Three Barley/Corn Diets For Feedlot Steers

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Feed grain production in North Dakota far exceeds demand. Likewise, feeder calf production exceeds supplies sought by farmers and feeders within the state. Ironically, North Dakotans produce quality feed grains and quality feeder cattle in high demand by feeders in other states. Cattlemen invest in genetically superior herd sires to produce high performance cattle only to sell off the calf crop at weaning. Similarly, agronomists develop excellent quality feed grains adapted to North Dakota growing seasons only to have farmers sell their grain and ship it out of state. Producers in this state have an opportunity to add value to both cattle and grain by combining them in a feedlot.

Barley is one of the leading feed grains in the northern plains states. It contains relatively high levels of protein plus adequate fiber and energy to provide excellent gains for growing calves. It is highly fermentable in the rumen, and when fed alone can occasionally cause acidosis. In combinations with other feed grains or forages, it is very palatable and safe and is an excellent feed for backgrounding and finishing steers.

Corn grain is the most widely used feed grain in the U.S. Corn and barley in combination with a roughage source (hay and/or silage) represent an optimum combination of energy and protein for growing and finishing feedlot cattle. Feeding combinations of grains is generally more advantageous than feeding one grain alone. Feeding a rapidly digested grain (barley) and a more slowly digested grain (corn) may reduce the incidence of acidosis and improve overall starch utilization. Few trials have been conducted on comparing barley-corn combinations.

The objective of this research was to study the effect of different proportions of corn and barley on steer feedlot performance, carcass characteristics and the optimum combinations to maximize returns to labor and management.

EXPERIMENTAL PROCEDURE

A three-year feeding trial was conducted at the Carrington Research Extension Center Livestock Unit using three barley-corn combinations for growing and finishing steers. Approximately six weeks after weaning each year, 48 to 57 straightbred Hereford and Hereford, Red Angus and Tarentaise sired crossbred steers were randomly allotted by breed group to one of three diets. Prior to allotment, all calves had been on a high energy growing ration since weaning in mid-September. The three diets were formulated to meet the energy needs for a gain goal of 2.9 pounds per day (NRC, 1984). Diets were fed to appetite. Table 1 lists ingredients for the three diets. The test weight of barley ranged between 45 and 49 pounds per bushel. Corn test weight ranged between 52 and 56 pounds. All grains were dry rolled.

Table 1. Composition of Three Barley-Corn Diets

Ingredient	Diet 1	Diet 2	Diet 3
Barley (dry rolled) %	10	35	60
Corn grain (dry rolled) %	70	47	24
Alfalfa hay (chopped) %	15	15	15
Soybean meal, %	4	2	0
Bovatec supplement, %	1	1	1

The trial started in early November and continued until steers were ready for slaughter. All steers were implanted with Ralgro during the trial. Steers were housed in outside pens with bedding added during severe winter cold. Wind fences, tree belts and buildings provided wind protection. Steers were weighed every 28 days. End point of the trial was determined by weight and visual appraisal of each animal. Steers were marketed in three drafts each year based on relative finish. Slaughtering was done at Aneta Meat Products, Inc., Aneta, N.D. Meat animal scientists from NDSU evaluated carcasses at the slaughter plant. All steers were marketed at 11 to 12½ months of age.

RESULTS AND DISCUSSIONS

All three rations used in this study were very palatable and sustained satisfactory weight gains. Starting weights were similar but end weights tended to be higher for Diets 1 and 2 (Table 2). Days on feed averaged four to five days longer for steers fed on the 60 percent barley diet. Steers on Diet 3 gained slower (2.58 pounds per day) than steers on Diets 1 (2.86) and 2 (2.84). Gains in all three treatments were consistent from start to finish with no interaction detected based on weight, weather or length of time on feed.

Feed conversion of feed per gain appeared to favor the 35 percent barley diet followed by the 10 percent and 60 percent barley diet.

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Table 2. Feedlot Performance of Steers on Three Barley/ Corn Diets

	Diet 1	Diet 2	Diet 3
	10% Barley	35% Barley	60% Barley
Number of Head	51	50	50
Starting Weight (lbs.)	639	635	637
Ending Weight (lbs.)	1079	1070	1050
Days on Feed	154	153	158
Average Daily Gain (lbs.)	2.86	2.84	2.58
Feed Per Gain (DM Basis)	6.71	6.49	7.02

Table 3. Carcass Data From Steers Fed Three Barley/Corn Diets

	Diet 1	Diet 2	Diet 3
	10% Barley	35% Barley	60% Barley
Carcass Weight (lb.)	623	619	601
Dressing Percent	61.44	61.53	61.20
Fat Thickness (inches)	.39	.40	.36
Kidney, Pelvic, Heart Fat (%)	2.35	2.25	2.32
Loin Eye Area (sq. inches)	11.60	11.58	11.23
USDA Quality Score*	9.65	9.65	9.47
Yield Grade**	2.71	2.71	2.63

* Quality score is based on point values for each carcass as follows: 7 = high standard; 8 = low select; 9 = high select; 10 = low choice; 11 = average choice; 12 = high choice; and 13 = low prime.

