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# Affordable Feed, Tender Beef

Backgrounding and finishing with peas offers beef producers new independence and a more tender end product.

Story & photos by **Ed Haag**

**F**ive years ago, commercial cow-calf operator Jack Kallenbach of Esmond, N.D., stopped selling off his calf crop in the fall and began backgrounding and finishing them on his ranch. Now, he is not only continuing the practice, but he has also expanded into purchasing and finishing additional feeders. His most recent project is establishing a 2,000-head feedlot for custom-finishing.

"We raise all our own rations now," Kallenbach says. "That way we can keep our overhead costs down."

In the recent past, Northern Plains ranchers like Kallenbach were forced to purchase protein-rich products such as distillers' grains, soy meal and canola meal to round out their rations. Today, thanks to the introduction of dry feed peas into his crop rotation system, Kallenbach and many of his fellow ranchers in North Dakota are no longer at the mercy of ever-increasing

shipping costs associated with purchasing their protein.

"We are at the end of the road here," he says. "Bringing in our commodities is always a big expense."

Kallenbach gives credit to peas for reducing his feeding costs and making backgrounding and finishing not only possible but profitable. "We are now looking for customers for our custom-feeding operation," he says. "Producing all our own feed makes that possible."

Dewayne Siebrasse, beef nutritionist and operator of Cattle Cents Consulting Inc.,

Aberdeen, S.D., sees similar trends in his state. "Peas are a protein-dense feed that can be grown by the producer and fed through finishing," he says. "It is becoming the protein source of choice with some of our largest and most successful ranchers."

## Homegrown ration

Kallenbach's homegrown ration consists of 26% corn earlage, 15% barley, 15% dry feed corn, 7.5% peas and 10% alfalfa silage, with the remainder consisting of chopped barley hay, alfalfa hay and pea residue. Prior to his using peas, distillers' grain was the protein source in the ration.

"We are getting gains about 35¢ per pound feed cost on our present ration," Kallenbach says, adding that he gets about 3 pounds (lb.) per day weight gain on a 120-day backgrounding and finishing program.

As a crop, Kallenbach sees field peas as



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well-suited to his region. He plants his spring variety of yellow feed pea as soon as it is dry enough to get on the fields. That is usually the end of April to the beginning of May. Harvest occurs in August.

“We usually get 25 to 35 bushels to the acre,” he says. Dry peas are 60 lb. to the bushel (bu.).

Prior to feeding, Kallenbach feeds his peas through a dry roller. Once cracked, the coarse-ground peas and the other ration ingredients are thoroughly blended in a mixing wagon.

Kallenbach also bales the pea residue for inclusion in his ration. He notes that cattle have no problem eating the residue and anything with a pea flavor is aggressively sought out. “I thought they liked the distillers’ grains, but that was nothing compared to peas,” Kallenbach says. “For cattle, peas are candy.”

Palatability is one of the real advantages to having peas in the ration, Kallenbach says. He believes that if the cattle really enjoy eating the ration, they are more likely to consume more and less likely to go off feed. This translates into higher overall feed intake and better weight gain.

### Studies support pea use

Kallenbach’s observations are supported by North Dakota State University (NDSU) feeding studies. “There are some very well-documented advantages to putting peas into a receiving ration,” Vern Anderson, NDSU beef researcher, says. “The cattle eat more; they gain faster and get off to a better start in the feedlot.”

One NDSU study, conducted in 1999, compared steer calves fed a finishing diet



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with dry-rolled barley and canola meal as a grain source with a finishing diet that used dry-rolled peas as a grain source. Diets were fed to appetite once a day.

Resulting data (see Table 1) showed that pea-fed steers consumed 4.7% more of their ration than barley-fed steers, and the daily gain was 5.5% higher for the pea-fed steers. It was calculated that feed efficiency was the same for both diets. While most carcass traits were similar in both sets of animals, pea-fed steers had higher marbling scores and a slightly higher percentage of Choice carcasses.

Anderson calculates that the breakeven price of peas is 162% of the price of a bushel of barley.

