Management Considerations for Accelerated Lambing in Western Oregon

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Most sheep producers would welcome the opportunity to increase production by 50 percent without a great increase in costs. In recent years, technology aiding such an opportunity has been developed; it is called accelerated or multiple lambing. This means decreasing the time interval between successive lambings for a flock. To obtain the 50 percent increase in production, three lamb crops must be raised each 2 years; so the normal lambing interval of 12 months must be decreased to an average of 8 months.

In 6 years of accelerated lambing at a Kansas experiment station, annual gross income per ewe was increased from 58 to 86 percent over that from once-a-year lambing. Such systems have been used successfully by Midwest producers for several years and involve complete or nearly complete confinement of ewes. This is feasible mainly because of the low cost of home-grown feedstuffs, primarily corn silage, alfalfa hay, and corn. These crops can be grown in western Oregon, but they must be irrigated to be grown successfully. Therefore, production costs for harvested feeds will be higher. Economically attractive accelerated lambing systems in western Oregon depend largely on forage from irrigated and dryland pastures. Therefore, western Oregon producers would not have sheep in total confinement but rather in partial confinement.

The purpose of this report is to outline management practices necessary for successful accelerated lambing in the coastal Pacific Northwest. Advantages as well as disadvantages of accelerated lambing are discussed, and forage production strategies on both hill land and irrigated valley pastures are examined.

Considerations

A successful accelerated lambing program requires more management skill than conventional once-a-year lambing. For this reason, not all sheep producers should be encouraged to start one. How proficient should a producer be before considering multiple lambing? Some guidelines: (1) Are 150 lambs born per 100 ewes exposed to rams? (2) Are there fewer than 5 percent dry ewes? (3) Is there at least a 130 percent lamb crop at weaning? If an operation is deficient in any of these areas, an immediate switch to accelerated lambing might not be wise. A better alternative would be to

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reach those levels of production in a conventional program first.

Many other areas should be considered. Some changes will be required in most facilities; how extensive the changes are depends on the farm. Additional fencing usually is required because of changes in breeding, lambing, and weaning schedules. Costs for these changes must be weighed against potential income from increased lamb production. Fuller utilization of facilities is an added advantage of a multiple lambing scheme (three lamb crops in 2 years).

The availability of labor also must be examined. The highest labor requirement in any sheep operation comes at lambing time. In an accelerated program this requirement comes more frequently and at different times of the year (in March, November, and July, for example). Often sheep are not the only farm enterprise; other labor requirements also must be met. Consideration must be given to the source, availability, and cost of labor.

A critical factor for any accelerated program is nutrient requirements of the sheep. Feed accounts for approximately 70 percent of the cost of lamb production in once-per-year lambing. This percentage is somewhat less on an accelerated program, since the ewe is more productive, but approximately 20 percent more feed is required for ewes in an accelerated program than for ewes lambing only once a year. This is because accelerated ewes are productive (in late gestation or lactation) a higher percentage of the time than unaccelerated ewes. Ewes lambing only once a year can be fed a low-cost maintenance diet for a larger portion of the year.

Setting Up the 2-Year Lambing Cycle

Many variables influence the decision of when to lamb. Generally, at least one mating is planned so that it corresponds with the natural breeding season of the ewe breed or cross. Commercial western Oregon ewes normally start estrous cycling in August or September and continue through December, with some variation between breeds. Ovulation rate and subsequent twinning rate are the highest from October mating and decline somewhat thereafter.

The natural breeding season could produce lambs as early as January and as late as May. The decision of when to start breeding usually is determined by the availability of labor and forage. Variables that also should be considered are weather, facilities, and lamb market. In making the final decision, consideration must be given not only to the first lambing but also to the second and third lambing seasons in the 2-year cycle.

Although lambings are generally 8 months apart, some accelerated programs have been set up on a 7-7-10-month lambing interval or some other combination using a 10-month interval. Using this approach, it is possible to breed ewes twice during a 2-year period without the use of hormone therapy. (The third mating requires hormones.) For example, ewes could be mated in September (without hormones), April (with hormones), November (without hormones), and September (without hormones) to lamb in February, September, April, and February.

Specialized producers with large flocks have the additional option of lambing six times during a normal 2-year cycle. This can be accomplished by dividing the flock into two groups, with the second group lambing 4 months after the first. The biggest advantage of lambing six times in 2 years is that any ewe that does not lamb, or that loses a lamb at birth, can be shifted back into the next breeding group. Thus, any ewe not nursing a lamb can be brought back into production 4 months earlier. This six-lambings-per-cycle program requires more labor throughout the year and therefore does not work in with other farm enterprises as well as the three-times-per-cycle program. Also, total confinement usually is required for the six-lambings-per-cycle program to be of any advantage over the three-lambings-per-cycle program.

