Impacts of Pricing Policies on Selected Financial Outcomes of the Cattlemen's Texas Longhorn Beef Cooperative, Inc.

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The impacts of meat pricing on selected financial results for the Cattlemen's Texas Longhorn Beef Cooperative, Inc. were investigated in a stochastic simulation model. Triangular price distributions for boxed beef and various carcasses categories were specified for each month and correlated, based on 2000 USDA carlot meat report data. Hot-carcass weights were also modeled as triangular distributions.

At 5,000 head and with meat prices 12% over USDA prices the probability of net profits before taxes (NPBT) falling below $0 was 1.3%. At 10,000 head and payments 9% over USDA prices there was an 11.8% chance of NPBT falling below $0.

Although meat packing is highly concentrated, the beef industry remains largely an atomistic, competitive industry at the cow-calf ranch level, with large numbers of small producers (McDonald and Ollinger 2000; Lamb and Beshear 1998). The beef industry competes with the highly coordinated consumer-oriented poultry and pork industries, which deliver products consumers desire and transmit price and quality information through vertically integrated chains (Lamb and Beshear 1998). One of the best options for the cattle industry to achieve greater market share through coordination is via marketing cooperatives and producer alliances (Lamb and Beshear 1998). Alliances enable participants throughout the vertical chain to share information regarding prices and products and to respond correctly to market signals (Ward 2001).

Such producer alliances have increased in number since one of the earliest exclusive marketing agreements was formed in the late 1980s between Cactus Feeders and IBP (Schroeder et al. 1998). The term "marketing agreements" was used to describe early feeder-packer arrangements, but with the National Cattlemen's Association study of contract integration in the early 1990s, the terms "alliances" and "grid" or "formula" pricing became more common (Schroeder et al. 1998; National Cattlemen's Association 1993).

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Review coordinated by the previous editor.

In 1998 and 2000, *Beef* magazine published a "Yellow Pages" of beef alliances (Kniffen 1998; *Beef* 2000). In 1998, 30 alliances were listed. By 2000, 36 consumer-based program alliances and seven calf-based program alliances were listed. Ward (2001) reviewed the alliances published in the 2000 Yellow Pages, along with 27 alliances identified in a separate study (Ward and Estrada 1999).

Ward found that 75% of alliances spanned at least three of the four stages in the production marketing chain, which included seedstock or cow/calf producer, feeder or feedyard, packer, and retailer/food service distributor. Half the alliance programs required only 1 head to participate, while 25% required full truckloads. Among the alliances in the *Beef* list, 75% required particular genetics. Source verification, which can be used to market identity-preserved beef products, was required in over half the alliances identified by Ward and about 66% of the alliances listed in *Beef*. About 25% of the alliances in the *Beef* list were natural beef programs, restricting the use of antibiotics and growth hormones. In 75% of the *Beef* magazine alliances, branded products were marketed. Grid pricing was common among alliances in the two studies. Two-thirds of the *Beef* alliances used pricing grids featuring premiums and discounts for both yield and quality grades. In the *Beef* list, average net premiums to producers (above enrollment costs) were $30/head (Ward 2001).

This study examines pricing strategies for boxed beef sales for the Texas Cattlemen's Longhorn Beef Cooperative, Inc. (the co-op), which was legally incorporated by members in Texas, New Mexico, and Colorado. The goal of the coopera-

tive is to sell branded Texas Longhorn meat, certified as having been produced without growth hormones or antibiotics, and being at least 50% Longhorn. By early summer 2001 the co-op was finalizing plans to begin its equity drive, so that animals could be placed on feed by early fall and slaughter could begin by January 2002 (Guldemann, personal communication).

The cattle producers in the cooperative are primarily hobby producers, who support their cattle production with off-farm incomes. However, several of the producers are full-time ranchers whose livelihoods depend on cattle. Texas Longhorn cattle are favored for several reasons, including the aesthetics of the animal and the traits that make it valuable as a beef animal. According to John L. Guldemann, CEO of the co-op, the Texas Longhorn is a low-maintenance, highly efficient animal. It is known for calving ease, disease resistance, ability to forage the range efficiently, longevity, ease of handling and gentleness, and ability to forage for a long time and at great distance from water, making it a sensible choice for dry-range conditions of the Southwest (Guldemann, personal communication).

