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Economics of Establishing a Beef Cattle Feedlot Using By-Products of Ethanol Production in North Dakota



Larry D. Stearns
Randall S. Sell
David L. Watt
V.L. Anderson

Department of Agricultural Economics - Agricultural Experiment Station
North Dakota State University, Fargo, ND 58105-5636

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The authors accept sole responsibility for any omissions or errors.

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HIGHLIGHTS

North Dakota is one of the top 10 states in production of feed grains. However, North Dakota exports a large share of its feed grains rather than feeding them to animals which are also exported. The Archer Daniels Midland (ADM) ethanol plant, located near Walhalla, ND, produced about 15 million gallons of ethanol and 55,845 tons of dry distillers' grains (DDG) per year in 1992. This study estimated economic feasibility of building and operating a beef feedlot to use by-products (wet distillers' grains and thin stillage) from the ethanol plant.

Detailed feedlot investment and operating costs were determined for a 10,200 head feedlot finishing 22,161 head of cattle annually on various rations. The estimated investment for the model feedlot was \$2,033,502. The feedlot assumably would be operating at full capacity in 6 months and would require approximately \$6.4 million in operating capital before the first finished cattle are sold.

Three alternative scenarios were investigated. First, a ration consisting of corn, straw, grass hay, wet distillers' grains (WDG), and thin stillage, was designed to use WDG and thin stillage based on expected animal performance from a WDG and corn feeding trial at Carrington Research Center, winter, 1992-93. Second, a conventional ration, represents profitability of finishing steers and heifers in a feedlot without feeding WDG or thin stillage. The third examines performance of the ADM steer feeding trial where steers were fed alfalfa, corn, barley, wet distillers' grains, thin stillage, and cob meal in 1992.

Ten-year profitability and cash flow statements were developed for each scenario, using livestock and feed price relationships from 1980 through 1989. Average profitability per head and cumulative net cash flow were \$9.88 and \$6,091,240; -\$24.83 and \$144,209; and \$9.04 and \$6,571,928 for the Carrington trial ration, conventional ration, and ADM trial ration, respectively.

ECONOMICS OF ESTABLISHING A BEEF CATTLE FEEDLOT USING BY-PRODUCTS OF ETHANOL PRODUCTION IN NORTH DAKOTA

Larry D. Stearns, Randall S. Sell, David L. Watt and V. L. Anderson*

North Dakota has been in the top 10 states for the production of feed grains for over 15 years. However, North Dakota exports a large share of its feed grains rather than feeding them to animals that are exported. The increase of ethanol processing plants in North Dakota, has increased availability of by-products. Given these trends, the economic feasibility of a beef feedlot located in North Dakota seems plausible. This report discusses the economic feasibility of a beef feedlot located near Walhalla, North Dakota, feeding by-products from Archer Daniels Midland (ADM) ethanol plant.

RESOURCES AVAILABLE

North Dakota Agricultural Statistical Service (1991) reports approximately 189,555 head of feeder calves were available in the northeastern one-quarter of North Dakota in 1991. About five percent were finished as slaughter animals in the state (Table 1).

The ADM ethanol plant, located in Walhalla, produced about 15 million gallons of ethanol and 55,845 tons of dried distillers' grains (DDG) a year in 1992. ADM sells most of the DDG to dairy producers in the northeastern United States. Marketing the DDG as wet distillers' grain (WDG) would save energy for ADM. WDG is about 65 percent moisture while DDG is 12 percent moisture. Removing 1 pound of water from WDG requires approximately 1,500 BTUs with a grain dryer at 80 percent efficiency (Hirning, 1992). This translates into a potential savings in energy alone of about \$10.93/ton of DDG (LP contains 91,500 BTUs/gallon and costs \$.63/gallon).

Crop residues and hay are available (Table 2). Assuming a 10,200 head capacity feedlot producing 22,161 head of finished cattle per year, would require an estimated 3,600 tons of hay and 4,000 tons of straw. This is about four percent of the hay production in Pembina and Cavalier Counties. Other feedstuffs necessary to finish this number of cattle would be 629,771 bu. of corn and 33,000 tons of WDG. These feeds are readily available through normal marketing channels.

*Stearns, Sell, and Watt are research assistant, research assistant, and associate professor, respectively, Department of Agricultural Economics, North Dakota State University. Anderson is an Animal Scientist, Carrington Research and Extension Center, Carrington, North Dakota.

Table 1. Feeder Cattle Available From North Central, Northeastern, Central, and East Central Regions of North Dakota, 1991

Region	Total cattle	Beef cows that have calved	Feeder calves ^a
North Central			
Benson	26,500	14,965	10,026
Bottineau	16,000	9,035	6,054
McHenry	66,000	37,271	24,971
Pierce	30,000	16,941	11,351
Rolette	<u>21,500</u>	<u>12,141</u>	<u>8,135</u>
	160,000	90,353	60,536
Northeast			
Cavalier	7,800	4,405	2,951
Grand Forks	8,000	4,518	3,027
Nelson	12,500	7,059	4,729
Pembina	8,500	4,800	3,216
Ramsey	7,500	4,235	2,838
Towner	7,500	4,235	2,838
Walsh	<u>13,200</u>	<u>7,454</u>	<u>4,994</u>
	65,000	36,706	24,593
Northwest			
Burke	11,000	6,212	4,162
Divide	13,500	7,624	5,108
Mountrail	33,500	18,918	12,675
Renville	7,000	3,953	2,648
Ward	44,000	24,847	16,648
Williams	<u>26,000</u>	<u>14,682</u>	<u>9,837</u>
	135,000	76,235	51,078
East Central			
Barnes	23,500	13,271	8,891
Cass	22,000	12,424	8,324
Griggs	1,500	847	568
Steele	6,000	3,388	2,270
Traill	<u>3,000</u>	<u>1,694</u>	<u>1,135</u>
	56,000	31,624	21,188
Central			
Eddy	20,000	11,294	7,567
Foster	19,000	10,729	7,189
Kidder	74,500	42,071	28,187
Sheridan	25,000	4,118	9,459
Stutsman	54,000	30,494	20,431
Wells	<u>27,500</u>	<u>15,529</u>	<u>10,405</u>
	<u>220,000</u>	<u>124,235</u>	<u>83,238</u>
Total in Northeast area	501,000	282,918	189,555
North Dakota	1,700,000	960,000	643,200

^aBased on assumption that 67 percent of beef cows calving produced feeder calves.

Source: North Dakota Agricultural Statistics, 1991.

Table 2. Ten-year Average Roughage Available Per Year for All Hay and Small Grains in Pembina and Cavalier Counties of North Dakota, 1979-1988

County	Crop	Collectable Production
		---tons/year---
Pembina	All hay	26,635
Pembina	Small grains	553,400
Cavalier	All hay	23,347
Cavalier	Small grains	820,036

Source: Johnson and Bangsund, 1990.

FACILITIES

The feedlot would require a feed handling building, cattle processing barn, cattle hospital barn, office, a maintenance shop, feed handling facilities, equipment, a semi scale, corrals, gates, working chutes, squeeze chutes, feed bunks, hay racks, windbreaks, mounds, lagoons, water supply, miscellaneous machinery, and a livestock scale.

Analysis for establishing a feedlot requires a clear description of the facilities. Facilities for 10,200 head would have 17 sections with a 600 head capacity per section. These 17 sections would be divided into smaller lots in multiples of semi-loads of feeder cattle (approximately 60 head). Pen sizes recommended are a combination of 60, 120, 180, and 240 head lots (Table 3). A schematic drawing of the general layout is shown in Figure 1.

Table 3. Total Amount of Fencing and Feed Bunks Required for 10,200 Capacity Feedlot

<u>Pen Size</u> --head--	<u>Number of</u> <u>Pens</u>	<u>Total</u> <u>Head</u>	<u>Fencing</u> <u>Per Head</u> --feet--	<u>Total</u> <u>Fence</u> --feet--	<u>Total</u> <u>Bunk</u> --feet--
60	10	600	9.2	5,520	500
120	24	2,880	5.5	15,840	2,400
180	24	4,320	4.3	18,576	3,600
240	<u>10</u>	<u>2,400</u>	3.7	<u>8,880</u>	<u>2,000</u>
Total	68	10,200		48,816	8,500
				(9.25 miles)	(1.6 miles)
Hospital Area Fencing				1,500	240
Loading/unloading and processing area fencing				1,200	360

Source: V.L. Anderson, Animal Scientist, Carrington Research Extension Center.

Cost estimates for establishing a feedlot are important. The following is based on 1991 cost estimates of buildings, where no previous feeding facility has been, but which is well suited for a feedlot. The office building and maintenance shop were combined in a 104-ft. by 60-ft. pole-type building with 16-ft. sidewalls. This is an insulated building with cement floors. The feed mill would be housed in a pole barn type building next to the grain handling facilities and dump pit. This building would be 104-ft. by 30-ft. with 16-ft. sidewalls, uninsulated, with a cement floor. The cattle processing barn and cattle hospital barn are both 48-ft. by 40-ft. with 12-ft. sidewalls, cement floors, and uninsulated. Estimated cost for all buildings, including cement, electric wiring, plumbing, and doors, is \$174,960 (Faultz Builders, Detroit Lakes)

Grain handling facilities were designed to store a 21-day supply of concentrate with the feedlot at full capacity. The grain facilities include three 25,000 bu. steel bins, a 3,000 bu./hour grain leg and dump pit, and a system to auger from bins to roller mills, and from roller mills to two 3,500 bu. overhead bins. Total estimated construction cost for this system, including cement and electric motors, is \$150,000 (Butler Grain Handling, Fargo).

The feed handling equipment includes electric roller mills, a hay grinder, and feed wagons. Two Automatic™ electric roller mills, are each capable of processing about 2,000 bushels of grain per hour, depending on coarseness of grind. Each roller mill is powered by a 60-hp. 3-phase electric motor. Installed cost of both roller mills, complete with electric motors, is \$29,750 (Grainger, Fargo). The tub grinder is a Haybuster™ self-contained model, capable of processing 30 tons/hour (\$53,000 at Haybuster Equipment, Jamestown). Feeding trucks are equipped with electronic scales and a 490 cubic foot ROTOMIX™ feed wagon. Total cost for one new and one used truck, feed wagons, and truck-mounted scales is \$108,000 (Tom Pullen, Sales Representative for Bill's Volume Sales, Inc., Central City, Nebraska).

The feedlot will need 34 waterers, 68 stillage tanks, 25 mercury lights, 230 12-foot long gates, 48,840 ft. of corral fencing, and 4,500 ft. plank fencing (working facilities, chutes, and receiving pens). The waterers cost \$500 each, delivered and installed (Stockman's Supply, West Fargo). Stillage waterers are tractor tires mounted in cement at a cost of \$100 each, not including cement (V.L. Anderson, Carrington Research Extension Center). Mercury lights cost \$750 each, including pole, light, wiring, ditching, and installation (Fritz Electric, Fargo). The gates are 12-ft. Powder River gates, costing \$109 each (Stockman's Supply, West Fargo). Linn corral fencing is available at \$4.76 per linear foot (Linn Enterprises, Linn, Kansas). Three working chutes are available from Linn Enterprises for \$15,000 (Linn Enterprises, Linn, Kansas). Total cost for waterers, mercury lights, gates, fencing, and working chutes is \$332,588. Other miscellaneous machinery and equipment are listed in Table 4.

