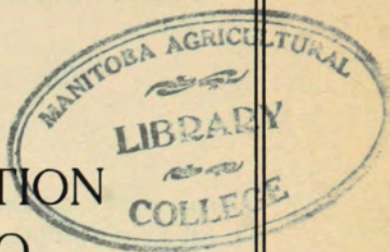


1) Colorado
2) Agricultural Experiment
3) Bulletin Station

4) Number 304

September, 1925

SHEEP PRODUCTION IN COLORADO



By CHAS. I. BRAY



Heading for Timberline

COLORADO EXPERIMENT STATION
Agricultural Division
Fort Collins

SHEEP PRODUCTION IN COLORADO

By C. I. BRAY

There are many reasons why sheep are profitable. They increase more rapidly than cattle and produce wool in addition to lambs. In time of good prices, the wool pays for a large part of the running expenses. Sheep are especially valuable in the western range country, making use of mountain forage, that except for beef cattle and sheep, would be of no value to the human race.

Sheep are first-class weed killers. They eat over eighty known species of weeds, and although not as good brush eaters as goats, can clean up light brush land in a very few years. Sheep can use profitably a lot of waste feed around the farm. They pick over stubble fields, make good use of beet tops and are often used to keep down grass and weeds on irrigation ditches and around fences or in orchards. Lambs make an ideal source of meat supply for summer use for people who live some distance from market and do not have a supply of fresh meat. Families that could not well dispose of even a small carcass of veal in warm weather can easily dispose of a small lamb carcass. There is nothing more palatable than the meat from a young lamb or yearling that has been properly killed and dressed and then well cooked.

Of great economic importance is the fact that wool is one agricultural product of which we do not produce enough for our own use. America uses annually about 560,000,000 pounds of wool, of which 320,000,000 pounds are imported. Since tariff laws were made to encourage home industry, wool receives the benefit of a protective tariff and is one of the few agricultural products selling for better prices in 1924 than in 1913, estimated in terms of goods that it will buy. Consequently it affords an opportunity for the farmer to put some of his land and labor into a well-protected industry rather than into the growing of products, the prices of which are low because they are governed by cheap European labor.

It is hardly necessary to re-emphasize the need of livestock on the farm to use up unsalable products and restore fertility to the soil. The sheep has been said to possess "a golden hoof" because of its ability to clean up waste land and restore fertility to worn-out soil. There is a great deal of unused land on farms in Colorado that could be put to profitable use raising sheep.



Fig. 2—A High-grade Farm Flock on Mixed Pasture

BREEDS OF SHEEP

The first question asked by a man going into the sheep business is generally "What is the best breed of sheep?" There is no one breed better than others. All popular breeds have their good qualities which render them satisfactory under the right conditions. The Down breeds, Shropshires, Hampshires, Southdowns and Oxfords,



Fig. 3—Southdown Wether Ready for Show

make the best farm sheep. As a class, they have superior mutton form, mature quickly and fatten easily on pasture as well as in the feedlot.

The Southdown is the smallest of the mutton breeds, but is of ideal mutton form and will fatten on pasture or alfalfa hay without grain. It is very square, blocky and short legged. It is not excelled for quality of mutton, though sometimes it gets too fat for good eating even without grain. The yield of wool is not great, running five or six pounds a year, but the quality of the wool is good, grading as half-blood.

The Shropshire is well known over the world as an ideal farm sheep. It has many of the good qualities of the Southdown, is blocky, compact, of excellent mutton form, does well on farm pas-

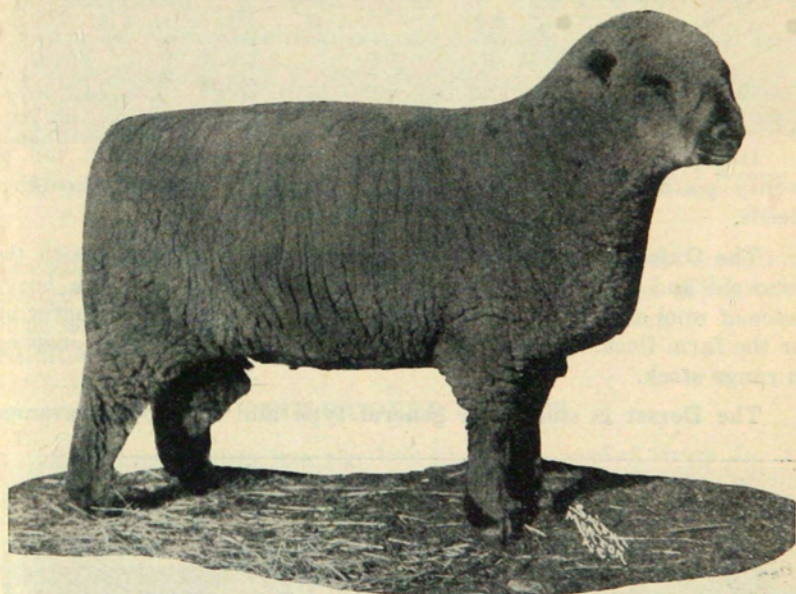


Fig. 4—Champion Shropshire Ram—National Western Stock Show, '25

tures and in addition has more size than the Southdown and shears a heavier clip of wool, weighing eight to ten pounds. The Shropshire is not especially adapted to the range, but is used with success in crossing on long-legged, open-wooled types of range sheep to produce feeder lambs.

The Hampshire is a larger breed and is preferred to the Shropshire for crossing on range sheep because of the greater size of the lambs. The Hampshire is readily recognized by its large head and

black nose and ears, the ears being large and somewhat drooping. It does not have quite the mutton form that the Shropshire has, nor as heavy a fleece, but is improving rapidly in both these respects. It is



Fig. 5—Championship Hampshire Flock, National Western Stock Show, 1925

a stronger framed sheep and somewhat more active than the Shropshire and marks its lambs on the range more uniformly.

Hampshire lambs grow very rapidly and may weight ten to twenty pounds more in the fall than lambs of some of the other breeds.

The Oxford was produced by crossing the Hampshire with the Cotswold and is the largest of the Down breeds. It shears a heavy fleece of wool and while of good mutton form, is a little slow maturing for the farm flock. The size of the Oxford makes it good for crossing on range stock.

The Dorset is similar in general type and size to the average



Fig. 6—Dorset Fall Lambs on Spring Pasture

Down sheep, being a little heavier than the Shropshire, standing a little higher from the ground and has a white face and horns. It is noted for its ability to raise lambs at any season of the year, which makes it valuable for the winter lamb trade. On account of its horns the Dorset can defend itself better against dogs than can hornless sheep; otherwise the horns are considered an objection.

The long-wool breeds, as the Lincolns, Cotswolds, Romneys and



Fig. 7—Some Prize-winning Lincoln Ewes. Lincolns, Cotswolds, and Romney Marsh Sheep Are Used for Crossing on Extremely Fine-wooled Sheep on the Range.

Leicesters, are not particularly suited to small farm conditions, though highly valued for cross-breeding on the range. They are a little slow maturing and require good pasture to keep in the best condition.

FINE-WOOLED BREEDS

The Rambouillets are the best-liked fine-wooled sheep for the western range. Introduced into America in 1893 at the World's Fair in Chicago, they soon became popular through the West, and took the place of the smaller, more greasy Merino. They flock together well on the range, while the mutton breeds do not. The dense wool is a protection against storms and does not tear out on brush as with open-wooled sheep. Fine-wooled sheep are good mothers but do not raise as many twins as the mutton breeds.

The Rambouillet has more size and a better mutton body than the other fine-wooled breeds. It is hardy and will stay in good flesh on range where the mutton breeds would loose too much weight. All range flocks need some Rambouillet blood as a foundation. The heavier-fleeced Merino does not have enough size for breeding on the range, and the greasier wool is less protection against cold. The smoother type of Rambouillet with good size and mutton form, and

with long staple wool, only medium oily, is most in demand. The Rambouillet is not especially a farm sheep but grade range ewes of that breeding make excellent foundation ewes for farm flocks.



Fig. 8—First Prize Rambouillet Flock at Denver, 1925

MISCELLANEOUS BREEDS

The **Corriedale** is one of the most promising of the newer breeds, but is not widely distributed and so far has been used almost altogether for crossing on the range. It is a fairly quick maturing sheep with a heavy fleece of medium wool. It was produced in Australia and New Zealand as a range sheep by crossing long-wooled breeds



Fig. 9—Corriedale Rams at U. S. D. A. Experiment Station, Dubois, Idaho. The Corriedale Makes a Good Cross on Lincoln, Rambouillet or Other Long-wool and Fine-wool Crosses on the Range.

on the Merino. It makes a good cross with the Rambouillet on the range, or with the Rambouillet long-wool crossbreds.

The **Suffolk** is being introduced in some parts of the West as a rival to the Hampshire, which it somewhat resembles, though not so highly improved in fleece.

The Romney Marsh, Cheviot and Tunis sheep are not found in any numbers in Colorado and need not be described here.

For further references on breeds, see Farmers Bulletin 576.

TYPES OF SHEEP PRODUCTION

Since the breed of sheep to select and the number to buy will depend altogether on the type of sheep production desired, it will be advisable to discuss briefly some of the different ways sheep are handled in Colorado.

Range Sheep.—The range-sheep industry is the principal type of sheep production in the State. This means handling sheep as a separate business, in bands of a thousand or more, where there are large amounts of cheap grazing land with enough cultivated land to grow hay or other forage for winter. For this type of sheep raising, flocks must have a large proportion of Rambouillet or Merino blood. The mutton breeds do not herd well on the range, and their open fleeces do not protect them so well from rain or snow and are more likely to tear out on brush. Flocks of this type should have at least a thousand head to be profitable. The range-sheep business calls for more personal and practical knowledge than can be given in this bulletin.

