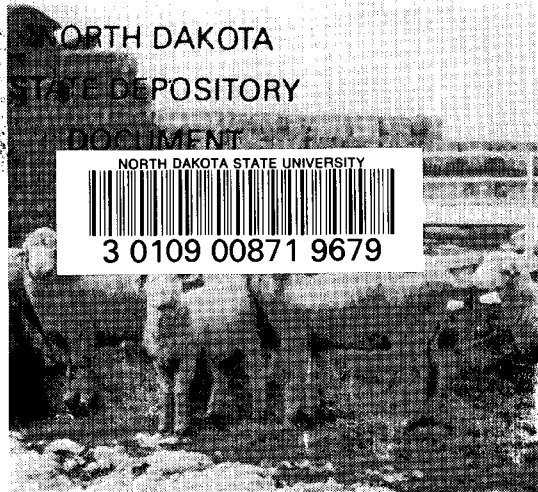


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# SHEEP POCKET GUIDE

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## INTRODUCTION

This pocket guide on sheep production is designed as an aid to basic sheep management practices in today's sheep business. It would be impossible to design a guide to meet every producer's operation; however, the recommendations and guidelines suggested should address most producers' questions and concerns on running a profitable sheep enterprise.

The authors do not assume any responsibility, make any guarantees, or offer any warranties in regard to the results obtained from the use of any of the management practices or suggestions made in this guide.

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## CALENDAR OF EVENTS

The following guidelines are neither inclusive nor intended to fit every sheep operation. Each operation is different, therefore each "calendar of events" should be tailored to each flock's needs.

### PRIOR TO BREEDING

- Bag and mouth ewes and cull those that are not sound.
  - Replace culled ewes with top-end yearlings or ewe lambs.
  - Keep replacement ewe lambs on growing ration.
  - ω • Evaluate sires: use production records.
    - Be sure they are vigorous, healthy and in good breeding condition.
    - Rams should be conditioned at least a month before the breeding season. Flush rams in poor condition.
    - Allow at least two mature rams or four buck lambs per 100 ewes.
  - Flush ewes:
    - 1 pound grain/day two weeks to five weeks before breeding (usually 17 days).
    - If ewes are overconditioned, the effect of flushing will be lessened.
  - Vaccinate ewes for vibriosis and enzootic abortion (EAE).
  - Identify all ewes and rams with ear tags, paint brands or tattoos.
-

## **BREEDING**

- The ovulation rate of a ewe tends to be lower at the first part of the breeding season. Vasectomized or teaser rams run with the ewes through the first heat period tend to stimulate them and increase the ovulation rate at the second heat period.
- Use a ram marking harness or painted brisket to monitor breeding. Soft gun grease with paint pigment mixed in works well for painting the brisket. A color sequence of orange, red and black is recommended with colors being changed every 17 days.
- Leave rams in NO LONGER than 51 days (35 days is more desirable).
  - An exception may be with ewe lambs. Allowing them four heat cycles or 68 days may be beneficial.
- 4 • Remove rams from ewes after the season (don't winter rams with ewes).

## **PRIOR TO LAMBING - EARLY PREGNANCY (First 15 Weeks)**

- Watch general health of ewes. If possible sort off thin ewes and give them extra feed so they can catch up.
- Feed the poor quality roughage you have on hand during this period, saving the better for lambing.
- An exception to the above is feeding pregnant ewe lambs. They should receive good quality roughages and grain (about 20 percent of the ration) during this period.
- Vaccinate all ewe lambs and new ewes in the flock with their second shot for Vibrio and EAE during midgestation.

## **LAST SIX WEEKS BEFORE LAMBING**

- Trim hoofs and treat for internal parasites.
  - Six to four weeks before lambing, feed 1/4 to 1/3 pound grain/ewe/day.
  - Shear ewes before lambing (with highly prolific ewes at least a month before is preferred). Keep feeding schedule regular and watch weather conditions immediately after shearing (cold).
  - Vaccinate ewes for enterotoxemia.
  - Control ticks and lice immediately after shearing.
  - 5 • Four weeks before lambing increase grain to 1/2 to 3/4 pound/ewe/day (usually done immediately after shearing).
  - Give A-D-E preparations to ewes if pastures and/or roughages are or have been poor quality.
  - Feed selenium-vitamin E or use an injectable product if white muscle is a problem.  
**Caution!** Don't do both.
  - Check facilities and equipment to be sure everything is ready for lambing.
  - Two weeks before lambing increase grain to 1 pound per ewe per day.
-

## **LAMBING**

- Be prepared for the first lambs 142 days after turning the rams in with the ewes, even though the average pregnancy period is 148 days.
- Watch ewes closely. Extra effort will be repaid with more lambs at weaning time. Saving lambs involves a 24-hour surveillance. Additional help at this time is money well spent.
- Put ewe and lambs in lambing pen (jug) after lambing (not before).
- Grain feeding the ewes during the first three days after lambing is **not** necessary!
- Be available to provide assistance if ewe has troubles.
- Disinfect lamb's navel with iodine as soon after birth as possible.
- Be sure both teats are functioning and lambs nurse as soon as possible.
- Use additional heat sources (heat lamps, etc.) in cold weather.
- Brand ewe and lambs with identical number on same sides. Identify lambs with ear tags, tattoos or both.
- Turn ewe and lambs out of jug as soon as all are doing well (one to three days).
- Bunch up ewes and lambs in small groups of four to eight ewes and then combine groups until they are a workable size unit.
- Castrate and dock lambs as soon as they are strong and have a good start (two days to two weeks of age). Use a tetanus toxoid if tetanus has been a problem on the farm (toxoids are not immediate protection, it takes at least 10 days for immunity to build).

- Vaccinate lambs for soremouth at one to two weeks of age if it has been a problem in the flock.
- Provide a place for orphaned lambs. Make decision on what lambs to orphan as soon after birth as possible for the best success. Few ewes can successfully nurse more than two lambs.

## **END OF LAMBING TO WEANING**

- Feed ewes according to number of lambs suckling. Ewes with twins and triplets should receive a higher plane of nutrition.
  - Provide creep feed for lambs (especially those born during the winter and early spring).
  - Vaccinate lambs for overeating at five weeks and seven weeks of age.
-

## **WEANING**

- Wean ewes from lambs, not lambs from the ewes. If possible, remove ewes from pen out of sight and sound of lambs. If lambs have to be moved to new quarters, leave a couple of ewes with them for a few days to lead the lambs to feed and water locations.
- Lambs should be weaned between 50 and 60 days of age or when they weigh at least 40 pounds and are eating creep and drinking water. The advantage of early weaning is that the ewe's milk production drops off to almost nothing after eight weeks of lactation.
- ∞ • Grain should be removed from the ewes diet at least one week prior to weaning and low quality roughage should be fed. Restriction of hay and water to the ewe following weaning lessens the chance of mastitis to occur. Poorer quality roughage should be fed to the ewes for at least 10 to 14 days following weaning.
- Handle the ewes as little as possible for about 10 days following weaning. Tight udders bruise easily. If possible, bed the area where the ewes will rest heavily with straw to form a soft bed for the ewes to lay on.

## **WEANING TO PRE-BREEDING**

- If ewes go to pasture, treat for internal parasites.
- Feed a maintenance ration to the ewes. Put ewe lambs that lambed back on a growing ration once they have quit milking.
- Adjust ewes' conditions so they can be effectively flushed for next breeding season. Don't get ewes too fat prior to breeding.

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## FEEDING TIPS

An average ewe (150 lbs) normally requires about half a ton of hay and about 120 pounds of grain to winter her (November thru April). That includes her gestation and lactation period. The most critical nutritional period for the ewe is late gestation and early lactation.

A 150 pound ewe needs about 3.5 lbs feed/day during the first 15 weeks of gestation, 4.5 lbs/day during the last four to six weeks of gestation and 6-7 lbs/day during lactation. Heavier ewes naturally require more feed. For each 25 pounds additional weight per ewe, feed about 1/4 pound more total feed per day. A 175 pound ewe requires about 3.75 pounds of feed per day during early gestation.

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**“Thumb Rule Estimates of Daily Feed Needs of Sheep”**  
(expressed in pounds)

	ROUGHAGE			PLUS	
	Hay	or Haylage	Corn or Silage	Grain	Protein Supplement*
<b>EWE</b>					
Maintenance	2.5-4	6-7	7-8		
Breeding	2.5-4	7-8	8-9	0.5-1.0	
Early gestation	2.5-4	7-8	8-9		
Late gestation	4-5	9-10	10-11	0.5-1.0	1/8 - 1/4
Lactation	5-7	10-12	11-13	1.0-2.5	1/4 - 1/2
<b>RAM</b>	4-7	8-10	11-15	0.5-2.5	0 - 1/4
<b>REPLACEMENTS</b>	2-4	6-7		1.0-2.0	1/4 - 1/2
<b>FEEDER LAMBS</b> (30-110 lbs)	0.5-2	2-4		1.0-3.5	1/4 - 1/2

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\*Protein supplement is normally needed when alfalfa hay is not used and corn is the grain.

## FLUSHING THE EWE

Feeding the ewe to gain weight about two weeks prior to breeding may increase lambing percentage by 10 to 20 percent. Ewes already in high condition may not respond as well to flushing as those in poorer condition. Flushing that is continued through the breeding season will favorably influence embryo survival during early pregnancy.

To flush, graze ewes on a good pasture saved for this purpose or feed them 0.5 to 1.0 lb of grain (corn, wheat, barley, or oats) per head per day. The amount per day depends on size and condition of ewes. Corn and wheat require less amounts (0.5 lb), barley in the middle (0.75 lb), and oats more (1.0 lb). Grains should be fed whole. Sheep are well equipped to do their own grinding.

Use some caution if flushing ewes on legume pastures. During years of heavy rainfall, such pastures may contain a high level of coumestrol, a plant estrogen that can delay conception.

## FEEDING ALTERNATIVES FOR EWES

### Feeding Higher Levels of Grains or Screenings

Corn, barley, and wheat all have about the same feeding value for ewes. Oats, rye, millet, and speltz can be used but their energy values are less and therefore more pounds per day will be needed especially during late gestation and lactation. Screenings can be used quite successfully during the early gestation period.

No experimental data are available on the minimum roughage requirements for ewes. However, experience tells us that ewes probably should have at least 1 to 1.5 pounds of roughage per day for normal rumen functions. During periods of low level roughage feeding, ewes can become bored and wood chewing or wool biting may be a problem. Suggested daily rations are:

<u>Gestation First 15 weeks</u>	<u>Gestation Last 4-6 weeks</u>	<u>Lactation</u>
1.5 lbs hay 2 lbs grain	2 lbs hay 2.5 lbs grain	2 lbs hay 4-5 lbs grain

During lactation, if the grain is not barley or wheat, 1/4 pound of protein meal should also be fed each day. When feeding high levels of grain to the ewes, feed half in the morning and half in the evening. This should reduce the problem of ewes engorging themselves when eating grain and getting sick.