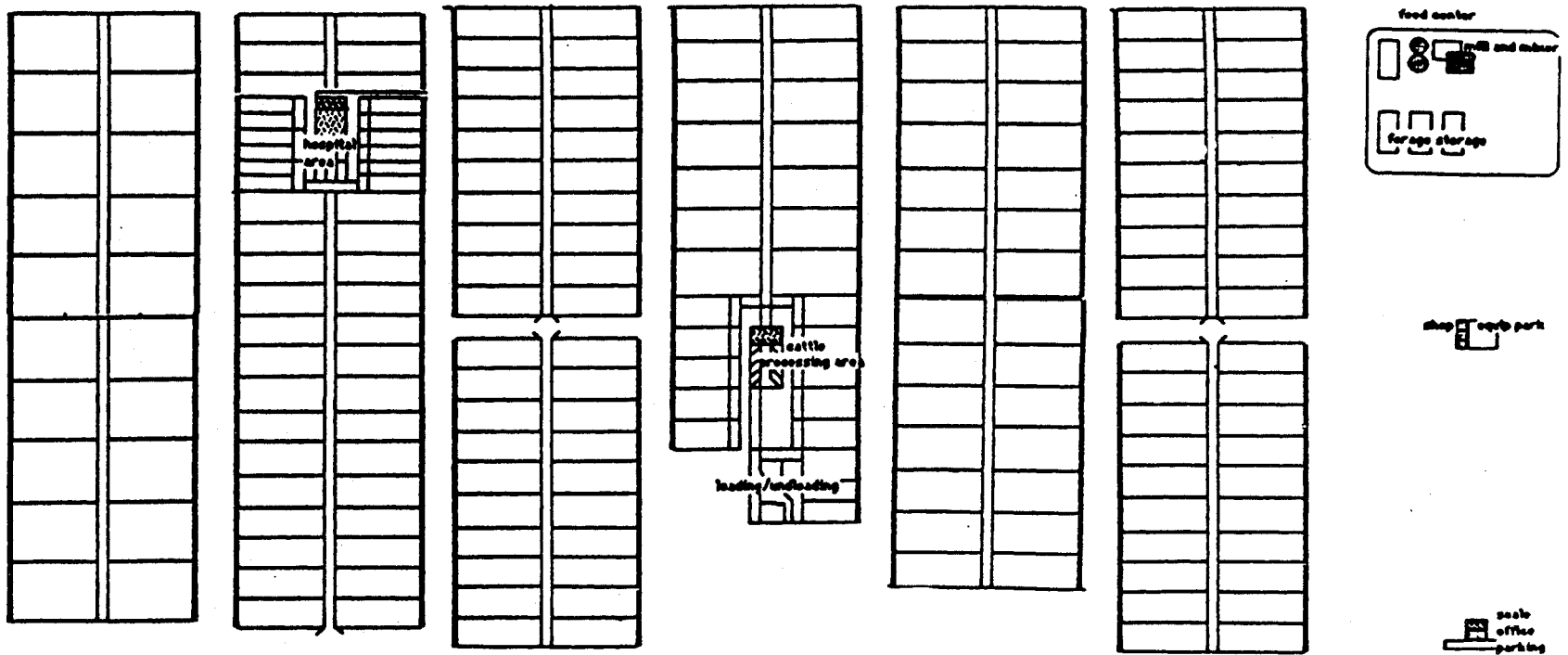


Figure 1. Schematic Drawing of Proposed Feedlot

Table 4. Other Machinery and Equipment Costs

Machinery/equipment	List price
Payloader-115 hp John Deere 2.63 yd. scoop ^a	\$ 91,600
Loader tractor-130 hp ^b	61,000
Tractor-70 hp ^b	30,000
3 point- 2 auger, 96" Snowblower John Deere ^b	3,000
Heavy duty 9' rear scraper blade ^b	2,700
9' three point mower ^b	3,200
Ford pickup 2 wheel dr ^c	13,000
Ford pickup 4 wheel dr ^c	16,000
Tandem truck for stillage ^d	65,000
Tandem truck for WDG ^d	65,000
Heavy-duty dump truck-new ^c	65,000
Goose neck trailer ^e	6,000
Post hole auger ^f	1,900
Hay feeders (6)ft. ^f	18,000
Powder River hydraulic squeeze chute ^f	6,500
Mechanical chute& self catch head gate ^f	1,500
(2) saddle horses & tack	6,000
Total cost other machinery	\$ 455,400

^aMidwest Industrial Machinery, Inc., Fargo

^bFargo Implement, Inc., Fargo

^cWallwork Truck Center, Fargo

^dHall-GMC, Fargo

^eTaylor Trailer Sales, Inc., West Fargo

^fStockman's Supply, Inc., West Fargo

The feedlot requires two water wells (\$8,000 each, LTP Enterprises, Fargo). Each pen must have a windbreak at least 8-ft. high. Total cost of the windbreaks is \$28,519 for 4,080 linear feet of windbreak, including construction costs. Cement necessary for feeding aprons, watering pads, and fence posts costs \$296,940 (Kalis Masonry, Construction, and Supplies, Walhalla). Precast cement feed bunks cost \$132,892 delivered and installed (J D Precast, Plankinton, South Dakota). Seventy-five thousand cubic yards of soil must be moved to construct the lagoon(s) necessary to comply with state and federal regulations concerning pollution control (\$113,400, Northern Improvement Company, Fargo). Ditching for water and electricity to waterers and building sites will cost \$13,860 (Fritz Electric, Fargo).

Heinisch Scale Service, Fargo, would install a semi-truck and livestock scale for a total cost of \$75,080. The semi-truck scale measures 70 ft. by 10 ft. while the livestock scale is 30 ft. by 10 ft.

Approximately 100 acres of land would be necessary for a feedlot of this size. Total land acquisition costs were included at \$53,140.

Total capital investment for the 10,200 head feedlot is \$2,033,502. Depreciation per year was calculated by allocating the assets into their appropriate Internal Revenue Service classification (either 3-, 7-, 15-, or 20-year assets) and calculating depreciation, based on straight line depreciation with no salvage value. Total depreciation per year is \$256,056.

If the feedlot were built adjacent to the ethanol plant, a conveyor from the plant to the feed processing area could be built. This would save transportation costs associated with WDG. Also, thin stillage could be piped for several miles. Therefore, locating the feedlot close to an ethanol plant could reduce initial capital costs slightly and decrease operating costs dramatically.

ENVIRONMENT

A concentrated livestock feeding facility must guard against being a hazard to groundwater and shallow aquifers. Fly control would require thorough spraying of potential problem areas. The feedlot should be located far enough from town in a direction to minimize odor problems.

Gary Haberstroh, environmental engineer, with the North Dakota State Department of Health and Consolidated Laboratories, Environmental Health Section, provided state regulations and recommendations for feeding livestock and applications. North Dakota environmental requirements for feedlot operation are more stringent than EPA requirements. Thus, when state requirements are met, EPA requirements are satisfied. The required area for a liquid waste-holding facility is determined by multiplying the number of acres in the exposed yard area times the runoff in inches of the 25-year, 24-hour storm event, and multiplying by 135. This gives the cubic yards of storage required. In the proposed 100-acre feedlot, rainfall and runoff for the 25-year, 24-hour storm event in Pembina County is 3.9 inches of rainfall and 2.8 inches of runoff. The North Dakota Department of Health recommends that the storage facility be designed to hold two times the runoff from a 25-year, 24-hour storm event to allow for future expansion, buildup of sludge, carryover from year to year, and better management of the system.

100 acres X 2.8 inches X 135 = 37,800 cubic yards

Doubling this figure gives 75,600 cubic yards of required storage.

Dirt removed from the storage area can be used for mounds in the feeding pens.

MANAGEMENT

The proposed feedlot staff is organized into two components: management and operations. The management group is responsible for planning and decision making. Operations are composed of three functional teams to carry out day-to-day activities (Table 5). The three functional teams work in cattle care, feeding, and feedlot maintenance. The number of people on each functional team will depend on expertise, time management, and economies of scale. Cross training of all staff is essential. Individuals assigned to functional areas should take leadership when other teams support them.

FINANCIAL ANALYSIS

The greatest source of uncertainty for determining the financial feasibility of the feedlot is feed consumed and livestock response to wet distillers' grains and thin stillage. Because of limited information in this area, three feeding programs and associated performance were analyzed.

The first scenario used livestock performance data from a 1993 Carrington feed trial where steers were fed a diet of corn, straw, grass hay, and wet distillers' grains (WDG). Second was the conventional ration, representing the profitability of feeding steers and heifers a ration of corn, barley, alfalfa, and straw. Third was performance analysis using the ADM steer feeding trial results where steers were fed alfalfa, corn, barley, wet distillers' grains, thin stillage, and cob meal. The ADM feed trial fed 95 steers from 562 lbs. to 1044 lbs. during the winter of 1991-92 in Walhalla, North Dakota. The number of cattle fed each year varied from one scenario to another because of varying performance by animals on different rations. The Carrington trial marketed 22,161 head annually, while the conventional and ADM trials marketed 19,759 and 19,101 head, respectively.

For the analysis, Carrington trial calves were purchased at 507 pounds and finished at 1,015 pounds. In the other scenarios, calves were purchased at 562 pounds and marketed at 1,044 pounds, the average purchase and selling weights in the ADM feeding trial. Packing industry standards suggest that finished cattle weigh 1150-1300 pounds. Projected ten-year profitability and cash flow tables are included. West Fargo prices were used for feeder calves (Petry, 1992). Sioux City, Iowa, prices were used to estimate selling price of fat steers and heifers (Petry, 1992). Different percentages of animals grading choice, based on type of ration fed, was not used, although Larson et al. (1992) found that animals fed the highest level of wet distillers' by-products (40 percent) had a significantly higher proportion of animals grading choice.

A ten-year planning horizon was used to estimate feasibility of the feedlot. Cattle and feed prices were used from 1980 through 1989. The beginning year was 1980 because of the position of the cattle cycle and its similarity to the current expansion phase (Petry, 1992). Yearly average prices were used in all scenarios. However, using yearly average prices for cattle and feed grains will reduce price variability and possibly increase profitability.

Table 5. Feedlot Positions and Responsibilities^a

<u>Title</u>	<u>Responsibilities</u>	<u>Management Team</u>	<u>Salary^b</u>
Manager	Responsible for entire operation Conduct business with creditors, customers, and board of directors Make buy/sell decisions on cattle and feed Develop future plans Manage personnel Develop and execute public relations activities Supervise environmental protection program Work with assistant manager, functional teams, and consultants		\$70,000 ^c
Assistant Manager	Responsible for day-to-day operations Maintain inventory control Manage cattle, feed, and maintenance teams Assist in buy/sell decision making Develop nutrition program and least-cost rations Read bunks and call feed with feed team Monitor cattle performance and health with cattle team Develop maintenance plan with maintenance team Establish safety plan Conduct quality assurance program Respond to the needs of the manager Substitute or supplement other staff as needed		\$26,000
Secretary/Accountant	Conduct receptionist and secretarial duties Maintain personnel information and payroll Accounting for feedlot Assist in public relations activities Perform other administrative tasks Computer literate		\$17,000
Consultants/Contractors	Veterinarian and nutritional consultant, hired on contract basis Perform specified tasks		on a per head basis

Continued

Table 5. (Cont.)

		<u>Cattle Team</u>	
Head Cow Handler			\$26,000
and assistant(s)			\$17,000
	Process arriving cattle		
	Weigh cattle in and out, assist in loading/unloading		
	Move cattle to/from pens		
	Check all cattle daily, new cattle twice per day		
	Treat sick cattle as prescribed by veterinarian		
	Monitor condition of cattle in hospital pens		
	Operate and maintain cattle handling facilities		
	Clean pens		
	Check water fountains		
	Support other teams as necessary		
		<u>Feed Team</u>	
Feed Mill Operator			\$26,000
	Conduct feed mill operations		
	Load and unload semi-trailers		
	Conduct quality assurance of feed ingredients		
	Deliver feeds to mixer wagon		
	Maintain feed mill and related equipment		
	Keep accurate records of feeds received and fed		
	Support other teams as needed		
Feed Truck Driver			\$17,000
	Deliver appropriate amount of properly mixed ration to each pen as needed		
	Work with assistant manager to read bunks		
	Load feed ingredients with wheel loader		
	Maintain feed truck(s)		
	Grind forages as required		
	Supplement other teams as needed		
		<u>Maintenance Team</u>	
Head Mechanic			\$26,000
Assistant Mechanic			\$17,000
	Conduct maintenance of facilities and equipment as required		
	Shop jobs: change oil, replace sprockets, modify equipment		
	Feed yard maintenance: repair fences, gates and water fountains		
	Area maintenance: grass and weed mowing, snow removal, maintain roads		
	Responsible for shop operations, bench stocks, lubricant, and fuel supplies		
	Supplement other teams as needed		

*Tasks to be assigned on a case-by-case basis to individuals or teams include bunk cleaning, snow removal, fly control, manure removal, rodent control, and disaster response.

^bSalary includes fringe benefits.

^cBase salary is expected to be lower with a significant incentive pay for performance.

Cash Flow

Table 6 summarizes detailed ten-year cash flow and profitability analysis results found in Appendix A. The appendix tables assume ten years' operation at full capacity. Cash flow is positive while profitability per head is negative in some cases, because profitability calculations include depreciation charges and interest on investment, while cash flow includes interest and principal repayment on outstanding debt.

Table 6. Cumulative Cash Flow and Profitability After 10 Years and Average Profitability Per Head for the Carrington Trial Ration, Conventional Ration, and ADM Steer Feeding Trial Performance

Scenario	Cumulative Cash Flow ^a	Cumulative Profitability	Average Profit Per Head		
			Steer	Heifer	Combined
Carrington Trial	\$ 6,091,240	\$ 2,280,367	\$9.88	*	*
Conventional Ration	144,209	(4,905,950)	(\$33.91)	(\$15.14)	(\$24.83)
ADM-trial	6,571,928	1,726,504	\$9.04	*	*

^a Cumulative net cash flow does not include the 30 percent down payment on capital investment.

*Indicates not calculated because trial did not include this information.

A monthly cash flow for operating the feedlot in year one is shown in Table 7. Start up assumes that 1,850 head of 507 lb. feeder cattle are purchased monthly. Monthly feed costs, operating expenses, wages, and operating interest were calculated, using total expenses for year one. Finished cattle were sold at 1015 lbs. at the end of the feeding period. The operation will require \$6.4 million in capital and start up investment before the first cattle are marketed in the seventh month of operation. Table 8 shows a projected ten-year cash flow for the Carrington trial incorporating the first-year start up costs.

