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Feeding the Ewe Flock

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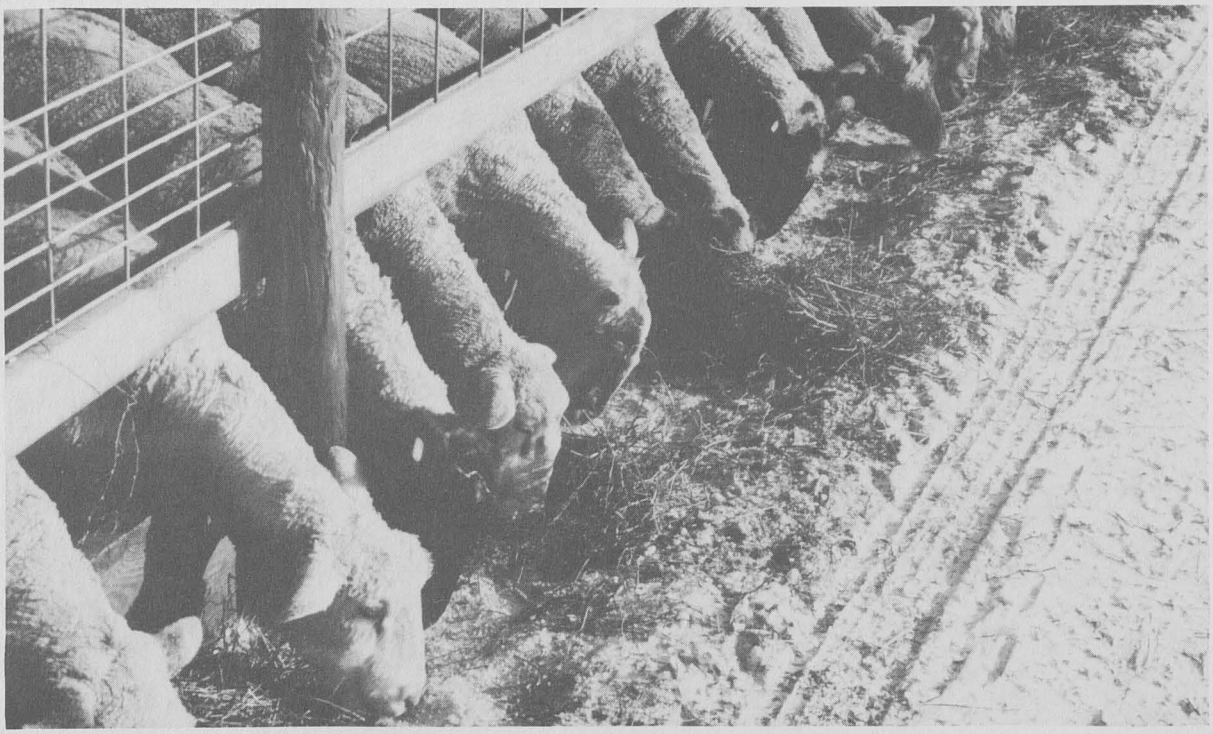

PHOTOS:

Front cover: **The ground makes an inexpensive feed bunk when a good fence keeps the sheep from walking on the feed.**

Back cover, top: **If the feed is handy to the bunk, a scoop shovel can be an efficient way to feed sheep — and keep you warm at the same time.**

Back cover, bottom: **A self-unloading feed mixer is an efficient way to feed grain along the front of a simple, but well-engineered fence line bunk.**

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Feeding the Ewe Flock

Robert M. Jordan, extension animal scientist

Aspects to consider and problems likely to be encountered

FEEDSTUFFS

Feeding the ewe and her lambs constitutes 60 to 70 percent of lamb production costs. The ewes' yearly feed represents about two-thirds of those costs. Producers can do little about feed costs per ton, but several practices can reduce daily ewe feed costs. Ewe cost per day and feed costs per ton are related, but they are not the same.

Feed bulk or density affects feed transport costs, wind loss, bunk capacity, mixing ease, and feeding methods. Lack of bulk or dry matter often results in excess salt and mineral intake, wood chewing, and eating wool off one another. Feed storage problems, handling costs, and feed spoilage in storage or in the bunk are other considerations when selecting feeds. Obviously, the nutrient content of feedstuffs, palatability, toxicity, and possible adverse physiological effects should receive major attention.

In short, solutions to some feeding problems shouldn't create others. The ideal sheep feed is low-cost, palatable, nontoxic, and nutrient rich that satisfies the ewe, minimizes handling and feed bunk problems, and maximizes lamb and wool production.

FEEDING EQUIPMENT

Low cost, convenient, easily maintained equipment that accommodates the feeding of large flocks with a minimum of labor should be the goal. Feed bunks that reduce feed wastage will pay for themselves in 1 or 2 years' time. Basically, feed bunks don't cost more than $1-3 per ewe and last 15 to 20 years. Feed bunks should be suitable for hay, silage, or grain; easy to clean; and easy to move from snow, mud, and manure piles.

The total cost of a silo unloader, augers, and feed bunks is considerable and may amount to $10 to $12 per ewe. Thus, your feeding system should maximize the use of the automatic feeding equipment.

You can reduce your capital investment in feeding equipment per ewe by feeding multiple groups of ewes per day in the same bunk. During gestation and summer dry periods, feeding on alternative days or three times per week works well and minimizes labor and equipment. This is particularly feasible if you are mechanically feeding with a belt feeder or auger system. Moving hungry ewes with their lambs through gates without injuring the lambs is the major problem in feeding multiple groups of ewes per day in the same feed bunks or on alternative days.