### Utilizing Straw

If straw is available, it will make the ration considerably cheaper and still meet the ewe requirements. Suggested daily rations with straw are:

Gestation First 15 weeks	Gestation Last 4-6 weeks	Lactation
1.5 lbs hay	2 lbs hay	2 lbs hay
1.5 lbs straw	1.5 lbs straw	1.5 lbs straw
0.5 lb grain	1 lb grain	3.5 lbs grain

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During the last four weeks prior to lambing, if straw is going to be used, the hay should be alfalfa. Straw should only be used at this time as a last resort.

During lactation, if the grain is not barley or wheat, 1/4 pound of protein meal should also be fed each day. Ideally, the hay and straw should be mixed together with the grain to get better consumption of the straw. However, if a grinder-mixer is not available, the hay and grain can be fed daily and straw fed free-choice. If the straw is not fed free-choice but rather on a daily basis, feed the straw in the morning and hay in the evening. This should help force the ewes to eat the straw more readily during the day when they are most active.

**CAUTION!** Ewe lambs that are bred to lamb as lambs will not respond as well as the older ewes to some of the feeding programs above, especially those where poorer quality feed is being substituted (screenings and straw).

## CREEP FEEDING

Creep feeding lambs is a means of providing supplemental feed to young lambs during the nursing period. It works best for early-born lambs (before March 15) and is especially beneficial when the lambing percentage is high. Lambs which have the inherited ability to gain rapidly benefit from creep feeding.

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Lambs begin to nibble grain a week to 10 days of age and should have access to a palatable lamb starter ration. A 75-90 percent concentrate level and a protein level of 17-20 percent are generally considered ideal for a lamb starter. Corn and oats plus leafy, high-quality alfalfa free choice are excellent feeds for starting lambs. Barley can be used but may not be quite as palatable as corn and oats for the first two weeks. Protein sources can be soybean meal, linseed meal, or sunflower meal. Molasses at 5 percent of the ration serves as an excellent appetizer and helps hold down the dust.

Antibiotics at the rate of 20-25 grams per ton are recommended. Aureomycin (chlortetracycline) and terramycin (oxytetracycline) are the two most commonly used antibiotics. The creep ration should be ground or cracked, unless a pelleted ration is used. Remember that lambs have a tendency to eat feed in whatever form their mother's ration is. At 35-45 days of age, it is advisable to change to a more practical ration of 14-16% protein.

The creep area should be clean and well bedded. A light in the creep is a good tool to attract the lambs to the creep area. The grain, hay and a source of water should be in the creep at all times.

## LAMB FEEDING

For early-born lambs that never see pasture, start with a hay/grain ration containing a grain-supplement mixture of about 85 percent cracked corn and 15 percent protein supplement for lambs up to 60 pounds. For lambs from 60 pounds to market, feed a grain mixture of 90 percent corn and 10 percent protein supplement. Restrict hay intake to about 1/2 to 1 lb/day when lambs reach 85 to 90 pounds. By reducing hay intake, lambs will consume more grain and put on faster gains. Replacement of corn with barley will give similar results. Barley based rations require little or no protein supplement. Lambs fed oats will take longer to get to market. Feed the grains in the whole form. The common problems of high grain feeding are greatly reduced when feeding whole grain.

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For purchased feeder lambs, start lambs on good to average quality hay for one to three days. Hand feed grain twice a day and feed the amounts lambs will clean up in 30 to 45 minutes. Gradually bring lambs up to full-feed. Utilize a ration containing about 90 percent grain and 10 percent protein supplement in a grain mixture. Restrict hay intake as lambs get heavier.

## URINARY CALCULI

Rams and wethers on high concentrate rations are susceptible to urinary calculi (water belly). Rations high in phosphorus increase the chances of calculi being formed in the urinary tract. Calculi (stones) are formed from salts that are normally excreted but because of their

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abnormally high concentration in the urine they precipitate out and become stones. These stones frequently lodge in the urethra, blocking the flow of urine. Cold or windy weather and reduced water intake tend to aggravate the condition.

Affected lambs stand around with arched backs straining to urinate, and they may kick at their belly. They go off feed and water and in some cases the abdomen may become noticeably larger or a swelling may develop along their underside. Most die of uremic toxemia or peritonitis.

Treatment requires the reestablishment of the ability to urinate. Mild cases may respond to ammonium chloride either in the feed at 0.25 oz per head per day for seven to 10 days, or in a drench at 1 to 1.5 fluid oz per head every other day of a 40 percent solution administered a total of three times. Severe cases may be saved only through surgical intervention. The condition is an emergency. Early action is crucial for survival of the animal.

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Prevention is achieved through proper management practices such as:

- providing plenty of fresh water and maintaining the water temperature at 45 to 50 degrees F during cold weather.
  - feeding the rams and wethers separate from the ewe lambs when lambs are on full feed.
  - adding feed grade limestone at 1 percent of the ration (20 lb/ton of feed).
  - maintaining the calcium - phosphorus ratio in the ration at 2:1.
  - adding ammonium chloride to the ration at 0.5 percent (10 lb/ton of feed). This may reduce the palatability of the ration and you may have to add molasses to improve the taste.
-

## RELATIONSHIP BETWEEN NUTRITION AND HEALTH

Most recommendations on the nutritional requirements of sheep are based on the animal's weight and physiological stage of production (growth, maintenance, gestation, lactation, etc.). Assumed in these recommendations is that the animal is healthy, but what about a sick sheep? Unfortunately, little is known about the interrelationship of health and nutrition and the adjustments that need to be made for an animal that is sick. However, two important facts that are known regarding nutrition and health are:

1. Animals experiencing a nutritional stress are much more susceptible to diseases.
2. Diseased animals cannot be cured by increasing their nutrient supply over and above what they normally require.

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## WATER

The exact amount of water required by sheep varies considerably depending on body metabolism, temperature, stage of production, size, wool covering, amount of feed consumed and feed composition.

Voluntary water consumption is two or three times dry matter consumption and increases with high-protein and salt-containing diets. A significant relationship exists between total water intake and dry matter intake. For example, sheep denied water for more than 24 hours eat little or no dry feed containing 15 percent protein but will eat 2 percent protein hay.

Water intake increases by the third month of gestation, is doubled by the fifth month, and is greater for twin-bearing ewes than for ewes carrying a single fetus. A lack of water accompanied by a severe depression in feed intake predisposes ewes to all sorts of problems, namely unthriftiness, malnutrition and, possibly, pregnancy disease in the case of multiple bearing ewes. It is estimated that lactating ewes require 100 percent more water than nonlactating ewes.

During cold winter months, many times ewes are maintained on extremely cold water in troughs and sometimes even on snow. Both circumstances lead to a reduced water intake. Ewes prefer and will consume larger quantities of warm water than cold. If you ever wonder why ewes are not milking enough, don't overlook the possibility that they're not drinking enough water because it's too cold.

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Sheep may consume 12 times more water in summer than in winter. Adequate intake of good-quality water is essential for ewes to excrete excess toxic substance such as oxalates, ammonia, and mineral salts.

### Daily Water Requirements

Adult sheep	1-2 gallons
Lactating ewes	2-3 gallons
Feeder lambs	1-2 gallons
Baby lambs	0.1-0.3 gallon

Try to maintain water above 35 F in winter and below 75 F in summer.

The following are ration nutrient requirements for different stages of production in sheep.

### RATION IDENTIFICATION

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- Ration 1 (Maintenance ration for 150 lb ewe)
- Ration 2 (Flushing ration for 150 lb ewe)
- Ration 3 (Ration for 150 lb ewe during 1st 15 weeks of gestation)
- Ration 4 (Ration for 150 lb ewe in last 6 weeks of gestation - 140% drop)
- Ration 5 (Ration for 150 lb ewe in last 6 weeks of gestation - 200% drop)
- Ration 6 (Lactation ration for 150 lb ewe nursing single)
- Ration 7 (Lactation ration for 150 lb ewe nursing twins)
- Ration 8 (Ration for 120 lb ewe lamb during 1st 15 weeks of gestation)
- Ration 9 (Ration for 120 lb ewe lamb in last 6 wks of gest - 110% drop)
- Ration 10 (Ration for 120 lb ewe lamb in last 6 wks of gest - 150% drop)
- Ration 11 (Lactation ration for 120 lb ewe lamb nursing single)
- Ration 12 (Lactation ration for 120 lb ewe lamb nursing twins)
- Ration 13 (Creep ration)
- Ration 14 (Growing ration (50 lbs)/early weaned (EW) - .6 ave daily gain)
- Ration 15 (Finishing ration (80 lbs)/early weaned (EW) - .8 ave daily gain)
- Ration 16 (Finishing ration/70 lb feeder - .6 ave daily gain)
- Ration 17 (Replacement 90 lb ewe lamb ration)
- Ration 18 (Replacement 130 lb ram lamb ration)
- Ration 19 (Ration for maintaining 220 lb stud ram)

### RATION NUTRIENT REQUIREMENTS

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Ration Number		1	2	3	4	5	6	7
		Maint	Flush	Gest	Gest	Gest	Lact	Lact
		-enance	-ing	15WKS	6WKS	6WKS	Single	Twins
				Ewe	Ewe	Ewe	Ewe	Ewe
Crude Protein	%	9.40	9.10	9.30	10.70	11.30	13.40	15.00
	lb needed/day	0.25	0.36	0.29	0.42	0.47	0.73	0.92
TDN	%	55.00	59.00	55.00	59.00	65.00	65.00	65.00
	lbs needed/day	1.5	2.3	1.7	2.3	2.8	3.6	4.0
Met. Energy	Mcal/Lb	0.90	0.95	0.90	0.95	1.04	1.09	1.09
Calcium-Min	%	0.20	0.32	0.25	0.35	0.40	0.32	0.39
Calcium-Max	%	0.40	0.45	0.50	0.58	0.60	0.65	0.73
Phosphorus	%	0.20	0.18	0.20	0.23	0.24	0.26	0.29
Ave Daily Dry Matter Intake	lbs	2.6	4.0	3.1	4.0	4.2	5.5	6.2

Ration Number		8	9	10	11	12	13
			Gest 6WKS 110% ELamb	Gest 6WKS 150% ELamb	Lact Single ELamb	Lact Twins ELamb	Creep
NS	Crude Protein %	10.60	11.80	12.80	13.10	13.70	26.20
	lb needed/day	0.35	0.42	0.46	0.64	0.73	0.35
	TDN %	59.00	63.00	66.00	66.00	69.00	80.00
	lbs needed/day	2.0	2.3	2.4	3.3	3.7	1.1
	Met. Energy Mcal/Lb	0.95	1.04	1.09	1.09	1.13	1.32
	Calcium-Min %	0.35	0.39	0.48	0.30	0.37	0.82
	Calcium-Max %	0.55	0.55	0.63	0.55	0.65	0.95
	Phosphorus %	0.22	0.22	0.25	0.22	0.26	0.38
	Ave Daily Dry Matter Intake lbs	3.5	3.7	3.7	5.1	5.5	1.3

Ration Number		14	15	16	17	18	19
		EW Grower .6Gain	EW Finish .8Gain	Feeder Finish .6Gain	Repl Ewe Lamb	Repl Ram Lamb	Stud Ram
NS	Crude Protein %	16.90	14.50	11.60	10.20	11.00	9.60
	lb needed/day	0.45	0.51	0.41	0.39	0.58	0.58
	TDN %	78.00	78.00	76.00	65.00	63.00	63.00
	lbs needed/day	2.0	2.5	2.7	2.0	3.4	4.2
	Met. Energy Mcal/Lb	1.27	1.23	1.23	1.09	1.04	1.04
	Calcium-Min %	0.54	0.55	0.42	0.42	0.35	0.30
	Calcium-Max %	0.60	0.70	0.53	0.45	0.45	0.40
	Phosphorus %	0.24	0.28	0.21	0.18	0.18	0.16
	Ave Daily Dry Matter Intake lbs	2.6	3.3	3.5	3.1	5.3	6.6

## REQUIREMENTS AND TOXIC LEVELS OF MINERALS FOR SHEEP

Like other nutrients (protein, energy, vitamins, and water), minerals have to be supplied within certain limits to serve their purpose. Sheep, like all other livestock, have their own specific requirements and toxic levels. The following is a list of requirements and toxic levels of different minerals for sheep. These figures are based on the sheep's total diet.

