Chapter 2: Management Practices to Decrease Inputs at Lambing and Kidding

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Specific Objectives

1. Identify some of the main factors influencing neonatal (newborn) mortality.
2. Describe ways to manage at least two of these factors to enhance animal performance.
3. Distinguish between the time demands of different labor tasks during lambing or kidding.
4. List methods to more efficiently manage two or more of these tasks.
5. Explain the bonding process between dams and offspring.
6. Evaluate and compare methods for artificially rearing and fostering (grafting) newborns that cannot be raised by their own dams.

Planning Ahead to Lower Labor and Operating Costs

The previous chapter focused on the possible benefits of lowering inputs at lambing and kidding. It pointed out that increased labor at birthing does not necessary go hand in hand with increased herd productivity. The remainder of this resource guide provides specific suggestions to reduce inputs without compromising flock or herd performance.

Ways to keep labor and operating costs down vary with the seasons and depend on your farm's unique situation. However, there are some generalizations that generally hold true.

One of these is that neonatal mortality is primarily determined by:

- Your herd's preventative health management program
- Your herd's nutritional program
- The suitability of your facilities for your season of birthing
- Litter size, offspring size at birth
- Unexpected catastrophic health problems

Each year, review the health problems that most impacted your dams and their lamb or kid crop and determine how likely these problems are to repeat themselves and whether you can prevent them or improve your handling of them in the future. Are there vaccines for these problems? Does your parasite management program need adjustment? Do you need to lower your animal density or do a better job of separating younger offspring from older lambs or kids?

An important part of this review is evaluating how well your nutritional management program is working. The body condition scores of dams, and the weight and vigor of their newborns at birthing are important indicators of whether the nutritional diet you are providing to dams during pregnancy is sufficient and manger space per dam is sufficient (at least 1 linear ft. per dam). Feed rations that are either too limited or excessive in nutrients can lead to ketosis problems in pregnant dams and to newborns that are abnormally small or large for their breed with accompanying increases in mortality rates at birth and shortly after. Plan ahead when feeding yearling ewes or doelings birthing at a young age. Design their rations to promote good growth in these young mothers in early and mid-pregnancy rather than waiting until late

pregnancy to “throw the food to them.” Sudden nutritional increases in late pregnancy to try to make up for growth deficiencies in young dams results in the nutrition being shunted to the fetuses rather than the dams leading to newborns that may be too large for easy delivery.

It is also important to evaluate the ration provided to all dams during lactation by observing the body condition scores of dams and the growth rates and survivability of their lambs or kids. Penciling out the amount of nutrients provided in the feed diet to compare to recommended levels for your animal species and production phase is a very useful though time consuming process. If the age makeup of your dams is changing (for example your dams are birthing at a younger age than in the past) or your average litter size has changed significantly, you may need to readjust a feed ration that has worked well in the past. If feed prices are increasing, compare whether increasing the quality of your forage while decreasing the amount of concentrate fed can help lower the feed bill without compromising quality. If feeding a prepackaged commercial grain, obtaining a similar diet in bulk from local feed mills or grain farmers may also help cut down feed costs without decreasing animal performance.

In a grass-fed enterprise, there are sometimes situations where forage is plenty, dams are in good body condition, yet offspring are growing slower than expected due to either low milk production and/or heavy parasite loads. Causes of poor milk production in grass-fed dams may be related to heat stress or genetics but may also reflect forage quality as compared to forage quantity. A common problem is not moving animals fast enough through the pastures leading in turn to dams that are eating forage that is too mature and too high in indigestible fiber to support good milk production. Having your forage tested can help to narrow down nutritional problems. Additionally, keep in mind that forages that are excessively high in indigestible fiber in late pregnancy predispose grass-fed dams to ketosis especially if dams are carrying large litters. Forages fed in late pregnancy to grass-fed dams should be high in fermentable fiber and fed in large enough quantities to allow dams to reject the most mature plant parts.

How adequate the facilities are for the season of the year a flock or herd is giving birth in impacts newborn mortality rates. Cold, drafty barns caused some of our participating winter farmers to check for births every hour of the night because of newborns freezing if not dried immediately after birthing. These same farmers, probably unwisely, often perceived bedding the barn or shearing ewes at this time as an unfeasible use of their labor.

A good barn for winter birthing is draft free at the animals' level. However, good air quality is paramount to discourage pneumonia problems. Therefore, good ventilation is essential to avoid ammonia and moisture build up. Fans, wind resistant screening, raised roofing, insulation, and adjustable barn windows and doors were all methods some farmers effectively employed to keep barns at reasonable temperatures for birthing while still insuring healthy air quality. An enormous amount of time can be spent on constantly checking for newborns to prevent lamb or kid "popsicles". Farmers who had invested labor and/or expense to carry out facility improvements appeared satisfied with their decisions and reported reduced labor demands.

Other options include switching to a season of birthing more compatible with your facilities or crossbreeding with a breed that is better fitted. This was the main reason why some of our sheep farmers introduced Romanov genetics into their flocks despite the low value of Romanov fleece (Figure 2-1).

Figure 2-1. Crossbreeding with breeds such as Romanov is one method to increase winter hardiness

Litter size and offspring size at birth are important determinants of newborn mortality. Very large or small newborns are less likely to survive and overly large offspring predispose a dam to delivery problems. As discussed earlier, one of the primary management practices influencing the size of newborns is the mid/late pregnancy diet of their dams. Litter size also has an influence on the size of newborns and their growth and survival until weaning. Large litters must compete more strenuously for nutrients both during pregnancy and lactation. Discouraging exceptionally large litters by elimination of nutritional flushing at breeding may be a practical solution for some farm enterprises. Crossbreeding with breeds with low reproductive rates is another possibility for farms that want to lower litter size but may be unreliable or counterproductive to flock/herd profitability. Other alternatives include bringing in genetics for better milk production or managing the herd so that large litters can be separated out to meet their additional nutritional needs.

During the course of our study, the main reasons for high mortality rates in newborns were unexpected catastrophic health problems. Examples encountered during the 4 year study

were: Floppy Kid Syndrome, iodine deficiencies, Cache Valley Virus, and *E.coli* outbreaks. Frankly, Cache Valley Virus is not treatable and the affected farmer made a conscious decision to get a good night's sleep every night and wake up early to assist any ewe needing assistance delivering deformed lambs. The farmer attributed the disease to the failure of the flock to breed early in the out of season (anestrus) period so that breeding instead occurred from July 7th through mid-August evidently resulting in fetuses being exposed to carrier mosquito populations at critical infection periods. The farmer's future plans include removing the rams for July and August.