If a ewe needed the same kind and amount of feed every day it would be easy to devise a feeding system, feed bunks, and ration to accommodate her. Actually, 8 months out of 12 the ewe wants to eat far more feed than she needs. To economize on feed costs and to feed the ewe no more than she can profitably utilize necessitates three approaches: a) hand feeding a specified amount each day (which entails considerable labor); b) changing the nutrient concentration of the ration according to her needs (very bulky or high-grain); or c) limiting the amount of time that she has to eat. With a high-energy ration, this might be 20 minutes during early gestation, 30 minutes during late gestation, and 1 hour twice a day during lactation.

Be conscious of the amount of labor required to feed sheep. For example, cornstalks are an inexpensive source of nutrients, but they are very bulky and entail considerable labor to feed. If they are ground to minimize waste and facilitate handling, the cost has almost doubled by the time they reach the bunk. If they are not ground, there are the problems of feed refusal, frequent cleaning out of the bunk, and an accumulation of refused stalks around the bunk or, worse, in the barn.

To summarize, other factors in addition to how much the ration costs per ton have a direct bearing on how to best facilitate the feeding of large numbers of sheep with a minimum of labor. The number one problem in American farm flock production is devising a scheme that enables maintenance of a large flock with a minimum of labor while maintaining maximum lamb production.

Nutrient requirement of the ewe

The amount and kind of feed that should be fed the farm flock ewe depends on several things, which if not considered will result in reduced production and/or excessive production cost.

1. **The age of the ewe.** Old ewes, possibly with poor teeth, may need a higher energy ground ration. Yearling ewes (lambed at 12-14 months) suckling one or two lambs need a far higher level of nutrients than a mature ewe to accommodate lactation requirements plus their growth needs. Failure to recognize this will result in low conception and a disappointing lamb crop as 2-year olds.

2. **Size of the ewe.** Basically, the nutrient requirements of the ewe are in relation to size. A 110-pound ewe requires considerably less feed to maintain than a 190-pound ewe.

3. **Production stage.** A ewe's production stage determines how much and what kind of feed should be fed. The two critical periods, when the required amount of nutrients must be supplied to avoid disaster, are during very late gestation and during lactation. Figure 1 illustrates the magnitude of the difference in nutrient requirements and the proportion of the year that constitutes critical and non-critical periods.

4. **Production level desired.** If you are satisfied with a lamb crop of 110 percent and lambs that gain .25 pound per day for 8 or 9 months, the ewe would not need to be fed milk-stimulating rations nor would her lambs need a high intake of energy daily. Under some circumstances, prolonging the feeding period and utilizing low-cost, low-energy feed, coupled with the possibility of marketing lambs at high prices, may actually be profitable. However, the most profit usually is made by those who feed for top production.

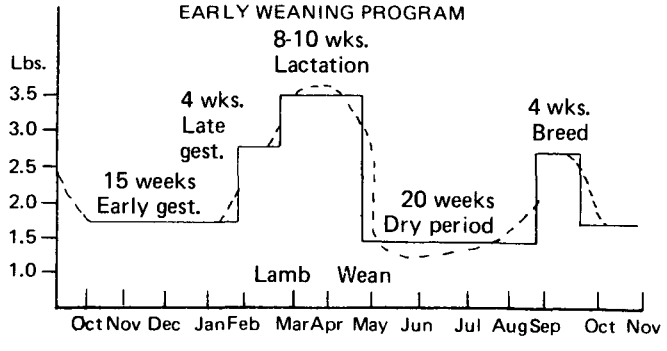
5. **Current conditions.** There is a saying, "Fat ewes in the fall are like money in the bank." In short, a ewe in good flesh can be kept healthy while developing a fetus even though she may lose a little weight during **early gestation** and gain only a moderate amount during late gestation. Conversely, a ewe that is rather thin in the fall **must gain** much more weight during gestation and thus must be fed well. Experiments at the University of Minnesota have shown that rather fleshy ewes in the fall that gained 30 to 40 pounds during gestation produced no heavier lambs at 30 to 60 days of age than equally fleshy ewes that gained only 5 or 10 pounds during gestation. Conversely, thin ewes carrying one or two lambs that gain only 5 or 10 pounds during gestation actually would be **much thinner** at lambing time, very apt to produce lightweight lambs and far less milk, and might not be strong enough to respond to adequate feed post-lambing.

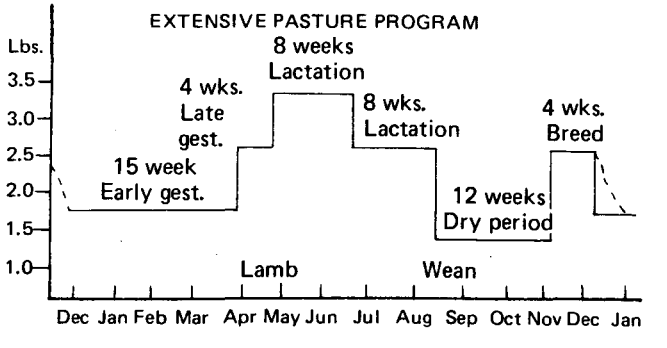
6. **Previous nutrition status.** Previous nutrition status affects condition and, equally important, affects stores of various nutrients. An example is the ewe's vitamin A status. Ewes that came off of green forage and were fed dry hay containing virtually no vitamin A (carotene) could conceivably go through the entire winter without suffering from vitamin A deficiency. Conversely, ewes that had been eating dry brown forage most of the summer and were fed hay with little or no vitamin A would become vitamin A-deficient long before the winter was over.

7. **Environment.** Wind, wet conditions, and cold weather definitely increase the ewe's energy requirements. Furthermore, if the ewe must travel long distances to procure feed, that too increases her energy requirements 20-30 percent in some cases.

