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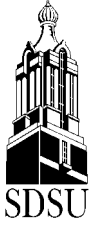
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## Characterization of the Beef Cow-calf Enterprise of the Northern Great Plains

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### Summary

One hundred eighty five privately owned and operated cow-calf enterprises provided production data on their beef cow-calf operations. One hundred and forty eight of those also provided financial information on a modified cost basis. The enterprises were located in the states of South Dakota, Nebraska, Montana, Minnesota, Iowa, Kansas, Wyoming, and North Dakota. The data were collected at the herd level according to Standardized Performance Analysis (SPA) guidelines during the years 1991-1999. By industry standards these operations were large, averaging just over 11,000 acres and 500 beginning year breeding females. They began calving approximately March 1<sup>st</sup>, had an average 93% pregnancy rates, and an average 86.7% weaning rate. They weaned at approximately 199 days and the average weaning weight of their calves was 519 pounds. These operations had invested on average \$2,087.00 per Beginning Fiscal Year Female. They spent \$397.00 of Total Expenses and realized \$33.00 of Net Income per Beginning Fiscal Year Female per year. Their average Return on Assets was 3.1%.

### Introduction

The cow-calf industry remains a large and dynamic part of the economy of the states in the Northern Great Plains of the United States. As over one-half of the farmers and ranchers in South Dakota have a cow-calf herd as part of their business, it is important to have benchmark data concerning the practices, production levels, and financial performance of these enterprises. The earliest report from South Dakota State University concerning these issues dates to 1930. Latter reports from South Dakota State University were published in 1982 the 1992. These reports add depth, richness and background for future analysis and decision making. The data reported herein was collected using a methodology approved by the cattle

industry in 1991 called Standardized Performance Analysis (SPA). Data within this report can be compared to data from other regions if similar methodology was used. However, caution should be advised in comparing these data to reports where SPA methodology was not used, as subtle differences in the definitions of terms and methodology can create misleading differences and could lead to erroneous conclusions.

### Materials and Methods

Data were collected from a sample of privately owned and operated commercial cow-calf enterprises. Dr. Edward D. Hamilton of South Dakota State University and Dr. Duane Griffith of Montana State University were the two individuals responsible for the collection of the SPA data. Data were collected from individual operations for the fiscal years 1991-1999. Individuals were invited to participate in the SPA process in a variety of methods. Veterinarians, county agents and educators, and Bootstraps groups hosted SPA workshops. Others contacted the University system through a variety of avenues and were invited to join scheduled workshops or were worked with on a personal basis. Participation was completely voluntary. The motivation of ranchers and farmers to participate was not recorded.

Farmers and ranchers from eight states cooperated in the collection of the data. All participants were asked for the animal production and financial information necessary to complete a SPA. Production data included: 1) breeding herd inventory and dates; 2) pregnancy test inventory and results; 3) female replacement rate; 4) the date the third mature cow in the herd calved; 5) calving distribution; 6) calf death loss; and 7) weaning date and weights. The financial information came from a variety of sources including: 1) cost basis beginning and ending year balance sheets; 2) accrual adjusted income statements; 3) IRS

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<sup>1</sup> Professor

Schedule F; and 4) depreciation schedules. This information was entered into one of three software packages used to calculate SPA numbers. They were: 1) CowCalf developed at the Great Plains Veterinary Educational Center of the University of Nebraska; 2) SPA-EZ written by Dr. Edward D. Hamilton, Dr. Daniel Kniffen, and Shawn Walters; and 3) SPA program and software developed at Texas A&M University.

During the spring of 2000, 239 individual SPAs were reviewed. Records from fifty-four herds were not used in the final data set for reasons including: 1) incomplete data entry; 2) obvious data entry inconsistencies; and 3) calculation errors that could not be reconciled by a third party. SPA production and financial measurements were used from 148 herds. ROA was measured by annual net income divided by average total assets. Net income is defined as a pre-tax and pre-family living measurement. Average total assets were calculated by averaging the beginning and ending year balance sheets. Balance sheet values were based on the financial cost of the assets or their book value. These data do not include deferred taxes. All data were collected on a cost basis of assets with accrual adjustments made to income statements. Means, standard deviations and minimum and maximum values were calculated for each SPA variable.

