Standardized Performance Analysis (SPA)
Cow-Calf Reproduction, Grazing, Feed Fed Production Performance Measures' Data Organization and Calculation Spreadsheet

SPA is a standardized beef cattle enterprise production and financial performance analysis system. The Cow-Calf and Seedstock SPA Subcommittees of the National Cattlemen's Association (NCA), in cooperation with the National Integrated Resource Management (IRM) Coordinating Committee, defined this cow-calf enterprise analysis system in 1991. SPA facilitates the comparison of an operation's performance between years, producers, production regions, and production systems. The analysis is based on fiscal year production and financial data.

Cow-Calf SPA includes performance measures for reproduction, production, grazing and raised feed, marketing, and financial and economic performance. SPA is an integrated analysis that links both financial and production performance. Cow-calf producers should do a complete SPA annually. What is measured is managed. Reproduction is the key to profitable cow-calf production.

The purpose of this spreadsheet is to provide the data organization, definitions of terms, and the calculation necessary to complete the reproduction and grazing production performance analysis for commercial or seedstock cow-calf. After fifteen years using the SPA tool is clear the collection and timely use of reproduction data is critical to accurate SPA. Timely recording of reproduction data also to reduce the time required completing SPA. It is very important to accurately record the exposed female numbers and make the necessary adjustments. The exposed females are the divisor for reproduction measures.

The cow-calf reproduction cycle between breeding and weaning is long and crosses fiscal years so it's important to follow the reproduction cycle starting with the breeding, and moving through pregnancy testing, calving and weaning and sales.

The dates describe the management or production seasons for the particular herd being analyzed. The production cycle include breeding, pregnancy testing, calving, and weaning. For consistency, use the mature cow beginning breeding date, even though the beginning breeding date for the heifers may be different. The weaning dates are important because they determine the year that is being analyzed. It is also important to note that because the production cycles overlap, the year in which the calves are weaned will not be the same year in which the females were exposed.

SPA is more accurate and meaningful when the breeding season is controlled to a defined period and the timing of pregnancy is clear. However, producers with year round breeding seasons using SPA should record the beginning of the breeding season as the first of the fiscal year, the ending at the end of the fiscal year. Caution must be made in identifying calves born and weaned during the fiscal year. Cows calving in the fall in the previous fiscal year of analysis and weaned in the fiscal year are part of production. Those born in the fall of the fiscal year of analysis are not considered part of the fiscal years production.

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Weaned calf production and values are entered in a second sheet. This includes all weaned calves, whether they are market calves, retained ownership calves, bull calves retained for sale, and bulls or replacement heifer calves. Weights and values should be at the time of weaning. For calves not sold, a value should be assigned based on current market price and net pay weight. Be sure to include any calves that were sold or transferred out prior to weaning if not sold in cow-calf pairs. Breeding stock sales is input in a sheet separate from the weaned calves. A sheet is provided to input grazing and raised feed land used by the cow-calf herd. It's good to review how land use is defined. See the definitions.

Breeding Herd Reproduction and Production Data

One of the principles providing the foundation for this analysis is that exposed females are used to calculate many of the performance measures. Lines 1-9 provide a reconciliation of the number of exposed females that adjusts the beginning-breeding inventory for transfers of females into and out of the herd. The end result of this section is the determination of the adjusted exposed female number (line 9). It is this number that is used as a denominator in calculating all reproduction performance measures. **This is the most important number used in the SPA analysis.**

Adjustments to the number of exposed females are divided into three time sections: (1) during breeding, (2) after breeding but before calving, and (3) after calving. Please refer to the "Description of Terms" section for details of what each of the items within these sections should and should not include.

Lines 10-12 are used to record death loss and herd replacements. This section is kept separate from the inventory reconciliation of exposed females because the exposed female number should not be adjusted for death loss. Death loss should correspond to the fiscal year of death. This will match financial statement and tax reorganization of death loss.

Although pregnancy testing can be an important activity, not everyone is able to pregnancy test. Therefore, pregnancy performance measures are secondary measures. In other words, the fact that an operation does not pregnancy test its cattle does not make this analysis null and void. It simply means that the performance measures relating to pregnancy rates will not be available. Lines 13-17b relates to pregnancy performance measures.

Lines 18a-21b are used to determine the calving performance for a particular herd. It is important to note that line 18a includes total females calving with full term calves. Even though a female's calf was born dead, it still falls into this category if it was a full term calf. Although it is an important bit of information, the calving distribution (line 18c) is not an essential element to this analysis. It can, however, provide valuable information to management regarding reproductive performance.

