Costs and Returns in Combinations of Ontario Cattle Enterprises: An Analytical Investigation

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EXECUTIVE SUMMARY

The purpose of this study was to consider the costs and returns in cattle enterprise combinations in Ontario and make observations that could lead to increased efficiency and returns. To do so, detailed models were developed of each of the three segments in the production chain and optimized with respect to feeding given the previous 3 years seasonal price averages. Cost and returns results were similarly calculated over the most recent 3 year seasonal average.

The results showed that cattle production has been broadly unprofitable given the last three years' data. Results were estimated for steers and heifers; using steers as an example, the results showed the following:

- At the cow-calf level average losses of $127/head for weaned steers were observed.
- In backgrounding steers, an average return of $10/head was observed
- In feedlot finishing, fed steers generated a loss of $60/head
- When the three stages were combined and feeder animals were transferred at cost, a loss of $138/head was observed
- Accelerated feeding of steers generated a loss of $146/head

These observations are troubling for the Ontario cattle industry, as it begs questions as to its long-term sustainability. These stem most directly from the following:

- Intermediate livestock prices appear inconsistent with segment production costs
- Intermediate livestock prices mask the fact that overall there are steady losses in the system; this is especially evident in cow-calf
- Intermediate livestock prices concentrate losses on specific segments
- Results at the feedlot level suggest that cattle can't effectively bid for corn
- Shortening the supply chain in an accelerated feeding program appears not to help, due to structurally lower revenues for smaller carcasses and increased exposure to high corn costs

The apparent engagement of these challenges will involve the following:

- Profitability at the cow-calf level should be viewed as a critical issue. This could be targeted with management improvements via training and research/innovation focused on productivity improvement.
- Alternatives to the existing means of transferring and marketing intermediate livestock are required.
- The results suggest that cattle feeding is challenged to compete for its feed supply. Thus, innovations that can improve feed efficiency through new feedstuffs or improved efficiency of existing feedstuffs will be valuable.
- The price discount on smaller carcasses would appear to be an important impediment to accelerated feeding, and more generally initiatives to shorten supply chains and cut costs out of the system.

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1.0 Introduction

The Ontario cattle industry is experiencing protracted challenges to its economic viability. As the industry confronts the prospect of difficult times ahead, the frontline response is improvements in management that can decrease costs and increase productivity and added value. To do so, a thorough understanding of the costs and technical relationships associated with the various stages of cattle production is required, and the resulting costs and benefits. Thus, functional knowledge is required at the cow-calf, backgrounding, and finishing segments, as well as in the combination of these activities.

1.1 Purpose and Objectives

The purpose of this study is to consider the costs and returns in cattle enterprise combinations in Ontario. The objectives are:

- To develop an appropriate set of technical parameters and price data to characterize beef cattle production, and
- To estimate costs and returns in cattle production in a consistent fashion

1.2 Organization of the Paper

Section 2 below describes the structure of the model, its technical assumptions, parameters, and data applied. Section 3 reports the results obtained from the model. Section 4 draws observations, and Section 5 concludes the report.

2.0 Model Structure

The model was structured as a profit-maximizing linear programming model of a linked cow-calf, backgrounding, and cattle finishing production system. Under this model, calves are weaned at just over eight months of age, transferred to backgrounding where they remain for just over seven months, and finally transferred into the feedlot where they are fed for a period of just under five months. Thus, slaughter cattle are marketed at about twenty months of age and are produced choosing a least-cost set of feed and inputs under a given marketing month. The profit maximizing feed regimen is solved for each stage. Separate models are developed for steer calves and heifer calves, and repeated for all 12 marketing months, so that cost and returns results are obtained for all twelve months.

The basic scenario is one in which the entire system is linked in cost-based transfers. The subsets of the chain model are also analyzed, including combined cow-calf and backgrounding, and combined backgrounding and feedlot.

2.1 Production System Assumptions

The cow-calf operation is based around a fixed cow herd, established at 100 cows. The assumptions relating to the herd are presented below in Table 2.1. It is assumed that the rate of live calf births is 95%. The cow mortality rate was set at 1.5%, the bull mortality rate was set at 1%, and the pre-wean calf mortality rate was 4%. The cull rate for cows was 11% for cows and 33% for bulls.

The costs of herd replacement was taken as the net cost of purchased replacement and cull revenues. Replacement cows were purchased at an assumed cost of $95/cwt for a 1400 lb cow, and sold as culls at a price of $42/cwt at 1400 lbs. Bulls are purchased at an assumed cost of $95/cwt for an 1804 lb animal, and sold as culls at $55/cwt assuming a constant weight. It was assumed that bull calves had a birth weight of 100 lbs and were sold as steer calves at 597 lbs. Heifer calves had an assumed birth weight of 95 lbs and were sold as weaned calves at 551 lbs.

Table 2.1 Cow-Calf Productivity Assumptions

Number of Cows, head	100
Portion of a Year Dry	16.4%
Calves Born per 100 Cows Bred	95
Bull-Cow Ratio,	3.3%
Cow Replacement Rate	11%
Bull Replacement Rate	33%
Cow Mortality Rate	1.50%
Bull Mortality Rate	1.00%
Pre-Weaned Calf Mortality Rate	4.0%
Portion of Steers, %	50.0%

2.2 Backgrounding

The backgrounding operation is based around an annual scale of 500 head. Weaned calves are transferred in and conditioned to feeder weight. Steer calves are acquired at 597 lbs and fed to 999 lbs. Heifer calves are acquired at a weight of 551 lbs and fed to a weight of 899 lbs. Mortality rates of 2% are assumed in the backgrounding stage. Average rates of gain for steers and heifers are presented in Appendix Tables 1 and 2.

2.3 Feedlot

The feedlot operation is based around a one-time capacity of 1500 head, and fills throughout the year. Feeder cattle are transferred in and fed to slaughter market weight. Steer calves are acquired at 999 lbs and fed to 1433 lbs. Heifer calves are acquired at a weight of 899 lbs and fed to a weight of 1299 lbs. Mortality rates of .75% are assumed in the feedlot stage. Average rates of gain for finishing steers and heifers are presented in Appendix Tables 1 and 2.

2.4 Livestock Purchase Costs and Revenues

Figure 2.1 below presents a time series of Ontario weaned calf prices. The figure shows that the most recent three years have seen relatively low calf prices, ranging between about $100 and$120/cwt; this compares with pre-BSE levels of mostly $120-150/cwt. Also, the seasonal pattern of calf pricing is evident, with seasonal price lows in the fall.

Figure 2.2 below presents a time series of Ontario feeder steer, feeder heifer, slaughter steer, and slaughter heifer prices. The figure shows that the most recent three years have seen relatively low feeder steer and heifer prices in the range of $80-$120/cwt, down from pre-BSE levels ranging from $120-$140/cwt. Similarly, slaughter cattle prices have ranged around $80 to $100/cwt, versus pre-BSE levels broadly in excess of $100/cwt.