## Results and Discussion

The means, standard deviations and minimum and maximum values for SPA production variables can be found in Table 1. Financial variables are reported on a per hundred weight of weaned calf, per beginning year breeding female, per acre in Tables 2,3, and 4 respectively. Table 5 contains financial data on an enterprise level.

*Size and Scale of Cow-calf Enterprises:* By historic comparison, operations in this sample population were large. The average beginning breeding female inventory was 508 head. As measured by acres and stocking rate, there was great deal of variation in size of operation. This would be expected, as annual rainfall in the geographical region represented in this survey would range from 23-25 inches in the eastern and southern areas to 12-14 inches in the western and northern areas. The average size of operation was 11,147 acres. The average

stocking rate was 21.3 acres per exposed female

*Reproductive Performance:* The mean calving date was the 59.4 day of the year, or approximately March 1<sup>st</sup>. Calves in this data set were born approximately 58 days earlier than cow-calf operations surveyed by researchers from SDSU for the years 1977 and 1978. The average length of breeding season for these 185 herds was 88.2 days. The average pregnancy percentage was 93.0. The number of calves weaned per exposed female (weaning percentage) was 86.7%. This contrasts to 65% in 1930 and 78% in 1977 and 1978. It is of interest that while definitions for production traits has varied over the years and with different authors, weaning percent was calculated the same way in these historic references as it was in this analysis. While the range in weaning percent in this data set was wide, it does reflect the effect of the environment on the beef cow-calf enterprise of the Northern Great Plains. The lowest weaning percent of 42.5% occurred on a ranch in the north central section of South Dakota for fiscal year 1997. The winter and spring weather of 1996-1997 in this area was abnormally and extremely cold and snowy. The mean calving percentage for cow-calf enterprises in this data set was 91.4. Causes of death loss at calving were not recorded but averaged 4.9%.

The mean female replacement rate was 19.7% with a range of 0-115.4%. While the upper limit may appear high, the decision to expand a herd is a reality in cow-calf enterprises and has been captured in this data set.

The calving distribution of the 138 herds that collected this information in this data set with those records can be found in Table 1. During the first 21 days of the calving period, 56.8% of the calves were born. By the 42<sup>nd</sup> day, 84.1% of the calves were born and 96% of the calves were on the ground by the 63<sup>rd</sup> day of the calving season.

*Production Performance Summary:* The mean calf age at weaning was 199 days. The mean weaning weight of the calves in the 185 herds was 519 pounds. Male calves averaged 529 pounds and female calves 512 pounds. This is very similar to weaning weights reported in recent literature from many mid-western and western states. The average pounds weaned

per exposed female and per acre were 451 and 39 respectively.

*Financial Performance Summary.* The SPA Financial Summary data on a dollar per 100 lbs. of weaned calf basis, per beginning year breeding female and per acre dedicated to the cow-calf enterprise are presented in Tables 2,3, and 4 respectively. The only published literature using the SPA formulas as outlined in the SPA Guidelines and which correspond to the methodology used in the data collection and calculation of this data set are from Colorado and Texas. The SPA reports from Iowa, Michigan and Illinois are based on an entirely different methodology for the calculation of financial measures. Data collected and reported with farm management methodology, common in some states, uses different inventory adjustments, which makes comparisons of total costs, breakevens, and net income difficult. Farm management methodology and the Iowa and Illinois SPA reports also do not include investment levels on a cost basis, which results in profit reported as net income per cow without regard to differences in levels of productivity or levels of investment required to generate the different levels of net income.

The standard way of selling livestock from farms and ranches is by dollars per 100 pounds of weight. There is also tremendous management value in the understanding of the breakeven prices necessary to cover basic expenses on a per 100 pounds of weight basis. Often referred to as the unit cost of production, this knowledge adds market relevance and sensitivity for managers. The mean investment on a per 100 lbs. of weaned calf, was \$441.35. The average total cost on a per 100 lbs. of weaned calf was \$85.16. The average breakeven on a per 100 lbs. of weaned calf basis was \$70.05. This figure represents the Total Cost minus sources of income not derived from calves; for instance cull cow and cull bull income. It is the minimum amount a hundred weight of calves will have to bring in the market place to cover the expenses not covered by other sources of income. Calf revenue, non-calf revenue, and total revenue on a per 100 lb. of weaned calf was \$79.39, 36.09, and 93.92 respectively and are listed in Table 2. Net income per 100 lbs. of weaned calf was \$7.77.