Lines 22-24 pertain to weaning performance. Of these three, total weaned calves (line 23) is the most important. This includes a total head count of all calves weaned during the weaning period. This number divided by the number of exposed females (heifer and cows) is the weaning percentage or calf crop.

SPA Reproduction Definitions Numbers and Calculations

1. **Total females exposed at the beginning of the breeding season** is the number of females in the beginning inventory that are exposed either to bulls or in an artificial insemination (AI) program. The number should correspond to the number on the beginning date of the breeding season.

2. **Culled exposed females not intended to be calved but in exposed herd** are cows that are often identified to be culled at the beginning of the breeding season but are left in the exposed cow herd. For example, older cows that have a nursing calf that will be culled when the calf is weaned. This number should not include those females that are diagnosed as open during pregnancy testing.

3. **Exposed females sold or transferred-out before the breeding season ends** are exposed females that are sold before the breeding season ends and should not be counted in the calculation of reproduction or production performance. Cows sold because they are diagnosed as open, based on a pregnancy test, should not be counted here either as these sales are made after the breeding season ends.

4. **Exposed females purchased or transferred-in during the breeding season** is a count of the exposed females, including pairs that are purchased. The actual reproductive performance reflects previous owner's management which must be considered as part of the total exposed females.

5a. **Open females sold or transferred-out after the breeding season** are females that are not pregnant and are removed from the breeding herd. This does not include any females that were not intended to be pregnant (item 2). This number should be included in the number of females diagnosed as open (item 15a), the number of sales or transfers of open females (item 16a), and the number of exposed females (item 9).

5b. **Pregnant females sold or transferred-out after the breeding season** are females that are pregnant and removed from the breeding herd. This does not include any females that were not intended to be pregnant (item 2). This number should be included in the number of females diagnosed as pregnant (item 14a), but is subtracted females (item 9).

5c. **Exposed females sold or transferred-out after the breeding season** are those cows who have not had pregnancy tests performed before the sale or transfer out. The number should be recorded here and will be included in the number of exposed females (item 29).

5d. **Total females sold or transferred-out after the breeding season -- *(5a+5b+5c)*** are all the females leaving the breeding herd after the breeding season should be pregnancy tested to ensure the accuracy of the reproduction performance measures. This adjustment to the breeding herd may occur before the entire herd is pregnancy tested. Therefore, any females pregnancy tested here would be added to the number of females pregnancy tested at a later date (i.e., herd pregnancy test) to arrive at a total number of exposed females pregnancy tested (item 13). This number is the sum of items 5a, 5b, and 5c.

6. **Exposed females purchased or transferred-in after the breeding season** are all the females entering the herd after the breeding season should be pregnancy tested. This allows for the inclusion of purchased exposed or bred females in the exposed female count.

7. **Females sold or transferred-out with nursing calves between calving and weaning** are the exposed females that are sold or transferred-out with nursing calves. They should be deducted from the exposed females and the calves from the number of calves born. Since these are females that met the first reproduction test (birth of a live calf), exclusion of them will likely reduce the overall weaning performance level.

8. **Females purchased or transferred-in with nursing calves between calving and weaning** are the cows that were exposed by the previous owner so they should be included in the exposed female count. Since they have calves, they should increase the overall performance measure at weaning.

9. **Adjusted exposed females including sales, transfers, purchases of pairs and exposed and pregnant females -- *(1-2-3+4-5b+6-7+8)*** is an inventory of exposed females that results from the beginning inventory plus all the adjustments. This is the most critical number that must be generated by the inventory in the reproduction and production performance measures of the cow-calf enterprise. The accuracy of this value will determine the overall accuracy of the productivity analysis. The key is to monitor monthly inventory to insure consistency between operating cycles. This number begins with the beginning inventory on day one of the breeding season, subtracts culls (item 22), as well as sales or transfers out (items 3, 5b, 7) and adds purchases or transfers in (items 4, 6, 8). The net result is used to determine the weaned calf percentage and other production measures of performance.

10a. **Total death loss of exposed females** is the value that reflects the death loss of exposed females for the exposed female group. Fiscal year financial statement adjustments must be in the fiscal year of death which will prevent double counting death loss between years.

10b. **Percent death loss -- *(10a/9) * 100*** - The total death loss is also expressed as a percentage of total exposed females (item 29).