8. **Diseases and parasites.** The effect of diseases and parasites on nutrient requirements is not well understood. Inadequate intake of protein and phosphorus, in particular, make sheep more susceptible to parasitism and bacterial infection. In addition, a heavy parasite load reduces feed intake and therefore energy and protein intake.

Figure 1. Daily TDN requirement year round of 154 pound ewe





PRODUCERS' ATTITUDES

To surmount some of the physical problems of feeding 100-500 ewes, to economize on the equipment and labor, and to understand the factors that affect the amount, kind, and cost of feeding a ewe daily, requires applying knowledge to the problem. If all sheep weighed 100 pounds, if they were always fed equal parts of grain and hay, if the hay was always alfalfa with 15 percent protein, and if the grain always corn, it would be quite easy to devise not only the equipment but the ration for sheep. However, that is seldom the case.

While sheep producers feed their sheep by the bale or tractor scoop and judge how well they are doing by their condition, they should appreciate the importance of the composition of the feed they're using. As a producer, do you weigh a bale of hay or a scoop load of silage once a month? Do you know whether oats has enough protein for a pregnant ewe or

if corn silage is high or low in calcium and phosphorus? Overfeeding didn't affect profits when feeds were low-priced, as it does now with $60-$80 a ton hay and $200-$300 per ton soybean meal.

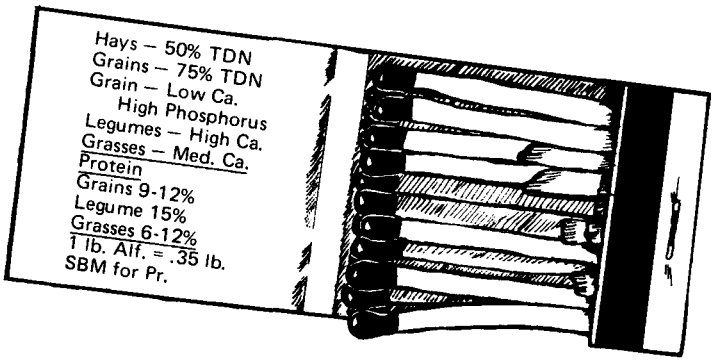
Useful feed composition data

The data on feed composition in table 1 is presented as reference information. The feedstuffs have been grouped according to type. First appreciate that these are average values and it's possible that a specific bale of alfalfa hay or bag of oats could have more or less TDN, protein, or minerals than the values shown.

Secondly, these values are on a 90 percent DM basis. A forkful of silage doesn't contain 63 percent TDN. Actually, it is 70 percent TDN content on 100 percent DM basis, X the DM content of the silage (30-40 percent), i.e., .70 TDN X .35 DM = 24.5 percent TDN on an as-fed basis. Most grains and dry forages are 85 to 90 percent DM so the values in table 1 are quite comparable to the as-fed basis. For example, corn with 90 percent TDN on a DM basis is 81 percent TDN on a 90 percent DM basis. Oats with 78 percent TDN on DM basis is 70 percent at 90 percent DM.

Thirdly, don't try to master all the feeds, only those you are apt to use.

As "rules of thumb" write some basic information about feeds on a match clip which will help you make better feeding decisions under pressure.



Quality factors are not covered in table 1 nor discussed in the feeds section. Quality of the forage is affected by: a) maturity at harvesting; b) deterioration during harvesting (hay rained upon and loss of leaves from shattering during raking and windrowing); and c) deterioration during storage (mold growth and heat damage or browing reaction [Mallard's reaction]). Quality factors are extremely crucial to a sound sheep feeding program. Minnesota research indicates the protein in heat damaged hay was 43.0 percent digestible compared to 70.8 percent for undamaged hay. Heat damage reduced the digestibility of hay dry matter from 61 percent to 52 percent. Forage color (green) and leafiness are two good visual ways to estimate quality.

Characteristics of feedstuffs for sheep

The following comments on various feeds of typical or average quality (harvested at proper date, with average weather conditions prevailing, and stored in a typical manner) and the nutritive values presented in table 1 are intended to help you formulate more nutritious and, at the same time, more economical rations for sheep.

LEGUME HAYS – ALFALFA, ALSIKE, AND RED CLOVER

With the exception of young growing/finishing lambs and lactating ewes, legume hays provide about 50 percent more protein than sheep require. Legumes' high protein (15 percent), calcium (1.25 percent), and carotene (50-100 mg/lb) content make them ideal for correcting those deficiencies that occur when you are feeding corn silage, corn stalks, low-quality grass hay, and straw rations. Sheep particularly like legumes. They are highly digestible and a good source of most trace minerals and vitamins. Regardless of what kind of sheep are being fed, nutrient deficiencies are unlikely to occur if legume hays constitute about 50 percent of the ration. As a source of energy (50-53 percent total digestible nutrients [TDN] on a 90 percent dry matter [DM] basis) they don't have a great advantage over non-legume forages. Their superiority, in comparison to other feeds, hinges on their high content of protein, minerals, and vitamins.

GRASS HAYS

Grass hays include bromegrass, orchard grass, canary grass, timothy, bluegrass, and a variety of native grasses. Grass hays normally contain about 90 percent DM; on that basis they contain 48 percent to 50 percent TDN. Thus, they have almost as much energy value as legumes. The difference is that they have 50 percent to 75 percent less protein (6-10 percent) and only about 25 percent as much calcium (.20 percent) as legumes. Furthermore, the quality of grass hays varies more than that of legumes. There is a tendency to put off harvesting grass hay thinking it's the one crop that can wait. Delaying cutting by 10 days-2 weeks can reduce the protein content of grass hays 3 percent or 4 percent and decrease the digestibility of the nutrients by 30 percent to 40 percent. Therefore, grass hays are often not as palatable to sheep as are legumes. Because of their lower protein content, and particularly lower calcium content, they cannot be used to correct the deficiencies of protein and calcium in corn silage or corn stalks rations. Ewes need at least 9 percent protein in their total ration during gestation. A ration consisting only of grass hays would likely be deficient in protein. Like most forages, grass hays are rather low in phosphorus, containing .17 percent to .22 percent. Sheep need a ration that provides about .25 percent phosphorus. Thus, supplemental phosphorus must be fed the ewe. Grass hay does have adequate carotene if it has good color and has not been stored for long periods.