Farm Flocks.—An increasingly large amount of wool and mutton in America is going to come from the small farm where sheep can be kept as a side line, rather than as a main business. Farm flocks can get much of their feed from the scattered bits of pasture around the place, in orchards or meadows, from the pick-up material in the fields after harvest, or around irrigation ditches and fence rows, etc. The average small farm can support a flock of ten to thirty head of sheep



Fig. 10—A Small Southdown Flock in a Farm Orchard

very easily without a great deal of expense for extra feed, except for hay in winter. No one should expect, however, that sheep can get along without any extra feed. Some farms have a lot of spare feed, others little. Farm flocks should generally be of mutton type, built up by using Shropshire, Hampshire or Southdown bucks or those of similar type. Some good four or five-year-old ewes are shipped each year off the ranges that are good for four or five more years of usefulness on the farm. No high degree of sheep knowledge is needed to start a small flock like this, providing a man has feed and shelter for them and likes sheep.

Purebred Flocks.—More purebred sheep should be raised in Colorado. We do not have enough purebred stock to supply range rams for the Colorado range flocks. The production of purebreds, however, should be left to those who have had experience in handling sheep or who are willing to start on a small scale, or who have sufficient money to stand some loss while learning the business. The successful breeding of purebred sheep requires time and patience, a knowledge of individual excellence in a sheep as well as the standards and blood lines of the breed one handles; care and skill in feeding, and reasonable amount of business ability in advertising, registering and selling breeding stock. The man who handles his purebreds so that they cost him but little more than common sheep for feed and care, can make a profit on lower sale prices than can the man who has expensive equipment, high-priced feed and labor, and much expense in showing and advertising.

PRINCIPLES OF JUDGING*

One need not be an expert sheep judge in order to pick good farm sheep. There are a few principal points to be looked for and a few outstanding faults to be avoided. In general, the requirements of a good sheep are width and thickness of body and head, shortness of neck, relatively short legs, thickness of fleshing on back, loins and quarters, with reasonable size, and plenty of constitution and vigor. Special attention should be paid to heart girth, as shown by fullness of the fore flank and width between fore legs; capacity as shown by depth of body, especially in the hind flank; and depth and width of thighs and twist. Wool should be as dense and fine as is consistent with the breed selected. The principal faults to avoid in sheep are narrow chests, long legs, long, slim necks, narrow heads and coarse open wool.

* Reference: Farmers Bulletin 1199, Judging Sheep.

CONDENSED SCORECARD FOR BREEDING SHEEP

Mutton Type

Weight or Size for age	5
General Form.—Wide, blocky, low set; head wide on top and wide muzzled, neck short and thick, shoulders broad but compact on top, and well laid in to body. Ribs well sprung, back and loin wide, top line straight. Rump long, wide and level. Thighs and twist deep and full.....	30
Constitution and Strength.—Chest deep and wide, heart girth full, nostrils large, eyes large and bright, ears well carried; the back strong and level, active carriage, legs straight, pasterns strong	20
Breeding Characteristics.—Well balanced and symmetrical throughout. Pure-breds showing correct breed type. Grades showing good percentage of pure blood. Rams bold and masculine in appearance with strong head and crest. Ewes with plenty of body length and capacity, and heads showing femininity and refinement	15
Condition and Fleshing.—Should show ability to fatten, with plenty of natural lean meat on back. Allowances should be made for ewes suckling lambs or for breeding rams in field condition	10
Wool.—Dense and of good length, well woolled over head, legs and belly, breed considered. Soft and elastic to touch, free from hair or black fibre. Crimp close and regular. Fibers bright, clean, sound and moderately oily.....	15

BUYING THE RAM

Only purebred rams should be used on either farm or range flocks, and not only pure bred but of good type as well. A good ram costs little more than a cheap one, but will make up for the extra price in his improved offspring. The wether lambs will be better sellers and the ewes will be more profitable in the flock if they have good breeding back of them.

For a grade flock, one should pay attention to useful points rather than fancy ones. In every purebred flock some rams are produced that are strong, vigorous and meaty but that do not have enough show type to be used on purebred flocks. Such rams will give excellent results as heads of grade flocks and do not cost so much as show rams. Sometimes a good aged ram can be bought at a bargain after the owner has used him several years, though one should be sure that he is a breeder before buying. It is economical to pay considerable more for the ram than is paid for individual ewes, as the ram adds more to the quality of the flock than can any one ewe. Consequently, both fleece and mutton form should be carefully considered.

The mutton-type ram should be thick, blocky, set close to the ground, well fleshed, have a wide chest, strong head, thick neck and good bone. The hind quarters should be full and deep. Such a ram will produce far better market lambs than one that is rangy, narrow and high off the ground. The most growthy type of ram must, however, have a certain amount of length and ranginess when young, if he is to make a good large ram when mature. Both fleece and form should be carefully considered.

The fine-wooled ram for the range needs masculinity, constitution

and vigor. He should have reasonable size with good bone, a strong frame, and a good mutton body. The fleece should be dense and of good weight but should get most of its weight from length of staple rather than grease. Range-bred rams are to be preferred to highly fed show rams for turning out with range flocks.

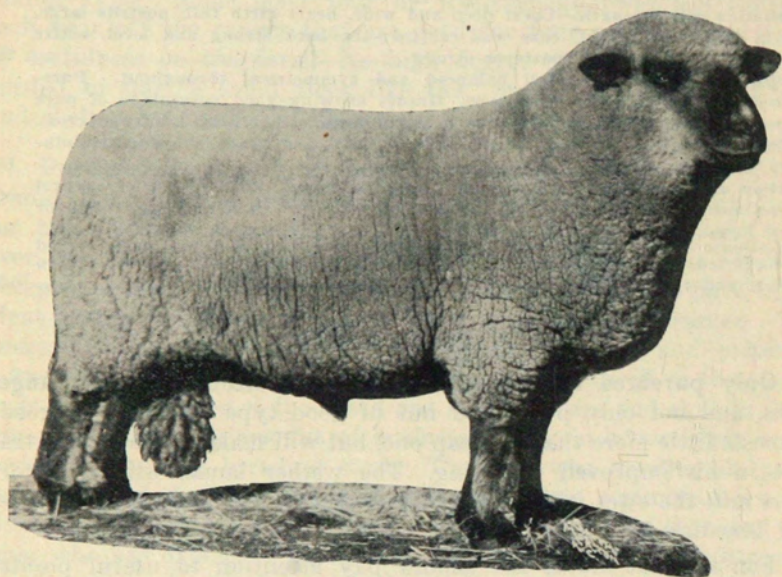


Fig. 11—The Ram Should Be Strong, Masculine, Thick Through Chest, Deep in Heart Girth, Thick Fleshed and Purebred.

PUREBRED RAMS PAY

At the Missouri Experiment Station lambs from western ewes by a Shropshire ram weighed $2\frac{1}{2}$ pounds more when three months old than did lambs from a grade sire at four months. The lambs by the purebred ram sold at \$7.35 per cwt., as compared to \$4.50 per cwt. for the grade-sire lambs.

At the Kentucky Station, lambs by a grade mountain ram from mountain ewes averaged 5 pounds wool, while lambs from purebred rams out of these ewes averaged 6 pounds to 7.5 pounds wool per head. Lambs by purebred rams weighed 87 to 93 pounds at 163 days, compared to 67 pounds from the grade sire.

BUYING THE EWE FLOCK

The number of ewes to buy depends on the amount of available feed and on the experience of the buyer. It is good policy for a beginner to buy about half the number of sheep he expects to keep finally, and increase his flock gradually by saving the ewe lambs or

by picking up occasional bargains. In this way one will learn the care and management of sheep without danger of serious loss or without a heavy outlay for new equipment. It is better to have a few less than the farm will carry than to be over-stocked. The man who is accustomed to sheep and can pay for a larger flock, will do better to stock his farm or range to capacity at the start. The first outlay will be greater but so will the sales, as there will be surplus ewes and lambs to sell after the first year.



Fig. 12—Old Range Ewes Making a Good Foundation for a Farm Flock
Akron Experiment Station, Colorado

The best way to start a grade flock in Colorado is to buy four- or five-year-old range ewes. These are usually good for several years on the farm, and are usually healthy, hardy and free from parasites. By crossing these with a mutton-type buck, a good farm flock can be produced in two generations. The second- and third-cross ewes will for all practical purposes be equal to purebreds for wool and mutton production, providing the rams used are always purebred and of the same breed. These ewes will last three or four years, after which there should be enough grade ewe lambs to replace them.

The main consideration in selecting ewes is to get them healthy, with sound udders and teats, and with teeth in fair condition. Ewes should show evidence of having raised lambs, as shown by their teats and udder development. The ewe that comes in from the range fat should be looked on with suspicion, as she either failed to breed or has not raised her lamb. Sheep with spoiled udders should not be bought, or any that show sickness or lack of constitution.

STARTING WITH PUREBREDS

A purebred ewe flock should be as uniform as possible in type and breeding. It is not always possible to do this, especially in

buying a large flock, but a man who is a good judge can pick a fairly uniform lot from a number of sources. The thing to guard against is starting a flock with a mixture of types that will not give uniform results.

The number of purebred ewes to buy and the price to pay depends on the judgment and pocketbook of the buyer, and on his market. A breeder with a national reputation who sells rams to other breeders at top figures can pay prices for ewes that would be unprofitable to the man who has only a local trade at medium prices. If the breeder is not in too big a hurry he can start a flock of purebreds gradually and inexpensively by buying a few purebred ewes to put with his grade flock and saving all the purebred ewe lambs till the grades can be disposed of. The better the foundation ewes, the sooner a high-class flock can be built up.

Good type does not always mean "high price." A \$25.00 ewe wisely bought may be a better breeder than a \$250.00 show ewe that owes her value to the skill of a professional shepherd.

BUILDING UP THE FLOCK

To maintain an improved flock, either grade or purebred, wise selection is needed as well as good breeding and feeding. Inferior runty lambs should not be kept. The ewe lambs kept in the flock should be the best mutton type, and in addition, should be from the best producing ewes. Prolificacy is inherited, the same as mutton



Fig. 13—First and Second Cross Lambs by Purebred Hampshire Buck
Akron Experiment Station, Colorado

type. The most valuable ewe is not always the best show ewe or the fattest and blockiest one. It is the ewe that produces good lambs, year after year, and that transmits this ability to her ewe lambs. A prolific line of females in a flock is a big asset. Type and form can be maintained by good rams, but unless there is prolificacy in the ewes the flock cannot be highly profitable.