Out-of-Season-Breeding

The predominantly Suffolk, Hampshire, and Romney crossbred ewes common to western Oregon are seasonal breeders. During long periods of each year they do not show estrous behavior and will not mate. This period of non-estrus (anestrus) normally is from the latter part of January through the first part of August. Hormones must be used during this period to induce ewes to mate, conceive, and produce a successful lamb crop. These hormones are progesterone and pregnant mare serum gonadotropin (PMS). Progesterone acts with other hormones on the ovaries, uterus, pituitary gland, and central nervous system to allow for estrus, ovulation, fertilization, and proper implantation of the fertilized eggs. PMS stimulates development of an increased number of ovarian follicles containing mature eggs. It therefore increases the twinning rate.

Hormone treatments vary, but one that has been widely used is to insert a Synchro-mate pes-

sary or sponge (G. D. Searle & Co., Skokie, Illinois) into the ewe's vagina on day one as shown in Figures 1 and 2. These pessaries, no longer manufactured in the United States, must be imported from France. At the time of publishing, adequate supplies of pessaries and PMS were available to producers, but their availability may be curtailed somewhat in the future. They contain flurogestone acetate, a synthetic progestagen, which is slowly absorbed through the vaginal wall in the ewe's blood stream. The pessary is removed 12 to 14 days later (Figure 3), when the ewe receives 500 to 750 international units (I. U.) of PMS intramuscularly (im). Ewes 3 years of age or more should receive no more than 500 I.U. of PMS. Within 20 to 72 hours after the PMS injection, the ewe will exhibit behavioral estrus and will ovulate.

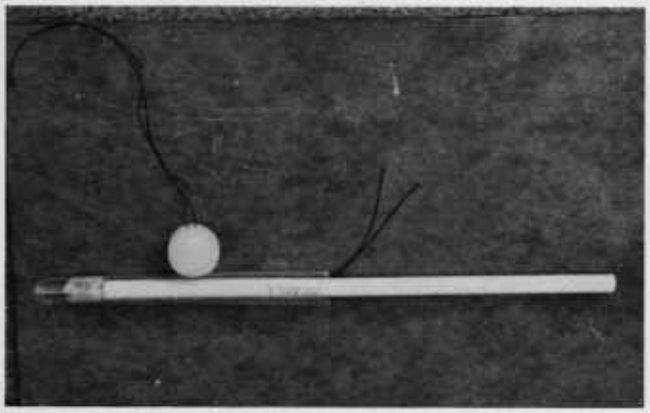

Figure 1. Pessary alone and pessary inserted into tube with rod.

Normally a second PMS injection is given 12 to 14 days after the first one, as those ewes which did not conceive at the first synchronized estrus will come into estrus again. Research indicates that a higher lamb crop percentage can sometimes be obtained by waiting until after the second PMS injection to expose ewes to fertile rams. With proper nutrition, health care, and management approximately 70 percent of treated ewes lamb.

There are several other ways that progestagen compounds can be administered. They can be fed daily in a mixture, implanted and then removed, or injected (im) daily or twice daily. The implanting and intramuscular progesterone injections require more labor. PSM injections are required with any method of progestagen administration.

It should be noted that several breeds of sheep and their crosses have been used experimentally as well as commercially in accelerated lambing

Figure 2. Tube inserted into ewe's vagina (about 5 inches). Notice bottle of rod lubricant at lower left hand corner of the photograph.

programs without the use of hormone therapy. Dorset, Polypay, Barbados Blackbelly (a hair-type sheep), and fine wool breeds, primarily Rambouillet and Merino, have been used most commonly. These breeds all have short anestrous periods, so they are capable of mating most of the year.

Figure 3. Pessary fully inserted with withdrawal string exposed.

Greater success has been obtained with a 7-7-10-month lambing interval than with the more common 8-8-8-month interval. Using the 10-month interval, it is usually possible to breed the ewes twice during a 2-year period when the ewes are ovulating at their highest rate. Although many ewes of these breeds do cycle in the spring, lamb crops resulting from spring matings are lower than lamb crops that result from fall matings.

The Polypay is a synthetic breed of sheep developed at the U.S. Sheep Experiment Station in Dubois, Idaho. It resulted from initial crosses of Rambouillet x Finnsheep and Targhee x Dorset. Crossbred sheep of these two types were then crossed to form the four-breed cross. In the future, Polypay ewes may adapt well to accelerated lambing programs without the use of hormone therapy, since the breed is being selected intensively for this trait.

Rambouillets and Merinos, being fine-wool breeds, do not adapt well to high rainfall areas such as western Oregon; but the crosses of these two breeds with coarser wool breeds may be reasonably well adapted to conditions here. The Rambouillet x Dorset cross is a likely candidate because it can combine good performance in an accelerated lambing program without hormones with adaptability to high rainfall conditions.

During those breeding periods when hormones are used, the ram-to-ewe ratio should be increased to 1:20 or 1:15, since estrus will be synchronized, with most ewes receptive to the rams at the same time. Rams should be thrifty and not overfat. They should have been sheared several weeks before mating except when the schedule requires winter breeding, in which case they should be tagged before the breeding season begins. As for any enterprise, accelerated or not, all rams should be in excellent health.