Commercial cattle feedlots are capital-intensive businesses. Approximately \$6.4 million of operating capital will be required to operate for the first six months until the first finished cattle are sold. The Bank of Cooperatives, local banks, and other lending sources require 30 percent capitalization by industries. If investors provide 30 percent of required capital, then \$2 million will need to be raised from private sources and the remaining \$4.4 million financed in an operating note. The ten-year cumulated cash flow for the Carrington trial ration is shown in Figure 2. Sensitivity of the cumulative cash flow to changes in capital investment, price of DDG, percent of animals grading choice, average daily gain, and operating interest is shown in Figure 3. Per head profitability and ten-year cash flow statements for each scenario under full operation are shown in Appendix A.

Table 7. Start Up Cost and Financial Requirements for Year One Operation.

Month	1	2	3	4	5	6	7	8	9	10	11	12
EXPENSES												
Calf purchase	774,694	774,694	774,694	774,694	774,694	774,694	774,694	774,694	774,694	774,694	774,694	774,694
Feed	56,221	112,443	168,664	224,885	281,107	337,328	337,328	337,328	337,328	337,328	337,328	337,328
Operating-Truck, Vet.&Overhead	52,865	52,865	52,865	52,865	52,865	52,865	52,865	52,865	52,865	52,865	52,865	52,865
Wages	15,583	15,583	15,583	15,583	15,583	15,583	15,583	15,583	15,583	15,583	15,583	15,583
Principal Repayment	0	0	0	0	0	0	12,622	12,622	12,622	12,622	12,622	12,622
Interest-fixed	11,566	11,566	11,566	11,566	11,566	11,566	11,566	11,566	11,566	11,566	11,566	11,566
Operating interest	5,115	7,307	15,071	23,292	31,970	41,105	50,696	50,227	49,758	49,289	48,821	48,352
Total cash outflow	916,044	974,458	1,038,444	1,102,886	1,167,785	1,233,141	1,290,705	1,290,236	1,289,767	1,289,299	1,288,830	1,288,361
INCOME												
Gross sales	0	0	0	0	0	0	1,286,146	1,286,146	1,286,146	1,286,146	1,286,146	1,286,146
Net cash flow	(916,044)	(974,458)	(1,038,444)	(1,102,886)	(1,157,785)	(1,233,141)	(4,559)	(4,090)	(3,621)	(3,152)	(2,683)	(2,215)
Cumulative total	(916,044)	(1,890,503)	(2,928,946)	(4,031,832)	(5,199,617)	(6,432,758)	(6,437,316)	(6,441,406)	(6,445,027)	(6,448,179)	(6,450,683)	(6,453,077)

Annual Expenses Used

Calf purchase	9,296,332
Feed	4,047,938
Operating-Truck, Vet.&Overhead	956,414
Wages	187,000
Principal	2,033,502
Interest-fixed	9.75%
Operating interest	9.75%

Table 8. Ten-year Cash Flow for Carrington WDG Trial Including Year-one Start Up Costs

Category	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10
Expenses										
Calf purchase	9,296,332	7,834,604	7,452,393	7,601,519	7,520,623	7,418,040	7,404,898	9,110,572	10,435,422	10,559,617
Feed	3,204,618	3,885,271	3,722,970	4,166,303	3,816,010	2,967,440	2,696,432	2,975,966	3,694,256	3,616,620
Operating-truck, vet.& overhead	846,483	941,797	937,975	939,466	938,657	937,631	937,500	954,557	967,805	969,047
Wages	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000
Principal	75,732	158,580	174,041	191,010	209,634	230,073	252,505	131,876	0	0
Interest-fixed	138,787	131,403	115,941	98,972	80,349	59,909	37,477	12,858	0	0
Operating interest (50% of calf, feed,wage,& overhead	421,004	626,373	599,642	628,597	607,537	561,118	547,259	644,870	745,119	747,449
Total cash outflow	14,169,955	13,765,027	13,189,962	13,812,867	13,359,810	12,361,211	12,063,071	13,872,964	16,029,602	16,079,733
Income										
Gross sales	7,716,878	14,574,792	14,126,404	14,250,928	13,872,931	12,558,024	13,968,658	15,209,961	16,046,158	16,749,675
Net cash flow	(6,453,077)	809,565	936,441	438,061	513,121	196,813	1,905,587	1,192,263	16,555	669,942
Cumulative total	(6,453,077)	(5,643,512)	(4,707,070)	(4,269,010)	(3,755,889)	(3,559,076)	(1,653,489)	(461,226)	(444,671)	225,272

Number of steers marketed annually 22,161

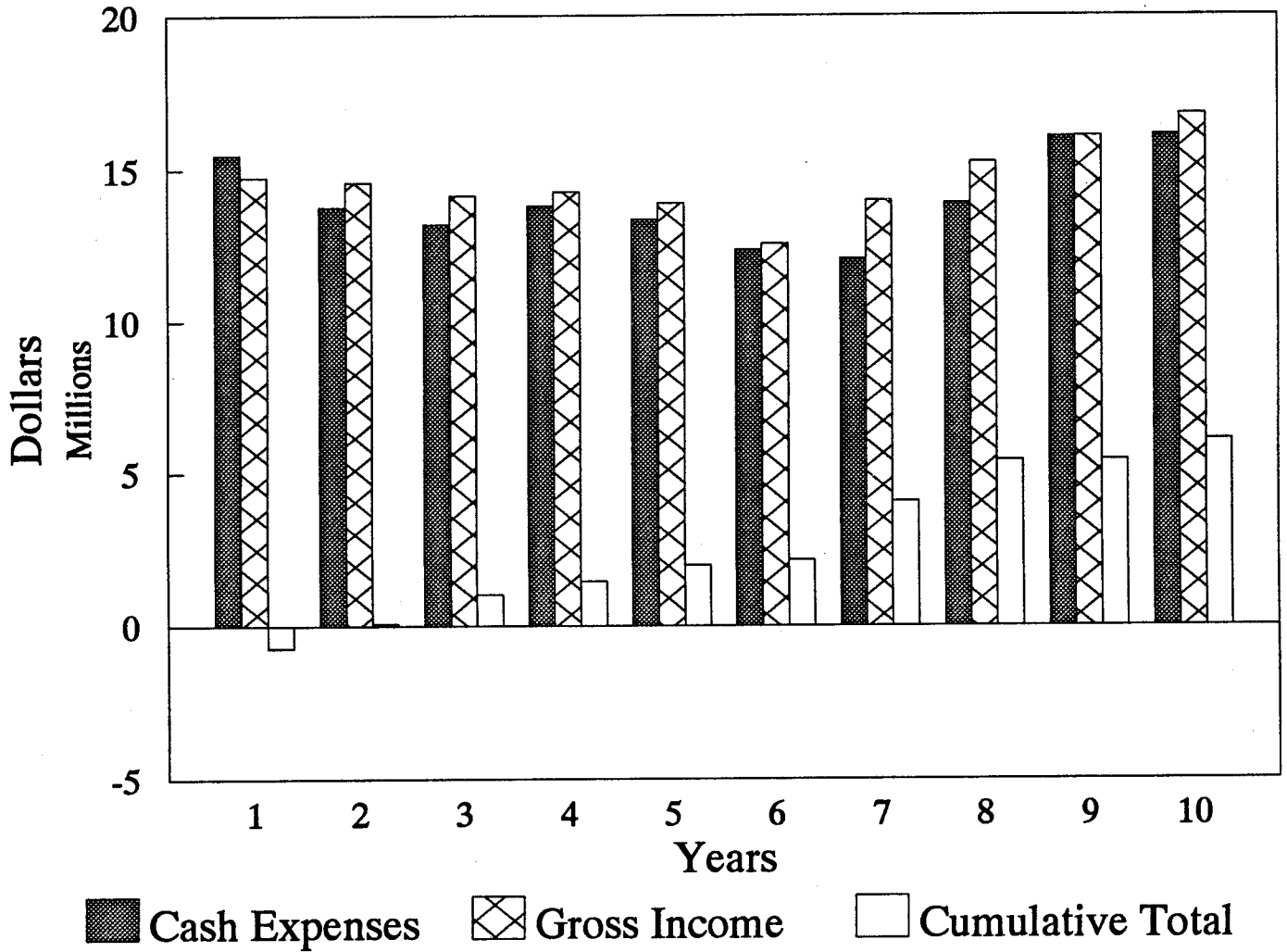


Figure 2. Ten-year Cash Flow for the Carrington WDG Trial Finishing Steers on a Continuous Basis

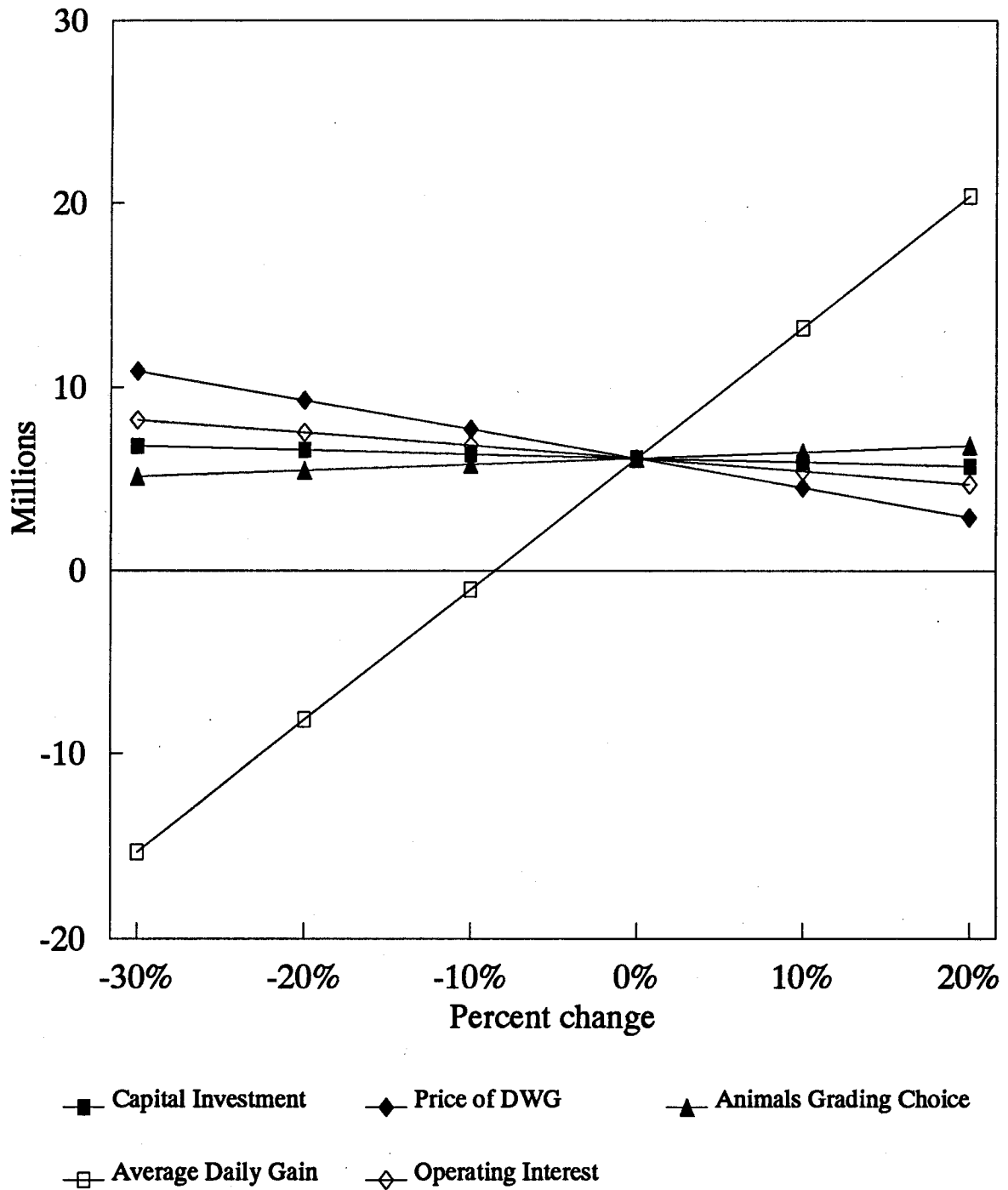


Figure 3. Sensitivity of Ten-year Cumulative Cash Flow for Carrington WDG Trial to Changes in Capital Investment, Price of DDG, Percent Animals Grading Choice, Average Daily Gain, and Interest Rate

Profitability

Price sensitivities for rations were determined by calculating break-even prices (Table 9). A comparison of break-even prices and returns/cwt for steers fed the Carrington trial ration and steers in Great Plains feedlots is shown in Figures 4 and 5. Years one through ten are shown for the proposed feedlot, while years two through ten (1981-1989) are shown for the Great Plains feedlots. Break-even prices and returns/cwt are similar in each case. This demonstrates that a feedlot feeding the WDGs may be competitive with traditional Great Plains feedlots.

