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Summary

One hundred and forty eight privately owned and operated cow-calf enterprises were surveyed for their production and financial performance measures and the results analyzed for factors that affected profitability. The results of these analyzes indicate that for cow-calf enterprises in the Northern Great Plains, high levels of profit are a function of lower than average investment, above average reproductive performance, lower than average total expenses, and above average market prices for calves produced. Neither high nor low levels of other biological production, geographical region, size of operation, or year were factors that explained differences in profitability. Profitability measured as Return on Assets (ROA) in the High Profit group (18.16%) was higher ($P<0.01$) than Medium or Low Profit groups and are very competitive with opportunities available in other sectors of the economy. The profit levels in the Medium and Low Profit groups (2.88% and -15.55%) are not competitive with other opportunities for investment in the economy. The long-term financial viability of the operations in these two groups would be difficult without other sources of income or investment.

Introduction

In a large, dynamic, capitalistic economy, money, energy, and people flow to where returns on the investments of money, labor, and management are the highest. The historic return on assets for businesses in our nation's economy averages 10%. With historic profit levels of 2% return on assets, cow-calf businesses have not been financially friendly environments for individuals or families. Fully one-half of the cow-calf producers in South Dakota have exited the business during the last three decades.

The response of those in leadership positions in the cattle and ranching industry and communities has largely focused on three topic areas: 1) The marketplace, especially efforts to increase consumer demand for beef, exports/imports, and industry concentration; 2) production increases; and 3) policy discussions related to taxes, federal land use, subsidies, and environmental issues. While these topic areas are certainly important, the collection of actual ranch financial and production data, and the application of analytical tools common in other businesses could provide insight and understanding into the complex problem of profitability and sustainability. This was the direction taken with this research project conducted at South Dakota State University in collaboration with faculty at Montana State University. The objectives of this study were: 1). To compare the Standardized Performance Analysis (SPA) measurements of cow-calf enterprises in the Northern Great Plains that had been categorized into high, medium, and low profit groups based on ROA. 2). To determine factors that distinguished highly profitable cow-calf enterprises from other less profitable cow-calf enterprises.

Materials and Methods

Data were collected from 148 cow-calf enterprises for fiscal years during the period of 1991-1999, according to the Standardized Performance Analysis (SPA) guidelines adopted by the National Cattlemen's Association in 1992. Owners of farms and ranches that included cow-calf enterprises were invited to participate in the SPA process in a variety of methods. Veterinarians, county agents and educators, and Bootstraps groups hosted SPA workshops. Some ranchers and farmers contacted the University system on their own through a variety

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of avenues and were invited to join scheduled workshops or were assisted with SPA on an individual basis. Participation was completely voluntary. The names of the participants have never been released and their information and privacy have been protected. The motivation of ranchers and farmers to participate was not recorded. Data collection was either done by or supervised by Dr. Edward Hamilton of South Dakota State University or Duane Griffith of Montana State University.

All participants were asked for the animal production and financial information necessary to complete a SPA analysis. 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 as defined by SPA; 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 Schedule F; and 4) depreciation schedules.

Return on Assets (ROA) was measured by annual net income divided by average total assets times 100. Net income is defined as the accrual adjusted revenues minus accrual adjusted expenses and family living expenses, plus interest expenses, but before income tax. 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. The analysis does not address the issues of deferred taxes. In this analysis, ROA at cost allows for the measurement and comparison of the return to invested capital, owner labor and management, and family living withdrawal. It is generally considered the most inclusive measurement of profitability.

The data set was divided into three profit groups. The High Profit group represented those herds with ROAs greater than one standard deviation (9.8%) above the mean ROA of 3.1% (greater than a positive 12.9%). The Low Profit herds were those with a ROA one standard deviation lower than the mean ROA (less than a negative 6.7%). The Medium Profit group represented those herds with a ROA between a negative 6.7% and a positive 12.9%. The means for all SPA variables of the High Profit, Medium Profit and Low Profit groups were compared.

