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Whole-Grain Diets For Finishing Lambs

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Introduction

Whole-grain feeding of lambs improves feed efficiency, increases average daily gain, and lowers overall feed costs per pound of gain. It is the most profitable feeding program that can be used for grain-based finishing of feedlot lambs. Whole-grain diets consist of whole (unprocessed) grains, such as shelled corn or barley, mixed with a pelleted protein-vitamin-mineral supplement

Roughage (hay) is not incorporated into a whole-grain diet or supplemented on the side. Consequently, whole-grain diets are high in energy and promote accelerated lamb gains. The feeding of whole grain provides lambs with a built-in "roughage factor." Only about one-third of the grain is cracked when first eaten by lambs. The remainder of the grain must be regurgitated during rumination for further mastication. This action of regurgitation and chewing contributes more saliva to the digestive process, thus increasing the buffering capacity of the rumen. Feeds containing processed grains must have roughage added to the grain mix or supplemented on the side to maintain proper rumen function and prevent digestive disorders.

Research conducted in 1986 and 1987 by Virginia Tech at the Shenandoah Valley Research and Extension Center compared high-energy pelleted diets, containing either peanut hulls or alfalfa meal as a source of roughage, with a whole-grain diet. The high-energy pelleted diets were similar to the more traditional types of feeds that might be mixed on the farm or purchased commercially for lamb feeding. The whole-grain diet contained a mixture of 85% shelled corn and 15% of a pelleted 36% protein-vitamin-mineral supplement. Both diets contained 13% crude protein. However, because the pelleted diets contained roughage, they were approximately 7% lower in TDN (energy) than the whole-grain diet. All diets were fed free choice. Results from the trials are summarized in Table 1.

Table 1. Pelleted diets versus whole-grain diets for finishing lambs.

	Treatment Diets		
Measurement	**Pellet With Peanut Hulls**	**Pellet With Alfalfa Meal**	**Whole Grain**
Weight			
Initial (lb)	74	72	71
Final (lb)	106	106	108
Average Daily Gain (lb)	0.53	0.57	0.59
Daily Feed Consumption (lb)	3.23	3.22	2.98
Pounds of Feed/Pound of Gain	6.64	6.48	5.22
Feed Cost/lb of Feed	$0.07	$0.07	$0.06
Feed Cost/lb of Lamb Gain	$0.46	$0.45	$0.31
Feed Cost/30 lb of Lamb Gain	$13.80	$13.50	$9.30

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Average daily gain was higher for lambs on the whole-grain diet compared to the combined average of the lambs on the pelleted diets. Most importantly, feed efficiency (pounds of feed per pound of gain) and feed cost per pound of lamb gain were significantly lower for the whole-grain diet. Lambs netted approximately $4.20 more per 30 pounds of gain on the whole-grain diet compared to the pelleted diet containing alfalfa meal. Assuming a 150% lamb crop marketed, that equates to $6.30 more income per ewe per year.

Whole-Grain Feeding

Whole-grain feeding programs are designed to increase profitability by improving lamb performance and minimizing the cost of feed manufacturing and handling. Whole grain is mixed with a pelleted protein-vitamin-mineral supplement and fed to lambs free choice. Once lambs are adjusted to full-feed, all roughage is removed from the diet. Shelled corn and barley are the most commonly used high-energy grains in Virginia. Compared to corn, lamb performance is reduced by approximately 10% when barley is fed. However, this difference is offset when barley can be purchased at less than 90% of the price of corn on a per pound basis. Because lambs prefer corn over barley, corn and barley should not be fed together. Grain must be whole and not cracked. Cracked grain contributes to poorer lamb performance and may lead to digestive disorders such as acidosis.

Pelleted supplements for whole-grain feeding are commercially available and are formulated to contain the additional protein, vitamins, and minerals required by lambs. When commercial supplements are not available, a custom pelleted supplement can be prepared using the formulation shown in Table 2. Pelleted supplements should range from 34 to 38% crude protein on an as-fed basis. An appropriate amount of supplement is mixed with the grain to meet the crude protein requirements of the lambs based on their live weight. Whole-grain diets generally contain 10 to 20% of the pelleted supplement.