** Yield grade (YG) is based on fat to lean ratio with 1 = very lean and 5 = very fat. Industry currently considers yield grades of 1, 2 and 3 as normal. YG of 4 or 5 are discounted for being too wasty.

Carcass information is presented in Table 3. Carcasses were weighed and graded after allowing adequate time for chilling. Cold carcass weights were adjusted to hot weight by adding 2 percent.

All carcass values are similar. Loin eye area for Diet 3 steers tended to be smaller, but carcass weights for cattle on this diet were proportionally lighter. All carcasses ended with an acceptable yield grade of 2.63 to 2.71.

An economic analysis was conducted with the trial data. Total gain, feed conversion and days on feed were used to calculate feed requirements for the trial. Barley and corn were valued at three different prices per bushel (1.50, 2.25 and 3.00 respectively). Alfalfa hay was valued at $40, $70 and $100 per ton. Soybean oil meal was priced at $200, $250, and $300 per ton. The protein sources were combined into one price at each low, medium and high price. It was assumed that the price of protein increased similarly for alfalfa and soybean soil meal. The ionophore supplement was not calculated into the feed cost as it was fed at a constant level to all treatments. The following table presents the total feed cost per head for the feeding period from after weaning to slaughter. The reader can compare levels of barley with cost of protein, barley and corn grain.

The most profitable ration is dependent on the price of corn, barley and protein. When the price spread is large between barley and corn, the ration contains more of the lowest price feed. Rations of mixed grains have been shown to be more efficient in conversion and gains than any single grain diet.

The decision to sell or feed calves is considered every year. More risk is probably encountered with the feedlot, but the potential for profit is greater. One of the key elements to a successful feeding enterprise is to get the calves started early before adverse weather occurs. Calves should be worked three to four weeks prior to weaning. It is important that calves learn to eat from a bunk before weaning to reduce the stress from a major diet change at weaning time. Weaning in September or early October enables calves to overcome the stress of weaning and vaccinations before

Table 4. Feed Costs Per Head For Growing and Finishing Steer Calves on Three Barley-Corn Diets Using Three Prices For Barley, Corn and Protein

	Barley Price ($/bu.)								
	$1.50/bu.			$2.25/bu.			$3.00/bu.		
Diets	10	35	60	10	35	60	10	35	60
Corn Price									
$1.50/bu.									
CP[a]	85	**81***	82	**90***	96	109	**94***	111	136
MP[b]	95	**88***	**88***	**99***	104	115	**104***	119	143
EP[c]	104	96	**95***	**109***	111	121	**114***	127	149
$2.25/bu.									
CP	113	98	**91***	118	**114***	118	**122***	129	145
MP	123	106	**98***	127	**122***	123	**132***	137	152
EP	132	114	**104***	137	**129***	131	**141***	145	158
$3.00/bu.									
CP	141	116	**100***	145	132	**128***	150	**147***	155
MP	150	124*	**107***	155	139	**134***	159	**155***	161
EP	160	132	**113***	164	147	**141***	169	**162***	168

[a,b,c] Cheap protein, Medium priced protein, and Expensive protein

* Lowest price within row for a particular price of barley

cold fall rains, wind and snow become another stressor to challenge calves health. Once calves are on a moderate to high energy ration, minimal facilities and care during the winter are necessary to keep animals relativley comfortable. Wind protection from trees, windfences and buildings is important but inside housing is not recommended due to moisture condensation and respiratory problems that often develop. Occasional bedding during cold weather is appropriate.

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Continued from page 9

LESSONS LEARNED

By bolstering a local economy, Rosenbluth has become part of the rural crisis solution. North Dakotans often say that the state's biggest export is its educated children. The state spends millions of dollars to educate a workforce for jobs in more urban states. By encouraging other companies to tap this workforce by expanding into rural areas with not just bare-bones jobs but with jobs plus benefits, states in the Upper Great Plains can work to solve their rural development problems. Successes are contagious; as towns succeed in expanding their economic base, other towns seek to do likewise. A positive way of thinking evolves, and hope for the future begins to replace despair.

When Jim Weisser was asked what one thing needs to be done to help towns like Linton, he responded that "we need a way to get our foot in the door." The word needs to get out to other companies that rural America with telecommunications links can become part of any business anywhere with a skilled, motivated workforce. But getting that word out takes talented people and money. Linton recently lost a chance for another large corporation to locate in their community. The corporation went to Rapid City, South Dakota, because of the existence of a "point of essence"[6] and low-interest loans from the state government.

If telecommunications are to become a part of North Dakota's future, the state must invest in upgrading this infrastructure. Noted sociologist Don Dillman and his associates[7] point out that rural America is slow to adopt new technologies. They warn that "a decade or so from now, rural America could be jeopardized by unconscious neglect." In addition to keeping pace with new technologies, the state must also support viable new and expanding businesses with financial incentives and promote North Dakota to the rest of the world as a good place to do business.

[6]The nearer a company is to a point of presence, the lower their telecommunications costs.

[7]Dillman, Don A., Donald M. Beck, and John C. Allen. "Rural Barriers to Job Creation Remain, Even in Today's Information Age." *Rural Development Perspectives* (February 1989):21-26.