11. **Replacement heifers exposed for first calf plus purchased replacement heifers and cows to expose or exposed in beginning inventory (item 1)**, as illustrated in the SPA Guidelines, must be carefully interpreted. Some exposed females may be actually used to replace culled females; however, increases in herd size could also be included in this number. This number should reflect the number of purchased or transferred-in female breeding animals while also including both raised and purchased heifers and mature cows.

12. Replacement rate based on females exposed -- *(11/9) * 100* **[1] is measured in terms of total exposed females as described in item 9. The numerator is defined in item 11 and is expressed as a percentage of total exposed females (item 9).
Note: Exposed female numbers should include all replacement heifers as well as adult breeding cows added to the herd. Female numbers should not be adjusted for death loss.

13. Number of exposed females that are pregnancy tested will be the base number used to calculate the pregnancy rate after adjustments. Include females, which were pregnancy tested and sold or transferred out after the breeding season (item 5a and item 5b).

14a. Number of females diagnosed as pregnant is the actual number of the exposed females diagnosed as pregnant. The accuracy of the pregnancy rate improves when all females that are exposed are pregnancy tested. Include females, which were diagnosed as pregnant, but sold or transferred out of the breeding herd after the breeding season (item 5b).

14b. Pregnancy percentage -- *(14a/13) * 100* ** expresses the number of females diagnosed as pregnant as a percentage of the number of exposed females that are pregnancy tested.

15a. Number of females diagnosed as open -- *(13-14a)* is the number of females diagnosed as not being pregnant or the total number pregnancy tested minus those diagnosed as being pregnant. Includes females, which were diagnosed as open but sold or transferred out of the breeding herd after the breeding season (item 5a).

15b. Percent open -- *(15a/13) * 100* reflects this value as a percentage of the total number of exposed females that are pregnancy tested.

16a. Sales or transfers of open exposed females intended to be bred during the breeding season but failed to conceive is the number of females culled and sold due to reproductive failure. Include females, which were diagnosed as open, but were sold or transferred out of the breeding herd after the breeding season (item 5a).

16b. Percent open sold or transferred -- *(16a/15a) * 100* expresses this value (item 16a) as a percentage of the number of females diagnosed as open (item 15a).

17a. Number of open females kept in breeding herd -- *(15a-16a)* is the number of open females that are retained in the breeding herd for a "second chance". Open females sold or transferred (item 16a) subtracted from total open females (item 15a) gives open females kept.

17b. Percent open females kept -- *(17a/15a)* 100* is the relationship between the number of open females kept in the herd and the number of females diagnosed as open.

[1] A double asterisk (**) denotes a secondary performance measure. A single asterisk (*) denotes a primary measure.

18a. **Total calves born** is the total number of calves born. It includes the number of all births of full term calves even if the calves are born dead (i.e. calves which died during calving due to dystocia) but do not include abortions (i.e. calves which have not reached full term).

18b. **Calving percentage** -- ***[18a/(9+7-8) * 100]*** * is the total number of calves born either alive or dead expressed as a percentage of exposed females.

18c. **Calving distribution** ** records the total number of calves born. Then record all births within the first 21-days of the calving season, between 22 and 42 days, 43 to 63 days, and births after 63 days. Accumulative total is also maintained. Include births of full term calves even though calves may have died during the calving process.
Note: Compute calving distribution at each of these days. The starting date for the first 21-day period is 285 days following the bull turn in date with the mature cow herd. If this is unavailable, then start the first 21-day period when the third mature cow (three years and older) calves. All calves born, either alive or dead, should be included.

19. **Calf loss due to calving problems** is included in the count the number of full term calves that died due to calving problems.

20. **Total live calves born** are only those calves, which were actually alive at the time of birth. Do not include calves, which died during the calving process (item 19).

21a. **Calving percentage based on exposed females and live calves produced** -- ***[20/(9+7-8)] * 100*** is the number of live births (item 20) as a percentage of the adjusted exposed female count (items 9, 7 and 8).

21b. **Calving death loss percentage based on exposed females** -- ***[19/(9+7-8)] * 100*** is the number of calf deaths due to calving problems, such as dystocia (item 19), expressed as a percentage of exposed females (items 9, 7, and 8).

21c. **Calving death loss based on calves born** -- ***(19/18a) * 100*** is the number of deaths due to calving problems (item 19) expressed as a percentage of the total calves born (18a).

22. **Nursing calves purchased and grafted onto females in herd** are those baby calves that are purchased and placed on females in the herd whose calves have died at birth. Grafted calves are not included in calculating calving or calf crop percentage, but are included in revenue and weaned calf production values.

