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**AN ECONOMIC ANALYSIS OF
THE NORTH DAKOTA CATTLE INDUSTRY**

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AN ECONOMIC ANALYSIS OF THE NORTH DAKOTA CATTLE INDUSTRY

Abstract

The analysis was conducted to evaluate the impacts of both the Federal Agricultural Improvement and Reform Act of 1996 (FAIR) and the cattle cycle on the livestock enterprises. The North Dakota Representative Farm and Ranch Model, which uses the Food and Agricultural Policy Research Institute price projections as an input, was developed and used for this analysis. Net farm income and farm debt-to-asset ratios for the average and large beef cattle farms were analyzed.

The U.S. cattle industry has been characterized by cyclical variations in production and prices. It appears that the current cattle cycle is in the final stages of expansion. Cattle numbers continued to increase during 1995, but at a slow rate. Industry estimates are that the bottom of cattle prices will occur in late 1996 or 1997. Price recovery is projected to start sometime in 1998 as inventory numbers decline. Prices are forecast to rise through 2002.

Net farm income for the representative beef cattle farms is projected to follow the cattle cycle with the lowest net incomes during 1997-1999. Net farm income for most representative beef cattle farms recovers by 2002-2003. The debt-to-asset ratios for the representative beef cattle farms will likely rise throughout the forecast period.

Keywords: livestock, representative farms, cattle cycle, FAPRI

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Abstract

The analysis was conducted to evaluate the impacts of both the Federal Agricultural Improvement and Reform Act of 1996 (FAIR) and the cattle cycle on the livestock enterprises. The North Dakota Representative Farm and Ranch Model, which uses the Food and Agricultural Policy Research Institute price projections as an input, was developed and used for this analysis. Net farm income and farm debt-to-asset ratios for the average and large beef cattle farms were analyzed.

The U.S. cattle industry has been characterized by cyclical variations in production and prices. It appears that the current cattle cycle is in the final stages of expansion. Cattle numbers continued to increase during 1995, but at a slow rate. Industry estimates are that the bottom of cattle prices will occur in late 1996 or 1997. Price recovery is projected to start sometime in 1998 as inventory numbers decline. Prices are forecast to rise through 2002.

Net farm income for the representative beef cattle farms is projected to follow the cattle cycle with the lowest net incomes during 1997-1999. Net farm income for most representative beef cattle farms recovers by 2002-2003. The debt-to-asset ratios for the representative beef cattle farms will likely rise throughout the forecast period.

Keywords: livestock, representative farms, cattle cycle, FAPRI

Highlights

The combined net farm income for the large representative beef cattle farm will increase 131.6% for the North Central (NC) region between 1995 and 2003.

The combined net farm income for the large representative beef cattle farm will fall 21.3% for the South Central (SC) region between 1995 and 1997, and then will increase 423.0% between 1997 and 2003.

The combined net farm income for the large representative beef cattle farm will fall 62.8% for the West region between 1995 and 1997 and then will increase 311.6% between 1997 and 2003.

Net income from beef cattle for the Red River Valley (RRV) livestock farm will remain negative until 1998, and then it will increase to \$25,300 in 2002.

For the average livestock farm, the net income from beef cattle will remain negative until 1998 in the NC region and 1999 in the SC and the West regions. For the large livestock farm, the net income from beef cattle will remain negative until 1998 in the NC region and until 1999 in the SC and the West regions.

The combined net farm income from beef cattle and crop operations will fall 45.2% between 1995 and 1999 for the RRV farm and will recover 97.4% between 1999 and 2003.

The combined net farm income for the average representative beef cattle farm will fall 8.6% for the NC region between 1995 and 1997 and then will increase 21.5% between 1997 and 2003.

The combined net farm income for the average representative beef cattle farm will increase 41.8% for the SC region between 1995 and 2003.

The combined net farm income for the average representative beef cattle farm will fall 45.7% for the West region between 1995 and 1997 and then will increase 60.7% between 1997 and 2003.

The debt-to asset ratio for the large representative beef cattle farms will rise throughout the 1995-2003 forecast period. The debt-to-asset ratios for the large representative beef cattle farms will rise from the 0.35 to 0.39 range in 1995 to the 0.37 to 0.38 range in 2003.