A stochastic-simulation model was constructed to determine appropriate transfer prices between the cooperative and a partner marketing company which was to be jointly owned by the cooperative and an investor. The marketing company intended, at least initially, to sell the meat in a chain of restaurants owned by the investor. Determination of the best meat-pricing policy was important, not only to establish the expected revenues for the cooperative but also to set input prices for the marketing company that purchased the meat. In other words, this analysis examined appropriate transfer prices that would ensure cooperative profitability. Impacts of these prices on the profitability of the marketing company also needed to be examined, as did net returns to producers from cattle purchases and cooperative patronage refunds. The results of this study served as the basis for price negotiations between the co-op and the marketing company.

Some of the assumptions used in the analyses were based on USDA-sponsored research conducted in summer 1999 in New Mexico and Texas. Texas Longhorn producers provided 40 head of cattle for feed, kill, processing, and market tests. These tests were needed to help the co-op analyze cattle performance, estimate costs, evaluate logistics, and identify potential business-alliance partners for the co-op so that a detailed business plan could be prepared. This paper first provides selected results from the research trials held in summer 1999, followed by the assumptions used in this analysis. The simulation model is then described and the results are reported and discussed.

Results from Summer 1999 Feed, Kill, and Marketing Trials

Feeding Costs

A feed trial was conducted in summer 1999 at the New Mexico State University's Clayton Livestock Research Center in Clayton, NM (Duff et al. 2000). Half the 40 head were fed for 110 days and half for 201 days. The estimated cost per pound of gain ($0.51/lb of gain) was based on the total cost of feed divided by the total pounds gained (Table 1). The total pounds gained was estimated by subtracting total beginning weight on 3/10/99 in pounds from total live-weight pounds at the time of the kill.

Table 1. Feed-Cost Estimates from Feed Trials.

Category	Cost estimates
Lbs. of feed used for 40 head	125,628
Cost of feed + markup	$7,630.64
Cost of feed/lb.	$0.061
Total days on feed (20*110)+(20*201)	6,220
Total lbs. of gain (Tot. Livewt - Tot. Beg. Weight)	15,056
Cost/lb of gain (Cost feed/total lbs gained)	$0.51
Mean cost/day on feed (Cost of feed/total days on feed)	$1.23
Mean daily gain (lbs)	2.52

Weights, Yields, and Grades

The first group of 20 cattle, fed 110 days, was killed and processed at a plant in New Mexico. The second group, fed 201 days, was killed in a west Texas plant. Meat yields from New Mexico were unreliable because the meat cuts did not conform to boxed-beef standards. The second group was sent to a processor in Oklahoma City.

Warner-Bratzler shear-force tests were conducted on meat samples, but the weights were not recorded. Thus the meat yields for the second group of cattle are underestimated (Table 2). The meat removed for the shear-force tests was the 9th through the 12th rib and a bone-in section of the anterior end of the loin, about 4 inches thick, from the right side of each carcass (Clavel and Montgomery 1999).

The average live weight in the summer 1999 study was 978 lbs, but the corrientes and the Longhorn X Limousine crosses reached 1,050 lbs live weight (Table 3). Eighty percent of the 40 animals had hot-carcass weights between 500 and 750 lbs, and 20% weighed less than 500 lbs. Of the 40 animals, 45% were choice quality, 47.5% were select quality, and the remainder were prime, standard, or commercial. Of the 40 head, 42.5% were yield grade 1 and 57.5% were yield grade 2.

Table 2. Products, lbs per carcass.