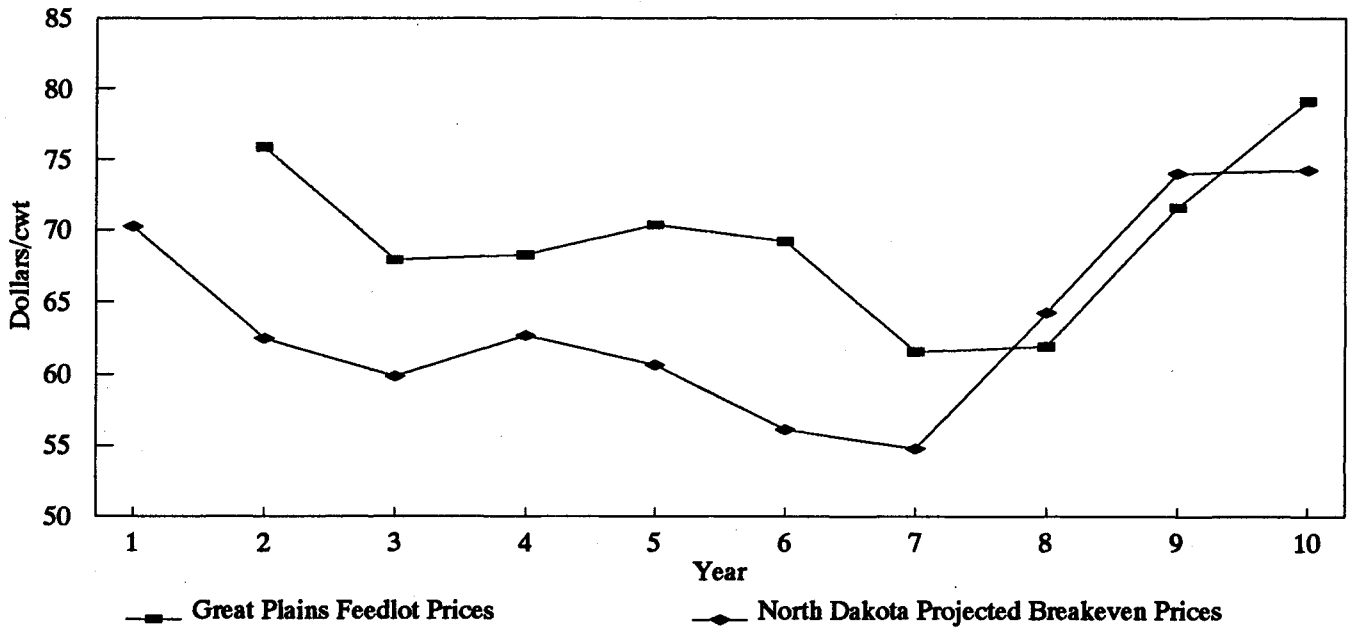
Table 9. Sensitivity of Break-even Prices to Changes in Feed Cost for Finished Steers and Heifers, Using Carrington WDG Ration, Conventional Ration, and ADM Feed Trial Ration for Year Ten*

Ration	Average daily gain	Feed cost (per head)	Break-even prices/cwt for percent change in base feed costs				
			-30%	-15%	Base	+15%	+30%
	lbs.	dollars	----- dollars -----				
<u>Carrington WDG Trial</u>							
Steers	3.03	163.20	69.10	71.67	74.24	76.81	79.38
<u>Conventional Ration (No WDG)</u>							
Steers	2.64	173.78	74.30	76.97	79.65	82.32	84.99
Heifers	2.48	185.90	70.64	73.51	76.37	79.24	82.11
<u>ADM Feed Trial</u>							
Steers	2.47	128.97	71.52	73.53	75.52	77.51	79.50

*Assumptions:

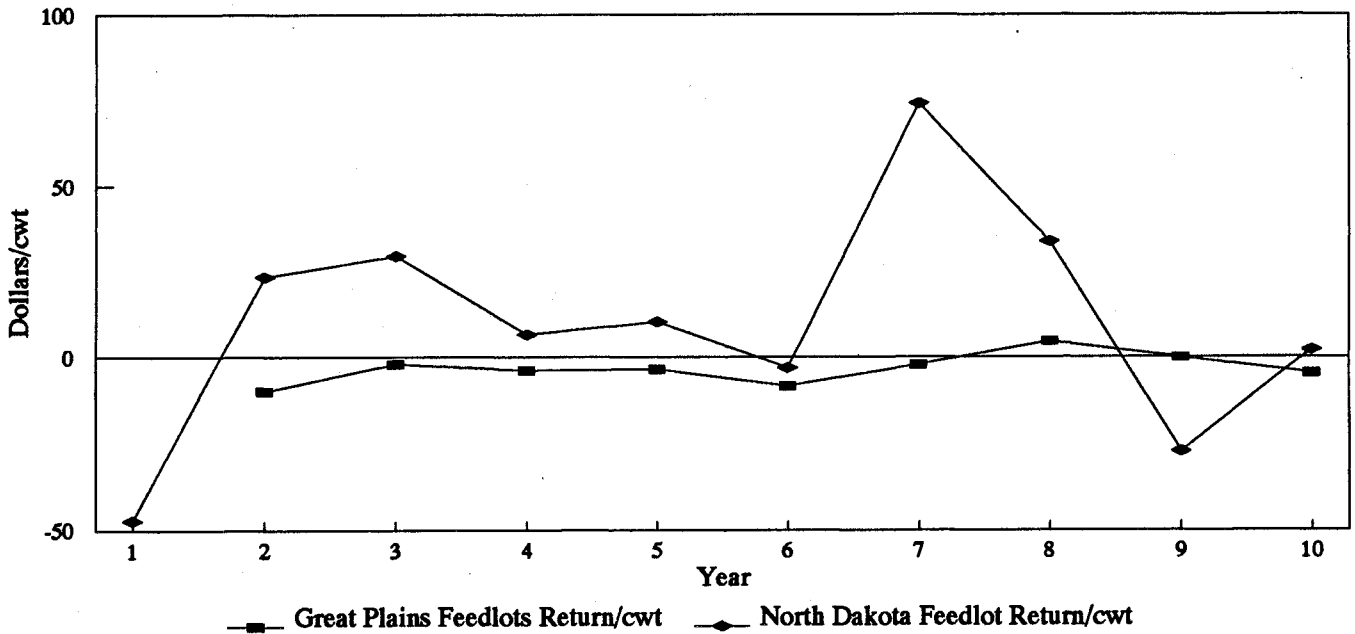
Corn Price \$2.39/bushel

WDG \$118.36 (88 % dry matter basis)



Source: Appendix Table B1.

Figure 4. Comparison of Break-even Prices for Great Plains Feedlots and a North Dakota Feedlot Using Carrington WDG Trial Ration



Source: Appendix Table B1.

Figure 5. Comparison of Returns/cwt for Steers for Great Plains Feedlots and a North Dakota Feedlot Using Carrington WDG Trial Ration

Each ten-year analysis has been based on the purchase of 1,850 calves per month for cattle fed the Carrington WDG trial ration. An effective manager would be expected to improve upon this performance with timely purchases and sales. Cattle prices and feeding costs explained at least 85 percent of the variation in profitability in feed trials conducted in Kansas (Mintert, 1993). When purchasing feeder cattle, the manager must determine if the future sales price for the cattle will cover variable costs. Purchase costs plus variable costs must be less than the sale price or profits will be maximized by leaving part of the lot empty for a period of time. Table 10 is an example of monthly cash flow showing only variable expenses incurred by the feedlot and sales revenue on a per head basis. In the first column of Table 10, January, West Fargo feeder cattle price and July, Sioux City finished cattle price (six months later) are used. The following months are calculated with a six-month, sale-price lag. The listed month is when the calf is purchased. Variable expenses are costs incurred during the feeding period. Only one-half of feedlot wages are considered variable (\$4.58/hd.), since only part of the staff may be laid off in case of a short-term shutdown.

In the example, April, May, June, July, and August are shutdown months. Break-even purchase prices for feeder calves are listed for each month, and break-even sales prices necessary if actual purchase prices are used. The manager must lock in a future sale price that will meet purchase price plus variable expenses, or he must purchase cattle at a lower price that meets expenses.

The price of WDG was estimated at 14 percent less than the price of DDG priced at Lawrenceburg, Indiana, adjusted from 65 to 12 percent moisture. The ten-year average price of DDG is \$116/ton. The effect of a percent change in the price of WDG on the cumulative cash flow of the feedlot is shown in Figure 3.

HEAVIER FINISHING WEIGHTS

The meat packing industry prefers finished cattle in the 1100-1300 pound range and may discount lighter animals. Heavier finished cattle yield a heavier carcass which improves efficiency in the meat packing plant (Petry). Cattle in the WDG feeding trials were considered finished at 1015 and 1044 pounds. The finished weights for the cattle in the Carrington WDG trial and the conventional ration were increased to 1159 pounds. Table 11 summarizes the projected profitability and net cash flow for the feedlot using WDG and conventional rations when selling heavier finished cattle. Complete ten-year cash flow and profitability tables are found in Appendix C.

Table 10. Guidelines Signaling Shutdown for Example Year for Proposed Feedlot Operation*

YEAR THREE												
Month Of Purchase	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<u>Variable Expenses/Head</u>												
Calf Purchase	\$316.10	\$322.67	\$343.86	\$349.96	\$367.97	\$367.83	\$360.24	\$362.74	\$361.20	\$349.37	\$339.95	\$342.40
Feed	191.83	191.83	191.83	191.83	191.83	191.83	191.83	191.83	191.83	191.83	191.83	191.83
Operating Exp.	48.70	48.70	48.70	48.70	48.70	48.70	48.70	48.70	48.70	48.70	48.70	48.70
Wages	4.58	4.58	4.58	4.58	4.58	4.58	4.58	4.58	4.58	4.58	4.58	4.58
Operating Interest	27.36	27.68	28.71	29.01	29.89	29.88	29.51	29.63	29.56	28.98	28.52	28.64
Cash Outflow/hd	588.57	595.47	617.69	624.08	642.97	642.83	634.87	637.49	635.87	623.47	613.59	616.16
<u>Income/Hd</u>												
Per Head Sales	674.96	666.16	620.09	601.33	601.49	600.85	613.69	632.50	657.56	696.91	689.72	667.70
<u>Projected Return/Hd</u>	86.38	70.69	2.41	(22.75)	(41.48)	(41.98)	(21.18)	(4.99)	21.69	73.44	76.13	51.54
Actual Purch. Price/cwt	56.25	57.42	61.19	62.27	65.48	65.45	64.10	64.55	64.27	62.17	60.49	60.93
Brkevn Purch. Price/cwt	71.62	69.99	61.61	58.22	58.09	57.98	60.33	63.66	68.13	75.23	74.04	70.10
Future Sale Price/cwt	64.65	63.81	59.40	57.60	57.61	57.55	58.78	60.58	62.98	66.75	66.07	63.96
Brkevn Sale Price/cwt	56.38	57.04	59.17	59.78	61.59	61.57	60.81	61.06	60.91	59.72	58.77	59.02

*Annual Variable Expenses

Calf Purchase	7,654,934
Feed	3,913,321
Operating Exp	993,558
Wages (one-half of wages is considered variable expenses)	93,500

Table 11. Projected Ten-year Profitability and Cash Flow Using Carrington WDG Trial and Conventional Rations to Finish Cattle at Heavier Weights, 1993

Category	# fed annually	ADG (lbs.)	Days on feed	Cumulative profitability	Cumulative net cash flow
Carrington WDG (507-1153 lbs.)					
Steers	17,561	3.05	212	\$ 5,799,120	\$ 6,164,075
Conventional ration (562-1154 lbs.)					
Steers	8,273	2.77	225	\$ 527,802	\$ 6,273,904
Heifers	8,093	2.57	230	(For steers and heifers combined)	

Source: Appendix C ten-year profitability and cash flow tables.

Note: The conventional ration is used to feed both steers and heifers.

AVERAGE DAILY GAIN

Changes in average daily gain (ADG) in fed cattle is reflected in feed efficiency and profits when feeding cattle. The sensitivity of ADG on feedlot profits was illustrated in Figure 3. To further illustrate the effect of changes in ADG, projected ten-year profitability and cash flow statements are created for ADGs of 3.00, 3.25, and 3.50 pounds per day for cattle fed from 800 to 1,200 pounds on the conventional ration. A portion of the change in ADG results from increased feed efficiency in the livestock, and the remainder from changes in the rations. Ten-year profitability and cashflow tables are included in Appendix D and summarized in Table 12.

COMMUNITY IMPACT

A feedlot could mean an additional eight to ten full-time employees. A feedlot of the size considered in this study could generate between \$10 to \$15 million in gross sales every year (Figure 2). Annual cash operating expenses would range from \$10 to \$15 million. Much of the cash expenses will be paid to livestock and grain producers either as cattle or feedstuffs.