The debt-to-asset ratio for the average representative beef cattle farms will rise throughout the forecast period. The debt-to-asset ratio for the RRV representative beef cattle farm will rise from 0.41 in 1995 to 0.45 in 2003. The debt-to-asset ratios for the other representative beef cattle farms will rise from the 0.29 to 0.32 range in 1995 to the 0.31 to 0.35 range in 2003.

An Economic Analysis of the North Dakota Cattle Industry

**Won W. Koo, Marvin R. Duncan, Richard D. Taylor,
Dwight G. Aakre, and Andrew L. Swenson***

The main objective of this analysis was to estimate the future net income and debt-to-asset ratios for different sizes of representative beef cattle farms selected from the North Dakota Farm and Ranch Business Management Association farm records. The farm records were completed and reported by farm and ranch operators across the state. They were compiled and summarized by instructors participating in the program. The program was in cooperation with the North Dakota State Board of Vocational Education. The records were analyzed by the FINPACK Center which is located at North Dakota State University. FINPACK computer software was developed by the University of Minnesota and was used to summarize the financial data within the business records.

In the previous studies conducted by the authors, income from livestock enterprises was assumed to remain constant, (Koo and et al.). In this study, beef cattle operations were targeted, and the analysis was conducted to evaluate the impacts of both the Federal Agricultural Improvement and Reform Act of 1996 (FAIR) and the cattle cycle (Stearns and Petry) on North Dakota livestock enterprises.

Procedure

This analysis was based on the North Dakota Representative Farm and Ranch Model which used the Food and Agricultural Policy Research Institute (FAPRI) price projections as an input. FAPRI is an Agricultural Policy Research Center located at Iowa State University at Ames, Iowa, and the University of Missouri at Columbus, Missouri. The model had seven representative beef cattle farms; one farm in the Red River Valley (RRV), two farms in each of the following regions: North Central (NC), South Central (SC), and Western (West) (Figure 1). The farms in each region were representative of both the average and the large beef cattle farms enrolled in the North Dakota Farm and Ranch Business Management Association. The representative beef cattle farms were developed from the North Dakota Vocational Agriculture Department farm record system data provided by cooperating North Dakota farmers and ranchers.

Net farm income and farm debt-to-asset ratios for the average and large beef cattle farms were analyzed. Five major crops, along with the beef enterprise, were used to estimate future net income and debt-to-asset ratios for the representative farms: wheat, barley, corn, soybeans, and sunflowers.

Figure 1

*Koo and Duncan are professors, Taylor is a research associate, and Aakre and Swenson are extension specialists, all in the Department of Agricultural Economics at North Dakota State University, Fargo.

The representative beef cattle farms were developed from livestock farms with more than 45 beef cows. A total of 205 beef cattle farms were identified and sorted into average and large representative beef cattle farms. The average representative beef cattle farm had between 46 and 195 beef cows. The large representative beef cattle farm had more than 195 beef cows.

Characteristics of the representative beef cattle farms in each region are shown in Table 1. The average representative beef cattle farm had 108 head of cattle in the NC region, 97 in the SC region, and 115 in the West region. The average representative beef cattle farm in each region had 1,276 cropland acres in the NC region, 1,178 in the SC region, and 1,053 in the West region. Only one representative beef cattle farm was developed for the RRV because of the small number of farms (15) with beef cows. The RRV representative beef cattle farm had 1,157 cropland acres and 85 head of beef cattle. The large representative beef cattle farm had 342 head of beef cattle in the SC region, 265 in the NC region, and 277 in the West region. The large representative beef cattle farm in each region had 1,103 cropland acres in the NC region, 1,651 in the SC region, and 1,322 in the West region.

The basic structure of the model is shown in Figure 2. Farm policy, crop revenue, and livestock revenue affect net farm income for the representative farms. Changes in return to cropland, given the market-determined capitalization rate, change land prices. Changes in land prices affect cash rental rates farmers are willing to pay on land used to produce crops.