HAYLAGE

Normally haylage is made from alfalfa-brome forage. Its value in relation to hay is determined by when it is cut and its moisture content. Typical haylage contains 40-50 percent DM but may drop down to 38-40 percent DM. When that occurs it is an entirely different feed, on an as-fed basis. For example, if you are feeding 8 pounds of alfalfa-brome haylage and assume it contains 45 percent DM, that will provide the ewe 3.6 pounds DM. This 3.6 pounds DM contains about 55 percent TDN, thus the ewe consumes 1.98 pounds of TDN. However, if the actual moisture content is a good deal higher and the haylage contains only 40 percent DM, then 8 pounds of haylage would provide 3.2 pounds DM or 1.76 pounds of TDN. Therefore, a 5 percent change in haylage DM content changes the TDN intake by twice that, or 10 to 12 percent. Failure to recognize a change in DM often leads to ewes receiv-

Table 1. Composition of typical sheep feeds[1]

Feedstuffs	Typical dry matter content % [2]	Based on 90% dry matter content							
		Energy		Protein					Vitamin A equivalent
		TDN %	DE McCal/lb.	Total %	Digestible %	Fiber %	Calcium %	Phosphorus %	I.U./lb.[3]
Grains									
Oats	88	70.0	1.40	11.9	7.3	11.2	.10	.34	–
Corn	88	81.0	1.62	9.0	4.6	2.1	.02	.31	500
Barley	88	75.0	1.50	11.7	7.2	5.0	.08	.41	–
Wheat	90	79.2	1.58	12.9	8.5	2.7	.05	.37	–
Rye	90	76.5	1.53	12.1	9.5	2.0	.06	.34	–
Sorghum	90	76.5	1.53	11.2	6.8	2.0	.04	.32	–
By-products									
Beet pulp	90	64.8	1.30	9.0	4.0	18.8	.68	.10	–
Beet molasses	77	80.1	1.60	7.8	3.8	–	.16	.03	–
Cane molasses	75	64.8	1.30	3.9	0.0	–	.89	.08	–
Wheat bran	90	58.5	1.17	16.2	11.6	10.1	.14	1.18	–
Protein supplements									
Soybean meal	90	72.0	1.44	46.4	40.2	6.0	.32	.68	–
Linseed meal	90	68.4	1.37	34.7	29.2	8.9	.40	.82	–
Brewers grains	90	59.4	1.17	25.3	20.2	14.7	.26	.49	–
Cottonseed meal	90	67.5	1.35	40.3	34.2	11.8	.15	1.18	–
Roughages									
Hay – alfalfa	88	51.3	1.02	15.4	9.7	27.8	1.20	.20	7,500
timothy	88	49.0	.98	7.5	3.2	29.8	.36	.17	4,000
bromegrass	88	49.0	.98	10.6	4.4	30.4	.35	.18	3,000
orchard grass	88	49.0	.98	8.6	4.8	31.0	.40	.22	7,500
canary grass	88	49.0	.98	9.4	5.3	31.7	.30	.22	7,500
alsike clover	88	51.0	1.02	13.2	7.6	26.5	1.20	.22	25,000
red clover	88	51.0	1.02	12.8	7.3	26.5	1.30	.20	8,000
Alfalfa-brome haylage	46	50.0	1.00	14.0	4.1	31.0	.54	.18	18,000
Corn silage	40	63.0	1.26	7.3	2.2	22.0	.24	.18	–
Corn stover	88	50.0	1.00	5.2	1.0	33.4	.44	.08	–

[1] Values are from NRC feed composition tables.

[2] For most feeds, the "as-fed basis" will provide nutrients similar to those presented here. To convert the exceptions, high moisture feeds, silage, haylage, molasses, etc., to an "as-fed basis", divide the values given by 90% to put them on a 100% DM basis and then multiply that answer by the dry matter content of the feeds in question, i.e., corn silage $\frac{7.3\% \text{ protein}}{90\%} = 8.1\% \times 40\% = 3.2\%$.

[3] Values calculated on basis of 1 mg. carotene equal to 400 I.U. of Vitamin A.

ing less energy than intended. Aside from problems with DM fluctuation, alfalfa-brome haylage normally is put up in less time and thus, on a DM basis, may be higher in protein and minerals, and possibly carotene, than hay.

CORN SILAGE

Corn silage is a major winter feed for beef cows in the corn belt but is seldom used for wintering ewes. The reluctance to feed ewes corn silage is based on several factors. 1. Often the flocks are small and the labor entailed in feeding corn silage is too great. 2. The fact that many producers have no feed bunks precludes its use. 3. Also, it has a bad reputation, only part of which is based on fact. Many producers believe that ewes wintered on high corn silage rations do not produce strong lambs or as much milk and that the lambs are lighter at weaning time. This is more myth than fact. It is true that poorly harvested corn silage (corn silage that is cut too coarse, is too dry, and is poorly packed) does harbor the bacteria, lysteria, which may affect the nervous system of the sheep and cause a disease called listerosis or circling disease. Unfortunately, there is no cure for this disease. However, if silage is properly stored, listerosis could become as rare as goiter. Corn silage produces more energy per acre and more sheep can be maintained utilizing corn silage than any other harvested feed. If you have a flock of 100 to 300 ewes, seriously consider corn silage as a major component in your rations. It will reduce production costs.