<u>MINERAL</u>	<u>REQUIREMENT</u>	<u>TOXIC LEVEL</u>
Calcium	0.20-0.82 %	-
Phosphorus	0.16-0.38 %	-
Magnesium	0.12-0.18 %	-
Potassium	0.50-0.80 %	-
Sulfur	0.14-0.26 %	-
Sodium	0.09-0.18 %	-
Iodine	0.10-0.80 ppm	50 ppm
Iron	30-50 ppm	500 ppm
Copper	7-11 ppm	25 ppm
Molybdenum	0.50 ppm	10 ppm
Cobalt	0.10-0.20 ppm	10 ppm
Manganese	20-40 ppm	1000 ppm
Zinc	20-33 ppm	750 ppm
Selenium	0.10-0.20 ppm	2 ppm
Fluorine	-	60-150 ppm

Within the ranges of values above, the requirements are higher for young growing animals and lactating ewes as compared to fattening lambs and dry ewes. Requirements for pregnant ewes in their last six to eight weeks of gestation fall in the middle of the ranges.

### Additional Comments:

- The salt requirement for sheep on complete mixed rations is met when salt is about 0.5 percent of the total diet. Ewes provided salt in the loose form generally consume 0.25 to 0.40 ounces per head per day. Normally, toxic levels of salt are not a problem if clean, soft water is provided at all times. However, be aware that a problem could arise with water that is high in salt content. Sheep can tolerate water containing 1.0 to 1.3 percent salt over a relatively long period of time but cannot tolerate water containing 1.5 to 2.0 percent salt.
- Sheep have a high requirement for sulfur due to their wool growth.
- Of all livestock, sheep are the least tolerant to excess copper. However, higher molybdenum levels (3-5ppm) can increase their copper tolerance.
- Do not use swine mineral for sheep, in part because of the excess copper.

### SIGNS of MINERAL DEFICIENCY

Salt	- decreased feed consumption and water intake.
Calcium	- abnormal bone development, tetany, urinary calculi.
Phosphorus	- abnormal bone development (rickets), slow growth, depraved appetite, unthrifty appearance, listlessness.
Magnesium	- tetany, frothing at mouth, profuse salivation.
Potassium	- decreased feed intake, reduced gains, listlessness, stiffness.
Sulfur	- loss of appetite, reduced gains, reduced wool growth, shedding wool.
Cobalt	- lack of appetite, severe emaciation, decreased estrous activity.
Copper	- "swayback" in lambs, "steely" or "stringy" wool in adults.
Iodine	- thyroid enlargement (big neck), lambs born without wool.
Iron	- poor growth, lethargy, anemia, increased respiration rate.
Manganese	- impaired growth, skeletal abnormalities, incoordination of baby lambs.
Selenium	- "white muscle disease", unthriftiness, early embryonic death.
Zinc	- decreased appetite, retarded growth, "parakeratosis", reduced reproductive ability.

### SIGNS of VITAMIN DEFICIENCY

Vitamin A	- growth retardation, retained placenta, bone malformation, degeneration of the reproductive organs, night blindness.
Vitamin D	- rickets in young lambs, osteomalacia in adult sheep.
Vitamin E	- "white muscle disease", stiffness, arched back.
Vitamin B <sub>1</sub> (Thiamine)	- polioencephalomalacia.

## UREA

### General Recommendations for the Use of Urea in Sheep Rations

- Urea can be used as about 1 percent of the total ration or 3 percent of the concentrate portion of the ration, but should not make up more than 1/3 of the total nitrogen in a ration. Urea can be added to silage at the rate of 1 percent at time of ensiling.
- Urea should be not used in rations for very young lambs or creep rations. The rumen of young lambs is not functioning completely and cannot utilize urea. Deaths may result if used.
- Urea should not be used in range sheep rations or in lamb rations when lambs are on limited feed. Urea is broken down to ammonia rapidly and absorbed and excreted in the urine, resulting in incomplete utilization.
- Urea should be introduced into the diet gradually to allow for adaptation by the rumen microorganisms. Full adaptation takes two to three weeks.
- Urea works best in rations containing high levels of readily available carbohydrates (grains).
- Care should be taken to be sure the urea is thoroughly mixed in the diet and to use formulations that prevent separation of ingredients. Also, the urea-containing diet should be fed regularly. Sudden high intakes (by a very hungry animal, or from urea settled to the bottom of the feed bunk) can cause toxicity and death.

Taken from The Sheepmen's Production Handbook (SID, Inc.), Revised 1986

## FEEDSTUFF VALUES

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		Corn	Ear Corn	Barley	Barley Scr	Wheat	Wheat Scr	Oats
1.Dry Matter	%	88.00	87.00	88.00	89.00	88.00	89.00	89.00
2.Crude Protein	%	10.10	9.00	13.50	13.10	17.20	15.80	13.30
3.TDN	%	87.00	83.00	86.00	80.00	90.00	75.00	77.00
4.Met. Energy	Mcal/Lb	1.43	1.36	1.41	1.41	1.47	1.23	1.26
5.Crude Fat	%	4.30	3.70	2.10	2.60	2.00	3.90	5.40
6.Crude Fiber	%	2.20	9.40	5.70	9.60	2.90	7.70	12.10
7.Calcium-Min	%	0.02	0.07	0.05	0.34	0.04	0.15	0.07
8.Calcium-Max	%	0.02	0.07	0.05	0.34	0.04	0.15	0.07
9.Phosphorus	%	0.35	0.27	0.38	0.33	0.43	0.39	0.38

		Trit- icale	Rye	Spelt	Pigeon- grass	Dist Grain	Mol- asses	Beet Pulp
1.Dry Matter	%	90.00	88.00	90.00	89.00	92.00	75.00	91.00
2.Crude Protein	%	17.60	13.80	13.30	14.40	29.40	5.80	9.70
3.TDN	%	84.00	85.00	75.00	59.00	70.00	79.00	74.00
4.Met. Energy	Mcal/Lb	1.46	1.39	1.31	0.99	1.15	1.30	1.21
5.Crude Fat	%	1.70	1.70	2.10	6.00	7.20	0.10	0.60
6.Crude Fiber	%	4.40	2.50	10.20	17.30	14.40	0.50	19.80
7.Calcium-Min	%	0.06	0.07	0.13	0.30	0.33	1.00	0.69
8.Calcium-Max	%	0.06	0.07	0.13	0.30	0.33	1.00	0.69
9.Phosphorus	%	0.33	0.37	0.42	0.39	0.55	0.11	0.10

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		Corn Silage	SBM 44%	Linseed Meal 35%	Sun Meal 28%	Sun Meal 34%	Sun Meal 41%	Rape Meal 37%
1.Dry Matter	%	33.00	90.00	90.00	90.00	90.00	90.00	91.00
2.Crude Protein	%	8.10	47.70	38.30	31.10	37.80	45.60	40.60
3.TDN	%	70.00	85.00	79.00	54.00	60.00	63.00	74.00
4.Met. Energy	Mcal/Lb	1.15	1.39	1.30	0.84	0.97	1.04	1.21
5.Crude Fat	%	3.10	1.50	1.50	1.50	0.80	0.50	1.80
6.Crude Fiber	%	23.70	6.60	10.10	34.00	21.00	14.00	13.20
7.Calcium-Min	%	0.23	0.29	0.43	0.36	0.35	0.34	0.67
8.Calcium-Max	%	0.23	0.29	0.43	0.36	0.35	0.34	0.67
9.Phosphorus	%	0.22	0.68	0.89	0.89	0.95	1.04	1.04



### FEEDSTUFF VALUES

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		Alfalfa Meal17%	Urea 45	Alfalfa Hay	Sweetcl Hay	Oats Hay	Barley Hay	Sorghum Hay
1.Dry Matter	%	92.00	99.00	90.00	87.00	91.00	87.00	89.00
2.Crude Protein	%	18.90	279.60	17.00	15.70	9.30	8.70	9.50
3.TDN	%	60.00	0.00	56.00	53.00	53.00	56.00	56.00
4.Met. Energy	Mcal/Lb	0.98	0.00	0.92	0.87	0.87	0.92	0.92
5.Crude Fat	%	3.00	0.00	1.80	2.00	2.60	2.10	2.40
6.Crude Fiber	%	26.20	0.00	26.00	33.40	30.40	27.50	33.50
7.Calcium-Min	%	1.52	0.00	1.41	1.27	0.24	0.23	0.84
8.Calcium-Max	%	1.52	0.00	1.41	1.27	0.24	0.23	0.84
9.Phosphorus	%	0.25	0.00	0.24	0.25	0.22	0.26	0.28

		Sorghum /Sudan	Millet Hay	Brome Hay	Timothy Hay	Prairie Hay	Kochia	Russian Thistle
1.Dry Matter	%	91.00	87.00	91.00	88.00	91.00	85.00	86.00
2.Crude Protein	%	8.00	8.60	9.70	7.80	5.10	9.00	12.40
3.TDN	%	55.00	59.00	55.00	55.00	48.00	50.00	46.00

4.Met. Energy	Mcal/Lb	0.90	0.99	0.90	0.90	0.79	0.82	0.72
5.Crude Fat	%	1.80	2.90	2.30	2.80	2.40	2.00	2.10
6.Crude Fiber	%	36.00	29.60	33.30	32.50	35.40	22.00	28.40
7.Calcium-Min	%	0.55	0.33	0.35	0.38	0.38	2.36	1.64
8.Calcium-Max	%	0.55	0.33	0.35	0.38	0.38	2.36	1.64
9.Phosphorus	%	0.30	0.19	0.19	0.18	0.16	0.12	0.22

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		Oats Straw	Barley Straw	Wheat Straw
1.Dry Matter	%	92.00	91.00	89.00
2.Crude Protein	%	4.40	4.30	3.60
3.TDN	%	47.00	48.00	41.00
4.Met. Energy	Mcal/Lb	0.77	0.79	0.67
5.Crude Fat	%	2.20	1.90	1.80
6.Crude Fiber	%	40.50	42.00	41.60
7.Calcium-Min	%	0.24	0.30	0.18
8.Calcium-Max	%	0.24	0.30	0.18
9.Phosphorus	%	0.06	0.07	0.05

Weights of Grains			
Grain	Pounds per Bushel	Pounds per Quart	Pounds per Cu Ft
Barley	48	1.5	38.4
Corn	56	1.7	44.8
Oats	32	1.0	25.6
Wheat	60	1.9	48.0

## PASTURE MANAGEMENT

Pasture rotation provides 20 percent more grazing days during the summer pasture season. Consider the following recommendations:

1. Use at least three permanent pastures in the rotation. Along with these, it is good management to provide a summer temporary pasture.
2. Use only one pasture at a time and start grazing when grass is 5 to 7 inches high.
3. Rotate sheep every two weeks or more often if grass coverage is down to 4 inches.
- 3 4. Allow at least 3 inches of growth to remain at the end of the grazing season. This will help preserve the stand and conserve moisture.