Creep Feeding

To allow accelerated ewes to recover from the stress of lactation before the next mating, lambs must be weaned at an early age. They should, however, be at least 30 days old and should weigh 30 pounds before weaning. By increasing weaning age to 40 days and weaning weight to 40 pounds, decreased growth rate and other problems from lambs not adjusting to early weaning can be lessened. The older the lamb, the lower the stress, the lower the weight loss and the lower the lamb mortality.

For lambs to be weaned successfully at an early age, they must have been provided supplemental feed during the nursing period or have had access to grazing on excellent-quality pasture. Lambs eat small amounts of a creep ration when 5 to 10 days old but do not eat significant amounts until they are 3 to 4 weeks of age. At 3 weeks, they should consume approximately .5 pounds of creep ration per day. By the time the lambs reach 6 weeks, they should consume 1.0 to 1.5 pounds of creep feed daily.

The primary reason for creep feeding lambs is to increase their energy intake and to stimulate rumen development at an early age. It is especially important that lambs to be weaned early, as in an accelerated lambing program, have a well-developed digestive tract.

Green leafy alfalfa hay is excellent to entice lambs into starting on creep feed. Lambs as young as 4 days will investigate the hay and start nibbling the tender leaves. After the lambs accept the hay, the creep ration gradually can be substituted. Placing the creep ration in the feed bunk and spreading a thin layer of alfalfa leaves over the top helps convert the lambs to the creep ration.

The most important factor in a starting ration is palatability, but after the lambs are 6 to 8 weeks old, this becomes less important. Soybean oil meal (SOM) is accepted readily by young lambs and frequently is used for that reason in creep rations, but its cost is limiting. Oats and dried molasses beet pulp are less expensive than SOM, and also are quite palatable, along with having higher energy values. Creep rations need not be complex, because lambs generally will do as well on simple rations as on complicated ones. For example, 50 percent rolled barley, 25 percent dried molasses beet pulp, and 25 percent whole oats can work quite well as a starting creep ration. As lambs get older, the amount of barley can be increased and it can be fed whole rather than in rolled form. The addition of antibiotics at the recommended level may be beneficial in reducing digestive disturbances and diarrhea.

Poorly located creeps are seldom used by lambs, so they should be in a well-lighted, dry area protected from weather. Young lambs normally start visiting a creep to find a clean, comfortable place to rest; therefore it is important that a creep be well bedded. During the rainy season, it is best to locate the creep in a barn. Heat lamps in creep feeders are an additional attraction for lambs. During sunny weather a creep in a barn will seldom be visited, and outside creeps will be more

effective. Outside creeps should be in an area frequented by the ewes such as a water trough, feed bunk, or bedding area. It is also important that the creep be set up before the lambs get too old, as young lambs will often investigate and use a creep more readily than older lambs.

Feed bunks should be cleaned daily, and they should be designed so that lambs cannot get into them. When lambs lie in the feed bunks, feed is wasted and there is an increased chance of coccidiosis.

Feeding Early Weaned Lambs

Research at OSU indicated that 71 percent of the total milk produced in a 10-week lactation had been produced by the end of the fourth week. These results were obtained from ewes grazing early spring pastures. Cornell University researchers found that 74 percent of the total milk produced during a normal lactation had been produced by the end of the fourth week. The Cornell data were obtained from ewes raised under complete confinement. This and other research has shown that allowing lambs to nurse longer than 60 days results in less efficient use of high-quality pasture. Cheaper lamb gains often can be obtained by weaning lambs early rather than by feeding ewes during extended lactations when their milk production cannot meet nutrient needs of the lambs.

Weaned lambs from 28 to 42 days of age should receive a minimum of 17 percent crude protein in the diet; weaned lambs from 42 to 70 days require a minimum of 16 percent crude protein. Older lambs should receive at least 15 percent crude protein. The energy needs of early weaned lambs can best be met by using a high-concentrate ration containing approximately 20 percent roughage.

Requirements of early weaned lambs for fat-soluble vitamins are not definitely known, but there is a general practice of adding 500 to 1,000 I. U. of vitamin A and 50 to 150 I. U. of vitamin D per pound of feed to high-concentrate diets. If lambs have access to good pasture and/or high-quality hay, the addition of vitamins A and D to the ration is not necessary.

Forage Production

Figure 4 illustrates the growth curve for subclover-ryegrass dryland hill pastures for the 2-year period in which ewes produce three lamb crops. The curve only describes the approximate amount of dry matter produced per acre per day and does not indicate the amount available for livestock consumption. Rapid growth begins in March and continues into May. By late May the quality of the forage (protein content and digestability) and the rate of growth have decreased considerably. Forage production from July to October is almost nonexistent. Then, from October to late February, there is moderate but variable new forage growth. Forage production during this period is influenced greatly by the amount of early autumn precipitation and by winter temperatures. Approximately 80 percent of dryland forage production during a year comes in a 3-month period in the spring.

Figure 4. Growth curve for subclover-ryegrass, dryland hill pasture during a 2-year period when ewes would raise three lamb crops in an accelerated lambing program.

