Reproduction in Sheep

R. E. Hudgens
Reproductive efficiency of sheep is affected by a number of different factors. To obtain the highest possible degree of reproductive performance from your flock, you should have a general understanding about the anatomy and physiology of sheep reproduction. In addition, it's important to know how the environment can influence the reproductive performance of sheep. Therefore, the purpose of this publication is to provide an overview of sheep reproduction so the sheep producer can make knowledgeable reproductive management decisions.

Reproductive Anatomy of the Ewe

The female reproductive organs of all breeds of sheep are the same (Fig. 1). The ovaries (two) are almond-shaped organs and are about 11/2 inches long by 1/2 inch wide. The ovaries release the ova (eggs) at 17-day intervals during the breeding season or until the ewe becomes pregnant. The ovaries also produce female hormones, progestogens and estrogens. These hormones are compounds that are involved in the control of the reproductive cycle of the ewe.

Fertilization, the union of the sperm from the ram and the egg from the ewe, takes place in the oviduct. After about four days in the oviduct, the fertilized egg(s) enters the uterus, and fetal membranes begin to grow and attach to the uterus at approximately 75 sites. These attachment sites are cup-like projections called caruncles. Nutrient and waste products are exchanged at these sites.

The cervix is a tough, tubular, gristle-like organ between the uterus and the vagina. The cervix is closed during pregnancy and does not allow foreign materials to enter the uterus. The cervix of the ewe has approximately seven folds or interlocking ridges and is about 3 inches long. These folds make it difficult to (insert) a catheter when artificially inseminating a ewe.

The vagina is posterior to the cervix, extending to the external opening. It receives the penis in copulation, and is the passageway for the fetus at birth.

Figure 1. Female reproductive organs of the ewe.
Table 1. General Information About Ewe Reproduction.

<table>
<thead>
<tr>
<th>Item</th>
<th>Average</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of the estrous cycle</td>
<td>17 days</td>
<td>14-19 days</td>
</tr>
<tr>
<td>(time from the beginning of one heat period to the start of the next heat)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of estrus (heat)</td>
<td>35 hours</td>
<td>20-42 hours</td>
</tr>
<tr>
<td>Anestrus (period of time when ewes are not having estrous cycles)</td>
<td>April, May, June, July, August</td>
<td>late spring, summer and early fall</td>
</tr>
<tr>
<td>Ovulation (when the egg is released after the onset of heat)</td>
<td>24 hours</td>
<td>18-40 hours</td>
</tr>
<tr>
<td>Gestation (pregnancy)</td>
<td>150 days</td>
<td>140-160 days</td>
</tr>
<tr>
<td>Age at puberty</td>
<td>5 months</td>
<td>4-7 months</td>
</tr>
<tr>
<td>Number of ova (eggs) shed per ovulation</td>
<td></td>
<td>1-4</td>
</tr>
</tbody>
</table>

Table 2. Gestation Length for Sheep.

<table>
<thead>
<tr>
<th>Average Number Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>144</td>
</tr>
<tr>
<td>Cheviot</td>
</tr>
<tr>
<td>Dorset</td>
</tr>
<tr>
<td>Finnsheep</td>
</tr>
</tbody>
</table>

Reproductive Anatomy of the Ram

The male reproductive system consists of two testes (or testicles) contained in the scrotum, accessory sex glands and the penis (Fig. 2). The testes are the primary organs of reproduction in males. The "normal" testicle should be firm but not hard, large and both of equal size. Recent research indicates testicular volume is related to fertility in both the ram and the offspring they produce. Testicular size can be easily measured with a flexible tape at the greatest scrotal circumference. Average scrotal circumference for ram lambs 5-7 months of age is 12-13 inches and 14-15 inches for a mature ram.

The testes produce spermatozoa (sperm) and male hormones which give the ram his masculine appearance and sex drive. The scrotum is a sac-like pouch that contains the testes and helps regulate their temperature. The testes must be maintained several degrees below body temperature for normal sperm production to occur. Each testicle is connected to the urethra by a single tube termed vas deferens. Sperm from the testicles pass through the vas deferens into the urethra and on out the penis during copulation.

The accessory sex glands (bulbourethral and vesicular glands) secrete fluids into the urethra. The function of these fluids is to add volume to the sperm, clean and lubricate the reproductive tract and provide energy for the sperm cells.

The penis is the male organ of copulation. Retractor penis muscles attach to the sigmoid flexure (an "S" curving of the penis) to shorten the length in the relaxed state.

Daylength

Most breeds of sheep have seasonal breeding patterns affected predominantly by the number of hours of light in a day. Ewes normally will begin to cycle when the number of daylight hours drop below 12 to 14. A definite pattern of daylength appears necessary to initiate heat—shorter days must be preceded by longer days. Ewes that come into heat before or after the normal breeding season demonstrate erratic cycle lengths.
The ram does not show a restricted breeding season common in the ewe, but seasonal variations in semen production and characteristics are evident. Sexual activity of the ram tends to be highest in the fall and often declines in winter, spring and summer. Aspects of semen quality, such as total sperm, motility, proportion of live and normal sperm and metabolic activity of the sperm are highest in the fall.

