



Feeding Ewes to Maximize Reproductive Success

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Reproductive failure is the most costly problem faced by livestock producers. The number one reason livestock fail to reproduce is poor nutrition. In Arkansas, summer drought and poor-quality forage leading up to the breeding season are not uncommon. For those who wait until early spring to breed to take advantage of fall lamb markets, winter hay quality may not be good enough to sustain proper reproduction. What's a sheep farmer to do?

Fertility Versus Prolificacy

There are two primary factors about which sheep producers need to be concerned – fertility and prolificacy. Fertility can be thought of as the ability of the ewe to become pregnant. Prolificacy can be thought of as the number of lambs to which the ewe will give birth. As a sheep producer, you want your ewes to become pregnant easily and you want them to give birth to healthy twins. Both events are highly dependent upon good nutrition.

Sheep are remarkably resilient when it comes to fertility. Ewes typically remain fertile even on fairly low levels of nutrition. However, puberty can be delayed until the next breeding season in ewe lambs that are fed poor diets. Poor nutrition will reduce prolificacy significantly.

Critical Periods for Nutrition

Fortunately or unfortunately, there are several critical periods in the life of a ewe that dictate her fertility and prolificacy. Fortunately, you can monitor nutrition closely during these critical periods to optimize your ewes' reproductive success. Unfortunately, if your ewes do not receive adequate nutrition during these periods, your ewes may not be as fertile or prolific as they could be.

Nutrition first plays a role in reproductive success while the embryo is still developing in the uterus. Ewes that are underfed during the last 100 days of pregnancy and the first 100 days of milk production give birth to daughters that produce more single lambs than twins. Ewes that are born to well-fed dams produce more twins. Lambs with low growth rates before weaning have lower ovulation rates and lower multiple births compared to lambs with normal growth before they are weaned. Poor nutrition before weaning can also delay puberty.

The last month of pregnancy is critical to reproductive success in more ways than one. First, the fetuses are growing rapidly at this time and are placing enormous demands on the ewe to provide

nutrients to them. Second, and resulting from the fetal demands, the ewe may not be able to meet her and her fetuses' needs, and she may develop pregnancy toxemia. Pregnancy toxemia is more common in fat ewes than thin ones. The ewe mobilizes fat reserves, causing a buildup of metabolic wastes called ketones. Ewes suffering from pregnancy toxemia will often have "sweet-smelling" breath, similar to acetone-based nail polish remover. Ewes with pregnancy toxemia go off feed, become unable to rise, and die. Lambs of ewes diagnosed with pregnancy toxemia almost always die, and removal or abortion of the fetuses is usually recommended to save the ewe. Ewes in the early stages of pregnancy toxemia can be treated with 2 to 3 ounces of propylene glycol twice per day. Because pregnancy toxemia usually occurs in ewes with twins, you lose not only the ewe, but two lambs as well. Maintaining adequate but not excessive nutrition is the key to avoiding pregnancy toxemia.

The period beginning six months before your breeding season is the time the ovary begins putting eggs into the pool for the next pregnancy. At the same time, the ewe is trying to produce milk for her lambs and the spring grass is just getting started. This means the nutrition available to her may not be sufficient to recruit as many eggs for the next breeding season as she might with good nutrition. Ewes that lose weight during this time period have fewer ovulations.

Two months before breeding is another critical period. Ewes that lose weight during the two-month period before breeding have fewer ovulations than ewes that do not lose weight. What appears to be happening is that the developing eggs begin to die at a faster rate just before breeding in ewes that lose weight than in ewes that do not lose weight at this time.

What Are Your Ewes' Requirements?

Ewes have different nutrient requirements depending upon the stage of their production cycle. For ease of management, we can use these general categories – maintenance, late pregnancy and lactation. Mature ewes that have weaned their lambs have the lowest nutrient needs of all. They need nothing more than a maintenance diet. Maintenance diets provide enough energy and protein to prevent weight loss and keep the basic functions of the body operating. During late pregnancy, your ewes must meet the needs of their growing fetuses, and their requirements for energy and protein can be twice as high as maintenance. Ewes that are producing milk for their lambs are lactating. Lactation creates the heaviest nutrient burden on the ewe in the production cycle. Her energy and protein requirements can be two and a half to three times that of a mature ewe that has weaned her lambs. Requirements for each of these stages of the production cycle can be found in Table 1 below.