Farmers and ranchers from eight states cooperated in the collection of the data (Table 1.). In order to examine the possible effects that the type of operation or geographical location within the Northern Great Plains may have on profitability, the area was divided into three regions. Region 1 represented an area from east of U.S. Highway 281 in the states of North Dakota, South Dakota, Nebraska, and Kansas, and included Minnesota and Iowa. This region was chosen to represent crop/livestock type of operations. Region 2 represented an area located from U.S. Highway 281 to the western borders of North Dakota, South Dakota, Nebraska, and Kansas and was chosen to represent range operations. Region 3 was made up of the states of Wyoming and Montana and represented ranch operations on the eastern slope of the Rocky Mountains that may have significant amounts of Federal land in their operations and operate in a more arid environment.

The experimental unit in this study was a ranch. In this report, the SPA production data are averages of ranch averages. For example, the average weaning weight of calves in the High Profit group was 513 pounds. This number was obtained by averaging the average weaning weights of the calves on the 20 ranches in the High Profit group for a production year. This is important because data reported in Table 5 cannot necessarily be used to calculate other data in the table. Means, and standard error of the means (SEM), which is a measure of the variability within the data, were calculated and compared using the General Linear Model of SAS. Means were compared on a per 100 lb of weaned calf, per cow, and per acre basis. Only results on a 100 lb of weaned calf basis are reported. This proved to be the most sensitive measure of differences in the dataset. Key SPA measures, along with other descriptive variables, were also analyzed using regression analysis to determine their impact on profitability. A list of these variables is found in Table 2.

Results and Discussion

As in any business, owners and managers of cow calf enterprises need to avoid being a low profit producer. For long-term sustainability,

achieving high levels of profit is essential. It follows that understanding the managerial behavior of the High Profit group in this sample population is important. Of the 23 SPA production measurements used to describe the cow-calf enterprise the only measurement for which High Profit enterprises were higher (P < 0.10) than Medium and Low Profit enterprises was weaning percentage. High and Medium Profit enterprises did have higher calving percentages, and weaned more pounds per cow exposed than Low Profit (P < 0.10). Medium Profit weaned heavier calves, and heavier male calves than did Low Profit (P < 0.10). There were no significant differences between High and Medium Profit operations for measures of size of operation, weaning weight, pregnancy percentage, calving percentage, female replacement rate, the measures of calving distribution, pounds of weaned calf per cow exposed, or stocking rate.

The same was not the case for the comparisons of SPA financial measurements. On a per 100 lb. of weaned calf basis (Table 3), High Profit enterprises had fewer total dollars invested than did Medium Profit (P < 0.05). They also had lower depreciation expenses (P < 0.10) and lower total expenditures (P < 0.05) than both Medium and Low Profit enterprises. High Profit enterprises also had higher revenue (P < 0.05), lower breakevens (P < 0.05), and higher net income (P < 0.01) and higher ROA (P < 0.01) than Medium and Low profit enterprises (Table 4).

High levels of profit can arise from many combinations of production and financial performance. For example, differences in ROA can be based on different levels of both financial investment, and net income. Net income is a function of quantity sold, dollars received, and total expenditures. Differences in ROA between cow-calf enterprises could be explained by any combination of assets invested, quantity produced, market value of that production, or the cost of that production. However, in this sample population, High Profit enterprises invested fewer dollars, had higher total revenue, lower total expenditures, and higher levels of net income, than Medium Profit enterprises.

It is important to note that High Profit enterprises were able to produce the same number of pounds of calf per exposed female (Table 5) at a lower breakeven (P < 0.01), and at lower level of investment (P < 0.01) than Medium or Low Profit enterprises (Table 3). This is contrary to reports that highly profitable cow-calf enterprises had higher production levels and annual expenses at least as high as average profit herds. It is important to note that differences reported by these other authors were numerical and not statistical.

Regression analysis resulted in similar results. On a per cwt. of weaned calf basis, Net Income, Owner's Equity, their interaction, and Pregnancy Percentage explained 81.27% of the variability in ROA. It can be interpreted that net income, arrived at by cost control, average production with a tendency towards high levels of reproduction, and excellent marketing, along with a strong financial position as reflected by owner's equity are key strategies for success in obtaining profitability.