Figure 2.1 Ontario Weaned Calf Prices, Monthly, 1999-2008

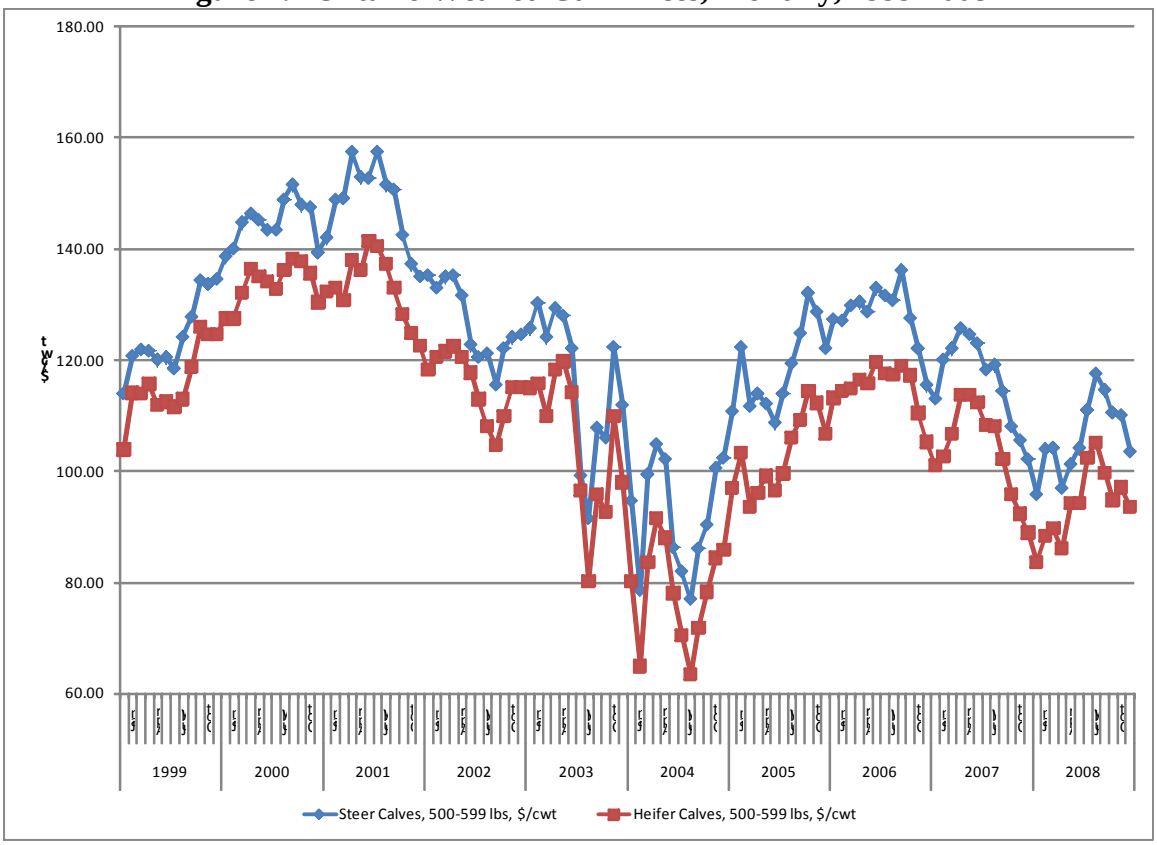
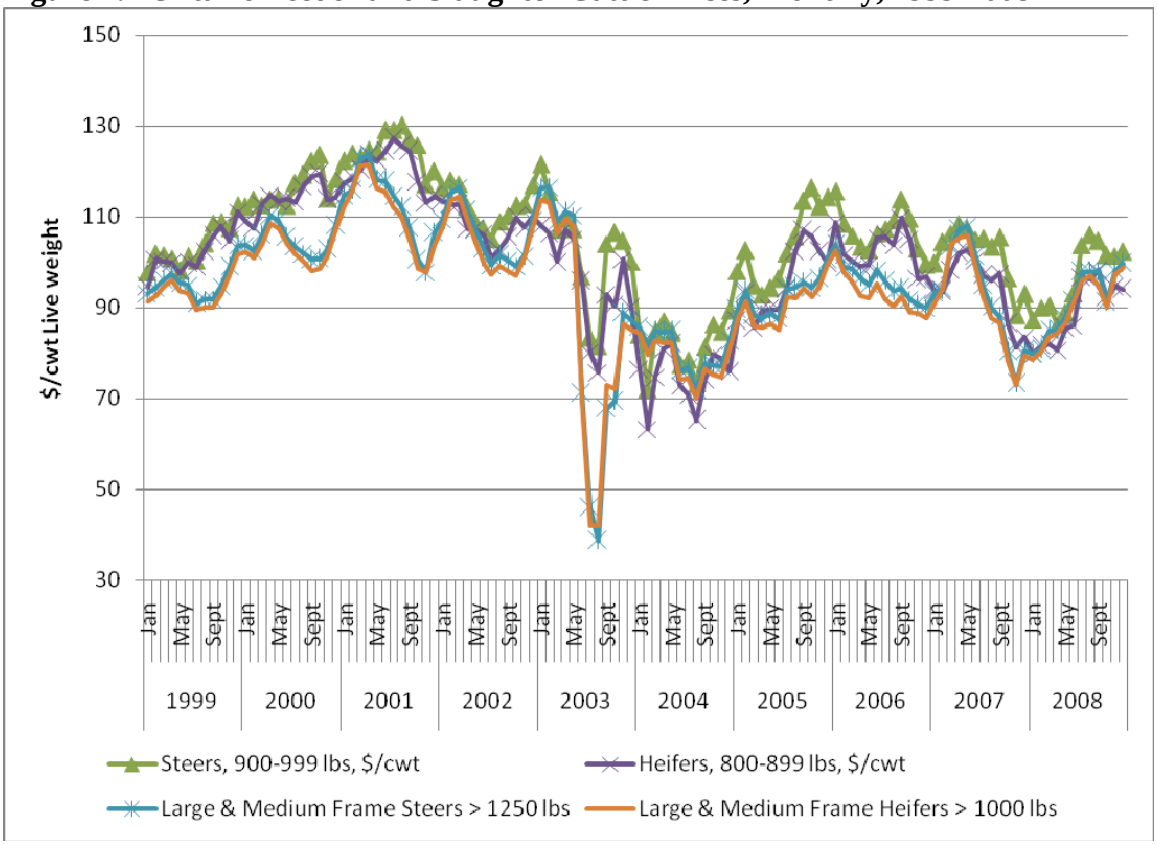


Figure 2.2 Ontario Feeder and Slaughter Cattle Prices, Monthly, 1999-2008



Because of the observed seasonality, the price history was used to obtain three-year averages for specific months, and these were used to estimate revenue in the future. For example, the expected price for animals marketed in January was taken as the average of January 2006, January 2007, and January 2008.

2.5 Feed Costs

Feed costs were driven off the NRC nutritional requirements, seasonal feed ingredient availability, along with Ontario feed ingredient values. The basic nutritional requirements of steers and heifers are presented in Appendix Tables 1 and 2. Nutrient requirements are given in terms Dry Matter (DM), Total Digestible Nutrients (TDN),, Crude Protein (CP), Calcium (Ca), and Phosphorus (P). The major feedstuffs used for optimizing the diets are hay, forage, corn silage, grain corn, protein supplement, corn distiller grains, salt, and minerals. Nutrient content of the feeds are taken from different literature sources and adjusted to reflect Ontario conditions.
Table 3 in the Appendix presents the assumptions relative to available feed ingredients in the model. It was also assumed that a small amount of supplement (1 lb/head/day) was required in feedlot diets as a carrier for vitamin and mineral, and that distillers' grain had a maximum inclusion rate of 20% of dry matter..

With regard to seasonality, the availability of pasture was restricted in certain parts of the year. This is presented in Appendix Table 4. It was assumed that pasture began its availability in early May, and lasted through most of October. Other feed ingredients were available throughout the year.

The model uses monthly 2006-2008 average prices for the feedstuffs used in simulation. It is assumed that all the feeds are purchased at the start of the feeding period, so the cow-calf operation effectively purchases the feeds at the time of calving. Similar to the calf pricing component, feeds were priced at averages for each month, based on the previous three year average. For baled hay, values from the CAIS/AgriStability program Fair Market Values database were used, multiplied through by a factor of .7 to convert alfalfa hay to hay fed to beef cows; corn silage values were also obtained from the Fair Market Values database. Other feedstuffs were based on market prices- corn valued at the Chatham track price, wet distillers' grain was valued at 30% of the Chatham track corn price, and a 32% protein supplement valued at 75% of the Hamilton soymeal price plus a fixed vitamin/mineral/growth additives cost component. The feedgrade limestone needed to maintain a 2:1 Ca:P balance with wet distillers' grains in the ration is assumed to be in the protein supplement with the calcium content adjusted accordingly (see Appendix Table 3).

For pasture forage costs, the following was undertaken. First, it was assumed that pasture and hay yields were the same on a dry matter basis. Next, it was assumed that pasture forage is 15% dry matter. These volumes were associated with the 2007/08 pasture costs for the Bruce Community Pasture, and reduced by 2.5% every two years prior to this period.

2.6 Other Variable Costs

Other operating costs relate to veterinary, labour and miscellaneous costs. These were obtained from Ontario and Manitoba enterprise budgets and are presented in Table 2.2. Marketing and transportation costs were adjusted for scenarios of combinations of enterprises by assessing only the cost from the last stage of production; for example, in the fully combined system only the marketing and transportation cost from the feedlot segment was assigned, and for cow-calf combined with backgrounding, only the marketing and transport cost from backgrounding is incurred. Operating expenses were calculated based on the financing of all variable costs for half of the production period, evaluated at the three year average prime interest rate, plus 2 percentage points. Labour costs refer only to hired labour and is exclusive of owner's unpaid labour.

Table 2.2 Other Variable Costs

	Cow-Calf, $/lb live	Backgrounding, $/lb gain	Feedlot, $/lb gain
Veterinary Medicine & Supplies	0.041	0.06	0.06
Fuel, Maintenance & Repairs	0.032	0.02	0.02
Utilities	0.027	0.01	0.01
Marketing & Transportation	0.032	0.06	0.07
Insurance	0.018	0.01	0.01
Miscellaneous (Office Expenses)	0.150	0.03	0.03
Operating Interest	0.050	0.01	0.005
Arm's Length Labour	0.011	0.02	0.04

The data in Table 2.2 are exclusive of the costs of straw bedding. The use of straw as bedding follows a seasonal pattern which is the direct offset of the seasonality in pasture availability. In periods in which straw is required, it was assumed that cow-calf operation requires 2.3 kg/day/cow and backgrounding requires 1.6 kg/day/head. By assumption, the feedlot operation uses a slatted floor facility that does not require straw bedding.

Table 2.3 Straw for Bedding

	Straw Requirements	Straw Price, $/tonne
Cow-Calf Operation, kg/cow/day	2.25	80
Backgrounding Operation, kg/head/day	1.58	
Feedlot Operation, kg/head/day	0.00	

2.7 Fixed Costs

Fixed costs in the model reflect assumptions about original costs of fixed capital and its useful life. These costs were annualized assuming straight line depreciation and a salvage value of 10% of new cost; interest was charged on the difference between new and

salvage values using an interest rate of prime plus 2 percentage points. The estimates for cow-calf assumed that buildings are limited to a barn, an all-terrain vehicle, and a tractor/loader with manure spreader, and a snow blower; These are summarized in Table 2.4. For backgrounding, fixed costs assume a barn, an all-terrain vehicle, two tractors with loaders, a manure spreader, and a snow blower. For the feedlot operation, it was assumed that buildings are limited to a slatted floor barn, two tractors with loaders, a mixing feed wagon, a manure spreader, and a snow blower. Costs were not assigned to the land base and fencing as all feeds were valued at purchase prices and assumed to cover production costs.

