



# Interpreting Cow-Calf Standardized Performance Analysis (SPA) Results<sup>1</sup>

**Damona Doye**

Extension Economist, Oklahoma State University

**Sally Dolezal**

Former Beef Breeding Specialist, Oklahoma State University

**James McGrann**

Extension Economist, Texas A&M University

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Historically, determining cost of production was a frustrating experience for cow-calf producers. Standardized Performance Analysis (SPA) is a national thrust to help producers identify major cost items in their operation.<sup>2</sup> SPA is not a record keeping system but a tool that can help producers become more competitive and improve management. Standardized records and reports ensure meaningful comparisons of production costs over time.

With Cow-Calf SPA, the cow-calf enterprise is isolated within the whole farm or ranch so its financial performance can be evaluated. Production and financial data are integrated into key performance measures. In a diversified operation, it may be difficult to accurately identify all costs and allocate them to different enterprises (cow-calf, stockers, wheat, grain sorghum). However, it is important to be as thorough as possible and consistent from year to year so that data is realistic and comparisons are valid. Sample SPA production and financial summary statistics are shown in Table 1.

## SPA Production and Reproduction Measures

The evaluation of reproductive efficiency requires analysis over an entire production cycle. The cycle begins when the females are exposed at the start of the breeding season; it ends when the calves which were conceived during the breeding season are weaned. Production cycles will overlap since females are exposed prior to weaning a calf from the previous cycle. When reporting reproductive efficiency measures, the analysis applies to the year that the calves are weaned.

For example, the data for 2003 would be based on the number of females actually exposed in 2002 in a spring calving herd.

## Pregnancy Percentage

Pregnancy percentage is an indicator of breeding performance in the herd. This measure has more meaning if it is kept by female age group since rebreeding may be a problem for certain age groups. Pregnancy percentage may also indicate the adequacy of the nutritional program, since reproduction is influenced by nutrition.

**Pregnancy Percentage** = (Number of Females Exposed that are Diagnosed as Pregnant) ÷ (Number of Females Exposed) x 100

Accurate computations require the following adjustments to the number of females actually exposed during the breeding season:

- Subtract the number of exposed pregnant females sold or transferred out between breeding and pregnancy diagnosis.
- Add the number of exposed females or pairs purchased for the herd between breeding and pregnancy diagnosis. Include purchased females (pairs) that are diagnosed as pregnant or exposed. Do not count purchased females (pairs) that are open.

All death losses of exposed females should remain in the exposed female numbers. Females that are intended to be culled and sold, but remain in the exposed female herd during the breeding season, are subtracted from the exposed number when sold. Some cautions about the pregnancy percentage measure are:

- Use this value only in comparisons of similar operations.
- A low value may indicate a problem, but it does not explain the cause of the problem.
- Environmental stresses will cause year-to-year variation in the pregnancy percentages.

<sup>1</sup> Revised from an earlier version by Damona Doye and Sally Northcutt (Dolezal).

<sup>2</sup> See OSU F-222 "Cow-calf Standardized Performance Analysis (SPA)" for additional information.

**Table 1. Selected Cow-Calf SPA Results (sample herd).**

<b>Reproduction Performance Based on Exposed Females:</b>		<b>Production Performance:</b>	
		<u>Actual Weaning Weights</u>	<u>Lbs/hd</u>
Calving Percentage	85.8%	Steers and Bulls	541
Calf Death Loss	3.3%	Heifers	504
Calf Crop or Weaning Percentage	82.7%	Average Weaning Weight	525
Pounds Weaned per Exposed Female		435	

**Investment per Breeding Cow (Average Asset Values in \$ per head)**

	<u>Cost Basis</u>	<u>Market Value</u>
Total Current Assets	\$118	\$118
Non- Current Assets		
Livestock	\$897	\$897
Machinery & Equipment	\$515	\$370
Real Estate Land and Improvements	\$315	\$2,592
Other Non-Current Assets	\$125	\$125
Total Investment Per Breeding Cow	\$1,253	\$5,047
Debt Per Breeding Cow	\$789	\$789
Equity to Asset or Percent Equity (%)	37.0%	84.4%

**Financial Performance**

	<u>\$/cow</u>	<u>\$/cwt<sup>1</sup></u>
Total Raised/Purchased Feed Cost	\$158	\$44
Total Grazing Cost	\$55	\$15
Total Cost <sup>2</sup>	\$412	\$95
Net Income <sup>3</sup>	-\$21	-\$7