Due to economies of scale, there has been speculation that larger cow-calf enterprises are more profitable than smaller operations. In this sample population, measurement of size of operation did not surface as a factor affecting profitability in regression analysis and there were no significant differences in size of operation between High, Medium, and Low Profit groups. While small operations may not be able to generate high enough levels of total income to fully cover family living and required returns to capital, they were just as efficient at converting dollars of investment into net income as large operations. This may be due to synergistic effects with other enterprises not measured by SPA. For example, the use of crop residues or the ability to depreciate equipment over multiple enterprises may compensate small operations for the loss of economies of scale when compared to larger operations.

There has also been speculation that regional differences may account for differences in profitability. While production systems in the three designated regions within this analysis vary, region was not a factor affecting profitability. This would indicate that the opportunity for profit was not determined by geographical region, but management's response to opportunities and challenges within regions.

While measurements on a per cow and per acre basis are useful and of interest, the most

sensitive unit of measure in these analyzes was on a hundred pounds of weaned calf basis. This is important because it is not only the unit of measure for marketing, but also the most inclusive measurement of productivity and efficiency.

The 18.16% ROA for High Profit herds (Table 4) in this sample population are very competitive with those of other businesses and investment opportunities in our economy. To generate $35,000.00 of family living and pay off all debt, as listed by individual operations and averaged for this study, in 10 years, the average cow-calf producer in the High Profit group would need a herd of approximately 200 beginning year breeding females. This size herd represents a very competitive opportunity for family farmers and ranchers from both an investment as well as labor perspective.

Implications

The results of these analyzes indicate that for cow-calf enterprises in the Northern Great Plains, high levels of profit are a function of lower than average levels of investment, at least average levels of biological production (with particular attention paid to measures of weaning and pregnancy percentage) achieved with lower than average total expenses, and higher than average market prices for calves produced. Neither high nor low levels of production, geographical region, size of operation, or year were factors that explained differences in profitability as expressed as ROA.

Tables

Table 1 . Location and number of participating farms and ranches

State	Number
South Dakota	43
Nebraska	68
Montana	54
Kansas	10
Wyoming	6
Iowa	6
Minnesota	3
North Dakota	1

Table 2. Variables used in regression analysis as possible factors affecting profitability

1. Avg weaning weight, lb
2. Number of beginning year breeding females
3. Pregnancy percentage
4. Weaning percentage
5. Pounds of weaned calf per cow exposed
6. Avg age at weaning, days
7. Pounds weaned per acre utilized by cow-calf enterprise
8. Total acres utilized by the cow-calf enterprise
9. Region
10. Breakeven, $ per 100 lb of weaned calf
11. Gross accrual revenue, $ per 100 lb of weaned calf
12. Total cow-calf enterprise operating costs, $ per 100 lb of weaned calf
13. Net pre-tax income, $ per 100 lb of weaned calf
14. Avg owner's equity, $ per 100 lb of weaned calf
15. Avg real estate investment, $ per 100 lb of weaned calf
16. Year

Table 3. SPA financial summary, $ per 100 lb of weaned calf for low, medium, and high profit cow-calf enterprises

	Low, n=17		Medium, n=111		High, n=20		
	Means	SEM	Means	SEM	Means	SEM	P>F
Investment							
Total assets	352.64[de]	74.37	477.62[e]	28.24	317.34[d]	64.92	.037
Total liability	113.00	36.05	148.86	13.69	95.23	31.46	.232
Avg real estate	103.12[g]	54.30	215.55[h]	20.62	114.24[g]	47.40	.039
Owner's equity	239.63	66.78	328.75	25.35	222.11	58.29	.147
Expenses							
Veterinary med	5.95[g]	0.89	3.95[h]	0.33	3.46[h]	.74	.077
Depreciation	17.98[g]	3.01	11.11[h]	1.11	6.15[i]	2.50	.013
Interest	7.16	2.24	8.54	0.85	6.77	1.95	.638
Labor & Mgt.	9.98	2.86	7.38	1.05	5.84	2.37	.538
Purchased feed	15.78	3.75	13.97	1.38	9.97	3.11	.416
Inventory Adj.	26.28[a]	6.19	1.28[b]	2.28	-2.41[b]	5.14	.001
Total expenses	145.52[d]	9.79	82.38[e]	3.71	60.92[f]	8.54	.001
Revenue							
Calf revenue	83.18[gh]	7.89	76.28[g]	3.04	92.96[h]	6.98	.083
Non-calf revenue	5.75	5.46	14.86	2.07	19.50	4.77	.161
Total revenue	88.92[d]	8.90	91.14[d]	3.38	112.45[e]	7.77	.038
Profit							
Breakeven	136.43[d]	9.28	66.05[e]	3.52	40.63[f]	8.10	.001
Net income	-56.63[a]	6.84	8.78[b]	2.60	51.53[c]	5.97	.001