NAMP#, Product	Consultant estimates		Kill-trial results	
	% of carcass	Meat yield (lbs.)	% of Carcass	Meat yield (lbs.)
112A Ribeye, bnls 12-dn	4.305	23.56	2.092	11.49
174 Short Loin, 2x3 16-30	2.75	15.03	2.835	15.57
180 Strip loin, 1x1 bnls	1.94	10.62	1.258	6.91
184 Top butt, bnls 13-dn	3.02	16.51	3.369	18.50
191A Butt tender, trmd	.89	4.86	.384	2.11
189A Tndrloin, trmd 5-dn	1.05	5.73	.625	3.43
Cap and Wedge (Blade)	0.0	0.00	.876	4.81
185A Sirloin, flap 1-3	0.29	1.56	.203	1.17
193 Flank steak, 1-3	0.37	2.04	.459	2.52
121D Inside skirt	0.49	2.66	.550	3.02
124 Backribs, Frozen	0.81	4.46	.765	4.20
185C Sirln, Tri tip, all wt	0.95	5.19	.219	1.20
Neck bones	0.00	0.00	1.788	9.82
Trim65 (Plates)	0.00	0.00	4.753	26.10
116A Chuck roll 1x1	9.56	52.32	5.19	28.50
114A Shoulder Clod, trmd	4.85	26.53	5.204	28.58
167A Knuckle, trmd 8-13	3.80	20.78	3.29	18.07
171B Outside round 10-16	5.49	30.06	3.088	16.96
171C Eye of round, 3-5	0.00	0.00	1.34	7.36
169 Inside round, denuded	5.76	31.54	3.593	19.73
120 Brisket, 6-14	1.39	7.61	1.147	6.30
Trim 50	7.81	42.73	11.95	65.65
Trim 90	19.14	104.75	18.63	102.30
Fat	7.17	39.24	10.789	59.25
Bone	16.10	88.14	14.899	81.82
Shrink	2.09	11.43	.699	3.84
Total	100	547.35	100	549.17

Market Test

Two three-day restaurant trials were conducted in August and October 1999 in Bedford, Plano, and Fort Worth, TX. The results were promising. In the first (second) trial, 74% (89%) of the customers buying Texas Longhorn steaks indicated the steaks were "better" or "much better " than other beef products. In the first trial, 97% said they would order the Texas Longhorn steaks again (Darby 2000). The Longhorn steaks were priced $1-per-entree higher than other steaks offered during the trial.

The co-op and the owner of the restaurant chain decided to make an exclusive marketing arrangement. The co-op agreed to sell the steak cuts, in boxed-beef form, to the restaurant chain, leaving the co-op with the task to sell the roast cuts. However, in Fall 2000 a new joint-venture company between the co-op and owner of the steak-house chain was proposed to process and market the cuts. The long-term goal was to develop frozen retail meat products, including Swiss steak, stir-fry, barbecue brisket, and patties, from the cuts not sold to the restaurant chain. Initial cost analyses and discussions with a processor to develop the retail products was undertaken.

Table 3. Percentage of Meat Sold and Cattle Purchased Each Month.

Month	Meat sold	Cattle purchases
January	5.00%	5.00%
February	6.00%	5.00%
March	6.00%	15.00%
April	6.00%	15.00%
May	6.00%	5.00%
June	10.00%	5.00%
July	15.00%	5.00%
August	12.00%	5.00%
September	10.00%	15.00%
October	10.00%	15.00%
November	8.00%	5.00%
December	6.00%	5.00%
Total	100%	100%

Table 4. Livestock and Meat Transportation Cost Estimates[1].

Destination from/to	# miles	Cost/ mile	# Head	Avg. lbs/ head	Head/ load	# Loads	Total cost	Cost/ head
Cattle: Feedlot to west Texas	300	$1.90	5000	1025	43.9	114	$64,980	$13
	# Head	Cwt./ head	# Cwt.	Cost / cwt.			Total cost	Cost/ head
Meat: West Texas to OKC	5000	5.781	28,905	$1.50			$43,358	$8.67
	Price/ lb.	# Head	Lbs./ head	Total lbs.			Total cost	Cost/ head
Meat: OKC to Dallas	$0.02	5000	460.57	2,302,872			$46,057	$9.21

[1]Because the hot-carcass weights are a stochastic variable in the model, these results represent only one iteration of the model. Meat freight costs will vary with hot-carcass weights.