Table 2.4 Fixed Costs

		Original Cost, $	Useful Life (years)
Cow-Calf 100 cows	**Buildings**	80,000	25
	Machinery & Equipment	107,000	10
Backgrounding 500 cows	**Buildings**	130,000	25
	Machinery & Equipment	175,000	10
Feedlot 1500 head bunk space	**Buildings**	525,000	25
	Machinery & Equipment	166,500	10

3.0 Results

Given the above structure and parameters, the model was solved to give returns per head under an optimal feed ration, given seasonal feed prices, forage availability, and nutrient balances. Separate results were obtained for steers and heifers.

3.1 Nutrition

Tables 3.1 to 3.3 below presents the results of optimal feed allocation at the three stages of production and in the fully integrated, combined system. The rows in the table are based on the month at which calves enter and exit each stage of production, with the columns identifying feed ingredients. The entries in the table give the proportions of dry matter according to feed ingredient. Some direction is required in interpreting the diets in a combined, coordinated system at the upstream levels. For example, fed cattle marketed in January were purchased as feeders in August, and feeders marketed in August were purchased as weaned calves in January. So the diets consumed by fed cattle marketed in January consist of the "January" row in Table 3.3, the "August" row in Table 3.2, and the "January" row from Table 3.1.

Scenarios were run for steers and heifers separately, but the feed ingredient proportions were identical for each stage, and as such can be summarized in a single table for each stage. The tables show that the weaned calf and backgrounding stages of production are strictly forage-based, with variable proportions of pasture and baled hay used based on the availability of pasture in the production period. The feedlot stage is mostly a grain feeding enterprise based on corn, wet distillers' grains, and small amounts of supplement and baled hay. The feedlot diet is stable across production periods. In all cases, the nutrient constraints are satisfied but the dry matter constraint is binding; this is an expected result.

3.2 Cow-Calf

Table 3.4 gives the costs and returns results for weaned steers. The table shows that there is significant variation in revenue seasonally, with a summer revenue high and winter marketing low of almost $90/head. At the same time, the seasonality in costs is such that winter marketings have the lowest cost, and the range in costs over marketing months is almost $100/head. Overall, revenue is significantly lower than total costs, giving an average loss per head of $127. This ranges from a loss of about $172/head marketing in May to a loss of about $92/head marketing in February and $94/head marketing in September.

The costs and returns results for weaned heifers are presented in Table 3.5. The results are structurally similar in terms of seasonality marketing weaned heifers in terms of seasonal pattern in revenues and production costs. What is somewhat difference is the magnitude of net returns (losses) on weaned heifers versus weaned steers; for example, on average, the loss on marketing weaned heifers was $218/head compared with $127/head on weaned steers. This derives from two sources. First, heifer calves are

Table 3.1 Optimal Steer Feed Ration Proportions, Dry Matter Basis, Weaned Steer Calves and Weaned Heifer Calves

Calf Marketing Month	Calving Month	Hay Forage	Pasture Forage	Corn Silage	Corn	Supplement 32% PROT SUPP	Corn Wet Distillers Grains	Salt & Minerals
January	**May**	31.9%	67.5%	0.0%	0.0%	0.0%	0.0%	0.6%
February	**June**	40.7%	58.8%	0.0%	0.0%	0.0%	0.0%	0.6%
March	**July**	53.2%	46.3%	0.0%	0.0%	0.0%	0.0%	0.6%
April	**August**	65.7%	33.8%	0.0%	0.0%	0.0%	0.0%	0.6%
May	**September**	78.2%	21.3%	0.0%	0.0%	0.0%	0.0%	0.6%
June	**October**	81.9%	17.5%	0.0%	0.0%	0.0%	0.0%	0.6%
July	**November**	78.2%	21.3%	0.0%	0.0%	0.0%	0.0%	0.6%
August	**December**	65.7%	33.8%	0.0%	0.0%	0.0%	0.0%	0.6%
September	**January**	53.2%	46.3%	0.0%	0.0%	0.0%	0.0%	0.6%
October	**February**	40.7%	58.8%	0.0%	0.0%	0.0%	0.0%	0.6%
November	**March**	31.9%	67.5%	0.0%	0.0%	0.0%	0.0%	0.6%
December	**April**	31.9%	67.5%	0.0%	0.0%	0.0%	0.0%	0.6%

Table 3.2 Optimal Steer Feed Ration Proportions, Dry Matter Basis, Backgrounding Steers and Heifers

Calf Marketing Month	Calf Purchase Month	Hay Forage	Pasture Forage	Corn Silage	Corn	32% PROT SUPP	Corn Wet Distillers Grains	Salt & Minerals
January	**June**	40.3%	59.1%	0.0%	0.0%	0.0%	0.0%	0.6%
February	**July**	57.0%	42.4%	0.0%	0.0%	0.0%	0.0%	0.6%
March	**August**	73.3%	26.1%	0.0%	0.0%	0.0%	0.0%	0.6%
April	**September**	88.7%	10.7%	0.0%	0.0%	0.0%	0.0%	0.6%
May	**October**	99.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
June	**November**	86.8%	12.6%	0.0%	0.0%	0.0%	0.0%	0.6%
July	**December**	68.9%	30.5%	0.0%	0.0%	0.0%	0.0%	0.6%
August	**January**	51.8%	47.6%	0.0%	0.0%	0.0%	0.0%	0.6%
September	**February**	35.1%	64.3%	0.0%	0.0%	0.0%	0.0%	0.6%
October	**March**	19.3%	80.1%	0.0%	0.0%	0.0%	0.0%	0.6%
November	**April**	9.4%	90.0%	0.0%	0.0%	0.0%	0.0%	0.6%
December	**May**	22.7%	76.7%	0.0%	0.0%	0.0%	0.0%	0.6%

Table 3.3 Optimal Feed Ration Proportions, Dry Matter Basis, Feeding Steers and Heifers

Calf Marketing Month	Feedlot Placement Month	Hay Forage	Pasture Forage	Corn Silage	Corn	32% PROT SUPP	Corn Wet Distillers Grains	Salt & Minerals
January	**August**	19.4%	0.0%	0.0%	56.0%	4.0%	20.0%	0.6%
February	**September**	19.4%	0.0%	0.0%	56.0%	4.0%	20.0%	0.6%
March	**October**	19.4%	0.0%	0.0%	56.0%	4.0%	20.0%	0.6%
April	**November**	19.4%	0.0%	0.0%	56.0%	4.0%	20.0%	0.6%
May	**December**	19.4%	0.0%	0.0%	56.0%	4.0%	20.0%	0.6%
June	**January**	19.4%	0.0%	0.0%	56.0%	4.0%	20.0%	0.6%
July	**February**	19.4%	0.0%	0.0%	56.0%	4.0%	20.0%	0.6%
August	**March**	19.4%	0.0%	0.0%	56.0%	4.0%	20.0%	0.6%
September	**April**	19.4%	0.0%	0.0%	56.0%	4.0%	20.0%	0.6%
October	**May**	19.4%	0.0%	0.0%	56.0%	4.0%	20.0%	0.6%
November	**June**	19.4%	0.0%	0.0%	56.0%	4.0%	20.0%	0.6%
December	**July**	19.4%	0.0%	0.0%	56.0%	4.0%	20.0%	0.6%

Table 3.4 Cow-Calf Costs and Returns, Steer Calves

	Start	End
Range, lb	100	597

Marketing Month	Calving Month	Feeding Period, months	Per Head, $					
			Revenue	Total Costs	Feed Costs	Other Costs	Net Return	Gross Margin
January	**May**	8.2	669	771	325	446	-101	90
February	**June**	8.2	699	791	342	449	-92	100
March	**July**	8.2	708	819	366	454	-111	81
April	**August**	8.2	703	848	389	459	-146	46
May	**September**	8.2	706	877	413	464	-172	20
June	**October**	8.2	717	886	420	466	-169	22
July	**November**	8.2	718	878	413	465	-160	32
August	**December**	8.2	731	849	389	460	-118	73
September	**January**	8.2	726	820	366	455	-94	98
October	**February**	8.2	689	791	342	449	-102	89
November	**March**	8.2	644	771	325	446	-127	64
December	**April**	8.2	639	771	325	446	-132	60
Average			696	823	368	455	-127	64

Table 3.5 Cow-Calf Costs and Returns, Heifer Calves

	Start	End						
Range, lb	95	551						
								Per Head, $
Marketing Month	**Calving Month**	**Feeding Period, months**	**Revenue**	**Total Costs**	**Feed Costs**	**Other Costs**	**Net Return**	**Gross Margin**
January	**May**	8.1	552	758	325	433	-206	-15
February	**June**	8.1	568	777	341	436	-209	-18
March	**July**	8.1	570	806	365	440	-236	-44
April	**August**	8.1	583	834	389	445	-251	-60
May	**September**	8.1	587	863	413	450	-275	-84
June	**October**	8.1	603	871	420	451	-268	-77
July	**November**	8.1	626	863	413	450	-237	-46
August	**December**	8.1	634	835	389	446	-201	-10
September	**January**	8.1	653	806	365	441	-154	38
October	**February**	8.1	605	778	341	436	-173	19
November	**March**	8.1	580	758	325	433	-178	14
December	**April**	8.1	530	758	325	433	-228	-36
Average			591	809	368	441	-218	-27

priced typically around $10/cwt lower than steers, which immediately explains revenue differences of about $55-$60/head. Second, heifers tend to be marketed somewhat lighter than steers. Finally, the average daily gain on heifers is slightly lower for heifers compared with steers, as can be seen comparing Appendix Tables 1 and 2.