A second study was conducted a year later by researchers at South Dakota State University (SDSU) in which field peas, representing 10% of a mixed ration, were compared with a similar ration using the equivalent in soybean meal (see Table 2). While no difference was observed in feedlot performance or carcass traits, the first 56-day period showed higher gains and better feed efficiency in the pea-fed animals.

In a Colorado State University finishing study (see Table 3, page 136), also conducted in 2000, peas with 20% protein were substituted for soybean meal at levels of 0%, 5%, 10% and 20% of the finishing diet. While

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**Table 1: Field peas in diets for finishing steers**

Item	Treatment	
	Barley/canola meal	Field peas
No. steers/ reps	41/4	42/4
Initial wt., lb.	711	716
Final wt., lb.	1,158	1,177
DM intake, lb.	21.54	22.59
Avg. daily gain, lb.	3.63	3.83
Gain/feed	0.170	0.171
Feed cost/lb. gain, \$	0.230	0.245
Dressing percent	62.1	62.3
Yield grade	2.14	2.35
Marbling score	369 <sup>a</sup>	395 <sup>b</sup>
% Choice/Prime	24.8	43.9

<sup>a,b</sup>Values with different superscripts are significantly different, (P<0.05).

Source: Anderson, 1999b.

**Table 2: Field peas in finishing diets for heavy feeders**

	Treatment		
	Control	Whole peas	Rolled peas
% peas, DM basis	0	10	10
No. head/ reps	52/6	52/6	52/6
Initial wt., lb.	917	912	914
Final wt., lb.	1,333	1,322	1,332
DM intake, lb.	24.27	23.75	23.89
Avg. daily gain, lb.	3.94	3.90	3.98
Gain/feed	0.162	0.164	0.166
Dressing percent	59.0	59.1	58.1
Yield grade	2.6	2.5	2.6
% Choice/Prime	76.5	82.4	84.3

Source: Birkelo et al., 2000.



gain remained constant for all levels, intake did decrease as the percentage of peas increased, thus indicating an improvement of feed efficiency was directly proportional to the increase of peas in the diet. Carcass traits remained the same, but mortality was lower for the calves fed any amount of field peas over the control.

Anderson concludes from the research completed that cattle respond differently to being fed peas in the receiving stage than they do in the finishing stage.

“In the receiving diet we see an increase in intake and an increase in gain,” he says. “In the finishing ration we will often see a decrease in intake and equal gain for improved feed efficiency.”

Also based on the research completed,

**“If corn is \$2.50 a bushel and soybean meal is \$200 a ton, then peas should be worth \$4.15 per bushel and not the \$3.50 per bushel they are currently trading at.”**

**— Vern Anderson**

Anderson sees the dry feed pea as a bargain when compared with other protein and energy sources.

“From a nutrition standpoint, peas are not only competitive with other sources such as corn and soybean meal, it has been undervalued,” he says. “If corn is \$2.50 a bushel and soybean meal is \$200 a ton, then peas should be worth \$4.15 per bushel and

not the \$3.50 per bushel they are currently trading at.”

**Tops in tenderness**

For Anderson and his associates, one of the most exciting aspects of their research is the correlation between feeding peas and the tenderness of the beef. Two studies have been conducted with somewhat differing results.

In the recently published first study, 118 yearling heifers were sorted into 16 identical pens (four pens per treatment). Treatments were 0%, 10%, 20% and 30% dry-rolled field peas on a dry matter (DM) basis replacing dry-rolled corn and canola meal in corn-based finishing diets (see tables 4-7, pages 136 and 138). Diets met or exceeded National Research Council (NRC) requirements for protein. Heifers were fed for 74 days on treatment diets and then sent to harvest.

U.S. Department of Agriculture (USDA) yield and quality grades were calculated for each carcass and recorded. A 3-inch portion of the short loin was removed from each carcass, aged for 14 days at 39° F and cut into two steaks.

One steak was evaluated using a mechanical tenderness-testing instrument known as the Warner-Bratzler shear force (WBSF) device. The second went to a trained taste panel to be evaluated for tenderness, juiciness, off-flavor and flavor intensity.