WHAT IS MANAGEMENT?

Business sense has been defined as the ability to see a dollar before the other fellow. Management is the ability to "see dollars", either to get them, or prevent them being lost. Dollars are made by a more efficient use of land, utilizing every part of the farm and getting the greatest income from the grass, weeds, stubble, beet tops, straws and fodders, as well as from grain and other cash crops; by a more efficient use of labor, having something profitable to do every day in winter as well as summer; and by efficient use of livestock, getting the greatest increase in gains in animals and in sales, for capital invested and feed fed. Dollars are lost by lack of care, failure to guard against diseases and pests, by overfeeding as well as by underfeeding, by too great expenditure of capital as well as by too little, by poor selling as well as by poor producing. **Good management is just getting the best income from the money and land invested.** The following paragraphs will discuss management from that standpoint.

FEED AND CARE OF THE RAM

The sole object in management of rams is to have them in vigorous condition at breeding time so that all ewes will be bred as nearly as possible inside of five or six weeks. Good condition comes from sufficient feed and plenty of exercise. Good pasture furnishes both feed and exercise and keeps the ram in fit shape for breeding. Grain feed is not needed by the ram in a small flock, but in a large range flock the rams usually need some grain feed ($\frac{1}{2}$ lb. per day) for 30 to 40 days before breeding begins, also during the breeding season, if it can be arranged.

The ram can be fed any good feed that is satisfactory for ewes, like alfalfa hay, ground oats or barley, with some cottonseed cake, but only moderate amounts of fattening feeds like corn or extremely bulky feeds like silage. A half pound of linseed cake or a pound of cracked corn or barley a day in addition to good hay or grass will keep a ram in good shape during the breeding period.

MANAGEMENT OF RAMS IN BREEDING SEASON

A mature, active ram will breed 50 to 75 ewes, or even more, if put with them only at night and fed during the day, or may run with them by day and be fed at night. A ram lamb should not be used for range breeding, but in a small farm flock of not over 15 or 20 ewes, where he can get good feed and care, an early lamb may give good satisfaction. Hand breeding is practiced in flocks of 100 to 200 ewes where an extra good ram is to be used and it is desired to make the greatest use of him. With this method a young, active

ram, called a "teaser", with an apron tied under him, is used to spot the ewes that are in heat. These are taken out and put with the flock ram, bred once and then removed.

Range.—On the range three bucks to 100 ewes are advisable, where the bucks run with the flock all the time without extra feed. The bucks should be range bred and in good condition to breed this many ewes on the range without losing considerably in breeding powers. Range rams may be cut out at night camp and fed grain, or, if this is not practicable, half the bucks may be turned with the ewes for periods of 12 to 24 hours to two days or longer, then brought in and fed while another group of bucks is turned with the ewes, and so on alternately during the season. The bucks are usually alternated in shorter periods early in the season than at the last when only a few ewes are being bred. Others make a practice of turning in only two-thirds of the rams the first week, then adding the others. Only a few of the strongest and best bucks need to be left in the band the last ten days. Failure to keep the bucks strong and vigorous in bucking season means too high a percentage of dry ewes in the spring.

Summer Management.—In the farm flock the ram can run with the ewes most of the year without troubling them after the breeding season is over. In most cases the ewes will not breed until July 1 or later, so that the ram is run in some flocks the year round. In a purebred flock, the ram lambs will have to be separated from the ewes at five months old and the stud bucks can be kept with them till breeding season begins. Where the farm flock ram must be run with the ewes all year, a canvas apron may be used on him in summer to prevent too early breeding.

On the range the bucks are run in a flock by themselves, preferably under fence, as they do not herd as quietly as do ewes. Two or three flock owners may throw their bucks together in charge of one herder for the summer. Range bucks will need some cake or grain before breeding begins. Half a pound of oil cake or corn will keep them in good shape.

Purebred Flock Rams.—Where two or more stud rams are being used in a purebred flock, it is most convenient to divide the ewes into groups, according to the rams they are to be bred to, and keep them permanently in separate flocks, or mark them with paint and run them through a cutting chute each night. With valuable stud rams in show condition it may be better not to let them run with the ewe flock, unless late in the evening when it is cool. The ewes in heat may be located by the "teaser," cut out of the flock and put with the desired ram for one service only.

MANAGEMENT OF EWES AT BREEDING TIME

It is best to breed ewes first as yearlings so that they will drop their first lambs when two years old. Breeding ewe lambs to lamb at one year old is liable to seriously stunt their growth, and the lambs produced will likely be small. However, a large, growthy ewe lamb in the farm flock that is to be well fed during the winter, can be bred without any bad effects, thus saving a year in getting an income from her.

When to Start Breeding.—If one is well fixed to care for lambs in cold weather, the earlier they are dropped after January 1 the better size will be obtained by fall. For most farm or range flocks that have good shelter for lambing, March and April are satisfactory months to have lambs dropped as there is less danger then of extremely cold nights or severe storms. Lambs dropped then are early enough to make good use of grass when summer comes. For lambing on open range in Colorado, lambs are dropped in May or June, insuring warmer weather and good feed. This does not produce a large lamb for the fall market, but May lambs on good range will make as good a weight by fall as March lambs that have been stunted by poor care and feeding up to June 1.

Since the ewe carries a lamb 145 days, or five days less than five months, breeding should start about August 6 for January and February lambs, October 6 for March and April lambs, and in December for May and June lambing. With breeds like the Shropshire the ewes will not breed in any case till the first cool nights in the fall, while Hampshires, Dorsets, or fine-wools, will breed at almost any season. Some ewes will not breed till after they wean their lambs.

Flushing Ewes.—Flushing means giving ewes extra feed before breeding to make them breed more surely and produce more twins. The term originally meant reserving some green forage crop for grazing previous to breeding. One breeder of purebred sheep feeds cabbage to his ewes before breeding season. Others feed a little grain if pasture is scarce. Experiments by the U. S. Department of Agriculture have shown that any kind of extra feed of good quality will be satisfactory so long as the ewes are gaining in weight at time of breeding. Forage crops, good pasture, grain and cake, all served to increase the lamb crop 30 and 40 per cent as compared to ewes getting no extra feeding and not gaining in weight. The only ewes not improved by flushing were those that were already fat. It may not always be convenient to supply extra feed to ewes in the fall, but they should at least be on good grazing and in thrifty condition.

If ewes are bred under range conditions a little native hay or cottonseed cake may be fed in addition to range if the ewes are not in good shape for breeding. Some range men feed cake or corn to ewes as well as bucks during the bucking season.

Fall Grazing.—During the fall months, before it is necessary to begin feeding hay or grain for winter, the flock can be carried at low cost on grain stubble, corn fields, beet fields or alfalfa meadows. Colorado weather is usually fine well into December, and, except after a heavy snowfall, sheep can be run in the fields with little extra feed through much of this time. The beet fields, alfalfa meadows and stubble ground often lie side by side without intervening fences and this combination can hardly be improved on for sheep feeding. If this is not sufficient to keep the ewes in good shape some hay can be fed at night. If the ewes are to lamb early in the winter, some grain can be added for four weeks before lambing starts.

WINTER CARE AND FEEDING OF EWES

The main thing in wintering ewes is to have them in thrifty condition at lambing time. It is difficult to describe good condition so that it will mean the same to everyone. What one man would call thin condition another man might call good condition, depending on what he was used to. The right balance is learned by experience. More lambs are lost through ewes being too poor than from being too fat. A very fat ewe may have difficulty in lambing but a very thin ewe will not have milk for her lamb and the lambs will likely be weak. The ewe should have some reserve fat to carry her through the period of lambing and suckling her lamb.

This means that the ewe should weigh more at lambing time than at time of breeding. Since she is producing one or two lambs weighing six to ten pounds each during this period, as well as several pounds of wool, and fetal membranes, etc., she needs to increase in weight at least 15 to 20 pounds during this time if she is not to lose body fat. The mutton ewe that comes in fat from a good pasture in fall can be kept on hay alone or hay and silage till lambing, without injury. The ewe that is thin will need some grain feed. Old breeding ewes, especially if broken mouthed, will need to go on feed earlier and get grain, beet pulp or other feeds if they are to be in good shape at lambing time. Purchased feeds are expensive if not needed; but lack of feed is also expensive, if it means losing ewes and lambs at lambing time.

No best ration can be named that will be advisable on all farms and ranches. Feeds and pastures that are on hand should be used first, and supplemented by purchased feeds only when necessary. The manner of feeding, the feeds used and the amounts of feed to use will depend on the available feed as well as on the condition of the ewes.

LEGUME HAYS ARE STANDARD ROUGHAGES

Alfalfa, clover, pea hay, sweet clover and bean straw are all good roughages. They are palatable to sheep, supply lime and other mineral matter and are rich in protein. Sheep take to these rather than to the grass hays, especially the coarser varieties like sudan and cane. Sheep can be allowed all the roughage they will eat and if these are of good quality they will need little extra feed. Some San Luis Valley sheepmen winter their ewes on pea fields, herding them on the peas for an hour or two daily, and running them on stubble ground or meadow land the rest of the time. Soy bean hay has been shown equal to alfalfa for wintering sheep, and a mixture of the

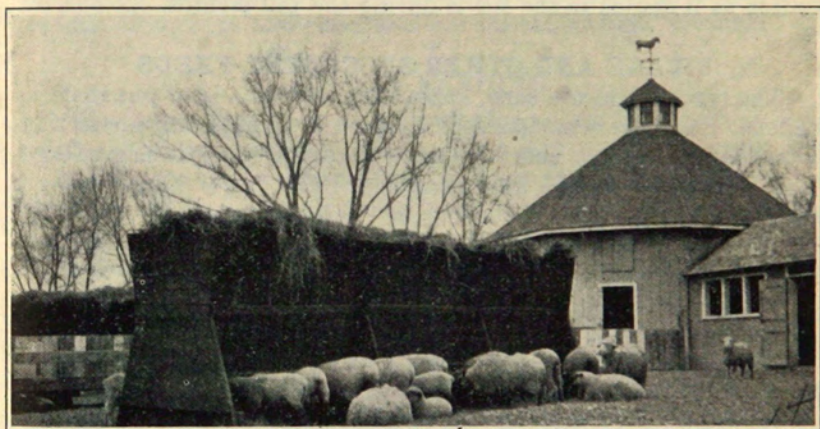


Fig. 14—Alfalfa Hay Is One of the Best Feeds for Wintering Ewes

two has given especially good results. Sweet clover hay is almost equal to alfalfa if cut early and cured right. Pea hay or pea-and-oat hay, cowpea hay or alsike clover, may all be used to good advantage. Some watch must be kept for bloating if third-cutting alfalfa or alsike is being fed, especially where the hay has been wet with snow or rain. Bean straw and pea straw make good roughages but need some grain fed with them.