Model Assumptions: Estimated Revenues

Product Mix and Pricing

Boxed-beef prices were estimated for the list of products from the 20 head processed in Oklahoma City. All product categories were later verified (Gruenwald, personal communication). However, in the model the percentage of carcass for each cut was based on advice from a consultant hired by the co-op (Table 2). The blade (or cap and wedge) and plates (or Trim 65) were assumed added to the trim (which was 80/20) to create a Trim 90 product, also based on consultant advice (Hull, personal communication). To estimate boxed-beef prices, the USDA National Carlot Meat Report daily prices for 2000 were obtained in electronic form (USDA 2000).

Seasonality Assumptions

Meat sales are assumed to be highest in the summer months and near Thanksgiving and Christmas, when families eat out more (Table 3). Some meat products may move in different seasonal patterns than others, but such distinctions were not known. Cattle acquisition assumed a different pattern, which may imply storage costs for the meat marketing company (Table 3).

Model Assumptions: Estimated Costs

Livestock/Meat Transportation

This analysis assumed the carcasses are transported from a kill floor in west Texas to the processor in Oklahoma City. The carcasses could be processed in west Texas (eliminating the need to transport whole carcasses to OKC), but that option was estimated to add more total transportation costs than the proposed arrangement. Meat transportation out of OKC was expected to be $0.02/lb, vs. $0.10/lb out of west Texas, if processing were to occur in west Texas instead of in Oklahoma City. In addition, the Oklahoma City processor was selected based on the positive results from the summer 1999 trials.

This analysis assumed full loads each trip. The cooperative plans to arrange transportation of the animals from the feedlot to the slaughter plant (300 miles), from the slaughter plant in west Texas to the fabricator in Oklahoma City, and from the fabricator to Dallas. However, producers will be expected to reimburse the co-op for the costs of transporting live animals to the kill floor at time of slaughter.

Although freight costs were estimated to be $0.02/lb between Oklahoma City and Dallas, a minimum of 10,000 lbs are needed to obtain the $0.02/lb rate. Weekly trips of 20 head produce about 8,000 lbs of meat. With less than 10,000 lbs, the per-pound cost rises to 10 cents (Table 4). The cost of freight between Oklahoma City and Dallas at $1.50/cwt. was based on the costs incurred during the summer 1999 trials.

Killing and Processing

Kill costs at the west Texas plant were $40/head in summer 1999, but have since increased to $55/head (Skipper, personal communication). During the trials, rebate on the drop averaged $45/head. However, the credit on the drop may exceed the kill cost by more than $5. The drop is the hide and internal organs that can be sold. The packing plant will credit back against the kill cost the USDA daily reported drop credit less $1.45 per cwt. For example, on May 14, 2001, drop credit on steers was $9.76 per cwt. live. An 1,100-lb steer's drop credit would be $9.76-$1.45 = $8.31 per cwt. x 11 cwt. =$91.41 credit per head, less the $55 kill fee, for a net drop credit of $36.41. However, to be conservative, kill costs were assumed in the model to be $0 and no drop credits were included.

Processing costs in Oklahoma City were assumed to be $100/head in the model, which is the current estimate. Costs during the trial were $85/head.

Cattle Purchases

The cooperative intends to award premiums and discounts for particular carcass characteristics (Table 5). Prices paid for carcasses will be based on a formula that adds 2% to USDA carlot prices and then adds the cooperative's premiums and discounts based on hot-carcass weights, yield grade, and quality grade (Table 6). It is assumed that 86% of the cattle hot-carcass weights will be between 500 and 750 lbs and 14% will be less than 500 lbs.

Table 5. Discounts and Premiums Added to USDA- Based Payments to Producers, $/cwt.

Carcass characteristics				
Hot Wt (lbs)[1]	<500	500 - 750	750-900	>900
Premium/Discounts	-7.50	+7.50	-7.50	Disqualified
Yield grade	YG 1	YG2	>=YG3	
Premium/Discounts	+1.50	+0.75	Disqualified	
Quality grade	Choice and Prime	Select	Commercial or Ungraded	
Premium/Discounts	+2.25	None	-10.00	
Backfat	>.33 inch			
Premium/Discounts	Disqualified			

[1]Hot weight is the weight of the carcass after the hide and drop is removed.