Since corn silage feeding is less well understood than the feeding of hay-type rations, let's briefly discuss some of the factors to consider.

On an as-fed basis, typical corn silage containing 35 percent to 40 percent DM contains approximately 26 percent TDN, 3.0-3.2 percent total protein, .11 percent calcium, and .08 percent phosphorus. A typical 140 to 150 pound ewe would have no difficulty eating 8 pounds of corn silage during early gestation. Would that meet her requirements according to

Table 2. Daily nutrient requirements — 154 lb. ewe (moisture free)

Production Stage	Gain	Protein		TDN		Calcium		Phosphorus		Vitamin A
	lb.	lb.	%	lb.	%	gm	%	gm	%	I.U.
1	0-.02	.24	9.0	1.4	50	3.2	.27	3.0	.25	1200
2	.04-.07	.28	9.0	1.7	50	3.2	.23	3.0	.21	1800
3	.40-.50	.43	9.0	2.7	52	4.5	.21	4.3	.20	6000
4	-.06	.57	10.0	3.6	56	12.0	.48	8.6	.34	6000
5	.13	.43	9.0	2.7	52	4.5	.30	4.3	.25	6000
6	.3-.4	.43	9.0	2.7	52	4.5	.27	4.3	.25	6000
7	.5-.7	.3-.4	15.0	.6-.9	73	3-4	.40	2-3	.27	2-3000

1. Maintenance — summer dry period
2. Dry — 1st 15 weeks gestation
3. Last 4-6 weeks gestation
4. First 8 weeks lactation
5. Last 8 weeks lactation
6. Flushing
7. Early weaned lamb (6 weeks old, 25-40 lb.)

the figures given in table 2? Eight pounds of corn silage would provide 2.2 pounds TDN, which is .5 pound more than the ewe needs during early gestation, and .24 pounds protein, which isn't enough. Actually, the ewe would have to eat 9 pounds of corn silage to meet her protein requirements. Therefore, it's extravagant to use corn silage as the only source of protein because in so doing the ewe eats approximately 50 percent more energy than is required during early gestation.

Would 8 pounds of silage meet the calcium and phosphorus requirements? According to the requirements during early gestation for 140 to 150 pound ewes, 8 pounds of silage would provide .008 pound calcium and .006 pound of phosphorus. This is enough calcium but a bit low on phosphorus. A corn silage ration would be particularly lacking in both calcium and phosphorus during late gestation, and tremendously lacking during lactation. Thus, you have to decide which is the most economical — to be extravagant and overfeed the ewe corn silage in order to provide protein, or to reduce the amount of corn silage fed and provide a better source of protein than corn silage. If you reduce the amount of corn silage from 8 pounds to 6 pounds and replace it with a drier feed, that feed must not only be higher in protein but also provide somewhat more calcium and phosphorus than the 2 pounds of corn silage contained. A good substitute that would meet all of those requirements (protein, calcium, and phosphorus) would be 1 pound of alfalfa hay.

CORN STOVER AND SOYBEAN STRAW

If sheep are going to be a viable part of the corn belt farm enterprise they must utilize more crop wastage than is now the case. With equipment that enables crop residue to be efficiently harvested, the crop residue that appears to offer great promise is corn stover (stalks and leaves left after the corn has been combined). Corn stover, on the basis of its chemical analyses, appears to be a reasonably good source of dry matter. In fact, in some reports, corn stover is credited with having 54-56 percent TDN. This value is too high, based on trials with pregnant ewes at the University of Minnesota. Corn stover primarily contributes bulk to the ration and some gross energy. The problem with corn stover is that it's not only variable in quality, ranging in protein content from 3 to 6 percent and in fiber from 32 to 38 percent, but its lack of palatability and the labor required to feed it. Corn stover is a good example of a feed that costs little initially, but by the time it is put into the feed bunk a sizeable cost has been incurred. For example, to grind corn stalks with a tub grinder costs $40-50 per hour, or about $10-15 per ton. Grinding alleviates the problem of refused feed and normally ewes will eat 10-15 percent more ground corn stalks. However, regardless of whether corn stalks are ground or not ground, there will be a 25-35 percent refusal. In addition, University of Minnesota studies have found that Columbia ewes weighing 180-200 pounds consumed only 2 pounds of corn stalks per ewe daily along with 1 pound of alfalfa hay or .4 to .5 pound of soybean meal.

Obviously 2 pounds of corn stalks and 1 pound of alfalfa hay is not enough energy for a ewe of that size. Nevertheless, corn stalks can be used as a source of energy to a greater degree than they are being used now. They do offer opportunities to reduce the cost of feeding ewes during early gestation. Much the same can be said about soybean straw. Soybean straw contains 35 percent TDN, has virtually no digestible protein, but is a source of dry matter and gross energy. To utilize either they must be supplemented with either a protein and mineral supplement, or about half of the DM must be provided as alfalfa hay.

BYPRODUCTS

Byproducts of the sugar beet industry — beet pulp and beet molasses, sunflower hulls, and wheat bran are the main byproducts available to sheep producers.

Beet pulp is generally offered as pelleted beet pulp. Aside from phosphorus, if you fed sheep nothing but beet pulp pellets they would do quite well. After all, they have on an as-fed basis (usually 90 percent DM) 9 percent protein, 19 percent fiber, .68 percent calcium, and .10 percent phosphorus. They are not as high in energy as oats, with 65 percent TDN. The pellets are easy to handle, an ideal feed for starting commercial feeder lambs on feed. During periods when hay

Super simple feeding equipment and inexpensive sheep feed (corn stalks) have vices as well as virtues. A ewe cannot eat enough corn stalks to meet her requirements. Guard against high ewe and lamb mortality with additional protein, vitamin, and energy supplements. Don't economize on feeding equipment to the extent that savings are lost in increased labor and wasted feed.

is scarce and high priced, the high fiber content of beet pulp helps extend short hay supplies.