While there was no difference in USDA grade among the treatments, the taste panel did note that the steaks from the pea-fed heifers were somewhat juicier. There was a marked difference in the tenderness between the steaks as they were evaluated mechanically and by the taste panel.

“With our Warner-Bratzler shear force evaluation there was a linear increase in tenderness as the percentage of peas was increased up to 20%,” says Kasey Carlin, NDSU muscle biologist and author of the study’s report.

She adds that the taste panel was unable to differentiate levels of tenderness among

**Table 3: Effect of increasing levels of field peas in diets for growing and finishing steers**

	Treatment			
	0% Peas	5% Peas	10% Peas	20% Peas
No. head/rep	75/6	78/6	78/6	78/6
Initial wt., lb.	608	601	597	602
Final wt., lb.	1,139	1,130	1,107	1,120
DM intake, <sup>a,b</sup> lb.	20.65	19.42	18.87	18.48
Avg. daily gain, lb.	3.17	3.14	3.06	3.12
Gain/feed, <sup>a,b</sup>	0.153	0.161	0.162	0.168
Dressing percent	63.71	63.72	63.01	63.50
Yield grade	2.35	2.38	2.29	2.37
Marbling score	2.28	2.12	2.40	2.42
% Choice/Prime	85.33	85.90	75.95	75.00
Morbidity	13.5	14.4	15.7	11.8
Mortality, <sup>a,b</sup>	6.7	1.5	0.0	0.8

<sup>a</sup>Linear effect of increasing peas in the diet (P<0.05).

<sup>b</sup>Significant effect of peas (P<0.05), 0% vs. 5, 10 and 20%.

Source: Flatt and Stanton, 2000.

**Table 4: Rations fed to finishing heifers with increasing amounts of peas fed on dry-matter basis**

Ingredient	Dry matter	Treatment			
		0% peas	10% peas	20% peas	30% peas
— Percent of diet on a DM basis —					
Dry-rolled corn	86	35.3	32.5	29.7	25.6
High-moisture corn	72	35.3	32.5	29.7	25.6
Field peas, rolled	89	0	10	20	30
Wheat straw, chopped	86	10	10	10	10
Cond. separator byproduct	60	5	5	5	5
Canola meal	89	10.6	6.2	1.9	0
MGA/Rumensin supplement	92	2.4	2.4	2.4	2.4
Calcium carbonate	95	1.4	1.4	1.4	1.4
Ration dry matter, %		80.3	80.9	81.5	82.3
Crude protein, %		13.43	13.45	13.51	14.37
Net energy for gain (NEg), Mcal/cwt.		62.01	62.34	62.66	62.75

varying percentages of peas, but panel members did report that all pea-fed beef had a tenderness advantage over the control beef.

SDSU Meat Scientist Robert Maddock, who was also involved in the study, speculates that there might be a correlation between the improved health of the animals that consumed the peas and meat tenderness.

“It could have something to do with the health of the gut or energy-to-protein balance,” he says, adding that anecdotal evidence points to the likelihood that animals that are healthier are more likely to produce tender beef if all other factors are the same.

In a second study, which involved steers, the tenderness difference between the animals fed the pea ration vs. those fed a corn ration as a control was not apparent. Rather than considering one of the studies an anomaly, Anderson believes there is a logical reason why the results of the first study did not match the results of the second.

“Steers have a tendency to be more tender than heifers, and we know the control group was already very tender,” he says. “There just wasn’t a lot of room for improvement with the animals in the second study.”

Anderson’s theory is supported by comparing the WBSF test results from the first study with the WBSF test results from the second. All the steaks in the second study — both from the pea-fed group and the control group — showed the same high level of tenderness. In the first study, that level of tenderness was only found in steaks from the animals that were fed the highest percentage of peas.

Currently, Anderson and his associates at NDSU are conducting a new study to see if their hypothesis is correct.