3.3 Backgrounding

Table 3.6 gives the cost and returns results for steers. The table shows that revenue per head varies seasonally, but is generally around $1000/head. Revenues were the highest in the summer months and lowest in the late fall. At the same time, the seasonality in costs is such that summer marketings have the lowest cost, and the range in costs over marketing months is over $100/head. Overall, revenue marginally exceeds total cost, giving an average return per head of $10. This ranges from a loss of about $69/head marketing in April to a return of about $105/head marketing in July.

The costs and returns results for backgrounding heifers are presented in Table 3.7. The results are structurally similar to marketing feeder steers in terms of seasonal pattern in revenues and production costs. Returns in backgrounding heifers are somewhat lower than that backgrounding steers, averaging a loss of $5. The difference in returns

Table 3.6 Costs and Returns, Steer Backgrounding

	Start	End
Range, lb	597	999

Marketing Month	Calf Purchase Month	Feeding Period, months	Per Head, $					
			Revenue	Total Costs	Feed Costs	Calf Cost	Net Return	Gross Margin
January	June	7.1	1,007	1,023	124	732	-15	45
February	July	7.1	1,008	1,037	135	733	-29	32
March	August	7.1	1,007	1,059	147	747	-52	8
April	September	7.1	992	1,061	157	742	-69	-9
May	October	7.1	994	1,028	166	704	-33	27
June	November	7.1	1,013	968	156	657	45	106
July	December	7.1	1,053	948	144	653	105	165
August	January	7.1	1,060	967	132	684	93	153
September	February	7.1	1,078	987	120	714	91	151
October	March	7.1	1,024	989	109	724	35	95
November	April	7.1	947	980	103	718	-33	28
December	May	7.1	981	996	112	721	-15	46
Average		7	1,014	1,004	134	711	10	71

Table 3.7 Costs and Returns, Heifer Backgrounding

	Start	End
Range, lb	551	899

Marketing Month	Calf Purchase Month	Feeding Period, months	Per Head, $					
			Revenue	Total Costs	Feed Costs	Calf Cost	Net Return	Gross Margin
January	June	6.7	846	874	105	616	-27	33
February	July	6.7	830	907	115	639	-78	-17
March	August	6.7	840	922	124	647	-83	-22
April	September	6.7	845	948	133	667	-103	-43
May	October	6.7	862	903	140	618	-41	20
June	November	6.7	875	866	132	592	9	69
July	December	6.7	898	802	121	541	96	156
August	January	6.7	888	814	111	563	74	134
September	February	6.7	916	822	101	580	94	154
October	March	6.7	850	817	92	582	33	93
November	April	6.7	816	828	86	596	-13	48
December	May	6.7	822	844	94	600	-22	38
Average			857	862	113	604	-5	55

compared with steers appears to relate to a lower marketing weight, heifers priced around $10/cwt lower than steers, lower average daily gain on heifers compared with steers, as can be seen comparing Appendix Tables 1 and 2.

3.4 Feedlot

Table 3.8 gives the cost and returns results for feeding steers. The table shows that revenue per head varies significantly on a seasonal basis, from $1257/head to just under $1400/head. Revenues decline sharply in the fall and begin to increase through the winter and are steady through spring and summer. At the same time, the seasonality in costs is such that spring and summer marketings have the lowest cost, and the range in costs over marketing months is about $150/head. Over the year, a net loss of $60/head is generated. This ranges from a loss of about $180/head marketing in November to a positive net return of about $62/head marketing in April.

The costs and returns results for feeding heifers are presented in Table 3.9. The results are structurally similar marketing heifers and steers in terms of seasonal pattern in revenues and production costs. Returns feeding heifers are somewhat higher than feeding steers, averaging a marginal net loss of $24/head. The difference in returns compared with steers relates to a lower feeder animal cost and lower feed cost that more than offset the lower marketing weight and discounted pricing for heifers.

Table 3.8 Costs and Returns, Steer Feeding

	Start	End						
Range, lb	999	1433						
Marketing Month	**Feedlot Placement Month**	**Feeding Period, months**	**Per Head, $**					
			Revenue	**Total Costs**	**Feed Costs**	**Feeder Cost**	**Net Return**	**Gross Margin**
January	**August**	4.7	1,323	1,436	237	1,068	-113	-75
February	**September**	4.7	1,308	1,467	250	1,087	-159	-121
March	**October**	4.7	1,370	1,393	231	1,032	-23	15
April	**November**	4.7	1,381	1,319	234	955	62	100
May	**December**	4.7	1,389	1,364	245	989	25	63
June	**January**	4.7	1,392	1,380	234	1,015	13	51
July	**February**	4.7	1,378	1,384	238	1,016	-6	32
August	**March**	4.7	1,345	1,383	237	1,015	-38	0
September	**April**	4.7	1,339	1,371	240	1,000	-31	7
October	**May**	4.7	1,257	1,375	242	1,002	-118	-80
November	**June**	4.7	1,228	1,408	256	1,022	-180	-142
December	**July**	4.7	1,291	1,444	252	1,061	-153	-115
Average			**1,333**	**1,394**	**241**	**1,022**	**-60**	**-22**

Table 3.9 Costs and Returns, Heifer Feeding

	Start	End
Range, lb	899	1299

Marketing Month	Feedlot Placement Month	Feeding Period, months	Per Head, $					
			Revenue	Total Costs	Feed Costs	Feeder Cost	Net Return	Gross Margin
January	**August**	4.6	1,178	1,238	220	895	-60	-22
February	**September**	4.6	1,179	1,279	233	923	-100	-61
March	**October**	4.6	1,227	1,195	215	857	32	70
April	**November**	4.6	1,222	1,163	217	822	60	98
May	**December**	4.6	1,232	1,179	228	828	53	91
June	**January**	4.6	1,235	1,194	217	853	41	79
July	**February**	4.6	1,213	1,181	221	836	33	71
August	**March**	4.6	1,192	1,190	221	846	1	40
September	**April**	4.6	1,184	1,198	223	852	-14	24
October	**May**	4.6	1,114	1,218	225	869	-104	-65
November	**June**	4.6	1,121	1,243	238	882	-122	-84
December	**July**	4.6	1,150	1,263	235	905	-113	-74
Average			**1,187**	**1,212**	**224**	**864**	**-24**	**14**

3.5 Enterprise Combinations

Within the combined system, cattle are transferred between stages at cost. In each case, cattle are transferred at the cost of production in lieu of the feeder animal price and assuming no transport and marketing cost; market prices for cattle and marketing/transportation costs are incurred only at the last stage of production.

3.5.1 Fully Combined Cow-Calf-Backgrounding-Feedlot System

Table 3.10 gives the cost and returns results for steers in the fully combined system. The table shows that there is significant variation in revenue seasonally, with a summer slaughter cattle revenue high and fall marketing low; this gives a range in revenues of over $160/head. At the same time, the seasonality in costs is such that winter fed cattle marketings have the lowest cost and summer marketings have the highest cost, generating a range in costs of about $131/head. Overall, slaughter steer revenue is significantly lower than total system accrued costs in every marketing month, giving an average loss per head of $138. This ranges from a loss of about $223/head marketing in November to a loss of about $59/head marketing in March.

The costs and returns results marketing fed heifers in a cow-calf-backgrounding- feedlot combined system are presented in Table 3.11. The table shows that the combined system generates broadly negative returns, averaging a loss of about $216/head. The seasonality of production gives minimal losses marketing fed cattle in the early spring and heavy losses in fall. This is broadly consistent with seasonality in fed cattle revenues.

3.5.2 Combined Cow-Calf and Backgrounding

An alternative organization was examined by examining the sale of feeder steers in a combined cow-calf-backgrounding system. Transfers were at cost as described above. Table 3.12 presents the costs and returns results from the combined cow-calf-backgrounding operation. The table shows that the combined operation manages a marginal profit marketing feeder steers in the early winter, but that its results are more broadly negative. On average, the operation loses $101/head over the course of the year.

Table 3.13 presents the costs and returns results from the combined cow-calf-backgrounding operation. The table shows that the combined operation generates a loss throughout the year. On average, the operation loses $211/head over the course of the year, with loses ranging from just over $100/head to in excess of $300/head. These are largely driven by seasonal variation in feed costs, which are driven by the availability of pasture.