Table 1. Characteristics of Representative North Dakota Farms With Beef Cattle, 1995

	RRV	NC		SC		West	
	Average	Large	Average	Large	Average	Large	Average
-----head-----							
Beef cows	85	265	108	342	97	277	115
Backgrounded calves	114	124	40	264	44	272	87
-----acres-----							
Total cropland	1,157	1,103	1,276	1,651	1,178	1,322	1,053
Spring wheat	459	398	297	842	603	634	581
Durum wheat	-	277	412	74	31	293	183
Barley	98	184	297	182	114	55	83
Corn	113	-	-	22	63	-	-
Sunflowers	92	83	81	255	179	-	-
Soybeans	230	-	-	2	16	-	-
Pasture	110	2,252	959	1,841	590	3,920	1,341

Figure 2

Structure of the Representative Farm Model

The model consists of two components: revenues and costs. The revenue component represents the total income from the farm operation, including farm program payments, crop and livestock revenue, and other farm income. The cost components include all expenses incurred in producing both crop and livestock.

Net Farm Income. Net farm income is calculated by subtracting total crop and livestock expenses from total farm income. Crop and livestock expenses consist of direct costs (including seed, fertilizer, fuel, repairs, feed, supplies, feeder livestock purchases, and hired labor) and indirect costs (including machinery depreciation, overhead such as insurance and licenses, land taxes, and land rent or interest on real estate debt). Total farm income is the sum of cash receipts from crop and livestock enterprises, government payments, CRP payments, custom work, patronage dividends, insurance income, and miscellaneous income. Net farm income is calculated as:

$$(1) \quad NFI = \sum_{j=1}^n Y_j P_j A_j + \sum_{h=1}^m P_h L_h + \sum_{j=1}^n S_j A_j + I^o - \sum_{h=1}^m EX_h^L - \sum_{j=1}^n EX_j^C$$

where

Y_j	=	yield per acre for crop j
P_j	=	price of crop j
A_j	=	planted acres of crop j
P_h	=	price of livestock h
L_h	=	number of livestock h sold
S_j	=	government subsidies for crop j per acre
I^o	=	other farm income
EX_j^C	=	total expenses in producing crop j
EX_h^L	=	total expenses in producing livestock h

Inventory changes, accounts receivable, accounts payable, and prepaid expenses and supplies are assumed to be constant from year to year. Cash crop receipts are based on predicted cash prices and yields in North Dakota. Cash prices received by farmers are estimated from North Dakota price equations which were estimated on the basis of the historical relationships between North Dakota prices and U.S. prices (FAPRI) of the commodities. North Dakota calf prices were estimated on the basis of the historical relationships between North Dakota calf prices (National Agricultural Statistics Service, NASS) and Oklahoma feeder steer calf prices (FAPRI). The prices reported by NASS are a yearly average of steer and heifer prices sold within North Dakota. Annual data from 1974 to 1993 were used to estimate price equations. Those equations were used to estimate cash prices received by North Dakota farmers. The FAPRI prices are used as exogenous variables in the price estimates.

Regional North Dakota yield trend equations were estimated from historical yield data reported by NASS from 1974 to 1993. The estimated equations were used to forecast crop yield trends for future years. A dummy variable was used to compensate for two drought years: 1980 and 1988.

Debt-to-asset Ratio. The debt-to-asset ratio was calculated by dividing total outstanding farm debt by total farm assets. Total debt included debt on land, intermediate debt, and short-term debt. Total assets included the price of farmland times acres of farmland, the depreciated value of farm equipment and supplies, livestock, and liquid assets. Withdrawal for family living and reductions in owned cropland prices reduced farm asset levels, increasing debt-to-asset ratios for representative farms.

Assumptions

This analysis was based of the following assumptions:

1. Net farm income from production of crops other than wheat, barley, corn, soybeans, and sunflowers (including potatoes and canola) remained constant during the analysis period.
2. All farm enterprises remained constant in size and operation during the analysis period.
3. The farm equipment stock remained constant, indicating that depreciation allowances were reinvested into farm equipment.
4. Inventory changes, accounts receivable, accounts payable, and prepaid expenses and supplies were constant from year to year.
5. All farms within a region had the same crop mix.
6. All farms within a region received the same price for commodities.
7. Yield differentials among regions that existed in 1993-94 will continue throughout the forecast period.

