

Reproductive Management of Sheep and Goats

The success of a sheep and goat operation depends on the number of lambs and kids raised, weaned, and marketed each year. The percentage of ewes, does, ewe lambs, and doelings conceived early in the breeding season; the lambing, kidding, and weaning percentages; and the percentage of ewes, does, ewe lambs, and doelings lambing and kidding unassisted are some of the most important factors influencing profits in the sheep and goat business.

In other words, production is equal to reproduction.

Although the genetic quality of a sheep and goat herd is important, reproductive traits in sheep have low heritability. Trying to improve the reproductive efficiency of a sheep and goat herd by genetic selection is slow and difficult. Table 1 shows that improving reproductive efficiency in sheep through genetic selection is highly unlikely. Reproductive traits are responsive to environmental influences, however, and they respond to careful herd reproductive management. Some important factors sheep and goat producers must carefully consider are age, weather, season, and nutrition.

Age

Puberty, the time of first sexual activity, has a marked effect on lifetime production. Breed and potential size at maturity create considerable variations in the time of first sexual activity in sheep and goats. Regardless of these factors, puberty is a function of both age and body weight. Nutrition is, therefore, a factor influencing the start of puberty. Overfeeding ewe lambs and doelings to get them to a heavy weight quickly, however, does not guarantee that a high percentage will show estrus early. They must also be old enough to cycle. Overfeeding ewe lambs before they reach puberty at 2 to 4 months has a detrimental effect on mammary development because they deposit excess fat in their udders, which affects subsequent milk-producing ability.

Table 1. Heritability Estimates for Reproductive Traits in Sheep

Trait	Heritability (Percent)
Ewe fertility	5
Prolificacy ^a	10
Scrotal circumference	35
Age at puberty	25
Lamb survival	5
Ewe productivity ^b	20

^a Lambs born per ewe lambing

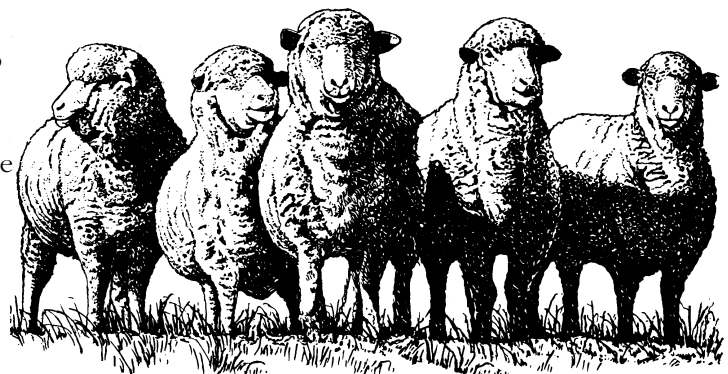
^b Pounds of lamb weaned per ewe exposed

Source: Adapted from *Sheep Production Handbook* 2002 edition, Volume 7

Weather—Temperature and Humidity

Sheep are more susceptible than goats to high temperatures and humidity. Stress caused by high environmental temperatures can seriously affect fertility, embryo survival, and fetal development. High humidity increases the risk of heat stress at any air temperature. A rise in body temperature is what actually causes reproductive problems. Increased body temperatures occur most commonly from high environmental temperatures but can also be the result of disease, fever, or any other factor that increases body temperature for an extended time.

If a ewe or doe cannot maintain normal body temperature, ovulation and conception rates decrease and the embryo is less likely to survive when conception does occur. The most critical period for conception and embryo survival in the ewe and doe is the first 21 to 30 days after breeding.



As with ewes and does, fertility in rams and bucks is also affected by temperature and humidity. Heat stress created by environmental conditions or fever caused by diseases that significantly elevate body temperature for an extended time can interfere with sperm production and development, thus affecting semen quality. The fertility of rams and bucks can be affected within days of exposure to extreme heat, and it can take at least 6 to 10 weeks before sperm quality returns to normal.

Shearing the ewe flock and rams 2 to 4 weeks before breeding can help reduce heat stress. Rams can also be turned out only at night during hot weather to minimize heat stress. Extremely cold temperatures can be harmful too, especially during bitterly cold weather with high wind and wind chill. The scrotum and even the testicles can freeze in such extreme conditions. Stress from periods of sickness can also slow or stop sperm production temporarily.

Nutrition

The nutritional status of a herd is the most important factor influencing reproduction. It is also the factor over which the producer has the most control by either increasing or reducing nutrient consumption.

The body condition of a ewe or doe strongly affects the following:

- the time at which puberty starts
- the conception rate at first estrus in ewe lambs and doelings
- the length of the postpartum interval
- the health and vigor of newborn lambs and kids

Body condition or changes in body condition before and during the breeding season affect reproductive performance in terms of services per conception, lambing and kidding intervals, and the percentages of open ewes and does. Ewes and does should be in good body condition at lambing and kidding and should maintain good body condition during the breeding season. Bucks and rams should also be evaluated for proper body condition.

The beginning of sexual activity is called puberty, which is the first time a ram or buck produces sperm cells capable of impregnating a ewe or doe. Most rams and bucks reach puberty between 5 and 9 months depending on body weight, nutrition, breed, and various environmental factors. Puberty in the ewe lamb and doeling is the time when she shows her first heat with ovulation, which is the release of the egg from the ovary. Puberty in the ewe lamb and doeling is also affected by many factors.

Sheep and goat producers usually breed ewe lambs and doelings at the same time. Replacement ewe lambs and doelings born early in the season reach puberty earlier than those born late in the season because of their increased

age and body weight. Ewe lambs and doelings will reach puberty by 5 to 8 months if they have gained sufficient weight. Recommended target weights are 50 to 70 percent of adult weight. However, a ewe lamb or doeling should weigh at least 60 percent of her mature weight when she is bred for the first time. Ewes and does that lamb and kid early breed back earlier in the next breeding season. Therefore, it is essential that ewe lambs and doelings reach puberty early in a breeding season so they can be bred as early as possible.