Investment per beginning year breeding female was \$2087.00. The average total cost per

beginning year female was \$397.00. The mean breakeven on a per beginning year breeding female basis was \$331.00. Calf Revenue per beginning year female was \$364.00. Non-calf Revenue and Total Revenue per beginning year female was \$66.00 and \$430.00 respectively. Cull cow and cull bull income has been the subject of discussions suggesting that it represent between 20 and 30% of the income from cow-calf enterprises. According to SPA guidelines Non-calf Revenue not only includes cull cow and cull bull income, but also accrual adjustments made to the balance sheets for inventory adjustments. When the negative inventory adjustments are added back to the Non-calf Revenue figure, income from cull cows and bulls represents approximately 19.5% of Total Revenue. Even with this being the case, it is important to keep marketing decisions regarding cull cow and bull marketing decisions in perspective. While important, they are not nearly as important as marketing decisions affecting Calf Revenue and cannot make up for problems associated with calf marketing.

The Total Assets invested per acre in these sample cow-calf enterprises were \$191.82. This would include land, equipment and machinery, buildings, breeding stock and current assets like feed. The average annual Total Cost was \$33.21 per acre. The average breakeven on a per acre basis was \$28.02. Calf Revenue, Non-calf Revenue, and Total Revenue on a is listed in Tables 4. Net income per acre was \$6.85.

The mean owner's equity was 65% (Table 5). Owner's equity is also referred to as net worth and is a measure of solvency. In a standardized farm or ranch business analysis, analysts would consider 65% owner's equity to be in the cautionary zone. USDA-Economic Research Service estimates owner's equity of the average farm business in the United States to 83.8%.

In general, and by several measures, the enterprises in this sample population were not very profitable. On a per beginning year female basis, they had 508 head which generated only \$33.00 per head of Net Income for a total of \$16,764.00. That is \$16,764.00 to cover family living, unpaid family labor and management and the costs associated with debt service, both interest costs and principle payments. This problem also reflects itself in other figures. The average percentage Return on Assets was 3.1 (Table 5). This measurement has changed little

over time. A 1960 survey reported the return on assets of 20 South Dakota ranches to be 3.09%. In the year 2000, there are less than half of the cattle operations in South Dakota and Nebraska

as there were in 1970. While many factors may have had an affect on this trend, the lack of profitability was undoubtedly a significant contributor.

## Tables

Table 1. SPA production summary

	N	Mean	SD	Min - Max
<b>Cow-calf enterprise summary</b>				
Total adjusted exposed females	185	523	723	20 - 4806
Beginning fiscal year breeding females	185	508	700	20 - 4945
Total acres	185	11,147	20,033	51.7 - 131,421
Acres/exposed female	185	21.3	10.3	1.6 - 47.3
<b>Reproduction performance measures based on exposed females</b>				
Avg beginning Gregorian calving date	181	59.4	26.6	3 - 213
Length of breeding season, days	182	88.2	49.9	36 - 365
Pregnancy percentage	163	93.0	4.6	70.4 - 100
Pregnancy loss percentage	163	3.1	9.6	0 - 57.5
Calving Percentage	185	91.4	7.3	42.5 - 102.0
Calf death loss percentage	185	3.2	3.8	0 - 30.4
Calf crop or weaning percentage	185	86.7	7.8	42.5 - 100
Female replacement rate	178	19.7	19.4	0 - 115.4
<b>Calving performance measures based on calves born</b>				
Calf death loss rate, %	185	4.9	4.4	0 - 38.5
% calves born d 1 – 21	138	56.8	15.5	11.0 - 82.0
% calves born d 1 – 42	138	84.1	11.6	38.0 - 100
% calves born d 1 – 63	138	96.0	4.8	77.5 - 100
% calves born after 63 d	138	4.0	4.9	0 - 22.5
<b>Production performance, lb</b>				
Avg age at weaning	185	199.0	28.0	113.0 - 300.0
Avg weaning wt steer (bull)	175	529.1	64.9	381.9 - 720.1
Avg weaning wt heifer	175	511.9	59.0	345.0 - 681.1
Avg weaning wt per calf	185	519.0	60.1	367.0 - 700.1
Lb. weaned per exposed female	185	451.0	71.1	207.0 - 620.0
Lb. weaned per acre used by the cow-calf enterprise	185	39.0	23.8	7.6 - 225.6