Enterprise Budgets

The FAPRI projected commodity prices (April 1996) under the FAIR Act of 1996 are used in these analyses to predict calf prices received by farmers in the region. The North Dakota calf and backgrounded calf prices were estimated using historical data from 1974 to 1994. The estimated equations are

$$\begin{aligned}
 CP_t &= 19.89 + 0.762(FP_t) \\
 &\quad (3.32) \quad (12.7) \\
 R^2 &= 0.89 \\
 BP_t &= -8.04 + 1.01(FP_t) \\
 &\quad (-1.74) \quad (16.24) \\
 R^2 &= 0.93
 \end{aligned}$$

where

CP_t = Average North Dakota Calf Price, 400-500 lbs.

BP_t = Average North Dakota Backgrounded Calf Price, 600-700 lbs.

FP_t = Oklahoma Feeder Steer Price, 500-600 lbs.

Table 2 shows the projected FAPRI Oklahoma feeder steer prices (500-600 lbs.) and the North Dakota estimated calf prices and backgrounded calf prices. The prices for North Dakota calves and backgrounded calves are used as inputs to estimate net farm income and farm debt-to-asset ratios.

Table 2. Calf Prices Projected by FAPRI and North Dakota Estimated Calf Prices

Year	FAPRI Calf	ND Calf	ND Background
-----\$/cwt-----			
1995	70.44	73.58	62.51
1996	60.90	66.31	52.95
1997	62.30	67.38	54.36
1998	71.25	74.20	63.32
1999	78.41	79.65	70.49
2000	87.51	86.59	79.60
2001	91.14	89.36	83.24
2002	96.60	93.52	88.71
2003	92.33	90.26	84.43

Table 3 shows the cow-calf enterprise budget for the beef cattle representative farms. The budgets were developed from costs and returns stated on the enterprise budgets reported by producers, in each region, enrolled in the North Dakota Farm and Ranch Business Management Association for 1995. The format, income, and expenses for the enterprise budgets were taken from the business records provided by the producers. The producers estimated and reported the expenses that were not a direct expense. The net return for cow-calf operations was projected for the representative farms by projecting this budget into the future, updating feed, calf, and cow prices each year. Calf weaning weights were assumed to rise 10 lbs. per year. Other direct and overhead expenses were assumed to increase 3% per year to address inflation.

Table 4 shows the backgrounding enterprise budget for the beef cattle representative farms. The net return for backgrounding operations was projected for the representative farms by projecting this budget into the future, updating feed and calf prices each year. Other direct and overhead expenses were assumed to increase 3% per year to address inflation.

Table 3. Cow-calf Enterprise Budget for North Dakota Beef Cattle Representative Farms, 1995

	RRV	NC	SC	West
Calves sold per cow	0.88	0.89	0.84	0.89
	----- \$ -----			
Beef calves sold	322.35	319.85	310.55	309.78
Cull cows sold	60.18	58.67	58.18	56.67
Stock cows purchase	<u>-77.82</u>	<u>-82.44</u>	<u>-80.46</u>	<u>-81.99</u>
Gross margin	304.71	296.08	288.27	281.46
Direct expenses				
Feed				
Barley	0.00	1.71	0.96	4.86
Corn	11.58	1.72	3.83	2.45
Wheat	0.00	0.00	1.36	0.00
Corn silage	25.04	4.66	9.76	11.16
Other grain	1.37	4.12	5.78	2.71
Other feed	110.51	128.17	122.01	106.79
Pasture	60.48	54.56	54.34	59.25
Livestock expenses	33.45	22.90	27.74	26.54
Other expenses	29.53	25.82	28.57	27.90
Operating interest	<u>12.56</u>	<u>8.68</u>	<u>10.27</u>	<u>6.60</u>
Total direct expenses	<u>284.53</u>	<u>252.35</u>	<u>264.62</u>	<u>248.25</u>
Return over				
direct expenses	20.19	43.73	23.65	33.21
Overhead expenses				
Hired labor	7.83	6.61	5.34	4.60
Interest	10.01	10.41	15.06	15.45
Utilities	3.38	6.76	8.47	9.79
Depreciation	6.55	13.23	12.13	13.93
Other misc	<u>11.90</u>	<u>12.01</u>	<u>12.73</u>	<u>17.40</u>
Total overhead expenses	<u>39.67</u>	<u>49.02</u>	<u>53.73</u>	<u>61.17</u>
Total listed expenses	<u>324.20</u>	<u>301.37</u>	<u>318.35</u>	<u>309.42</u>
Net return/cow	-19.48	-5.29	-30.08	-27.96