Table 7. Comparison of Target Grades and Those Used in Model.

Share	Distribution in model[1]	Target distribution[2]
Percentage of Choice	77.30%	77.50%
Percentage of Select	20.20%	20.00%
Percentage Standard	2.50%	2.50%
Percentage of YG1	44.25%	43.00%
Percentage of YG2	55.75%	57.00%
Percentage of Smalls(<500)	12.75%	10.00%
Percentage of Large (500-750)	87.25%	90.00%

[1]The cattle purchased assumed in the model followed this distribution.
[2]The goal was to model the cattle purchases according to this distribution, but it was not achieved due to trial and error in distributing the cattle purchases across the categories.

Assumed quality grades were 77.5% choice and prime, 20% select, and 2.5% commercial, standard or ungraded. Assumed yield grades were 44% yield grade 1 and 56% yield grade 2. The number of cattle was estimated for each combination of yield grade, quality grade, and weight, resulting in slight differences between targets and percentages used in the model (Tables 6-7).

Administrative/Overhead

Four managers were assumed hired: a cooperative manager, a chief financial officer, a cattle-procurement manager, and an office manager, at respective annual salaries of $50,000, $45,000, $45,000, and $30,000. The cooperative's employee-burden costs were estimated at 14.62%, including FICA/Medicare (7.65%), unemployment (1.9%), and workers compensation (5.07%). However, the model included the full monthly administrative salary cost for the second half of the first year only. In months January through June, only the cooperative manager's salary was assumed paid, for a total annual administrative cost of $117,489 rather than the total estimated annual cost of $177,661. Administrative salaries were reduced because the sce-

Table 6. Estimated Cooperative Premiums and Discounts, 5000 Head.

Cooperative premiums and discounts	No. of Head	Est. HCW (cwt)	Total HCW (cwt)	$/cwt	Total Cost of Prem / Discount
<500 lbs, 14%	637.5	4.5	2,868.75	(7.50)	($21,516)
500-750 lbs, 86%	4362.5	5.75	25,084.37	7.50	$188,133
YG 1, 44%	2200	5.5	12,100	1.50	$18,150
YG 2, 56%	2800	5.7	15,960	0.75	$11,970
Choice and Prime, 77.5%	3865	5.7	22,030.5	2.25	$49,569
Select, 20%	1010	5.5	5555	0.00	$0
Comm or Stnd, 2.5%	125	5.5	687.5	(10.00)	($6,875)
TOTALS	5000		28,273.00		**$196,737.19**
Avg. Per Head			565.46 lbs		**$39.35**
Avg. Per Cwt.					$6.96

Number of head by quality/yield category assumed in model

Quality, yield, weight	No. of Head	HC Weight (cwt)	Total Weight	Percent of total head
Choice, 1, 400-500	125.00	4.50	562.50	2.50
Choice, 1, 500-550	250.00	5.25	1,312.50	5.00
Choice 1, 550-950	1,500.00	6.50	9,750.00	30.00
Select 1, 500-550	250.00	5.25	1,312.50	5.00
Select 1, 550-950	25.00	6.00	150.00	0.50
Standard, 1-3, 400-500	62.50	4.50	281.25	1.25
Standard 1-3, 500-550	62.50	5.25	328.13	1.25
Choice, 2, 400-500*	225.00	4.50	1,012.50	4.50
Choice 2, 500-550*	1,005.00	5.25	5,276.25	20.10
Choice, 2, 550-950*	760.00	6.00	4,560.00	15.20
Select 2, 400-500*	225.00	4.50	1,012.50	4.50
Select 2, 500-550*	250.00	5.25	1,312.50	5.00
Select 2, 550-950*	260.00	6.00	1,560.00	5.20
TOTALS	5000		**28,430.63**	
Avg. HCW per head			**568.61**	

narios simulated were volume levels possible for the first year of operation, in which a full administrative staff is not thought to be necessary immediately.

Product-liability insurance was budgeted at $1,400/year. Equipment insurance was budgeted at 2% of the investment cost per year.