**Unit Cost of Weaned Calf Production  
(Breakeven Economic Cost)**

Total Calf Cost (Non-Calf Revenue Adj.)	\$469	\$108
Percent Return on Enterprise Assets (ROA)		
Cost Basis	-1.53%	
Market Value	-0.04%	

1 Dollars per hundredweight of weaned calves.

2 These are pre-tax costs, thus they do not include income tax payments.

3 The net income is pre-tax income, but is not equal to IRS taxable income.

- This value applies only to production systems that routinely diagnose pregnancy through rectal palpation or ultrasound technology
- Adding exposed females may influence the pregnancy percentage.

## Calving Percentage

Calving Percentage is a good indicator of breeding performance and gestational management in the herd. Percentages may have more meaning when computed by female age group, such as first-calf heifers.

**Calving Percentage** = (Number of Calves Born ÷ Number of Females Exposed) x 100

The important part of computing calving percentage is deriving the number of females exposed. Accurate computations require the following two adjustments to the number of females actually exposed during the breeding season:

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

*Note: all "term" calves born should be included in the number of calves born even if they are dead on arrival.*

Again, the calving percentage should be used only in comparing similar operations. The measure may indicate an existing problem, but it does not pinpoint the cause. Environmental influences may cause year-to-year variation in calving percentage. Also, the percentage does not describe the distribution of calving birth dates during the calving season.

## Calf Death Loss

Calf death loss statistics can shed light on the herd health program, calving environment, nutrition, and breeding program.

**Calf Death Loss Based on Exposed Females** = (Number of Calves Which Died Prior to Weaning) ÷ (Number of Females Exposed) x 100

**Calf Death Loss Based on Calves Born** = (Number of Calves Which Died Prior to Weaning) ÷ (Number of Calves Born) x 100

*Note: calf death loss should include any calves lost at birth plus any calves that die prior to weaning. Again, deriving the number of females exposed is critical.*

The type of operation, extensive versus intensive, should be considered when comparing calf death losses

across herds. Likewise, the age make-up of the cowherd should be considered in any across-herd comparison. Finally, the calculations do not distinguish between calf death loss at birth versus death loss during the suckling period. More detailed records may be justified in cases of high calf death loss to determine the cause of premature deaths.

## Calf Crop or Weaning Percentage

Calf crop percentage is one of the most important measures of production performance as it measures the overall reproductive rate of the herd. In addition to reflecting embryo mortality and calf death loss, this percentage may provide some insight on how well cows are matched to their production resources and other factors. The computations for calf crop percentage are as follows:

**Calf Crop Weaning Percentage** = (Number of Calves Weaned) ÷ (Number of Females Exposed) x 100

To accurately compute calf crop percentage, adjust the number of females exposed during the breeding season:

- Subtract the number of exposed pregnant females sold or transferred out of the herd between breeding and weaning.
- Add the number of exposed females or pairs purchased between breeding and weaning.
- Subtract the number of calves purchased and grafted on females from the number of calves weaned.

Additional points to note:

- All death losses of exposed females should remain in the number of exposed females.
- 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.
- The exposed females that were intended to be bred, but are later culled when diagnosed as open, must remain in the exposed number.
- Do not include purchased grafted calves that are nursing cows in the number of weaned calves.

As with other performance measures, comparisons are valid only between herds with similar calving season management systems and environments. While the calf crop percentage is a good indicator of total herd output, nutritional adequacy, and husbandry practices, it does not account for excessive use of inputs (fed and non-feed).

## Actual Weaning Weights

Actual weaning weights are usually evaluated by individual management or contemporary groups, such as steers, bulls, heifers, creep and no-creep calves. Use of

actual average weaning weight is limited by management plans for calving and weaning. Actual weaning weights are not standardized to a given age. The influence of production environment and feed resources may be evident in long-term trends. In addition, comparisons between operations are difficult, as pasture conditions and management influence weaning weights. Fall and spring calving seasons, in particular, should be evaluated separately in two SPAs for an operation.

### **Pounds Weaned per Exposed Female**

Pounds weaned per exposed female is one of the key production figures every cow-calf operator should know for each calf crop. By evaluating weaning performance on an exposed female basis, this measure becomes a tool to help producers optimize growth rate and reproductive rate.