Iodine deficiencies (Figure 2-2) in one herd that had planned to participate in our lambing/kidding study resulted in ~70% neonatal mortality. The deficiency was attributed to preferential eating of a Selenium salt block by does in late pregnancy. The block contained iodized salt and the animals were also being offered a loose trace mineral containing iodine. However, the farmer observed that they were not eating the loose salt and spent a great deal of time licking the hard Selenium block without making much of a dent in it. The deficiency may have occurred because the physical properties of the block made it hard for the does to consume sufficient amounts of iodine from it or possibly the iodine had leached from the block. Treatment following veterinarian recommendation consisted of removing the Selenium salt block, refreshing the loose salt feeder with fresh trace mineral mix containing iodine, adding soluble iodine to the water following label recommendations, parting the hair on the backs of pregnant does and squirting the exposed skin with 2 ml. of 7% iodine tincture and putting iodine tincture on the teats of dams. Within a week, the situation corrected itself. It is recommended that farmers make sure their dams are consuming loose minerals containing iodized salt during late pregnancy and lactation, and check that any salt in grain mixes being fed is also iodized.

Figure 2-2. Iodine deficiencies may result in hairless newborns with goiters

Floppy Kid Syndrome does not occur immediately at birth. Thus, farmers who are not already exhausting themselves checking for births may be more able to cope with it. The

problem occurs in kids, lambs and calves within a few days of birth. The young animals suddenly get poor muscle tone because of too much acidity in their stomachs. The actual cause is not well understood. During an episode of Floppy kid, newborns that are getting lots of milk appear to exhibit the problem far more than offspring getting restricted milk (i.e. large litters). Standard treatment generally consists of oral treatment with sodium bicarbonate (baking soda), restricting milk consumption by substituting with electrolytes/sugars temporarily, and administering antibiotics. The participating farmer in our study lost approximately 22% of their kids to the disease from Day 1 to Day 7. The disease had repeated itself in the herd which is atypical. In some cases, *Clostridium* bacteria have been implicated as a possible culprit. Historically, the farmer had never vaccinated for Clostridium C & D. The farmer decided to implement a Clostridium C & D vaccination program and make sure that dams were always vaccinated prior to birth in the hope of never experiencing this disease again. The problem has not recurred in the herd since he started vaccinating but this may well be coincidental. The farmer's view was that the cost and time involved in vaccination were not substantial.

A possible outbreak of *E. coli* in one participating goat farm resulted in 29 kids dying (~10% of the entire kid crop) between 1 to 7 days of age during the first two weeks of winter kidding. The relatively well rested farm manager reviewed herd management changes and determined that rather than using shavings for bedding that year, he had switched to straw from a local cow dairy. Checking confirmed that the straw field had been fertilized with calf manure. The farm's veterinarian suggested off label usage of an *E. coli* antiserum labeled for newborn lambs as well as calves. Mortality from diarrhea ceased when the farm started administering the antiserum at birth. The farmer credited the rapid correction to luck and quick thinking. An exhausted farmer may not have had the time or energy to rapidly put this scenario together. It is important for farmers to keep in mind that getting exhausted at lambing and kidding may actually impede their ability to respond to a crisis.

The following sections describe different tasks at birthing and how they can be managed more efficiently. Keep in mind that what works for one farm may not always make sense for another farm or season of birthing.

Readying Dams and Facilities

Readying your dams and facilities for birthing may take as much as day or two of preparation. However, according to our study, these hours are not substantial when compared to 1) the overall labor spent during birthing and 2) their benefits. Vaccinating dams for overeating disease (enterotoxemia) and tetanus more than 10 days prior to lambing or kidding is much more effective at protecting their offspring than attempting to vaccinate kids and lambs at birth which provides essentially no protection. If newborns are from unvaccinated dams, time must be spent giving them tetanus antitoxin when docked, castrated or disbudded for short term temporary protection rather than depending on tetanus toxoid vaccines at birth. Most participating farms sheared ewes that were in full fleece 2 weeks to 2 months prior to lambing to encourage ewes to seek protected areas for lambing, help warm lambs when snuggling up with their dams, ease crowding and make it easier for lambs to find udders. All but one farm crutched their fleeced ewes prior to lambing if they were not being sheared.

When at all possible, piggy back multiple tasks to avoid having to repeatedly handle dams. For example, many farms used this time to also trim hooves, spray paint dams for easy distance identification, check udders and general health (body condition, FAMACHA scores - anemia status for worms), replace ear tags, separate dams into separate pastures or birthing groups, etc. Some farms used this time for identifying dams with udder issues (low slung, scar tissue, blind teats or large teats) to separate into closer pastures or pens in anticipation of needing more attention at birthing. Recording identifications at this time for future culling is also helpful.

Having good handling or working facilities cuts down on the time spent preparing dams for birthing and was the major reason for variability in time spent among farms handling dams prior to birthing. Even primitive facilities make a difference. One farm that normally cornered dams in a small barn for handling found that the time spent increased from 1.5 man hours reported for previous years to 4 man hours when they instead had to work their pregnant does in a large outside paddock where they were individually chased down. The barn was simultaneously being cleaned and they had opted to not postpone vaccinating, FAMACHA scoring and selectively deworming does until the following day in order to “not waste time.”

Checking for and Assisting Births

One of the most time consuming and exhausting tasks for many farms during birthing is checking for and assisting births. It is well worthwhile to ask what methods a farm can adopt to spend less time at this task without decreasing herd productivity.

Are you on the farm a lot already? – This doesn't seem to reduce the time spent for birthing checks unless the farmer finds something productive to do within easy monitoring range of the birthing area. Some stay-at-home farmers in our study, spent more than 12 extra hours per day during birthing because they stopped all other activities to observe each birth. In contrast farmers who planned activities such as hoof trimming in adjacent pens, machinery repairs in nearby sheds or tractor work in nearby fields were able to get a lot of other work done while still keeping abreast of birthing. Anecdotally, farms with constant watching seemed to have longer labors and more complications. There were two separate motivations for constant watching. One was the philosophy that "I got her pregnant and should be there for her" and the other was that "offspring from my farm's bloodlines are so valuable that I MUST invest in round the clock monitoring to make sure the births are risk free". However, mortality rates in our study seemed to suggest that a belief that the dam is the one delivering the newborns and can handle a normal labor without active interference appeared to be healthier for the dam and less likely to interfere with her proper hormonal responses to the advancing stages of labor. During peak birthing periods, time can be saved by carrying clean OB gloves in a pocket and having 7% iodine tincture available for dipping in each barn rather than planning on going back to a central area to retrieve a tote box of birthing supplies for every birth.

Figure 2-3. This farmer has assigned a lambing pasture viewable from both his house and hay fields

Are the animals in easy view? If possible plan birthing facilities so that they are relatively centralized and easy to observe during the normal course of your day. Having to drive to barns on other properties or move between barns or

pastures that are distant from each other to check for births adds appreciatively to labor. However, avoid having a lot of commotion in the birthing areas. It makes sense to have the birthing barn or pasture peaceful at the time you would ideally prefer births to occur. Dams should be well acclimatized to any activities that go on in the area. The presence of strange dogs, noises, etc. can cause them to try to delay birthing.