General Expenses, Equipment, and Cash-Flow Assumptions

Monthly general-expense estimates consisted of utilities, phone, promotion, office rental, travel and office supplies. The utilities are associated with running an office, and the travel is for the manag-

ers to visit markets, producers, and processors as needed. This budget should cover costs of maintaining communications with the cooperative members. Office supplies include paper, printer toner, folders, etc. To cover unforeseen costs, 10% of total general expenses from the previous month were added to each month's expenses. Each month, the estimated expenses were electricity, $50; gas and water, $50; telephone, $200; promotion $1,200; office rental, $500; travel $1,500; and office supplies, $50. The promotion budget may be over-estimated since the marketing company is expected to sell all of the meat. However, the promotion budget may be used to offset costs of developing the case-ready products.

The co-op office employees will need a computer, phone, answering machine, fax, printer, filing cabinets, desks, and chairs. A budget of $8,400 for these items was included. This equipment was assumed purchased without incurring finance charges. Maintenance, insurance, and repairs were budgeted at 2% of asset values.

Assumptions regarding timing of cash flows were included. Although it is likely that most payments on accounts receivable will be received in the same month as the sales are made, a more conservative approach was taken. Accounts receivable were assumed to be received 20% in the same month as the sale, 70% one month later, and 10% two months later. All accounts payable were assumed to be paid in the month the expense occurred, including payments to producers.

The Model

A set of integrated financial statements was constructed on a spreadsheet, including a monthly cash-flow and income statement and a beginning and ending balance sheet. They were linked to each other and to all of the input assumptions regarding overhead costs, volumes, meat prices, and carcass costs. The cash-flow statement included an operating loan section that borrowed on a monthly basis when cash reserves dropped below a $500 limit and paid off outstanding principal and interest balances as cash reserves permitted.

A triangular distribution was estimated for each boxed-beef product price each month and for both choice and select quality grades. A triangular distribution is defined by its minimum, most likely (modal), and maximum values. The triangular distribution is one of two continuous distributions commonly used when no system data are available (Law and Kelton2000). In this case, USDA Carlot Meat Report data was purchased for the year 2000, but that data set contains daily high and low values, not the entire set of prices for each day.

Using the USDA Carlot Meat Report data, the maximum value was estimated from the highest price in the data series, the minimum value was the lowest value observed for that product that month (across all days), and the most-frequently occurring daily high or low was used for the modal value. A weighted average of USDA choice and select grade meats was estimated, with choice weighted 75% and select 25%. After the weighted average of choice and select boxed-beef prices was calculated, a markup, (ranging from 8 to 12%) was added to the weighted price.

To estimate cattle acquisition costs, the USDA National Carlot Meat Report was again consulted. A triangular distribution was estimated for each distinct carcass category by using the USDA Carcass Equivalent Index Value (CEIV) data set for the year 2000 and applying appropriate premiums and discounts from the USDA Cattle Discounts and Premiums (DP) data set for the year 2000. The USDA CEIV data set provides base numbers for a few categories of carcass. To obtain estimated prices for carcasses which do not fall into these few categories, a series of adjustments can be made using the DP data set for variations such as different weight, quality grade, yield grade, or other characteristics such as dark cutters.

During each iteration of the model all of the select and choice boxed-beef and carcass prices were sampled from their triangular distributions and correlated using Pearson rank correlation coefficients. The correlation coefficients were estimated for each beef product and carcass category using the monthly average of the high and low prices. Correlation preserved relationships between meat and carcass prices; when both meat and carcass prices are high, this positive correlation is maintained.

Hot-carcass weights were modeled as independent stochastic variables, also using the triangular distribution. The weight category's designated minimums and maximums were used, except where the category goes up to 950 lbs. In that case, 700

lbs. was the maximum for the triangular distribution sampling, as 700 lbs. is roughly the upper end of hot-carcass weights achieved during the kill trials in summer 1999.

The output variables chosen for analysis were total annual meat sales, net income before taxes, outstanding operating loan, hot-carcass weight in pounds, total cost of cattle, cost of cattle per head, total freight cost, and interest costs. The outstanding operating loan was for the month of April in each year, the month when the outstanding operating loan tended to be the highest due to timing of cattle acquisition, meat sales, and cash payments on account.