Table 4. Background Enterprise Budget for North Dakota Beef Cattle Representative Farms, 1995

	RRV	NC	SC	West
	----- \$ -----			
Background calves sold	418.64	480.69	407.24	459.86
Beef calves purchased	<u>-362.22</u>	<u>-420.99</u>	<u>-333.20</u>	<u>-362.46</u>
Gross return	56.42	59.71	74.03	97.39
Direct expenses				
Feed				
Barley	3.01	5.43	2.28	13.17
Corn	25.73	3.79	24.31	1.87
Wheat	14.68	0.00	0.04	0.00
Corn silage	10.22	4.91	5.61	8.74
Other grain	1.82	10.73	3.94	10.12
Other feed	21.51	46.44	33.81	38.07
Pasture	2.21	5.28	5.50	5.46
Livestock expenses	9.23	3.87	8.40	5.87
Other expenses	9.81	4.77	8.96	7.05
Operating interest	<u>3.17</u>	<u>0.70</u>	<u>6.13</u>	<u>1.08</u>
Total direct expenses	<u>101.39</u>	<u>85.92</u>	<u>98.98</u>	<u>91.43</u>
Return over				
direct expenses	-44.96	-26.22	-24.94	5.97
Overhead expenses				
Hired labor	2.53	1.52	1.67	0.49
Interest	3.09	1.62	2.26	2.16
Utilities	0.59	1.07	1.20	1.39
Depreciation	0.60	2.60	1.92	2.02
Other misc	<u>2.79</u>	<u>2.18</u>	<u>1.74</u>	<u>2.12</u>
Total overhead expenses	<u>9.60</u>	<u>8.99</u>	<u>8.79</u>	<u>8.18</u>
Total listed expenses	<u>110.99</u>	<u>94.91</u>	<u>107.77</u>	<u>99.61</u>
Net return/head	-54.56	-35.21	-33.73	-2.21

Beef Cycle

Figure 3 shows the historical prices for Oklahoma feeder steers (FAPRI) and North Dakota calf prices (NASS). The prices for both bottomed out in 1975 at between \$30 and \$35 per cwt. The price then increased until 1979 to over \$80 per cwt. Oklahoma feeder steers fell to below \$70 per cwt in 1986 and then increased to over \$90 per cwt in 1991-92. Prices since 1992 have fallen to \$70 per cwt. Historically, cattle prices have followed about a ten-year cycle.

Figure 4 shows the number of beef cows on farms on January 1 for 1974 through 1996 in both the United States and North Dakota (USDA). Beef cow numbers for the nation and the state follow similar trends. Beef cow numbers peaked in 1975, 1982, and probably in 1996, when the prices of calves were at or near their lowest point. Cow numbers for January 1, 1996, indicate an increase for the last half of 1995, but at a slower rate, indicating that the liquidation cycle had not started. FAPRI estimates that prices will bottom out for the current cattle cycle in 1996 or 1997 with calf prices near \$61 to \$62 per cwt (Table 2).

Results

Net Farm Income for Representative Beef Cattle Farms

Table 5 shows the net income from the cow-calf enterprise for the large and average representative farms. The net income from beef cattle operations was calculated by subtracting expenses relating to the production of beef cattle from gross sales of beef calves and cattle. These expenses include feed, livestock supplies, marketing costs, grazing fees, veterinary charges, feeder calf purchases, and breeding fees. Other expenses such as pasture costs, interest expense, and overhead were obtained from the enterprise budgets.