Table 12. Projected Ten-year Profitability and Cash Flow For Various ADGs Using Carrington WDG Trial and Conventional Rations to Finish Cattle From 800 to 1200 Pounds

Category	# fed annually	ADG (lbs.)	Days on feed	Cumulative profitability	Cumulative net cash flow
Carrington WDG					
(Steers only)	28,638	3.00	130	(1,527,356)	1,496,379
	31,025	3.25	120	798,237	3,334,234
	33,214	3.49	112	2,738,722	4,827,670
Conventional ration					
(Steers and heifers)	28,638	3.00	130	(864,912)	3,306,374
	31,025	3.25	120	3,589,502	7,369,158
	33,241	3.50	112	7,6998,554	11,131,082

Source: Appendix D ten-year profitability and cash flow tables.

A local North Dakota community could provide most inputs into a feedlot. Hay, forage, barley, and corn purchased annually for the feedlot would average about \$3.5 million. Assuming the feedlot is running at capacity, \$187,000 in wages and benefits would be paid annually. Miscellaneous operating expenses, such as veterinary, trucking, fuel, and repairs, would be approximately \$1 million per year. A feedlot financed locally could mean an additional average \$640,000 in operating interest per year and \$138,000 in interest paid on fixed capital investment in the first year.

SUMMARY

North Dakota has been in the top ten states for the production of feed grains over the past 15 years; however, North Dakota exports a large share of the feed grains it produces rather than feeding it to animals which it also exports. The Archer Daniels Midland (ADM) ethanol plant located near Walhalla, North Dakota, produces about 15 million gallons of ethanol and 55,845 tons of dry distillers' grains (DDG) per year. This study estimated the economic feasibility of building and operating a beef feedlot which would use by-products (wet distillers' grains and thin stillage) from an ethanol plant.

Detailed feedlot investment and operating costs were determined for a model 10,200 head feedlot finishing, 22,161 head of cattle annually. The estimated investment for the feedlot was \$2 million. The feedlot was assumed to be operating at full capacity in six months and would require approximately \$6.4 million in operating capital before the first finished cattle are sold.

Three alternative scenarios were investigated. The first ration, consisting of corn, straw, grass hay, wet distillers' grains (WDG), and thin stillage. This scenario was designed to use WDG and thin stillage, based on performance of steers fed in a WDG and corn feeding trial at Carrington Research Center, winter 1992-93. The second is a conventional ration investigating the profitability of finishing steers and heifers in a feedlot without feeding WDG or thin stillage. The third examines performance from the ADM steer feeding trial where steers were fed alfalfa, corn, barley, wet distillers' grains, thin stillage, and cob meal.

All feeder calves were assumed to be purchased at 507 pounds and marketed at 1,015 pounds for finished animals. West Fargo prices were used to estimate purchase prices for feeder calves. Sioux City, Iowa, prices were used to estimate selling price of fat steers and heifers. Ten-year profitability and cash flow statements were developed for each scenario, using livestock and feed price relationships from 1980 through 1989. Average profitability per head and cumulative net cash flow were \$9.88 and \$6,091,240; -\$24.83 and \$144,209; and \$9.04 and \$6.5 million for the Carrington trial ration, conventional ration, and ADM trial ration, respectively.

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APPENDIX A

**Per Head Profitability Statements;
Ten-year Cash Flow Statements**

Appendix Table A1. Profitability Per Head for the Carrington WDG Trial Ration Using Operating Costs/Head - Finishing Steers, 1993

Category		YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10	Average
Variable expenses	Steers	dollars										
Feeder purchase		419.50	353.54	336.29	343.02	339.37	334.74	334.15	411.11	470.90	476.50	381.91
Trucking-in	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66
Trucking-out	17.02	17.02	17.02	17.02	17.02	17.02	17.02	17.02	17.02	17.02	17.02	17.02
Veterinary	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50
Feed-lbs.(as fed)												
Grass Hay	323	7.97	9.82	6.95	5.04	5.27	5.88	5.78	4.55	7.56	9.49	6.83
Straw	357	5.56	6.92	4.95	3.85	4.21	4.83	4.61	3.61	6.25	7.83	5.26
Wet Dis.grain	2,973	72.48	79.83	72.24	79.62	76.30	48.15	49.54	58.47	71.31	69.98	68.79
Stillage	168	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corn	1,592	88.86	70.85	75.97	91.60	78.52	67.16	43.85	59.77	73.69	68.01	71.82
Vit.&min.	158	7.90	7.90	7.90	7.90	7.90	7.90	7.90	7.90	7.90	7.90	7.90
Total feed		182.66	175.32	168.00	188.00	172.20	133.91	121.68	134.29	166.70	163.20	160.60
Death loss	1.00%	4.19	3.54	3.36	3.43	3.39	3.35	3.34	4.11	4.71	4.77	3.82
Operating interest		28.66	25.34	24.23	25.43	24.55	22.63	22.05	26.10	30.27	30.37	25.96
Fixed expenses- interest charged on overhead, & labor for 6 months												
Labor	8.44	8.44	8.44	8.44	8.44	8.44	8.44	8.44	8.44	8.44	8.44	8.44
Overhead	6.78	6.78	6.78	6.78	6.78	6.78	6.78	6.78	6.78	6.78	6.78	6.78
Depreciation	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55	11.55
Fixed interest/year	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81
Total cost		698.77	621.49	595.64	623.64	603.28	558.38	544.98	639.38	736.34	738.60	636.05
Break even price/cwt		70.24	62.47	59.87	62.68	60.64	56.12	54.78	64.27	74.01	74.24	63.93
Profit/head		(47.35)	23.50	29.66	6.70	10.43	(3.10)	74.24	33.92	(27.29)	2.16	9.88
Cumulative Profitability		(1,049,244)		128,732		508,260		2,084,739		2,231,598		
			(528,479)		277,196		439,632		2,836,332		2,279,418	
Number Steers	22,161											
Purchase weight	507											
Sale weight	1015											

Appendix Table A2. Profitability Per Head for the Conventional Ration Using Operating Costs/Head - Finishing Steers and Heifers, 1993

Category			YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10	Average
Variable expenses	Steers	Heifers	----- dollars -----										
Feeder purchase			437.56	370.10	347.42	357.29	351.75	349.14	347.67	435.63	502.00	504.92	400.35
Trucking-in	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06
Trucking-out	19.24	19.24	19.24	19.24	19.24	19.24	19.24	19.24	19.24	19.24	19.24	19.24	19.24
Veterinary	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50
Feed-lbs.(as fed)													
Alfalfa	492	778	15.53	19.14	13.55	9.82	10.27	11.45	11.27	8.88	14.73	18.49	13.31
Straw	140	0	1.12	1.40	1.00	0.78	0.85	0.98	0.93	0.73	1.20	1.58	1.06
Barley	1,343	1,273	56.06	58.15	46.65	50.27	55.99	44.93	36.93	38.52	51.29	53.04	49.18
Wet Dis.grain	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stillage	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corn	2,277	2,496	132.88	106.08	113.74	137.14	117.57	100.55	65.65	89.48	110.33	101.82	107.52
Vit.&min.	91	97	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71	4.71
Total feed			210.31	189.48	179.65	202.72	189.39	162.61	119.49	142.32	182.33	179.64	175.79
Death loss	1.00%		4.38	3.70	3.47	3.57	3.52	3.49	3.48	4.36	5.02	5.05	4.00
Operating interest			34.54	29.93	28.52	29.99	29.19	27.65	25.58	30.86	36.01	36.18	30.85
Fixed expenses- interest charged on overhead,& labor for 6months													
Labor	9.17	9.78	9.46	9.46	9.46	9.46	9.46	9.46	9.46	9.46	9.46	9.46	9.46
Overhead	7.32	7.81	7.56	7.56	7.56	7.56	7.56	7.56	7.56	7.56	7.56	7.56	7.56
Depreciation	12.55	13.39	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96	12.96
Fixed interest/year	5.22	5.57	5.39	5.39	5.39	5.39	5.39	5.39	5.39	5.39	5.39	5.39	5.39
Total cost			756.96	663.38	629.23	663.74	644.02	613.06	566.39	683.33	795.52	795.96	681.16
Break even price/cwt			72.51	63.54	60.27	63.58	61.69	58.72	54.25	65.45	76.20	76.24	65.25
Profit/head			(\$100.73)	(\$11.64)	\$2.00	(\$25.72)	(\$19.39)	(\$47.63)	\$64.75	\$1.64	(\$72.22)	(\$39.35)	(\$24.83)
Cumulative Profitability			(1,990,303)	(2,180,889)	(3,072,242)	(2,733,962)	(4,128,449)						
			(2,220,315)	(2,689,025)	(4,013,381)	(2,701,516)	(4,905,950)						
Number	Steer 10,199	Heifers 9,560	Total 19,759										
Purchase weight	542	Sale weight 1044											

Appendix Table A3. Profitability Per Head With the ADM Trial Ration Using Operating Costs/Head - Finishing Steers, 1993

Category		YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10	Average
Variable expenses	Steers	----- dollars -----										
Feeder purchase	519.74	465.00	391.89	372.77	380.23	376.18	371.05	370.39	455.71	521.98	528.19	423.34
Trucking-in	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06
Trucking-out	19.24	19.24	19.24	19.24	19.24	19.24	19.24	19.24	19.24	19.24	19.24	19.24
Veterinary	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50
Feed-lbs.(as fed)												
Alfalfa	211	5.19	6.39	4.53	3.28	3.43	3.82	3.76	2.96	4.92	6.17	4.45
Corn	164	9.13	7.29	7.81	9.42	8.08	6.91	4.51	6.15	7.58	7.00	7.39
Barley	968	41.47	43.02	34.51	37.19	41.42	33.24	27.32	28.49	37.94	39.24	36.38
Wet Dis.grain	2,984	72.76	80.13	72.51	79.92	76.59	48.34	59.76	58.69	71.58	70.25	69.05
Stillage	195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cob	28	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81	2.81
Vit.&min.	70	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51
Total feed		134.87	143.15	125.68	136.13	135.84	98.62	101.67	102.61	128.34	128.97	123.59
Death loss	1.00%	4.65	3.92	3.73	3.80	3.76	3.71	3.70	4.56	5.22	5.28	4.23
Operating interest		33.29	29.87	27.96	28.89	28.67	26.46	26.58	31.12	35.94	36.30	30.51
Fixed expenses- interest charged on overhead,& labor for 6 months												
Labor	9.79	9.79	9.79	9.79	9.79	9.79	9.79	9.79	9.79	9.79	9.79	9.79
Overhead	7.82	7.82	7.82	7.82	7.82	7.82	7.82	7.82	7.82	7.82	7.82	7.82
Depreciation	13.41	13.41	13.41	13.41	13.41	13.41	13.41	13.41	13.41	13.41	13.41	13.41
Fixed interest/year	8.12	8.12	8.12	8.12	8.12	8.12	8.12	8.12	8.12	8.12	8.12	8.12
Total cost		846.61	785.92	729.75	759.11	754.22	672.39	677.96	770.55	893.76	901.65	779.19
Breakeven price/cwt		81.09	75.28	69.90	72.71	72.24	64.41	64.94	73.81	85.61	86.36	74.64
Profit/head		(41.70)	20.45	39.14	25.61	12.77	(2.73)	60.17	24.25	(36.41)	(11.18)	9.04
Cumulative Profits		(796,450)		341,793		1,075,055		2,172,289		1,940,020		
			(405,776)		831,049		1,022,976		2,635,580		1,726,504	
Number Steers	19,101											
Purchase weight	562	Selling weight		1044								

Appendix Table A4. Ten-year Cash Flow for the Carrington WDG Trial for Finishing Steers, 1993

Category	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10
Expenses										
Calf purchase	9,296,332	7,834,604	7,452,393	7,601,519	7,520,623	7,418,040	7,404,898	9,110,572	10,435,422	10,559,617
Feed	4,047,938	3,885,271	3,722,970	4,166,303	3,816,010	2,967,440	2,696,432	2,975,966	3,694,256	3,616,620
Operating-truck, vet.& overhead	956,414	941,797	937,975	939,466	938,657	937,631	937,500	954,557	967,805	969,047
Wages	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000
Principal	151,196	165,937	182,116	199,873	219,360	240,748	264,221	0	0	0
Interest-fixed	138,787	124,045	107,866	90,110	70,622	49,234	25,762	0	0	0
Operating interest (50% of calf, feed,wage,& overhead	706,275	626,373	599,642	628,597	607,537	561,118	547,259	644,870	745,119	747,449
Total cash outflow	15,483,940	13,765,027	13,189,962	13,812,867	13,359,810	12,361,211	12,063,071	13,872,964	16,029,602	16,079,733
Income										
Gross sales	14,752,098	14,574,792	14,126,404	14,250,928	13,872,931	12,558,024	13,968,658	15,209,961	16,046,158	16,749,675
Net cash flow	(731,842)	809,565	936,441	438,061	513,121	196,813	1,905,587	1,336,997	16,555	669,942
Cumulative total	(731,842)	77,723	1,014,164	1,452,225	1,965,346	2,162,159	4,067,746	5,404,743	5,421,298	6,091,240