The frequency of rumen contractions in cattle tends to drop sharply in the last couple of hours before calving. Most studies indicate that restricting the forage feeding of cattle to night rather than day helps to decrease the incidence of night time calving. In contrast, the time of day of birthing in sheep and goats seems to be related to their circadian rhythm with more birthings occurring during the daylight hours when dams are well awake and both dams and fetuses have reduced plasma melatonin levels. For this reason, some of our study farmers avoid major feedings in the late afternoon or night and make extra efforts to avoid disturbing the sleep of pregnant animals during night time checks. Still others fed their only grain feeding at noon following the suggestions by Ron Parker in the Sheep Book for resetting the "metabolic clock". There are probably many factors that influence the time of day when a ewe or doe is going to give birth. However, most studies with sheep and goats have shown that births in these species are not regularly distributed over a 24 hour period. Instead there are high incidence times of day for both lambing and kidding. If you like the pattern your animals have fallen into, stick with your current feed and barn activity patterns.

Dealing with night time checks? Involving other family members or employees helps to combat exhaustion by assigning people to regular shifts. However, most farmers are on their own when it comes to checking for births. Middle of the night checks can be particularly stressful and should be organized so that a farmer can readily return to sleep if there is no activity. Wear clothing/pajamas such as sweat pants that allow a quick return to bed after shedding barn overalls. When possible, make it easy on your body by planning checks for the same time each night. Knowing when individual animals are due can help to eliminate or decrease checks on nights when few animals are likely to birth.

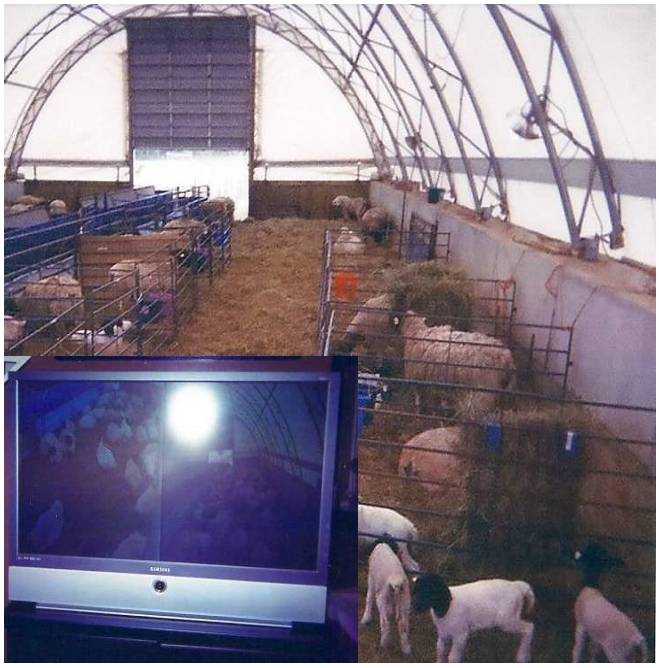

Figure 2-4. An example of video cameras wired into a split screen TV

Monitors? Depending on how they are used, monitors, web cams, or video cameras (Figure 2-4) may help eliminate the necessity for frequent birthing checks. However, they also make it difficult to "leave the barn behind". One farmer indicated that when she started to work fulltime off the farm, she turned her baby monitor off and instead confined her barn checks to specific times because she needed uninterrupted time to focus on family, meal preparation and sleep. Others complained that if they had already had a lot of birthing that day the bleat of a two hour old kid seeking its dam was difficult to distinguish from a new born kid and that they had to train themselves to only respond to the sound of does in actual labor.

The advantage of an audio system such as a baby monitor or intercom is that light sleepers can use them to substitute for some of their birthing checks. Some farmers indicated that they set their alarm for "birthing checks" but rather than going out to the barn when the alarm went off, turned on their baby monitor, video camera or webcam and went back to sleep if there was no activity. Others indicated that they checked their monitors first thing in the morning and if there was birthing activity, delayed going out to feed and disrupting the flock unless labor appeared abnormal.

Cameras and webcams can be hooked into either your TV or computer. In buying a monitor make sure that it is suitable for your distance. Compare costs and consider your life style when deciding what sort of monitor and link to invest in. Be sure to consider location when placing monitors in the barn. You want optimum viewing of your birthing animals. Rain on a metal roof can drown out baby monitors. In summary, monitors helped most to combat farmer exhaustion at night when used to replace specific birthing checks rather than in an attempt to increase the time spent surveying animals.

Figure 2-5. Kid/Lamb proof your facilities so newborns cannot be easily separated from dams

Are your facilities suitable for unassisted birthing? Having facilities that meet the weather requirements of the season of birthing make it less critical for a farmer to be present to dry and warm newborns. However, it also helps if you've done some troubleshooting and feel confident your facilities are safe for dams to birth in unassisted. Trenches and low spots in pastures can pose drowning and hypothermia dangers. Pole gates or gaps in walls that dams can push against during labor may need reinforcement with livestock panels to make sure newborns cannot slip through during delivery and become separated from their dams (Figure 2-5). Sleeping benches or hideaways that newborns can crawl into may be problematic in cold weather because newborns will seek dark draft-free areas and fixate on trying to nurse off overhangs (view video). Plug up these areas if birthing checks are infrequent.

Figure 2-6. A propane furnace in combination with insulate boards is used to keep this lambing barn above freezing

If you use artificial heat

Barns do not have to be warm for safe lambing and kidding. Ambient temperatures of 33 to 50˚ F are often ideal for birthing in a draft free environment. However, some participating farmers in our study found themselves checking pregnant animals hourly or every two hours around the clock because of severe cold in their barns. In this case, investing in insulation or even a heating system to minimally warm your barn or litters may significantly help reduce labor. If you do need to use routine artificial heat consider the cost and safety of different alternatives and make sure to address humidity and ventilation concerns which can predispose animals to prevent pneumonia.

Every year barns and livestock are lost to heat lamps. Those farmers in our study who routinely used heat lamps generally used 125 to 175 watt bulbs. Close use of 250 watt heat lamps resulted in neonatal deaths on at least one farm. Farmers using heat lamps employed many mandatory safety measures including heat resistant plastic guards, two methods of secure hanging support at all times (do not count on the cord to support the lamp) and thoughtful placement of heat lamps(e.g. ≥30 inches above bedding, ≥20 inches above animals). They emphasized that curious goats readily hank on cords and/or upset lamps if they can reach them. Newborns should be dried before being left under lamps and able to readily move away from lamps if too warm. Cost to use 125 watt heat lamps for 8 hours per litter in 2009 totaled $6.25 for 50 litters assuming an electricity cost of 12.5 cents per kWh(Kilowatt hour) as compared to $12.50 if using 250 watt lamps. However, if the heat lamps were used for 3 days per litter, total cost to heat 50 litters was $56.25 and $102.50 for 125 and 250 watt heat lamps, respectively.

Figure 2-7.Overhead radiant lamps may not be cost effective to warm up large areas

Overhead radiant heat is less effective at warming a large number of animals than warming the air directly (Figure 2-7). One study farm employed 17 radiant lamps on 20 foot centers to radiantly heat the lambing barn 24 hrs./day when lambing out 172 ewes during their typical 28 day winter lambing season (Figure 2-7). The lamp fixtures were ~12 feet above the bedding and utilized 1000 watts each to increase the overall barn temperature ~10 ˚F. Assuming an electricity cost of 12.5 cents per kWh in 2009, total heating cost for winter lambing was approximately $1428.