23. **Total weaned calves** is a total head count of all the calves actually weaned during the weaning period.

24. **Average age at weaning (months)** * is the average age, in months, that the calves were at weaning.

Owned and Leased Land Definitions

Grazing acres -- cow-calf enterprise definitions of forage terms - The Forage and Grazing Terminology Committee American Forage and Grassland Council, 1991.

Native unimproved (rangeland and meadows) - Land on which the indigenous vegetation is predominantly grass, grass-like plants, forbs or shrubs and is managed as a natural ecosystem.

Native improved - Land devoted to the production of introduced forages for harvest primarily by grazing; managed as a natural ecosystem.

Improved perennial - Land devoted to the production of introduced perennial forage for harvest primarily by grazing. Improved perennial pasture land must be managed to arrest successional processes.

Annual pasture or forage crop - A crop of cultivated annual plants or plant parts produced to be grazed or harvested for use as feed for animals.

Woodlands (grazeable forestland) - Forest lands that produce, at least periodically, sufficient understory vegetation that can be grazed. Forage is indigenous or, if introduced, it is managed as though it were indigenous.

Crop aftermath - Forage remaining on the land as a consequence of harvest of a crop. At times, crop residues are used for grazing (i.e. rice stubble or wheat stubble). To calculate the acreage, multiply the number of acres times the time spent grazing. For example, 100 acres of crop aftermath grazed for 2 months would yield 16.7 acres (10 x 2/12 = 16.7).

Raised feed acres - Raised feed land acres, i.e. land for hay production, must be adjusted for the amount of production or raised feed actually used by the cow-calf enterprise. Consider for example, a situation where the raised feed land (hay pasture) totaled 85 acres and produced 25,000 pounds of hay. Of the total hay production 12,500 pounds of the hay is fed, 10,000 pounds sold and the balance, 2500 pounds, is in inventory. Therefore, 50% of the production [(12500/25000) x 100] was actually fed to the cow-calf enterprise and the acreage should be adjusted. Total raised feed acres times percentage of production fed (i.e. 85 x (12500/25000) = 42.5 ac.) equals adjusted raised feed land acreage.

Silage fed should be converted to a dry air basis (i.e. 6000# of silage, 60% moisture content, 40% DM or 2,400 lbs. DM converts to 2,759 lbs. of 13% moisture content, 2,400/.87).

Leased land - The same descriptions and calculations are utilized for leased land as that used with owned land with the exception that the actual lease expense is not recorded as they are in the financial data.

FEED FED DEFINITIONS

Raised feed fed - This is the total pounds (as fed) of raised feed by forage type fed including roughages, complete feed or concentrate, and protein supplement. Include the market value of each raised feed fed by type.

Market value of raised feed fed (valued at the beginning of the feeding season) - This is the market value of the raised feed fed valued at the beginning of the feeding season. This value is the opportunity cost associated with the raised feed activity (i.e. earnings foregone by not selling the raised feed that was fed).

Matching use and costs -- Purchased/raised feed cost - Often times, the actual accrual adjusted raised and purchased feed costs do not match the weaned calf production cycle for most operations. If there are wide fluctuations in feed prices between years, these costs can be somewhat distorted. It is most accurate to calculate feed costs, the fiscal year weaned calf crop, as illustrated in Figure 1.

The financial or fiscal year for most operations includes the end of one winter feeding period (before the calves are born) and the beginning of a second winter feeding period (after the weaned calves are sold or transferred into a new production activity). It is recommended that accurate accrual accounting values be used as the fiscal year cost for raised and purchased feed, see form. This should take into account the end of one wintering year and the beginning of another wintering year.

Implementation of SPA also requires placing a market value on raised feed fed. This should be done at the beginning of the feeding season for the winter before the calves are weaned. Therefore, the total market value for raised feed fed is the total value based on the market value of the feed at the beginning of the feeding season prior to weaning.