**Pounds Weaned per Exposed Female** = (Total Pounds of Calves Weaned) ÷ (Total Number of Females Exposed)

The value reflects herd reproductive rate, calf death loss, the overall nutritional environment, and the genetics for growth and maternal performance. Age at weaning and the calving distribution impact pounds weaned per exposed female, making the measures more valuable for the individual operation and year-to-year comparisons. Comparisons between farms or ranches are less meaningful if production systems vary widely.

### **SPA Financial Results**

The overall financial performance and position of a business or a single enterprise within a business is evaluated through measures of liquidity, solvency, profitability, financial efficiency, and repayment capacity. No single measure is sufficient for evaluating a business's financial position and performance. Several measures must be tracked over time to provide a true perspective.

Profitability measures the financial performance of the farm or enterprise over a period of time, which is generally one year. Net income and the rate of return on assets are measures of profitability. Solvency measures the ability of the firm to retire debts if all of the business assets are sold. The equity/asset ratio or percent equity is one measure of solvency.

### **Investment per Breeding Cow (average asset value)**

Investment figures are expressed on a per cow basis. The value of the assets used in supporting the cow-calf enterprise is divided by the number of breeding cows. The average asset value is calculated by adding the asset values at the beginning and ending of the accounting period (generally a calendar year) and dividing

by two. Two columns of averages are reported, one for cost basis and one for market value. The cost basis for asset values is based on the price paid for the asset less accumulated depreciation. The market value reflects the value that owners can receive for their assets on a specific date (for example, the beginning of the accounting period). When evaluating the performance of an individual business over time, the cost approach to valuing assets provides more meaningful statistics since it is not influenced by fluctuations in market prices that create unrealized capital gains or losses. Market values are more meaningful for comparisons across ranches, such as those in different geographic regions or different production systems.

The assets whose values make up the total investment per breeding cow are sorted into two categories: current and non-current. *Current* assets are assets that will be converted to cash, sold, or consumed within one year. Examples of current assets include weaned calves, hay and feed inventories, and supplies on hand. *Non-current* assets include livestock, machinery and equipment, real estate (land and improvements), and other assets which will not be converted to cash in the current year.

In purebred operations, per cow costs for livestock (cost and market basis) are expected to be higher than in commercial operations. The cost basis for raised breeding livestock in a SPA is its base value.<sup>6</sup> Machinery and equipment depreciate over time, lowering their cost basis eventually to salvage value. Sometimes used machinery and equipment can be sold for more than its "book value" which could make the market value higher than the cost basis. Assets such as land typically appreciate over time and are generally expected to have a higher market value than cost basis, particularly if land was inherited with a low cost basis. Machinery and equipment costs per cow and real estate costs per cow will be higher for ranches in which many assets are owned rather than rented or leased.

*The Total Investment per Breeding Cow* is the sum of the values of current and non-current assets. High investment costs per cow are not necessarily bad. The key to whether high investment costs are justified is whether the income generated is sufficiently high to yield a rate of return on assets comparable to other

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<sup>6</sup> In SPA, the ranch manager establishes a base value for various categories of raised breeding animals, for example, replacement heifers, first calf heifers, and cows. As individual or groups of animals move through those categories in their normal life cycle, their individual value is the base value established for that particular category (for example, replacement heifers) when the valuation is done. If multiple categories are used to identify the life cycle of a breeding animal, then there will be multiple transfer points with a change in valuation as the animal shifts from one category into another, for example, from replacement heifer to first calf heifer. A base value is selected to approximate the full cost of raising the breeding animal to each stage in its life cycle. See also WF-323, "Valuation of Raised Breeding Livestock."

operations. Higher values for total investment per cow are expected if high prices are paid for assets (breeding stock, vehicles, machinery, equipment, land), if new rather than used vehicles or machinery or equipment is purchased, if most assets are owned rather than leased or rented, and if the assets are under-utilized (too few cows are run for a given set of assets).