Temperature

The role of temperature in reproduction of sheep is important. Most breeds begin cycling in cooler weather. Some sheep such as the blackface mutton breeds (Hampshire, Suffolk) are particularly sensitive to heat stress. Other breeds, such as Dorset and Merino, tend to cycle year-round and appear to be little affected by higher temperatures. Embryo death losses are increased when environmental temperatures remain 90°F or higher during breeding and early gestation. Lamb birth weights are reduced and lamb survival is decreased when temperatures remain high throughout pregnancy which is often the case for fall-born lambs.

Sperm production by the ram is sensitive to temperature changes. Environmental temperature above 90°F for a prolonged period of time will usually interfere with the production of semen. During prolonged periods of excessive heat, the ram may become sterile. This damage is usually not permanent, but requires approximately 50 days of cooler temperatures before the ram fully recovers. Heat stress is greater as the relative humidity rises.

The fertile ram should be kept or have access to a cool environment (<75°F) for at least 50 days before turning him with the ewes. Shearing will help keep him cool.

Nutrition and Reproduction

Proper nutrition is necessary for optimum reproductive performance. Ewes in moderate body condition during the breeding season will produce more lambs than ewes in poor condition or ewes that are overfat.

The practice of placing ewes on a higher level of nutrition, before the breeding season (“flushing”) increases the number of ova shed and can result in a higher lamb crop percentage. Ewes can be flushed by placing them on fresh, good quality, grass pasture or by feeding them approximately 1/2 lb./day shelled corn per head beginning 14 days before breeding.

The results from flushing experiments, however, have been variable. In general, ewes in poor or medium body condition will respond to a nutritional flush by producing a higher lamb crop. Response to flushing is also greater either early or late in a breeding season.

Ewes should not be grazed on pastures containing a high percentage of legumes, such as alfalfa or clover just before and during the breeding season. The estrogen content of legumes can reduce conception rates and delay breeding which will reduce the lamb crop. Estrogen content is reduced after frost and when legumes are in late maturing stages.

Rams should be in moderate body condition but not overly fat before and during the breeding season. A ram lamb should receive 1-2 lb./day shelled corn in addition to a high quality pasture during the breeding season. Pasture alone may be adequate for the mature ram during the breeding season. If, however, the ram is thin before breeding or begins to lose weight during breeding, he should receive 1-2 lb./day shelled corn.

Effect of the Ram on Ewe Fertility

Placing a “teaser” ram (sterile ram) with ewes near the end of the anestrous period may help to induce estrus and ovulation earlier than would normally occur without the presence of a ram. Ewes in the transitional stage, from anestrous to “normal” estrous cycles have been shown to ovulate within 6 days after being placed with a ram. Often, this first ovulation is not accompanied with outward signs of heat but estrus and ovulation will occur one cycle later. For best results, teaser rams should be placed with ewes 10-14 days before the breeding season. Ewes will cycle and conceive earlier in the season and estrus activity is somewhat synchronized. Lambing percentage will not be increased, in fact, ewes that breed later in the fall breeding season have more twins than ewes bred early in the season.

The average number of ewes that a ram can serve varies with age, season, temperature, sex drive and physical condition of the ram. The following can be used as a guide to determine the number of ewes one ram can serve during a fall breeding season: well-matured ram lamb—15-30; yearling to five-year-old ram—25-50; six years and older varies with the ram’s condition.

The ram can greatly influence the number of lambs born per ewe exposed as well as the number of ewes conceiving during the breeding season. Variation in sexual behavior can affect lambing rate. Some rams are more aggressive breeders than others. Some rams mate repeatedly with the
same ewe even though many ewes are in heat at the same time. Malnutrition, internal parasites, or diseases may cause sterility or depress his desire to mate.

Breeding soundness evaluation of potential sires is a recommended practice particularly in one-sire flocks where the entire lamb crop is dependent on one ram. It requires some technical training and special equipment and is usually done by a practicing veterinarian. It includes an evaluation of body soundness, reproductive tract soundness and semen quality.

During the breeding season a marking harness with a crayon should be used on the ram or his breast can be smeared with a marking pigment. In either case, when the ram mounts the ewe her rump will be marked. By changing the color of the crayon or marking pigment every 15 days, approximate lambing dates can be calculated.

Summary
Success and profitability of any sheep enterprise is closely related to the level of lamb production. The number of lambs raised per ewe in Indiana has changed very little in the past 10 years. Knowledge of reproduction and the environmental factors that influence it are necessary for making management decisions that will result in maximum lamb production.