GRASS HAYS AND FODDERS MUST BE SUPPLEMENTED

Feeds like timothy or prairie hay, sudan-grass hay, cane hay, corn fodder, kafir and milo fodder, or oat straw and oat hay, are not as palatable to sheep as are the legumes, though they should be used if on hand. These hays are all low in protein and need to be supplemented with a little legume hay (like alfalfa) or by protein concentrates like cottonseed cake or linseed cake. Barley straw and wheat

straw of the bearded varieties, or feeds like foxtail hay should be avoided because the awns get into the eyes and around the teeth of the sheep and greatly lower the value of the wool.

Oat straw and alfalfa hay fed together give good results; so will timothy and clover, or other combinations of leguminous and non-leguminous roughages. If the coarse fodders can be cut and mixed with alfalfa and molasses, they will be eaten more readily and with less waste than when fed alone. A good way to feed corn fodder, kafir fodder and such feeds is to scatter the feed around in some nearby field where the sheep can pick out the finer parts they want. This gives the ewes exercise and leaves the uneaten stalks where they can easily be raked up and hauled away. Much of this material can be eaten as it stands in the fields during the fall months.

SILAGE AND OTHER SUCCULENT FEEDS

The best way to use corn, kafir, cane and milo is to put them up as silage. Sunflowers make a food silage crop in high-altitude sections where the season is too short for maturing corn, though the sunflower silage is not as valuable as corn silage. The use of silage will not greatly reduce the cost of feeding in Colorado, especially where hay is cheap and corn crops light, but will keep the ewes in better condition and will produce stronger and healthier lambs.

Three years' experiments at the Colorado Station with alfalfa hay for ewes, compared to alfalfa and corn silage, showed 3 to 16 pounds increased gain on the ewes getting silage, or an average of eight pounds for the three years' work, covering a period of a month



Fig. 15—Ewes and Lambs Do Well on Silage

before lambing till the end of the lambing period. The lambs weighed from one-fourth to half a pound heavier at birth in the silage lots. Feeding silage alone, without hay or some dry roughage, is not recommended, though the writer has wintered ewes satisfactorily on silage and cottonseed meal. Sunflower silage is a good substitute for corn silage, though not quite equal in feeding value. Cane and kafir silages are satisfactory in the dry sections of eastern Colorado. Wet beet pulp is an excellent succulent feed, especially for broken-mouthed ewes.

Roots are not usually fed where corn silage can be produced on account of the greater cost of handling and storing. A good way to use roots is to let the sheep harvest them in the fields. Frozen roots are bad for pregnant ewes. Mangels are liable to form stones in the bladder of wethers and rams and are unsafe on that account.

GRAIN FEEDING

Whether to feed grain or not must depend on the condition of the ewes as lambing time approaches. They may appear in good shape when they are really getting thin, because of the increasing growth of wool. By feeling their backs occasionally one can judge if they are losing too much flesh. Ewes may be carried through without grain, but it is generally best to feed grain at least a month before lambing starts. Ewes in the College flock carried through to the end of lambing on alfalfa hay alone or alfalfa hay and silage lost five pounds in weight while the following winter when fed one-half pound of grain from three weeks before lambing began they gained nine pounds and the lambs dropped averaged one and one-half pounds heavier at birth. Whether the grain was paid for by the greater development of the lambs and the increased strength of the ewes is not easy to say. Weak and slow-growing lambs, due to lack of milk, or any loss of lambs and ewes due to weakness and insufficient nourishment may make a total loss that will more than offset any saving made by not feeding grain.

WHAT GRAIN TO FEED

Feed the grains grown on the farm as much as possible. Oats, barley, wheat screenings, cull beans, field peas, corn, kafir, milo, and other common grains can be used successfully, especially where alfalfa is the hay fed. If silage or other carbonaceous roughages are used, feeds like oil cake or cottonseed cake will be needed to balance the ration.

A quarter pound of oil cake or one-third to a half pound of corn or other grain is a good daily allowance for 100-pound range ewes, while 150-pound purebred or high-grade mutton-type ewes will take more in proportion.

SOME REPRESENTATIVE RATIONS

The following rations can be considered representative for different types of roughages for 125-pound ewes:

<p>I.</p> <p>Alfalfa 3 lbs. Ground barley) Dried beet pulp) ½ lb.</p>	<p>II.</p> <p>Alfalfa hay 2 lbs. Silage 3 lbs. Corn Chop ¼ lb. Oil Meal 2 oz.</p>	<p>III.</p> <p>Sunflower Silage..... 4 lbs. Oat Straw.....Free choice Ground Oats ¼ lb. Cottonseed Meal ¼ lb.</p>
<p>IV.</p> <p>Prairie or oat hay Free choice Dried Beet Pulp..... ¼ lb. Oil Cake ¼ lb.</p>	<p>Corn fodder or cane hay Free choice Sweet clover hay..... 1 lb. Ground oats or barley ½ lb. Oil Cake 2 oz.</p>	<p>Bean or pea straw Free choice Corn ½ lb. Oil Cake 2 oz.</p>

FEEDING RANGE EWES

The feeding of range ewes will vary according to the condition of range, time of lambing, amount of snowfall and condition of the ewes. The range-flock owner wants to make the greatest possible use of range feed. Sheep do not hunt for grass very industriously if they know they can get other feed. The rancher who grows alfalfa and other roughages will bring his flock onto the fields and meadows to winter them. If he intends to keep the sheep on the range all winter he will take them to the most sheltered places where feed can be found. If grass is plentiful no extra feed need be given unless heavy snow covers the grass too deep or prevents moving the sheep to other feed. Cottonseed cake and oil cake make good emergency feeds, as they can be transported more readily than hay in bad weather and are preferred to small grains or ground feed since they can be fed on the ground or on the snow with little waste. Some sheepmen prefer yellow corn to cake for supplementing winter range. Others may put caches of baled hay on high platforms in different parts of the range for emergency use. Trails may have to be broken through deep snow, over which hay may be hauled to sheep or the sheep brought out to where they may be fed. If lambs are to be dropped early the flock will require more feed and care than if lambing is late.

The same considerations govern feeding on the range as on the farm; that is, keeping the ewes in strong condition for lambing so as to be able to suckle lambs satisfactorily till grass comes.

EXERCISE FOR FARM BREEDING EWES

Farm ewes may get too fat and soft before lambing if allowed to lie around in a feedlot several months on good feed. In Colorado, ewes can get out on the fields through most of the winter and should

be allowed to do so for several hours a day. Some hay or fodder can be spread out in the field where the ewes can get it, if there is no grazing for them. Thin ewes or those brought in within a few weeks of lambing do not need such exercise.

WATER AND SALT

Ewes need salt regularly. Salt blocks are good to put in the feed troughs, or granulated stock salt can be set in troughs in a sheltered place. Clean, fresh water is advisable at all times, though on the range sheep may go for several weeks on snow alone.

CARE OF EWES AT LAMBING TIME

Shelter.—Where ewes lamb in late winter or early spring, some type of lambing shelter is necessary in this State. Expensive barns are not needed—just a protection from the wind, snow or rain, that can be kept warm enough in cold weather to prevent new-born lambs from chilling. A low shed like that in figure 16 is used for January lambing in northern Colorado, a canvas curtain being let down in front in cold weather. One end of this shed is closed in and has a small stove, so that new-born lambs can be dried off in zero weather without chilling.

On the range, the shelter may be a permanent shed, but more often is a large tent or a skeleton frame over which a canvas roof

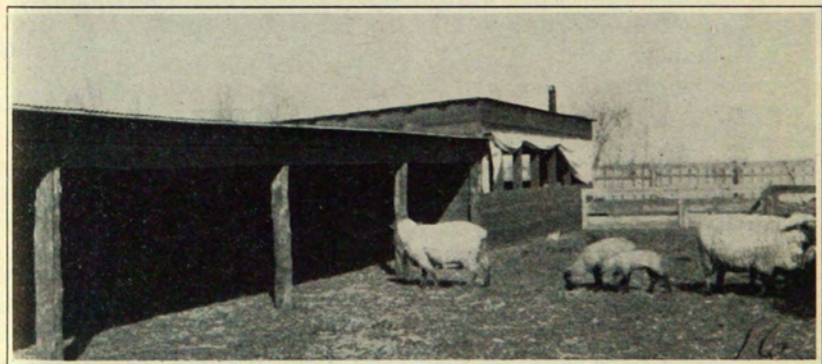


Fig. 16—A Handy Type of Lambing Shed for a Farm Flock

can be stretched at lambing time. With a small stove or two, these lambing sheds can be kept comfortable in any but the most severe weather. The type of shelter used will vary, depending on the time of lambing and the prevailing climate. The main object is to save all the lamb crop with as little capital as possible tied up in buildings.

In large lambing sheds special arrangements may be added for

feeding and watering. For the farm flock any good shed may be used for lambing. Portable panels four to six feet long make the best pens and may be hinged together in pairs with hooks and staples or tied together with baling wire while in use. Such panels are readily taken down when not needed and the shed used for other purposes the rest of the year.