*Debt per Breeding Cow* is the sum of operating non real estate and real estate debt attributed to the cow-calf operation plus deferred taxes (taxes that would be incurred if assets were liquidated)<sup>7</sup>. This figure sums the amounts borrowed to buy feed, purchase breeding livestock, and purchase pasture land for grazing, etc. Debt is not inherently good or bad. The earnings generated by the assets purchased with debt must exceed the cost of borrowing (interest payments) for the use of debt as a financing tool to be beneficial. Higher debt levels increase financial risk and expose the business to greater negative impacts from adverse production and market factors. Debt per breeding cow is useful for individual businesses to monitor over time but is not a useful comparison across operations. This measure is often higher for younger operators who have borrowed money to start a farming operation.

*Equity to Asset or Percent Ownership* reflects the financial position with respect to debt and assets assigned to the cow-calf enterprise. Equity equals assets minus debt. For a business, the equity to asset ratio could range from 0 (the business is technically insolvent since debt equals assets) to 1 (assets are unencumbered by debt). For an individual enterprise like the cow-calf enterprise, debts may equal or exceed the value of assets (the equity to asset ratio can be negative) if the enterprise is being subsidized by other enterprises or off-farm income. The cow-calf enterprise equity/asset ratio indicates the proportion of the farm assets owned or financed by the owner's equity capital. If the ratio exceeds 0.5 (or percent equity exceeds 50 percent), the owner is supplying a greater percent of the total capital in the enterprise than the creditors.

## Financial and Economic Performance

Financial costs are the actual accounting costs for the cow-calf portion of the business. Examples of financial costs are cash costs (rents, purchased feed, veterinary expenses, interest, etc.) plus non-cash costs such as depreciation on purchased breeding livestock, machinery, equipment, vehicles, and buildings. Economic costs differ in that they also include the opportunity cost of owned land<sup>8</sup> and equity capital in the enterprise plus

<sup>7</sup> Deferred taxes that would result from the sale of assets should be considered as liabilities in developing debt figures. Using current market value for assets without considering deferred taxes would suggest more potential income than exists; that is, the value that is realized if the business is liquidated is generally less than the market value of the assets due to the tax liability on gains.

<sup>8</sup> The opportunity cost of owned land is the income that it could have generated if it had been rented out, for instance, \$7 per acre for native pasture.

the net potential sales value of raised feed.

*Total Raised/Purchased Feed Cost* is the sum of purchased feed costs, accrual adjustments in feed inventories and bills payable, machinery, equipment, and other expenses associated with feed production. Costs differ between production systems and regions. Costs on a ranch will vary over time due to weather, pasture availability and condition, and the condition of cattle. Feed costs are important to monitor because they are generally a significant portion of the total expenses.

*Total Grazing Cost* is the sum of machinery, equipment and other expenses for grazing land maintenance and real estate costs (lease payments, mortgage interest payments, depreciation, property taxes, etc.). The cash lease rate for owned real estate is used to approximate the "economic" real estate cost, which could have been earned by renting the land out (as compared to what was earned in cow-calf production).

*Gross Cow-Calf Enterprise Accrual Revenue* is the sum of sales, changes in inventory values and capital asset adjustments, both cash and non-cash value changes. Specifically, gross revenue includes raised weaned calf sales, the value of calf inventory changes, the base value of the calves transferred into raised replacement stock, gains or losses (relative to their base value) on sale of culled replacement and breeding stock, increases in the base value of the quantity transferred into raised breeding stock, non-cash transfers of weaned calves out of the enterprise (to another ranch with separate management, but within a single corporation), farm consumption, and other revenue.<sup>9</sup> Both the change in value of raised breeding livestock, resulting from either movement to a category having a higher base value or from an increased number of raised replacements and the income or loss from the sale of animals are included in income.

*Total Cow-Calf Enterprise Operating Cost* is the sum of direct and indirect operating costs, including costs associated with raised and purchased feed, grazing, cow-calf production, and overhead which are the things not easily allocated to the previous categories. Direct costs associated with cow-calf production can include the ranch truck, labor, fuel, and oil, commissions, insurance, veterinary and medicine, breeding fees, depreciation on vehicles, purchased breeding livestock, and depreciation on barns. Since total cow-calf enterprise operating cost is on a pre-tax basis and is not influenced by debt structure, it is a useful comparison across operations. The cost of raising replacement breeding animals are often included in expenses.

<sup>9</sup> In years where there is a change in the base value of one or more categories of raised breeding animals, the income or loss resulting from that change would be included as component of income or loss from the sale of capital assets. Excessively conservative or inflated base values will distort adjustments to cash basis records. See "Financial Guidelines for Agricultural Producer: Recommendations of the Farm Financial Standards Council (Revised)," [www.ffsc.org](http://www.ffsc.org), for more detail.