Estrus, Sign of Estrus, Length of Estrous Cycle, and Ovulation

Estrus, or heat, is the period of time when the female is sexually receptive to the ram or buck. Sheep and goats are seasonally polyestrous and short-day breeders, meaning they will cycle regularly starting with the shortening days of fall. The most natural time for sheep to breed in Alabama is from August through December. For goats, the most natural time is usually from late July through December, but tropical breeds may cycle throughout the year.

The signs of estrus in ewes are less noticeable than they are in does. A doe in heat is restless, bleats and urinates frequently, and wags her tail rapidly. She may also experience loss of appetite and rub against other goats in the herd. Other signs include redness and swelling around the vulva, which may have a thin mucous discharge.

The signs of estrus in the ewe are not as easily detected when the ewe cannot hear, smell, or see the ram. Sheep and goats do not mount, or stand to be mounted, as often as cattle do. They will demonstrate this behavior when they are in heat by seeking out a ram or a buck and standing to be mounted by him or other ewes and does.

The estrous cycle is the period of time from the beginning of one heat period to the beginning of the next. The average cycle length is 17 days for sheep and 21 days for goats, with most cycles falling between 14 and 20 days for sheep and between 18 and 22 days for goats. Estrus can last from 24 to 36 hours in ewes and 24 to 48 hours in does. Ovulation normally occurs toward the end of estrus. Typical ovulation times for the ewe are about 24 to 27 hours from the beginning of estrus and about 24 to 36 hours from the beginning of estrus in the doe. An ovulation rate is the numbers of eggs produced per cycle. For ewes and does, the rate ranges from 1 to 2 per cycle; up to 3 eggs are occasionally ovulated. In both sheep and goats, the ovulation rate increases with age and reaches a maximum at 3 to 6 years, then declines gradually. Following ovulation, sheep and goat eggs are generally capable of fertilization for 10 to 25 hours.

Conception and Early Pregnancy

When a ewe or a doe is successfully bred to a fertile ram or buck, sperm cells meet the eggs in the oviduct. One sperm cell enters the egg and conception occurs. Maternal recognition of pregnancy in sheep occurs by day 13 and in goats by day 15 following conception. In sheep, embryonic implantation occurs by day 21 after conception. In goats, the fertilized embryo becomes firmly attached to the uterine walls by day 52. Implantation allows nutrient exchange and hormonal communication between the developing embryo and uterus.

Middle and Late Gestation—Fetal Growth and Maternal Support

During middle gestation, the ewe and doe have their lowest nutritional requirements. In late gestation (the last 50 days), nutrition is critical because 70 percent of fetal growth occurs during this time. Lack of adequate nutrition for the pregnant ewe or doe during the latter part of gestation will influence the offspring's birth weight, vigor, and survival. Poor nutrition during this period will also reduce the ewe's or the doe's level of milk production and, thereby, reduce the lamb's or kid's weaning weight. A ewe or doe should not be allowed to lose weight during this period.

An unborn lamb or kid receives its nutrients from the maternal blood circulation across the placenta. It is like a parasite living within the mother. Fetal development and growth have priority over any maternal needs, often at the expense of the ewe's or doe's own well-being.

Lambing and Kidding

Lambing and kidding time, known as parturition, is a very critical period in a producer's management schedule. Lambing and kidding usually occurs at the end of a 147- to 155-day pregnancy. Proper preparation, good breeding records, and personal notes will allow you to increase the survival rates of newborn lambs and kids. Table 2, based on a 148-day gestation period, can assist you in predicting the date of lambing and kidding. You should, however, watch your ewes and does closely beginning about 142 days after breeding. If you do not know breeding dates, a good rule of thumb is to watch for udder development and looseness of the vulva. Enlargement of the udder can be seen as early as 4 to 6 weeks before lambing and kidding. This development is less noticeable in first-time pregnancies than it is in later pregnancies. Both psychological and anatomical changes indicate impending lambing and kidding. Many ewes, does, ewe lambs, and doelings appear restless as lambing and kidding time approaches. Some separate from other animals and look for a secluded area in the pasture or barn. Swelling of the vulva and relaxation of the pelvic muscles and ligaments are noticeable. The tail may rise,

and the lambs and kids will appear to have dropped in the abdomen. The udder will become hard because of a mammary secretion, known as colostrum, near the time of parturition. The teats become swollen and enlarged. Signs of impending parturition are useful, but they vary so much that producers should be cautious when interpreting them.

Lambing and kidding are divided into three distinct stages of labor and can last from a few to several hours. Ewe lambs and doelings generally have a longer labor than ewes and does, and assistance may be required. The first stage of labor involves the beginning of uterine contractions and dilation of the cervix, which can last several hours. During the first stage, the ewe or doe will frequently separate herself from the herd. The end of stage one is sometimes marked by the appearance of a thick, clear, whitish mucous discharge in sheep, and of a tan, sticky substance smeared about the hind parts of the doe.

Stage two involves the actual birth of the lamb or kid and can take a few minutes or as long as 3 to 4 hours. As labor progresses, the ewe or doe will spend more time lying down on her side, with her head in the air or extended forward with front and rear legs touching the ground. The uterine and abdominal muscles have strong contractions during this stage. Soon a large bubble or water bag will appear, break, and expel the water. At this time during a normal birth, the tip of the nose and front feet of the lamb or kid can be felt; they are ready to enter the vagina. As labor progresses, the lamb or kid is forced along the vagina until its toes and nose are visible at the vulva. When the head has passed the vulva, the lamb or kid is born quickly. As soon as the ewe or the doe has delivered her lamb or kid, she starts cleaning it—licking its nose and the remainder of its head. If the ewe or doe is to have multiple births, interest in the previous lamb or kid will usually cease after the head is cleaned. She will return to labor, a water bag will appear, and soon another lamb or kid will be born.