Care of Ewes at Lambing.—The important points to consider in successful lambing are:

1. Have all ewes in reach of good feed and water.
2. Have reasonable shelter for ewes and lambs in cold weather.
3. Get each ewe with her lambs by themselves as soon as possible, without materially disturbing the rest of the flock.
4. Assist ewes that have difficulty in lambing, after allowing a reasonable time for the lamb to come naturally.
5. See that each lamb gets a feed of milk in the first half hour. Clip wool from around udder of ewe if it is in the way of the lamb.
6. See that every lambed ewe has a lamb to suckle and that every lamb has a nurse. Lambs from ewes that have clipped teats, spoiled udders or have no milk for other reasons must be put on other ewes or raised by hand.
7. In large flocks, keep ewes with their young lambs in small bunches till the lambs are strong and active and able to find their dams in a crowd.

If it is not convenient in the farm flock to shut all the ewes in at night even in cold weather, the ewes nearest to lambing may be sorted out and shut in the barn. Some ewes will go in a shed to lamb while others will as likely choose the iciest part of the yard. Ewes due to lamb may be picked out by the enlarged udders, full teats, and by the relaxation around the hind parts. If the shed is fairly storm-proof, with ventilation on the south side, and is not too large for the number of sheep enclosed, it will keep reasonably warm from the natural warmth of the sheep. If a man visits the flock two or three times in an evening up until 11 or 12 o'clock and again at five in the morning, there will not be many ewes drop lambs in the meantime. In large flocks a man is kept with the flock all night. For very cold nights a warm room should be available for chilled lambs. A badly chilled lamb can be warmed by immersing all but its nose in warm water, as hot as the hand can bear. The lamb, after

reviving, should be rubbed dry and taken to the ewe for a fill of milk, then returned to the warm room until strong and active.

Difficult Lambing.—Occasionally a fat, mutton-type ewe, or sometimes a range ewe has difficulty in giving birth to a lamb. This is due sometimes to a large head on the lamb and sometimes to wrong presentation (head or forelegs turned back, etc.). Space does not permit here of more than brief instructions. Experience will teach the shepherd how to handle other forms of presentation and how soon to assist the ewe. Leaving the ewe too long (two hours or more) exhausts her and loses the lamb, especially if the waterbag has ruptured or the lamb has got its head into the passageway (vagina) and is in danger of strangling. The shepherd should have some carbolized oil or carbolized vaseline to anoint his hand and arm, both for the ewe's safety and his own. If hot water is available wash hind parts of ewe as well as the hands. Introduce hand gradually into the vulva. Locate neck of womb, and find whether the fore feet and nose are presented. If the feet are presented and the nose not, slip a loop of cord over the feet so as to be able to bring them forward again at the right time. Push lamb back while ewe is not straining, and reach back into the womb till the fingers get over the lamb's head and can pull it forward. If one or both of the fore legs are back, and the head presented, push the lamb back, then get the legs forward into the passage. Make sure that the head is brought back again into position before pulling on the legs. After the lamb is in the right position, pull on the fore feet slowly as the ewe strains. Rub lamb dry if ewe is exhausted and unable to lick it, and help it to get a fill of milk within half an hour.

Making Ewes Adopt Other Lambs.—If a ewe has lost her lamb some orphan lamb should be put with her or a twin lamb taken from a ewe that has only milk for one. Ewes recognize their lambs by smell. The dead lamb may be rubbed over the live one or a little of the ewe's milk may be put on the head and rump of the one to be adopted. If a ewe will not own her own lamb, as sometimes happens when she has not enough milk or is young and foolish, she may be made to by tying her to the side of the pen and seeing that the lamb gets milk every two or three hours. After her milk has gone through the lamb she will likely take to it. Another method is to skin the dead lamb and tie the skin on the live one. On the open range the ewe is sometimes held with light stakes driven in the ground on either side of her neck and one pair on either side of her hips, or she may have her legs hobbled with a piece of robe or strip of gunny sack. If no stakes are available a small pit may be dug, the ewe and lamb put in and a light cover of brush put over the top. After two or three days together, if the lamb is doing well,

the two can be turned in with a few other ewes and lambs that for any reason require special watching.

Feeding After Lambing.—Ewes should not be fed heavily soon after lambing. If on good grass they will need no other feed. If lambing in winter, they should have clean, fresh water, good hay, and some grain after two or three days. For range feeding, either one-third pound oil cake or cotton cake will go well with grass hay or oat hay. If alfalfa hay is available a half-pound of corn and oats or corn and wheat bran may be given. Any of the rations given on page 22 will be satisfactory. If raising purebreds, or crowding the lambs for an early market, the grain ration can be raised to one pound a day for 150-pound ewes. If the ewes are to be fattened and sold with the lambs, two pounds a day can be fed.

RANGE LAMBING METHODS

Shed Lambing.—The best equipment for early lambing of range ewes is the lambing shed, capable of holding 1,000 or 1,500 ewes, with facilities for watering and feeding, and enough small individual pens and larger pens holding ten or twelve ewes each to care for

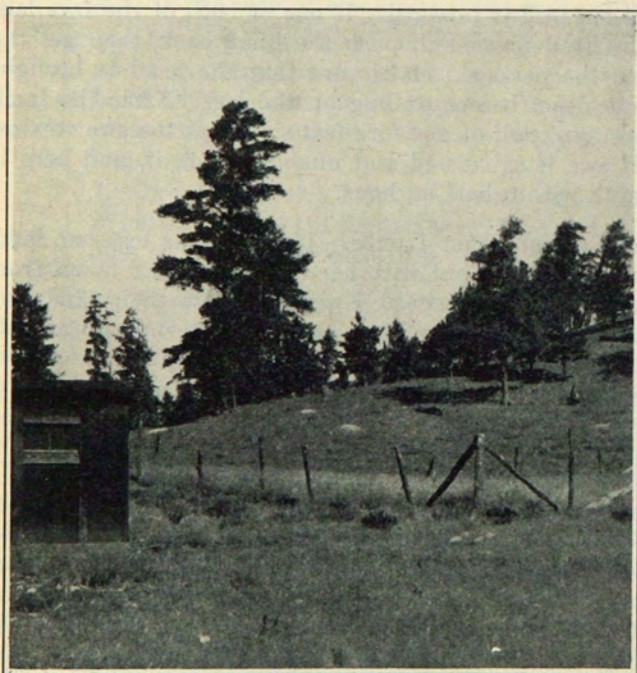


Fig. 17—Sheltered Spots Are Held for Winter Grazing. Shows Herder's Cabin and Corral for Sheep

two or three three days' drop in case of storms. The drop band runs on surrounding range during the day. The shed must necessarily be located where sufficient range is available and should have some smaller corrals within easy distance for the smaller lamb bands. If weather is not too cold, the ewes dropping lambs during the day are herded together.

er, and either bedded down where they are at night or taken into one of the outlying corrals where there is a shelter. If left out at night, lanterns, flags or similar devices are set up to keep off coyotes. In bad weather, lambs and ewes are picked up by the drop wagon which has compartments for each ewe and lamb, hauled to the lambing shed and put in small individual pens. The main band is put in the center part of the shed at night, and ewes dropping lambs then are put in small pens by the night man.

If the ewe and lamb get on satisfactorily for twenty-four hours a dozen or more ewes are thrown together in a larger pen for one or two days longer. Then each day's drop is thrown together in a band and moved out on the range. These can be put in the smaller corrals at night.

These small groups of ewes and lambs are combined into larger and larger groups as in open-range lambing until there are 500 ewes in a band, which is large enough until the sheep go on the summer range.

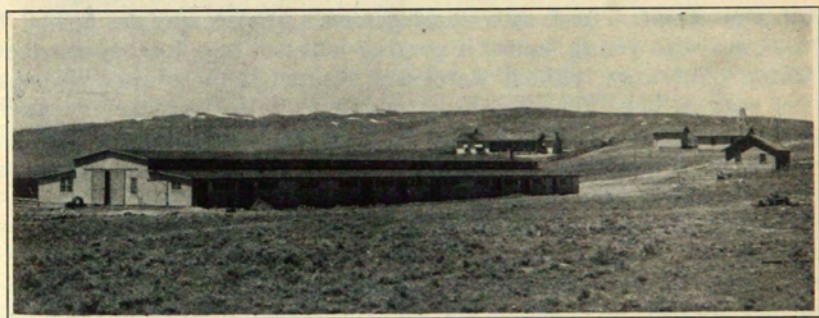


Fig. 18—An Improved Type of Range Lambing Shed, U. S. Experiment Station at Dubois, Idaho

At the lambing shed, ewes are checked over immediately to see that they are suckling their lambs and that any excess wool is sheared off their udders. Ewes with bad udders or blind teats are marked for sale by cropping one ear and their lambs transferred to ewes that have lost their lambs.

BROADCAST OR OPEN-RANGE LAMBING

This method is followed in many parts of the West, especially where there is little likelihood of severe weather and no need of extra feed. The ewes run on the range without shelter and no corrals or pens are used, except temporary "cells" for refractory ewes. Ewes dropping lambs through the day are left behind the main band and gathered together in a small group for the night. Lanterns, old

clothes, red flags, or carbide guns are hung up near the band to scare off coyotes. When the main drop band moves off the bed grounds in the morning, the ewes that have dropped lambs during the night are kept back with their lambs and form another small unit. The night and day drops, if large (40 to 100 lambs), may be kept separate for a day or two or, if small, may be thrown together at once. Where the lambs are being dropped at the rate of 200 in 24 hours, the day drop may be divided in two parts making three small bands per day. In four or five days the lamb bands of two or three days' drop may be thrown together. These groups are then combined with others in five to seven days more. The longer the ewes and lambs can be run in small groups, the less distance they have to travel, the better the lambs thrive, and there is less danger of lambs getting separated from their dams.

This type of lambing calls for moderate weather, good grazing and fairly open range, reasonably free from predatory animals. The best grass and the most favorable locations near to water are reserved for the lambing season. Cake or corn can be fed on the range if the ewes need extra feed in a short season. Water may be hauled to the ewes with young lambs, if grazing is better in a locality far from water. Territory without water can be used if there are snowbanks for ewes to lick. The broadcast system is fairly satisfactory where good herders are in charge, and as there is little equipment used the overhead is not great. The objections are that lambing must be later in the spring than with shed lambing, and there is a heavier loss of both ewes and lambs, if bad weather intervenes.