Beet molasses. Many producers have the idea that this is a very high energy rich feed. Actually, on an as-fed basis (77 percent DM), it contains about 68 percent TDN, which is less than oats or corn, and about 6.7 percent protein. It is an excellent feed to enhance the palatability of feeds such as corn stalks. It quiets the dust but it should not be thought of as a magic feed, a preventer of pregnancy disease, or maker of a lot of milk. Recently it's been used as an excellent carrier for some mineral supplements and for urea type supplements offered sheep free choice. If it can be bought competitively with other energy and protein sources, molasses has a place. If not, most typical producers will find it a difficult product to handle.

Sunflower hulls. Pelleted sunflower hulls are a uniform product, high in fiber (51 percent), low in protein (5 percent), and low in energy (35 percent TDN). View them primarily as a source of dry matter to satiate the ewe's appetite and to prevent wool picking. As a source of nutrients, expect them to contribute little. They serve as a good carrier for molasses.

Wheat bran is a very bulky but palatable feed. On an as-fed basis it contains 58 percent TDN and 16 percent protein and is exceedingly high in phosphorus (1.2 percent). Therefore, it is a good additive to a ration a little low in phosphorus for ewes or lambs. Furthermore, because it's produced from Dakota and Montana grown wheat, it's higher in selenium. If you are in a selenium-deficient area, the addition of 10-20 percent wheat bran to the grain ration would contribute needed selenium.

PROTEIN SUPPLEMENTS

Soybean meal tops this list. It has 72 percent TDN and 45 percent protein (table 1). While not as rich in phosphorus (.68 percent) as cottonseed meal (1.2 percent) or wheat bran, it is much higher in phosphorus than the other grains. It is very palatable and, therefore, a good addition to creep rations. Soybean meal usually is the least costly source of protein.

Linseed meal contains 68 percent TDN and 35 percent protein. It is considerably lower in both energy and protein than soybean meal. For the most part it is solvent-extracted so it is not higher in fat than typical soybean meal. While it's an excellent source of protein and very palatable to sheep, it normally is higher priced per pound of protein than soybean meal.

UREA

Urea is the dominant source of non-protein nitrogen used in ruminant rations. Sheep producers usually buy it as a component of a commercial supplement that often contains added vitamins A and D and minerals. However, it is available and can be mixed by the producer. Basically a mixture of 12 percent urea and 88 percent corn results in a supplement with an approximate 45 percent protein equivalent. Normally sheep rations (corn silage, corn stalks, grass hay) are deficient in both calcium and phosphorus. The addition of 5 percent dicalcium phosphate to the above described corn and urea mixture results in a supplement containing 42 percent protein and 1.2 percent of both calcium and phosphorus. Feeding a .2 pound of the supplement per ewe daily would

provide from 10-15 percent of her total calcium and phosphorus requirements.

MINERAL SUPPLEMENTS

Calcium and phosphorus are the major components of bonemeal and dicalcium phosphate (dical). Dical is a more uniform product and its calcium and phosphorus is just as available as that in bonemeal. Dical contains 25 percent calcium and 18.5 percent phosphorus whereas bonemeal contains 24 percent calcium and 12 percent phosphorus. Sodium phosphate contains 22 percent phosphorus and no calcium, so it is used only when additional phosphorus is needed. Feed-grade limestone (38 percent calcium and no phosphorus) is used in high-grain rations. None of these supplements are palatable, so if you expect a sheep to consume adequate amounts to meet requirements, mix them with 60 percent salt in the summer and 50 percent salt in the winter.

Pastures

Sheep are efficient grazers and will consume readily a wide variety of forages, forbs, and weeds. However, both the pasture and the sheep must be managed to maximize land returns. Pasture management must include renovation, fertility maintenance, and productive forage species. Sheep management for optimum lamb production and a vigorous forage stand includes: a) avoiding grazing too early in the spring or too late in the fall (poaching); b) rotational grazing, which permits legumes to remain vigorous; c) uniform grazing; d) parasite control; and e) grazing the class of sheep that will respond to nutritious forage.

If you apply those simple principles, pasture should provide the least-cost ration and the simplest management of any period. Conversely, unproductive, parasite-infested pasture will reduce your gross returns by 30 to 40 percent. University of Minnesota experiments indicate that well managed pastures can produce 400-500 pounds of lamb per acre and average daily gains of .35 to .45 pound per lamb. Conversely, ill-managed pasture will result in only 3 to 4 pounds lamb gain per month.

FORAGE SPECIES

Legumes (alfalfa, clovers, and birdsfoot treefoil) will result in more gain and finish and more pounds of lamb per acre than any forage species tested at the University of Minnesota. But they also have faults. In some areas legumes cause a great deal of bloat and may become unusable. At St. Paul and Rosemount, legume pastures cause virtually no bloat. Legumes won't stand abuse, i.e., constant grazing will kill a stand of alfalfa or clover in 1 year. Grazing too early (prior to May 5-10) or too late in the fall (after September 5-15),which does not give the plant an opportunity to develop a vigorous root system, will shorten the life of the stand appreciably. Mixture of alfalfa and brome or orchard grass will provide a better turf and an earlier pasture with greater flexibility of use and fewer bloat problems.

GRASSES

Orchard grass is the species of choice. While it isn't as early or as hardy as brome, it provides more palatable and nutritious forage in July and August and greater overall tonage. It also responds well to fertilizer.

