the following should remain in the exposed female number for this and other calculations where the exposed female number is used:

- Exposed females that are confirmed open and sold or removed from the herd
- Exposed females that die during or after the breeding season
- Exposed females culled after the start of the breeding season, even if culled prior to pregnancy diagnosis

Interpretation

If this percentage is lower than expected, there are several possible reasons — cow nutritional program is inadequate, bull power or bull fertility is inadequate, presence of disease or conditions that cause infertility or early embryonic loss, and/or mismatch between herd genetics and environment. Calculating a pregnancy percentage by age, pasture, breed, etc. may indicate that a specific group is primarily responsible for the low percentage.

Limitations

In order for this percentage to be accurate and comparable across years, all exposed females should be pregnancy examined annually. Year-to-year fluctuation is to be expected, and it will take several years of data to know what is considered normal variation for your operation.

Calving percentage

Following calving season, calculate the calving percentage and evaluate the calving distribution. Each metric provides different insight into the reproductive performance of the herd. Calving Percentage is calculated as follows:

$$(\text{Number of calves born} \div \text{Number of females exposed}) \times 100\%$$

“Number of calves born” includes all calves born alive and any full-term calves that are born dead. Abortions should not be included in this number and twins should be counted as one calf. “Number of females exposed” in

this case is the number of cows exposed at the beginning of the breeding season with the following adjustments:

- Subtract the number of exposed pregnant females sold or transferred out of the herd between *breeding* and *calving*.
- Add the number of exposed females or pairs purchased between *breeding* and *calving*.

Interpretation

This is an indicator of breeding performance and gestational management. Subtracting calving percentage from pregnancy percentage will provide a **pregnancy loss percentage**. Benchmark data suggests this should be around 0.7%. If the pregnancy loss percentage is significantly higher, it may be an indicator of reproductive disease or other challenges – toxins, environmental factors, inaccurate pregnancy diagnosis, etc.

Limitations

Year-to-year variation due to environmental factors is to be expected. This percentage does not indicate the timing of when calves were born

Calving distribution

Calving distribution is a representation of when calves are born during the calving season. It is often expressed as the percentage of calves born at 21-day intervals, since 21 days is the average length of the estrous cycle in cattle. Assessing the calving distribution provides insight into both the reproductive performance and the productivity of the herd, since calves born earlier in the calving season will be heavier when marketed. For more information on the commercial value associated with a front-loaded calving distribution, see MU Extension publication G2029, [Calving Season Considerations for Commercial Beef Cattle Operations](https://extension.missouri.edu/publications/g2029) (<https://extension.missouri.edu/publications/g2029>).

To assess the calving distribution, you need to establish when the counting period begins. One option is to use 283 days from bull turn-in/AI as your starting point. If this information is not available, then the first 21-day period begins when the third calf is born. Regardless of which method you use, try to be consistent across years.

Once the start date is established, count the number of calves born during the first 21 days of the calving season and divide that number by the total number of calves born in the herd. Repeat the process for days 22–42, 43–63, and greater than 63 days. All full-term calves born, either alive or dead, should be counted. Calves born before the beginning date are included in the first 21 days. Finally, assess the calving distribution of first-calf heifers (2-year-old cows) separate from the

mature herd, since their breeding season is often earlier or managed differently.

Interpretation

The target distribution for the first, second, and third 21-day period is 65%, 23%, and 7%. The remaining 5% of calves are born at greater than 63 days. To achieve this, all cows must be cycling at the beginning of the breeding season and bulls must be fertile. An abnormal distribution could be an indicator of one or more problems such as inadequate nutritional program, inadequate bull power or fertility, disease or conditions that cause early embryonic loss or infertility, or a mismatch between herd genetics and environment. Evaluating the calving distribution for each age category, pasture, etc. may indicate a specific group is primarily responsible for the abnormal distribution.

Limitations

It may be difficult to determine the cause of an abnormal distribution. In some cases, it is due to a single event, but it is more often a combination of factors.

Weaning percentage

When calves are weaned, calculate the Weaning Percentage as follows:

$$\text{(Number of calves weaned} \div \text{Number of females exposed)} \times 100\%$$

“Number of calves weaned” is total calves weaned, not including any calves that were purchased and grafted on females

“Number of females exposed” is beginning inventory at breeding time with the following adjustments:

- Subtract the number of exposed pregnant females that were sold or transferred out between *breeding* and *weaning*.
- Add the number of exposed females or pairs purchased between *breeding* and *weaning*.

Note: When calculating number of females exposed at weaning time, remember to use the beginning inventory of cows from the correct breeding season. For example, the beginning inventory from the spring 2020 breeding season is the correct number to use when calculating a weaning percentage in the fall of 2021.

Interpretation

This percentage is affected by the reproductive rate and calf survival from birth to weaning. Therefore, it is an indicator of overall herd management. Determining the cause of a low weaning percentage will require examining factors that affect pregnancy percentage, calving percentage and calf survival. Comparing

pregnancy, calving and weaning percentage will help you pinpoint when losses occur during the production cycle.

Pounds of calf weaned per cow exposed

Calculating the pounds of calf weaned per cow exposed provides one indication of herd performance. This is calculated as follows:

$$\text{Total pounds of calf weaned} \div \text{Number of females exposed}$$

“Total pounds of calf weaned” is the sum of all weaning weights that were collected. “Number of females exposed” is the same number that was used to calculate the weaning percentage.

Interpretation

This metric is affected by reproductive rate, calf death loss, genetics for growth, maternal traits and environmental factors. Therefore, improvement requires a balanced approach to cowherd management. Age at weaning and calving distribution can influence it a great deal.