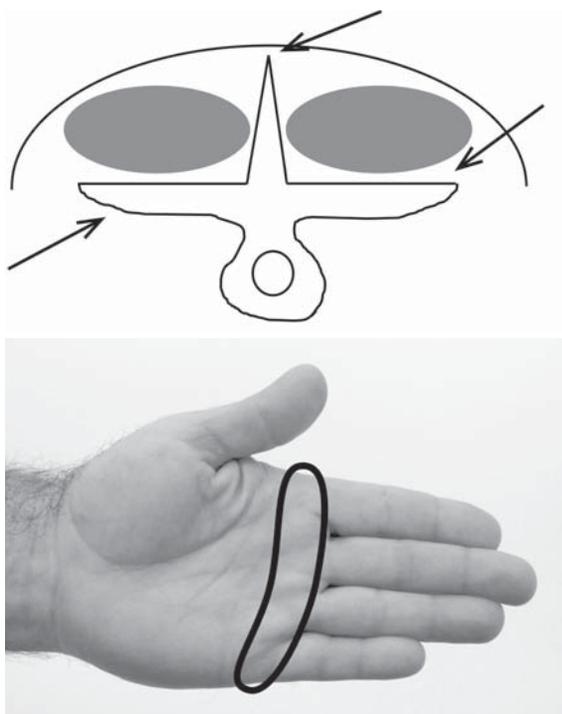
TABLE 1. Nutrient requirements of ewes at different stages of the production cycle.

	Body Weight	Weight Gain	DM per hd per d		Nutrients per hd per d			
	lbs	lbs/d	lbs	% of BW	TDN (lbs)	CP (lbs)	Ca (g)	P (g)
Ewe maintenance								
	110	.02	2.2	2.0	1.2	.21	2.0	1.8
	132	.02	2.4	1.8	1.3	.23	2.3	2.1
	154	.02	2.6	1.7	1.5	.25	2.5	2.4
Flushing								
	110	.22	3.5	3.2	2.1	.33	5.3	2.6
	132	.22	3.7	2.8	2.2	.34	5.5	2.9
	154	.22	4.0	2.6	2.3	.36	5.7	3.2
Last 4 weeks of pregnancy (twins)								
	110	.50	3.7	3.4	2.4	.43	6.2	3.4
	132	.50	4.0	3.0	2.6	.45	6.9	4.0
	154	.50	4.2	2.7	2.8	.47	7.6	4.5
Early lactation (twins)								
	110	-.06	4.6	4.2	3.0	.67	8.9	6.1
	132	-.06	5.1	3.8	3.3	.70	9.1	6.6
	154	-.06	5.5	3.6	3.6	.73	9.3	7.0

Assessing Nutritional Status

The easiest way for most producers to estimate the nutritional status of their flock is by measuring the body condition of the flock. Using the Body Condition Score (BCS) scale of 1 to 5, with 1 being emaciated and 5 being obese, you should target your ewes to a BCS of 3 to 3.5. Ewes in moderate body condition have higher twinning rates than overly thin sheep, and they avoid the problems of embryonic losses and lambing difficulty seen in overly fat ewes.

FIGURE 1. Feel along the spinal processes (arrows) of the lumbar vertebrae between the last rib and the hip bones to measure body condition in your ewes. A ewe in moderate body condition will have spinal processes that feel similar to your palm just below the fingers and have good muscle in the loin.



To body condition score your sheep, feel along the backbone between the last rib and the hip. If your ewes are in moderate body condition, the backbone and short ribs of your ewes should feel like the area of the palm of your hand just below the fingers. There should be some fat cover and good muscle cover, but you should still be able to feel the backbone and short ribs. (For more about how to body condition score your sheep, see *FSA9610, Body Condition Scoring of Sheep*, available online at <http://www.uaex.edu>.)

Flushing

Flushing is the practice of feeding ewes a high-energy diet for a short time (10-14 days)

before the breeding season begins. You can provide supplemental feed to ewes entering the breeding season in moderately poor body condition (BCS 2-2.5) and improve their twinning rate significantly (see Table 1). It is likely that the increased nutrition improves the survival of eggs that would otherwise have died so that they can go on to be ovulated. Flushing will not benefit ewes that are already in good body condition, and you should avoid over-conditioning your ewes for the breeding season. Don't continue to flush your ewes for too long after breeding either. High levels of nutrition during early pregnancy can damage embryos and lower pregnancy and twinning rates.

How Do I Use This Information?

Let's look at an example of how this would work on your farm. Let's assume you begin breeding in September, lamb in February and March, your ewes weigh 130 pounds and are carrying twins. March is when your ewes will also begin recruiting the next pool of follicles for the next breeding season. This is also the time at which they are producing milk for their lambs and are probably losing body condition, which is normal. This means your ewes will have to be in good body condition (BCS 3-3.5) when they lamb, and you will have to do your best to meet their nutritional requirements so they don't lose too much condition. Looking at Table 1, you can see that your ewes will require 5.1 pounds of feed on a dry matter basis per day, 3.3 pounds of TDN and .7 pound of crude protein in their diet per day, and you can expect them to lose about .5 pound of body weight per week. Good-quality hay, cool-season grasses or winter annuals should meet these requirements in March. If you feed grain supplements at this time, they should make up no more than a third of the ewe's diet.