Table 3.10 Steer Production Costs and Returns, Fully Integrated System

	Start	End
Range, lb	100	1433

Marketing Month	Calving Month, prior year	Production Period, months	Per Head, $				
			Revenue	Total Costs	Feed Costs	Net Return	Gross Margin
January	**May**	20	1,323	1,404	704	-81	215
February	**June**	20	1,308	1,427	723	-119	177
March	**July**	20	1,370	1,430	717	-59	237
April	**August**	20	1,381	1,459	738	-78	218
May	**September**	20	1,389	1,513	783	-124	172
June	**October**	20	1,392	1,527	791	-135	161
July	**November**	20	1,378	1,535	800	-157	140
August	**December**	20	1,345	1,514	786	-169	127
September	**January**	20	1,339	1,494	775	-155	141
October	**February**	20	1,257	1,471	761	-214	82
November	**March**	20	1,228	1,451	748	-223	74
December	**April**	20	1,291	1,431	732	-141	155
Average			**1,333**	**1,471**	**755**	**-138**	**158**

Table 3.11 Heifer Production Costs and Returns, Fully Integrated System

	Start	End
Range, lb	95	1299

Marketing Month	Calving Month, prior year	Production Period, months	Per Head, $				
			Revenue	Total Costs	Feed Costs	Net Return	Gross Margin
January	**May**	19.4	1,178	1,338	667	-160	136
February	**June**	19.4	1,179	1,361	686	-182	114
March	**July**	19.4	1,227	1,366	683	-139	157
April	**August**	19.4	1,222	1,396	705	-174	123
May	**September**	19.4	1,232	1,447	748	-215	81
June	**October**	19.4	1,235	1,459	756	-225	72
July	**November**	19.4	1,213	1,465	762	-252	44
August	**December**	19.4	1,192	1,443	746	-251	45
September	**January**	19.4	1,184	1,422	733	-238	58
October	**February**	19.4	1,114	1,398	718	-284	12
November	**March**	19.4	1,121	1,379	705	-258	38
December	**April**	19.4	1,150	1,362	691	-212	84
Average			**1,187**	**1,403**	**717**	**-216**	**80**

Table 3.12 Steer Production Costs and Returns, Cow-Calf- Backgrounding Combination

	Start	End
Range, lb	100	999

Marketing Month	Calving Month, prior year	Production Period, months	Per Head, $				
			Revenue	Total Costs	Feed Costs	Net Return	Gross Margin
January	**October**	15.3	1,068	1,060	468	9	267
February	**November**	15.3	1,087	1,070	473	17	275
March	**December**	15.3	1,032	1,092	487	-60	199
April	**January**	15.3	955	1,118	504	-163	95
May	**February**	15.3	989	1,161	538	-172	86
June	**March**	15.3	1,015	1,186	558	-171	87
July	**April**	15.3	1,016	1,190	562	-174	84
August	**May**	15.3	1,015	1,169	549	-154	104
September	**June**	15.3	1,000	1,147	535	-147	111
October	**July**	15.3	1,002	1,122	519	-119	139
November	**August**	15.3	1,022	1,087	492	-66	192
December	**September**	15.3	1,061	1,072	479	-11	247
Average			**1,022**	**1,123**	**514**	**-101**	**157**

Table 3.13 Heifer Production Costs and Returns, Cow-Calf- Backgrounding Combination

	Start	End
Range, lb	95	899

Marketing Month	Calving Month, prior year	Production Period, months	Per Head, $				
			Revenue	Total Costs	Feed Costs	Net Return	Gross Margin
January	**October**	14.8	895	1,014	446	-120	138
February	**November**	14.8	923	1,026	454	-103	155
March	**December**	14.8	857	1,049	469	-192	66
April	**January**	14.8	822	1,076	488	-253	5
May	**February**	14.8	828	1,116	520	-288	-30
June	**March**	14.8	853	1,139	538	-285	-28
July	**April**	14.8	836	1,141	541	-304	-46
August	**May**	14.8	846	1,119	526	-273	-15
September	**June**	14.8	852	1,095	510	-244	14
October	**July**	14.8	869	1,070	493	-201	57
November	**August**	14.8	882	1,038	467	-156	102
December	**September**	14.8	905	1,025	456	-120	138
Average			**864**	**1,076**	**492**	**-211**	**46**

3.5.3 Combined Backgrounding and Feedlot

A scenario was considered in which backgrounding and feedlot finishing was combined, with transfers between the backgrounding and feedlot stages based on costs as described above. Table 3.14 gives the costs and returns results. The table shows that the combined operation experiences variable returns throughout the year, and ultimately loses about $27/head over the course of the year. Production costs range between just over $1,300 and just over $1,400/head through the year, with relatively more of the variability coming in fed cattle revenues. The early spring to mid summer months show a period of profitability, with significant losses occurring in the fall.

A second subset was considered in which backgrounding and feedlot finishing of heifers were combined, with weaned calves purchased and internal transfers based on costs as described above. Table 3.15 gives the costs and returns results. The table shows that the combined operation experiences broadly positive returns throughout the year, and generates an average net loss of about $10/head. Production costs range between $1,142 and $1,242/head through the year, with relatively more of the variability coming in production costs. Losses generally occur in mid-summer to fall, with the remainder of the year profitable.

3.6 Accelerated Feeding

A final scenario was examined for accelerated finishing. Under this scenario, weaned calves are purchased and placed immediately in the feedlot and rapidly shifted into a grain-based ration in what is essentially a combined backgrounding feedlot stage. The resulting market weights for slaughter cattle are lower- 1202 lbs for steers and 1089 lbs for heifers. The nutritional requirements of this approach are presented in Tables 6 and 7 in the Appendix. As with the conventional feedlot model, it was assumed that a minimum level of supplement of 1 lb/head/day was required in the diet as a carrier for vitamins and minerals. In addition, it was assumed that a discount of 2¢/lb would apply to slaughter animal pricing due to lighter weights and lesser marbling in the accelerated feeding scenario.

Table 3.16 presents the feed ration structure, which was proportionally the same for steers and heifers. It shows that the corn is the principal feed ingredient, combined with hay and distillers' grains, with small amounts of concentrate. The diet is thus very similar to the feedlot diet observed in Table 3.3, but occurring over a longer period of time.

Table 3.17 presents the costs and returns results for accelerated feeding of steers. The tables shows that accelerated feeding of steers is broadly unprofitable, averaging a loss of $146/head. The seasonality in returns closely follows the seasonality in fed cattle pricing. Table 3.18 gives the comparable results for feeding heifers. The losses in heifers are broadly lower than with steers, but follow a similar set of trends.

Table 3.14 Steer Production Costs and Returns, Backgrounding-Feedlot Combination

	Start	End
Range, lb	597	1433

Marketing Month	Calving Month, prior year	Production Period, months	Per Head, $					
			Revenue	Total Costs	Feed Costs	Feeder	Net Return	Gross Margin
January	**January**	11.8	1,323	1,319	370	689	3	103
February	**February**	11.8	1,308	1,352	371	719	-44	55
March	**March**	11.8	1,370	1,335	341	729	35	135
April	**April**	11.8	1,381	1,329	337	723	52	151
May	**May**	11.8	1,389	1,356	357	726	33	133
June	**June**	11.8	1,392	1,372	359	738	20	119
July	**July**	11.8	1,378	1,390	374	739	-12	87
August	**August**	11.8	1,345	1,412	385	753	-67	32
September	**September**	11.8	1,339	1,417	399	748	-78	21
October	**October**	11.8	1,257	1,386	409	709	-128	-29
November	**November**	11.8	1,228	1,339	413	663	-111	-12
December	**December**	11.8	1,291	1,315	397	658	-25	75
Average			**1,333**	**1,360**	**376**	**716**	**-27**	**72**

Table 3.15 Heifer Production Costs and Returns, Backgrounding-Feedlot Combination

	Start	End
Range, lb	551	1299

Marketing Month	Calving Month, prior year	Production Period, months	Per Head, $					
			Revenue	Total Costs	Feed Costs	Feeder Costs	Net Return	Gross Margin
January	**February**	11.3	1,178	1,144	332	568	34	134
February	**March**	11.3	1,179	1,164	335	585	15	114
March	**April**	11.3	1,227	1,142	307	587	85	184
April	**May**	11.3	1,222	1,155	305	600	67	166
May	**June**	11.3	1,232	1,181	323	605	51	150
June	**July**	11.3	1,235	1,201	323	621	33	133
July	**August**	11.3	1,213	1,239	337	645	-26	73
August	**September**	11.3	1,192	1,253	346	652	-62	37
September	**October**	11.3	1,184	1,282	357	672	-98	1
October	**November**	11.3	1,114	1,238	366	623	-124	-25
November	**December**	11.3	1,121	1,214	371	597	-93	6
December	**January**	11.3	1,150	1,146	356	546	4	103
Average			**1,187**	**1,197**	**338**	**608**	**-10**	**90**

Table 3.16 Optimal Feed Ration Proportions, Dry Matter Basis, Accelerated Feeding of Steers and Heifers