The third stage of lambing or kidding consists of the expulsion of the afterbirth or placenta. The placenta is a red, shiny mass that many inexperienced sheep and goat producers mistake for part of the ewe's interior, a dead fetus, or a tumor. The placenta will have strawberry-like lumps and may have whitish cords. It will be expelled naturally about 2 to 3 hours after final delivery of the lamb(s) or kid(s). In multiple births, each lamb or kid will have a separate placenta. If the placenta is not expelled within a few hours, call your veterinarian. A retained placenta can result in a uterine infection.

You may miss the expulsion of the placenta if you do not check the ewe or doe at regular intervals. Some ewes and does may eat the placenta quickly, because her instincts are to hide the evidence of her lambing or kidding

Table 2. Gestation Table for Lambs and Kids

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
Mar	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	
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	-	
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
Sep	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	-	
May	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	Jun
Oct	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	
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	

Find breeding date in upper line; look below to find lambing or kidding date. Based on a 148-day gestation period.

Source: *Sheep Pocket Guide* AS-989, North Dakota Extension Service, Fargo, North Dakota.

to protect her offspring from predators. Properly dispose any remaining afterbirth so dogs and predators are not attracted to it.

Assistance at Lambing and Kidding

If the lamb(s) or kid(s) are in a normal position in the uterus and the environmental conditions are favorable, no assistance will be required. A normal lambing or kidding usually takes 5 hours—4 hours for dilation of the cervix and 1 hour for the actual delivery of the lamb or kid (Table 3). However, ewes and does that have been in stage two for 30 to 45 minutes without apparent progress may be having a difficult time. Personal experience and judgment are critical. Some people assist after 30 to 45 minutes so the ewe or doe does not become exhausted; others prefer to wait longer until fatigue is evident.

The two main causes of death for lambs and kids at birth are delayed assistance and assistance without sufficient skill. When stage one of labor has been in progress for more than 4 hours with no sign of the lamb or kid and the ewe or doe appears to be in unusual discomfort (standing, arching her back, and spreading her legs as if to urinate), the cause should be determined. Restrain the ewe or doe

before attempting to assist her. Follow these three steps: entry, examination, and manipulation. Every lambing and kidding is unique and demands a different action.

Many sheep and goat producers are skilled in areas of production but do not know their limitations. The principal ingredients for success when assisting with lambing or kidding are complete sanitation of the hands, knowledge of the anatomy of the reproductive tract, gentleness, patience, experience, and good judgment. Call a veterinarian if you are unsure of your skills in helping your animal.

Before assisting in the lambing or kidding process, remove all jewelry from your fingers and wrists. Trim your fingernails as close as possible, and scrub your hands and arms up to the elbows, preferably with surgical or highly antiseptic soap. Mild soap, either liquid or bar, will work too. Rinse in clean, warm water. Wash the external genitalia of the ewe and doe with a mild, soapy solution and disposable, sterile gauze or sterile cotton balls.

Lubricate your dominant hand with a sterile jelly. Begin by inserting three fingers in the vagina and gradually enter the entire hand. Carefully work your hand into the vaginal canal and assess the presentation. Quickly determine the

position of the lamb or the kid. When you feel the lamb or the kid, be sure you can tell the rear from the front and the forelegs from the hind legs. If you cannot tell the difference, stop and ask for qualified help. Some of the major frustrations experienced during the examination are working with one hand, feeling blind because you cannot see what is going on, and being unfamiliar with everything you feel with your hand.

Equipment for Lambing and Kidding

To be ready for lambing and kidding assistance, you need two clean buckets, mild soap for cleaning the genital area of the ewe or the doe, disinfectant, and commercial obstetrical lubricant. Do not use soap as a lubricant. Soap is irritating to the vaginal membranes and can cause inflammation and swelling of the reproductive tract that can result in a long uterine involution or recovery from lambing or kidding. You should also have vinyl gloves, KY Gel, Septi-Lube, or mineral oil for your hands to facilitate vaginal entry during a difficult delivery. Always wear disposable gloves to minimize the potential for zoonotic disease transmission. Fingernail clippers and an emery board to keep your fingernails short and smooth should be part of every kit. You might need a lamb puller, obstetric leg snare, or obstetric chain. Paper towels, old towels, and rags to dry newborn lambs or kids should also be part of your equipment.

Another set of equipment should be available to take care of the newborn. The newborn kit should include bottles, nipples, and a stomach tube in case the lamb or kid needs help getting colostrum, a thermometer, and a tincture of iodine (7 percent solution) for saturating and disinfecting the umbilical cord.

Normal and Abnormal Presentations During Parturition

Normal lambing and kidding in sheep and goats should be completed within 2 hours after the water sac appears. The most common types of presentations are anterior and posterior. In an anterior presentation, the front feet, with the head resting between them, appear first. When the head has exited the vulva, expulsion of the lamb or kid quickly follows. The appearance of the hind feet first is called posterior presentation, which may be a little slower than the anterior type and not as easy to deliver. The lamb or kid may also be twisted or turned in many different ways. Following are the common presentations and directions for assisting with each. Remember, when in doubt, call your veterinarian for assistance.

Head first with both forelegs, body right side up (Figure 1). This is an anterior presentation that occurs when the front feet appear first with the head resting between them. Rarely is any assistance necessary. However, when a small ewe or doe is delivering a very large lamb or

kid, she may encounter difficulty getting the lamb or kid through her narrow vulva. Lubrication and gentle assistance are sometimes required. Pull downward and only during the contractions. The lamb or kid is usually hung by the shoulders, and the contractions that follow will pass the shoulders through the remainder of the birth canal.



