Cereal Grains for Finishing Lambs

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Cereal grains constitute the major part of the ration for finishing lambs. The proportion of the ration that is grain will vary and depend on such factors as lamb size, type of lamb, cereal grain used, quality of the grain and price differences among the grains and roughages.

Availability and price of each of the grains varies by locations within the state and is variable among years. Environemental factors affect grain quality, affecting the total supply available to be used as animal feed rather than for human consumption. Environmental factors also affect the feeding value of the grains. For example, thin kernels and light bushel weight grains are higher in fibrous components and therefore lower in digestibility.

Economics should enter into the decision making process in feed production, feed procurement and ration formulation for feeder lambs. Environment and price dictates to a large extent which of the cereals is produced more efficiently in the various areas of the state. Since most of the types of cereal grains enter the feed market, it is important that the livestock producer has the information to formulate rations with cereals or combination of the cereals for efficient livestock production. Several experiments have been conducted with feeder lambs at the Hettinger and Fargo experiment stations (NDSU) over the past six years to determine the comparative feeding value of the cereal grains.

The detailed procedures and results of each of these experiments have been reported (Erickson et al., 1986; Erickson et al., 1985; Erickson et al., 1984a,b; Insley et al., 1982; Erickson et al., 1981a,b and Erickson et al., 1980).

General Experimental Procedures

The feedstuffs used for the experimental rations were analyzed for nutritional composition with the rations balanced based on those analyses. The rations were sampled weekly during the experimental period and analyzed for 10 nutritional or nutritionally related components. Complete mixed rations were self fed in ground form at the Hettinger experiment station and in the pelleted form at Fargo. Primarily early weaned lambs were used from the ewe flocks at each of the stations. Several purebred breeds were included as well as crossbred lambs from breeding and management studies.

The lambs were assigned to the experimental rations with consideration given to weight, breed and sex. Individual lamb weights were taken every two weeks and feed intake was recorded for each pen. Lambs were started on experiment averaging from 50 to 70 pounds and taken off experiment from 100 to 110 pounds. Dressing percentage was determined on representative lambs from each ration treatment in several experiments. All rations contained levels of nutrients above the National Research Council required levels. In most experiments antibiotics and ionophores were used across all treatments. Alfalfa hay was the roughage used in all experiments. The protein supplement was either soybean or sunflower meals or combinations of these. The ration total digestible nutrients (TDN) ranged from 65 to 72 percent among the experiments. The cereal grains used in these experiments were corn, barley, oats, wheat or various combinations of some of these grains.

Results and Discussion

Five experiments (three at Fargo and two at Hettinger) were conducted comparing corn and corn/oats rations. Lamb numbers for each treatment, ration TDN, ration protein and lamb performance are shown in table 1. The ration analysis and complete experimental design was previously reported (Erickson et al., 1980 and Erickson et al., 1981).

The lambs gained faster and were more efficient ($P < .05$) when fed corn as the only grain (Table 1) in the three experiments conducted at the Fargo station with no difference in lamb performance at the Hettinger Station. The rations within each experiment were balanced to contain equal TDN but the fiber (ADF) analysis was higher 16.0 percent for the ration with the oats compared to 13.4 percent for the corn ration in the experiments at Fargo. Both the corn and corn/oats rations were 20 percent fiber in the experiments at Hettinger (Erickson et al., 1980; Erickson et al., 1981a,b). The experiments also included various levels of protein but there was no protein to cereal grain interaction ($P < .05$).

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Table 1. Lamb Performance on Corn or Corn/Oats[1] with Alfalfa.

Exp. location	Cereal	% TDN	% Protein	lambs numbers	daily gain	feed/ gain
Fargo (1980)	Corn	73	15.0	42	1.08[a]	4.13[a]
(Res. Center)	Corn/oats	73	15.0	42	.96[b]	4.27[b]
Fargo (1980)	Corn	73	16.0	48	.67[a]	5.59[a]
(Sheep barn)	Corn/oats	73	16.0	48	.64[b]	5.56[a]
Hettinger (1980)	Corn	73	17.6	51	.64[a]	6.05[a]
	Corn/oats	73	16.6	51	.67[a]	5.90[a]
Fargo (1981)	Corn	70	12-20	60	.75[a]	5.43[a]
(Sheep barn)	Corn/oats	69	12-20	60	.70[b]	5.88[b]
Hettinger (1981)	Corn	65	12-20	90	.63[a]	7.10[a]
	Corn/oats	65	12-20	90	.65[a]	7.00[a]

[1]Corn and oats were in equal proportions.

[a,b]Within an experiment within columns different ($P < .05$).