A non-lactating ewe will often consume much more feed than she requires for maintenance, especially during periods of lush vegetative growth. She may become too fat, which can affect conception rate. Providing access to pasture for four hours or less per day (depending upon condition of the pasture) will meet the ewe's requirement and also increase carrying capacity.

To obtain maximum sustained sheep production from native range:

1. Utilize no more than 45 percent of the annual forage production during the summer grazing season.
  2. Use water sources, fencing, shade, and distribution of salt and mineral to achieve even grazing of the entire pasture.
  3. If possible, rotate grazing so that you use each pasture during a different season in different years.
  - 3 4. If possible, provide an early spring tame pasture so that native range will not be grazed early in the spring when range plants are in their most critical growth stage. At this time they can be damaged excessively by grazing.
  5. Allow each native pasture to rest one year out of every four to six.
  6. Carry over a plentiful supply of hay and cull heavily during drought conditions so that rangelands will continue to stay in good condition.
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## RELATIVE RANKING OF PASTURE FORAGES FOR SHEEP

Species	Carrying Capacity	Lamb Performance	Lamb Prod/Acre	Sheep/Pasture Management Required
Alfalfa	High	High	High	Medium
Ladino Clover	Low	High	Medium	Medium
Bird's-foot Trefoil	Low	High	High	Medium
Blue Grass	Low	Low	Low	Low
Brome Grass	Medium	Medium	Medium	Low
Fescue	High	Low	Low	Low
Orchard Grass	High	Medium	Medium	Low
Canarygrass	High	Low	Medium	Low
Timothy	Low	Low	Low	Low
Oats	Medium	Medium	Medium	Low
Barley	Medium	Medium	Medium	Low
Sudan	High	Low	Medium	High
Rape	High	High	High	Low
Turnips	High	Low	Medium	Low

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## STOCKING RATES

Stocking rate means the number of animal units that are on a certain area of land for a certain period of time. An animal unit is equal to one mature cow or five sheep. Stocking rate figures are expressed as animal unit months per acre. The forage required for one animal unit for one month is an AUM.

### Animal Unit Months (AUM) Conversion Factors

Animal	AUM
Mature ewe with lamb	= 0.20
Ram	= 0.20
Weaned lamb	= 0.17
Nanny and kid	= 0.17
Buck	= 0.17
Weaned goat	= 0.14
Mature cow with calf	= 1.00
Mature bull	= 1.25
Weaned calf	= 0.60
Yearling	= 0.75
2 year old heifer	= 0.90
Horse	= 1.50

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### BUYING HAY BY THE BALE OR PER TON

The best way to purchase hay is by the ton, not by the bale. However, many times hay is purchased by the bale, especially in small amounts. Here are two ways to determine hay prices, one per bale and the other per ton. The charts give comparison figures by each method. Don't forget that delivery cost is also a factor in the final cost of your hay.

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Price/Bale	BALE WEIGHT			
	30 LBS	40 LBS	50 LBS	60 LBS
\$0.50	\$33.33	\$25.00	\$20.00	\$16.67
\$0.75	\$50.00	\$37.50	\$30.00	\$25.00
\$1.00	\$66.67	\$50.00	\$40.00	\$33.33
\$1.25	\$83.33	\$62.50	\$50.00	\$41.67
\$1.50	\$100.00	\$75.00	\$60.00	\$50.00
\$1.75	\$116.67	\$87.50	\$70.00	\$58.33
\$2.00	\$133.33	\$100.00	\$80.00	\$66.67
\$2.25	\$150.00	\$112.50	\$90.00	\$75.00
\$2.50	\$166.67	\$125.00	\$100.00	\$83.33
\$2.75	\$183.33	\$137.50	\$110.00	\$91.67
\$3.00	\$200.00	\$150.00	\$120.00	\$100.00
COST PER TON				

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Price/Ton	BALE WEIGHT			
	30 LBS	40 LBS	50 LBS	60 LBS
\$30	\$0.45	\$0.60	\$0.75	\$0.90
\$40	\$0.60	\$0.80	\$1.00	\$1.20
\$50	\$0.75	\$1.00	\$1.25	\$1.50
\$60	\$0.90	\$1.20	\$1.50	\$1.80
\$70	\$1.05	\$1.40	\$1.75	\$2.10
\$80	\$1.20	\$1.60	\$2.00	\$2.40
\$90	\$1.35	\$1.80	\$2.25	\$2.70
\$100	\$1.50	\$2.00	\$2.50	\$3.00
\$110	\$1.65	\$2.20	\$2.75	\$3.30
\$120	\$1.80	\$2.40	\$3.00	\$3.60
\$130	\$1.95	\$2.60	\$3.25	\$3.90
COST PER BALE				

## PRINCIPAL INSECT PESTS OF SHEEP

The major insect pests of sheep that cause economic losses are the sheep ked, sheep bot fly, and several species of lice which are specific to sheep. In addition, nuisance flies frequently cause annoyance to sheep as well as producers.

**The Sheep Ked.** The sheep ked is a wingless fly which is often called the sheep tick. Keds cause irritation by their blood-feeding. Keds are pale to dark brown in color, wingless and approximately 1/8 inch long and superficially resemble ticks. The sheep ked larvae develop within the adult female and is deposited into the fleece as a single fully developed larva. The larva rapidly transform into reddish barrel-shaped puparia which are sometimes called eggs. The ked emerges from the puparium in 18 to 40 days. Direct damage results from the bites of keds causing irritation and blood loss to the sheep.

**Sheep Lice.** Lice which commonly parasitize sheep are the sheep biting louse, the sheep foot louse and the sheep head louse. These insects are all small (less than 1/8 inch long), wingless ectoparasites which live in the wool of sheep during all stages of development. Female lice glue fertilized eggs onto hairs of the fleece and these eggs hatch in about two to three weeks. Adults live for about a month and mated females deposit one to two eggs per day. Lice dislodged from sheep die within a short period of time. When animals become heavily infested, wool may be completely removed or become ragged, which lowers the quality and the value of the clip.

**Sheep Bot Flies.** The immature stage of the sheep bot fly is an internal parasite in the nasal cavities of the head of sheep. Bot flies look like bees and adult females deposit larvae in the nostrils of grazing sheep. Larvae feed on secretions from mucus membranes in the nasal passages and sinuses in the sheep. Eventually larvae leave the head to drop from the sheep and pupate in loose soil. Adult flies cause sheep distress and interfere with normal grazing behavior. Larvae irritate membranes in the head and cause snotty discharges. There are one to two generations of flies per season of grazing.

**Wool maggots.** A number of species of bottle or blow flies may infest sheep and cause serious problems. These flies are normally found associated with rotting flesh, but under certain conditions can invade healthy tissues. Blow flies are attracted to rotting odors from areas of fleece contaminated with liquid feces, urine, blood or pus. Blow flies lay eggs in these soiled areas of fleece. Eggs hatch within a few hours and the larvae feed on the skin surface or may even penetrate the skin. Maggot infested wool loosens and falls off and there is a loss of productivity. Several generations may develop during the summer.

**Nuisance Flies.** House flies and stable flies are two barnyard flies that annoy sheep, as well as people. Of these two flies, only the stable fly bites. The house flies have sponging/lapping mouthparts. The continual annoyance caused by either or both fly species can torment sheep to the point that their performance is considerably reduced. Both species of flies develop in rotting and decaying organic matter. Mixtures of water, manure and spilled feed are ideal egg laying sites and larval production areas.

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## RECOMMENDATIONS FOR CONTROL OF INSECT PESTS OF SHEEP

**Wool Maggots.** Preventive measures will minimize wool maggot infestations. Shearing done in late winter or early spring before fly activity starts lessens the potential of maggot infestations. When areas of the fleece become soiled and matted, clipping and disinfecting these areas will prevent the attraction of blow flies and the establishment of maggots. Spot treatments with an insecticide can clean up an infestation when an animal is infested.

**Sheep Keds and Lice.** Control measures applied for keds will also control lice. A variety of chemicals and treatment methods are available (see following table). Spray, dip and pour-on formulations of insecticides are registered for ked and louse control. Best control of both keds and lice is achieved when insecticide treatments are made within 30 days after shearing. The shearing process itself will greatly reduce populations of keds and lice. Insecticide treatment of short fleeced animals allows for thorough coverage and distribution of the pesticide.

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PEST	INSECTICIDE	RATE	REMARKS
WOOL MAGGOTS	Preventive Spray or Dip: Spray animals thoroughly or treat the wounded areas with the following:		
	coumaphos 25% WP (Co-Ral) (spray or dip)	8 lb./100 gal. water	Do not use on lactating animals. Do not apply within 15 days of slaughter.

SHEEP BOT	Ivomec (drench)	3 ml/26 lbs. of body weight	Do not apply within 11 days of slaughter
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SHEEP KEDS and LICE	All applications are most effective after shearing. Make no more than two applications in the spring and two applications in the fall or a total of four applications per year.		
	coumaphos 25% WP (Co-Ral)	4 lb./100 gal. water	Do not treat within 15 days of slaughter.
	fenvalerate 10% WDL (Ectrin)	Spray: 1 qt./100 gal. water	Wet sheep with up to 1 qt of finished spray. Repeat in 30 days if necessary.
		Pour-on: 1 qt. in 12-1/2 gal. water	Apply 4 oz. of prepared pour-on formulation to backline.
		ULV sprayer: 1 qt./1 gal. water	Mist 1/3 oz./animal.
	lindane 20% EC	2 pt./100 gal. water	Do not use within 30 days of slaughter. Do not treat lambs under 3 months of age.
	permethrin 10% EC (Anchor)	1 pt./100 gal. water	Spray to run-off or fog or mist using 1 qt. spray mix/head.

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## FLY CONTROL

**Nuisance Flies.** Flies can be the most troublesome insect problem in confinement operations and around the barnyard when sheep are penned there through the summer months. Proper sheep management involves providing a clean, dry area for healthy sheep. Sanitation or clean up to reduce or eliminate wet areas containing manure and rotting plant material which can become larval breeding sites will greatly enhance the effectiveness of insecticides. Premise sprays are most effective for control of nuisance flies. However, during times of high fly pressure, a direct application to or misting of the animals is helpful to provide temporary relief from adult flies.