[abc] Means within the same row with different superscripts differ (P < 0.01).
[def] Means within the same row with different superscripts differ (P < 0.05).
[ghi] Means within the same row with different superscripts differ (P < 0.10).
Note: The experimental unit in this analysis is a ranch. Data in the table cannot necessarily be used to generate other data.

Table 4. SPA financial summary, owner's equity and ROA for low, medium, and high profit cow-calf enterprises, %

	Low, n=17		Medium, n=111		High, n=20		
	Means	SEM	Means	SEM	Means	SEM	P>F
Owner's equity	67.95	2.24	68.83	.85	69.99	1.96	.741
ROA	-15.55[a]	1.28	2.88[b]	0.49	18.16[c]	1.12	.001

[abc] Means within the same row with different superscripts differ (*P < 0.01*).

Table 5. SPA production summary for low, medium, and high profit cow-calf enterprises

	Low, n=17		Medium, n=111		High, n=20		
	Mean	SEM	Means	SEM	Mean	SEM	P>F
Cow-Calf enterprise summary							
Total adjusted exposed females	490	182	535	69	486	159	0.942
Beginning fiscal year breeding females	469	176	519	67	474	154	0.940
Total acre	10,646	5,844	12,933	2,179	11,708	4,940	0.921
Acre/exposed female	21.74	17.29	24.21	7.41	24.21	14.82	0.468
Reproduction performance measures based on exposed females							
Avg beginning calving day of year	70	6	58	2	58	5	0.952
Days in breeding season	79	13	89	5	90	11	0.749
Pregnancy percentage	90.88	1.17	93.03	0.46	94.13	0.99	0.104
Pregnancy loss percentage	3.17	2.50	3.11	0.99	3.02	2.12	0.999
Calving Percentage	88[a]	1.80	92[b]	0.68	94[b]	1.57	0.061
Calf death loss percentage	2.98	0.96	3.42	0.36	2.37	0.84	0.501
Calf crop or weaning %	83[a]	1.91	87[a]	0.73	90[b]	1.67	0.029
Female replacement rate, %	15.99	5.04	20.28	1.90	19.32	4.36	0.725
Calving performance measures based on calves born							
Calf death loss rate, %	5.42	1.09	5.05	0.42	3.69	0.10	0.379
% calves born d 1 - 21	52.22	4.32	57.06	1.70	58.96	3.78	0.481
% calves born d 1 – 42	81.84	1.99	84.61	1.34	86.51	2.98	0.353
% calves born d 1 – 63 d	95.45	1.99	95.92	0.90	95.45	1.99	0.626
% calves born 63+ d	4.79	2.43	4.09	0.96	4.43	2.13	0.960
Production performance measures, pound							
Avg age at weaning, d	200	7	199	3	198	6	0.963
Avg weaning weight, male	499[a]	16	536[b]	6	513[ab]	15	0.056
Avg weaning weight heifer	487	15	517	6	504	13	0.133
Avg weaning weight calf	493[a]	15	525[b]	6	507[ab]	13	0.082
Lb. weaned/exposed female	413[a]	18	455[b]	7	455[ab]	15	0.078
Lb. weaned/acre used by the cow-calf enterprise	39.3	9.8	41.1	3.6	33.9	8.9	0.727

[a, b] Means within the same row with different superscripts differ ($P < 0.10$).

Note: The experimental unit in this analysis is a ranch. Data in the table cannot necessarily be used to generate other data.