For the large beef cattle farm in the NC and West regions, net income from cow-calf enterprise will remain negative until 1998. The net income from the large beef cattle farms in the SC region will remain negative until 1999. The net income for large beef farms will increase to \$37,100, \$34,300, and \$28,800 in 2002 for the NC, SC, and West regions, respectively.

Net income from the cow-calf operation for the RRV livestock farm will fall and will remain negative until 1998. Net income will increase to \$10,700 in 2002. The eight-year average is \$4,400 per year. For the average beef cattle farm in the NC and West regions, the net income from the cow-calf operation will remain negative until 1998. The net income for the average beef cattle in the SC region will remain negative until 1999. Net income will increase to \$15,100, \$9,700, and \$12,000 in 2002 for the NC, SC, and West regions, respectively.

Figure 3

Figure 4

Table 5. North Dakota Net Farm Income From Cow-calf Operations for Representative Farms With Beef Cattle

	RRV	NC		SC		West	
	Average	Large	Average	Large	Average	Large	Average
-----000 dollars-----							
1995	-1.7	-1.4	-0.6	-10.3	-2.9	-7.7	-3.2
1996	-3.2	-5.3	-2.2	-17.4	-4.9	-12.6	-5.2
1997	-2.3	-3.1	-1.3	-14.5	-4.1	-10.3	-4.3
1998	1.1	7.2	3.0	-1.8	-0.5	0.0	0.0
1999	3.7	14.8	6.0	7.5	2.1	7.3	3.0
2000	7.0	25.2	10.3	20.1	5.7	17.4	7.2
2001	8.5	30.1	12.3	25.9	7.4	22.1	9.2
2002	10.7	37.1	15.1	34.3	9.7	28.8	12.0
2003	9.5	33.6	13.7	29.9	8.5	25.2	10.5
1996-2003 Ave	4.4	17.5	7.1	10.5	3.0	9.7	4.0

Table 6 shows the net income from the background enterprise for the large and average representative farms. For the large beef cattle farm in the NC and SC regions, the net income from backgrounding will remain negative until 2000. The net income for the large beef cattle representative farm in the West region will remain negative until 1999. The net income will increase to \$8,800, \$17,800, and \$33,700 in 2002 for large beef cattle farms in the NC, SC, and West regions, respectively.

Table 6. North Dakota Net Farm Income From Backgrounding Operations for Representative Farms With Beef Cattle

	RRV	NC		SC		West	
	Average	Large	Average	Large	Average	Large	Average
-----000 dollars-----							
1995	-6.2	-4.4	-1.4	-8.9	-1.5	-0.6	-0.2
1996	-6.4	-11.4	-3.7	-23.7	-3.9	-16.0	-5.0
1997	-5.9	-11.7	-3.8	-23.5	-3.9	-16.3	-5.1
1998	0.6	-5.2	-1.7	-10.2	-1.7	-0.7	-0.2
1999	4.8	-1.1	-0.4	-1.8	-0.3	9.5	3.0
2000	9.9	4.2	1.4	8.5	1.4	22.3	7.0
2001	12.6	6.9	2.2	14.0	2.3	28.8	9.0
2002	14.6	8.8	2.8	17.8	3.0	33.7	10.6
2003	13.2	7.6	2.5	15.4	2.6	30.4	9.6
1996-2003 Ave	5.4	-0.2	-0.0	-0.4	-0.0	11.5	3.6

The net income from backgrounding for the RRV livestock farm will continue to be negative until 1998. The net income will increase to \$14,600 in 2002. The eight-year average is \$5,400 per year. For the average beef cattle farm in the NC and SC regions, the net income from backgrounding will remain negative until 2000. The net income for the average beef cattle representative farm in the West region will remain negative until 1999. The net income will increase to \$2,800, \$3,000, and \$10,600 in 2002 for the NC, SC, and West regions, respectively. The eight-year average is negative for both the large and average farms in the NC and SC regions.