Figure 1. Head first with both forelegs, body right side up

Head first with one foreleg, body right side up (Figure 2). In this situation, you must bring the other foreleg forward. Try to elevate the ewe's or doe's posterior. Sometimes if the rump is elevated, the lamb or kid will recede into the abdominal cavity and naturally reposition itself. However, you will probably have to reach in and bring the other leg up beside the foreleg that is in the correct position. Such action will bring the legs farther in front of the head than normal. The head will often turn back when an attempt is made to pull both legs and the head into the birth canal. Be gentle as you work your way in. Use only one or two fingers if possible. A synthetic sterile cord ($\frac{1}{8}$ inch in diameter) may be required but only as a last resort. Make sure you bring up a foreleg and not a hind leg.



Figure 2. Head first with one foreleg, body right side up

Head bent down with forelegs correct, body right side up (Figure 3). This presentation, though abnormal, is neither unusual nor very difficult to correct. Push the lamb or kid back into the uterus. Try to elevate the ewe's or doe's rump so the lamb or kid will recede into the abdominal cavity and give you more room to move your hand in the uterus. Place the head on the forelegs. The contractions that follow will usually force the lamb or kid out as long as it maintains the correct position.



Figure 3. Head bent down with forelegs correct, body right side up

Head thrown back with forelegs correct, body right side up (Figure 4). This is almost the same presentation as shown in Figure 3. Remedial procedures are the same. Remember that you must move the head far enough back to turn it around.



Figure 4. Head thrown back with forelegs correct, body right side up

Hind feet first, body right side up (Figure 5). This is a posterior presentation that is slow and laborious but not abnormal. The hind legs are identified by feeling the hock joint and upper leg curvature instead of a straight knee and forearm on the forelegs. When the hind legs are out, you must help. With a very clean rag or towel, grasp both hind legs and pull downward gently with the contractions. Twist the lamb or kid gently from side to side and lubricate it with oil if it becomes too dry. When the rump appears, pull very hard when the ewe or doe pushes. When the lamb or kid starts to move, keep it coming. Be careful to avoid breaking the umbilical cord prematurely.

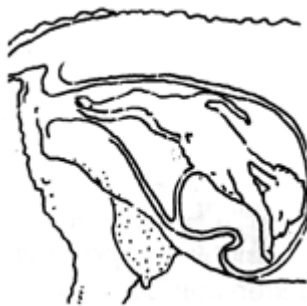


Figure 5. Hind feet first, body right side up

Hind feet first, body upside down (Figure 6). A large ewe or doe may deliver a lamb or kid in this position without assistance. This happens sometimes with the second presentation in a triplet birth when the birth canal is already enlarged and lubricated by the birth of the first lamb or kid. If assistance is needed, reach for both hind feet, twist, and gently pull downward when the ewe or doe pushes. Continue with assistance as explained above.



Figure 6. Hind feet first, body upside down

Breech position with rump and tail, no feet visible (Figure 7). A lamb or kid cannot be delivered in a breech position. However, patience is advised because a little time may bring the appearance of the hind feet into the birth canal. If the hind feet do not appear after a short time, assistance is required.



Figure 7. Breech position with rump and tail, no feet visible

Sometimes this presentation is confusing because the body is completely in the uterus. Or, if the body is in the birth canal, the rump may resemble the head. Feeling for the tail will help you to discern the presentation. Also check the direction the toes are pointing. If the toes point downward, the presentation is breech. If you feel only the tail, the hocks of the lamb or kid may be against the pelvis and no progress can be made. Bring the hind legs out one at a time, and be very careful to avoid entanglement with the umbilical cord. Continue as with a hind-feet-first presentation.

Head first with one foreleg, body upside down (Figure 8). This is much simpler than it looks if you recognize the presentation from examination. Reach over the top of the lamb or kid by pressing its head down. Then gently grasp the hind feet and pull them into the birth canal. The presentation will be changed into a hind-feet-first presentation, as in Figure 5.

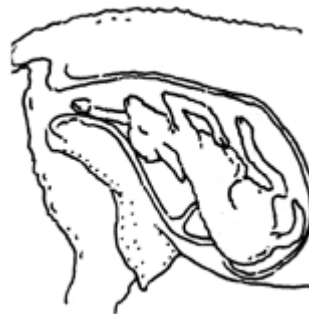


Figure 8. Head first with one foreleg, body upside down

Head alone, no feet visible (Figure 9). Lambs and kids cannot be delivered in this position. Early in the lambing or kidding process, if both feet are not under the nose, push the head back into the uterus. If the lamb or kid does not rearrange itself, then reach in the uterus, grab the forelegs, and place them under the lamb's or kid's head. Resist efforts to expel the lamb or kid by the ewe or doe. Reach under the lamb's or kid's neck with one finger and

hook a leg to pull it forward under the chin. Repeat this procedure with the second foreleg.



Figure 9. Head alone, no feet visible.

Assistance After Lambing and Kidding

In normal lambing and kidding, the ewe or doe can usually take care of the newborn; therefore, it is best not to interfere. Let them establish their bond, but be sure the ewe or doe claims each of her lambs or kids and allows it to nurse before you leave the area. In unusual cases, it may be necessary to wipe the mucous from a lamb's or kid's nostrils to permit breathing. Stimulate breathing by rubbing the inner nostril with a feather or a straw. Artificial respiration methods may be required for some lambs or kids. The first minutes are critical, and any measures must be taken without hesitation to get breathing started.