Figure 2-8. Insulated room with portable heater

Another participating farmer had a two tiered barn and fitted the outer walls of the low-ceiling section with insulate boards many years earlier for housing late pregnancy ewes. During winter lambing, a butane furnace hanging in the alley way

runs off a thermostat set at 40 ˚F to keep lambs comfortable and water thawed. Propane cost to maintain the area (~720 sq. ft.) housing 32 litters at 40 ˚F for ~3 months in 2009 was approximately $150 (Figure 2-6). Another large farm invested in a 240 sq. ft. insulated room maintained at 50 to 60 ˚F using a small 40,000 BTU portable forced air propane heater running off of 20 lb. propane bottles (Figure 2-8). Litters of sheep and goats were moved to the room after birthing and left there approximately 8 hours to ensure a good start in life. Cost to build the room was substantial. Approximately 33 newborns passed through the room weekly in 2009 during the staggered 12 week long winter birthing period at a propane cost of approximately $50/week. Other farms employed various types of heat to warm converted milk rooms fitted with claiming pens (jugs). Keep in mind that pneumonia, carbon monoxide poisoning (combustion heaters) and electrical fires (electric heaters) are life-threatening hazards associated with artificial heating.

Many winter birthing farms participating in our study had invested in facilities that were very adequate without the use of routine artificial heat. One of these utilized large south facing windows and skylights to passively warm their jug area. Good planning when designing, insulating or renovating your barn can help alleviate cold weather concerns.

Extra feeding, bedding and watering

Most farmers who clean barns shortly before birthing complete the task (particularly in winter) by disinfecting and re-bedding the pens. This usually does not take much time or expense and helps discourage infections (udder, uterine, newborn) at birthing. Additional bedding for sheep and particularly for goats in our study was often in the form of discarded hay from the mangers. Selection allows sheep and goats to select a forage diet that is higher in both fermentable fiber and protein than when animals are required to clean up all their forage. Providing sufficient forage at birthing so that animals can practice some selection while re-bedding their pens themselves, is often a rational management decision. The amount of selection to allow depends on the quality and diversity of the forage.

Deep bedding worked for most of our barn birthing farms. Farms that instead cleaned barns on a weekly basis indicated that this was because of labor issues, i.e. children that could be used to clean the barn only if manure was not allowed to build up too much, or employees who needed regular hours rather than being able to free up enough time for a major barn cleaning.

The extra time it took to feed a herd of birthing/nursing dams versus a herd of dry dams in the barn during winter was usually pretty insignificant. Feeding late pregnancy and dams with offspring in the barn was only noticeably more time consuming than feeding dry females in our study on farms where dry females are housed outside consuming round bales or stockpiled forage. Even then the time spent was very minimal compared to other labor demands at birthing. With the exception of animals in jugs (individual claiming pens), labor demands for extra watering were a minor part of the labor associated with birthing.

However, time is often at a premium during lambing or kidding. Even though it does not take that much more time to bed, feed and water late pregnancy and nursing dams as compared to dry ones, these tasks as a whole still take time. Anything that can be done prior to birthing season to streamline these tasks will help reduce the labor burden at birthing.

Problem animals

A single problem animal can consume an incredible amount of time. This was especially true of severe cases of ketosis and, to a lesser extent, hypothermic newborns. Monitoring of appetites in late pregnancy dams is important for early detection of ketosis. In our study, drenching dams that were starting to go off feed twice with propylene glycol used up about 10 extra minutes (view video of 13 mo. old doeling carrying triplets whose ketosis was caught and treated early) and adjusting management on vulnerable dams by providing additional manger space, nutrition and exercise did not contribute significantly to labor. In contrast, a single case of full blown ketosis on one farm eventually requiring induced delivery and caesarian section resulted in approximately 17.75 extra hours of farmer labor, while an advanced case at another farm requiring forced feeding/drenching 4 times daily as well as medication and the offering of a wide choice of grains and forages for two weeks contributed to14.25 extra hours of farmer labor.

It is important to establish SOPs (standards operating procedures) for commonly experienced health problems as well as to implement preventative management practices. **Some examples of 1) health SOPS, 2) procedures for tube feeding and giving interperitineal injections, and 3) a flow chart for treating hypothermic offspring are available in the Appendix of this handbook.** Be sure that medical supplies and SOPs for early treatment of these health problems are kept together and easily accessed. Set up equipment and supplies for dealing with dystocia and handling hypothermic newborns at the beginning of the birthing

season rather than having to locate and assemble this equipment during an emergency. Prior to birthing season, determine how animals requiring euthanasia will be handled. Acknowledging beforehand that some death of lambs and kids at birth is inevitable may also help to alleviate stress.

Being able to readily and regularly observe the herd or flock allows early detection of health problems in individual animals. Some experienced farmers have easy methods to gently startle the herd such as clapping hands against metal panels that allow them to quickly observe young stock and identify those with atypical behavior. Healthy lambs and kids will usually stretch, urinate and seek their dam's udder when their rest is interrupted. Sick adults, weak young, mis-mothering, and severe dystocia can take up a lot of time. Performance records should include information to help identify dams with dystocia problems, health problems, poor udders, weak offspring or mothering issues for potential culling. Several farmers in our study who spent less time checking for and assisting births had previously culled dams based on dystocia and/or poor mothering as an important component of their breeding program.

Handling the Birthing Season

The amount of time spent handling birthing season varied widely from farm to farm in our on-farm study. How well organized a farmer is influences the amount of time spent on birthing activities. Lactating dams have the highest feed and water requirements in a herd or flock. Therefore time is saved by housing them as close to their feed storage as possible and in a facility where they are easily watered. Almost all the large herds or flocks in our study used automatic waterers for dams housed off of pastures. If dams and their offspring are going to be housed in individual small pens (jugs) after birthing make sure that the panels to assemble the jugs and the necessary bedding for them are stored within easy reach during the season.

Figure 2-9. Grain storage and jug panels situated right next to the kidding

Watering in jugs was time consuming in our study because none of the farms were able to employ automated waterers for jugs. A recent webinar put on by the American Sheep Institute and the Pipestone Lamb and Wool Program promoted running 6" plastic piping along rows of jugs with openings cut in the top side of the pipes at each jug (Figure 2-10) to help save labor in barns that are maintained above freezing during lambing. Keep in mind that it is important that watering systems be reliable in very cold temperatures when using jugs during winter. One farm whose barn water froze one year during the peak of lambing reported that over a 3 day period in which 75 lambs were born they put in 51 extra man hours with the majority of the time spent fetching water from the house to individually water the jugged litters.