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### CONTROL IN BUILDINGS AND PREMISES

PEST	INSECTICIDE	RATE	REMARKS
HOUSE FLIES and STABLE FLIES	fenvalerate 10% WDL (Ectrin)	1 qt./10 gal. water	Apply 1/2 gal. of finished spray to 1,000 sq. ft. of surface. Avoid contamination of feed and water.
	diazinon 50% WP	2 lb./25 gal. water	Remove animals for at least 4 hours. Do not contaminate feed/water.
	methoxychlor 50% WP	8 lb./20 gal. water	Avoid contamination of feed or water with the sprays.
	permethrin 25% WP (Ectiban)	6 oz./11 gal. water	Use 1 gal. diluted spray/750 sq. ft. of surface. Spray directly to walls and ceiling as a residual surface spray. Avoid contamination of feed and water.
	Pyrethrins + synergist (0.1% to 0.2%)	Apply as directed on container	The pyrethrin sprays are prepared oil sprays that contain synergists such as piperonyl butoxide or MGK-264. Apply as a space spray for quick knock down of flies.
	Cyfluthrin 24.3% EC (Tempo 2)	8 ml in water to cover 1,000 sp. ft.	Apply finished spray to fly resting surfaces to the point of runoff.

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**NOTE:** These rates are not for direct application to animals. The key to successful fly control around farm buildings is sanitation. If conditions prevail where flies can breed successfully, then any attempt to control flies with chemicals will likely fail. Start fly control programs early. Always treat all infested areas including manure piles, wet areas around silos, etc.

## WORMS

There is NO EXCUSE for wormy sheep. There are available effective dewormers. Worms occur year-round and cause reduced productivity plus open the door to secondary diseases.

WORMS	DEWORMERS
<b>ROUNDWORMS</b> Stomach Intestinal	Phenothiazine Levasole/Tramisol Thiabendazole/TBZ Ivermectin/Ivomec Valbazen (non-approved) Panacur (non-approved)
<b>TAPEWORMS</b>	Lead arsenate Valbazen (non-approved)
<b>LUNGWORMS</b>	Tramisol Fenbendazole (non-approved) Ivermectin/Ivomec Valbazen (non-approved) Panacur (non-approved)
<b>FLUKES</b>	Valbazen (non-approved)

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## SEEKING ASSISTANCE

### WHY?

1. Sick sheep can be treated successfully **provided** their ailments have been accurately diagnosed.
2. Many times, the local veterinarian's diagnosis will easily correct a problem.
3. There is only one justification for seeking assistance: **PROTECT YOUR INVESTMENT BETTER** by gaining accurate and expedient knowledge on disease problems.

### HOW TO USE THE DIAGNOSTIC LABORATORY?

1. The North Dakota Veterinary Diagnostic Laboratory is housed in the Van Es building at NDSU, Fargo. The Laboratory phone number is (701) 231-8307.
2. The following points are important:
  - a. **The results of laboratory examinations are no better than the specimen submitted.**  
Therefore avoid submitting:
    - rotten tissues or animals
    - "runts" or "chronics"
    - heavily treated animals
    - frozen carcasses
  - b. whenever possible, submit a **live animal, preferably untreated, which is truly representative of the problem to be diagnosed.** This cannot be overemphasized; it is the best specimen.
  - c. When distance or other circumstances preclude submission of live, sick animals, have your veterinarian perform a necropsy (*post-mortem* examination), collect, preserve and ship tissues to the laboratory.
  - d. No matter how adequate, a specimen without a **detailed** history is of little use to the personnel in the laboratory.

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## DISEASE IDENTIFICATION

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DISEASE	ORGANISM/ CAUSE	TIME OF OCCURRENCE	CLINICAL SIGNS	PREVENTION/ VACCINATION	REMARKS
ARTHRITIS	Chlamydia (Staph., strep.) (erysipelas)	Anytime	Stiffness, lameness Swollen joints	No vaccine available	Often accompanied by conjunctivitis
BLACK LEG	Clostr. chauvei	Anytime	Sudden death "Gassy" pockets in muscles	Vaccinate ewes and lambs (7-way)	Not too common in sheep
BLEEDING DISEASE	Spoiled, toxic sweet clover hay or haylage	Anytime	Hemorrhages, subcu- taneous swellings full of blood, anemia; abortion	Test sweet clover forage Quality nutrition	
BLOAT	Legume plants Sudden changes in diet	Grazing season or feedlot feeding	Distended left side Breathing difficulty	Dietary management Ionophors and/or surfactants	Stomach tube used to relieve gas pressure
BLUE-BAG	Pasteurella hemolytica, Staph. aureus	Anytime, usually at lambing	Ewe appears quite sick. Fever; dark, painful, swollen udder	Sanitation! Culling (No vaccine available)	Must also control sore mouth

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BLUE TONGUE	A virus : BT	Summer Early fall	Fever; lameness Swollen face, lips, ears. Erosions: lips, tongue	Vaccine available but effectiveness is relative	Transmitted by an insect (midge)
BORDER DISEASE	A virus (similar to BVD)	Lambing	Abortions "Hairy-shakers" Small lambs	Purchase of BD free breeding stock	BVD vaccine has been used in some areas
BRAXY	Clostridium septicum	Mainly in in lambs	Sudden death Severely inflamed stomach	7-way clostridial vaccine	Known also as "bradsot"
BRUCELLOSIS	Brucella ovis	Anytime	Abortion, low conception Ram: Epididymitis	Testing & removal Prepurchase exams and test	(See: "EPIDIDYMITIS")
CASEOUS LYMPHADENITIS	Corynebacterium ovis	After 1 yr. of age	Swollen lymph nodes Localized abscesses Weight loss	Sanitation and disinfection, especially at shearing	
COCCIDIOSIS	Protozoal parasites of intestines	Mainly in lambs	Diarrhea Dehydration	Sanitation Ionophors Amprolium, Decox	Numerous symp- toms may occur
CONJUNCTIVITIS	Chlamydia (main cause)	Anytime (summer)	Lacrimation Swollen lids Clouding of eye	Control dust, flies Cull infected "chronics"	(See "ARTHRITIS")

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DISEASE	ORGANISM/ CAUSE	TIME OF OCCURRENCE	CLINICAL SIGNS	PREVENTION/ VACCINATION	REMARKS
EAE (Enzootic abortion)	Chlamydia	Anytime	Abortion "storms" Weak lambs Pinkeye/arthrits	Yearly vaccination before breeding	
ENTEROTOXEMIA	Clostridium perfringens C & D	Nursing (C) Feedlot (D)	Sudden death Convulsions	Vaccination of ewes & lambs	Known as "overeating"
ENTROPION/ ECTROPION	Inherited eye defect	At birth	Eye irritation Constant tears Secondary infection	Culling (Records)	Surgical correction is employed
EPIDIDYMITIS	Brucella ovis	Mature rams	Poor semen quality Testicular atrophy Hardening, adhesions, Swelling	Prepurchase and/or prebreeding physical examination	(See "Brucellosis")
FOOT ROT	Two bacteria: 1. Bacteroides n. 2. Sphaerophorus n.	Anytime (common in fall/winter)	Lameness Reduce rate of gain Reduce lactation	Culling, trimming, Clean, dry lots Vaccine: aids prevention	Foot baths are helpful
GOITER	Iodine deficiency	At birth	Swollen throat Little (or no) wool coat, Weakness	Stabilized iodized salt to pregnant ewes	

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GRAIN OVERLOAD	Excessive ingestion of concentrate with rumen pH of 4.0-4.5	Common in feeders	Indigestion, dehydration, Off feed, dull Diarrhea, Incoordination	Dietary management	Founder often follows
HYPOCALCEMIA OF EWES	Calcium deficiency	At lambing	"Downer" ewes (mimic "Pregnancy Dis.")	Free-choice limestone mixed with 1/3 salt	Treat like "Milk fever" in dairy cows
LISTERIOSIS	A soil borne bacterium: Listeria m.	Anytime	Abortion in pregnant ewes. Nervous signs in ewes & lambs	No vaccine is available	Listeria affects humans also
MALIGNANT EDEMA	A bacterium: Clostr. Septicum	Anytime	Sudden death Soft swellings of muscles	7-way clostridial vaccination	Uncommon
MASTITIS	Several bacteria Mycoplasma	Lactation	Decreased milk Swelling Gargety milk Gangrene	Sanitation Clean lambing quarters & "jugs"	Sore mouth prevention is important
PINKEYE	Bacteria Chlamydia Mycoplasma	Anytime	Lacrimation Painful eye swelling clouding, blindness Inverted lids	Control of chlamydia dust, flies	

DISEASE	ORGANISM/ CAUSE	TIME OF OCCURRENCE	CLINICAL SIGNS	PREVENTION/ VACCINATION	REMARKS
PNEUMONIA	Multiple: Bacteria, viruses Stress Dehydration Mycoplasma	Common: -early life -at weaning	Fever, off-feed Cough, abdominal breathing Discharges: eyes, nose High mortality	Requires MANAGEMENT -Environment -Water/feed medication -Vaccines: question efficacy	
POLIO (Polioenceph- alomalacia)	Vitamin B1 destruction or deficiency	Mainly during feeding period	Incoordination, depression. Rumen paralysis, Blindness	Management of concentrates in diet of lambs	
50 PREGNANCY DISEASE	Inadequate energy intake by pregnant ewe	Late gestation or at lambing	Listlessness, twitch- ing, Loss of reflexes Blindness Paralysis, death	ONLY through adequate nutrition of breeding flock	"A disease of man the symptoms are seen in sheep"
PROGRESSIVE PNEUMONIA	A virus shed by ewes in milk, secretions	Infection is acquired early in life; symp- toms appear years later	Start at about 2 yrs Cough: mild to severe Weight loss: progres- sive, Shallow, labored breathing, Coarse wool...death	Culling by identification of carriers	Eradication is possible
PROLAPSES	Tails docked too short Heredity Coughing	Anytime	Rectal and/or vaginal prolapse	Proper docking Culling	Suturing is only temporary solution
RABIES	A virus, trans- mitted by bite of rabid animal	Usually spring, summer	Incoordination Paralysis Can't drink or eat Lethal disease	Vaccine is available (IMRAB)	Skunks: main source of rabies in ND
RICKETS	Inadequate intake of Ca, P and Vit D	Growing period	Lameness Swelling Fractures	Adequate Ca/P intake by pregnant ewes and lambs	Diet analysis is useful
SALMONELLOSIS	Salmonella Stress, crowding filth	Lambing Weaning	Pregnant ewes abort Lambs: Fever Severe diarrhea High mortality	Vaccines are ineffective Sanitation Stress reduction at weaning	
51 SCOURS (of baby lambs)	Stress, wetness drafts, filth Bacteria, viruses protozans	Right after birth	Severe diarrhea Dehydration Mortality	Sanitation Dry, clean jugs COLOSTRUM asap after birth (2-4 hr)	Vit. A assist in control
SHEATH ROT	Hydrolysis of urea in urine by bacterium	Rams grazing, during warm weather. Alfalfa hay	Ulceration, swelling pain of preputial opening	Removal from pasture or lower protein	May occur among housed rams