Nutrition of Newborn Lambs and Kids

A vigorous lamb or kid will attempt to nurse within a half hour to an hour after birth. A weaker lamb or kid takes a longer time before it is up and nursing. Make sure the lamb or kid receives adequate colostrums, the first milk produced by the ewe or doe for a short period following lambing and kidding. Newborn lambs and kids need colostrum soon after birth. It is very important because it provides energy, protein, vitamins, and minerals as well

as antibodies that help the lamb or kid resist infections. Colostrum also has laxative properties, removing fecal matter that has accumulated in the digestive tract. Because lambs and kids are born with a low level of vitamin A, colostrum, which is rich in vitamin A, is essential to build up vitamin A reserves. A lamb's or kid's ability to absorb antibodies from colostrum decreases rapidly after birth, and after 36 hours, the newborn is unable to absorb any more antibodies from the colostrum. For optimum immunity, newborn lambs and kids should ingest 10 percent of their body weight in colostrum during the first 24 hours of life. The extra colostrum produced by high lactating ewes and does during the first 24 hours following lambing and kidding can be frozen for later use when needed. Only the first milking from healthy animals should be frozen for later feeding. Colostrum from older animals that have been on the premises for several years is typically higher in antibody content against endemic pathogens than is colostrum from first fresheners. Ice cube trays are ideal containers: once frozen, cubed colostrum can be stored in larger containers and the trays used for another batch. Ice cubes are the perfect size for newborn lambs and kids, thus thawed colostrum is always fresh, and waste is minimized. Thaw colostrum either at room temperature or at a fairly low temperature. Do not warm it in a microwave oven because the heat will destroy the antibodies in the colostrums. Do not dilute colostrum with water.

Lactation—Nutritional Demands

Lactation has priority over all the other physiological functions in the ewe or doe and, most important, over resuming the estrous cycle. If a ewe or doe gives birth during the breeding season, she will be lactating during a time when she not only has to meet the needs for the start and maintenance of lactation, which receives top priority,

Table 3. Stages of Lambing and Kidding, Related Events, and Duration

Stage	Events	Ewe lamb or doeling duration	Ewe or doe duration
Stage One: Preparatory (dilation of cervix)	Lamb or kid rotates to upright position. Uterine contractions begin. Female is very restless.	6 to 12 hours	4 to 8 hours
Stage Two: Delivery (expulsion of fetus)	Lamb or kid enters birth canal. Water sac appears. Water sac ruptures. Front feet and head protrude first. Lamb or kid is delivered.	1 to 4 hours	Less than 1 hour
Stage Three: Cleaning (expulsion of placenta)	Ewe or doe straining decreases. Button attachment between uterus and placenta relaxes and separates. Placenta is expelled.	1 to 8 hours	1 to 8 hours

Source: Adapted from G.H. and D.B. Hudson. 1988. Assisting The Beef Cow At Calving Time. Univ. of Nebraska—Lincoln. Agricultural Publication G81-539A.

but she must also maintain her body condition, repair her reproductive tract, and resume her reproductive cycle. The ability of the ewe or doe to meet these requirements correlates to both her body condition at lambing or kidding and to the level of nutrition she receives after giving birth.

Return to Cyclicity—Hormones

Without estrus and ovulation, there will be no more lambs or kids. The major problem producers have is the lack of estrus activity, which is called anestrus. Lack of estrus is normal during three reproductive stages:

(1) before reaching puberty, (2) during pregnancy, and (3) depending on the timing of lambing and kidding, for a short period after parturition. Because ewes and does are seasonal breeders, postpartum estrus is greatly affected by the season.

Breeding Soundness Exams for Rams and Bucks Before the Breeding Season

To help reduce production losses due to infertility, rams and bucks should be evaluated by a veterinarian for breeding soundness 30 to 60 days before the breeding season, allowing time to recheck or replace subfertile rams and bucks.

Remember that a good ram or buck is an important part of a breeding program, and a poor ram or buck can ruin your entire breeding program. Evaluation for breeding soundness may be one of the most neglected management practices. The evaluation should include the following:

- Physical examination
- Reproductive tract examination
- Semen evaluation

The physical exam should include observation of all that may interfere with a ram's or buck's ability to locate ewes and does in heat and successfully breed them. The ram or buck must be able to move freely, have adequate senses of sight and smell, carry sufficient body condition to work the length of the breeding season, and be free of diseases. Watch the ram or buck walk. All rams and bucks should be free of structural defects that may affect their ability to breed. Look for conditions, such as lameness, that can affect mobility. The rear legs are especially important because they must support his weight while breeding. Check the feet for swelling and overgrown hoofs. Reject any ram or buck that has poor feet and legs. Any indication of disease, internal parasites, or external parasites should be managed properly. The head and eyes should also be checked carefully.

The reproductive tract exam consists of both an external examination of the reproductive organs and a rectal examination of internal reproductive structures and accessory glands.

Scrotal Circumference

Scrotal circumference is one of the most useful measurements of a ram's or buck's breeding ability. Research indicates that scrotal circumference is highly related to improved semen quality, quantity, and reproductive success. Rams and bucks with larger testicles also tend to sire ewe lambs and doelings that reach puberty at a younger age. Table 4 shows how rams can be classified according to scrotal circumference.

Table 4. Minimum Recommended Scrotal Circumference by Age in Rams and Bucks

Age	Minimum circumference
5 to 6 months	29 centimeters
6 to 8 months	30 centimeters
8 to 10 months	31 centimeters
10 to 12 months	32 centimeters
12 to 18 months	33 centimeters
18 + months	34 centimeters

Make sure the testicles are the same size and firmness and that they slide freely within the scrotum. The epididymis, which carries sperm from the testicles, can be felt at both the top and bottom of the testicles and can also be checked in this way for any abnormalities.