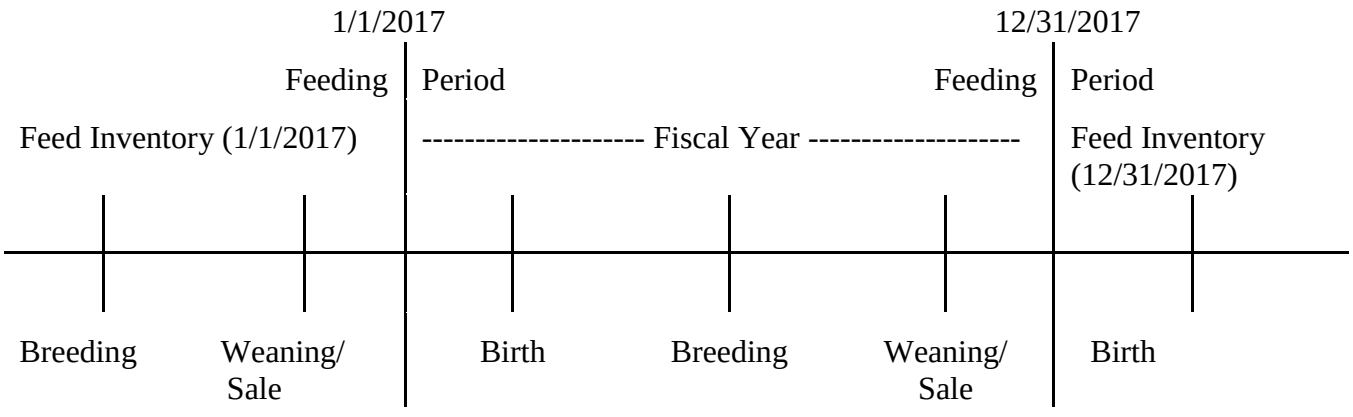

Figure 1. Matching Feeding Costs for Spring Calving Season and Fiscal Year Accounting

In cases of wide variation in feeding cost, it is advisable to use actual costs for the raised feed fed during the winter feeding periods. However, proper adjustments must be made to prevent double accounting during the fiscal year.
Matching of expenses with revenue is challenging in the case of raised feed. Again, consistency between years will lead to the greatest accuracy. The better the feed use records the more accurately costs can be calculated.

Purchased feed fed - This is the total pounds (as fed) of purchased feed by forage type fed including roughages, complete feed or concentrate, mineral and salt, and protein supplement. The cost of the purchased should be generated by the business accounting system. Its critical to determine want part of the total feed cost should be charged to the cow-calf herd where part of the feed is used for retained ownership or selling replacement heifers.

Total pounds of raised/purchased feed fed to breeding cows - This is the total in pounds of all raised or purchased feed fed during the fiscal year. Include feed fed to all classes of animals within the cow-calf enterprise (i.e. breeding cows, bulls, replacement heifers, calves). Feed fed to sale bulls and replacement heifers for sale should not be included, because sale bulls and replacement heifers for sale are enterprises that should be analyzed separately. This number is the numerator for the calculation of pounds of raised/purchased feed fed per breeding cow. The beginning fiscal year inventory of breeding cows will be the denominator.

Silage fed should be converted to a dry air basis (i.e. 6000$^{\#}$ of silage, 60% moisture content, 40% DM or 2,400 lbs. DM converts to 2,759 lbs. of 13% moisture content, 2,400/.87). Liquid supplements should be converted to as fed to be comparable to cubed feeds (88-90% DM as fed.

Standardized Performance Analysis – Reproduction and Production Measures

Listed below are the SPA reproduction, production, and the grazing and feed fed measures. The computation, interpretation, and limitation of each measure calculated and reported follows. As can be noted, select measures are identified as primary measures and others as secondary measures. Primary measures are those the committee felt are essential for a meaningful production performance analysis. Secondary measures are values that are very valuable for evaluation, but viewed as difficult to attain data in some production environments so are not viewed as essential to do a meaningful performance evaluation.

Reproduction

- Based on Exposed Females
  - Pregnancy Percentage**
  - Pregnancy Loss Percentage**
  - Calving Percentage*
  - Calf Death Loss*
  - Calf Crop or Weaning Percentage*
  - Female Replacement Rate**
- Calf Death Loss Based on Calves Born

- Calving Distribution**
  - Cumulative Distribution
    Calves during first 21 days
    Calves during first 42 days
    Calves during first 63 days
    Calves after first 63 days

Production

- Based on Exposed Females
  - Average Calf Weaned Age (months)
  - Actual Weaning Weight (lbs./hd.)*
    Steers / Bulls
    Heifers
    Average Weaning Weight
  - Pounds Weaned Per Exposed Female*

Within the reproduction performance measures are identified as either primary or secondary measures of performance. Primary measures require data that must be provided in order to complete the analysis; however, secondary measures require data that the participant may or may not be able to provide. A single asterisk denotes primary measures of performance while double asterisks denote secondary measures.