Attempting to superimpose the nutritional needs of accelerated lambing ewes onto the growth curve of the pasture would show that dryland permanent pasture will not support an accelerated lambing program unless a large percentage of the total pasture area is not grazed and is used for silage or hay production instead. Alternatively, other low-cost feed sources would have to be available.

Figure 5 shows the growth curve for an irrigated pasture of white clover and ryegrass and/or orchard grass. Recommended mixtures would differ depending on area, growing season, and soil type. The growth curve for irrigated pastures is similar

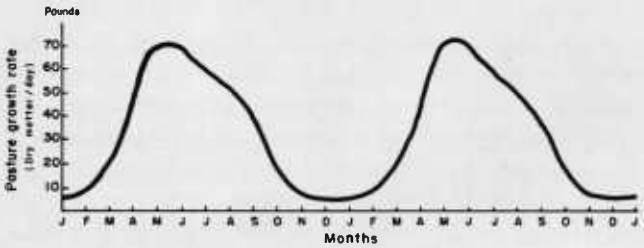

Figure 5. Growth curve for an irrigated white clover and ryegrass and/or orchard grass pasture during a 2-year period when ewes would raise three lamb crops in an accelerated lambing program.

to that of dryland pastures from November to May, but irrigated pastures have much higher production during the summer. This allows greater flexibility and more hay or silage production per acre. The irrigated pastures, like dryland pastures, have very low production during the winter months—only about 5 pounds of dry matter per acre per day, or even less if orchard grass is the main grass. At this level of production, the pasture supports only one ewe and no lambs per acre. Therefore, hay or other supplementary feed generally must be provided during this period. Some pastures must be conserved for hay production during the summer, or feed must be purchased.

Irrigated pastures solve the problem of summer feed, but like dryland pastures they have very poor winter production. Feeding hay or silage during the winter can be costly and can require that high-producing pasture be set aside that could have been used to fatten lambs or for lactating ewes.

Another alternative to winter hay feeding is using winter annuals such as spring-type grains, rye, annual ryegrass, turnips, or some combination thereof. None of them, however, produces large amounts of forage during the early winter period. Large acreages of winter annuals would be necessary, therefore, totally to support the flock during the winter months. Land previously used for fall or spring pastures would have to be taken out of production during these periods to allow the winter annuals to become established. This, in turn, would cause problems during the spring and summer grazing periods.

A problem that can occur when using spring-type grains for winter pasture is their susceptibility to winter kill when temperatures are below 10°F. Low temperatures also affect rye and annual ryegrass, but these plants are not killed as are spring-type grains. They will start growing again in the spring.

Although forage quantity is important, the quality of the forage is equally important. In a successful accelerated lambing program, the ewe's nutritional needs must be met. Nutritional deficiencies are most likely to occur when a ewe is grazing mature pasture, but this will depend on the phase of production at the time. Ewe nutritional requirements are highest during the last 6 weeks of gestation and during lactation. In planning a grazing program, the producer should consider both the pasture quantity and quality along with the nutritional requirements of the ewes.

Ewe Nutrition

Ewes under accelerated lambing experience more frequent weight fluctuations in a year than ewes on a once-per-year program, as can be seen by comparing Figures 6 and 7. These fluctuations and the higher nutritional needs of accelerated ewes necessitate special attention to ewe nutrition.

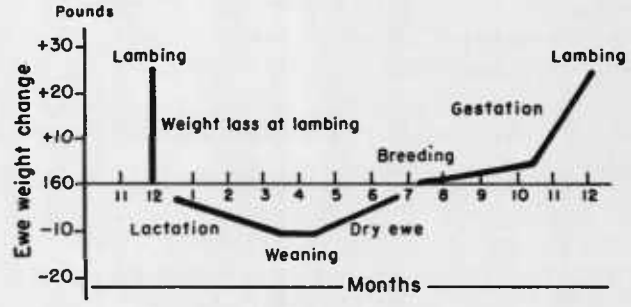

Figure 6. Weight changes normally expected in a year for a 160-pound ewe giving birth to and rearing twin lambs.

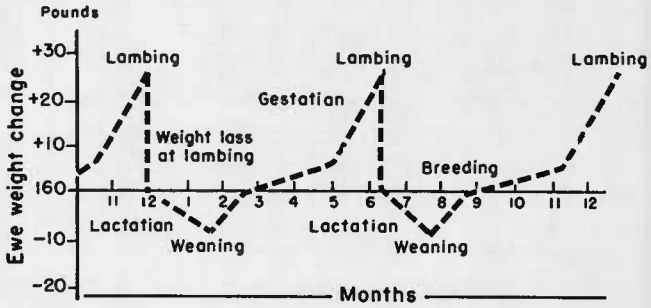

Figure 7. Weight changes normally expected for a 160-pound ewe on an accelerated lambing program giving birth to and rearing twin lambs.