Number Steers 22,161

Appendix Table A5. Ten-year Cash Flow for the Conventional Ration for Finishing Steers and Heifers, 1993

Category	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10
Expenses										
Calf purchase	8,646,001	7,312,898	6,864,766	7,059,800	6,950,384	6,898,840	6,869,814	8,607,739	9,919,146	9,976,863
Feed	4,155,645	3,744,097	3,549,792	4,005,549	3,742,204	3,213,043	2,361,070	2,812,093	3,602,682	3,549,642
Operating-truck, vet.& overhead	923,350	910,018	905,537	907,487	906,393	905,878	905,588	922,967	936,081	936,658
Wages	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000
Principal	151,196	165,937	182,116	199,873	219,360	240,748	264,221	0	0	0
Interest-fixed	138,787	124,045	107,866	90,110	70,622	49,234	25,762	0	0	0
Operating interest (50% of calf, feed,wage,& overhead	678,210	592,508	560,971	592,792	574,567	546,232	503,269	610,828	713,939	714,195
Total cash outflow	14,880,187	13,036,504	12,358,049	13,042,611	12,650,531	12,040,975	11,116,723	13,140,627	15,358,850	15,364,359
Income										
Gross sales	13,321,639	13,21,2177	12,790,039	12,951,612	12,688,826	11,490,141	12,773,852	13,877,360	14,703,551	15,344,429
Net cash flow	(1,558,848)	175,673	431,990	(90,999)	18,295	(550,834)	1,657,128	736,733	(655,300)	(199,930)
Cumulative total	(1,558,848)	(1,382,875)	(950,886)	(1,041,885)	(1,023,590)	(1,574,423)	82,705	819,438	164,139	144,209

Number Steers 10,199 Heifers 9,560 Total 19,759

Appendix Table A6. Ten-year Cash Flow for the ADM Trial Ration for Finishing Steers, 1993

Category	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10
Expenses										
Calf purchase	8,882,118	7,485,520	7,120,339	7,262,820	7,185,529	7,087,517	7,074,960	8,704,635	9,970,455	10,089,116
Feed	2,576,162	2,734,356	2,400,691	2,600,202	2,594,625	1,883,734	1,942,044	1,960,015	2,451,436	2,463,439
Operating-truck, vet.& overhead	902,807	888,84	885,18	886,61	885,84	884,861	884,736	901,032	913,691	914,877
Wages	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000
Principal	151,196	165,937	182,116	199,873	219,360	240,748	264,221	0	0	0
Interest-fixed	138,787	124,045	107,866	90,110	70,622	49,234	25,762	0	0	0
Operating interest (50% of calf, feed,wage,& overhead	611,719	550,666	516,419	533,161	529,084	489,602	491,826	572,943	659,226	665,654
Total cash outflow	13,449,789	12,136,366	11,399,622	11,759,780	11,672,061	10,822,696	10,870,548	12,325,625	14,181,807	14,320,085
Income										
Gross sales	3,076,150	12,918,810	12,521,538	12,631,916	12,296,863	11,131,339	12,381,714	13,481,996	14,223,195	14,846,787
Net cash flow	(373,640)	782,444	1,211,916	872,136	624,801	308,642	1,511,166	1,156,371	41,388	526,702
Cumulative total	(373,640)	408,804	1,530,721	2,402,857	3,027,658	3,336,301	4,847,767	6,003,838	6,045,226	6,571,928

Number Steers 19,101

APPENDIX B

Great Plains Feedlots Break-even Prices and Per Head Profitability

Appendix Table B1. Ten-year Break-even Prices and Returns/cwt for Great Plains Feedlots, 1991

Year	Great Plains Feedlots		North Dakota Feedlot	
	Breakeven price/cwt	Return/cwt	Breakeven price/cwt	Return/cwt
1980	na	na	70.24	(47.35)
1981	75.86	(10.04)	62.47	23.50
1982	67.92	(1.98)	59.87	29.66
1983	68.27	(3.87)	62.88	6.70
1984	70.36	(3.57)	60.64	10.43
1985	69.21	(8.47)	56.12	(3.10)
1986	61.54	(2.18)	54.78	74.24
1987	61.94	4.69	64.64	33.92
1988	71.59	(0.03)	74.01	(27.29)
1989	79.08	(4.65)	74.24	2.16

Source: Western Livestock Marketing Information Project, 1990.

APPENDIX C

**Finishing Cattle at Heavier Weights
Per Head Profitability Statements
Ten-year Cash Flow Statements**

Appendix Table C1. Profitability Per Head for the Carrington WDG Trial Ration Using Operating Costs/Head -
Finishing Steers, 507-1154 Pounds, 1993

Category		YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10	Average
Variable expenses	Steers	----- dollars -----										
Feeder purchase		419.50	353.54	336.29	343.02	339.37	334.74	334.15	411.11	470.90	476.50	381.91
Trucking-in	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66
Trucking-out	17.96	17.96	17.96	17.96	17.96	17.96	17.96	17.96	17.96	17.96	17.96	17.96
Veterinary	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50
Feed-lbs.(as fed)												
Grass hay	323	7.97	9.82	6.95	5.04	5.27	5.88	5.78	4.55	7.56	9.49	6.83
Straw	477	7.42	9.25	6.61	5.15	5.62	6.45	6.16	4.82	8.35	10.46	7.03
Wet Dis.grain	3,671	89.51	98.57	89.20	98.32	94.22	59.46	73.52	72.19	88.05	86.41	84.94
Stillage	212	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corn	2,186	121.92	94.32	104.35	125.82	107.86	92.25	60.24	82.10	101.23	93.42	98.65
Vit.&min.	202	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08	10.08
Total feed		236.89	225.05	217.19	244.40	223.05	174.11	155.77	173.74	215.26	209.85	207.53
Death loss	1.00%	4.19	3.54	3.36	3.43	3.39	3.35	3.34	4.11	4.71	4.77	3.02
Operating interest		39.28	34.84	33.41	35.34	33.92	30.88	29.81	35.23	41.00	41.01	35.47
Fixed expenses- interest charged on overhead, & labor for 6 months												
Labor	10.65	10.65	10.65	10.65	10.65	10.65	10.65	10.65	10.65	10.65	10.65	10.65
Overhead	8.56	8.56	8.56	8.56	8.56	8.56	8.56	8.56	8.56	8.56	8.56	8.56
Depreciation	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58	14.58
Fixed interest/year	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57	6.57
Total cost		773.34	690.43	663.72	699.65	673.20	616.55	596.54	697.67	815.34	805.61	702.20
Break even price/cwt		68.37	61.04	58.68	61.86	59.52	54.51	52.74	61.68	71.20	71.23	62.08
Profit/head		(32.32)	43.17	47.43	17.16	24.76	15.11	107.89	68.38	1.41	37.23	33.02
Cumulative Profitability		(567,658)	1,023,472	1,759,553	3,919,707	5,145,340						
			190,466	1,324,745	2,024,948	5,120,570	5,799,120					
Number Steers	17,561											
Purchase weight	507	Sale weight	1154									

Appendix Table C2. Ten-year Cash Flow Using Carrington WDG Trial Ration for Finishing Steers, 507-1154 lbs., 1993

Category	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10
Expenses										
Calf purchase	7,366,904	6,208,554	5,905,670	6,023,845	5,959,739	5,878,447	3,868,032	7,219,698	8,269,580	8,367,998
Feed	3,204,618	3,952,122	3,814,086	4,291,949	3,917,000	3,057,524	2,735,540	3,051,136	3,780,262	3,685,311
Operating-truck, vet.& overhead	846,483	793,910	790,881	792,063	791,421	790,606	790,504	804,021	814,520	815,504
Wages	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000
Principal	151,196	165,937	182,116	199,873	219,360	240,748	264,221	0	0	0
Interest-fixed	138,787	124,045	107,866	90,110	70,622	49,234	25,762	0	0	0
Operating interest (50% of calf, feed,wage,& overhead	421,004	543,152	521,510	550,624	529,189	483,287	467,077	549,015	636,254	636,471
Total cash outflow	12,240,528	11,974,720	11,509,129	12,135,463	11,674,332	10,686,849	10,338,137	11,955,604	13,687,616	13,692,284
Income										
Gross sales	13,290,394	13,130,477	12,726,696	12,838,882	12,498,339	11,313,719	12,584,581	13,702,890	14,456,232	15,090,042
Net cash flow	1,049,866	1,155,757	1,217,567	703,419	824,007	626,870	2,246,444	1,747,285	768,617	1,397,758
Cumulative total	1,049,866	2,205,623	3,423,190	4,126,609	4,950,617	5,577,487	7,823,931	9,571,216	10,339,833	11,737,591

Number Steers 17,561

Appendix Table C3. Profitability Per Head for Conventional Ration Using Operating Costs/Head -
Finishing Steers and Heifers, 562-1159 Pounds, 1993

Category			YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10	Average
Variable expenses	Steers	Heifers	----- dollars -----										
Feeder purchase			436.96	369.62	346.86	356.78	351.21	348.66	347.17	435.19	501.56	504.41	399.84
Trucking-in	\$4.06	\$4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06
Trucking-out	21.86	\$21.86	21.86	21.86	21.86	21.86	21.86	21.86	21.86	21.86	21.86	21.86	21.86
Veterinary	\$11.50	\$11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50
Feed-lbs.(as fed)													
Alfalfa	610	980	24.68	30.76	21.97	17.11	18.70	21.44	20.48	16.02	17.75	34.79	23.37
Straw	170	0	1.34	1.67	1.19	0.93	1.01	1.16	1.11	0.87	1.50	1.89	1.27
Barley	1,760	1,450	68.92	71.49	57.36	61.80	68.84	55.23	45.40	47.35	63.06	65.21	60.47
Corn	2,530	2,740	146.88	117.25	125.72	151.59	129.95	111.14	72.57	98.91	121.96	112.55	118.85
Vit.&min.	113	113	5.69	5.69	5.69	5.69	5.69	5.69	5.69	5.69	5.69	5.69	5.69
Total feed			247.51	226.86	211.93	237.12	224.19	194.66	145.25	168.84	219.96	220.12	209.64
Death loss	1.00%		4.37	3.70	3.47	3.57	3.51	3.49	3.47	4.35	5.02	5.04	4.00
Operating interest			44.09	39.48	37.41	39.40	38.45	36.30	33.33	39.93	46.93	47.28	40.26
Fixed expenses- interest charged on overhead, & labor for 6 months													
Labor	11.30	11.55	11.43	11.43	11.43	11.43	11.43	11.43	11.43	11.43	11.43	11.43	11.43
Overhead	9.02	9.22	9.12	9.12	9.12	9.12	9.12	9.12	9.12	9.12	9.12	9.12	9.12
Depreciation	15.47	15.82	15.64	15.64	15.64	15.64	15.64	15.64	15.64	15.64	15.64	15.64	15.64
Fixed interest/year	6.44	6.58	6.51	6.51	6.51	6.51	6.51	6.51	6.51	6.51	6.51	6.51	6.51
Total cost			813.05	719.77	679.78	716.97	697.48	663.22	609.34	718.42	853.58	856.96	733.86
Break even price/cwt			68.56	60.69	57.32	60.46	58.81	55.93	51.38	61.42	71.98	72.26	61.88
Profit/head			(76.84)	12.13	29.13	(0.34)	4.13	(28.07)	99.38	41.01	(41.07)	(7.21)	3.22
Cumulative Profitability			(1,257,632)	(582,254)	(520,348)			646,824		645,833			
				(1,059,342)	(587,863)			(979,791)		1,317,961		527,802	
Number Steers	8,273	Heifers 8,093	Total 16,367										
Purchase weight	562	Sale weight 1,159											

Appendix Table C4. Ten-year Cash Flow for the Conventional Ration for Finishing Steers and Heifers, 562-1159 Lbs., 1993

Category	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10
Expenses										
Calf purchase	7,151,639	6,049,460	5,676,984	5,839,402	5,748,234	5,706,450	5,682,114	7,122,601	8,208,884	8,255,504
Feed	4,050,988	3,712,986	3,468,537	3,880,820	3,669,314	3,186,033	2,377,328	2,763,453	3,599,997	3,602,674
Operating-truck, vet.& overhead	833,153	822,131	818,406	820,030	819,119	818,701	818,458	832,862	843,725	844,191
Wages	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000
Principal	151,196	165,937	182,116	199,873	219,360	240,748	264,221	0	0	0
Interest-fixed	138,787	124,045	107,866	90,110	70,622	49,234	25,762	0	0	0
Operating interest (50% of calf, feed,wage,& overhead	595,861	525,114	494,858	522,954	508,154	482,536	441,914	531,663	625,931	628,357
Total cash outflow	13,108,623	11,586,674	10,935,768	11,540,188	11,221,802	10,670,703	9,796,796	11,437,580	13,465,537	13,517,726
Income										
Gross sales	12,362,352	12,261,138	11,869,272	12,019,565	11,757,564	10,663,820	11,855,161	12,879,081	13,646,290	14,241,059
Net cash flow	(746,271)	674,464	933,504	479,376	535,762	(6,883)	2,058,366	1,441,500	180,753	723,334
Cumulative total	(746,271)	(71,807)	861,697	1,341,073	1,876,835	1,869,952	3,928,318	5,369,818	5,550,571	6,273,904