An experiment to compare corn to corn/barley (equal parts) was conducted at Hettinger. The rations were balanced to contain 70 percent TDN and either 13 or 16 percent protein using either sunflower or soybean meals. The experiment involved 320 lambs with 160 on each of the grain treatments. Lambs gained slightly faster, .76 pounds per day, on corn compared to .74 pounds per day on corn/barley ($P < .05$), but the feed/gains were similar (4.67 and 4.70, respectively). There was no interaction between the grains and protein levels or protein sources (Insley et al. 1982).

Another experiment comparing corn and barley was conducted at Hettinger. Rations were balanced to contain 69 percent TDN and 14.15 percent protein. The analyzed fiber levels of the corn rations were 14.0 percent compared to the barley rations which were 11.3 percent (Erickson et al., 1984b). Three hundred and twenty lambs were used resulting in 160 lambs on each grain. The lambs gained .68 pounds per day on corn compared to .62 on barley ($P < .05$). The feed/gain was .6 more for corn than barley which may be accounted for by the higher fiber corn ration where 35 percent alfalfa was used compared to only 22 percent alfalfa in the barley rations. These differences were necessary to equalize the TDN at 69 percent.

An experiment was conducted at Hettinger to compare barley or oats or two combinations of barley and oats. The barley and oats had bushel weights of 52 and 37 pounds, respectivley. The rations all contained 20 percent alfalfa and ranged in TDN from 70.5 to 66.8 percent with the barley ration the highest and oats the lowest. The rations contained 15 percent protein (Erickson et al., 1984a). Two hundred and forty lambs were used resulting in 60 lambs fed each of the grain treatments. The results of this experiment is shown in table 2.

Feed intake increased with the level of oats in the ration as did feed required for gain. These increases show a pattern but were not significant ($P < .05$). The lambs on barley dressed out higher ($P < .05$) than those fed rations containing oats.

Table 2. Performance of Lambs Fed Barley, Oats or Barley/Oats Rations.

	Barley	⅔ Barley ⅓ Oats	⅓ Barley ⅔ Oats	Oats
Daily gain (#)	.54	.54	.54	.54
Feed/gain	7.04	7.32	7.33	7.47
Feed intake/day (#)	3.80	3.95	3.96	4.10
Initial wt. (#)	74 ± 10	74 ± 11	74 ± 11	74 ± 11
Final wt. (#)	109 ± 11	109 ± 13	109 ± 12	110 ± 13
Dressing %	56.17	54.68	55.47	54.97
Shrink %	2.09[a]	5.63[b]	7.46[b]	6.51[b]
Grade	choice	choice	choice	choice

[a,b]No differences in any of the parameters except shrink ($P < .05$).

In order to compare corn, barley, oats and an equal combination of these grains, two experiments were conducted at Hettinger. Rations were balanced to contain equal energy (70 percent TDN) and 15 percent protein as shown in table 3.

The rations ranged from 53 percent grain (corn) to 83 percent grain (oats) in order to equalize TDN. The bushel weight of the grains were 51, 51 and 37 pounds for corn,

Table 3. Experimental Rations for Lambs Fed Corn, Barley, Oats or Equal Combinations (Hettinger 1984).

	Treatments			
Feedstuff	Corn	Barley	Oats	3 Grains
			%	
Grain	53	65	83	22, 22 & 22
Alfalfa	36	26	13	26
SBM	11	9	4	8
% TDN	70	70	70	70
% Protein	15	15	15	15

Common to all diets: .5% TM salt, 1% (treatments 1 & 2) .5% (treatments 3 & 4), .5% ammonium chloride, .05% ADE and 2.5 g Terramycin/100#.

barley and oats, respectively, in experiment one and 52, 46 and 37 pounds in experiment two. A total of 604 lambs were utilized in these two experiments with 151 lambs tested per ration. The fiber content of the rations were the lowest for corn and the highest for oats (Erickson et al., 1985). The combined results of these two experiments are shown in table 4.

Table 4. Combined Results from Trials One and Two Comparing the Cereal Grains.

	Dietary treatment[1]				
	Corn	Barley	Oats	3 Grains	SEM
Daily gain #	.644[a]	.602[a]	.468[b]	.604[a]	.0261
Feed/gain	6.61[a]	6.26[a]	7.10[a]	7.05[a]	.221
Dressing %[2]	51.7[a]	52.6[a]	47.4[b]	51.1[a]	

[1]Average of two experiments 4 replicate lots per treatment.

[2]Shrunk cold carcass.

[a,b]$P < .002$ for corn, barley and mixed over oats.