Feed intake of the ewes should gradually be decreased approximately one week before weaning. This will cause decreased milk production. Twenty-four hours before weaning, access to water should be removed from the ewes; and all feed should be removed 12 hours before weaning. Approximately 4 hours after the lambs are weaned, the ewes can be given water and feed. During this entire period, lambs should have unlimited access to both feed and water. The ewes' feed should be limited to low-quality hay or pasture for at least 3 days immediately after weaning. Adherence to these recommendations should prevent udder problems in heavy-milking ewes. Also it is recommended that at weaning, ewes be removed so lambs may remain in their familiar environment. This lessens the stress.

Before feed allowance is increased, all ewes should be examined. Ewes with hard or abnormally

full udders should be separated from the flock and treated. Ewes with full udders should remain on low-quality hay or pasture until udders are no longer distended.

During the short period of time between weaning and rebreeding, grain or high-quality pasture should be provided to allow ewes to gain back the weight lost during lactation. Ewes should not, however, remain on a high plane of nutrition during the entire breeding season. Research indicates that embryo mortality is increased if the energy level in the diet is too high up to the time the embryo is completely implanted in the uterus. This occurs about 3 weeks after mating.

When breeding is conducted on legume pastures before the first frost, forage may contain enough coumestrol, a plant estrogen, to cause failure or delay in conception. For this reason it is not wise to breed on legume, particularly red clover, pastures.

Ewes should consume the equivalent of 2.5 percent of their body weight in air-dry feed per day (4 pounds for a 160-pound ewe) during the first 15 weeks of pregnancy. During this period, ewes should gain about .07 pound per day. Ewes in poor condition at weaning can be allowed to gain more rapidly, but gains in excess of .1 pound per day are not recommended. If ewes gain at a more rapid rate, there is increased possibility of pregnancy toxemia and lambing difficulties.

During the last 6 weeks of pregnancy, the nutritional requirements of the ewe increase greatly since approximately 70 percent of fetal growth occurs during this period. Ewes should gain approximately .4 pound per day. Between breeding and lambing, ewes should gain 20 to 40 pounds, depending on the number of lambs they carry and breed of the ewe.

The last 2 to 3 weeks of pregnancy are the most critical in the development of a healthy lamb. Pregnancy toxemia can develop rapidly if nutrition is inadequate. The ewe's ability to consume large amounts of feed is impaired, since the rapidly growing fetus requires space in the abdominal cavity normally taken up by the rumen. With bulky or high-moisture feeds—lush pasture, long hay, or corn silage, for example—the ewe frequently is unable to consume enough to meet increased nutritional requirements. This is especially true when ewes are carrying twins or triplets or when they are excessively fat. Ewes grazing on average-quality pasture should be given .5 pound of grain per day. On poor-quality pastures, ewes should receive .75 pound per day.

Pregnancy toxemia, more commonly called ketosis or twin lamb disease, is a metabolic disease of sheep. It is caused by impaired metabolism of carbohydrates and fatty acids and frequently is associated with faulty diets. Improper feeding in late gestation increases the incidence of ketosis, particularly in ewes that are overfat or in poor condition. It often affects ewes carrying twins or triplets, hence the common name of twin lamb disease. Other factors that predispose ewes to ketosis are inadequate exercise, a sudden change in diet, transporting, storms, and excessive heat. Symptoms in advanced pregnancy are signs of nervousness (such as twitching of the ears), muscle spasms, convulsions, and blindness. The ewes are listless and show loss of appetite. Eventually they lapse into coma, and death occurs 2 to 5 days after the symptoms are first noticed. Treatment after the disease occurs often is ineffective, so prevention is the answer. If the disease is noticed in one animal in the flock, this should be a warning that it likely could affect others. Immediate steps should be taken to improve the nutrition of the flock by gradually adding grains, molasses, and/or high-quality legume hay to the diet.

Providing adequate nutrition during the last 6 weeks of pregnancy has advantages in addition to ketosis prevention. A ewe will have higher protein and energy reserves which will allow her to produce a larger volume of milk for her lamb(s). This is very important in an accelerated lambing program, because lambs are weaned at an early age, and the more milk that is available, the better the lamb growth between birth and weaning. In addition, lambs from ewes receiving a high plane of nutrition have higher fat reserves as a source of readily available energy to maintain body heat following birth. This is especially important during wet, cold weather. Lambs from well-fed ewes are larger and stronger at birth and have a higher survival rate. Well-fed ewes also have better mothering instinct. Producers should also be aware that overfeeding ewes during late pregnancy, especially those carrying a single lamb, causes the lamb to grow abnormally large, thus increasing lambing difficulties. Lambs that weigh more than 12 pounds at birth have as high a death loss within the first day of life as do lambs weighing under 8 pounds. Therefore, it is just as important not to overfeed ewes as it is not to underfeed them.