LAMBING UNDER FENCE

A system which has found some favor where possible, is lambing under fence, the claim being that there is a great saving of labor as well as no losses from predatory animals. The following account of pasture lambing is from Forest Service Bulletin 97, published by the U. S. Department of Agriculture, and to which the reader is directed for more complete information:

"A good grazing area with natural shelter is fenced with 34-inch woven wire, with three barbed wires on top and one on the surface of the ground, all well braced and subdivided into four large and two small pastures. The drop band is grazed outside the enclosure and penned in the corrals at night. Lambs dropped during the night are left in the corrals with their dams when the main band is taken out. This small bunch may be taken out to graze later after mothers have been located for all lambs. Ewes with strong single lambs are then put into pasture No. A; those with twins or weak lambs or those refusing to own lambs in one of the small corrals. The day drop when close in would be brought in the first night and divided into the same two pastures. If further out they would be left at one of the small outlying corrals for the first night



Fig. 19—The Lambing Wagon Follows the Band to Pick up the New Lambs

and then brought in. The next day those in pasture A are turned into pasture C for two days while A is filled again with a new day's drop, which is moved next into pasture D for two days. Those from pastures C and D are then moved together into pasture E for two or three days more and then turned out on the range.

"The weak lambs are nursed along in the small pastures with the unclaimed ones, being put on other ewes until it is safe to turn them out. Misbehaving ewes may be hobbled with strips of gunny sacking, tied to stakes, or put in small pens till they claim their lambs."

The advantages claimed for this system are saving of lambs and labor. The fencing, of course, costs something and not every flock owner is situated where he can take advantage of this method. A test made on the Cochetopa forest showed an 85 per cent lamb crop saved under the pasture system, as compared to 60 to 82 per cent on flocks lambled in the open. It is claimed that three men can care for 1,000 ewes with these pastures where the crew needed in the open would be five to seven men. Whether this system comes into more general use or not will depend on the relative costs of labor and fencing.

Mr. K. W. Chalmers, a graduate of the Colorado Agricultural College and part owner of a large sheep ranch in Park County, describes his methods as follows:

"Most range owners in this locality use a combination of shed and open-range lambing. The dropping herd is sent out to graze on meadows adjacent to the central corral or lambing sheds. The ewes that drop lambs are brought back to the sheds in lambing wagons where each ewe and lamb is put into a separate pen, remaining there from 12 to 24 hours. After the ewes and lambs are taken out the individual pens the lambs dropped during the same day are put into one bunch and either put into a small pasture adjacent to the corrals or herded by a herder, the object being to keep the ewes and lambs in as small bunches as possible for as long a time as possible. This all depends on how pasture or open range is available near the lambing corrals. As soon as all the

pasture near by is utilized the oldest ewes with lambs are joined together in larger bunches and moved to what are known as remove camps, some little distance from the lambing sheds.

"During the night the dropping herds are corralled and there is a man left on duty during this time to move all ewes and lambs into the sheds immediately after the lambs are dropped. Too much care cannot be exercised in choosing the night man as the entire responsibility for the care of lambs rests upon him at this time.

"During the daytime the lambing boss, with one helper or corral man, is continually on duty at the sheds where the lambs are being brought in, it being their duty to see that the ewes own their lambs or, if not, to mark those individuals and put them in separate pens or so-called 'penitentiaries'. The lambing boss has to see that all twins are marked and classified and has general supervision over all work around the corrals under the direction of the boss in charge of the entire camp.

"The point to be stressed during the entire lambing season is strict-est attention to detail. It is the small details that count as the attention given to the ewes with lambs either spell a successful or a poor lamb crop.

FEEDING ORPHAN LAMBS

In all cases try first to put the orphan on some ewe that has lost her lamb, or on a good milking ewe that has only one lamb. On the range, sheepmen usually give bum lambs away rather than feed them, if they do not have a ewe to take them. Many boys and girls have got started with sheep by raising these bum lambs. Good cow's milk is the best feed. A little lime water in the milk will help to prevent indigestion. The following table will prove a guide to the right amounts to feed and the number of feeds daily for best results. Size of feed is given both in fluid ounces and pints, to suit whatever measure is handier.

Feeds for Orphan Lambs

Age	No. of feeds Daily	Milk per feed		Pints of milk per day
		(in ounces)	(in pints)	
1 to 6 days	6 to 8	1 to 2	1-10	$\frac{1}{2}$ to $\frac{3}{4}$
2d week	4	4 to 6	$\frac{1}{4}$ to $\frac{3}{8}$	1 to $1\frac{1}{2}$
3d week	4	6 to 8	$\frac{3}{8}$ to $\frac{1}{2}$	$1\frac{1}{2}$ to 2
4th week	4 to 3	9 to 12	$\frac{3}{4}$	2 to $2\frac{1}{2}$
6th week	3	16	1	3
8th week	3		1 1-3	4

A large (Hygiea type) nipple that will fit on an ordinary milk bottle can be used, with the opening enlarged with a small knife-blade. A swan-bill nipple can be put on an ordinary 8-ounce bottle or small nursing bottle. Bottles with the ounces marked on the side are handy with which to measure.

The lamb must be the final guide as to amounts. A six-pound lamb and a fourteen-pound lamb will not take the same sized feed.

The lamb will let the feeder know if it is not getting enough, but should not get all it will swallow at one time.

Milk should be clean and sweet, fed at blood heat, and the utensils scalded daily. A handy way to warm a bottle of milk is to set the bottle in a pan of almost boiling water. Dip the bottle in quickly a few times till it gets well warmed, then let it stay till the water cools to near the right temperature. Milk can be fed fresh from the cow to good advantage. More than six feeds a day are rather inconvenient. Lambs soon learn to do with three or four feeds a day. In case of scouring cut the amount of milk in half for a day, then gradually increase.

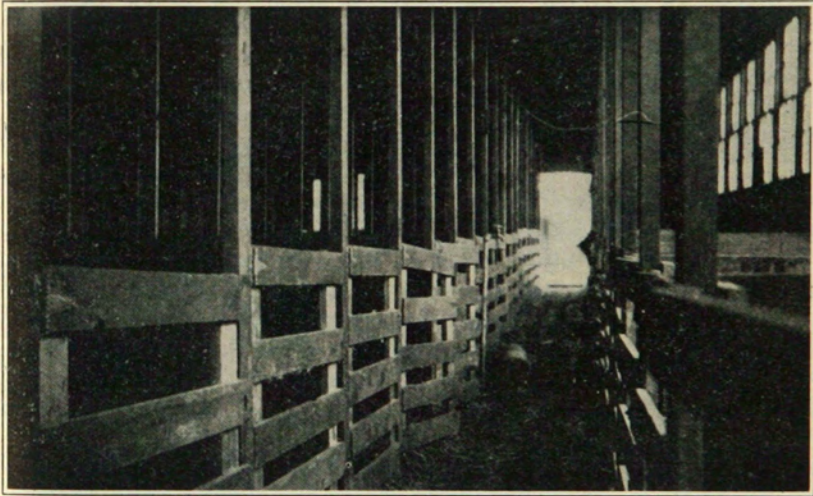


Fig. 20—Interior of Lamb Hospital on a Large Wyoming Ranch, Showing Individual Pens

One range breeder makes small stanchions, like calf stanchions, so that the lambs can be held in place. In front of these is a board laid flat, with round holes cut out to hold small pans in front of each lamb. The lambs are fastened in place and the pans filled with the right amount of milk. The lamb is taught to drink by putting a nipple into its mouth and then lowering it into the milk.

DOCKING LAMBS

For full instructions on docking and castrating, see Farmers' Bulletin 1134. Docking lambs gives them a neater appearance, renders them less liable to fly blowing, keeps them cleaner, especially in the case of ewes, and is a necessity in the case of ewes kept for breeding purposes. In the dry Southwest there is some excuse for

leaving tails on range lambs in view of possible losses from screw worms, but for farm flocks docking is always advisable. Docking is done when lambs are two to five weeks old, with either the knife, docking pincers, or the hot iron (Ellenwood type). The hot pincers appear to be favored in small flocks, with the knife or the chisel type of iron used most on the range.

The knife is handy for the man working alone on a few lambs if he has time to watch cases of excessive bleeding. In the first place the knife is a one-man affair, requiring no fire to heat irons or any assistant to hold lambs. The knife is credited with making a faster healing wound than that by any other method of docking. The tail is cut from the underside at about the third joint or about one inch long. A man working alone holds the lamb between his legs, its head to the rear. If the artery bleeds badly the dock is held between finger and thumb for a minute. Do not pull on the tail while cutting or the skin will pull away from the bone when released, making a bad dock to heal.

The hot pincers are favored for docking for high-class farm flocks. The crushing effect of the pincers as well as the heat dulls pain and checks bleeding compared to the sharp knife. Farmers' Bulletin 1134 gives illustrations of an upright board with a hole through it fastened to the end of a horizontal plank. The assistant holds the lamb and runs its tail through the hole, while the operator cuts the tail off even with the board. With the Ellenwood type iron, a wooden paddle with a large notch in the side can be put over the tail to protect the lamb and give a uni-



Fig. 21—Docking, Castrating and Ear-marking on the Range, Showing Ellenwood Iron—the Lamb in the Middle Says "Life Is Sure One Durned Thing After Another"

form length to the dock. An expert docker needs no devices of this sort. For fast work under range conditions at least four irons of the Ellenwood type are used, three being in the fire while the fourth is in use.

Although some tests seem to show that the cut from the hot iron heals a little slower than from the knife, the experience of many sheepmen shows less bleeding and fewer losses with the hot iron.

CASTRATING

Buck lambs are docked fifty cents to one dollar per hundred because of the heaviness of their fore quarters and necks and for lack

of flesh compared to wethers. Castrating is usually done at the same time as docking, and it is a simple operation. Hold lamb in position as in figures 21 or 22. The operator cuts off the lower half of the scrotum, exposing the testicles. If they do not show in a small lamb they can be pushed out by pressure in the flanks. In small lambs they can be grasped with the fingers and pulled out along with the cord; on the range they are pulled with the teeth. With lambs weighing thirty pounds or more the cord should be cut or rather scraped through. No disinfectant is used in castrating lambs, though in fly season especially a little tar can be put on to keep away flies.