Calf Marketing Month	Feedlot Placement Month	Hay Forage	Pasture Forage	Corn Silage	Corn	32% PROT SUPP	Corn Wet Distillers Grains	Salt & Minerals
January	**July**	12.0%	0.0%	0.0%	65.0%	4.0%	17.0%	0.6%
February	**August**	12.0%	0.0%	0.0%	65.0%	4.0%	17.0%	0.6%
March	**September**	12.0%	0.0%	0.0%	65.0%	4.0%	17.0%	0.6%
April	**October**	12.0%	0.0%	0.0%	65.0%	4.0%	17.0%	0.6%
May	**November**	12.0%	0.0%	0.0%	65.0%	4.0%	17.0%	0.6%
June	**December**	12.0%	0.0%	0.0%	65.0%	4.0%	17.0%	0.6%
July	**January**	12.0%	0.0%	0.0%	65.0%	4.0%	17.0%	0.6%
August	**February**	12.0%	0.0%	0.0%	65.0%	4.0%	17.0%	0.6%
September	**March**	12.0%	0.0%	0.0%	65.0%	4.0%	17.0%	0.6%
October	**April**	12.0%	0.0%	0.0%	65.0%	4.0%	17.0%	0.6%
November	**May**	12.0%	0.0%	0.0%	65.0%	4.0%	17.0%	0.6%
December	**June**	12.0%	0.0%	0.0%	65.0%	4.0%	17.0%	0.6%

Table 3.17 Steer Production Costs and Returns, Accelerated Feeding

	Start	End
Range, lb	597	1202

Marketing Month	Feedlot Placement Month	Feeding Period, months	Per Head, $					
			Revenue	Total Costs	Feed Costs	Feeder Cost	Net Return	Gross Margin
January	**July**	6	1,091	1,257	288	739	-165	-67
February	**August**	6	1,079	1,274	292	753	-195	-97
March	**September**	6	1,131	1,284	307	748	-153	-54
April	**October**	6	1,140	1,231	293	709	-91	8
May	**November**	6	1,147	1,190	298	663	-43	56
June	**December**	6	1,149	1,184	297	658	-34	64
July	**January**	6	1,138	1,219	301	689	-81	17
August	**February**	6	1,110	1,252	304	719	-143	-44
September	**March**	6	1,105	1,281	323	729	-176	-77
October	**April**	6	1,036	1,269	317	723	-233	-135
November	**May**	6	1,032	1,252	297	726	-220	-122
December	**June**	6	1,064	1,281	315	738	-217	-118
Average			**1,102**	**1,248**	**303**	**716**	**-146**	**-48**

Table 3.18 Heifer Production Costs and Returns, Accelerated Feeding

	Start	End
Range, lb	551	1089

Marketing Month	Feedlot Placement Month	Feeding Period, months	Per Head, $					
			Revenue	Total Costs	Feed Costs	Feeder Cost	Net Return	Gross Margin
January	**July**	6	972	1,117	258	645	-145	-47
February	**August**	6	973	1,128	262	652	-155	-57
March	**September**	6	1,013	1,161	275	672	-149	-51
April	**October**	6	1,009	1,099	262	623	-90	8
May	**November**	6	1,017	1,078	267	597	-61	37
June	**December**	6	1,019	1,026	266	546	-7	92
July	**January**	6	1,001	1,052	270	568	-50	48
August	**February**	6	983	1,072	273	585	-88	10
September	**March**	6	977	1,090	289	587	-113	-15
October	**April**	6	918	1,098	284	600	-180	-82
November	**May**	6	924	1,085	266	605	-161	-63
December	**June**	6	948	1,117	282	621	-169	-70
Average			**980**	**1,094**	**271**	**608**	**-114**	**-16**

4.0 Observations

The results above show that when a precise accounting is made of production conditions in the Ontario beef cattle segment, it has had an unprofitable previous three years. There is profound seasonal variation in costs and returns, and it is clear that at a given point in the year one segment can be profitable while others suffer crushing losses. It must also be recognized that owners' unpaid labour is excluded from the model. There are also marked differences at the segments, and in producing slaughter steers vs. slaughter heifers.

4.1 Cow-Calf

The following observations on producing weaned calves are evident. First, the cow-calf enterprise has experienced some crushing losses. While there is significant seasonality observed, there are none that generate positive returns. The determinants of seasonal fluctuations have been weaned calf revenues and feed costs. Feed costs are driven by the availability of pasture; the marketing periods that entail the lowest feed cost also generate the lowest calf prices.

Secondly, fixed costs in the cow-calf enterprise are very significant. The fixed costs can be partitioned from the "other costs" by subtracting the gross margin from the net return; this fixed cost amounts to $191/head. Clearly, this impinges on returns in the model, and efforts that can be made to drive fixed costs out of the enterprise or decrease them. One approach would be to increase the scale of the operation to fully utilize machinery capacity.

Finally, the results show that the returns from the cow-calf segment will be broadly insufficient to allow for accessing a land base. The negative results underscore the fact that the cow-calf enterprise is something of a residual land use, and cannot afford to bid land away from most alternative agricultural uses.

4.2 Backgrounding

Production of feeder steers from weaned calves has been marginally profitable, and production of feeder heifers marginally unprofitable. This experiences significant seasonal variability due to cattle pricing and feed costs, and differs in magnitude for steers and heifers.

The key drivers of seasonality are feed costs and pricing of weaned calves and feeder animals. The feed cost seasonality relates to the availability of pasture; this drives a range in feed costs from a low of about $103/head when maximum pasture is available over the production period for November marketings, to about $166/head for May marketings in which almost no pasture is available over the production period. At the same time, seasonality in calf weanings drives seasonally low calf costs in the late fall, which is consistent with June or July feeder animal marketings. Overall, the range in calf

procurement cost ranges by almost $100/head. Finally, the seasonality in feeder prices is such that prices peak in the mid-late summer, then drop off sharply. The seasonal swing in revenues from maximum to minimum accounts for about $100/head.

In this environment, the ability to market feeder animals and purchase calves effectively is critical. Feeder cattle futures hedging offers some prospect of mitigating the risk associated with revenue over the course of the year, and clearly returns are very sensitive to calf purchase pricing. Finally, the results suggest material differences in backgrounding steers vs. heifers. Heifer calves essentially cost just over $100/head less than weaned steers on average, and return about $157 less than steers as backgrounded feeder animals.

4.3 Feedlot

The following can be observed on cattle feeding. First, the significant seasonal variation observed highlights the importance of marketing in managing profitability. The key determinants driving observed profitability across marketing months were feeder and fed animal prices, with the recognition that feeder animal prices are closely tied to feed prices. These can be managed by hedging with futures and options, and the results suggest that the ability to do so must be critical in obtaining a profitable feedlot enterprise.

Secondly, the results show significant differences between feeding steers and heifers. Heifers are discounted relative to steers in pricing, and the feed conversion and average daily gain levels for heifers lag that of steers. However, the profitability in feeding heifers appears to exceed that of steers. This surprising result appears to derive from a relative discounting of feeder heifers compared with feeder steers, and savings in feed costs that more than offsets the slaughter animal revenues.

Finally, the seasonal return nature emphasizes the required capitalization in cattle feeding. In order to manage fixed costs by maintaining capacity utilization, feedlots fill on a year ‘round basis. This means that negative returns will be realized on a foreseeable basis for about 5 or 6 months of the year. Capitalization levels must anticipate the cash consumed in these negative return periods.

4.4 Enterprise Combinations

Some important observations can be made by viewing cattle production as a system that are not obvious by viewing segments in isolation, or by attempting to overlay the segments with one another due to the complexities introduced by differences in timing. First, while the transfers at cost show that cattle production has broadly operated at a loss in Ontario since 2006, intermediate pricing of feeder animals has the effect of capping and allocating these losses to specific segments. For example, the cow-calf segment, as represented here, broadly operates at a loss when compared with weaned calf pricing; when this is combined with the downstream backgrounding and feedlot segment it has

the effect of carrying these losses forward and increasing the loss of the system in aggregate.

Some sense of this can be seen by comparing the profitability of the combined cow-calf-backgrounding-feedlot system (using steers as an example). Table 4.1 below provides a comparison of the total costs of production with weaned calves and feeder steers transferred through to the feedlot at cost in the combined system (and given the assumptions above on marketing and transportation costs) versus transfers of weaned calves and feeders in an independent system at market prices. The first column is the total costs of the aligned system, which replicates total costs observed in Table 3.10. The second column maps the marketings in the same time period, but at market prices for feeders. The third column gives fed cattle revenue. Depending on the marketing month, transfers of feeders at cost or market give relatively higher net returns; on average however, the transfers at cost generate a loss of $118/head (as reported in Table 3.10) versus a loss of $40/head when the feeders are transferred at market values. The three columns to the right of the table disaggregate this difference. The aligned system has a built in advantage in marketing and transport costs of $43/head; the other source of difference is the spread between the accrued costs of producing weaned calves and feeders vs. the market price of weaned calves and feeders. The table shows that the market price of weaned calves and feeders is always lower than total cost, and that for the most part the spread between total accrued costs of producing weaned calves and feeders vs, market prices exceeds the marketing and transportation cost advantage. On average, the accrued cost of producing calves and feeders exceeded the price by about $120/head. Thus larger total returns result with transfers at market prices.

Secondly, distortions in feeder animal pricing are also evident comparing steers versus heifers. Comparing the results in Table 3.10 versus Table 3.11, it is clear that in the fully aligned system returns are larger (i.e. the loss is less) producing slaughter steers than slaughter heifers. Similarly, comparing Tables 3.12 and 3.13, the combination of cow-calf and backgrounding for steers gives higher returns (the loss is less) than the same combination for heifers. However, the combination of backgrounding and feedlot is actually more profitable for heifers compared with steers, as evident comparing Tables 3.6 and 3.9. In other words, for the portions of the production system based on forage, steers are clearly more efficient than heifers, but in elements that involve grain feeding, the heifers are more efficient. Observations on the individual segments transferring feeder animals at market prices are consistent with this.