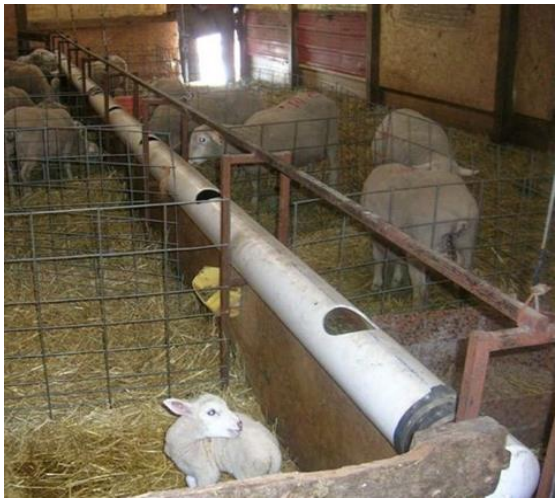

Figure 2-10. Watering system for jugs in above freezing barns, Courtesy, Dan Persons, Pipestone Lamb and Wool Program

Most farms in our study did not report additional hours of labor because of the increased feeding requirements of lactating dams. However, well thought out feeding systems help farmers to have more time available to focus on birthing. One farm reported significant labor savings overall by relocating all feeders to the interior fence line for easy feeding from the central aisle so that staff no longer had to go through the flock to get to the feeders.

How facilities are organized not only affects the time spent on daily tasks such as feeding and watering but also influences how much time and effort is going to have to be spent moving the animals though different locations from late pregnancy until weaning. Locating birthing in just one barn rather than across several barns cuts down on the time spent traveling between barns to check for births and care for newborns. Testing out different animal flow designs can help to determine the easiest yet quickest way to move animals from late pregnancy pens to jugs after delivery, and from jugs to mixing pens (if used) and then on to larger collective pens for housing until weaning. If jugs are used, situate them so that litters can be carried to them easily with dams following, and litters can be herded from them back to group pens with minimal effort

and time. The American Sheep Industry Association has available a webinar "Reducing Labor at Lambing Time" that has several examples of planning lambing systems to improve animal flow.

How well organized a farmer is influences the time spent on lamb or kid management tasks such as ear tagging, docking, and weighing. Organizing tasks into modules with a tote or tool box containing the required equipment for these activities is an effective way of handling these tasks (Figure 2-11). Essentially, organizational skills and well planned out facilities help to save time during lambing and kidding.

Figure 2-11. Good organizational skills save time during lambing and kidding

A Review of Bonding in Goats and Sheep

Bonding is the formation of an exclusive attachment between a mother (dam) and her offspring (Figure 2-12). The ewe or doe becomes attached to her own young, after which she will reject lambs or kids to which she has not bonded. This process is controlled by hormones and triggered by the action of physically giving birth. The strongest bonding response occurs with a few minutes to a few hours after parturition. Most ewes and does will form secure bonds after 2 to 4 hours of exposure to their young, although it can take as little as 15 minutes. The first memories formed are olfactory, or smell memories. These memories are helped along by components of the mother's amniotic fluid, which is not only sniffed but licked up as the mother cleans off her young. By this process, the mother learns her lamb or kid's smell. She will act aggressively toward young animals whose smell she does not recognize as that of her own young.

Because the amniotic fluid provides important smells and other chemical cues, it can be more difficult to convince a mother to accept kids or lambs that have been washed off or that have been accidently exposed to a strong foreign smell. Amniotic fluid can be helpful, too – ewes and does that are about to give birth or have recently done so are very attracted to amniotic fluid, and so covering a foreign lamb with amniotic fluid can make the young animal more attractive to the new mother when grafting.

The first time a doe or ewe gives birth, she undergoes more extreme hormonal changes and experiences much more learning than she will as an experienced mother. She has a lot to learn, and her brain cells are essentially growing at this time, as she uses areas of her brain for maternal bonding and recognition, processes she has never had to use before. This is why bonding can be a slower or more finicky process for a first-time mother. Usually once the mother gets another boost of bonding hormones stimulated by the young animal nursing, she will settle in to the maternal role.

Figure 2-12. Bonding is the formation of exclusive bonds between a dam and her litter's members

For bonding to occur rapidly the ewe or doe must have the right hormone levels. This exact hormone mixture only occurs at the time of birth; the mother's body has been preparing itself for months. **The physical stretching of the cervix and birth canal triggers a flood of these hormones and fast-tracks the learning process of bonding.** The bonding process is time-sensitive, and its strength decreases with time. The mother's strongest response occurs right during and after she gives birth. She remains very hormonally primed for around 30 minutes; at this time she can often be induced to form a maternal bond to a new lamb or kid quite quickly, even within minutes. If her offspring are immediately taken from her, she can remain responsive to newborn kids or lambs for over twelve hours. However, if she does form a bond with a kid or lamb, her responsiveness to other young animals will not persist.

For several hours after giving birth, a ewe or doe will respond hormonally to physical stimulation of the cervix and vagina as if she has just delivered another newborn. By this process, additional lambs or kids may be grafted or fostered onto a dam. This process is known as vaginocervical stimulation or VCS. Some studies have shown that even when VCS is delayed until 27 hours after lambing, the majority of dams will still bond with a strange offspring. If the ewe or doe misses this window for using VCS to promote early bonding, she can still potentially form a bond with a young animal, but it will take much longer. From a couple of days up to a week of constant exposure to a young kid or lamb leads to the same bonding hormones and learning processes seen in rapid bonding, although the progression is less reliable. This slow bonding is much more likely to be successful in experienced mothers, who already have been through the learning process once before.

In contrast to the rapid bonding experienced by a dam during the delivery of her young, the bonding procedure is a longer learning process for the newborn lamb or kid itself. Some newborns will become exclusive of strange dams shortly after birth while other kids and lambs have difficulty identifying their own dams for several days. Studies have shown that lambs can identify their own mothers at a day of age, but that the behavior of the ewe plays a large role. Lambs respond strongly to ewes expressing maternal behaviors, particularly making low rumbling noises or low-pitched bleats, and not displaying rejection behaviors. Early recognition appears to be strongly auditory by both the ewe and lambs, though there has been evidence for visual recognition as well. Lambs learn to identify their dams' bleats by 48 hours of age, while ewes can recognize their lambs' vocalizations after only 24 hours.

Challenging a lamb or kid at an early age can help it to better differentiate its dam from other ewes or does. It is important if possible to gradually increase the complexity of the bonding challenge in terms of the number of dams the kid or lamb is exposed to and the density of these dams. A lamb or kid that is not allowed to interact with strange dams will have more difficulty identifying its mother in a large group after separation. The best scenario is to gradually increase the number of litters in a group, so that the offspring have practice identifying their own dams without much challenge.

