MANAGEMENT

Lamb Feedlot Nutrition

no. 1.613

by T.L. Stanton and S.B. LeValley[1]

Quick Facts...

Meeting protein, energy, vitamin and mineral requirements is essential for profitable lamb finishing.

Feedlot lambs are more efficient when self-fed than when hand-fed twice daily.

Lambs fed whole grains have as good or better performance than when they are fed rolled or ground grains.

If lamb finishing rations are more than 60 percent roughage, they should be pelleted for best performance.

Compare protein and energy sources for lamb finishing on a cost-per-nutrient basis with maximum ingredient restrictions in mind.

Colorado State University

Extension

Nutrient Levels

Recommended nutrient levels for 70-pound finishing lambs are listed in Table 1. These protein levels (12 percent to 14 percent) are higher than those recommended by the National Research Council (11 percent CP) based on recent research showing lamb performance response.

One of the more critical areas to watch is the calcium to phosphorus ratio. This ratio should be kept at approximately 2 or 2.5 to 1 in order to prevent urinary calculi. The addition of ammonium chloride (.25 ounces/head/day) to the ration has been recommended to prevent urinary calculi; however, ammonium chloride has been implicated in causing throat irritation that leads to excessive coughing and possibly to increased incidence of prolapses.

Urea and dust may have a similar implication in the prolapse problem. Urea should not provide more than 15 percent to 25 percent of the total crude protein in fattening rations.

Trace Minerals

Sheep are sensitive to trace mineral imbalances. Since copper-molybdenum-sulfur levels interact with each other, check these trace minerals to prevent imbalances and reduced performance (Table 2). Supplements that use poultry manure contain high copper levels, so special attention must be paid to trace mineral levels when these products are fed. Selenium also is of concern, especially in areas that have a high incidence of white muscle disease.

Vitamins

Vitamins A, D and E are important for finishing lambs and usually need to be supplemented in finishing rations (Table 3). Including these in the ration is fairly easy; however, some studies indicate that injecting these into lambs upon receiving is more advantageous than day-to-day vitamin supplementation. Water soluble vitamins (B vitamins) usually are not needed unless lambs are sick and their digestive systems are not functioning properly.

What Feeding Method?

Essentially, two feeding methods exist for finishing lambs. Method one is referred to as perimeter, or fence-line, feeding. The other is a self-feeding system in which lambs gradually are brought up to a medium- to high-concentrate ration, and feed is available continuously. A study conducted at the University of Minnesota in 1972 compared the effects of feeding methods on lamb performance (Table 4). One group of lambs was hand-fed twice daily while the others were self-fed. Those lambs given 24-hour access to a self-feeder consumed more and gained significantly more than hand-fed lambs. Feed efficiency also improved significantly with self-feeding.

Table 1: Recommended nutrient levels for 70-pound finishing lambs (dry-matter basis).

	%
Crude protein	12-14
Sodium	.04-.10
Calcium	.21-.52
Phosphorus	.16-.37
Magnesium	.04-.08
Potassium	.50
Sulfur	.14-.16

Table 2: Trace minerals for 70-pound finishing lambs (dry-matter basis).

	ppm
Copper	5
Iron	30-50
Manganese	20-40
Zinc	35-50
Cobalt	.1
Iodine	.1-.8
Molybdenum	>.5
Selenium	.1

Table 3: Vitamins for 70-pound finishing lambs.

Vitamin	per head per day
A	1000 IU
D	300 IU
E	50 mg

Table 4: Method of feeding and lamb performance (Minn. '72)

	Hand-fed 2x/day	Self-fed
ADG (lbs)	.58	.75
Intake (lbs)	3.27	3.53
FE	5.64	4.71

Table 5: Energy levels and performance of lambs.[1]

	Concentrate, %			
	100	90	75	50
ADG (lbs)	.66[a]	.77[b]	.79[b]	.70[a]
FE	4.60	4.76	5.24	5.95

[1]Colby Sheep Day, 1979. [ab]P<.05

Table 6: Wheat levels and 104-day lamb performance.[1]

	% Wheat in grain portion of ration				
	0	25	50	75	100
ADG (lbs)	.61	.60	.63	.64	.63
FE	5.12	4.92	4.85	5.00	4.56

[1]Colby Sheep Day, 1979.