Because feed grains are low in calcium, it is critical that pelleted supplements contain additional calcium as a preventive for urinary calculi. Ammonium chloride or ammonium sulfate can be added to the pelleted supplement at a rate equivalent to 0.5% of the complete feed as additional insurance for the prevention of urinary calculi. In Table 2, the actual proportion of ammonium chloride in the whole-grain diet is 0.41% (15% of 2.7%).

Table 2. Pelleted supplement used in Virginia Tech studies.

Ingredient	Percentage (As Fed)
Corn	18.60
Soybean Oil Meal (44%)	52.70
Wheat Middlings	9.10
Urea (281%)	1.30
Ammonium Chloride	2.70
Trace Mineral Salt	3.00
Limestone	10.20
Dicalcium Phosphate	0.80
Sodium Bentonite (pellet binder)	1.60
Bovatec®	200 g/ton
Selenium	2.00 ppm
Vitamin A	7,300,000 IU/ton
Vitamin D	800,000 IU/ton
Vitamin E	160,000 IU/ton

This formulation is based on a mixing rate of 85 parts corn to 15 parts supplement. At 15% of the whole-grain diet, it provides 30 g of Bovatec per ton of feed and .3 ppm selenium.

Feed additives such as antibiotics (Aureomycin®) or ionophores (Bovatec®) are often added to pelleted supplements. Aureomycin is added at low levels to enhance average daily gain and feed efficiency. Bovatec is added for the prevention of coccidiosis. In addition to its role as a coccidiostat, Bovatec has also been shown to improve lamb gain and feed efficiency. The combined use of Aureomycin and Bovatec is not approved by the Federal Drug Administration. Therefore, the benefits of improved lamb performance and coccidiosis control make Bovatec the preferred feed additive. Lamb feed consumption must reflect an intake of 15 to 70 mg of Bovatec per head per day for the prevention of coccidiosis.

Whole-grain feeding is used in the fall and winter as the finishing phase in lamb feedlots for old-crop (spring-born) lambs, or it can be incorporated into the feeding program for young, growing lambs typical of a winter-lambing system. Because of the difference in maturity patterns between old-crop lambs and young, growing lambs, old-crop lambs should not be placed on whole-grain diets until they weigh approximately 75 pounds. When started at lighter weights, old-crop lambs fatten too early and only reach heavier weights of 120 to 125 pounds at the expense of poorer feed conversions. At weights of 50 to 75 pounds, old-crop lambs make very acceptable feed conversions on complete feeds with TDN values of 70 to 75%. Young lambs can be started on whole-grain diets at weights of 60 to 65 pounds. Crude protein requirements are higher for lighter weight lambs (Table 3). Consequently, more supplement should be added to the grain mix for lighter weight lambs instead of the level recommended by the feed manufacturer for heavier lambs.

Young lambs are capable of consuming and utilizing whole grains at weights of 25 pounds and up. Some producers prefer to use the whole-grain feeding program with lighter weight lambs rather than use other feeds. If this is the case, lambs should be supplemented with high quality hay such as alfalfa or second-cutting orchardgrass until they reach weights of 60 to 65 pounds. Because young lambs do not have a functional rumen, pelleted supplements containing non-protein nitrogen should not be used with lambs weighing less than 50 pounds.