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DISEASE	ORGANISM/ CAUSE	TIME OF OCCURRENCE	CLINICAL SIGNS	PREVENTION/ VACCINATION	REMARKS
SORE-MOUTH	A pox virus	Before and after lambing	Blisters in lips, muzzle, lids, teats vulva, feet Mastitis complications in lactating ewes. Starvation, Pneumonia	Vaccine is available (It is live, unattenuated)	Must wear rubber gloves when vaccinating or handling sick animals
TETANUS	Toxin from a soil borne bacterium (Cl. tetani)	After castration docking, vaccination, tagging	Limb stiffness with convulsions Rigid jaw Often fatal	Toxoid available Sanitation	
TOXOPLASMOSIS	Protozoan parasite (related to coccidia)	Mid to late gestation	Abortion White patches in the buttons of the afterbirth		Carried by cats, especially young ones
VIBRIOSIS	Vibrio fetus intestinalis (Campylobacter) Feeding on ground	Mid to late gestation	Abortion Birth of dead lambs Weak lambs	Yearly vaccination and boosters jointly with EAE	Is not a venereal disease (as is in cattle) Use feed troughs

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WHITE MUSCLE DISEASE	Diets deficient in Selenium and/or Vit. E	Usually after lambing	Stiffness, arched back. Paralysis, starvation. Some lambs appear healthy and die from heart-arrest	Vit. E & Selenium in ewe's diet Injections: Bo-Se Mu-Se	
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## NORMAL PHYSIOLOGICAL VALUES OF SHEEP

	<u>Average (Range)</u>
<b>Rectal Temperature</b>	102.8 degrees F (102.5 - 103.2)
<b>Heart Rate</b>	75 beats/minute (60 - 120)
<b>Respiration Rate</b>	20 breaths/minute
<b>Reproductive Values:</b>	
Gestation Period	148 days (140 - 155)
Onset of Puberty	8 months (4 - 12)
Length of Estrus Cycle	17 days (14 - 20)
Length of Heat	1-2 days
Time of Ovulation	12-24 hours before end of heat
Optimum Time to Service	18-24 hours after onset of heat
Ram Semen/Volume per Ejaculum	1 ml (0.7 - 3.0)
<b>Milk Composition:</b>	
Water	82.9%
Fat	6.2%
Protein	5.4%
Lactose	4.3%
<b>Daily Manure Production (feces and urine):</b>	
Adult sheep	6-10 pounds (dry ewes to mature rams)
Lactating ewes	7 pounds
Feeder lambs	4 pounds
Total solids make up about 25% of the manure and water about 75%	

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## **WAYS TO IDENTIFY SHEEP**

**Ear Tags** - Tags fastened in the ears.

**Tattoos** - Numerical ink tattoos on the lip or ear.

**Hot Branding** - A hot iron applied to the nose.

**Paint Branding** - A branding iron dipped in paint and touched on the fleece.

Tips on paint branding:

1. Use only fluids made specifically for sheep branding. Never use spray paint.
2. Use only fresh branding fluid and shake or stir it before using.
3. If the fluid must be thinned, stir in a small amount of the thinner recommended by the manufacturer. Don't over-thin because too much of any solvent can remove the grease from wool fibers.
4. If the fluid must be heated, set the can in a bucket of water. Don't apply heat directly to the paint can and to warm the fluid; don't boil it.
5. Avoid heavy applications. The extra fluid makes scouring of wool difficult.
6. Brand on the curve of the sheep's back, towards the rump.
7. Release the sheep from the pens as soon as possible after branding to avoid rubbing.

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## SPACE ALLOTMENTS For SHEEP

	Ewe	Ewe & Lambs	Feeder Lambs
<b>SHELTER SPACE</b>			
Open-front bldg w/lot	10-12 sq.ft.	12-16 sq.ft.	6-8 sq.ft.
Lot	20-30 sq.ft.	25-35 sq.ft.	15-20 sq.ft.
Confinement	12-16 sq.ft.	16-20 sq.ft.*	8-10 sq.ft.
<b>HANDLING AREA</b>			
	4-5 sq.ft.	7 sq.ft.	4-5 sq.ft.
<b>FEEDER SPACE</b>			
Hand feeding	16-20 inches	16-20 inches	9-12 inches
Self feeding	8-12 inches	8-12 inches	3-4 inches
<b>FEEDER THROAT HEIGHT</b>			
Maximums	15 inches (creep feeder)	10 inches	13 inches
<b>WATERER SPACE</b>			
Open tank	15-25 ewes/foot	15-25 ewes/foot	25-40 lambs/foot
Automatic bowl	40-50 ewes/bowl	40-50 ewes/bowl	50-75 lambs/bowl
<b>LAMBING JUGS:</b> Number - 10% for 100 ewes, 7-9% for 600, and 4-6% for 1000 Size - 4'x4'x32" minimum or 5'x5'x36" for large ewes			
<b>LAMB CREEP SPACE</b> 1.5-2.0 sq.ft./lamb			

\* For lambing rates over 170%, space should be increased by 5 square ft/hd.

## RECOMMENDED GROUP SIZES DURING LAMBING SEASON

Limiting the number of sheep per pen during the lambing season reduces lamb losses. Lamb losses are mainly due to chilling, starvation, and pneumonia. Young lambs in large groups can easily get separated from their mothers. The following are recommendations taken from the Midwest Sheep Housing and Equipment Handbook.

Maximum Group Size	
Pregnant ewes	200 ewes
Ewes about to lamb	50 ewes
Ewes with lambs (birth to 2 days)	lambing jugs
Ewes with lambs (2 to 4 days)	5 - 10 ewes
Ewes with lambs (5 to 7 days)	10 - 20 ewes
Ewes with lambs (8 to 14 days)	20 - 40 ewes
Ewes with lambs (2 weeks to weaning)	50 - 100 ewes
Early weaned lambs	50 head

The bond between a ewe and her lamb or lambs needs between three to six days to become fully established. This is an important consideration when bunching ewes after they have lambed.

## LAMBING TIME EQUIPMENT

- propylene glycol for treatment of pregnancy disease
- bearing retainers for treating prolapses, lamb puller
- thermometer, surgical scissors or pocket knife, suturing material
- lubricant plus disinfectant for assisting ewe during lambing
- mild soap, bucket and warm water
- antibiotic, uterine boluses, injectable vitamin E and selenium mixture
- old towels to wipe off and dry newborn lambs, heat lamps
- frozen colostrum from ewe or cow
- bottles, nipples, and stomach tube for helping weak or orphan lambs
- ear tags and paint brands for identification, lambing record book
- docking and castrating equipment
- mastitis treatment, scour remedies

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## GRAFTING LAMBS

It is a good management practice, if possible, to graft lambs not receiving enough milk from their own mothers onto other ewes. A number of grafting methods are possible.

1. **Slime Graft** - Use fetal fluids from the ewe that the lamb is to be grafted to and rub the fluids and membranes on the lamb just before grafting.
2. **Wet Graft** - Immerse lamb to be grafted as well as the ewe's own lamb in a saturated salt solution.
3. **Stanchion** - Place the ewe's head and neck in a set of stocks where she can eat and drink but must allow lambs to nurse. Grafts of this type require from three to five days.
4. **Lamb Coat** - Skin the pelt off the lamb that died and tie the skin on the lamb to be grafted.
5. **Stocking Graft** - Place a stocking (burlap cover) over a ewe's own lamb for two to three days and then remove it and turn it inside out and place it on the lamb to be grafted.

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When attempts to graft lambs fail, it is necessary to put the newborn lambs on milk replacer or even put them on goats if available.

Taken from The Sheepmen's Production Handbook (SID, Inc.), Revised 1986

## TIPS FOR REARING LAMBS ARTIFICIALLY

Within two to four hours after birth, decide which lambs among those from multiple births you should remove. Look for the weaker or smaller ones to choose for artificial rearing. It is important to make this decision early. Relatively weak lambs remaining with the ewes can experience more stress than those reared artificially. Consider the following tips:

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1. It is essential that newborn lambs receive colostrum milk. Cow's colostrum will work if ewe's milk is not available. Do not dilute with water or warm too quickly if colostrum is frozen.
2. Lambs should be removed from sight and hearing distance of ewe.
3. Provide a warm, dry, draft-free area to start lambs.
4. Lambs may require some assistance the first day or two to teach them to nurse on whatever feeding device is used.
5. Avoid placing young lambs with older lambs, as they may be pushed aside and not be able to obtain milk replacer. Remember that lambs nursing ewes drink 25 to 40 times per 24 hours.
6. Hang a light over the milk replacer feeding device and dry ration feeder.

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7. Inject lambs in the first few days with Iron Dextran, Vitamin A-D-E, and Selenium-Vitamin E. At 15 days of age, vaccinate for overeating (*Colostridium perfringens* type C & D).
8. Start lambs on high-quality lamb creep feed at two weeks of age. Provide ample fresh water in front of lambs at all times. Do not feed hay or oats the first three weeks of age as it encourages bloat. Caution! Do not feed leafy alfalfa until two weeks after weaning, as it may encourage bloat.
9. Wean at 30 days of age or at a weight of about 25 pounds and when the lambs are eating creep feed.



## TUBE FEEDING

Sometimes lambs are born too weak to nurse. Without that first colostrum, their survival rate is very low. If left to fend for themselves, they don't make it. However, many can be saved by tube feeding, even those too weak to suck.

The key is getting milk into them as soon as possible after birth. The milk should be warm but not hot. Generally 2 ounces every two hours will do the trick. Return the lamb to its mother as soon as it is strong enough to stand and nurse. Leaving it away from mother too long may result in the ewe rejecting the lamb.

29 The tubing should be 14 to 18 inches long and preferably rubber like that used for surgical purposes. What it is attached to can be the spout of an antibiotic syringe (like those used to treat mastitis in dairy cattle); a needle-type syringe (preferably a 60 cc or about 2 ounce); or an all rubber ear syringe.

The tubing should be coated with vegetable oil before inserting it into the lamb's throat. It is very important to get the tube in the stomach and not the lungs. Mistakenly pouring milk into the lungs can cause pneumonia. If possible, it is best to insert the tubing into the lamb without it being attached to the syringe.