Limitations

Multiple aspects of the operation need to be evaluated to determine where improvements can be made. For consistency, all calves should be weighed annually at weaning time. In addition, this metric does not account for cow-related costs and other factors that can impact profitability, such as cow size and feed requirements.

Pounds of calf weaned per acre

Land is a primary input in a cattle operation, particularly when the operation is primarily based around feed harvested via grazing. Calculating pounds of calf weaned per acre provides an indication of how productively land resources are being used. It is calculated as follows:

$$\text{Total pounds of calf weaned} \div \text{Total acres of land}$$

“Total pounds of calf weaned” is the sum of all weaning weights that were collected. “Total acres of land” includes all owned and leased land used for grazing and/or production of feeds used by the cow-calf operation, with the following adjustments:

- When land has more than one use, such as corn grain production and corn stalks grazing, acreage should be adjusted according to the time actually used for grazing purposes.

- When supplemental feeding and grazing is simultaneous, this metric may be misleading unless acreage is adjusted to account for the portion of cow nutrient requirements being met via supplemental feeding.

Interpretation

The factors that influence pounds of calf weaned per cow exposed also influence this metric. Forage production and cow nutrient requirements, which ultimately determines the number of animals the land base will support, also have a significant impact. Research suggests that on the same acreage, smaller-sized cows wean more pounds per acre when compared to larger-sized cows and therefore may be more profitable.

Limitations

Determining total acres may be difficult, but the process for making that determination should be consistent across years. This metric is most valuable as a within-operation metric to evaluate improved production over time and/or to assess year-to-year variability in land productivity.

Most probable producing ability

Most probable producing ability (MPPA) is an individual animal metric used to compare performance of cows within a group. MPPA provides an estimate of a cow's future productivity for a trait based on her past productivity. In this case, the trait is progeny weaning weight.

Calculating MPPA is somewhat more challenging than the other metrics discussed in this publication, as it first requires calculation of the 205-day adjusted weaning weight and weaning ratios for all the calves in the herd. Additionally, an adjustment is required to take into account the age of the dam. If attempting to calculate MPPA, refer to the Beef Improvement Federation (BIF) guidelines. In particular, it will be necessary to ensure the following:

- Adjusted weaning weights should be calculated for calves within an age range of 160 to 250 days of age. Records on calves weaned outside this range should be handled as a separate management group and they should not be adjusted for age of dam, because appropriate correction factors are not available.
- If actual birthweight is not available, use 70 pounds for female calves and 75 pounds for males.
- Age of dam adjustments are made using adjustment factors from the relevant breed association.
- Weaning ratios should be calculated and reported separately for bulls, steers and heifers.

- Weaning ratio should be calculated using the average adjusted 205-day weight from a calf's contemporary group. A contemporary group is defined as herd mates that are similar in sex, age, and genetic composition and have been raised under the same management and environmental conditions.

Interpretation

MPPA takes into account a cow's past production, the number of progeny records, and the repeatability of a trait which in this case is progeny weaning weight. A cow that has an MPPA of greater than 100 suggests the cow will produce calves with an above average weaning weight ratio, thus an above average 205-day adjusted weaning weight.

Limitations

Intensive selection for MPPA can increase weaning weights but also lead to larger cow size. Therefore, it is best to use this metric in conjunction with other information when making selection or culling decisions. Since MPPA is a ranking within a contemporary group, comparisons cannot be made across groups. Finally, MPPA is an estimate, and the reliability of the estimate increases with more progeny records.

Percent of cow body weight weaned

Calculating the percentage of a cow's body weight that is represented by the weaning weight of her calf can provide valuable insight. This is calculated as follows on an individual animal basis

$$\text{Calf adjusted 205-day weaning weight} \div \text{Cow body weight}$$

Use of 205-day adjusted weaning weights in this calculation provides a fairer comparison between cows by adjusting for calf age, but note that economic returns generated by cows are largely affected by actual weights and timing of calving within the calving season. Both pieces of information may have value.

Ideally, cow weight is collected within 45 days of weaning and adjusted based on body condition score (BCS). A BCS of 5 (scale of 1 to 9) is considered to be the baseline, and a change in one BCS unit is equivalent to 75–100 pounds of body weight depending on frame of the cow. For example, a cow with a BCS of 4 and weighing 1,200 pounds may be adjusted upward to 1,300 pounds, and a cow with a BCS of 7 and weighing 1,400 pounds may be adjusted downward to 1,200 pounds.

Interpretation

A cow that weans a high percentage of her body weight is generally considered to be more efficient and potentially more profitable. It is suggested this percentage should be 50% or higher, although this target can be very difficult to achieve depending on the size of cows in the operation.

Limitations

An important concept to remember is that as cow size increases, calf size also increases but not to the same degree. Therefore, larger cows typically wean less percentage of their body weight than smaller cows. Although larger cows typically wean larger calves, larger cows also have higher maintenance energy requirements. Therefore, the additional revenue from selling a heavier calf may not offset the higher costs associated with feed and other inputs related to larger cow size.

Summary

Even though production records are a valuable management tool, the process of keeping records, calculating the metrics and using data to make decisions may seem a little overwhelming at first. To make it more manageable, the following are a few suggestions. First, focus only on pregnancy percentage, calving distribution and weaning percentage the first year. Then, begin to incorporate other metrics the following year. Additionally, calculate metrics immediately following key events such as pregnancy examination, calving and weaning, instead of waiting until the end of the year. Finally, if you need assistance, contact your herd veterinarian or local extension office.