PREGNANCY PERCENTAGE**

Computation:

Pregnancy Percentage =

[(Number of Females Exposed Diagnosed As Pregnant / Number of Females Exposed) * 100]

Accurate computation requires the following adjustments to the number of females actually exposed during the breeding season:

1. Subtract the number of exposed pregnant females sold or transferred out between breeding and pregnancy diagnosis (from the number of exposed females).
2. Add the number of exposed females or pairs purchased between breeding and pregnancy diagnosis.

Interpretation: This measure of performance is a good indicator of breeding performance in the herd. If the measure is lower than the average of similar operations, it may indicate that the nutritional program is inadequate, that bull power or fertility is inadequate, that there is the presence of diseases causing early embryonic death, or that there is a mismatch between herd genetics and the environment (i.e., feed resources and management style). The meaning of this percentage is greatly enhanced if female age group keeps it since rebreeding is often only a problem with certain age groups (i.e., females exposed for their second calf).

Limitations:

**Secondary performance measures that the participant may not be able to provide.

1. As with any measure of reproductive performance, this value should be used only in comparing similar operations.
2. This value may only indicate that a problem exists with little indication of the cause of the problem.
3. There will be year-to-year variation due to environmental stresses (i.e., droughts, severe winters, etc.).
4. This value will only be available to production systems that routinely diagnose pregnancy through rectal palpation procedures. However, small herds with good heat checking will know who is not pregnant without rectal palpation and, therefore, can calculate this percentage.
5. Adding in exposed females may influence the pregnancy percentage.

Notes:

a) Do not count purchased females (pairs) which are open and added to the herd between breeding and pregnancy diagnosis. Do include purchased females (pairs), which are diagnosed as pregnant or exposed and added to the herd between breeding and pregnancy diagnosis.

b) All death losses of exposed females should remain in the exposed female numbers.

c) Females that are intended to be culled and sold, but remain in the exposed female herd during the breeding season, should be subtracted from the exposed number when sold.

PREGNANCY LOSS PERCENTAGE** [redacted]

Computation:

Pregnancy Loss Percentage =
[(Number of Females Diagnosed as Pregnant That Failed to Calve / Number of Females Diagnosed as Pregnant) * 100]

Pregnancy Loss Percentage =
(Pregnancy Percentage - Calving Percentage)

Accurate computation requires the following adjustments to the number:

1. Females that abort and are sold between pregnancy diagnoses and calving should be included in the numerator.

2. Subtract pregnant females sold and add pregnant females purchased to the divisor.

Interpretation: This measure is a good indicator of reproductive performance. If the measure is higher than the average of similar operations, it may indicate late pregnancy reproductive disease problems, which cause abortions. When kept over time, this measure may point out a potential problem prior to its becoming serious. There may be nutritional inadequacies of feedstuff quality groups or a management problem with the females.

Limitations:

1. As with any measure of reproductive performance, this value should be used only in comparing similar operations.

2. This value may only indicate that a problem exists with little indication of the cause of the problem.

3. There will be year-to-year variation due to environmental stresses (i.e., droughts, severe winters, etc.).

4. This value will only be available to those who routinely diagnose pregnancy through rectal palpation procedures. However, small herds with good heat checking will know which females are not pregnant without rectal palpation, therefore, can calculate this pregnancy.

5. Accuracy is reduced if only a portion of the total herd is tested for pregnancy. The exposed females not tested may have a higher or lower pregnancy rate.

Notes:

a) Do not count purchased females or pairs, which are open and added to the herd between pregnancy diagnosis and calving season.

b) All death losses of pregnant females should remain in the females diagnosed as pregnant numbers.

**Secondary performance measures that the participant may not be able to provide.

CALVING PERCENTAGE* [redacted]

Computation:

Calving Percentage =
[(Number of Calves Born / Number of Females Exposed) * 100]

Accurate computation requires the following adjustments to the number of females actually exposed during the breeding season:

1. Subtract the number of exposed pregnant females sold or transferred out between breeding and calving (from the number of exposed females).

2. Add the number of exposed females or pairs purchased between breeding and calving (to the number of exposed females).

Interpretation: This measure of performance is a good indicator of breeding performance and gestational management in the herd. If the measure is lower than the average of similar operations, it may indicate that the nutrition or grazing program is inadequate, that bull power or fertility is inadequate, that there is the presence of diseases causing embryonic death, or that a mismatch between herd genetics and the environment exists. The meaning of this percentage is greatly enhanced if it is kept by female age group since rebreeding is often a problem with certain age groups (i.e., rebreeding first-calf heifers).