Number Steers 8,273 Heifers 8,093 Total 16,367

APPENDIX D

**Finishing Cattle From 800-1190 Pound Weights
Per Head Profitability Statements
Ten-year Cash Flow Statements**

Appendix Table D1. Profitability Per Head for the Carrington WDG Trial Ration Using Operating Costs/Head - Finishing Steers, 800-1190 Pounds, 3.00 ADG, 1993

Category		YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10	Average
Variable expenses	Steers	----- dollars -----										
Feeder purchase		549.99	493.98	493.98	488.12	503.24	467.27	481.17	596.52	629.99	641.89	534.58
Trucking-in	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78
Trucking-out	21.93	17.51	17.51	17.51	17.51	17.51	17.51	17.51	17.51	17.51	17.51	17.51
Veterinary	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50
Feed-lbs.(as fed)												
Straw	355	5.52	6.88	4.91	3.83	4.18	4.79	4.58	3.58	6.21	7.78	5.23
Wet Dis.grain	2,063	50.29	55.39	50.12	55.24	52.94	33.41	41.31	40.57	49.48	48.55	47.73
Stillage	130	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corn	1,757	97.99	78.22	83.87	101.13	86.69	74.14	48.41	65.99	81.36	75.08	79.29
Vit.&min.	129	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44	6.44
Total feed		160.24	146.93	145.34	166.64	150.25	118.79	100.74	116.57	143.48	137.86	138.68
Death loss	1.00%	5.50	4.94	4.94	4.88	5.03	4.67	4.81	5.97	6.30	6.42	5.35
Operating interest		26.06	23.64	23.58	24.11	24.08	21.72	21.58	26.18	28.28	28.51	24.77
Fixed expenses- interest charged on overhead, & labor for 6 months												
Labor	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53
Overhead	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25
Depreciation	8.94	8.94	8.94	8.94	8.94	8.94	8.94	8.94	8.94	8.94	8.94	8.94
Fixed interest/year	3.72	3.72	3.72	3.72	3.72	3.72	3.72	3.72	3.72	3.72	3.72	3.72
Total cost		801.01	728.70	727.07	742.97	741.82	671.68	667.53	804.46	866.97	876.89	762.61
Break even price/cwt		68.69	62.49	62.34	63.71	63.61	57.60	57.24	68.98	74.34	74.93	65.39
Profit/head		(37.05)	27.34	5.31	(4.34)	(23.16)	(21.13)	57.72	(16.35)	(35.91)	(5.76)	(5.33)
Cumulative Profitability		(1,061,112)	(126,119)	(913,642)	134,130	(1,362,448)	(334,138)	(1,527,356)				
			(278,102)	(250,378)	(1,518,834)							
Number Steers	28,638											
Purchase weight	800											
Sale weight	1190											

Appendix Table D2. Ten-year Cash Flow Using Carrington WDG Trial Ration for Finishing Steers, 800-1190 lbs.,
3.00 ADG, 1993

Category	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10
Expenses										
Calf purchase	15,750,772	14,146,827	14,146,827	13,979,006	14,412,019	13,381,989	13,779,873	17,083,415	18,033,448	18,382,647
Feed	4,589,047	4,207,776	4,162,411	4,772,197	4,303,038	3,401,867	2,885,121	3,338,486	4,109,068	3,947,978
Operating-truck, vet.& overhead	1,303,930	1,287,891	1,287,891	1,286,212	1,290,543	1,280,242	1,284,221	1,317,256	1,326,757	1,330,249
Wages	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000
Principal	151,196	165,937	182,116	199,873	219,360	240,748	264,221	0	0	0
Interest-fixed	138,787	124,045	107,866	90,110	70,622	49,234	25,762	0	0	0
Operating interest (50% of calf, feed,wage,& overhead	1,064,249	966,688	964,476	985,940	984,389	889,741	884,141	1,068,900	1,153,243	1,162,584
Total cash outflow	23,184,981	21,086,164	21,038,588	21,500,338	21,466,972	19,430,822	19,310,339	22,995,058	24,809,517	25,010,458
Income										
Gross sales	22,346,786	22,077,897	21,398,971	21,587,603	21,015,006	19,023,157	21,160,015	23,040,366	24,307,055	15,373,757
Net cash flow	(838,194)	991,733	360,383	87,265	(451,966)	(407,665)	1,849,677	45,308	(502,462)	362,300
Cumulative total	(838,194)	153,539	513,922	601,187	149,221	(258,444)	1,591,233	1,636,541	1,134,079	1,496,379

Number Steers 28,638

Appendix Table D3. Profitability Per Head for the Carrington WDG Trial Ration Using Operating Costs/Head - Finishing Steers, 800-1190 Pounds, 3.25 ADG, 1993

Category		YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10	Average
Variable expenses	Steers	----- dollars -----										
Feeder purchase		549.99	493.98	493.98	488.12	503.24	467.27	481.17	596.52	629.99	641.89	534.58
Trucking-in	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78
Trucking-out	14.74	14.74	14.74	14.74	14.74	14.74	14.74	14.74	14.74	14.74	14.74	14.74
Veterinary	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50
Feed-lbs.(as fed)												
Straw	240	3.74	4.66	3.33	2.59	2.83	3.25	3.10	2.43	4.20	5.27	3.54
Wet Dis.grain	1,320	32.18	35.44	32.07	35.35	33.88	21.38	26.43	25.96	31.66	31.07	30.54
Stillage	120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corn	2,160	120.46	96.16	103.10	124.32	106.57	91.14	59.52	81.12	100.02	92.30	97.47
Vit.&min.	121	6.06	6.06	6.06	6.06	6.06	6.06	6.06	6.06	6.06	6.06	6.06
Total feed		162.44	142.32	144.56	168.32	149.34	121.83	95.11	115.56	141.94	134.70	137.61
Death loss	1.00%	5.50	4.94	4.94	4.88	5.03	4.67	4.81	5.97	6.30	6.42	5.35
Operating interest		24.04	21.58	21.65	22.22	22.11	20.06	19.65	24.04	25.96	26.13	22.74
Fixed expenses- interest charged on overhead, & labor for 6 months												
Labor	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03
Overhead	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84
Depreciation	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25
Fixed interest/year	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43
Total cost		796.54	717.39	719.71	738.12	734.29	668.41	655.32	796.66	858.47	863.71	754.86
Break even price/cwt		68.30	61.52	61.71	63.29	62.96	57.32	56.19	68.31	73.61	74.06	64.73
Profit/head		(32.49)	38.884	12.81	0.61	(15.48)	(17.80)	70.17	(8.40)	(27.23)	4.64	2.57
Cumulative Profitability		(1,007,965)		595,889		134,800		1,759,721		654,362		
			198,350		614,965		(417,455)		1,499,174		798,237	
Number Steers	28,638											
Purchase weight	800	Sale weight		1190								

Appendix Table D4. Ten-year Cash Flow Using Carrington WDG Trial Ration for Finishing Steers, 800-1190 lbs.,
3.25, ADG, 1993

Category	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10
Expenses										
Calf purchase	17,063,336	15,325,730	15,325,730	15,143,923	15,613,021	14,497,155	14,928,196	18,507,033	19,536,236	19,914,534
Feed	5,039,580	4,415,364	4,484,940	5,221,983	4,633,228	3,779,708	2,950,762	3,585,208	4,403,542	4,178,921
Operating-truck, vet.& overhead	1,314,302	1,296,926	1,296,926	1,295,108	1,299,798	1,288,640	1,292,950	1,328,739	1,339,031	1,342,814
Wages	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000
Principal	151,196	165,937	182,116	199,873	219,360	240,748	264,221	0	0	0
Interest-fixed	138,787	124,045	107,866	90,110	70,622	49,234	25,762	0	0	0
Operating interest (50% of calf, feed,wage,& overhead	1,150,706	1,034,720	1,038,112	1,065,091	1,059,486	962,935	943,747	1,150,889	1,241,458	1,249,134
Total cash outflow	25,044,906	22,549,721	22,622,689	23,203,087	23,082,516	21,005,420	20,592,637	24,758,868	26,707,266	26,872,403
Income										
Gross sales	24,209,018	23,917,722	23,182,219	23,386,570	22,766,256	20,608,420	22,923,350	24,960,397	26,332,642	27,487,154
Net cash flow	(835,888)	1,368,001	559,529	183,482	(316,260)	(397,000)	2,330,713	201,529	(374,624)	614,751
Cumulative total	(835,888)	523,113	1,091,642	1,275,124	958,865	561,865	2,892,578	3,094,106	2,719,483	3,334,234

Number Steers 31,025

Appendix Table D5. Profitability Per Head for the Carrington WDG Trial Ration Using Operating Costs/Head - Finishing Steers, 800-1190 Pounds, 3.49 ADG, 1993

Category		YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10	Average
Variable expenses	Steers	----- dollars -----										
Feeder purchase		549.99	493.98	493.98	488.12	503.24	467.27	481.17	596.52	629.99	641.89	534.58
Trucking-in	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78
Trucking-out	14.74	14.74	14.74	14.74	14.74	14.74	14.74	14.74	14.74	14.74	14.74	14.74
Veterinary	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50
Feed-lbs.(as fed)												
Straw	224	3.49	4.34	3.10	2.42	2.64	3.03	2.89	2.26	3.92	4.91	3.30
Wet Dis.grain	672	16.38	18.04	16.33	18.00	17.25	10.88	13.46	13.21	16.12	15.82	15.55
Stillage	120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corn	2,464	137.41	109.69	117.61	141.81	121.57	103.97	67.89	92.53	114.09	105.29	111.19
Vit.&min.	113	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66
Total feed		162.94	137.74	142.70	167.88	147.12	123.54	89.90	113.67	139.79	131.68	135.69
Death loss	1.00%	5.50	4.94	4.94	4.88	5.03	4.67	4.81	5.97	6.30	6.42	5.35
Operating interest		22.45	20.01	20.15	20.73	20.57	18.77	18.19	22.38	24.17	24.29	21.17
Fixed expenses- interest charged on overhead, & labor for 6 months												
Labor	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63
Overhead	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52	4.52
Depreciation	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70
Fixed interest/year	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21
Total cost		793.95	709.74	714.85	734.69	729.03	667.33	647.14	791.61	853.02	857.35	749.87
Break even price/cwt		68.03	60.81	61.25	62.95	62.47	57.18	55.45	67.83	73.09	73.46	64.25
Profit/head		(29.27)	47.27	18.33	4.61	(9.56)	(16.21)	79.07	(2.64)	(21.04)	11.77	8.24
Cumulative Profitability		(972,938)	1,207,550	1,045,187	3,134,698	2,347,329						
			598,304	1,362,940	506,360	3,046,805	2,738,722					
Number Steers		33,241										
Purchase weight 800	Sale weight	1,190										

Appendix Table D6. Ten-year Cash Flow Using Carrington WDG Trial Ration for Finishing Steers, 800-1190 lbs.,
3.50, ADG, 1993

Category	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10
Expenses										
Calf purchase	18,282,146	16,420,424	16,420,424	16,225,632	16,728,237	15,532,666	15,994,496	19,828,964	20,931,681	21,337,001
Feed	5,416,228	4,578,500	4,743,473	5,580,561	4,890,264	4,106,611	2,988,318	3,778,389	4,646,623	4,377,147
Operating-truck, vet.& overhead	1,397,448	1,378,831	1,378,831	1,376,883	1,381,909	1,369,954	1,374,572	1,412,917	1,423,944	1,427,997
Wages	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000
Principal	151,196	165,937	182,116	199,873	219,360	240,748	264,221	0	0	0
Interest-fixed	138,787	124,045	107,866	90,110	70,622	49,234	25,762	0	0	0
Operating interest (50% of calf, feed,wage,& overhead	1,232,538	1,100,032	1,108,074	1,139,291	1,130,386	1,033,316	1,001,539	1,228,854	1,325,476	1,332,296
Total cash outflow	26,805,343	23,954,770	24,127,785	24,799,350	24,607,779	22,519,530	21,835,906	26,436,124	28,514,723	28,661,440
Income										
Gross sales	25,957,415	25,645,081	24,856,459	25,075,568	24,410,455	22,096,778	24,578,894	26,763,059	28,234,409	29,472,301
Net cash flow	(847,928)	1,690,310	728,674	276,219	(197,324)	(422,751)	2,742,988	326,935	(280,314)	810,861
Cumulative total	(847,928)	842,383	1,571,057	1,847,276	1,649,952	1,227,201	3,970,189	4,297,123	4,016,809	4,827,670