Immediately after lambing, ewes should be given water but no feed until they have cleaned their lambs and the lambs have nursed. Ewes nursing twins should be given grain starting ap-

proximately 5 days after lambing. Those with single lambs should be started on grain 7 days after lambing. Lambs make their most economical gains during the first few weeks of life, so it usually pays to feed ewes to produce the maximum amount of milk. Ewes nursing twin lambs produce 20 to 40 percent more milk than ewes nursing a single, and they require as much as 1 pound more grain per day than ewes nursing single lambs. Ewes that milk well are expected to lose weight during lactation, but this loss should be held to a reasonable level.

Energy is the most common nutritional deficiency in sheep in many areas of the world. Energy requirements change with the stage of production and also are affected by environmental factors. For example, the energy requirement of a ewe in confinement is 10 to 30 percent less than that of a ewe grazing on excellent pasture and more than 70 percent less than that of a ewe grazing on sparse pasture. Energy deficiencies are most common during late pregnancy and during lactation. Inadequate energy may result in reproductive failure, reduced prolificacy, lower milk production, reduced wool growth, or increased susceptibility to parasites.

Protein deficiencies are not common in ewes, but they can develop, especially when ewes are under stress as they are in accelerated lambing. Protein deficiencies also can occur when poor-quality grass hay or mature pastures are being utilized. Protein requirements are highest during lactation, so the producer should reserve the highest-quality hay for that time or see that ewes are on excellent-quality pasture. When protein deficiencies do occur, reduced appetite, lower feed intake, and lower efficiency in utilization of feed are the results. Reduced wool growth and a decrease in reproductive efficiency also will occur.

Mineral deficiencies are not common, since most producers provide their sheep with trace-mineralized salt. The most common mineral deficiency is inadequate phosphorus. Mature pastures are quite low in phosphorus, and a deficiency can occur when forage containing less than .16 percent phosphorus is grazed by pregnant ewes. Lactating ewes should receive at least .2 percent phosphorus in the diet. Phosphorus deficiency can cause deprived appetite, unthrifty appearance, weak lambs at birth, and decreased milk production. It can be prevented by providing ewes a free choice mixture of one part dicalcium phosphate to two parts trace-mineralized salt.

Selenium deficiency is a serious problem in western Oregon. Other than internal parasites and footrot, white muscle disease (WMD) is the most common disease affecting sheep in western Oregon. Many Oregon soils are deficient in selenium; therefore forages produced on these soils are also deficient. WMD or stiff lamb disease is caused by interference with selenium metabolism or from actual deficiencies of selenium in the diet. WMD may be present at birth. Such lambs usually die from starvation as they are unable to suckle. The disease is most common among lambs 3 to 8 weeks of age. Skeletal muscles become progressively paralyzed. The rear legs are affected first—the reason for the name, stiff lamb disease. Relaxation of muscles in the shoulder girdle caused by WMD may cause an open-shouldered appearance of affected lambs. Tongue, heart, and diaphram muscles also are affected, resulting in breathing difficulties or even starvation or heart failure. Lambs up to 8 mouths of age are reported to have been affected.

When selenium is inadequate in the diet, mature ewes normally do not suffer from WMD as do younger animals. The main effects are reduced fertility and poor health of newborn lambs. In selenium-deficient areas, all sheep should receive supplementary selenium. It is available in loose trace-mineralized salt for sheep. A veterinarian or Extension agent can recommend how to administer selenium and the appropriate dosages.

Grass tetany or grass staggers is a metabolic disturbance caused by a low magnesium content of the blood. Blood calcium also may be low. The disease usually occurs in the spring when lactating ewes are turned onto rapidly growing or lush pastures or onto green pastures after fertilization and irrigation or rain. In Oregon, these conditions also can be found after the early autumn rains. Ingestion of large quantities of lush pasture with a high nitrogen content is thought to result in reduced absorption of magnesium. Animals suffering from grass tetany become separated from the flock. They experience muscular tremors and when trying to run may lose their coordination and fall to the ground. Death occurs after convulsion. The clinical signs appear rapidly. Death occurs in a few hours.

Prevention of grass tetany is largely a matter of management. If sheep are to be grazed on predominantly grass pastures, the pastures should not be heavily fertilized with nitrogen. If nitrogen fertilizers are applied, then access to hay or dry pasture should be provided to the flock. Supple-

mentary feeding with magnesium-rich mineral mixes during the danger period greatly reduces the frequency of grass tetany. Affected animals must be attended immediately for treatment to be successful. If prompt treatment is given, a majority can be saved. An animal can recover in as little as 30 minutes after treatment. The intravenous injection of 50 to 100 milliliters of 20 percent calcium borogluconate is most successful, but it must be administered slowly. A second injection may be required several hours after the first. Care must be taken, as an overdose can be fatal.

Vitamin deficiencies among mature ewes usually are limited to vitamins A and D. A lack of vitamin A occurs only when ewes are fed dry, mature, and bleached-out forage for long periods of time. Vitamin A is fat soluble and is stored in the body, mainly in the liver. Ewes can store enough vitamin A to maintain normal production for 3 to 4 months. For this reason, vitamin A deficiencies are not common among ewes lambing once a year. Ewes on an accelerated program are more susceptible to deficiencies since their vitamin A requirements are somewhat higher, but vitamin A deficiency is unlikely to occur. The effects of vitamin A deficiency are lower resistance to infection, night blindness and weak, malformed, or dead lambs at birth. Deficiencies can be prevented by injections or by feeding high-quality hay when ewes are grazing mature pastures.