Limitations:

1. As with any measure of reproductive performance, this value should be used only in comparing similar operations.

2. This value may serve only as an indicator of an existing problem but does little to pinpoint the cause.

3. Year-to-year variation will exist in this value due to environmental stresses.

4. This value does not indicate in what manner the calf crop is born. Are the calves tightly grouped or spread out?

Notes:

All "term" calves born should be included in the number of calves born even if they are dead on arrival.

*Primary performance measures that must be supplied by the participant.

CALF DEATH LOSS* [redacted]

Computation:

Calf Death Loss Based on Exposed Females =
[(Number of Calves Which Died / Number of Exposed Females) * 100]

Calf Death Loss Based on Calves Born =
[(Number of Calves Which Died / Number of Calves Born) * 100]

Interpretation: This measure of performance can be very useful in evaluating the herd health program, calving environment, nutritional program, and genetic selection program. The cause of death in each case would make the information much more valuable since calf losses can result from many factors at or following birth.

Limitations:

1. The type of operation, extensive versus intensive, should be considered when a comparison is made using this measure of performance.

2. The age make-up of the cow herd could influence calf death loss and must be considered when comparisons are made between herds.

3. Calf death loss at birth versus death loss during the suckling period is not distinguished here. Therefore, one may want to keep more detailed records if consistently high calf death loss occurs.

Notes:

Calf death loss should include those calves lost at birth and any that die up to weaning time. Abortions before calving should be included in the pregnancy loss percentage.

*Primary performance measures that must be supplied by the participant.

CALF CROP OR WEANING PERCENTAGE*

Computation:

Calf Crop or Weaning Percentage =

[(Number of Calves Weaned / Number of Females Exposed) * 100]

Accurate computation requires the following adjustments to the number of females actually exposed during the breeding season:

1. Subtract the number of exposed pregnant females sold or transferred out between breeding and weaning (from the number of exposed females).

2. Add the number of exposed females or pairs purchased between breeding and weaning (to the number of exposed females).

3. Subtract the number of calves purchased and grafted on females from the number of calves weaned.

Interpretation: This percentage measures the reproductive rate of the herd, and since reproductive rate has been shown to be a major factor in profitability, it is probably the most important single measure of production performance. Since reproduction is largely a function of nutrition, it is an excellent indicator of the adequacy of the nutritional program. Additionally, it is an excellent indicator of how well the cows are matched to the resources. The adequacy of the herd health program used and any disease problems can be, in part, evaluated by this measure. As with any measure of performance used in evaluating cow herd management, comparisons should only be made between herds with similar calving seasons, management systems, and environmental inputs.

Limitations:

1. This measure of performance is a good indicator of total herd output, nutritional adequacy and managerial skills or husbandry practices. It should be noted that this measure does not account for excessive use of feed and non-feed inputs.
2. Calf crop percent may not correlate highly to economic performance. This is seen in cases where cull marketing decisions are made prior to times of high input costs and when the measure is compared to herds where this practice is not followed.

Notes:

a) All death losses of exposed females should remain in the exposed female numbers.

b) Females that are intended to be culled and sold, but remain in the exposed female herd during the breeding season, should be subtracted from the exposed number when sold.

c) The exposed females that were intended to be bred, but are later culled when found open, must remain in the exposed number.

d) Do not include purchased grafted calves that are nursing cows in the number of weaned calves.

*Primary performance measures that must be supplied by the participant.

FEMALE REPLACEMENT RATE PERCENTAGE**

Computation:

Female Replacement Rate =
[[(Raised Replacement Heifers Exposed for First Calf + Purchased Replacement Heifers and Breeding Cows Exposed) / Number of Females Exposed] * 100]

Accurate calculation requires the following adjustments to be computed:

1. Subtract the number of heifers sold or transferred out from the number of heifers exposed.

2. Add the number of heifers and cows purchased between breeding and calving to the number of heifers exposed.

3. Using the previously defined female exposed definition includes both heifers and cows in the number of females exposed.

Interpretation: This measure of performance is a good indicator of herd replacement rate and cow longevity. If this percentage is higher than the average of similar operations it may indicate the herd has reproductive problems or may be in an expansion phase. Generally, a high percentage will mean higher herd costs and lower productivity per cow because a larger portion of the herds is first and second calving females. Also, if this percentage is high, it may mean the current genetic type does not match the resources and thus causes a higher than normal culling rate and heifer retention. A low percentage may indicate the herd is in a liquidation phase.

Limitation:

1. As with any measure of performance, this value should be used only in comparing similar operations.

2. This value may only indicate that a problem exists with little indication of the cause of the problem.

3. Market fluctuation may cause this percentage to vary more than production factors in some herds.

4. Farmers or ranchers with herds in either an expansion or liquidation phase will find this percentage hard to compare and of less value.