Starting Lambs on Feed

Timing the start of lambs on feed is critical in feeder-lamb management. Typically, when lambs are started on feed, they are brought gradually from a high roughage-low concentrate to a high concentrate-low roughage ration over several weeks. Some feedlots have a series of five to nine different rations that are changed every two to three days to enable lambs to adapt to a high-concentrate finishing ration within 15 to 20 days.

When lambs are fed with self-feeders, another set of management considerations are needed. Lambs can be penned up while the next higher concentrate ration is fed into the feeder. However, determining when lambs will be consuming the higher concentrate level is difficult. A more successful approach is to start lambs on feed by moving them to pens that have increasingly higher concentrate rations in the self-feeders. Lambs are on full feed after four or five pen changes.

What Concentrate Level?

Energy level is one of the major factors used in finishing-lamb rations and is one of the most important. A 1973 study conducted at Colby, Kansas, evaluated concentrate level in lamb-finishing rations. The diet contained 17 percent crude protein on a dry-matter basis. Concentrate levels of 100 percent, 90 percent, 75 percent and 50 percent were evaluated (Table 5). Milo was used as the grain source. Concentrate levels of 90 percent and 75 percent provided significantly higher average-daily-gains than the 50 percent or 100 percent concentrate level. Feed efficiency improved as the concentrate level increased in the ration. However, feeding 100 percent concentrate is not recommended in most instances because problems with enterotoxemia or overeating disease could increase. Furthermore, lambs should be vaccinated for enterotoxemia or overeating disease at least twice prior to being fed a high-concentrate ration.

Another study conducted in Colby, Kansas, evaluated the percent wheat in the grain portion of a 70 percent-concentrate ration. Wheat levels of 0 percent, 25 percent, 50 percent, 75 percent, or 100 percent of the 70 percent-concentrate ration were evaluated (Table 6). Wheat replaced milo as the grain source. ADG was not affected significantly by replacing milo with wheat in the ration's grain portion. Feed efficiency was most improved when wheat was included at 100 percent of the grain portion of a 70 percent-concentrate ration.

Exercise caution when using processed wheat. It should not make up more than 50 percent of the grain in a ration.

Another Colby study evaluated wheat and alfalfa levels in self-fed ground rations. Wheat made up 82 percent, 68 percent, 60 percent and 48 percent while alfalfa was included at 10 percent, 25 percent, 35 percent and 50 percent of the four rations, respectively. Lambs fed the 50 percent alfalfa ration needed 5.33 pounds of feed to produce a pound of gain. Those on the 25 percent alfalfa ration (the most efficient) required 4.24 lbs of feed to produce a pound of postweaning gain (Table 7). Wheat rations containing up to 35 percent alfalfa produced satisfactory gains when fed to growing-finishing lambs. When the level of alfalfa reached 50 percent performance dropped markedly.

Should Grain Be Processed?

The effect of wheat processing on lamb performance (Table 8) was evaluated in a Canadian study. Wheat was evaluated in the whole, rolled or pelleted form. Lambs fed wheat that was either whole or rolled had significantly higher average daily gains (ADG) than lambs fed pelleted wheat. Feed efficiency also favored the whole or rolled form of wheat. Barley also was fed to lambs in whole, rolled or pelleted forms (Table 9). Lamb performance was significantly better with the feeding of whole barley. In comparing barley and wheat, wheat

Table 7: Wheat and alfalfa level in lamb fattening rations.[1]

	Alfalfa levels			
	10	25	35	50
ADG (lbs)	.78	.78	.75	.60
FE	4.50	4.24	5.21	4.58

[1]Colby Sheep Day, April 2, 1979.