Table 2. SPA financial summary, \$ per 100 lb of weaned calf

	N	Mean	SD	Min – Max
<b>Investment</b>				
Total assets	148	441.35	302.23	42.81 - 1782.29
Total liabilities	148	137.38	144.65	0.00 - 8.61
Avg real estate	148	289.02	220.63	0.00 - 1589.99
Owner's equity	148	304.28	223.75	23.53 - 1760.82
<b>Expenses</b>				
Veterinary medicine	108	4.08	3.00	0.00 - 14.71
Depreciation	108	11.08	10.33	0.00 - 44.98
Interest	108	8.14	8.91	0.00 - 43.37
Labor and management.	108	7.41	9.45	0.00 - 45.15
Purchased feed	108	13.56	12.43	0.00 - 63.37
Inventory adjustment	108	3.29	18.40	-110.18 - 74.57
Total expenditures	148	85.16	44.68	22.89 - 344.79
<b>Revenue</b>				
Calf revenue	148	79.39	42.21	11.25 - 316.92
Non-calf revenue	148	36.09	10.52	-23.60 - 167.87
Total revenue	148	93.92	36.18	126.20 - 336.57
<b>Profit</b>				
Breakeven	148	70.05	44.43	6.80 - 351.48
Net income	148	7.77	38.26	-15.75 - 81.62

Table 3. SPA financial summary, \$ per beginning year female

	N	Mean	SD	Min – Max
<b>Investment</b>				
Total assets	148	2087	1473	156 - 8944
Total liabilities	148	675	783	0 - 4805
Avg real estate	148	892	1055	0 - 6977
Owner's equity	148	1413	1009	-185 - 7726
<b>Expenses</b>				
Veterinary medicine	108	19	14	0 - 59
Depreciation	108	51	44	0 - 192
Interest	108	39	48	0 - 230
Labor and management.	108	33	23	0 - 252
Purchased feed	108	62	57	0 - 248
Inventory adjustment	108	18	96	-377 - 418
Total expenditures	148	397	217	96 - 2009
<b>Revenue</b>				
Calf revenue	148	364	180	63 - 1164
Non-calf revenue	148	66	106	44 - 942
Total revenue	148	430	159	208 - 1125
<b>Profit</b>				
Breakeven	148	331	217	31 - 2048
Net income	148	33	175	-152 - 379

Table 4. SPA financial summary, \$ per acre

	N	Mean	SD	Min – Max
<b>Investment</b>				
Total assets	148	191.82	176.40	12.51 - 1282.23
Total liabilities	148	46.57	58.66	0.00 - 630.11
Avg. real estate	148	113.39	155.30	0.00 - 954.17
Owner's equity	148	145.36	143.59	-11.45 - 1089.04
<b>Expenses</b>				
Veterinary medicine	108	2.41	4.09	0.00 - 26.07
Depreciation	108	5.59	8.99	0.00 - 58.46
Interest	108	2.62	3.40	0.00 - 19.55
Labor and management.	108	2.87	2.87	0.00 - 51.91
Purchased feed	108	7.30	6.64	0.00 - 82.72
Inventory adjustment.	108	.84	5.68	143.15 - 80.25
Total expenditures	148	33.21	35.03	4.17 - 210.48
<b>Revenue</b>				
Calf revenue	148	30.99	22.71	2.75 - 180.38
Non-calf revenue	148	5.21	9.32	-9.57 - 72.34
Total revenue	148	36.14	28.85	6.15 - 202.82
<b>Profit</b>				
Breakeven	148	28.02	32.47	1.82 - 212.55
Net income	148	6.85	16.80	-130.48 - 144.48

Table 5. SPA financial summary, owner's equity and return on assets (ROA), %

	N	Mean	SD	Min – Max
Owner's equity	148	65.0	27.3	-80 - 100
ROA	148	3.1	9.8	-37.9 - 31.9