Older rams can be castrated successfully, but on account of greater danger of bleeding the cord should be severed with an emasculator or the hot docking iron. If neither are available, scrape through carefully with the knife. Feed lightly for a day or two and keep them quiet.

CULLING THE FLOCK

Weeding is an important and necessary part of breeding. The best flocks develop some poor individuals that should be sent to market. Mark all barren ewes at lambing time and those with clipped



Fig. 22—Docking With Knife

teats, spoiled udders or that have no milk for their lambs, so that they may be sent to the market in the fall. A common mark is cutting off half an ear. In the fall these ewes, together with all thin, broken-mouthed ewes are shipped to market. This way the flock is kept at a high standard of lamb production.

Too little attention has been paid to culling for wool. The average Colorado fleece weighs 6.5 pounds of grease wool, much of which is not high grade. Range ewes vary from 4 pounds to 12 to 14 pounds wool per head, and a systematic culling out of all ewes shearing below 6 pounds with the consistent use of heavy shearing rams would raise the average of a flock very rapidly. Flock owners on the Cochetopa National Forest have by such methods raised their clip to a 9.5 pounds average.

As it is not practicable to weigh the wool from each ewe in a range flock, culling for wool can be done by examination just before shearing. The sheep are run through a cutting chute and the fleece



Fig. 23—A Bunch of Navajo Ewes Drop Some Early Lambs

examined in regard to length of staple, density, covering and quality of wool. Opening the fleece at the shoulder shows the quality and length of fiber, while a grasp of the wool indicates density and covering. Length of staple is important. Wool that is of combing length, i. e., over $2\frac{1}{2}$ inches for fine wool or $3\frac{1}{2}$ inches for medium wool is priced at 5 cents a pound more in 1925 than clothing (short) wool. A fleece with long staple will weigh more than a short-stapled fleece of similar quality, averaging in some cases $1\frac{1}{2}$ to 2 pounds more per fleece. A ten-pound fleece of combing wool at 40 cents would be worth \$4.00, while an eight-pound fleece of clothing wool at 35 cents would return only \$2.80, a difference of \$1.20 in favor of the long staple.

SHEARING

In eastern Colorado shearing is generally done in April and in the higher altitudes from the latter part of May to June. Shearing

too early causes losses in case of storms, while late shearing causes discomfort to the sheep and deterioration or loss of wool. Most shearing in Colorado is done by professional shearers, but for beginners who do their own shearing a few suggestions may be made.

Hand shears will serve satisfactorily for flocks of less than twenty-five or as many head as one wants to shear in that way.

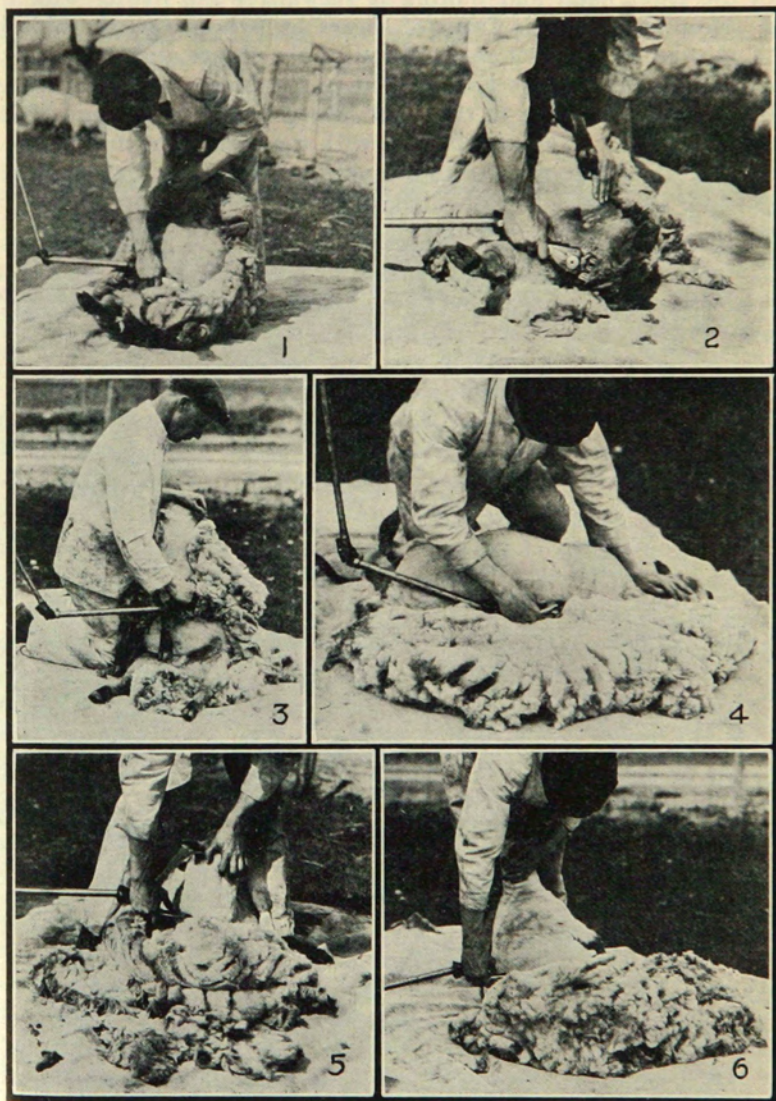


Fig. 24—Various Positions in Shearing Sheep

Hand-turned machine shears can be used for flocks up to 200 or more. Have shears or shearing knives sharp and in good order. Select a warm day for shearing, or shut the sheep in a close pen where the oil will warm in the wool and make shearing easy. Have a clean floor or wagon canvas to shear on. Set sheep on rump by putting left arm under sheep's neck, grasping the nearest rear leg with the right hand and pulling it forward while lifting with left arm. Keep skin tight in front of shears by pressure on the hide behind the shears. Do not reach ahead of the shears and pull on wool as a "buttonhole" is likely to be cut in the hide. Shear to the left and keep sheep turning to the right. Keep points of machine shears flat on the skin. Take long strokes with the shears and full width of the shear and keep as close to the skin as possible. In learning to shear aim at accuracy rather than speed, until the work becomes familiar.

Machine shearers usually start at point of brisket and shear down across belly. Shear inside of hind legs and around udder or scrotum. Be careful in shearing around sheath of males and the teats and genitals of ewes. After shearing the belly shear along neck from point of brisket to left ear and on down over the point of the left shoulder and the foreleg. Hold the ears down with the left hand while shearing around the head. It is easy to get the edge of the ear into the shear, making a bad gash, while getting a metal tag in the shears wrecks both comb and cutter.

Now lay sheep on its side with the back toward the machine, holding the left hand on the sheep's head and the right knee in its



Fig. 25—Shearing in a Large Western Shed

rear flank. Shear along the side in long strokes from thigh to shoulder, continuing on over the backbone. These long strokes take the wool off rapidly. Next raise the sheep's head, keeping hold of the right ear and shear the right side of the face and neck to the shoulder. Gradually raise sheep up on its rump as the shear progresses down the right side, the strokes going diagonally down and across the right side from back to front. Continue down the right thigh to the tail head. See that no locks of wool are left hanging around the legs or neck. If the hoofs of farm sheep are badly grown out, this is a good time to trim them with a pocket knife or hand pruning shear.



Fig. 26—Branding Sheep With Branding Fluid After Shearing

On the range, where bands are liable to become mixed, the sheep are branded with a paint brand after shearing. Australian Wool Branding fluid or any similar prepared mixture that will scour out of the wool, should be used in preference to lead paints or tar. The latter do not scour out of the wool, but have to be cut out as their presence injures any fabric into which they get.

The following suggestions for preparing and sacking fleeces are given by George T. Willingmyre, Specialist in Marketing Wool, of the U. S. Department of Agriculture:

Clip all tag-locks from each fleece and pack separately. Never permit them to remain in the fleece.

Fleece should be prepared with the flesh side out, the weather side in.

Fold, roll, or use fleece box for tying up the fleece.

Tie each fleece separately. Never tie two fleeces together or pack and market untied wool.

Use only enough twine to tie the fleece securely.

Paper or hard, glazed-surface twine should be used. Never use sisal or binder twine. (The fibers get into the fleece and ruin any fabrics made from the wool.)

Never permit the fleece to come into contact with chaff, hay, dust, or any other foreign material.

Place the tied fleeces in regulation wool sacks or cover them with canvas or new burlap.

Select a dry, clean place for storing the wool until sold. Never permit the wool to lie upon the ground or store it in a basement.

Keep the white and black wool separate. Never permit any portion of black wool to be mixed through the white.

Divide the burry, seedy, cotted, dead, black and gray fleeces from the clean, white well-grown wool, and pack separately. Never pack all grades together indiscriminately.

SUMMER MANAGEMENT

On the Farm.—The management of farm sheep in summer is largely a matter of keeping them on good pasture with a clean water supply, salt, shade, and a dog-proof corral for protection at night. A small permanent pasture can be used part of the time when no other pasture is available. The sheep can be run with cattle or with quiet horses, on ditch banks, or in the orchard, during the early part of the season. Later on, they can make use of stubble fields and meadows, or can clean out the weeds in the corn fields before the corn is cut. Bloat must be guarded against if sheep are run on green or wet forage, especially alfalfa, clover or rape. It is customary in some eastern states to grow special forage crops, as peas and oats, cow peas, or rape for the sheep to graze down part of the day, especially if there are purebred lambs to be grown out, or if the lambs are to be forced along for an early summer market. Forage crops of this kind reduce losses from stomach worms where these are in evidence on permanent pasture. If there is danger from dogs, shut sheep in at night. A 34-inch woven wire fence with two strands of barbed wire on top and one along the ground makes a good fence.

Summer Management on the Range.—Any discussion here on range management must be brief, as this is written mainly for the man with the small farm flock. The man who raises sheep on the range as a main business will need a good deal of personal experience on the range or must hire reliable help with that knowledge.

The main points of good range management are to get large summer gains on the lambs, to keep down losses of ewes and lambs, and to do all this as cheaply and efficiently as possible.