Table 8: Effect of wheat processing on lamb performance.[1]

Item	Whole	Rolled	Pelleted
ADG (lbs)	.59	.55	.46
FE	4.22	4.20	4.34

[1]*Can. Journal of Animal Science* 53:89.

Table 9: Effect of barley processing on lamb performance.[1]

Item	Whole	Rolled	Pelleted
ADG (lbs)	.64	.55	.48
FE	3.85	4.43	3.98

[1]Can. Journal of Animal Science 53:89.

Table 10: Effect of corn processing on 56-day lamb performance.[1]

	Cracked corn	Shelled corn
ADG (lbs)	.50	.58
FE	6.62	6.06

[1]Missouri Sheep Day, 1980.

Table 12: Method of feeding and lamb performance.[1]

	Group self-fed[a]	
Item	Pelleted	Unpelleted
ADG (lbs)	.52	.44
FE	7.50	7.60
Intake (lbs)	3.90	3.30

[1]*Journal of Animal Science* 16:863.
[a]47.5% alfalfa hay, 47.5% corn, 5% molasses.

had a slight advantage over barley in ADG; however, barley had an advantage in feed efficiency.

A Missouri study evaluated corn processed in either the cracked or whole shelled form and fed to lambs with alfalfa pellets and alfalfa hay (Table 10). Feed efficiency and ADG were slightly improved with the whole shelled corn feeding. This would suggest that cracking corn holds no advantage compared to feeding whole, unprocessed corn.

Energy Costs

Besides evaluating grain processing differences, different energy sources on a cost-per-unit of energy should be evaluated. Divide the supplement cost by the percent TDN, which will equal TDN cost. Doing this with a number of various energy sources will generate a basis for comparing cost of energy relative to the value of corn (Table 11).

Table 11: Comparative values of various energy sources (100% dry-matter basis).[1]

	Relative value compared to corn		restrictions	Ration
Feedstuff	% TDN	%[2]	($)/CWT	%
Corn	91	100	5.36	100
Barley	87	90	4.82	100
Milo	89	85	4.56	100
Oats	66	80	4.29	100
Wheat	92	105	5.63	50
Beet pulp	72	100	5.36	30
Fat	225	225	12.06	5
Alfalfa hay (good)	58	64	6.50	100
Alfalfa hay (poor)	53	58	5.50	100
Dehy alfalfa	60	66	7.50	100
Pelleted whole corn plant	65	71	3.81	N.A.[3]
Corn silage	69	76	5.00	50
Molasses	89	70	4.75	10

[1]Processing methods and type of ration may modify these results on a percentage basis.
[2]Comparison of relative feeding value pound for pound as percent of corn, where corn = 100.
[3]Information not available.

For example, if corn is selling for $5.36/cwt, milo would be worth only $4.56/cwt. However, costs and energy values must be computed on an equivalent dry-matter basis, especially when comparing silages to dry grains. Energy costs should not be the only factor considered when formulating a lamb-finishing ration. Palatibility, physical characteristics and energy density of rations are other factors to consider when designing a feeding program.

Pelleting

Pelleting of self-fed lamb rations was evaluated in an University of Illinois study (Table 12). Lambs that were fed the pelleted ration gained significantly faster than those fed an unpelleted ration. Feed efficiency was similar between the two groups; however, feed intake was higher (.6 lb) for lambs fed the pelleted ration. Typically, pelleting rations that are more than 60 percent roughage are recommended for finishing lambs. This should result in similar ADGs as observed with feeding high-concentrate rations; however, feed efficiency will be poorer than when lambs are fed a high-concentrate finishing ration. Compare the costs of pelleting to the advantages expected in ADG and feed intake. Pelleting of high-concentrate rations has led to a higher incidence of ruminal parakeratosis in lambs.