There are two ways to check if the tube is going into the right place. First, if a bump is encountered when inserting the tube, backup and try again. The length of tube inserted into the lamb should indicate whether the stomach is reached or not. Secondly, if cool air is felt

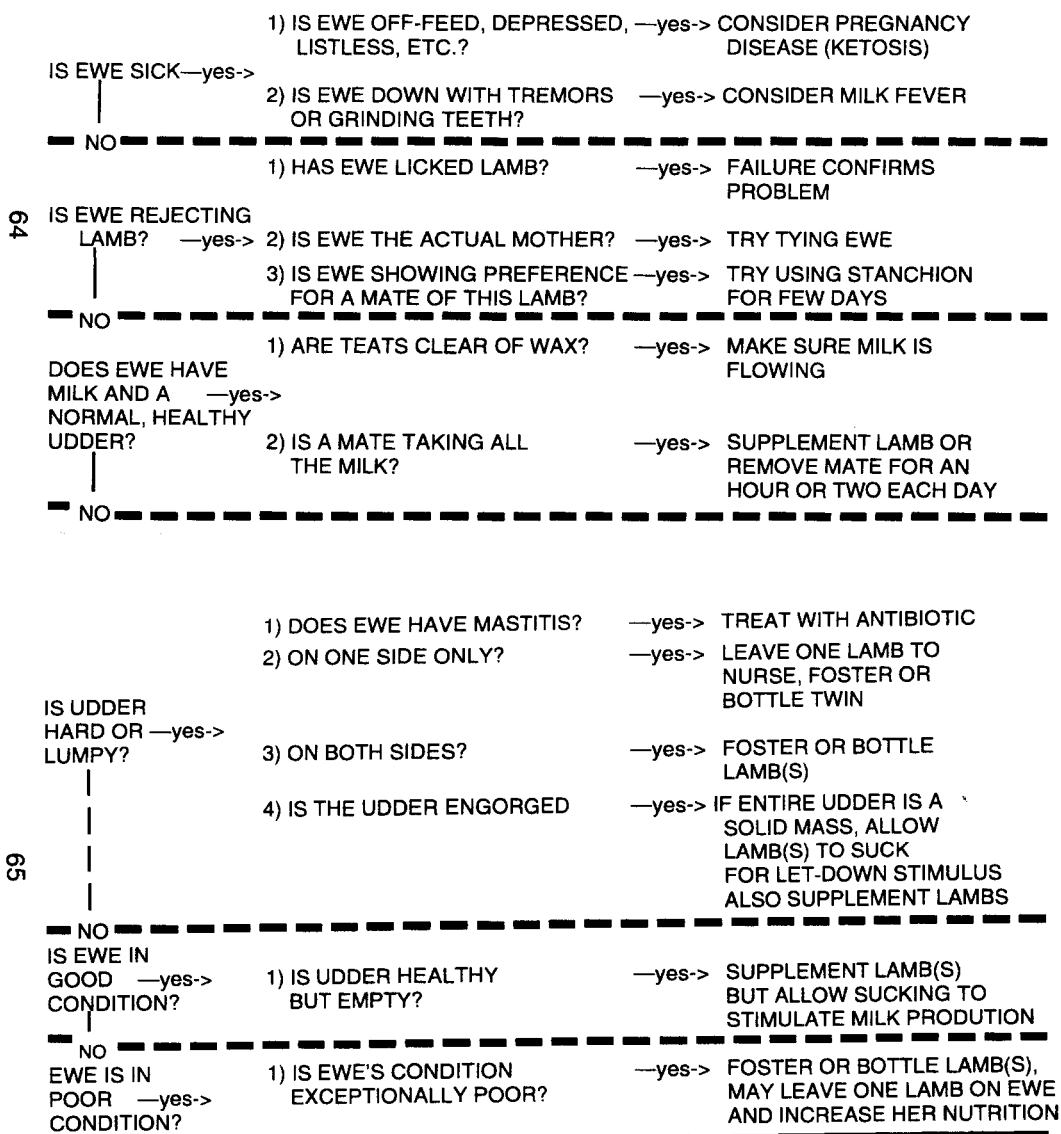
coming out of the empty tube after it has been inserted, the lungs have been reached. Remove the tube and try again.

The positioning of the lamb before inserting the tube depends on the amount of assistance available. In any situation, the head and neck of the lamb should be extended forward to allow a more direct path for the tube to get into the stomach.

If alone, place the lamb on a table or series of straw bales so that the lamb is at a handy height to work with. Have all four feet facing you and hold the body with your left forearm. Straighten the lamb's head and neck with your left hand while at the same time using your fingers to open the lamb's mouth to receive the tube.

30 The tubing should be placed in a warm sterile solution before insertion. A couple of feedings (2 ounces each) of colostrum will save many lambs that would otherwise die.

## TROUBLE SHOOTING CHART FOR "STARVING" LAMBS



## BREEDS OF SHEEP

	Ave Mature Weight		Growth Rate	Prolificacy	Milk -ing Ability	Grease Fleece Weight
	Rams	Ewes				
<b>EWE BREEDS:</b>						
Border Leicester	175-250	140-180	M-H	M-H	M-H	8-12
Corriedale	175-275	130-180	M	M	M	10-17
Finnsheep	175-225	120-160	L-M	H++	H	4-8
Merino	150-225	110-150	L-M	L-M	M	8-14
Polypay	200-250	140-180	M	H	H	7-12
Rambouillet	250-300	150-200	M-H	L-M	M	8-18
Targhee	200-300	150-200	M-H	M	M	10-14
<b>DUAL PURPOSE BREEDS:</b>						
Columbia	225-350	150-225	H	M	M	10-16
Dorset	200-250	140-180	M-H	M-H	H	5-9
Lincoln	250-350	200-250	M	M	L-M	12-20
Montadale	200-275	150-200	M	M	M	8-12
Romney	200-275	150-200	M	M	L-M	8-12
<b>RAM BREEDS:</b>						
Cheviot	160-200	120-150	M	M	M	5-10
Hampshire	250-325	175-225	H	M-H	H	6-10
Oxford	200-300	150-200	M-H	M	M	8-12
Shropshire	200-250	150-180	M-H	M	M	6-10
Southdown	175-225	130-180	M	M	M	5-8
Suffolk	250-350	180-250	H+	H	H	5-8

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## RAM SELECTION

Rams should be selected that have the genes for rapid gains, desirable carcass qualities, and the ability to sire daughters with greater reproductive ability. The key factor in a profitable sheep enterprise is total pounds of lamb produced per ewe per year.

The level of fertility in a ram is important to the overall sheep program. A highly fertile ram will not only settle a greater number of ewes earlier in the breeding season but will also fertilize a higher proportion of twin eggs than rams with poor fertility. In addition, data suggest that highly fertile rams tend to sire daughters that reach sexual maturity at an earlier age and ovulate more ova during each heat period.

Studies have indicated that as testicular size increases there is also an increase in sperm numbers, improving overall semen quality. Research indicates that rams with larger testicles are capable of superior reproductive performance and will produce offspring with greater reproductive capacity.

Sexual maturity of ram lambs is related to both age, weight, and genetics. These factors are influenced by heredity and environmental factors such as climate and nutrition. Sexual maturity of the ram lamb appears to be more closely related to body weight than age. Studies indicate sexual maturity in rams occurs at a body weight nearing 40 to 60 percent of the mature weight for that breed. Investigations indicate that full development of a ram's reproductive organs occur somewhere between 100 to 130 days of age. Most lambs are first ready to reproduce by 150

days. Sexual maturity may be delayed beyond one year of age if the ram lamb is subjected to inadequate nutrition and/or unfavorable environmental conditions.

Breeding has no adverse effect on the growing ram lamb as long as adequate nutrition is supplied. However, this does not mean that all ram lambs will satisfactorily breed ewes. Ram lambs may be ready, willing and even able to reproduce by five months of age or earlier, but their ability to settle a large number of ewes still needs time to develop. Researchers studying semen production in ram lambs have noted that sperm motility scores dramatically improve from six to nine months of age.

Physically, a ram should be examined from head to toe. He should have normal eyes with no indication of inverted eyelids, and a mouth with a normal bite. He should be tipped over and his testicles checked for uniformity and size. No evidence of epididymitis or pizzle rot should be present. Be skeptical about any abnormality affecting any portion of the reproductive tract. His feet should be free of defects or diseases. His fleece should be free of black fibers.

Check the ram closely for external parasites. Healthy sheep have a characteristic pink color to their skin (slightly darker in the black-face breeds). Note the color of the mucous membrane of the mouth and eyes. Absence of color indicates anemia, yellowness may indicate a liver disorder. When in doubt about a health question, seek the advice of a veterinarian.

## GESTATION TABLE

Breeding Date in Upper Line; Lambing Date in Lower Line

- Based on 148 days -

70	Aug 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 Sep
	Jan 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
	Sep 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 1 2 3 Oct
	Feb 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
	Oct 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 Nov
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Nov 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 1 2 3 Dec	
Apr 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	
Dec 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 Jan	
May 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
Jan 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 Feb	
Jun 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	

71	Feb 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 1 2 3 4 5 Mar
	Jul 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
	Mar 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 Apr
	Aug 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
	Apr 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 1 2 3 4 5 May
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Jun 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 1 2 3 4 5 Jul	
Nov 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	
Jul 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 Aug	
Dec 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	

### LAMBING RECORDS

LAMB ID	EWE ID	SIRE ID	BIRTH DATE	SEX	BIRTH WT	WEAN WT	WEAN DATE	REMARKS

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**LAMBING RECORDS**

LAMB ID	EWE ID	SIRE ID	BIRTH DATE	SEX	BIRTH WT	WEAN WT	WEAN DATE	REMARKS

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### LAMBING RECORDS

LAMB ID	EWE ID	SIRE ID	BIRTH DATE	SEX	BIRTH WT	WEAN WT	WEAN DATE	REMARKS

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## GRADE OF WOOL

Diameter of individual wool fibers determines the grade of wools. In the United States, grades of wool are designated by the American Blood System, the Spinning Count or micron diameter.

84 The Blood system was originally derived from the fine wool Merino sheep. Their wool was called fine. If a sheep was half Merino breeding, their wool was called 1/2 Blood. Today this system no longer refers to breeding background, but is used to describe typical fiber diameter.

The Spinning Count (Bradford) system is a more technical classification of wool in terms of fiber diameter. This count refers to the number of "hanks" of yarn, each 560 yards long, which can be spun from 1 pound of clean wool. For example, a 64s wool would yield 35,840 (560 x 64) yards or 107,520 feet (20.4 miles) of yarn.

The micron system is a more technical and more accurate measurement of the average diameter of wool fiber using a micrometer. The micron (1/25,400 of an inch) is used as the actual average diameter measurement.

### WOOL CLASSIFICATIONS

American Grade	Spinning Count Grade	Micron Diameter(s)
Fine	Finer than 80s	Under 17.70
Fine	80s	17.70-19.14
Fine	70s	19.15-20.59
Fine	64s	20.60-22.04
1/2	62s	22.05-23.49
1/2	60s	23.50-24.94
3/8	58s	24.95-26.39
3/8	56s	26.40-27.84
1/4	54s	27.85-29.29
1/4	50s	29.30-30.99
Low 1/4	48s	31.00-32.69
Low 1/4	46s	32.70-34.39
Common	44s	34.40-36.19
Common	40s	36.20-38.09
Common	36s	38.10-40.20
Common	Coarser than 36s	Over 40.20

## WOOL TERMS

**Bellies** - short and less desirable wool from the belly of the sheep.

**Britch or Breech Wool** - wool from the hindquarters of the sheep, usually the coarsest on the body, often approaching hair in characteristics.

**Crimp** - the natural curl in the wool fiber, gives wool its natural resilience and elasticity.

**Fleece** - the wool from a single sheep in the shorn grease state.

**Grease Wool** - wool as shorn from sheep, not washed or scoured (raw wool).

86 **Handle or Hand** - a term referring to the actual feel of wool.