Range flocks are run in bands of 1,000 to 1,500 head in charge of two men, a herder and a camp tender. The herder stays with the sheep, moves them to the next grazing ground, guards against predatory animals, avoids poison-weed localities if he can, cares for sick animals and keeps the sheep from straying or mixing with other bands. Where one owner has several bands, one camp tender may look after two or three herders, if they are not moving camp every day. It is his duty to keep the herders in supplies, move the camp equipment and look for new camp grounds.

Watering and Salting.—Range sheep do not require much water in cool weather, especially if the grazing is fresh and green. In winter, with snow on the ground, they may be carried for several days or weeks without water. They should be watered at least every two days and in warm weather, daily. They should not be taken more than two miles from water in warm weather. Where water is scarce on otherwise good range it may be stored temporarily in ponds or concrete vats when the snow melts. On range lambing grounds water is sometimes hauled to ewes with small lambs when it is to the advantage of the herder.

Sheep need salt regularly, at least two pounds per ewe for the summer. By careful and systematic salting the band can be made to cover the range allotted in a very thorough manner. Salt should be put out in handfuls on flat rocks or on grass rather than on loose dirt or gravel. No salt troughs are needed for sheep as the amount put out at any one place is small and readily cleaned up.

The sheep are sheared shortly before they go to the hills for the summer. Generally they must go along certain designated runways till they reach their destination in the Forest Reserve if that is their destination, and are counted into the forest by the ranger or his assistant. From the lower part of the range they work their way gradually up to the higher parts, till they are above timberline. Then they graze back through the valleys as the summer ends, reaching the cutting corrals in September or October, where lambs and broken-mouthed ewes are cut out for shipment.

Methods of Handling on the Range.—Open herding with one-night bed grounds is considered the better way of handling sheep on the range where the character of the range permits. As one successful sheepman expresses it, the best herder is the one who does the least in the way of herding, letting the sheep scatter as they will in open formation, merely keeping the stragglers in line and seeing that they go in the right direction. By bedding down in a new place each night, the grass is not killed out as where they are bedded several nights in the same place. Sheep do better under fence than under the herding system, but fencing is impracticable at present

with our free public range system and the present method of annual permits on the Forest Reserves.

The following extract from U. S. D. A. bulletin 790, Range Management on the National Forests, gives a good account of a herder's day on the forest reserve:

"As early as 1909 investigations showed that mountain summer range grazed by sheep under fence supported from 25 to 50 per cent more sheep than where being grazed on the same acreage of similar range on which the sheep were herded by the methods generally practiced at that time, and that the pastured sheep made better gains in weight than the herded sheep. It was found also that there may be a variation of at least 25 per cent in the grazing capacity of a given range when used by the same sheep under different herders. From four years' study of the actions of the pastured sheep and the methods of herding on unfenced range it was concluded that the marked differences in grazing capacity and in growth of the sheep under the two systems were due largely to a few differences in the way the sheep were handled—differences which could be largely eliminated by improved methods of herding.

"As a general rule sheep should be bedded one night in a place. The damage to range so characteristic around old bedding grounds will then be eliminated, and the sheep will be on fresh feeding during the cool hours of the morning and evening, when they graze best on the summer range.

"The herder should be with his sheep, ordinarily, from the time they begin grazing in the afternoon until they are shaded up the following forenoon. This is necessary to prevent straying and as a protection against predatory animals. Coyotes, especially, attack sheep most frequently in the late evening and early in the morning. Bears usually attack the band during the night. In some localities the herder remains with his sheep all the time, carrying his camp outfit, provisions, and, if necessary, drinking water, on a pack animal, usually a burro.

"The sheep should be allowed to begin grazing soon after daybreak so that they will fill up before the heat of the day. Their course of travel can be directed by the herder, and, if necessary, the leaders should be checked so that the herd will spread out quietly over an area sufficient to provide forage for the morning. Until the sheep settle down to rest after the morning grazing the herder should move quietly around the outside of the herd, keeping track especially of the leaders, but not disturbing them except where necessary to check them or change their direction.

"Between 7 and 9 o'clock in the morning during the summer the sheep usually settle down to rest. They will not move far during the remainder of the warm part of the day and need not be disturbed. The herder should go around the outside of the band occasionally to see that none of the sheep are straying off.

"During the time that the sheep are resting the herder has several hours to do his main cooking for the day. Where the burro system is followed he usually makes a cup of coffee before starting his sheep at daybreak. When the sheep shade up he unpacks his burro and does his

cooking. Herders who do not remain with the sheep all the time, carrying their provisions and cooking outfit, return to the herder's supply camp while the sheep are resting and do their cooking and camp work for the day. Herders who follow this plan usually eat two meals at the supply camp each day, one upon arrival in the morning and one before leaving to round up the sheep and remain permanently with them during the night. The herder's supply camp should be moved often enough so that he will be able to go around the band occasionally while they are resting. During the scouting trips around the band a bedding place for the night should be selected; and, if the burro system is not being followed, the herder's bed and salt for the sheep should be moved to the new location. A site comparatively open, free from down timber and brush, and larger than the actual bedding space required should be selected. On an open site the lambs can find their mothers with the least difficulty; there is least danger from attack by predatory animals, and there is less danger of a 'pile up' or crippling of sheep in case the band is frightened during the night.



Fig. 27—The Best Herder Is the One Who Lets His Sheep Graze as Quietly as Possible

"High, dry ground on mounds or ridges furnishes the best sites for bedding grounds. Sheep bedded in canyons with adjacent intermediate ground open or comparatively free from dense timber and brush have a tendency to leave the bed ground and drift to the ridges. They rarely drift far from a ridge into a canyon.

"Where heavy timber and brush extend over large areas of the range, small openings are of vital importance. Their location should be known, and grazing should be planned so as to use them to best advantage.

"In gathering the sheep in the evening it is especially important that the herder circle the outermost tracks made by the sheep during

the day. Tracks are the best indicators of where the sheep have been. From this outer circle the sheep should be turned toward the site selected for bedding. Stragglers and isolated bunches should be driven to the main band. By about 6 o'clock the sheep should be collected into a loose band near the bedding ground. They may then graze in this formation until they bed for the night. Meantime, the herder should move about them, counting the bells and markers and watching the ewes and lambs. Lambs that cannot find their mothers or ewes that cannot find their lambs in a reasonable time may be indications that the sheep are not all in. Care in rounding up the sheep at night cannot be over-emphasized. The greatest losses occur from leaving small bunches away from the band, subject to attack by predatory animals."

FEEDING LAMBS

The commercial fattening of lambs for market is a subject in itself and cannot be discussed here. Commercial lambs that are to graze through the summer and be fattened the following winter are not grained unless in case of storm or other feed shortage. Pure-bred lambs, or farm lambs marketed in early summer are usually given grain as soon as they will eat, and as much as they will clean up readily. Crushed oats, bran, barley or corn mixtures are all used. One breeder mixes fine cut alfalfa with his grain in equal parts and gives the lambs all they want. Such grain is fed in low troughs easily cleaned and put inside a "creep." This is a small pen with upright slats through which the lambs can pass without letting in the older ewes.

SELLING LAMBS AND SURPLUS EWES

Lambs from the farm flock are usually sold early in the season, so that they do not compete with range lambs. The best ewe lambs should be held to build up the flock, and any old ewes proved unsatisfactory discarded. The man with plenty of pasture land or farm fields for fall grazing can keep the lambs profitably till fall, though if short of grass he may strike a good market in early summer.

In selling purebreds, surplus ewes may be sold for better money while one or two years old, while the best breeding ewes may be retained in the flock as long as they will produce lambs. It is most important, however, to keep the best breeding ewes of any age, especially those that are not only regular breeders but those whose offspring are also of good type and are good breeders.

In selling rams, the breeder should study his market and produce the type and breed of rams the market wants. The small farm breeder will usually get the best sale for medium-wool mutton breeds and can sell these to best advantage as lambs. Range rams get better sale as yearlings, and must be of breeds suited for range purposes,

such as the Rambouillet, Corriedale, Hampshire or some of the long-wool breeds. The breeder of purebreds on a large scale will have to show at fairs and advertise freely in order to get his stock known. Satisfied customers are the best advertisement, but are not the only form of advertising needed.



Fig. 28—Near the End of the Trail. Counting Them Into the Railroad Yards in South Park

SALE OF WOOL

Wool can be sold to local or travelling buyers, shipped to commission houses, or sold through wool pools. The wool pool may be of a local or county nature, dealing through a nearby commission man, or may be a state-wide organization, grading its own wool and selling direct to the mills. No one method will guarantee the wool grower a higher price than any other. One year a man may make three, five, ten or more cents a pound by selling through a commission firm or through a wool pool. The next year the wool market may drop as the season progresses and the late-sold wool thus take a much lower price than the local dealer offered.

The main thing is to know fairly well what grade of wool one has, what the Boston price is on that grade, what the shipping expense will be including commissions, and to what extent a higher net return per pound will offset the inconvenience of waiting for the money. The method of sale will depend also on the amount of wool one has to sell. To the man with 60 pounds of wool a difference of five cents a pound means only \$3.00, which may hardly pay him for shipping his wool, waiting for his money, and taking his chance on getting the extra five cents. To the man with 50,000 pounds of wool a dif-

ference of only two cents a pound means \$1,000.00, which will pay him well for selecting the best means of selling at the highest price.

The man with the large clip can ship by carload to Boston, Philadelphia or Chicago, while the smaller grower can only do so economically by shipping in co-operation with other small growers in his vicinity. The man with the small or medium-sized clip may get a line on prices at the nearest wool houses by submitting fair samples of his clip and should be prepared to intelligently accept or reject any bids made locally.

Wool pools have proved advantageous in some sections like Ohio and on the Pacific coast, but have not done so well in other places. The wool pool attempts to gather the small clips together at a central point, weigh, grade and give receipts for same and sell to the eastern mills on grade. The grower gets the average net price of the year for each grade of wool in his clip. Many of the wool pools were unfortunate on account of starting during a slump when the late season price was lower than the growers were offered earlier in the season. The method which will net the grower the largest share of the final price in proportion to the effort involved will pay best on an average of years.

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