To achieve BCS 3-3.5 at lambing, you will have to do a good job feeding in December and January. December and January will also be the time of most rapid fetal growth and increased nutrient requirements for your ewes. The problem you may encounter at this time is that the rapidly growing fetuses take up so much room inside the ewe that she may not be able to eat enough forage to meet her nutritional needs. This is also the time during which the fetuses are developing the capacity to be highly prolific, as we saw above. You will have to provide high-quality feed during this time to make up for the loss of room in the rumen, which means good-quality hay and perhaps some supplemental feeds. (For more information about determining the quality of your hay, see *FSA3114, Test Hays for Nutrient Composition Before Feeding*, available at <http://www.uaex.edu>.)

Based upon the nutrient requirements listed in Table 1, you will have to provide each ewe with 4 pounds of feed on a dry matter basis that provides 2.6 pounds of TDN and .45 pound of crude protein per day. On this diet you can expect your ewes to gain about .5 pound per day. Given that hay will generally be about 88 percent dry matter, this translates into 4.5 pounds of hay that is 65 percent TDN and 11 percent crude protein per ewe per day. Bermudagrass hay in Arkansas averages about 52 percent TDN and 12.3 percent crude protein, so you will have to substitute some grain (roughly .5 pound cracked corn in this example) for hay to provide enough energy in the diet. (For more information about substituting grain for hay, see *FSA3036, Substituting Grain for Hay in Beef Cow Diets*, available at <http://www.uaex.edu>.)

Let's suppose for a moment that your ewes did not receive enough nutrients to meet their needs during a drought in early summer and are entering the breeding season soon. Flushing your ewes may improve their prolificacy. Looking at Table 1, we can see that you will need to provide your ewes with 3.7 pounds of feed on a dry matter basis containing 2.2 pounds of TDN and .34 pound of crude protein. If we assume that your pasture is meeting their maintenance requirements, you will need to provide an additional 1.3 pounds of dry matter containing .9 pound of TDN and .11 pound of crude protein. This translates into a feed that is 69 percent TDN and 8.5 percent crude protein, or a little less than 1.5 pounds of cracked corn per ewe per day for 10-14 days before breeding begins.

Summary

Sheep are capable of being very prolific breeders and are remarkably resilient when it comes to fertility. But for your ewes to maximize their reproductive potential, they must receive proper nutrition, especially during several critical periods in their lives. The critical periods for nutrition to affect reproduction include the last 100 days of fetal development and the first 100 days of life, six months before breeding and late pregnancy. Fortunately, these periods overlap to some degree, and focusing on

proper winter and spring feeding will often be enough. Ewes should not be too thin, but they should not be allowed to become overly fat either. In the event ewes are about to enter the breeding season in poor condition, flushing for 10-14 days before the breeding season begins can dramatically improve fertility and prolificacy.

References

- Gunn, R. G., D. A. Sim and E. A. Hunter. 1995. Effects of nutrition in utero and in early life on the subsequent lifetime reproductive performance of Scottish Blackface ewes in two management systems. *Animal Science* 60: 223-230. <http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=6947920>. Accessed October 3, 2012.
- Merck Veterinary Manual. 2011. Pregnancy toxemia in ewes (twin lamb disease, pregnancy ketosis, sleeping ewe disease). <http://www.merckvetmanual.com/mvm/index.jsp?cfile=htm/bc/80803.htm>. Accessed October 4, 2012.
- Nottle, M. B., D. O. Kleemann and R. F. Seamark. 1997. Effect of previous undernutrition on the ovulation rate of Merino ewes supplemented with lupin grain. *Anim Reprod Sci* 49: 29-36. <http://www.sciencedirect.com/science/article/pii/S0378432097000663>. Accessed October 4, 2012.
- NRC. 1985. Nutrient requirements of sheep, sixth revised edition. http://www.nap.edu/openbook.php?record_id=614&page=45. Accessed October 4, 2012.
- Rhind, S. M., D. A. Elston, J. R. Jones, M. E. Rees, S. R. McMillen and R. G. Gunn. 1998. Effects of restriction of growth and development of Brecon Cheviot ewe lambs on subsequent lifetime reproductive performance. *Small Ruminant Research* 30: 121-126. <http://www.sciencedirect.com/science/article/pii/S0921448898001035#>. Accessed October 3, 2012.
- Rhind, S. M., R. G. Gunn, J. M. Doney and I. D. Leslie. 1984. A note on the reproductive performance of grey-face ewes in moderately fat and very fat condition at mating. *Anim Prod* 38: 305-307.
- Robinson, J. J., J. A. Rooke and T. G. McEvoy. 2002. Nutrition for conception and pregnancy. *In*: M. Freer and H. Dove (Eds.). *Sheep nutrition*. CAB International, Wallingford, UK, pp. 189-211.
- Russel, A. 1984. Body condition scoring of sheep. *In Practice* 6: 91-93. www.inpractice.bmj.com. Accessed October 4, 2012.
- Schillo, K. K. 1992. Effects of dietary energy on control of luteinizing hormone secretion in cattle and sheep. *J Anim Sci* 70: 1271-1282.

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