Number Steers 33,241

Appendix Table D7. Profitability Per Head for Conventional Ration Using Operating Costs/Head - Finishing Steers and Heifers, 800-1190 Pounds, 3.00 ADG, 1993

Category			YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10	Average
Variable expenses	Steers	Heifers	----- dollars -----										
Feeder purchase			524.41	472.46	472.46	465.86	478.98	447.64	466.94	572.32	610.70	624.52	513.63
Trucking-in	\$5.78	\$5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78
Trucking-out	\$21.93	\$21.93	21.93	21.93	21.93	21.93	21.93	21.93	21.93	21.93	21.93	21.93	21.93
Veterinary	\$11.50	\$11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50
Feed-lbs.(as fed)													
Alfalfa	260	260	8.09	10.09	7.20	5.61	6.13	7.03	6.72	5.25	9.10	11.41	7.66
Barley	1,055	1,055	39.30	41.76	32.70	35.23	39.25	31.49	25.88	27.00	35.95	37.18	34.47
Corn	2,066	2,066	122.69	97.49	105.01	126.62	108.55	92.83	60.62	82.62	101.87	94.01	99.28
Vit.&min.	65	65	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25
Total feed			173.33	152.04	148.17	170.71	157.18	134.60	96.47	118.12	150.17	145.85	144.66
Death loss	1.00%		5.24	4.72	4.72	4.66	4.79	4.48	4.67	5.72	6.11	6.25	5.14
Operating interest			25.77	23.96	23.77	24.31	24.43	22.38	21.59	26.34	28.62	28.92	25.01
Fixed expenses- interest charged on overhead, & labor for 6 months													
Labor	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53	6.53
Overhead	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21
Depreciation	8.94	8.94	8.94	8.94	8.94	8.94	8.94	8.94	8.94	8.94	8.94	8.94	8.94
Fixed interest/year	3.72	3.72	3.72	3.72	3.72	3.72	3.72	3.72	3.72	3.72	3.72	3.72	3.72
Total cost			792.37	716.80	712.74	729.16	728.99	672.71	653.28	786.12	859.21	869.14	752.05
Break even price/cwt			66.59	60.24	59.89	61.27	61.26	56.53	54.90	66.06	72.20	73.04	63.20
Profit/head			(43.41)	27.41	7.01	0.91	(16.38)	(27.19)	66.06	(4.74)	(32.83)	(5.21)	(3.02)
Cumulative Profitability			(1,243,146)	(257,508)	(752,683)	360,317	(715,765)						
			(458,216)	(283,515)	(1,531,416)	224,560	(864,912)						
Number Steers	14,319	Heifers 14,319	Total 28,638										
Purchase weight	800	Sale weight 1,190											

Appendix Table D8. Ten-year Cash Flow Using Conventional Rations for Finishing Steers and Heifers, 800-1190 lbs.,
3.00 ADG, 1993

Category	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10
Expenses										
Calf purchase	15,018,296	13,530,623	13,530,623	13,341,514	13,717,250	12,819,625	13,372,539	16,390,460	17,489,413	17,885,231
Feed	4,963,853	4,354,105	4,243,268	4,888,988	4,501,299	3,854,859	2,762,720	3,382,814	4,300,615	4,176,807
Operating-truck, vet.& overhead	1,422,323	1,407,447	1,407,447	1,405,556	1,409,313	1,400,337	1,405,866	1,436,045	1,447,035	1,450,993
Wages	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000
Principal	151,196	165,937	182,116	199,873	219,360	240,748	264,221	0	0	0
Interest-fixed	138,787	124,045	107,866	90,110	70,622	49,234	25,762	0	0	0
Operating interest (50% of calf, feed,wage,& overhead	1,052,584	949,610	944,206	966,374	965,975	890,264	864,246	1,043,071	1,141,923	1,155,377
Total cash outflow	22,934,038	20,718,767	20,602,526	21,079,414	21,070,819	19,442,067	18,882,353	22,439,390	24,565,986	24,855,408
Income										
Gross sales	21,996,702	21,818,805	21,120,795	21,390,338	20,926,682	18,980,926	21,101,142	22,922,280	24,290,469	25,349,001
Net cash flow	(937,336)	1,100,039	518,269	310,923	(144,137)	(461,141)	2,218,790	482,890	(275,516)	493,593
Cumulative total	(937,336)	162,703	680,971	991,895	847,758	386,617	2,605,407	3,088,297	2,812,781	3,306,374

Number Steers 14,319 Heifers 14,319 Total 28,638

Appendix Table D9. Profitability Per Head for Conventional Ration Using Operating Costs/Head - Finishing Steers and Heifers, 800-1190 Pounds, 3.25 ADG, 1993

Category			YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10	Average
Variable expenses	Steers	Heifers	----- dollars -----										
Feeder purchase			524.41	472.46	472.46	465.86	478.98	447.64	466.94	572.32	610.70	624.52	513.63
Trucking-in	\$5.78	\$5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78
Trucking-out	\$21.93	\$21.93	21.93	21.93	21.93	21.93	21.93	21.93	21.93	21.93	21.93	21.93	21.93
Veterinary	\$11.50	\$11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50
Feed-lbs.(as fed)													
Alfalfa	240	240	7.47	9.31	6.65	5.18	5.66	6.49	6.20	4.85	8.40	10.53	7.07
Barley	760	720	31.69	32.88	26.38	28.42	31.66	25.40	20.88	21.78	29.00	29.99	27.81
Corn	2,120	2,160	119.34	95.27	102.15	123.16	105.59	90.30	58.96	80.36	99.09	91.45	96.57
Vit.&min.	60	60	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Total feed			161.51	140.45	138.17	159.76	145.90	125.19	89.04	109.99	139.49	134.96	134.45
Death loss	1.00%		5.24	4.72	4.72	4.66	4.79	4.48	4.67	5.72	6.11	6.25	5.14
Operating interest			23.41	21.75	21.67	22.17	22.22	20.39	19.69	24.09	26.11	26.36	22.79
Fixed expenses- interest charged on overhead, & labor for 6 months													
Labor	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03	6.03
Overhead	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81
Depreciation	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25
Fixed interest/year	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43
Total cost			776.31	701.13	698.76	714.18	716.63	659.43	642.08	773.86	844.13	853.82	737.73
Break even price/cwt			65.24	58.92	58.72	60.02	59.97	55.41	53.96	65.03	70.94	71.75	61.99
Profit/head			(27.02)	43.34	21.26	14.40	(0.74)	(13.66)	77.45	7.74	(17.47)	10.39	11.57
Cumulative Profitability			(838,328)	1,166,021	1,589,698	3,568,880	3,267,052						
				506,407	1,612,628	1,166,042	3,809,078	3,589,502					
Number Steers	15,513	Heifers 15,513	Total	31,025									
Purchase weight	800	Sale weight	1,190										

Appendix Table D10. Ten-year Cash Flow Using Conventional Rations for Finishing Steers and Heifers, 800-1190 lbs.,
3.25 ADG, 1993

Category	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10
Expenses										
Calf purchase	16,269,820	14,658,175	14,658,175	14,453,307	14,860,355	13,887,928	14,486,917	17,756,331	18,946,864	19,675,667
Feed	5,010,764	4,357,593	4,286,790	4,956,638	4,526,598	3,883,999	2,762,509	3,412,461	4,327,548	4,187,202
Operating-truck, vet.& overhead	1,528,409	1,512,293	1,512,293	1,510,244	1,514,315	1,504,590	1,510,580	1,543,274	1,555,180	1,559,468
Wages	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000
Principal	151,196	165,937	182,116	199,873	219,360	240,748	264,221	0	0	0
Interest-fixed	138,787	124,045	107,866	90,110	70,622	49,234	25,762	0	0	0
Operating interest (50% of calf, feed,wage,& overhead	1,121,031	1,009,859	1,006,408	1,028,975	1,028,053	948,846	923,667	1,116,330	1,219,559	1,233,830
Total cash outflow	24,407,031	22,014,903	21,940,648	22,426,146	22,406,303	20,702,345	20,160,655	24,015,396	26,236,150	26,543,167
Income										
Gross sales	23,839,760	23,637,039	22,880,861	23,172,866	22,670,572	20,562,670	22,859,571	24,832,470	26,314,675	27,461,418
Net cash flow	(577,271)	1,622,137	940,213	746,719	264,270	(139,675)	2,698,916	817,074	78,525	918,250
Cumulative total	(577,271)	1,044,866	1,985,079	2,931,798	2,996,068	2,856,393	5,555,309	6,372,383	6,450,907	7,369,158

Number Steers 31,025

Appendix Table D11. Profitability Per Head for Conventional Ration Using Operating Costs/Head - Finishing Steers and Heifers, 800-1190 Pounds, 3.50 ADG, 1993

Category			YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10	Average
Variable expenses	Steers	Heifers	----- dollars -----										
Feeder purchase			524.41	472.46	472.46	465.86	478.98	447.64	466.94	572.32	610.70	624.52	513.63
Trucking-in	\$5.78	\$5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78
Trucking-out	\$21.93	\$21.93	21.97	21.97	21.97	21.97	21.97	21.97	21.97	21.97	21.97	21.97	21.97
Veterinary	\$11.50	\$11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50
Feed-lbs.(as fed)													
Alfalfa	240	240	6.97	8.69	6.21	4.83	5.28	6.06	5.79	4.53	7.84	9.83	6.60
Barley	560	240	17.13	17.77	14.26	15.36	17.11	13.73	11.28	11.77	15.67	16.21	15.03
Corn	2,120	2,448	127.37	101.68	109.02	131.45	112.69	96.38	62.93	85.77	105.76	97.60	103.07
Vit.&min.	56	56	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80
Total feed			154.28	130.94	132.28	154.45	137.88	118.96	82.80	104.87	132.07	126.44	127.50
Death loss	1.00%		5.24	4.72	4.72	4.66	4.79	4.48	4.67	5.72	6.11	6.25	5.14
Operating interest			21.64	20.01	19.99	20.45	20.47	18.81	18.19	22.29	24.11	24.34	21.03
Fixed expenses- interest charged on overhead, & labor for 6 months													
Labor	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63	5.63
Overhead	4.49	4.49	4.49	4.49	4.49	4.49	4.49	4.49	4.49	4.49	4.49	4.49	4.49
Depreciation	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70
Fixed interest/year	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20	3.20
Total cost			765.84	688.41	689.73	705.68	702.39	650.15	632.88	765.48	833.26	841.80	727.56
Break even price/cwt			64.25	57.75	57.86	59.20	58.93	54.54	53.09	64.22	69.90	70.62	61.04
Profit/head			(15.05)	57.54	31.60	24.18	11.86	(3.17)	88.04	17.54	(5.03)	24.08	23.16
Cumulative Profitability			(500,313)	2,463,009	3,661,059	6,482,190	6,898,017						
			1,412,498	3,266,832	3,555,779	7,065,305	7,698,554						
Number Steers	33,241												
Purchase weight 800	Sale weight	1,190											

Appendix Table D12. Ten-year Cash Flow Using Conventional Rations for Finishing Steers and Heifers, 800-1190 lbs.,
3.50 ADG, 1993

Category	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10
Expenses										
Calf purchase	17,431,950	15,705,187	15,705,187	15,485,686	15,921,808	14,879,922	15,521,697	19,024,641	20,300,212	20,759,643
Feed	5,128,357	4,352,551	4,397,256	5,134,021	4,583,435	3,954,462	2,752,485	3,485,986	4,690,180	4,202,886
Operating-truck, vet.& overhead	1,626,143	1,610,875	1,610,875	1,608,680	1,613,042	1,602,623	1,609,040	1,644,070	1,656,826	1,661,420
Wages	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000	187,000
Principal	151,196	165,937	182,116	199,873	219,360	240,748	264,221	0	0	0
Interest-fixed	138,787	124,045	107,866	90,110	70,622	49,234	25,762	0	0	0
Operating interest (50% of calf, feed,wage,& overhead	1,188,303	1,065,461	1,067,641	1,092,750	1,087,383	1,225,420	978,423	1,186,658	1,293,543	1,307,034
Total cash outflow	25,853,736	23,211,057	23,357,942	23,798,120	23,682,650	21,919,410	21,338,628	25,528,355	27,927,761	28,177,983
Income										
Gross sales	25,574,797	25,367,963	24,556,410	24,869,798	24,330,722	22,068,460	24,633,561	26,650,934	28,241,680	29,472,398
Net cash flow	(278,939)	2,156,906	1,298,469	1,071,678	648,072	149,050	3,194,933	1,122,579	413,919	1,354,414
Cumulative total	(278,939)	1,877,967	3,176,435	4,248,114	4,896,186	5,045,236	8,240,169	9,362,748	9,776,667	11,131,082

Number Steers 33,241