When lambs are not properly adjusted to whole grain diets, the result is unnecessary death loss caused by acidosis and overeating disease. Young lambs already on feed can be adjusted to whole grain over a two-week period by adding increasing amounts of the complete whole-grain diet to their existing feed at ratios of 25:75, 50:50, 75:25, and 100:0 whole-grain diet to existing diet. With old-crop lambs, a number of alternatives can be used for the adjustment phase, which usually takes 10 to 14 days. One method is to hand feed increasing amounts of a whole-grain diet along with decreasing amounts of hay or pasture. Lambs may be started in dry lot by feeding .25 pound of whole-grain diet and free choice hay. Every two days, the amount of grain received is increased by .25 pound. Once lambs are on full feed, the hay can be gradually removed from the diet. This program is less exact and may result in higher than normal death losses. It also requires a minimum of 10 inches of trough space per lamb. An alternative method uses a systematic approach of mixing the com-

Table 3. Influence of lamb weight on crude protein requirements.

Lamb Weight	Crude Protein Requirement (Dry Matter Basis)	Proportion of Pelleted Supplement in Diet
30 to 70 pounds	15%	20%
70 pounds and up	13%	15%

Table 4. Adjustment pellet used successfully in Virginia lamb feedlots.

Ingredient	Percentage (As Fed)
Corn	39.25
Soybean Oil Meal (44%)	8.30
Soybean Hulls	48.45
Fat	0.45
Sodium Bentonite (Pellet Binder)	1.70
Trace Mineral Salt	0.45
Urea (281%)	0.20
Ammonium Chloride	0.45
Limestone	0.75
Bovatec®	30 g/ton
Selenium	.3 ppm
Vitamin A	1,100,000 IU/ton
Vitamin D	120,000 IU/ton
Vitamin A	24,000 IU/ton

plete whole-grain diet with an adjustment pellet formulated (Table 4) to contain 65 to 70% TDN. An example of such a system is described in Table 5.

Table 5. Placing lambs on a whole-grain diet with an adjustment pellet.

Day	Feed
1	Free choice good quality hay
2	1 pound hay plus 1 pound adjustment pellet per head
3	1 pound hay plus 2 pounds adjustment pellet per head
4 & 5	1/2 pound hay and free choice adjustment pellet
6 & 7	Free choice adjustment pellet
8 & 9	Free choice mix of 75% adjustment pellet and 25% whole-grain diet
10 & 11	Free choice mix of 50% adjustment pellet and 50% whole-grain diet
12 & 13	Free choice mix of 25% adjustment pellet and 75% whole-grain diet
14	Free choice whole-grain diet

The adjustment program depicted in Table 5 requires additional feed preparation and labor, but prevents serious losses from occurring when trying to adjust large numbers of lambs to feed with a poorly administered adjustment regimen. Rather than change the feed in a single pen daily, a number of pens can be used so that lambs move to a new pen for each adjustment mixture. With self-feeders, the feed mixture for the next phase can be added to the top and allowed to work its way down to the bottom of the feeder.

Lambs should be vaccinated for overeating disease before starting on feed and boostered three weeks later. Clean water should be available at all times. Although all the mineral requirements are met with the pelleted supplement, a free-choice source of plain salt helps serve as additional insurance for the prevention of urinary calculi.

Whole-grain diets should be fed to lambs on a free-choice basis. Self-feeders can be purchased commercially (Figure 1) or constructed on the farm using plans available through Virginia Cooperative Extension. Hog and turkey feeders (Figure 2) can be modified to work as lamb feeders. A minimum of 0.50 inch of feeder space per lamb is required for self-feeding. The lip of the feeder should be approximately 16 to 18 inches above the ground. Feeders should be adjusted so that sorting and feed wastage is minimized. Failure to keep feed available for lambs at all times may result in death losses from acidosis or overeating disease after empty feeders are refilled.

Whole-grain feeding programs utilize high energy feeds that cause lambs to gain at accelerated rates. Lambs should be removed from feed and marketed once they have reached their expected finished weight. Feeding lambs past their optimum slaughter weight results in poor lamb performance, increased costs per pound of gain, and overfinished carcasses. Lambs on whole-grain diets in excess of 80 days may stall or cut back on feed consumption. As a result, lamb performance suffers. Consequently, some producers have found that feed intake can be enhanced by providing a source of low quality, long stem hay on the side during the latter stages of whole-grain feeding.

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