Figures 5 and 6 show the net income from cow-calf and backgrounding operations for the representative beef cattle farms. The net income from beef operations for the average farms in the four regions follows similar patterns. The net income from beef cattle decreases in 1996 from 1995 for all representative farms. It remains negative until 1998-1999. The net income then increases in all four regions, reaching a peak in 2002. The increases are due to higher cattle prices beginning in 1998.

Figures 7 and 8 show the net income received from all non-beef cattle operations. The representative beef cattle farm's net income from crop enterprises is lower for all farms and in all regions in 2003 than in 1995.

The net income from crop enterprises for the average North Dakota beef cattle farms declines substantially over the forecast period. Net income from crop enterprises declines until about 2001-2002 and increases in all regions for both large and average representative farms in 2003. Table 7 shows the 1996 to 2003 average for non-beef income for beef cattle representative farms.

Figures 9 and 10 show the combined net farm income from both crop and livestock for North Dakota large and average beef cattle representative farms. The net income for the average representative farms declines until 1997 for all farms except the RRV, where it declines until 1999. In each case, after the period of decline, net farm income generally rises until the end of the forecast period. For the large farm, the net income falls until 1997 and then increases throughout the remainder of the forecast period.

Table 8 shows the combined net farm income from grain and livestock for representative beef cattle farms. The combined net farm income for the large representative beef cattle farm for the NC region increases 131.6% between 1995 and 2003 (from \$34,800 to \$80,600). The combined net farm income for the large representative beef cattle farm falls 21.3% (from \$18,800 to \$14,800) for the SC region between 1995 and 1997; it then increases 422.9% (to \$77,400) between 1997 and 2003. The combined net farm income for the large representative beef cattle farm falls 62.8% for the West region between 1995 and 1997 (from \$57,800 to \$21,500); it then increases 311.6% (to \$88,500) between 1997 and 2003.

Figure 5

Figure 6

Figure 7

Figure 8

Figure 9

Figure 10

Table 7. North Dakota Net Farm Income From Crop Enterprises for Representative Farms With Beef Cattle

	RRV	NC		SC		WEST	
	Average	Large	Average	Large	Average	Large	Average
-----000 dollars-----							
1995	42.4	40.6	49.8	38.0	38.1	66.2	64.4
1996	40.7	64.7	60.4	62.3	59.2	65.2	54.2
1997	28.0	53.1	48.7	52.7	46.8	48.2	42.5
1998	18.1	51.2	46.0	44.0	42.3	44.0	40.9
1999	10.4	46.9	42.4	34.4	37.7	36.6	37.2
2000	10.0	44.8	42.1	31.5	37.6	33.8	37.1
2001	7.2	36.5	35.2	22.9	32.3	25.1	31.1
2002	9.0	35.7	33.4	23.5	33.3	26.3	30.8
2003	14.7	39.4	36.9	32.1	36.8	32.8	33.2
1996-2003							
Ave	17.3	46.5	43.2	37.9	40.7	39.0	38.4

Table 8. North Dakota Combined Net Farm Income for Representative Farms With Beef Cattle

	RRV	NC		SC		West	
	Average	Large	Average	Large	Average	Large	Average
-----000 dollars-----							
1995	34.5	34.8	47.8	18.8	33.7	57.8	61.0
1996	31.0	47.9	54.6	21.3	50.3	36.6	43.9
1997	19.8	38.3	43.7	14.8	38.7	21.5	33.1
1998	19.8	53.2	47.3	32.0	40.1	43.3	40.7
1999	18.9	60.7	48.1	40.1	39.5	53.3	43.2
2000	26.9	74.2	53.7	60.0	44.7	73.5	51.3
2001	28.4	73.6	49.7	62.9	42.0	76.0	49.3
2002	34.3	81.6	51.4	75.6	46.0	88.8	53.4
2003	37.3	80.6	53.1	77.4	47.8	88.5	53.2
1996-2003							
Ave	27.9	60.5	49.9	44.8	42.5	59.9	47.7

The combined net income falls 45.2% between 1995 and 1999 for the RRV farm (from \$34,500 to \$18,900) and recovers 97.4% (to \$37,300) between 1999 and 2003. The combined net farm income for the average representative beef cattle farm falls 8.6% for the NC region between 1995 and 1997 (from \$47,800 to \$43,700) and then increases 21.5% (to \$53,100) between 1997 and 2003. The combined net farm income for the average beef cattle representative

beef cattle farm for the SC region increases 41.8% between 1995 and 2003 (from \$33,700 to \$47,800). The combined net farm income for the average representative beef farm falls 45.7% for the West region between 1995 and 1997 (from \$61,000 to \$33,100) and then increases 60.7% (to \$53,200) between 1997 and 2003.