The penis, urethral process, and prepuce should also be examined. Check for sores, swellings, or blood clots that may indicate penile or preputial injuries. Rams and bucks occasionally suffer from adhesions on the penis, making it difficult or impossible to extend for breeding. While this problem can be corrected surgically, it is an inherited defect and these rams and bucks should be culled.

Semen Quality Evaluation

The semen evaluation can be conducted more than once if a less than satisfactory result is obtained the first time. Table 5 shows normal semen parameters in the mature ram and buck. A good sample will have a milky or creamy appearance. Under a microscope, a drop of semen will have the appearance of boiling or rolling with the activity of millions of sperm. A veterinarian will also stain some sperm to evaluate the percentage of normal and abnormal sperm. Use judgment in culling a young ram or buck on the basis of one semen evaluation, because the first sample can be misleading. From the time sperm cells begin to form in the testicles, it is 40 to 60 days before they are ejaculated.

Rams and bucks can experience temporary periods of poor semen quality due to stress. Higher than normal temperatures caused by weather or infection are the most common causes. If a ram or buck has poor semen quality, do a second semen evaluation within 30 days. Exposure to extreme environmental temperature can damage semen quality for up to 45 days.

Table 5. Normal Semen Parameters in the Mature Ram and Buck

	Ram	Buck
Volume (mL)	1 (0.8 to 1.2)	0.8 (0.5 to 1.0)
Sperm concentration (billion and ml)	2.5 (1 to 6)	2.4 (2 to 5)
Motile sperm (%)	75 (60 to 80)	80 (70 to 90)
Morphological normal sperm (%)	90 (80 to 95)	90 (75 to 95)

Post-breeding Season Pregnancy Check and Ewe and Doe Physical Exam

Responsible culling improves flock and herd productivity and efficiency. Cull ewes and does early. Failing to check and cull open ewes and does can allow the spread of diseases that affect reproduction. At the same time, check the eyes, mouth, feet, legs, and udders. Ewes and does must have good eyes and teeth to get the forage they need for milk production and fetal growth. Missing teeth, or badly worn teeth, are sure ways of getting your ewes and does in poor body condition, and ewes and does in poor condition do not breed early in the breeding season, if at all. Cull ewes and does with poor teeth. Ewes and does with bad feet and legs get lame. A good udder, well-balanced with well-spaced teats, is necessary to raise a good lamb or kid to weaning. A good quality, heavy-weight lamb or kid has a dam that produces and dispenses plenty of milk. Lactating females with pendulous, large teats should be culled because the newborn will have a hard time nursing and getting the essential colostrum as soon as possible after birth.

Body Condition Exam Before Lambing and Kidding

Improper nutrition before parturition negatively influences a lamb's or a kid's birth weight, vigor, and survival. Also, poor nutrition before lambing or kidding also causes a longer postpartum interval, reduces the level of milk production, reduces weaning weights, and may cause other metabolic abnormalities for the ewe or doe.

Breeding for the Marketplace: When to Lamb and Kid and When to Wean

In Alabama, sheep and goat producers typically lamb and kid their herds January through June so relatively few lambs and kids are born in July and August. While the demand for lamb is not built around ethnic considerations, the demand for goat meat is derived from religious and social traditions. Accordingly, the demand for goat meat increases at specific times of the year including Easter and Christmas. One of the greatest challenges to the meat goat industry is reaching mainstream consumers and not just specific ethnic groups. Another challenge is the excessive supply of animals on the market during certain times of the

year and the scarcity during other times.

If producers want to market a lamb or kid for a specific ethnic religious holiday, they should first identify the date for that

specific holiday and the type of lamb or kid preferred. For example, if the market prefers milk-fed lambs or kids between 30 and 55 pounds for a particular holiday, the producer can follow this timeline: For a lamb or kid weighing 6 pounds at birth to grow to 55 pounds—assuming an average daily gain of one-half pound—he or she will need 98 days; for the lamb or kid to grow to 30 pounds, he or she will need 48 days. Use the average 150-day gestation period for sheep and goats to calculate when the lambs or kids need to be born. This means you definitely want your ram or bucks in the herd 150 days before that birth date. Most ewes and does are stimulated to come into heat by the smell of a ram or buck within a week of the male's sudden introduction into the herd. However, the heat cycle of ewes and does is 14 to 22 days so if you want to make sure your ewes and does have a chance to lamb or kid by the estimated birth date, put the ram or buck in the herd 2 weeks earlier.

Pasture Breeding Management

Pasture breeding and artificial insemination are the two methods of breeding used in sheep and goats, with pasture breeding being the most commonly used. The main advantage of pasture breeding is the reduction in required labor. After the rams and bucks are put in with the ewes and does, all that is required is an occasional visit to the pasture to see that the males are actually with the ewes and does and that the females are being settled. A marking harness can be used with sheep to help determine that the ram is mounting although this does not guarantee that breeding has occurred.

Male and Female Ratios

The number of ewes or does that a ram or buck can service under pasture breeding depends on the length of the breeding season, the age of the ram or buck, and the type of housing (pasture, paddock, range, etc.). Yearlings and two-year-olds are still growing and should avoid excessive loss of body weight during the breeding season. A good management practice in this case limits the number of females to 15 to 30. Generally recommended ram-to-doe and buck-to-ewe ratios are shown in Table 6. These are average numbers only—individual rams and bucks may be able to serve more or less females than the numbers indicated in table 6. Producers must provide supplemental nutrition to young rams and bucks after their first breeding

season to bring their body condition back. Remember, they are still growing.

A young ram or buck should generally not be put in a pasture with an older, more experienced ram or buck because the younger males are often intimidated and sometimes injured by the older ones.