Finally, the general seasonal nature of pricing and costs keeps a lid on returns which are highly variable. In the fully aligned system, the highest fed cattle price period in the spring and summer is met with the highest level of accrued cost in the system. Costs decrease somewhat for fall marketing periods, but fed cattle prices in the fall decrease relatively more. The range in costs and revenues ranges seasonally well in excess of $100/head

Table 5.1 Differences in Returns, Calf and Feeder Transfers in Aligned System Versus Independent Market Based Transfers

Fed Cattle Marketing Month	Total Costs, Feeders @Cost	Total Costs, Feeder @Market Value	Fed Steer Revenue	Net Return, Feeders @Cost	Net Return, Feeders @Market	Spread in Net Return	Decomposition of Net Return Difference		
							Marketing & Transportation	Feeder Cattle Price vs Feeder Cost	Net Cost
January	$1,404	$1,436	$1,323	-$81	-$113	$32	$43	-$11	$32
February	$1,427	$1,467	$1,308	-$119	-$159	$40	$43	-$3	$40
March	$1,430	$1,394	$1,370	-$59	-$23	-$36	$43	-$79	-$36
April	$1,458	$1,318	$1,381	-$78	$62	-$140	$43	-$183	-$140
May	$1,512	$1,363	$1,389	-$124	$25	-$149	$43	-$192	-$149
June	$1,526	$1,379	$1,392	-$135	$13	-$147	$43	-$190	-$147
July	$1,535	$1,384	$1,378	-$157	-$6	-$151	$43	-$193	-$151
August	$1,514	$1,383	$1,345	-$169	-$38	-$131	$43	-$174	-$131
September	$1,495	$1,371	$1,339	-$155	-$31	-$124	$43	-$166	-$124
October	$1,472	$1,375	$1,257	-$214	-$118	-$96	$43	-$139	-$96
November	$1,451	$1,408	$1,228	-$223	-$180	-$43	$43	-$85	-$43
December	$1,431	$1,444	$1,291	-$141	-$153	$12	$43	-$30	$12
	$1,471	**$1,394**	**$1,333**	**-$138**	**-$60**	**-$78**	**$43**	**-$120**	**-$78**

4.5 Accelerated Feeding

Accelerated feeding, which presents the prospect of increased profitability by shortening the supply chain and intensifying production over a shorter period, gives disappointing results. Losses were higher feeding both steers and heifers in accelerated feeding compared with the conventional feeding of heavier weight feeder animals. This appears to relate to lower revenues from cattle sold compared with weaned calf expense, and lower revenues compared with more total corn fed under accelerated feeding.

5.0 Conclusions

The purpose of this study was to consider the costs and returns in cattle enterprise combinations in Ontario. To do so, detailed models were developed of each of the three segments in the production chain and optimized with respect to feeding given the previous 3 years seasonal price averages. Cost and returns results were similarly calculated over the most recent 3 year seasonal average.

The results showed that cattle production has been broadly unprofitable given the last three years' data. For example, the total average return producing fed steers, based on transfers through the system at cost, was a loss of $138/head. At the cow-calf level alone average losses of $127/head for weaned steers were observed. When the full costs of production are moved through the system, the total cost of cattle production in Ontario exceeds fed cattle revenues; this is masked by pricing of intermediate weight cattle (weaned calves and feeders) that has the effect of capping and allocating profits and losses within a system that has fundamentally operated at a loss, given the last three years data. Current and future projected market conditions do not appear better than the previous three years.

These observations are troubling for the Ontario cattle industry, as it begs questions as to its long-term sustainability. These stem most directly from the following:

- Intermediate livestock prices appear inconsistent with segment production costs
- Intermediate livestock prices mask the fact that overall there are steady losses in the system; this is especially evident in cow-calf
- Intermediate livestock prices concentrate losses on specific segments
- Results at the feedlot level suggest that cattle can't effectively bid for corn
- Shortening the supply chain in an accelerated feeding program appears not to help, due to structurally lower revenues for smaller carcasses and increased exposure to high corn costs

These results and observations are based on Ontario information; similar results may be occurring in other regions in the current environment. Moreover, it is important to recognize that cattle feeding and the raising of feeder livestock as an input to it has historically been an Ontario success story, which explains how the cattle sector grew to the size that it is today. Thus, these observations cannot be written off as merely the logical manifestation of a fundamentally inefficient industry; rather it is an industry with a record of success facing protracted challenges currently which this study serves to highlight.

The apparent engagement of these challenges will involve the following:

- Profitability at the cow-calf level should be viewed as a critical issue. This could be targeted with management improvements via training and research/innovation focused on productivity improvement. Potential examples could include improved pasture productivity and breeding efficiency, as well as initiatives that facilitate an increase in herd scale that reduces unit fixed costs.

- Alternatives to the existing means of transferring and marketing intermediate livestock are required. The apparent implication of calf and feeder cattle prices that allocate profit and loss across segments without reference to the total revenue in the system is that individual segments benefit at the expense of others, weakening the ultimate sustainability of the system. Possible alternatives to investigate include the system employed in marketing weaner/feeder pigs, and other perishable intermediate goods
- The results suggest that cattle feeding is challenged to compete for its feed supply. Thus, innovations that can improve feed efficiency through new feedstuffs or improved efficiency of existing feedstuffs will be valuable. This could include increased work in cattle nutragenomics and work to improve the utilization of low priced feedstuffs such as wet distillers grains, bakery waste, etc.
- The price discount on smaller carcasses would appear to be an important impediment to accelerated feeding, and more generally initiatives to shorten supply chains and cut costs out of the system. There is an opportunity for producers and processors to work closely together to improve the marketability and quality of smaller carcasses. This would create the revenue base for processors to pay more for smaller frame carcasses. The Ontario Corn Fed Beef initiative would appear to be an example of this, and a stronger link between beef marketing and cattle production technology with the common goal of increasing revenue and driving out costs by producing a lighter weight animal is warranted.

Appendix

Table 1 Steer Feeding Requirements

	Diet Type	Lower Weight, lbs live/head	Upper Weight, lbs live/head	ADG (kg/day)	DMI, % DM of Live Weight/Day	Nutrient Density					Feedstuff Density & Restrictions (% of DM Intake)							
						TDN, % of DM	NEM, of DM	CP, % of DM	Ca, % of DM	P, % of DM	Pasture Feed	Hay feed	Corn Silage	Grain feed	Distiller Grains	Grain Mix (=barley+oat)	Protein Supplement	Salt & Minerals
Bulls	Breeding Herd			x	2.3%	55.0%	0.0%	10.0%	0.2%	0.1%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
Cows Dry	Breeding Herd			x	2.0%	50.0%	0.0%	6.0%	0.1%	0.1%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
Cows with Suckling Calves	Pre-Weaning	100	498	0.920	2.5%	58.0%	0.0%	10.0%	0.2%	0.1%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
Cows with Suckling Calves	Pre-Weaning	498	597	0.920	2.5%	58.0%	0.0%	10.0%	0.2%	0.1%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
Calves	Backgrounding	597	699	0.850	2.6%	58.0%	0.0%	12.0%	0.2%	0.1%	100.0%	100.0%	100.0%	0.0%	10.0%	0.0%	0.0%	0.6%
Calves	Backgrounding	699	798	0.850	2.6%	58.0%	0.0%	12.0%	0.2%	0.1%	100.0%	100.0%	100.0%	0.0%	10.0%	0.0%	0.0%	0.6%
Calves	Backgrounding	798	899	0.850	2.5%	58.0%	0.0%	11.0%	0.2%	0.1%	100.0%	100.0%	100.0%	0.0%	10.0%	0.0%	0.0%	0.6%
Calves	Backgrounding	899	999	0.850	2.4%	58.0%	0.0%	10.0%	0.2%	0.1%	100.0%	100.0%	100.0%	0.0%	10.0%	0.0%	0.0%	0.6%
Calves	Finishing	999	1210	1.400	2.0%	75.0%	0.0%	10.0%	0.2%	0.1%	0.0%	100.0%	100.0%	80.0%	20.0%	20.0%	5.0%	0.6%
Calves	Finishing	1210	1433	1.420	1.7%	82.5%	0.0%	9.5%	0.2%	0.1%	0.0%	100.0%	100.0%	80.0%	20.0%	20.0%	5.0%	0.6%