Vitamin D deficiency could occur in western Oregon during long periods of foggy or overcast weather. Sheep receive vitamin D from feed exposed to ultraviolet light or by receiving ultraviolet light on the skin. Malformed lambs (rickets) are the result of extreme deficiencies. During prolonged periods of decreased sunshine, injections of vitamin D or feeding sun-cured hay can prevent this problem.

Flock Health

Health problems in accelerated lambing programs may be intensified because of extra stress from more frequent pregnancy, lambing, and lactation. The key to producers' success is their willingness to spend time and money to prevent diseases. Here, certainly, an ounce of prevention is worth a pound of cure. Prevention is not always expensive. Sanitation practices are not costly, but they do take time. Simple practices, such as cleaning water tanks and providing adequate water, can help prevent disease.

Health problems common to western Oregon, such as footrot, internal parasites, and external parasites, can be minimized or treated by practices suggested in the OSU Agricultural Experiment Station Circular of Information 666, *Sheep Management at Oregon State University*. These problems are potentially more serious in accelerated lambing programs because the ewes are often kept in one central area during lambing. Crowded conditions provide an excellent environment for transmitting diseases and parasites from animal to animal.

Isolation periods of 30 days should be enforced for all new livestock brought onto the farm. During the isolation period, sheep should be treated for both internal and external parasites. Any vaccinations given to the foundation flock should also be given to incoming stock. Any tests for diseases should also be done during this quarantine period. Vaccination programs for abortion-causing diseases such as vibriosis and leptospirosis should be implemented if the diseases are present in the area or if replacement animals are brought in from areas with a history of the diseases. If abortion does occur, the fetus' placental membranes and a ewe blood sample should be taken to a veterinarian or to the nearest veterinary diagnostic laboratory to determine the cause. Vaccinations or drugs sometimes can be used to reduce the incidence of further abortions.

Mastitis occurs frequently in farm flocks. It is an infection of the udder that can be caused by a variety of microorganisms. Two types are gangrenous and non-gangrenous.

The gangrenous type develops rapidly and generally is called blue bag. Ewes with blue bag become quite sick and depressed, with a fever of 104°-107°F. Usually only one half the udder is affected, becoming hard, reddish, and swollen. Two or three days after infection, gangrene often develops, with a characteristic blue color and coldness of the udder. An infected ewe will show signs of lameness, carrying one leg away from the sensitive side; she will not allow her lamb or lambs to suckle. Many affected ewes recover within 4 to 5 days but the infected portion of the udder remains nonfunctional. Any ewe that has been infected with blue bag should be culled.

The non-gangrenous type of mastitis is not as obvious and often goes undetected. Milk production is reduced or the udder may become nonfunctional. Lambs may die of starvation because of lack of milk.

Prevention is the most effective way of limiting monetary losses from either form of the disease. Providing clean bedding grounds and preventing

mechanical injury to the teats and udder will decrease the frequency of mastitis. If a ewe becomes infected, she and her lambs should be isolated at once. Even though the infected udder usually remains nonfunctional, death losses can be reduced by using one of several wide-spectrum antibiotics.

One of the simplest and most widely used tests for mastitis is the California Mastitis Test (CMT, Dairy Research Products Inc., Spencerville, Indiana 46788). It allows producers to obtain results within a minute of taking the milk sample so treatment can be started immediately for ewes that are found to have the disease. Detection as early as possible by using the CMT, and treatment of mastitis, will reduce further tissue damage and will increase the recovery rate.

Sore mouth or contagious ecthyma is a highly contagious disease that commonly affects suckling young lambs. Sheep of all ages, however, can contract the disease, which is caused by a virus. An infected lamb may transmit the disease to the ewe's udder, which causes her a great deal of discomfort. Mastitis may develop as a result of secondary infection. Sore mouth rarely causes death except when complicated by secondary infection. Early symptoms are reddened and swollen lips. Later small vesicles or water blisters appear. These soon become pustules that rupture in a few days, becoming open and raw, bleeding sores. Scabs form, making it difficult for lambs with severe cases to nurse or take food and water from troughs. During severe outbreaks, sores may appear between the hooves and on the tongue, lungs, stomach, liver, and eyelids. Scabs gradually dry up and fall off in 15 to 20 days without leaving scars.

It is important to note that sore mouth can be transmitted to humans, so extreme care should be taken if an outbreak occurs. Wear rubber gloves when working with infected sheep.

There is no effective treatment for sore mouth, but providing highly nutritious, soft, and relatively non-fibrous feeds helps minimize weight loss. Prevention of the disease is relatively simple through vaccination. There is, however, a disadvantage to vaccination. Once the program is begun, the vaccine must be given to all new animals. Sore mouth vaccine is a live virus, and when live virus vaccines have been used, the virus will remain present in the flock, available to infect any new animal not immunized. The vaccine, similar to that given to humans for smallpox, should not be administered to lambs under 6 weeks. The same precautions taken while handling infected animals must be taken while vaccinating.