Bromegrass is the standard for comparison. It is much more productive than bluegrass or timothy, equally hardy, and remains palatable longer into the summer months than fescues, wheat grasses, bluegrass, or timothy. However, it is not ideal as it, like all cool season grasses, becomes dormant during the heat and dry weather of summer.

Reed canary grass produces more forage per acre, is as early a spring producer and as hardy as any grass grown in Minnesota. But in hot weather it produces a toxic alkaloid that causes severe scouring, reduces forage intake, and consequently causes weight gains hiatus. Don't use it for lambs you are attempting to grow and fatten; rather, utilize it for non-lactating ewes.

ANNUAL PASTURES

If your alfalfa killed out and your permanent pasture is inadequate, what should you use as a supplement? Many producers utilize sudan grass or sorghum-sudan hybrids. Unquestionably they provide lots of forage during late June, July, and August. Remember sudan is planted in late May and early June and is very sensitive to cold weather. It is a 60-day pasture only. Further, managing sheep on sudan is difficult. They tend to eat it into the ground in one area and permit it to grow to 5-foot heights in another. Very heavy stocking rates and rotational grazing will minimize the problem.

Small grains and rape. Planting rape with oats early in the spring will provide excellent feed by late May. Sheep initially dislike rape and will graze exclusively on the oats. By mid-June, when the oats is flowering and heading, the rape will be 4 to 10 inches high. With a reduced oats intake, the rape will provide excellent forage (barring a drought and an insect invasion) until freeze-up. In sheep grazing studies, rape has produced the fastest gains among suckling or early weaned lambs (.4 to .5 pound daily) and with feeder lambs in the fall (September to November), a gain of .5 pound daily has been consistently obtained. There has been no bloat whether the rape was frozen or not. Rape is very succulent and lambs may scour, so be careful of fly strike or maggots.

Mineral deficiencies and toxicities

SALT

Typical consumption of salt is .03 to .06 pound per ewe daily depending upon season, lactation, and salt content in the water and feed eaten. Inadequate dry matter intake may increase salt and mineral intake to .10 to .20 pounds daily. This level isn't toxic, provided adequate water is available. Salt is an excellent carrier for sources of calcium and phosphorus.

CALCIUM AND PHOSPHORUS

Ewes fed primarily hay are *not apt* to be deficient in calcium, but most forage rations, including alfalfa hay, are low in phosphorus. Corn silage is deficient in both calcium and phosphorus. Calcium deficiency will exist with non-legume hays, grain rations (very low in calcium), and corn silage. A salt-limestone mix of 50-60 percent salt and the balance limestone (34 percent calcium) fed as the *only* source of salt will encourage ewes to consume approximately 2.5g calcium, which is 50 to 60 percent of their total needs during gestation

and about 25 percent of their requirement during peak lactation. Deficiencies of either calcium or phosphorus will retard growth before resulting in abnormal bone development, tetany, and depraved appetite.

MAGNESIUM

The magnesium requirement isn't known. Sheep do develop hypocalcemia and grass tetany, both of which will respond to treatment with magnesium. If grass tetany is a problem, a salt-mineral mix containing 10 percent magnesium salts (chlorine, carbonate) would be beneficial.

POTASSIUM

The potassium requirement is .5 percent of the diet. Very high-grain diets could be low in potassium; forages usually have two to five times that level.

SULFUR

Wool is high in sulfur; the sulfur requirement is about .15 to .25 percent of the diet dry matter. Rations containing less than half forage are apt to be deficient in sulfur. Trace-mineralized salt contains supplemental sulfur and beet molasses; linseed meal and soybean meal are relatively rich in sulfur. The Ohio Agricultural Experiment Station reports improved feed intake and heavier lambs were produced at 30-40 days when ewes were fed corn silage fortified with .5 to 1.0 percent sulfur at the time of ensiling. Furthermore, the sulfur helps control listeria growth in the silage, thus reducing problems with circling disease.

IODINE

When trace mineral salt containing iodine is provided, problems with goiter are eliminated.

IRON

Normally no iron deficiency occurs in sheep. However, in lambs raised on slatted wooded floors, a deficiency may occur. Intramuscular injections of iron-dextran will prevent the problem.

COPPER

Several severe copper toxicity incidents have occurred in Minnesota in the last 5 years following an error in mixing feed. An analysis of several types of Minnesota feeds indicate a content of 10 to 20 ppm copper, which is well in excess of the requirement of 5-8 ppm. Toxicity has occurred with diets containing 40 to 50 ppm. Feeder lambs and pregnant ewes have been fed balanced diets containing 60 to 150 ppm for 60 to 90 days with no problem. However, diets containing in excess of 30 ppm should be viewed with suspicion. If the molybdenum content is low, copper toxicity may occur with diets containing as little as 15 to 20 ppm copper.

COBALT, MANGANESE, AND ZINC

When trace mineral salt is available, cobalt deficiency doesn't occur in Minnesota. Deficiencies of cobalt cause lack of appetite and thrift, low fertility, and decreased lamb and wool production.

Manganese deficiencies have occurred among lambs fed purified diets containing 1 ppm. Morrison provides data indicating most feeds contain several thousand ppm, suggesting manganese deficiencies are not apt to occur.

Zinc deficiencies are unheard of in Minnesota. Diets containing less than 20 ppm depress growth and reproduction, but because feedstuffs contain many times those levels supplementation is not necessary.