Table 2 Heifer Feeding Requirements

	Diet Type	Lower Weight, lbs live/head	Upper Weight, lbs live/head	ADG (kg/day)	DMI, % DM of Live Weight/Day	Nutrient Density					Feedstuff Density & Restrictions (% of DM Intake)							
						TDN, % of DM	NEM, of DM	CP, % of DM	Ca, % of DM	P, % of DM	Pasture Feed	Hay feed	Corn Silage	Grain feed	Distiller Grains	Grain Mix (=barley+oat)	Protein Supplement	Salt & Minerals
Bulls	Breeding Herd			x	2.3%	55.0%	0.0%	10.0%	0.2%	0.1%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
Cows Dry	Breeding Herd			x	2.0%	50.0%	0.0%	6.0%	0.1%	0.1%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
Cows with Suckling Calves	Pre-Weaning	95	298	0.850	2.5%	58.0%	0.0%	10.0%	0.2%	0.1%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
Cows with Suckling Calves	Pre-Weaning	298	551	0.850	2.5%	58.0%	0.0%	10.0%	0.2%	0.1%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
Calves	Backgrounding	551	600	0.790	2.6%	58.0%	0.0%	12.0%	0.2%	0.1%	100.0%	100.0%	100.0%	0.0%	10.0%	0.0%	0.0%	0.6%
Calves	Backgrounding	600	699	0.790	2.6%	58.0%	0.0%	12.0%	0.2%	0.1%	100.0%	100.0%	100.0%	0.0%	10.0%	0.0%	0.0%	0.6%
Calves	Backgrounding	699	800	0.790	2.5%	58.0%	0.0%	11.0%	0.2%	0.1%	100.0%	100.0%	100.0%	0.0%	10.0%	0.0%	0.0%	0.6%
Calves	Backgrounding	800	899	0.790	2.4%	58.0%	0.0%	10.0%	0.2%	0.1%	100.0%	100.0%	100.0%	0.0%	10.0%	0.0%	0.0%	0.6%
Calves	Finishing	899	1049	1.300	2.1%	75.0%	0.0%	10.0%	0.2%	0.1%	0.0%	100.0%	100.0%	80.0%	20.0%	0.0%	5.0%	0.6%
Calves	Finishing	1049	1299	1.320	1.8%	82.5%	0.0%	9.5%	0.2%	0.1%	0.0%	100.0%	100.0%	80.0%	20.0%	0.0%	5.0%	0.6%

Table 3 Feedstuff Nutrient Content

	Hay Forage (=mixed grass + legume)	Non-Hay (Pasture) Forage (=mixed grass + legume)	Corn Silage	Mixed Grains (= barley + oat)	Supplement: 32% PROT SUPP	Corn Distillers Grains (WDG)	Salt & Minerals
DM, %	88.00%	17.00%	35.00%	0.00%	90.00%	36.00%	99.00%
TDN, % (DM basis)	58.00%	61.00%	68.00%	0.00%	70.00%	100.00%	0.00%
NEm (DM basis)							
CP, % (DM basis)	14.00%	15.00%	8.00%	0.00%	35.60%	28.00%	0.00%
Ca, % (DM basis)	1.00%	1.22%	0.35%	0.00%	5.88%	0.09%	0.00%
P, % (DM basis)	0.24%	0.19%	0.25%	0.00%	0.67%	0.66%	0.00%

Table 4 Feedstuff Seasonality Assumptions

Months	Dec	Nov	Oct	Sep	Aug	Jul	Jun	May	Apr	Mar	Feb	Jan
Feeds Seasonality	31	30	31	30	31	31	30	31	30	31	28	31
Pasture Forage Availability Index (	0.0	0.0	0.7	1.0	1.0	1.0	1.0	0.7	0.0	0.0	0.0	0.0
Hay Availability Index	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Silage Availability Index	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Grains Availability Index	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Nutrients Seasonality Index												
DM Seasonal Variability Index	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
TDN Seasonal Variability Index	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
NEm Seasonal Variability Index	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
CP Seasonal Variability Index	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Ca Seasonal Variability Index	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
P Seasonal Variability Index	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Table 5 Sample Feed Ingredient Costs, $/tonne

	Hay Forage (=mixed grass + legume)	Non-Hay (Pasture) Forage (=mixed grass + legume)	Corn Silage	Corn	Supplement: 32% PROT SUPP	Corn Distillers Grains (=WetDGS)	Salt & Minerals
Jul 1999	62.30	7.67	24.20	111.17	390.22	33.35	455.00
Jul 2000	57.40	7.35	23.00	104.52	430.74	31.36	460.00
Jul 2001	56.00	8.82	27.00	126.76	481.36	38.03	465.00
Jul 2002	53.90	8.42	33.00	153.38	494.71	46.01	470.00
Jul 2003	69.30	8.09	27.00	137.08	462.69	41.12	475.00
Jul 2004	70.00	8.09	26.86	141.92	541.43	42.58	480.00
Jul 2005	74.20	8.82	20.85	113.23	485.40	33.97	485.00
Jul 2006	72.10	7.52	18.77	106.88	406.71	32.07	490.00
Jul 2007	66.50	9.21	26.83	146.94	476.33	44.08	495.00
Jul 2008	85.40	7.84	44.86	267.80	653.08	80.34	500.00

Table 6 Steer Feeding Requirements Under Accelerated Feeding

						Nutrient Density					Feedstuff Density & Restrictions (% of DM Intake)						
	Diet Type	Lower Weight, lbs live/head	Upper Weight, lbs live/head	ADG (kg/day)	DMI, % DM of Live Weight/ Day	TDN, % of DM	NEM, of DM	CP, % of DM	Ca, % of DM	P, % of DM	Pasture Feed	Hay feed	Corn Silage	Corn	Distiller Grains	Protein Supplement	Salt & Minerals
Source:																	
Bulls	Breeding Herd			x	2.3%	55.0%	0.0%	10.0%	0.2%	0.1%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.6%
Cows Dry	Breeding Herd			x	2.0%	50.0%	0.0%	6.0%	0.1%	0.1%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.6%
Cows with Suckling Calves	Pre-Weaning	100	498	0.920	2.5%	58.0%	0.0%	10.0%	0.2%	0.1%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.6%
Cows with Suckling Calves	Pre-Weaning	498	597	0.920	2.5%	58.0%	0.0%	10.0%	0.2%	0.1%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.6%
Calves	Backgrounding	597	699	1.350	2.6%	70.0%	0.0%	12.6%	0.4%	0.2%	0.0%	5.0%	8.0%	59.0%	16.0%	10.0%	2.0%
Calves	Backgrounding	699	798	1.350	2.6%	70.0%	0.0%	12.6%	0.4%	0.2%	0.0%	5.0%	8.0%	59.0%	16.0%	10.0%	2.0%
Calves	Backgrounding	798	899	1.350	2.6%	70.0%	0.0%	12.6%	0.4%	0.2%	0.0%	5.0%	8.0%	59.0%	16.0%	10.0%	2.0%
Calves	Backgrounding	899	899	1.350	2.6%	70.0%	0.0%	12.6%	0.4%	0.2%	0.0%	5.0%	8.0%	59.0%	16.0%	10.0%	2.0%
Calves	Finishing	899	899	1.600	2.1%	80.0%	0.0%	14.4%	0.4%	0.2%	0.0%	3.0%	8.0%	59.0%	18.0%	10.0%	2.0%
Calves	Finishing	899	1202	1.600	2.1%	80.0%	0.0%	14.4%	0.4%	0.2%	0.0%	3.0%	8.0%	59.0%	18.0%	10.0%	2.0%

Table 7 Heifer Feeding Requirements Under Accelerated Feeding

						Nutrient Density					& Restrictions (% of DM Intake)						
	Diet Type	Lower Weight, lbs live/head	Upper Weight, lbs live/head	ADG (kg/day)	DMI, % DM of Live Weight/ Day	TDN, % of DM	NEM, of DM	CP, % of DM	Ca, % of DM	P, % of DM	Pasture Feed	Hay feed	Corn Silage	Corn	Distiller Grains	Protein Supplement	Salt & Minerals
Source:																	
Bulls	Breeding Herd			x	2.3%	55.0%	0.0%	10.0%	0.2%	0.1%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.6%
Cows Dry	Breeding Herd			x	2.0%	50.0%	0.0%	6.0%	0.1%	0.1%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.6%
Cows with Suckling Calves	Pre-Weaning	95	298	0.850	2.5%	58.0%	0.0%	10.0%	0.2%	0.1%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.6%
Cows with Suckling Calves	Pre-Weaning	298	551	0.850	2.5%	58.0%	0.0%	10.0%	0.2%	0.1%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.6%
Calves	Backgrounding	551	600	1.255	2.6%	70.0%	0.0%	12.6%	0.4%	0.2%	0.0%	5.0%	8.0%	59.0%	16.0%	10.0%	2.0%
Calves	Backgrounding	600	699	1.255	2.6%	70.0%	0.0%	12.6%	0.4%	0.2%	0.0%	5.0%	8.0%	59.0%	16.0%	10.0%	2.0%
Calves	Backgrounding	699	800	1.255	2.6%	70.0%	0.0%	12.6%	0.4%	0.2%	0.0%	5.0%	8.0%	59.0%	16.0%	10.0%	2.0%
Calves	Backgrounding	800	810	1.255	2.6%	70.0%	0.0%	12.6%	0.4%	0.2%	0.0%	5.0%	8.0%	59.0%	16.0%	10.0%	2.0%
Calves	Finishing	810	780	1.486	2.2%	80.0%	0.0%	14.4%	0.4%	0.2%	0.0%	3.0%	8.0%	59.0%	18.0%	10.0%	2.0%
Calves	Finishing	780	1089	1.487	2.2%	80.0%	0.0%	14.4%	0.4%	0.2%	0.0%	3.0%	8.0%	59.0%	18.0%	10.0%	2.0%