Additionally, some kids and lambs are able to form a strong attachment to their dam without becoming exclusive with regard to who they are willing to steal milk from. For farmers

interested in further reading, some research articles with good reviews on either bonding or VCS include:

1) Lévy, F., Keller, M., Cornilleau, F., Moussu, C., & Ferreira, G. (2010). Vaginocervical stimulation of ewes induces the rapid formation of a new bond with an alien young without interfering with a previous bond. *Developmental Psychobiology*, *52*(6), 537–44.
2) Kendrick, K.M., Lévy, F., & Keverne, E. B. (1991). Importance of vaginocervical stimulation for the formation of maternal bonding in primiparous and multiparous parturient ewes. *Physiology & Behavior*, 50, 595-600.
3) Poindron, P., Lévy, F., & Keller, M. (2007). Maternal responsiveness and maternal selectivity in domestic sheep and goats: the two facets of maternal attachment. *Developmental Psychobiology*, *49*(1), 54–70.
4) Vallaillet D, Nowak R. (2006). Socio-spatial criteria are important for the establishment of maternal preference in lambs. *Applied Animal Behaviour Science*, 96(3-4):269–280.
5) Vince, M. A. (1993). Newborn lambs and their dams: the interaction that leads to sucking. *Advances in the Study of Behavior*, *22*, 239–268.

Why do farmers use jugs?

Most dams are housed in fairly high density situations, ≤35 sq. ft. per dam, during barn lambing or kidding. Many sheep farms in our birthing study could only provide 16 to 25 sq. ft. per dam during winter birthings. In high density situations, bonding between dams and offspring is challenging because a doe or ewe's nesting area is easily disturbed by other animals and she may become unintentionally separated from her newborns during the critical bonding window. Therefore, many farmers use jugs (also referred to as claiming pens) when birthing indoors. Jugs are small pens where individual litters and their respective dams are housed after birthing to give them opportunity to bond.

In general, does and ewes should not be disturbed during the birthing process but can be moved with their litters to jugs after birthing is complete. In our study, farms that routinely moved dams to jugs **during** labor seemed to have more problems with dystocia and/or failure to dilate, than farms that did otherwise. We did have farms that had no problem moving dams to

birthing pens prior to birthing but in these cases, dams were usually moved ≥7 days before their projected due date to larger (6'*6') jugs.

Another reason farmers use jugs is to discourage grannying. As mentioned in the previous section on bonding, amniotic fluid is very attractive to pregnant dams that are close to birthing and helps to trigger the bonding process. Dominant dams in early labor may disrupt another dam's delivery, and claim one or more of her newborns (view video demonstrating grannying). However, once the "thief" goes into active labor she will often abandon the stolen newborns in favor of her own. Unfortunately, the original mother may now be unwilling to accept the stolen offspring. Putting litters into jugs soon after birthing helps to combat grannying issues. However, if a farmer observes a ewe or doe starting to exhibit grannying, it is often best to put the grannying dam into a jug so she can focus on her own labor rather than disrupting the new mother. The new mother and her litter can be moved to a jug after birthing is complete.

Some farms with low animal density only use jugs when dealing with health problems or resolving mis-mothering issues. The dam is restrained in a jug or head lock as soon as the farmer notices her rejecting a lamb or kid. If there is no reason for the rejection (such as dam and offspring got accidently separated shortly after birth, mastitis, sharp offspring teeth requiring filing, etc.), the dam should be recorded for possible culling. Sometimes a first time dam is very attracted to her offspring but hesitant to let them nurse (view before and after videos). In this case, farmers often use jugs to temporarily restrain her and put her newborns to the teat. The hormones released during nursing quickly counter her inhibition and depending on flock density she and her litter can quickly be released back into a paddock with other dams and offspring.

The optimum amount of time to leave a litter in a jug depends on many factors. If the jug is just being used to help a first time dam over her inhibition to nursing, 10 minutes in a jug may suffice. If the jugs are situated in the warmest part of the barn of a very cold barn to provide warmth in the critical hours immediately after birth, the litter may be released once all members are well dried and belly full (often within 8 to 12 hours) to make room for newer litters in critical need of the extra warmth. Some farms leave their litters in jugs for 2 to 4 days to facilitate bonding and complete several management tasks.

Many farmers in our study were able to take care of several management tasks while moving a litter to a jug. Tasks that are easily done at this time include cord-dipping, ear-tagging, weighing, sexing, recording data, checking bellies to confirm that newborns have nursed and putting them to the teat if not, etc. There are also several later tasks that can be done as the litter is removed from the jug. Dam's hooves will often soften and become easier to trim after a few days in a bedded jug. Offspring will also be better able to take the pain of castration or disbudding after extra time in a jug. Tail docking and tattooing can also be done in the jug rather than having to chase offspring down later to restrain them for these tasks. View a video of efficiently using a jug to complete management tasks.

As mentioned in the previous section on bonding, leaving a litter in a jug for too many days may actually slow down the bonding process by keeping the litter from learning to distinguish between dams. After jugging, litters are moved into group pens (Figure 2-13). In cases where lambs and kids leave jugs at relatively early ages (<1 day) or are part of a large litter, the litter is often moved to a small pen with just a subset of dams in it. These pens are called mixing pens and help a litter to continue the bonding learning process without being challenged by too many dams too soon. Most farmers in our study varied the time spent in jugs depending in large part on litter size. In many cases, singles were not put in jugs or just left there for ≤1 day. Litters of triplets or more were often given more time in jugs or moved from jugs to mixing pens reserved for large litters.

Figure 2-13. Birthing pen on the left, mixing pen on the right. Jugs run down the middle and open from both sides to allow easy animal flow from lambing pens to bonding jugs and back to group pens.

In our study, the most popular size for jugs for single and twin litters was 4' x 5' while litters with triplets or more commonly used larger jug space. We did have one farm in our study that built their jugs around a ewe's nesting area after birthing was complete to avoid disrupting the bonding process. However, this farm had designed their birthing paddocks so that they bordered a central aisle with several large box mangers extending into each paddock. The paddock walls were lined with staples so that hinged pairs of panels could have one side tied to the exterior walls and the other to

the box mangers. Panels were only 4’ long but multiple pairs of panels could be used to configure larger jugs as needed.

When designing jugs, consider your primary reason for using them. If the goal is to address the issue of too cold a barn, situate them where wind chill is least likely to be a problem or where sky lights, insulation, wind breaks, and/or artificial heating can be employed. If you plan to only use them for exceptional situations involving sick or weak animals, mis-mothering, or orphans needing fostering, place a few jugs in the corners of your birthing pens.

Design jugs for easy set up and dismantle. Jugs often need to be bedded in between litters so locate bedding within easy reach. Water is a time consuming activity in jugs so make sure jugs are near a reliable water source. Only a few farmers in our study preferred solid walled jugs citing that solid walls encouraged the dams to focus only on their litter and helped cut down on draft. However, lambs and kids in solid walled jugs do not get to interact with other dams and these farmers generally put litters into mixing pens after removing them from the solid jugs rather than turning them out into large groups. Mesh panels are easy to pour water through and encourage lambs and kids to interact through the mesh with other animals. However, they need to be lifted up periodically to keep their bottoms from getting buried in bedding. Wooden panels are less likely to have this problem and may be easier to open and close but are heavier to carry.