Debt-to-asset Ratios for Representative Beef Cattle Farms

Figures 11 and 12 show the debt-to-asset ratio forecast for the large and average representative beef cattle farms. The debt-to-asset ratios for the large representative beef cattle farms also generally rise throughout the forecast period. The debt-to-asset ratios for the large representative beef cattle farms rise from between 0.35 and 0.39 in 1995 to between 0.39 and 0.41 in 2003. The debt-to-asset ratios for the average representative beef cattle farms generally rise throughout the forecast period. The debt-to-asset ratio for the RRV farm rises from 0.41 in 1995 to 0.45 in 2003. The debt-to-asset ratios for the other regions rise from between 0.29 and 0.32 in 1995 to between 0.36 and 0.40 in 2003. In no case does the debt-to-asset ratio for a representative beef cattle farm rise high enough to impair that farm's credit-worthiness. Table 9 indicates the debt-to-asset ratios for average and large livestock farms.

Because the crop income for the North Dakota representative farms cushions the losses due to cattle production, debt-to-asset ratios do not rise to worrisome levels for the representative farms.

Table 9. Debt-to-asset Ratios for North Dakota Representative Farms With Beef Cattle

End of Year	RRV Average	NC		SC		West	
		Large	Average	Large	Average	Large	Average
1995	0.41	0.39	0.32	0.37	0.30	0.35	0.29
1996	0.42	0.37	0.32	0.36	0.28	0.34	0.28
1997	0.43	0.38	0.33	0.36	0.29	0.35	0.30
1998	0.44	0.38	0.33	0.36	0.29	0.35	0.34
1999	0.45	0.38	0.34	0.37	0.30	0.35	0.35
2000	0.45	0.38	0.34	0.37	0.31	0.35	0.36
2001	0.46	0.38	0.35	0.38	0.32	0.37	0.39
2002	0.47	0.39	0.36	0.38	0.33	0.39	0.37
2003	0.45	0.39	0.36	0.39	0.34	0.41	0.40
1996-2003 Ave	0.45	0.38	0.34	0.37	0.31	0.37	0.35

Figure 11

Figure 12

Considering the beef cattle enterprise alone, the indicated losses in this study may exceed the actual cash losses where the beef cattle farm is producing its own hay and forage and providing its own pasture. That too would limit the increases in debt-to-asset ratios for the representative farms. This is true since the analysis assumed a market price for hay, forage, and pasture which was credited to the crop enterprises.

In those cases where beef cattle producers must pay out cash expenses to purchase hay, forage, and pasture, the cash losses would be as indicated in the budget analysis. For those farmers, a substantially greater increase in debt-to-asset ratios might also be expected.

Conclusions

Historically, the U.S. cattle industry has been characterized by cyclical variations in production and prices. The cycles are about 10 years in length. It appears that the current cattle cycle is in the final stages of expansion. Cattle numbers continued to increase during 1995, but at a slow rate. Reduction in cattle inventories may be evident by the end of 1996. Industry estimates are that the bottom of cattle prices will occur in late 1996 or 1997. Price recovery should occur sometime in 1998 as inventory numbers decline. Prices are forecast to rise through 2002.

Net farm income for the representative beef cattle farms is projected to follow the cattle cycle with the lowest net incomes during 1997-1999. Net farm income for most representative beef cattle farms recovers by 2002-2003.

The debt-to-asset ratios for the representative beef cattle farms will likely rise throughout the forecast period, beginning in the 0.29 to 0.41 range in 1995 and ending in the 0.31 to 0.45 range by 2003.

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