**Hoggett Wool** - also called virgin wool, first fleece shorn from a sheep when about one year old.

**Keratin** - a complicated chemical protein substance, major constituent of a wool fiber.

**Lamb's Wool** - wool taken from a lamb not over seven months old.

**Luster** - determined by the amount of light reflected by the fiber.

**Pelt** - the skin of the sheep with wool still on the skin.

**Pulled Wool** - wool removed from pelts after slaughter, also known as "sripe."

**Scouring** - actual washing of dirt, grease and foreign matter from grease wool.

**Shearling** - shortest wool obtained from sheep sheared about a month before slaughtering, about 1/2 inch in length.

**Skirting** - a practice of removing from the edges of the whole fleece, at shearing time, all stained and inferior parts.

**Staple** - the length of a lock of shorn wool. In the trade "staple" refers to wool that averages 2.5 inches or more in length.

**Suint** - salts of perspiration present in the raw wool fleece.

87 **Woolen Yarn** - yarn spun from wool fibers which are short.

**Worsted Yarn** - yarn spun from wool fibers which are long.

**Yield** - amount of clean wool derived from grease wool in the scouring process.

**Yolk** - natural grease and suint in sheep's wool, when purified is known as lanolin.

**WEIGHT EQUIVALENTS**

- 1 lb = 453.6 gram (g) = 0.4536 kilogram (kg) = 16 ounces (oz)  
 1 oz = 28.35 g  
 1 kg = 2.2046 lbs  
 1 g = 1,000 milligrams (mg)  
 1 mg = 1,000 micrograms (ug)  
 1 ug = 0.000001 g  
 1 ppm = 1 ug/g or 1 mg/kg or 453.6 ug/lb or 45.36 mg/100 lbs or 1.1 g/ton  
 ppm = parts per million

**LENGTH EQUIVALENTS**

- 1 in = 2.54 centimeters (cm)  
 1 cm = 0.394 inch  
 1 ft = 30.48 cm  
 1 yd = 0.9144 meter (m)  
 1 rod = 16.5 ft = 5.5 yds  
 1 m = 39.37 in = 3.28 ft  
 1 km = 0.6214 mile  
 1 mile = 5,280 ft = 1,760 yds = 320 rds = 1.609 kilometers (km)

**AREA EQUIVALENTS**

- 1 sq in = 6.45 sq cm ; 1 sq cm = 0.16 sq in  
 1 sq rd = 30.25 sq yds = 272.25 sq ft  
 1 acre = 160 sq rds = 4,840 sq yds = 43,560 sq ft = 0.4047 hectare (ha)  
 1 ha = 2.471 acres  
 1 sq mile = 1 section = 640 acres  
 1 township = 36 sections = 23,040 acres

**VOLUME EQUIVALENTS**

- 1 cubic centimeter (cc) = 0.061 cubic in  
 1 cubic meter = 35.31 cu ft = 1.3 cu yd  
 1 cu in = 16.387 cc  
 1 cu ft = 1,728 cu in = 0.03 cubic meter  
 1 cu yd = 27 cu ft = 46,656 cu in = 0.7646 cubic meter

**CAPACITY EQUIVALENTS**

- 1 tablespoon = 14.79 ml  
 1 fluid oz = 2 tablespoons = 29.573 ml  
 1 cup = 8 fl oz = 236.58 ml  
 1 pint = 473.167 milliliters (ml) = 0.473167 liter (l) = 2 cups  
 1 liter = 33.81 fl oz = 2.1134 pints = 1.057 quarts  
 1 gallon = 3.7853 liters  
 1 kiloliter = 264.18 gallons

**WATER EQUIVALENTS**

- 1 gal = 8.34 lbs = 231 cu in = 0.1337 cu ft  
 1 cu ft = 7.48 gals = 62.4 lbs  
 1 cu ft per second = 448.8 gallons per minute

**TEMPERATURE CONVERSION**

- $F = [9/5 \times (C + 40)] - 40$   
 $C = [5/9 \times (F + 40)] - 40$

## Sheep Associations and Organizations

American Sheep Industry Assn (ASI)  
6911 South Yosemite Street  
Englewood, CO 80112-1414  
(303) 771-3500 (771-8200 FAX)

American Border Leicester Assn  
Rt 4 Box 138  
Taylorsville, NC 28681  
06 (704) 632-6529

American Cheviot Sheep Society  
RR 1 Box 100  
Clarks Hill, IN 47930  
(317) 523-2767

Columbia Sheep Breeders Assn of America  
P.O. Box 272E  
Upper Sandusky, OH 43351  
(614) 482-2608

Natural Colored Wool Growers Assn  
Box 487  
Willits, CA 95490  
(707) 459-6520

American Cotswold Record Assn  
18 Elm St Box 59  
Plympton, MA 02367  
(617) 585-2026

16 The Black Cotswold Society  
Box 542  
Goffstown, NH 03045  
(603) 774-4104

Continental Dorset Club  
P.O. Box 506  
Hudson, IA 50643  
(319) 988-4122

National Lamb Feeders Association  
6911 South Yosemite Street  
Englewood, CO 80112-1414  
(303) 771-3500 (771-8200 FAX)

North American Border Leicester Assn  
1699 H H Hwy  
Willow Springs, MO 65793  
(417) 962-5466

North American Clun Forest Assn  
W5855 Mahlum Rd  
Holmen, WI 54636  
(608) 526-4104

American Corriedale Assn, Inc.  
2911 N. 32 Rd  
Seneca, IL 61360  
(815) 357-6339

Coopworth Sheep Society/North America  
2644 Old Hwy, 2N  
Troy, MT 59935  
(406) 295-5263

American & Delaine-Merino Assn  
1026 Co Rd 1175 RD 6  
Ashland, OH 44805  
(419) 281-5786

North American Dairy Sheep Assn  
N20712 Thompson Lane  
Galesville, WI 54630  
(608) 582-4746

National Finnsheep Breeders' Assn  
P.O. Box 512  
Zionsville, IN 46077-0512  
(317) 873-3597

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American Dorper Sheep Breeders Society  
2427 220th Street  
Tripoli, IA 50676  
(319) 637-2792

Jacob Sheep Breeders Association  
6350 East County Rd 56  
Fort Collins, CO 80524  
(970) 484-3344

American Hampshire Sheep Assn  
1557 173 Rd Ave  
Milo, IA 50166  
(515) 942-6402

American Karakul Sheep Registry  
3026 Thomas Rd  
Rice, WA 99167  
(509) 738-6310

NS Katahdin Hair Sheep International  
Box 115  
Fairview, Ks 66425  
(913) 467-8041

American Lincoln Assn, Inc.  
4355 Yaquina Bay Rd.  
Newport, OR 97365  
(503) 265-5494

National Lincoln Sheep Breeders Assn  
1557 173 Rd Ave  
Milo, IA 50166  
(515) 942-6402

Montadale Sheep Breeders Assn  
Box 603  
Plainfield, IN 46168  
(317) 839-6198

American North Country Cheviot Assn  
Box 265  
Lula, GA 30554  
(770) 869-7726

American Oxford Down Record Assn  
1960 E. 2100 N Rd  
Stonington, IL 62567  
(217) 325-3515

American Polypay Sheep Assn  
609 S. Central Ave #9  
Sidney, MT 59270  
(406) 482-7768

Navajo Churro Sheep Association  
Box 94  
Ojo Caliente, NM 87549  
(505) 986-2952

OS American Rambouillet Sheep Breeders Assn  
2709 Sherwood Way  
San Angelo, TX 76901  
(915) 949-4414

American Romney Breeders Assn  
29515 N.E. Weslenn Dr  
Corvallis, OR 97331  
(503) 753-7603

North American Romanov Sheep Assn  
Box 1126  
Pataskala, OH 43062  
(614) 927-3098

North American Shetland Sheepbreeders  
% Tut Doane  
Roxbury, VT 05669  
(802) 728-3081



Scottish Blackface Sheep Breeders Assn  
1699 H H Hwy  
Willow Springs, MO 65793  
(417) 962-5466

American Shropshire Registry Assn  
Box 250  
Hebron, IL 60034  
(815) 648-4750

American Southdown Breeders' Assn  
HCR 13, Box 220  
Fredonia, TX 76842  
(915) 429-6226

St. Croix Sheep Breeders Assn, Inc  
UMC 4815 Utah State University  
Logan, UT 84322  
(801) 750-2181

96 American Suffolk Sheep Society  
P.O. Box 256 17 West Main  
Newton, UT 84327  
(801) 563-6105

National Suffolk Sheep Assn  
3316 Ponderosa St.  
Columbia, MO 65205  
(314) 442-4103

U.S. Targhee Sheep Assn  
Box 462  
Jordan, MT 59337  
(406) 557-2305

National Tunis Sheep Registry  
311 Scotch Settlement Rd  
Gouverneur, NY 13642  
(315) 287-3776

North Dakota Lamb and Wool Producers Assn  
Box 26  
Beulah, ND 58523  
(701) 873-5219

North American Texel Sheep Assn  
740 Lower Myrick Rd  
Laurel, MS 39440  
(601) 426-2264

**NORTH DAKOTA STATE UNIVERSITY  
SHEEP RESOURCE SPECIALISTS**

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Dr. Rick Meyer, Entomologist . . . . . 231-7922  
Wes Limesand, Sheep Herdsman . . . . . 231-7782  
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Diagnostic Laboratory . . . . . 231-8307

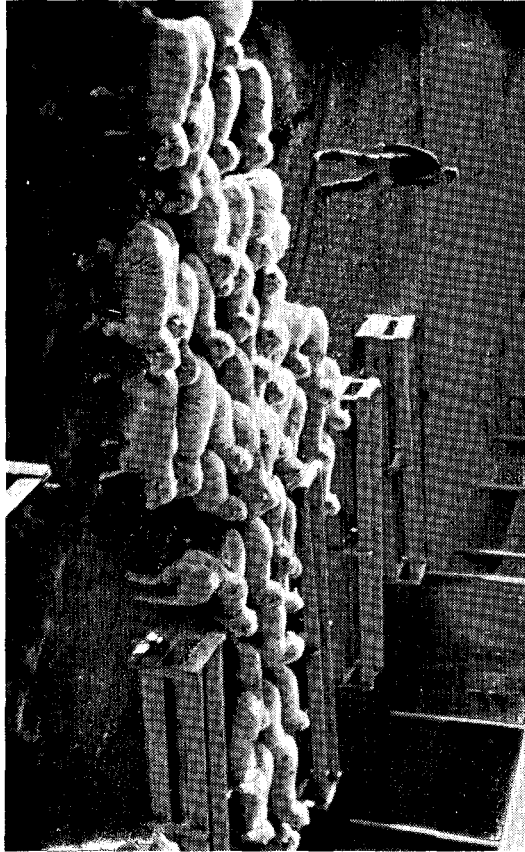
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**NORTH DAKOTA ANIMAL HEALTH DEPARTMENT**

Dr. Bill Rotenberger, State Veterinarian, Bismarck . . 328-2655

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