Some farms that birth indoors have low enough birthing densities that they do not need to use jugs but instead leave the litters in their original nesting areas within the “pregnant” paddock. Eventually all the dams give birth converting the pen to a “dam and offspring” paddock. In other cases, a farmer may have a paddock for pregnant does bordering a “birthing” paddock for dams that are very close to birthing with movable panels separating the two paddocks. Very pregnant dams are moved to the birthing paddocks in groups several days before birthing to avoid any single dam being singled out as an intruder by does already in the paddock. The panels are moved farther into the original “pregnant” paddock as more and more dams move to the birthing area to give them more space. Birthing density is low enough that jugs are not employed. Instead, litters remain in the birthing paddock and it gradually becomes a paddock of dams and offspring.

Artificial Rearing

Artificial rearing is a time commitment that adds up over the course of many weeks. Prices for milk replacer have also increased rapidly over time. However, artificial rearing often has long term benefits for a farm family. It is a task that is easily performed and enjoyed by young family members and may serve to bond the next generation to a farm's livestock.

Figure 2-14. Using the same nipples on bottles and lamb bars can ease the transition. Helping with these chores help bond youth to a farm's livestock

Newborn lambs and kids are easily trained to bottles while kids or lambs that have already imprinted on their dam's udder tend to be more resistant. If the plan is to continue feeding bottles to a group of lambs or kids, plan on using larger bottles that can feed multiple animals and/or design a bottle rack so that animals can be fed simultaneously. Keep in mind that bottles are time consuming to properly clean. Storing empty bottles in the refrigerator in between uses can cut down on the amount of times they need to be washed daily.

Figure 2-15. Gravity flow lamb bar

If planning to switch lambs or kids to a lamb bar, accustom them to a similar nipple as used on the lamb bar as soon as they are readily nursing (Figure 2-14 & 2-15). This makes the switch to the lamb bar quicker and easier. Try to avoid introducing lots of changes all at once. For example, if possible, get young animals accustomed to cold milk before or after they are started

on the lamb bar rather than simultaneously. Same thing goes with making the switch from colostrum to milk replacer or from a gravity flow system to one that requires active sucking. Keep in mind that the ambient temperature (particularly if below freezing) affects how cold the milk can be for young animals to readily consume and grow well on. Additionally, ad lib feeding of cold milk in a lamb bar is difficult in a freezing barn because the milk may quickly freeze.

When choosing a lamb bar system and accompanying nipples, consider how many animals you need to feed simultaneously, whether milk is provided by gravity flow or by sucking, the volume of milk needed, how easy the lamb bar is to leave unattended and the ease of cleaning it. Organize things so that it's easy to get the milk or milk replacer ready and to clean equipment afterwards. If there are children on the farm, try to utilize them for artificial feeding tasks once lambs or kids are readily nursing.

Fostering or grafting newborns

In contrast to artificial rearing, fostering (grafting) newborns that cannot be raised by their own dams onto strange dams is not time consuming in the long term **if successful**. Instead, the total time commitment generally takes place within the first week of fostering. When successful, grafting: 1) reduces or eliminates the need for artificial rearing, 2) improves animal performance and ultimate welfare, and 3) reduces labor inputs during birth period.

Grafting is more likely to be successful when a large number of dams are birthing at the same time, thus permitting more matching opportunities between offspring needing fostering and recipient dams. Techniques that concentrate the birthing period include having a high ration of sires to dams during breeding and/or exposing dams to sires a few days prior to breeding so that dams become synchronized and the majority of dams come into heat within 7 days of the breeding males being put in the flock. Some examples of using the "buck or ram effect" are leading a buck through the herd daily, exposing ewes to a vasectomized teaser ram, or putting breeding males across a sturdy permanent fence from the breeding group prior to the start of actual breeding.

In choosing dams and offspring for fostering, you need to consider both the milk supply of your dams and the milk requirement of their litters. You need to figure out ways to fool the dams and newborns with respect to both the maternal bond and the newborn's sucking drive.

WET grafting - In general, grafting is more successful when the foster dam is "wet" or "slimy" versus when she is "dry". In WET grafting, the foster dam is in the midst of giving birth or has given birth within the last 24 hours. If possible, conduct the graft while the foster dam is still in her nesting area and prior to her getting up from birthing. Otherwise you may want to move her into a jug and administer vaginocertvical stimulation (VCS).

Doing VCS - Using lubricant and sterile gloves, gently check the dam for additional fetuses. If there are no additional fetuses, move your hand back slightly and start VCS by moving your arm slowly but firmly forward and back to stretch the neck of the cervix. Run your knuckles back and forth along the roof of the uterus to simulate labor and encourage contractions. If the cervix is already closing up and/or the dam has already passed the afterbirths, you should not need to check for more fetuses and instead would put your hand in the vagina and gently push your fingers back and forth into the cervix as far as you can reach. The dam may be upset at first but should start to curl her upper lip, stretch her neck and head, stiffen her legs and start contracting if the VSC is successful. Wipe amniotic fluid from her own newborns or from her nesting area all over the graftee (the kid or lamb you plan to foster onto her). Feces from her own newborns and milk from her udder can also be put on the rear and back of the graftee. If she goes through a hard contraction as if delivering a fetus, the graftee can be placed in front of her. Otherwise continue VSC for 5 to 15 minutes. During the last couple of minutes put the graftee in front of her so that she can start to show interest in it. Please note, VCS is also very helpful when a dam has failed to bond successfully with her kids. For example, in the event that a newborn got accidently separated from its dam or if another dam temporarily stole the newborn.

Ideally, the graftee should not have already bonded with its own dam or imprinted onto a bottle. In our study, farms that extensively used fostering averaged very high lambing percentages (~2.5 lambs/ewe). They made fostering decisions at birth based on the number of lambs in the litter, the natural mother's probable milk supply and the likelihood of several ewes lambing within the next 48 hours. On one farm, potential graftees were taken from their dam immediately and put in a warming box with forced air heating provided by an inexpensive electric heater in a separate area. Potential graftees were tube fed rather than bottle fed to maintain their "natural nursing" drive. Tube feeding was limited to 24 to 48 hours maximum with the goal of identifying a recipient foster dam within this limited time period.

Often a farm does not have the guarantee that a potential dam will show up and must leave a large litter on a dam with a questionable milk supply or put a newborn on a bottle. If a potential foster dam does appear, choose as your graftee a member of the litter who appears eager to nurse from any source. If the graftee has already bonded with its dam or a bottle, make sure it cannot escape the recipient dam's jug to search for either you or its original dam. Some people suggest tying its legs so that it will appear to be uncertain on its feet like a newborn. However some dams are very suspicious of graftees that flail around struggling against restraints.

Table 2-1. How to foster a lamb or kid using VCS (vaginocervical stimulation)

	
1. Ewe with 2 dead lambs and 1 live lamb → lambing at the same time as ewe with live triplets.	2. Check deep for additional lambs. Then retract gloved hand slightly and start VCS to simulate birthing and stretch the neck of the cervix, thus causing the release of the bonding hormones.
	
3. Meanwhile another person takes the hopeful graftee and places fetal fluids from the foster dam onto the graftee. After a contraction, the graftee is put in front of foster dam and VCS continued.	4. Successful graft. Same procedures will work on goats.