Artificial Insemination

The use of artificial insemination allows producers to use superior rams and bucks to dramatically improve lamb and kid performance in the areas of birth weight, weaning weight, and muscling. However, the rewards of artificial insemination depend on sound management. Estrus synchronization in sheep and goats in the United States is limited by their classification as minor livestock species. The availability of pharmaceuticals for estrus synchronization is restricted, and most applications currently used require the extra-label application of products developed for the major livestock species, such as cattle and swine. Extra-label use of reproductive hormones in food producing animals is illegal according to the U.S. Food and Drug Administration; therefore, producers must learn how to detect heat visually or with teaser animals.

Artificial insemination in sheep and goats is more difficult than it is in cattle because of the small size of the animal and the complex anatomy of the cervix, making insemination into the uterus difficult. Sheep are more difficult than goats. Live, viable sperm must be deposited correctly into the reproductive tract of a female in heat in order to establish a pregnancy. As mentioned previously, ovulation occurs near the end of heat, or estrus. Estrus can last from 24 to 36 hours in the ewe and 24 to 48 hours in the doe. Ovulation occurs toward the end of estrus about 24 to 27 hours from the beginning in the ewe and 24 to 36 hours in the doe.

Producers should have realistic expectations of the results of artificial insemination programs. Many have expectations that are well beyond what is normally achieved. A good benchmark is to compare the results of sheep and goat artificial insemination programs with the results of cattle artificial insemination programs.

Factors that will improve results include adequate nutrition before, during, and after breeding; good animal health; accurate record keeping; organization of the breeding program; the producer's ability to detect estrus;

high-quality semen; proper storage and handling of the semen; and availability of working facilities adequate enough to allow easy handling. Even when everything is done properly, it is hard to beat the ram or buck at his own game. Artificial insemination's slow growth in sheep and goat herds is not only due to the illegal extra-label application of products but also to the problems producers have detecting estrus, especially in terms of time and labor. Detecting heat is one of the least popular management practices of any artificial insemination program, and it is a major deterrent to success.

Alternatives to Induce Out-of-Season Estrus and Estrus Synchronization During the Breeding Season

A gestation period of 148 days makes it possible for a ewe or doe to give birth more than once a year. But because of the seasonality of anestrus, ewes and does do not cycle after spring kidding and lambing until late summer or early fall resulting in just one lamb or kid crop per year. If the ewe and doe could be induced to come into estrus and breed during this seasonal anestrus period, they could lamb and kid in the breeding season and produce three in two years (8-month interval) or twice a year (6-month interval). A possible breeding scheme would be to breed in January, then again in September. Out-of-season breeding programs help producers attempting to increase the profitability of their operations by increasing the supply of lamb and cabrito to the marketplace on a year-round basis. Goats generally respond more favorably than sheep to out-of-season breeding. Two methods for inducing out of season estrus are light control (photo period) and the ram or buck effect.

Light Control

Altering the day-length pattern by controlled lighting can be used to induce estrus. The change of day length from long days to short days initiates the estrous cycle in sheep and goats. Rams and bucks as well as ewes and does should be exposed to the same amount of light every day. Exposure of rams and bucks to short days will increase sperm production, mating activity, and semen quality. The amount of light should be reduced gradually over an 8- to 12-week period.

Table 6. Ratio of Ewes per Ram or Does per Buck

Age of Rams or Bucks	Ratio of Ewes Per Ram or Does Per Buck
Ram lambs and buck kids (approximately 8 to 10 months)	15 to 30 ewes or does per 1 ram lamb or buck kid
Yearlings (approximately 12 to 16 months)	25 to 50 ewes or does per 1 yearling ram or buck
Mature rams and bucks	100 ewes or does per 2.5 to 3 rams or bucks

Ram or Buck Effect

When a ram or buck is introduced to a group of females, the ewes and does come into estrus. This effect is known as the ram or buck effect. The male effect works best in breeds that are less seasonal and during the transitional breeding season (July through August) when most ewes and does have not yet begun to cycle but are almost ready. During the nonbreeding season, some females may even be stimulated to ovulate and express estrus. The male effect relies on females and males being totally isolated from each other for at least 1 month. Ewes and does must be far away from rams and bucks so no contact is made by either sight or smell. The initial ovulation will be a nondetectable “silent heat” at 3 to 4 days after the introduction of the ram and buck. Two peaks of estrus activity follow this around days 18 and 25. Ewes that do not conceive may cycle again in 17 days. In does, ovulation occurs 2 to 10 days after introduction of the buck. The male effect works because rams and bucks produce chemical substances called pheromones, the smell of which changes the reproductive physiology of the female and stimulates her to start cycling. The value of the ram or buck effect is the synchronization of estrus activity resulting in large numbers of ewes and does ovulating, conceiving, and birthing in a relatively short period of time. To be effective, it is important to have adequate numbers of young, healthy rams and bucks. Teaser or vasectomized rams and bucks can also stimulate the ram or buck effect.

Management Factors Affecting Out-of-Season-Induced Estrus and Breeding

The management and care of ewes and does have an impact on the success of out-of-season breeding. They must be in good body condition, preferably gaining body weight at the time of breeding. Flush, a term meaning to provide excess energy, the ewe or doe before and during breeding. The start and duration of flushing depends on the body condition of the animals.

Rams and bucks must also be in good body condition. Poor nutrition can decrease testicular size and sperm reserves at a time when the size and reserves are already smaller than during the breeding season. Production of spermatozoa takes 7 to 8 weeks. As a result, supplementary feeding must begin 8 weeks before the start of the breeding season to increase sperm reserves. Seasonal variations with respect to semen production, semen quality, and libido should also be considered. Elevated body temperatures from hot weather can cause temporary infertility. Shear rams 2 months before breeding and be sure that all wool is removed from the scrotum area. Another very important factor is to ensure that adequate ram power is available

for out-of-season breeding. Rams are not able to breed as many ewes out of season.