[1]*T.L. Stanton, former Colorado State University Extension feedlot specialist and professor, animal sciences. Reviewed by S.B. LeValley, Extension sheep/youth specialist and assistant professor, animal sciences department.*

Table 13: Protein level and lamb performance.[1]

	Crude protein level, %		
	10	12	14
ADG (lbs)	.42[a]	.48[b]	.55[c]
FE	6.30[a]	5.72[b]	5.45[b]

[1]*Journal of Animal Science* 28.279
[abc](P < .05)
Wheat straw 20%, corn and SBM 80%.

Table 14: Performance of lambs fed different protein sources.[1]

	Cotton-seed meal	Soy-bean meal	Blood meal	Feather meal	Urea
ADG (lbs)	.62	.64	.55	.55	.57
Feed intake	3.26	3.04	3.01	3.06	3.10
FE	5.29	4.76	5.48	5.56	5.42

[1]Huston and Shelton (1971).

Pelleting probably does not greatly change the nutritive value. However, it improves palatability and forces lambs to eat the grain and roughage in the proportions put into the pellet, thus controlling the concentrate and roughage ratio. When pelleted, rations that include poor quality roughage give more rapid, efficient gains and higher grading carcasses than unpelleted rations with poor quality roughages. A comparable rapid response probably would not occur from pelleting good quality roughage with grain.

Protein

Crude protein levels (dry-matter basis) of 10 percent, 12 percent and 14 percent crude protein were evaluated in an 80 percent-concentrate diet (Table 13). ADG significantly increased as the level of crude protein increased from 10 percent to 12 percent to 14 percent. Feed efficiency improved significantly when protein was raised from 10 percent to 12 percent and tended to improve when protein was increased from 12 percent to 14 percent.

Protein source and lamb performance were evaluated in a finishing trial. Cottonseed meal, soybean meal, blood meal, feather meal and urea were evaluated in this study (Table 14). Ration crude protein levels were 12.6 percent. Lambs fed cottonseed meal or soybean meal had significantly higher ADGs than those lambs fed blood meal, feather meal or urea. Feed intake was the highest with those lambs fed cottonseed meal in the ration. Feed efficiency was the best when lambs were fed soybean meal in the ration. Therefore, the natural proteins such as cottonseed meal and soybean meal should provide better performance than alternative protein sources such as blood meal, feather meal or urea. Comparative values of various protein sources for lambs are listed in Table 15.

Table 15: Comparative values of various protein sources (100% dry-matter basis).

Feedstuff	Relative value compared to soybean meal[1] %	Ration restrictions %
Soybean meal	100	100
Cottonseed meal	98-100	100
Linseed meal	90	100
Peanut meal	100	100
Safflower meal (42%)	40-45	100
Sunflower meal	100	100
Brewers dried grains	75	100
Corn gluten meal	100	50
Peas, dried	65-75	50

[1]Comparison of relative feeding value pound for pound as percent of soybean meal, where soybean meal = 100.
[2]Maximum percentage of soybean meal, which can be replaced for best results.

To efficiently shop for protein sources to include in lamb finishing rations, a basis of comparison is needed for evaluation. One method is to calculate digestible protein cost by dividing the cost per pound of protein by the percent digestibility, which will equal digestible protein cost. By assembling a table of various alternative protein sources much in the same way that energy sources would be compared, the best buy on a cost-per-pound of crude protein or a cost-per-pound of digestible protein basis can be determined (Table 16). Because urea has one of the lowest cost-per-pound of protein, it usually is included in high-concentrate finishing rations. When urea is included in high-concentrate rations, it should provide no more than 15 percent to 25 percent of the total crude protein.

Table 16: Protein level and cost of feedstuffs (1/20/03).

Feedstuff	CP (%)	Cost /ton ($)	Cost /lb. protein ($)
Dehy alfalfa	17	150	.44
Alfalfa	15	130	.43
CSM	41	175	.21
SBM	44	180	.20
Wheat middlings	14	110	.39
Brewers grains	26	135	.26
Sunflower meal	38	130	.18
Corn	8	94	.59
Urea	281	240	.05