

# Costs of producing beef in a “natural” program without implants or antibiotics.

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There is considerable interest in programs that market beef that has been produced from cattle that were not implanted or fed antibiotics. This research measured the additional costs from engaging in a natural program in which performance would be adversely affected by omitting technology that improves production efficiency.

In this study, steers on the conventional program were implanted with Synovex Plus at the beginning of the trial in Experiment 1 and with Synovex Choice at the beginning of the trial and Synovex Plus 70 days before slaughter in Experiment 2. In both experiments 300 mg Rumensin and 90 g Tylan were fed daily to cattle on the conventional treatment. These practices were omitted among the natural cattle. It is not known whether the cattle had been implanted before they were obtained for this research; but that should have not materially affected results.

Two experiments were conducted. Trial 1 extended from June 15, 2004, until September 28, 106 days. Trial 2 started August 11 and ran for 126 days until December 14. The substantial difference between the two trials was that steers on the conventional treatment were implanted only at the beginning of Trial 1 (Synovex Plus) but the extended length of Trial 2 enabled implanting initially (Synovex Choice) and then reimplanting 70 days before slaughter (Synovex Plus). Synovex Plus contains 200 mg trenbolone acetate and 28 mg estradiol benzoate, twice the dosage of Synovex Choice (Fort Dodge Animal Health, Fort Dodge, IA).

In both Trials we used yearling black-hided steers that were mostly Angus with an initial shrunk weight that averaged 899 lb in Trial 1 and 1023 lb in Trial 2. Cattle had been wormed and vaccinated prior to arrival.

Finishing rations fed to both treatments were comprised of finely rolled milo fed ad lib and sorghum silage, supplemented with soybean meal, urea and ammonium sulfate along with a premix that included vitamin A, trace mineral and 4-Plex (Zinpro Corporation, Eden Prairie, MN). Rumensin and

Tylan (300 mg and 90 mg per head per day) were added to the conventional rations.

In Trial 1 there were three pens of 20 or 21 head on each treatment and in Trial 2 there were two pens of 27 or 28 head on each treatment. Least squares means for each pen were obtained with a model that included animal source, initial weight, and initial ultrasound measures of backfat, marbling and muscle depth. The adjusted median marbling score of each pen was considered as the average for that trait because it has a non-parametric distribution although the pen median differed little from the mean among these cattle. The ten (two treatments times five reps) unweighted pen averages from both trials were combined for analysis of variance to test significance of differences between conventional and natural averages (Table 3).

Results of the two trials are reported separately because the relative additional costs associated with natural feeding appeared to be proportional to trial length (Tables 1 and 2). However, there did not appear to be interaction associated with trial length in the differences between the performance and carcass attributes so those are combined for the statistical analysis in Table 3.

Feed intake was 7 percent higher ( $p < .001$ ) by the conventional cattle. But the increase in gain by that treatment exceeded more than one pound per day ( $p < .001$ ) so feed efficiency was 31 percent better for the conventional cattle ( $p < .001$ ). Dressing percent was higher ( $p < .03$ ) for the conventional cattle. (Average daily gain was adjusted to a constant dressing percent by dividing carcass weight by 0.64.)

Rib eye area was significantly higher among the conventional cattle. Part of this can be attributed to their larger carcass weight. In order to test whether there was an additional effect of treatment a projected rib eye area was calculated using a model derived from 885 carcasses from other experiments (implanted cattle) where expected rib eye area per cwt carcass weight =  $5.02 - 0.000743 X + .00000403 X^2$  ( $X$  = carcass weight as lb). This relationship is shown in Figure 1. . (Rib eye area is often expressed as square inches per 100 pounds carcass weight. This is misleading because the relationship is not constant.) This analysis indicated that rib eye area of conventional cattle averaged 0.47 square inches more ( $p < .03$ ) than was accounted for by increased carcass weight.

There was no difference between the two treatments in percent kidney heart and pelvic fat but conventional cattle tended to have a greater backfat thickness ( $p < .08$ ). But, because of greater rib eye area, calculated yield grades were lower (better) for the conventional cattle ( $p < .05$ ). This is important because it indicates that the natural cattle could not have been fed longer to attain larger carcass weights.

The observation that marbling scores ( $p < .002$ ) and quality grades were higher among natural cattle was expected because the adverse effect of implanting on those traits is widely accepted. Because cattle in both treatments had a high proportion of Choice (93% and 82% for natural and conventional, respectively –  $p < .08$ ) the difference is more apparent for differences in proportion of carcasses that graded average Choice and higher (Premium Choice). There were 58% of the carcasses of the natural cattle with marbling sufficient for Premium Choice compared with 38% of the conventional cattle ( $p < .04$ ). This agrees with previous research at this location that carcass quality grades of cattle with high marbling potential are also adversely affected by implanting.

Economic interpretations are included at the bottom of Tables 1 and 2. The natural cattle were credited with increases of Choice and Premium Choice proportions at \$10 and \$5 per cwt carcass weight, respectively. That treatment was also credited with the conventional treatment costs of implants (Synovex Choice @ \$2.11 and Synovex Plus @ \$2.50) and costs of feeding Rumensin and Tylan (@\$0.021 and \$0.011 /head/d, respectively). The increase in feed intake by the conventional group consisted of only finely rolled milo, which was priced at \$4.00/cwt. Other costs were the same for both treatments because cattle were fed the same length of time.