DRY graft - In many cases, the only foster dam available has given birth too long ago to attempt VCS. We can refer to these situations as "dry grafts". DRY Grafts take more time to "take" than wet grafts. The newborn lamb or kid is being adopted into an already established litter and there is no delivery taking place to cause the release of bonding hormones. The foster dam will often appear to accept the newborn initially. She may lick off its amniotic fluid and allow it to nurse without being restrained. However, once the fetal fluids on the newborn are dry she will often attack it. The procedure can be significantly helped along if the ewe or doe was identified as a prospective "adopter" at birthing and a sock or coat of absorbent material immediately placed on her existing offspring. When a potential graftee comes along the sock can be pulled off her offspring and inverted and put on the graftee. This may shorten the time needed to accept the graftee. However, as mentioned in the section on bonding it can take up to a week of constant exposure to a young kid or lamb to lead to the same amount of bonding hormones as occur during an actual delivery or VCS.

When conducting a dry graft, try to use a head gate or stanchion (Figure 2-16) to restrain the foster dam and keep her from being able to smell or see the lamb or kid initially. If no head lock is available, the recipient dam can be haltered and tied up short in a jug making sure she cannot jump over the jug panels and possibly strangle. Goat hobbles can be put on her hind legs to keep her from kicking at the graftee and discouraging it from nursing. Try to confuse the dam's sense of smell and sight to make it difficult for her to differentiate between her own offspring and the graftee. Her milk and offspring feces can repeatedly be put on the graftee's rear end. A strong but pleasant smell (peppermint oil, neatsfoot oil, mentholatum, etc.) can be put on the recipient dam's nostrils and on all the offspring to confuse her. Keeping lights off at night helps discourage her from visually identifying her litter.

Figure 2-16. A stanchion and hobbles are helpful tools for conducting dry grafts. View other successful set-ups.

Plan on putting the graftee to the teat at least 3 to 4 times a day to make sure it is getting enough milk. If a head restraint and/or hobbles are not used, the entire litter may need to be housed in a jug adjoining the foster dam's and presented to her several times a day for nursing in order to make sure the graftee is able to get its allotment of milk. A first time mother who has bonded with her own single offspring or her dead newborns is more likely to be fooled into accepting a graftee than an experienced dam who has already inventoried her litter. However, a first time dam who failed to bond with her dead fetuses is an unlikely candidate for fostering as she has not been through the initial learning process. After 7 days, evaluate the success of the graft. In some cases, the dam never actually bonds with the graftee but instead learns to tolerate it nursing whenever her own offspring suckle.

Dry grafts are less challenging if the adopting dam has lost all of her own offspring because her udder will welcome the relief of nursing. It is especially likely to succeed if her dead offspring's hide is placed on the graftee. The dead offspring can be skinned like a commercial fryer rabbit (cut off head, hang by hind legs, make incision from one hock to the other and pull off hide) or cut down the belly and the hide fisted off.

Handling animals

Herd management tasks such as ear tagging or deworming go much faster and stress free if you have some method to crowd and work animals. Catching individual animals for treatment is also easier if cornering and restraining the animal can be done easily. Have you invested in handling facilities or equipment? Are you skilled at catching animals with a leg or neck crook?

Having a stockpile of hinged wooden sheep panels around is useful regardless of whether you raise sheep or goats. Panels generally need to be taller for goats than sheep and lengths generally vary from 4 to 6 feet. They should be light enough for farm helpers to readily use them. Metal meshed livestock panels cut in various lengths or left whole and clipped together can also be used to squeeze animals into a section of a barn or pasture for working.

Fence line feeders can be equipped with self-locking mechanisms to restrain animals for vaccinating or goats for hoof trimming. Commercial handling equipment is a considerable investment. However, most commercial equipment is well tested and designed to cut down substantially on the number of people needed to work large numbers of animals. If possible try out different brands and configurations to figure out what will best meet your needs. When designing new barns, alleyways, and barn yards take into account the need to work animals.

Creep Feeding

Figure 2-17. Most creep areas are easily blocked with a livestock panel to double as a handling facility

In our 4 year study, setting up creep feeder areas and providing feed in them on a regular basis took very little time. Creep feeders were an efficient method to adjust for the increased nutritional needs of large litters and permitted litters of variable sizes to be easily mixed together once offspring were ready to consume solid food. Some farmers who had lost lambs or kids due to offspring piling on each other to keep warm installed heat lamps in their creep feeders to encourage offspring to congregate there even before they were starting to consume grain to cut down on the risk of piling. However, as mentioned earlier, there are always fire risks when using heat lamps. Locating creep feeders in draft free areas or under skylights may also address mothering issues. Planning ahead when designing or situating a creep feeder so that lambs or kids can be easily confined in them at need, allows creep feeders to serve a double purpose as working areas for vaccinating, deworming and weighing young stock (Figure 2-17).

Summary

Labor requirements and feed expenses generally increase during lambing and kidding. However, there are many benefits from farmers not overexerting themselves during birthing season. Planning ahead so that a human presence is not mandatory for a safe delivery helps to cut down on stress and exhaustion. Modest investments in making facilities or equipment more suitable to the birthing season also result in substantial savings in terms of labor demands and heating, bedding and feed costs. Good organizational skills cut down on the amount of time needed to move animals and to conduct management tasks. Therefore, try to take the time each year to evaluate your birthing practices and determine whether any changes are possible to decrease farm expenses, labor inputs, and stress without adversely affecting herd productivity.

Suggested Activities

1. Using your past records, identify a goat or sheep health problem that has negatively affected your herd's performance. Develop a written standard of procedure (SOP) for this herd health problem with clearly outlined steps describing symptoms, treatment and prevention. *See sample SOPs in Appendix I through V.*
2. Evaluate ways to improve the lambing or kidding procedure at your farm with special regard to ways to save labor when checking for births and processing newborns.
3. Sketch the animal flow on your farm from:

   Prior to births→ Birthing→ Shortly post birth→ Pre-weaning

   For example, from "Dropping Pens" to "Jugs" to "Mixing Pens" to larger pens or pastures. Be sure to include the availability of gates, the distances between these different areas and the time required to move from area to area.

   Determine possible ways to save labor and time when transferring animals through these production phases. *A sample barn plan outlining animal flow in one large barn is available in Appendix VI of this handbook.*
4. Calculate the nutritional value of your late pregnancy and lactation diets for either the previous or upcoming year and compare them to the nutritional requirements listed in one of the following ration builders. *Most of these ration builders provide average nutritional values for different grains and forages. However, you may want to obtain feed analyses for your specific forages, concentrates or total mixed rations through companies such as Dairy One, 730 Warren Rd., Ithaca, NY 14850, ph: 800-496-3344, forage@dairyone.com. If using conventional feed ingredients and forages, NIR analyses is adequate.*

   Ration builders:
   - Institute for Goat Research Ration Balancer
   - Cornell Sheep Program's Feedform
   - Univ. of Maryland Ext. Sheep and Meat Goat Ration Evaluator
   - Montana State Univ. Sheep Ration Program