Two volumes (5,000 and 10,000 head) and three pricing scenarios were modeled; thus six models were run, each with 200 iterations. Each volume was modeled independently, meaning no cash-flow impacts were carried forward from one year to the next, which would be necessary if the model were trying to capture a planned increase in volume. The risk analysis was conducted using @RISK software. The target-value option in @Risk was used to determine the probability of net income before taxes falling below $0.0 for each meat-pricing strategy.

The triangular distributions were sampled using the Latin Hypercube sampling technique. The Latin Hypercube sampling technique is considered superior to Monte Carlo simulation because in Latin Hypercube sampling the distribution is randomly sampled in a stratified manner, ensuring sampling from the complete distribution with fewer iterations than in Monte Carlo sampling. In Monte Carlo simulation, samples are randomly drawn from throughout the distribution, which does not guarantee sampling from all regions of the distribution, such as the tails (Palisade Corporation 2000).

Results and Discussion

The results for the 5,000 head scenario indicate that the marketing company should pay the co-op at least 12% above USDA prices to ensure a reasonably

Table 8. Selected Financial Results from 200 Iterations: 5,000 Head.

Output variable	Minimum	Maximum	Mean	Standard deviation
	----------Meat prices 10% above USDA----------			
Meat sales ($)	3,711,413	4,066,069	3,884,355	74,540
Net income ($)	(68,227)	39,958	(19,844)	21,328
Outstanding oper. loan ($)	824,459	914,030	865,143	16923.29
Interest costs ($)	40,897	46,576	43,439	981
Probability of net income falling below $0: 82.93%				
	----------Meat prices 11% above USDA----------			
Meat sales ($)	3,730,371	4,126,459	3,919,698	73,321
Net income ($)	(37,224)	92,114	16,730	22,787
Outstanding oper. loan ($)	813,731	907,470	859,012	16,878
Interest costs ($)	39,838	44,878	42,200	1,019
Probability of net income falling below $0: 20.42%				
	----------Meat prices 12% above USDA----------			
Meat sales ($)	3,754,367	4,150,769	3,954,983	79,170
Net income ($)	(17,472)	112,638	53,277	21,389
Outstanding oper. loan ($)	812,544	889,904	852,877	16,828
Interest costs ($)	38,877	43,107	40,959	911
Probability of net income falling below $0: 1.299%				

low risk of net profits before taxes dropping below $0.0 (Tables 8-9). This markup can drop to 10% above USDA prices when volume increases to 10,000 head to ensure the probability of net income falling below $0.0 is negligible (Tables 8-9). Even with a 9% markup at 10,000 head, the risk of negative net income before taxes is quite low.

During the first few years of the co-op's operation, maintaining profitability will be important. Eventually, volumes should increase sufficiently (the goal is 50,000 head) such that the markup over USDA prices can be much smaller. Whether or not the co-op can negotiate these markups over USDA prices with the marketing company remains to be seen. The feasibility of these markups depends on whether or not the marketing company has the ability to pass on the costs to the restaurant chain, and still make a profit.

One important result from this analysis is the need for the co-op to obtain an operating loan of at least $800,000 when 5,000 head are processed and at least $1.6 million when 10,000 head are processed. The source of this financing had not been identified at the time of this analysis. The large operating loan is due to several factors, including a mismatch between timing of cattle acquisition and expected highest meat sales, co-op financing of cattle processing costs in Oklahoma City, and delay in receipt of payment for the meat while cattle are immediately paid for when killed.

The usefulness of these results depends on future prices being similar to USDA boxed-beef and carcass prices from the year 2000. If the spread between boxed-beef and carcass prices changes significantly, additional analyses will be needed.

Table 9. Selected Financial Results from 200 Iterations: 10,000 Head.