Causes of Poor Reproductive Performance

The goal of this publication is to provide Alabama sheep and goat producers with the most effective measures available to achieve reproductive success. At some point, even the most experienced sheep and goat producer will face the unexpected—the problem whose source is not easily identified (Figure 10).

Sudden low lambing and kidding percentages are always unexpected. Identifying and correcting the problem is seldom easy but must be done for the success of your operation.

Reproductive Management: A Summary

Starting with the premise that production is equal to reproduction, sheep and goat producers must control the reproduction of their flocks and herds. Because reproductive traits are only slowly improved through genetic selection, producers must manage what factors they can control: age, environment, and nutrition.

- Carefully watching for first estrus, or puberty, in ewe lambs and doelings is the first of these considerations.
- Be aware of weather extremes during all reproductive stages. Every member of the flock or herd requires some protection from weather extremes, especially in the hot, humid summer months.
- Monitor body condition, an important factor that producers can control. Body condition in ewes, does, ewe lambs, and doelings influences puberty, conception rate, and the health and vigor of newborn lambs and kids.
- Remember that older ewes and does have different body condition needs than ewe lambs and doelings, which are still growing. Feeding the bred ewe lamb and doeling is feeding a developing fetus as well. The body condition and lambing and kidding performance of a ewe lamb or doeling will have a major effect on subsequent reproductive performance.
- Pay special attention to the pregnancy itself, which is probably more important to the average sheep and goat producer than the physiology of conception. Don't allow the ewe or doe to lose weight while pregnant. Lack of proper nutrition during the last trimester when the lamb or kid is gaining up to 60 to 70 percent of its growth reduces the birth weight and the prospects for survival. Poor nutrition also reduces the level of milk production, thus reducing weaning weight.

- Conduct breeding soundness exams for rams and bucks 1 to 2 months before the start of the breeding season. Ewes and does should also be physically examined at weaning and evaluated not just for body condition score but for soundness of feet, udder, eyes, and mouth. Lamé animals have a difficult time grazing, browsing (eating woody plants), and getting to water. Goats sometimes stand on their hind legs to reach leaves and brush. A good udder is necessary to raise a healthy lamb or kid, and a newborn must be able to

nurse its dam shortly after birth to receive colostrum. Animals with good eyes and vision are easier to handle and, therefore, you will have less stress when performing the many management practices scheduled during the year. To raise a good lamb or kid, a ewe or doe must also be able to convert forage and browse into milk, starting with a good set of teeth.

- Remember that good reproductive management pays off.

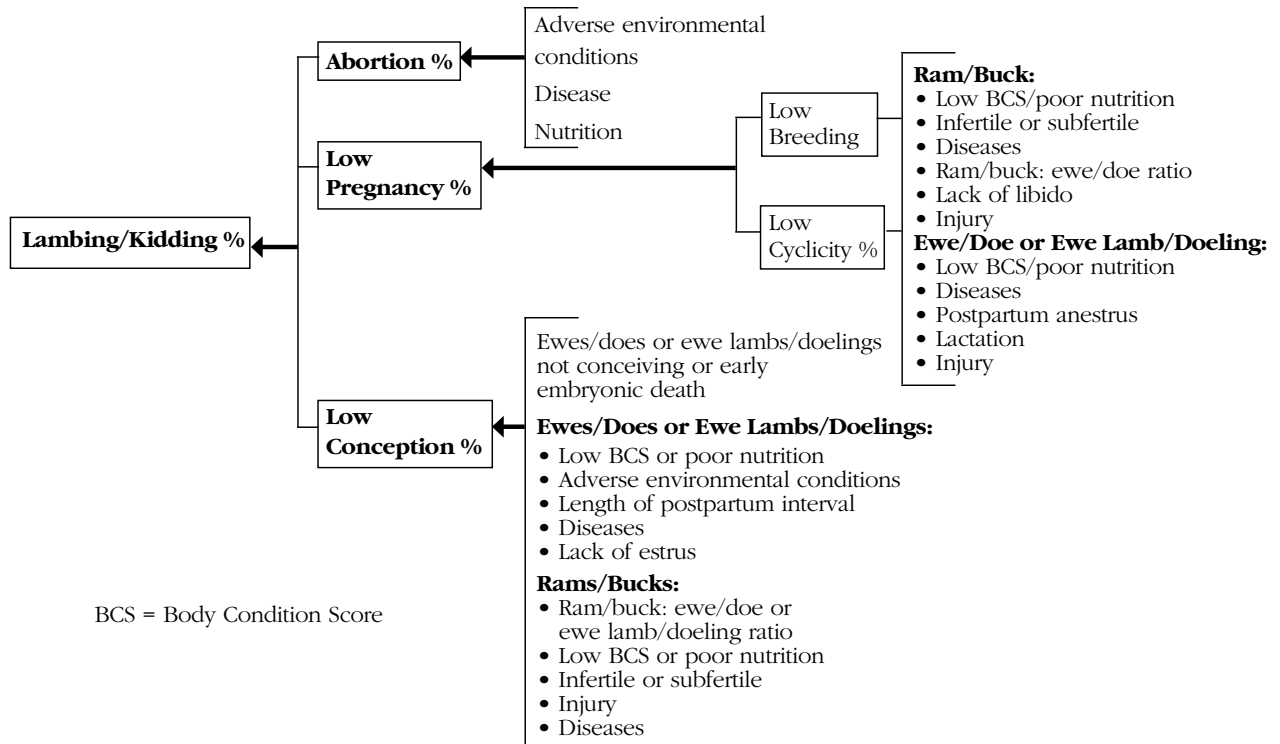


Figure 10. Possible causes of poor reproductive performance

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