The offsetting credit for the conventional group was the substantially higher carcass weight which was priced at \$140 per cwt. The differences in carcass weight were 66 and 85 pounds which were equivalent to 103 and 133 pounds live weight in Trials 1 and 2, respectively. In an economic environment of low cost feed and expensive replacement cattle, it is essential to maximize feedlot gain, but cattle in the natural program could not have been fed longer without incurring yield grade #4 penalties.

Many feeders assess the additional costs of a natural program by the increase in cost of gain without taking into account the larger carcass weight from

conventional feeding. This results in grossly underestimating the extra costs of a natural program. The additional costs of gain averaged \$22.54 in these two trials.

Possibly a better analysis is the estimate of additional price per cwt carcass needed from a natural program. This appeared to be proportional to the length of the feeding period because it was \$7.50 in Trial 1 and \$10.08 in Trial 2. These estimates would be reduced by higher feed costs, greater premiums for higher grading cattle, or lower carcass prices.

Beef from natural fed cattle is marketed at a substantial premium. The results of this research should help document the proportion of that premium which should be passed back to the cattle feeder.

Table 1. Cost of "Natural"(no implants, no Rumensin, no Tylan) vs. conventional feeding.  
Rep 1 June 15 to September 28, 2004. 106 days

	Natural	Conventional	Percent Response	Standard error of mean
Number of head	61	60		
Average initial weight	1023.17	1023.17		
Average final weight	1283.34	1358.32		
Average carcass weight	820.98	886.73	108.01%	3.99
Average dressing percent	63.98	65.27	102.02%	0.15
Average daily gain	2.45	3.42	139.58%	0.06
Median marbling score	6.21	5.71	91.87%	0.09
Percent Choice	90.16%	78.16%	86.69%	
Percent average Choice and higher	54.21%	35.53%	65.54%	
Average backfat, in	0.56	0.59	105.41%	0.01
Percent KHP fat	2.80	2.62	93.35%	0.07
Average rib eye area, sq in	13.65	14.87	108.90%	0.11
Expected rib eye area, sq in	13.46	14.24	105.79%	
Calculated yield grade	3.73	3.56	95.64%	0.06
DM intake	21.10	22.76	107.86%	
Lb gain/ lb feed	11.60	15.02	129.41%	
Economic interpretation				
Additional Choice @\$10/cwt	\$9.85			
Additional premium Choice @\$5.cwt	\$7.67			
Lower feed intake	\$7.03			
Costs of implants and additives.	5.89			
Additional carcass weight@ \$140/cwt		\$92.05		
Net		\$61.61		
Premiums needed for "natural" program				
Premium per cwt gain	\$23.73			
Premium per 100 lb carcass	\$7.50			

Table 2. Cost of "Natural"(no implants, no Rumensin, no Tylan) vs. conventional feeding  
 Rep 2. August 11 to December 14, 2004, 126 days

	Natural	Conventional	Percent Response	Standard error of mean
Number of head	56	55		
Average initial weight	899.20	898.61		
Average final weight	1269.51	1396.64		
Average carcass weight	824.12	909.31	110.34%	
Average dressing percent	64.89	65.08	100.29%	0.19
Average daily gain	3.09	4.14	134.23%	0.07
Median marbling score	6.52	5.85	89.63%	0.11
Percent Choice	96.43%	87.50%	90.74%	
Percent average Choice and higher	64.29%	41.93%	65.23%	
Average backfat, in	0.42	0.46	110.39%	0.02
Percent KHP fat	2.00	1.91	95.59%	0.04
Average rib eye area, sq in	12.68	14.22	112.12%	0.15
Expected rib eye area, sq in	13.50	14.53		
Calculated yield grade	3.51	3.35	95.34%	0.08
DM intake	27.60	29.50	106.87%	
Lb gain/ lb feed	11.18	14.04	125.60%	
Economic interpretation				
Additional Choice @\$10/cwt	\$7.36			
Additional premium Choice @\$5/cwt	\$9.21			
Lower feed intake	\$10.99			
Cost of implants and additives	8.642			
Additional carcass weight@ \$140/cwt		\$119.27		
Net		\$83.07		
Premium needed for "natural" program				
Premium per cwt gain	\$21.36			
Premium per 100 lb carcass	\$10.08			

Table 3. Summary of statistical analysis of pen mean differences.

	Natural	Conventional	F value	P value (<)	
Average carcass weight	822.24	895.76	174.96	0.0001	***
Average dressing percent	64.35	65.20	8.28	0.0240	**
Average daily gain	2.70	3.71	231.79	0.0001	***
Median marbling score	633.71	576.33	21.65	0.0020	**
Percent Choice	93%	82%	4.28	0.0770	*
Percent average Choice and higher	58%	38%	6.57	0.0370	**
Average backfat, in	0.50	0.54	4.30	0.0770	*
Percent KHP fat	2.48	2.34	2.44	0.1620	NS
Average rib eye area, sq in	13.26	14.61	45.27	0.0003	***
Observed - expected REA	-0.22	0.25	8.79	0.0210	**
Calculated yield grade	3.64	3.48	5.94	0.0450	**
DM intake	26.14	27.90	27.07	0.0010	***
Lb gain/ lb feed	10.31	13.26	220.25	0.0001	***

Figure 1. Relationship of rib eye area to carcass weight