While the jury may still be out for the research community on whether peas consistently produce tender beef, Jack Kallenbach has no doubts that pea-fed beef has no rival when it comes to taste and tenderness. “Every person that tastes pea-fed beef swears it is the best they have ever eaten,” he says enthusiastically. “Ask anyone who buys our meat. Once they are hooked on it, they can’t get enough of it.”



**Table 5: Performance of feedlot heifers finished with increasing levels of field peas**

Ingredient	Treatment			
	0% peas	10% peas	20% peas	30% peas
Avg. weight per head, lb.				
June 3, 2005	929.3	926.9	916.2	925.6
July 1, 2005	1,032.8	1,038.0	1,033.5	1,026.4
July 29, 2005	1,124.1	1,121.5	1,120.0	1,118.4
Aug. 16, 2005	1,188.2	1,179.0	1,191.8	1,187.3
Dry-matter intake, lb. per head per day				
Period 1	26.74	24.88	24.63	24.22
Period 2	26.39	25.27	25.56	25.29
Period 3	27.79	25.47	26.99	25.91
Overall	26.86	25.17	25.56	25.04
Average daily gain, lb.				
Period 1	3.70	3.97	4.19	3.60
Period 2	3.28	2.99	3.09	3.29
Period 3	3.55 <sup>a,b</sup>	3.19 <sup>a</sup>	3.98 <sup>b</sup>	3.82 <sup>b</sup>
Overall	3.50	3.41	3.72	3.54
Feed efficiency: feed per 1 lb. gain				
Period 1	7.59 <sup>a</sup>	6.39 <sup>b</sup>	5.91 <sup>b</sup>	6.77 <sup>a,b</sup>
Period 2	8.33	8.78	8.42	7.99
Period 3	7.71 <sup>a,b</sup>	8.12 <sup>a</sup>	6.71 <sup>b</sup>	6.79 <sup>b</sup>
Overall	7.85 <sup>a</sup>	7.41 <sup>a</sup>	6.85 <sup>b</sup>	7.08 <sup>a,b</sup>

<sup>a,b</sup> Values with different superscripts have less than a 5% chance of being a random effect.

**Table 6: Carcass traits of feedlot heifers finished with increasing levels of field peas**

Trait	Treatment			
	0% peas	10% peas	20% peas	30% peas
Hot carcass wt., lb.	710.3	715.5	716.3	710.9
Dressing percentage	62.41	62.99	62.48	62.43
Ribeye area, sq. in.	12.20	12.56	12.54	12.02
Fat thickness, in.	0.38	0.42	0.46	0.38
KPH fat, %	2.33	2.43	2.32	2.38
Yield grade*	2.43	2.44	2.53	2.39
Marbling score**	372	399	372	382
% Choice	47	57	39	40

\*Yield grade is a calculated score based on the fat-to-lean ratio of a carcass.

\*\*Marbling scores: 300-399 = Select; 400-499 = Choice.

**Table 7: Tenderness and taste panel response to ribeye steaks from heifers fed increasing levels of field peas**

Item	Treatment			
	0% peas	10% peas	20% peas	30% peas
WBSF <sup>†</sup> , lb.	9.48 <sup>a</sup>	8.00 <sup>b</sup>	7.81 <sup>b</sup>	8.18 <sup>b</sup>
Taste panel responses**				
Tenderness	4.56 <sup>a</sup>	5.14 <sup>b</sup>	5.28 <sup>b</sup>	5.35 <sup>b</sup>
Juiciness	4.78 <sup>a</sup>	5.05 <sup>a,b</sup>	5.14 <sup>b</sup>	5.14 <sup>b</sup>
Flavor intensity	5.06 <sup>a</sup>	5.11 <sup>a,b</sup>	5.31 <sup>b</sup>	5.14 <sup>a,b</sup>
Off-flavor presence	3.89	3.86	3.81	3.84

<sup>†</sup>Warner-Bratzler mechanical shear force test. Lower score indicates less force is required (more tender) to cut. Lower score is more desirable.

\*\*Higher score is more desirable.

<sup>a,b</sup> Values with different superscripts are significantly different.