Output variable	Minimum	Maximum	Mean	Standard deviation
	----------Meat prices 8% above USDA----------			
Meat Sales ($)	7,195,230	8,020,116	7,628,139	155,033
Net Income ($)	(114,937)	95,346	(22,315)	40,084
Outstanding oper. loan ($)	1,621,160	1,814,536	1,726,040	35,760
Interest costs ($)	79,315	91,441	86,244	1,979
Probability of net income falling below $0: 73.16%				
	----------Meat prices 9% above USDA----------			
Meat sales ($)	7,281,927	8,007,277	7,698,621	151,701
Net income ($)	(90,195)	154,630	50,745	43,059
Outstanding oper. loan ($)	1,612,543	1,804,771	1,713,842	35,502
Interest costs ($)	78,266	88,709	83,769	2,027
Probability of net income falling below $0: 11.8%				
	----------Meat prices 10% above USDA----------			
Meat sales ($)	7,361,883	8,100,283	7,769,329	154,986
Net income ($)	30,327	215,301	123,978	39,633
Outstanding oper. loan ($)	1,602,482	1,797,678	1,701,564	35,980
Interest costs ($)	76,708	86,130	81,287	1,891
Probability of net income falling below $0: 0%				

References

Beef. "Alliances 2000: The Yellow Pages." August 2000.

Clavel, B. and T.H. Montgomery. 1999. "Carcass Characteristics and Warner-Bratzler Shear Values of Criollo Type (Longhorn) Cattle." Unpublished consulting report, West Texas A&M University.

Darby, P. 2000. *Final Report by the Cattlemen's Texas Longhorn Registry In Fulfillment of the Requirements of the Rural Business Enterprise Grant*, unpublished consulting report.

Duff, G. C., D. A. Walker, K. Malcolm-Callis, and M. Wiseman. 2000. "Final Report: Performance of Longhorn Beef Cattle Fed an 80% Concentrate Diet." Clayton Livestock Research Center, New Mexico State University. In *Final Report By the Cattlemen's Texas Longhorn Registry In Fulfillment of the Requirements of the Rural Business Enterprise Grant*, unpublished consulting report by Paul Darby.

Gruenwald, K. 2001. Personal communication, Manager, Canadian Meats, Oklahoma City, OK.

Guldemann, J. 2001. Personal communication, CEO, Cattlemen's Texas Longhorn Beef Cooperative, Inc., Animas, NM.

Hull, C. 2000. Personal communication. Denver Buffalo, Denver, CO.

Kniffen, D. "The Alliance Yellow Pages." *Beef* Spring 1998.

Lamb, R. L. and M. Beshear. 1998. "From the Plains to the Plate: Can the Beef Industry Regain Market Share?" *Economic Review* Third Quarter. Federal Reserve Bank of Kansas City.

Law, A.M. and W.D. Kelton. 2000. *Simulation Modeling and Analysis*. Boston: McGraw Hill.

McDonald, J. M. and M.E. Ollinger. 2000. "Consolidation in Meatpacking: Causes and Concerns." *Agricultural Outlook* June-July. USDA-ERS.

National Cattlemen's Association. 1993. *Strategic Alliances Field Study: Executive Summary*. Englewood, CO.

Palisade Corporation. 2000. *@Risk: Advanced Risk Analysis for Spreadsheets*. New York: Newfield.

Schroeder, T.C., C. E. Ward, J. Mintert, and D. S. Peel. 1998. *Beef Price Discovery: A Look Ahead*. Research Institute on Livestock Pricing, Research Bulletin 1-98, Virginia Tech, Blacksburg, VA.

Skipper, D. 2001. Personal communication. Manager, Booker Packing Company, Booker, TX.

United States Department of Agriculture. 2000. "National Carlot Meat Report." Livestock and Grain Market News Service. A weekly report is available at .http://www.ams.usda.gov/lsg/mncs/pdf_weekly/wklyblue.pdf.

Ward, C. 2001. "Characteristics and Dynamics of Alliances in the Beef Industry," proceedings from the *Livestock Briefs and Cattle Growers' Short Course*. New Mexico State University and the New Mexico Cattle Growers' Association.

Ward, C. and T.L. Estrada. 1999. "Vertical Coordination and Beef Industry Alliances." *Visions* 72(2):16-21.