Coccidiosis, or red dysentery, is a disease of lambs and is rarely seen in adult sheep. It is caused by protozoan parasites called coccidia. The disease is not as common as the diseases previously described, but it sometimes occurs in accelerated lambing programs when lambs are creep fed under unsanitary conditions. Coccidiosis may attack lambs that are allowed to lie or put their feet in their creep feeding bunks. This causes feed to become contaminated with manure and facilitates transmission of coccidia to the lambs. Lambs suffering from coccidiosis have severe diarrhea, and the feces may be bloody. The blood is a result of coccidia invading the cells that line the intestinal tract where they may cause severe inflammation. Lambs lose their appetite and become thin and weak. Straining to eliminate is sometimes seen, and prolapse of the rectum is a frequent complication. Not allowing feed or water to become contaminated is the most effective prevention of coccidiosis. Very young affected lambs should be given sulfa drugs. Consult a veterinarian for specific medicines and dosages.

Enterotoxemia, more commonly known as overeating disease or pulpy kidney disease, is a highly fatal condition caused by *Clostridium perfringens, type D.* The causative organism is an anaerobic bacterium found in the soil and in the digestive tract of nearly every warm-blooded animal. Under normal conditions it causes no difficulty, but under certain conditions in the digestive tract, these bacteria multiply rapidly and produce very potent toxins. The toxins are then absorbed through the intestinal wall, causing death in a few hours. Lambs under 6 weeks of age nursing heavy-milking ewes and lambs feeding on lush pastures are the most susceptible, but sheep of all ages can be affected. Also creep-fed lambs and those with heavy parasite loads are affected more than usual. The disease develops so rapidly that lambs may die before producers are aware of symptoms. If symptoms are observed, they include frothing at the mouth, diarrhea, listlessness, incoordination, convulsions, and coma. Circling, throwing back the head, and pushing against objects also are occasionally seen. Postmortem examination often shows an easily crumbled kidney and an excessive amount of fluid in the sac surrounding the heart. A definite diagnosis is generally possible only from a veterinarian.

There is no satisfactory treatment for affected animals, so all emphasis should be placed on

prevention. Sheep can be immunized using a *Clostridium perfringens D* toxoid or bacterin-toxoid vaccination. Newborn lambs receive passive immunity from the colostrum milk of their mothers if the ewes were vaccinated during pregnancy. New replacement ewes must be vaccinated twice—2 to 4 weeks apart, with the second vaccination being given 2 to 4 weeks before lambing. With each lambing, a booster vaccination is recommended. Since passive immunity from the ewe is effective for only about 6 weeks, lambs that are on a high plane of nutrition should be vaccinated at that time.

A second form of enterotoxemia is caused by the bacterium *Clostridium perfringens type C*. This form, called hemorrhagic enterotoxemia, is highly fatal to young lambs. Lambs between 1 and 4 weeks of age are most frequently affected. Periods of cold, wet, or chilling weather increase the incidence of the disease, so lambs born in winter or early spring in western Oregon are most susceptible. Clean, dry, draft-free lambing barns help prevent the disease. The most effective prevention is to vaccinate ewes during pregnancy. The same procedure used in vaccinating with type D toxoid should be used. Vaccines with both types C and D toxoids are available and when used during pregnancy are effective in providing passive immunity to newborn lambs.

Summary

Accelerated lambing can allow a 50 percent increase in lamb production, but many factors should be considered before such a program is initiated. One of the first is the producer's management ability. Accelerated lambing requires a higher degree of management skill than the usual once-a-year lambing program. Another consideration is the availability of labor, since labor requirements are much higher for accelerated lambing. Usually, additional capital is needed, and physical plant additions often are required or facilities must be renovated.

Careful planning is necessary in selecting a lambing schedule; the availability of labor and feed and the ewes' natural breeding season all are important considerations. Nutrition is important due to the increased requirements of the ewe. Early weaning of lambs generally is required so ewes can breed successfully for the next lambing. The period just before and after weaning is critical; the ewe's milk supply must be decreased to control udder problems. Also, lambs must be on full feed prior to weaning to prevent health problems or serious checks in their growth.

For accelerated lambing to be economically feasible in western Oregon, the proper utilization of forage must play a key role. Careful pasture planning and management will help to minimize the purchase of expensive feeds. A successful accelerated lambing program most likely would utilize a combination of dryland pasture, irrigated pasture and winter pasture, along with some hay or silage production.

The key to any successful sheep operation is a healthy flock. This is especially true for accelerated lambing, because health problems may be intensified from the added stress of more frequent pregnancy, lambing, and lactation for ewes and the early weaning of lambs. Prevention rather than treatment should be emphasized, because it is normally less expensive to prevent a disease outbreak than to treat one.