SELENIUM

This trace mineral causes the most concern among Minnesota sheepmen because selenium deficient areas exist. Selenium supplementation of the sheep feed isn't permitted and many lambs die each year from selenium deficiency. Feeds should contain .1 ppm selenium. Grains contain about half as much selenium as forage grown on the same soil. The western half of Minnesota normally produces feeds containing .1 to .4 ppm and Dakota feedstuffs are even higher. Therefore, feedstuffs produced in western Minnesota, the Dakotas, and Montana (flax [linseed meal], sunflower meal, and wheat bran) contain considerable selenium. Some producers are using selenium-fortified turkey and swine feeds, particularly in creep rations to correct selenium deficiencies.

NITRATE POISONING AND UREA TOXICITY

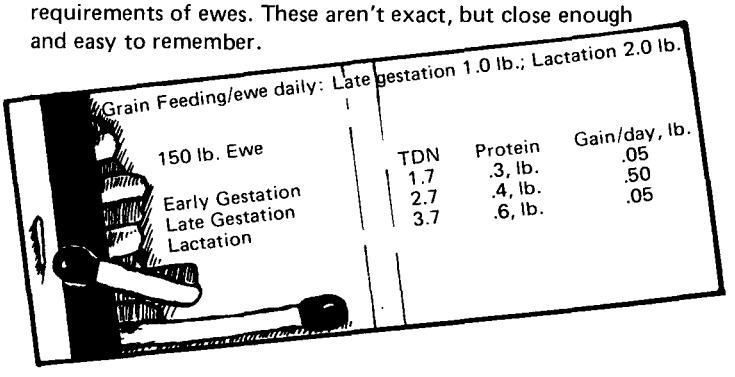
Heavily fertilized fields, accompanied by an arrest in growth from drought, are conditions that may result in an accumulation of nitrate in forage and corn plant. Just what the lethal level is depends on the protein and energy level and rate of intake. Sheep fed a complete ration containing 12.8 percent potassium nitrate showed no symptoms, whereas lambs fed low-quality hay plus .5 gm KNO_3 per Kg showed severe symptoms.

If your feed contains 1-3 percent KNO_3, dilute it with other feeds, feed corn with it, and be certain protein is adequate. Corn silage can also contain toxic levels of nitrate, though ensiling reduces it somewhat.

Urea toxicity is not apt to occur when urea is added to silage at 1 to 2 percent, when supplied from a commercial supplement, or when mixed well and fed with high energy rations. Problems occur when hungry sheep are fed poorly mixed urea supplements in which urea is providing 40-50 percent of the protein equivalent. Mixing urea with salt is another lethal procedure.

Feeding the ewe

Now let's talk about feeding the sheep. The daily requirements for sheep at several stages of production are presented in table 2. Don't let the mass of figures confuse you. Zero in on the basics. On another match clip note the feed requirements of ewes. These aren't exact, but close enough and easy to remember.



You can also remember TDN requirements as 1.0, 1.5, and 2.0 percent of ewe's body weight during early and late gestation and lactation, respectively.

The information given about various feeds and the requirements of ewes at various stages of production have been used to formulate the example rations presented in table 3. Remember, no one single ration is always best. Certainly changing costs and availability of certain feedstuffs suggest that sheep producers must be able to formulate rations that will be low cost yet nutritionally adequate from a variety of feeds.

When you begin formulating a ration, realize that the daily nutrient requirements of a typical ewe are contained in 3.5 to 4.0 pounds of good hay. Secondly, if she is not pregnant or lactating, she requires somewhat less than 3.5 to 4.0 pounds of hay and if she is, she needs somewhat more than 3.5 to 4.0 pounds of hay.

The third point, ewes bearing twins or triplets, especially if they are a bit fat, are quite susceptible to ketosis or lambing paralysis. Mortality from ketosis is usually 100 percent. Prevention can be 100 percent successful if, during the last 4 to 5 weeks, the ewe is fed so she gains weight (8 to 15 pounds) during that period. Don't waste money by feeding to prevent pregnancy disease during the first 3 months of gestation, it never occurs then. Regardless of what you are feeding or how much you are feeding, increase the *energy* intake the last 4 weeks before the first lamb is due by feeding .50 to 1.0 pound of grain per ewe daily.

Ewes need energy, protein, calcium, phosphorus, and vitamins if they are to produce 3.0 to 5.0 pounds of milk daily so as to produce 1.0 to 1.5 pounds of lamb gain daily. All of the requirements for milk production are provided when quality forage and grain are fed in adequate amounts (5.0 pounds of hay and 1 to 2.0 pounds of grain equivalent).

It's hard to starve a ewe that's full-fed hay, but she may starve her lambs because she can't eat enough hay to produce enough milk. Feed at a level that makes money. Set a goal to do a better job of feeding than you did last year, and better than your neighbor ever did.

SUMMARY

A ewe's nutrient intake during the critical stages of production (breeding, late gestation, and lactation) largely determines her level of lamb and wool production.

A sheepman's willingness to apply what feeding know-how he has to his flock largely determines its profitability.

Knowledge about sheep feeds and how to feed sheep to **your** greatest advantage is not a complicated subject. To master the subject, reread this bulletin; apply the information to your own sheep; then teach your sons and daughters; and laugh all the way to the bank.

Table 3. Rations appropriate at various stages of production (per ewe daily)

Maintenance	Hay lb.	Corn silage lb.	Haylage lb.	Straw	Corn stalks	Grain lb.	Soybean meal lb.
1.	2.5						
2.		6.0					.2
3.			6.0				
4.				3.0			.3
Gestation early							
1.	3.5						
2.	2.5					.5	
3.	1.8					.5	.2
4.		8.0					.2
5.			7.0			.2	
6.	2.0				2.0		
7.	1.0				2.0	.2	.3
Gestation late	Add .5-1.0 lb. grain per ewe daily to any of the above rations.						
Lactation	4.0					2.0	–
		10.0				1.5	.25
	1.0	8.0				1.5	.2
			8.0			2.0