*Total Financing Cost and Economic Return* is actual interest paid on real estate and non-real estate debt plus changes in accrued interest. Financing costs are highly variable between operations depending on the debt structure and loan repayment terms. Operators who finance their operation through retained earnings and do not borrow money will have total financing costs of zero.

*Total Pre-Tax Cost Before Non Calf Revenue Adjustment* is the sum of all pre-tax operating and financing costs.

*Net Pre-Tax Income (after withdrawals)* is net farm income (pre-tax) less family living withdrawals. Pre-tax figures are used since taxes paid are highly variable between operations, depending on other personal and business financial situations. Net farm income is the return to unpaid operator and family labor and management and the owner's equity capital. It is calculated by subtracting all farm operating expenses incurred from gross farm revenues. Because accrual accounting procedures are used, net farm income also reflects the gain/loss resulting from the sale of assets as well as changes in the values of inventories. In a profitable operation, net farm income is positive and hopefully, sufficiently large to compensate the owner for family labor, management, and equity conditions. Profits are needed over time to replace assets such as breeding livestock, machinery and equipment, and pay family living expenses.

*Percent Return on Assets (ROA)*<sup>10</sup> is an index of profitability. The higher the value, the more profitable the enterprise. Some limitations do exist. For instance, if two farms have the same net farm income but one leases land or other assets (the value is not included in owned assets), the ROA for the operation with leased assets will be significantly higher simply because of the way the assets are controlled. If the ROA exceeds the cost of debt financing or average interest rate, then borrowed capital is being used profitably in the business. If the ROA is less than the interest rate on the loan (the cost of debt financing), then increasing debt will further decrease equity. If operators do not include a value for family labor in the expense section or assign a portion of family living expenses to the cow-calf operation, this causes the ROA to be inflated.

## **Unit Cost of Weaned Calf Production (Break-even Economic Cost)**

*Total Non-Calf Revenue* is the sum of revenues generated by the cow-calf enterprise in addition to sales from calves weaned. Non-calf revenue includes gains or losses on cull cow or bull sales, the increase in base

value of quantities transferred into raised breeding stock, and farm consumption.

*Total Calf Pre-tax Cost (Non-calf Revenue Adjusted)* is a value derived for use in comparison to an average price for cull sales and other non-calf revenue, resulting in a break-even value. If a producer does not include a value for their labor in costs of production or assign a portion of family living expenses to the cow-calf operation, the break-even price is understated.

## **Economic Return**

*Rate of Economic Return on Real Estate Investment at Market Value* attributes all net economic income to the real estate investment. If the rate is below an expected rate of capital return, it means the real estate investment might earn more outside the cow-calf enterprise. The statistic is not calculated and will read N/A if some land is leased.

## **Putting It All Together...**

SPA is a set of guidelines and standards to encourage uniform data collection, calculation, analysis, and reporting of production, reproduction, marketing, economic, and financial indices of a cow-calf enterprise. SPA software integrates production and financial information to generate reports and statistics useful to ranch managers. The first SPA for a ranch serves as a baseline. Each additional year that a SPA is completed further documents the ranch management's financial and production track record.

## **References**

"Guidelines for Production and Financial Performance Analysis for the Cow-Calf Producers: Cow-Calf SPA".™ Extension Service - USDA, Washington, D.C. January 15, 1992. National Cattlemen's Association.

F-222, Cow-Calf Standardized Performance Analysis (SPA)

F-231, Cow-calf Financial and Production Performance: What We Are Learning from Standardized Performance Analysis (SPA) Data

F-751, Developing a Cash Flow Plan

F-752, Developing a Balance Sheet

F-753,, Developing an Income Statement

F-302 Information Systems for Oklahoma

WF-323, Valuation of Raised Breeding Livestock

WCR-3279, Cow-Calf Production Record Software

### **OSU Farm Financial Management Resources:**

[www.agecon.okstate.edu/ffmr.asp](http://www.agecon.okstate.edu/ffmr.asp)

### **Texas A&M Extension Services:**

<http://agecoext.tamu.edu/spa>

<sup>10</sup> ROA is the net enterprise income from operations plus total interest expenses, minus family living withdrawals, divided by the average of total enterprise assets, and multiplied by 100.

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