Lambs on the oats ration gained less ($P < .002$) than lambs on the other rations. There was a pattern of increased feed required for gain as the fiber level of the ration increased but the differences were not significant ($P > .05$). Dressing percentage was lower for the lambs fed oats, which supports the results of the previously reported experiment comparing oats to barley.

There are occasions when wheat will be economically competitive as a livestock feed. Two experiments were conducted at Hettinger utilizing 576 lambs with 144 lambs on each ration treatment (Erickson et al., 1986). It has been reported that wheat may result in digestive disturbances and reduced feed intake if fed at high levels of the ration. These experiments included wheat up to 45 percent of the ration in replacement of corn (table 5). Rations were balanced to contain 69 percent TDN and 14.6 percent protein.

Table 5. Diets and Calculated Nutritional Composition for Both Lamb Feeding Experiments at Hettinger (1985).

	Ration			
Feedstuff	1	2	3	4
		%		
Corn[a]	53	44	35	25
Wheat[b]	—	15	30	45
Alfalfa	32	31	30	30
SFM	15	10	5	—
Nutrient fraction (calculated)				
% Protein	14.67	14.64	14.60	14.63
% TDN	69.2	69.3	69.2	69.0
% Ca	.622	.599	.531	.580
% P	.452	.414	.374	.334

[a]Corn 52#/bushel.

[b]Wheat 53#/bushel.

The combined results of these two experiments are shown in table 6. Wheat can make up 45 percent of the grain in high energy ration for lambs without affecting feed efficiency or dressing percentage. The gains were unaffected with up to 30 percent wheat in the ration but the lambs on the 45 percent wheat gained slower ($P < .05$). Results of these experiments indicate that wheat can be incorporated up to 30 percent and even 45 percent of the ration without appreciably affecting lamb performance on high energy diets.

Table 6. Lamb Performance Comparing Corn with Varying Levels of Wheat (Hettinger 1985).

	% Wheat			
	0	15	30	45
Daily gain	.66[a]	.64[a]	.63[a]	.60[b]
Feed/gain	6.9[a]	7.2[a]	7.0[a]	7.3[a]
Dressing %	52.0[a]	51.5[a]	52.2[a]	51.1[a]

[1]Combined results of two experiments.

[a,b]Within rows different ($P < .05$).

Summary and Conclusions

The results of the experiments reported here (in more detail in the "Annual Western Dakota Sheep Day Proceedings" from 1980 to 1986) indicate that the cereal grains corn, barley, oats or combinations of these grains and wheat and corn combinations all serve as useful high energy feed sources for finishing lambs. When the rations contain similar fiber levels, the lambs perform much the same on any of the grains or combinations. When the rations formulated where one grain substitutes in equal quantities with another, the lambs will perform better on the higher digestible energy and lower fiber rations (for example, comparing corn to oats). The quality of the grains vary and this should be taken into account when formulating rations.

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Table 4. Light weight Hereford Steers.

	Bovatec	Control	Rumensin
No. head	6	6	6
Days fed	109	109	109
Initial wt., lbs.	477.5	484.2	483.3
Final wt., lbs.	784.6	783.8	788.8
Gain, lbs.	307.1	299.6	305.4
ADG, lbs.	2.82	2.75	2.80
Feed Summary			
Feed/lb of gain	7.40	7.91	7.49
Feed savings, %	6.4	0	5.3
Feeding Economics			
Feed cost/lb., $	.0438	.0428	.0431
Feed cost/steer, $	99.49	101.40	98.55
Feed cost/cwt. gain, $	32.40	33.85	32.27
Steer value/hd., $	384.61	382.19	388.14
Advantage over control, $	2.42	0	5.95

Table 5. Compudose growth implant comparison among backgrounded steer calves.

	Compudose	Control
No. head	27	27
Days fed	109	109
Initial wt., lbs.	523.0	508.1
Final wt., lbs.	851.6	785.6
Gain, lbs.	328.6	277.5
ADG, lbs.	3.01	2.55
Implant Economics		
Steer value/hd., $	525.42	484.74
Purchase value of steer, $	339.92	330.30
Return/steer, $	185.50	154.44
Value of Compudose implant, $	31.05	
Cost of implant, $	2.40	
Less estimate of greater feed consumption for Compudose implanted steers, $	6.23	
Net return/steer from implanting, $	22.42	

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Low reproductive rates for all groups may be related to influence of light on ewes bred in confinement. Self feeding ground rations did significantly reduce the labor associated with feeding the ewe when confined.

Niether trial indicated a severe reduction in ewe performance when straw was added to the maintenance period ration. Nutritient analysis indicated a wide range of quality of both straw and alfalfa among years. Extreme caution should be used when formulating rations utilizing straw for ewes without sufficient nutrient analysis to verify that minimal energy and protein requirements are met.

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