**Secondary performance measures that the participant may not be able to provide.

CALVING DISTRIBUTION** [redacted]

Computation:

Calving Distribution =
[(Cumulative Number of Calves Born by 21, 42, and 63 Days and Those After 63 Days of the Calving Season / Total Number of Calves Born) * 100]

Note: Compute calving distribution at each of these days. The starting date for the first 21-day period is 285 days following the bull turn in date with the mature cowherd. If this is unavailable, then start the first 21-day period when the third mature cow (three years and older) calves. All calves born, either alive or dead, should be included in this analysis.

Interpretation: Since calf weaning weight and uniformity of the calf crop is greatly affected by calf age, this measure of how early in the calving season that calves are born is an excellent measure of reproductive performance. This measure is very useful in evaluating the adequacy of nutrition during crucial reproductive periods and adequacy of bull power, herd health, and heifer development programs.

Calving distribution is most useful if calculated by the age of the females since the distribution for certain groups, particularly second-calf-heifers, is often much lower than for the mature cows. Additionally, separate calculations by age of females may be necessary for meaningful comparisons when yearling heifers are bred prior to the cow herd.

Limitations:

1. This measure of performance may not be as useful in the southern part of the U.S. as in the northern part where pasture growth is more seasonal; however, a tight calving distribution has many benefits in all environments.

2. Calving distribution cannot be used in extensive grazing environments where accurate counts of the number of calves born may be difficult to obtain.

**Secondary performance measures that the participant may not be able to provide.

ACTUAL WEANING WEIGHTS*

Computation:

Steer/Bull Calf Weaning Weight =
(Total Weight of Weaned Steer and Bull Calves / Total Number of Weaned Steer and Bull Calves)

Heifer Calf Weaning Weight =
(Total Weight of Heifer Calves Weaned / Total Number of Heifer Calves Weaned)

Average Weaning Weight =
(Total Weight of Weaned Calves / Total Number of Calves Weaned)

Average Age at Weaning (Months)
Calving distribution should be considered when evaluating average age at weaning.

Interpretation: While weaning weight is extremely difficult to interpret, it must be assessed to measure productivity and performance. As with any other measure, it must be compared to similar operations in order to have any meaning. The best use of this measure of performance is to establish gross revenue for the operation and to evaluate the effect of changes in the breeding program or management. Also, since the environment and feed supply greatly affect weaning weights in any year, long-term trends should be more useful than yearly changes.

Limitations:

1. Since producers calve and wean calves at different times and ages, actual weaning weights are not standardized to age. However, including average aged weaning in the data serves as a guide in interpreting weaning weights for comparative purposes.

2. Due to pasture production and management, it can be difficult to compare weaning weights between operations. This is especially a problem when comparing fall versus spring calving herds in which calf-weaning age may differ by three months. Where two calving seasons are used, it is best to do a separate analysis for each season.
3. Weaning weights are greatly affected by annual environmental conditions. For example, high and low levels of moisture, extremes in temperature, etc., which are beyond the manager's control, can influence weaning weights more than all controlled management factors. Thus, producers should avoid placing too much emphasis on the weights for any single year and should concentrate on long-term trends.

4. Users of this measure must remember that higher weaning weights normally mean higher gross revenue, but not necessarily increased profit. Increased profit is dependent also on calf crop and production costs.

*Primary performance measures that must be supplied by the participant.

POUNDS WEANED PER EXPOSED FEMALE

Computation:

Pounds Weaned Per Exposed Female =
(Total Pounds of Calf Weaned / Total Number of Females Exposed)

Interpretation: This calculation combines into one figure the herd reproductive rate, calf death loss, and genetics for growth and maternal traits. Thus, from a herd production standpoint, this is probably the best measure of performance. This measure is a tool to assist producers in managing the tradeoffs between growth rate and reproductive rate. In other words, concentrating on improving the number of pounds weaned per cow exposed should be more profitable than emphasizing either calf crop or weaning weight separately.

Limitations:

1. Since this measure is a combination of the measures used to analyze reproduction and production, it has some of the limitations of each.

2. Age at weaning and distribution of calving can influence this value a great deal by making it more valuable as a measure for an individual operation than for comparison between farms or ranches.

Note:

The number of females exposed must be adjusted for the same factors that were used in the calf crop percent calculation.

*Primary performance measures that must be supplied by the participant.