

The Missouri Plan of Sheep Improvement

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Ewes receiving proper winter care on Boone county farm.

Missouri ranks as the leading state in the corn belt in the production of early spring lambs. A relatively short winter with sufficiently low temperatures to hold sheep parasites in check, and an early spring, make conditions nearly ideal for the production of February lambs. Pasture from bluegrass and the small grains (wheat, rye, barley and oats mixed with rape) supplies early spring grazing for ewes. A liberal milk flow as a result of good pasture enables February and March lambs to reach the late May and early June market. These

natural conditions and the proximity of markets give Missouri sheep raisers advantages not common in other sections of the corn belt.

Sheep production on Missouri farms has undergone marked changes during the last 15 years. Although numbers have not varied materially during that period, there has been a shift from lamb feeding to the maintenance of ewe flocks and the production of spring lambs. This change has resulted in a reduction in the number of lambs brought in for feeding and an increase in the number of ewes maintained in farm flocks. It has come about largely because of economic conditions. Some of the western states are favored as lamb feeding sections over Missouri because of the nearness to the source of feeder lambs, feed-in-transit privileges, dry winter weather, cheaper alfalfa, and cheaper grains. The change to ewe flocks in Missouri has been made because of the opportunity to eliminate some of the speculative features involved in lamb feeding.

Many Missouri farms are adapted to the maintenance of ewe flocks because their general topography and fertility is such that more of the land should be kept in grass and hay crops. Where sheep have been properly cared for they have converted grass and hay into lambs and wool constituting a larger cash return per animal unit and dollar invested than the income from other classes of farm animals. Although it is probable that more Missouri farmers need farm flocks, sheep should not be produced on every farm, because many farms are not adapted to sheep raising and many farmers do not like the sheep business. While sheep have often been commended for their work as scavengers and their ability to kill weeds, successful sheep men realize that ewes and lambs must have sufficient good pasture and other roughage such as legume hay if they are to be profitable. Neglect of a flock and failure to provide good feed soon eliminate the operator from the sheep business.

The Ozark section with its grazing possibilities will probably become a greater sheep producing area. Relatively cheap land that will produce abundant pasture, excellent water, shade, mild winters, and cool summer nights give this area an advantage in the production of early lambs. Conditions are such that lambs can be dropped two to three weeks earlier than in the northern part of the State, and as a result ready for market that much before north Missouri lambs.

With all of the natural advantages outlined above it may seem surprising that sheep production has not progressed more rapidly in the State. A study of the situation shows that the change from lamb feeding to maintenance of ewe flocks has resulted in an increase in the number of ewes and a corresponding increase in the number of flock owners inexperienced in sheep management. As a consequence many farmers have not yet adopted proper methods of flock management, and have been discouraged because of the production of inferior quality lambs marketed during the months of lowest prices. Information from the markets showed that prior to 1928, fully 60 per cent of all male

lambs from Missouri were being marketed as bucks. Records of packing companies showed that 75 to 85 per cent of all cull lambs bought at St. Louis during 1926 and 1927 were bucks. Shipping association records revealed that in many sections one-third of all of the lambs shipped during the year sold as culls. Market prices showed an average difference of \$6.00 a hundredweight between top lambs and culls during the early seasons of 1928, 1929 and 1930. A further study showed that the inferior quality and large percentage of cull lambs were due to the use of grade rams, to stomach worm infestation, failure to dock and castrate, and inadequate pasture and winter rations for the ewes. The late marketing resulted from failure to follow a definite plan of sheep improvement.

With this information at hand a sheep improvement program was outlined with the view to assisting farmers with their sheep production problems, and thereby improving the quality of Missouri lambs to such a degree that they would establish a reputation for quality on the market.

The Missouri Plan of Sheep Improvement as developed and used by the Extension Service was first established in Monroe county. The untiring efforts of the county extension agent and the leading sheep producers in that county, in cooperation with the College of Agriculture, made the plan a success within the county and furnished valuable guidance for a state-wide program.

The plan includes the following steps:

1. The production of early lambs.
2. The use of purebred rams.
3. Proper winter care and feed for the bred ewes.
4. Docking and castrating lambs.
5. Grain feeding of the lambs.
6. Selling of the lambs on a graded basis.
7. Control of parasites.

THE PRODUCTION OF EARLY LAMBS

Kentucky, Tennessee, and the Virginias have long been known as early lamb producing states. Missouri must now be included, because it is one of the few states in the corn belt with winters mild enough and springs early enough to permit the production of early lambs on an extensive and economical basis. There are many advantages for Missouri flock owners in the production of early lambs.

The average price of lambs in May and June during the ten-year period, 1925-1934, was \$1.10 above the average for the six following months. Climatic conditions of the early lamb producing sections are such that the supply of fat spring lambs going to market is normally smaller in May and June. Missouri spring lambs sold before July also tend to escape the ravages of internal parasites which are greatest during the hot summer and fall months.

Ewes from which the lambs are weaned by the first of July are given a rest period before a late August or early September breeding

date. The rest period enables breeding ewes to gain in vitality, if properly handled. Strong healthy ewes are most profitable.

It is sometimes said that a larger percentage of the lamb crop will be saved if the lambs come in April and May. Actual surveys show this to be incorrect. If the lambs are dropped in February and early March there is less field work to take the attention of the flock master away from the proper care of the lambs. Later in April and May with the field work pressing and the weather changeable, the flock is often neglected and as a consequence a smaller percentage of lambs is saved than in the case of the earlier lambing period.

Flushing the Ewes.—In order to produce early lambs, ewes must be bred in late August and early September. The average gestation period for ewes is 145 to 147 days. It is necessary to wean lambs by July 15 to give the ewes a chance to gain in flesh, if they are to be bred early. A practice that is growing in favor is known as “flushing” the ewes. It is accomplished by feeding grain such as oats (about one-half pound per ewe daily) or by turning on a fresh and more luxuriant pasture three to four weeks before the ram is to be turned in. Second growth clover or lush grass that is washy will not have the desired effect. Ewes are often slow to settle on such pastures. In addition to increasing the size of the lamb crop, the flushing has a tendency to result in an earlier and shorter lambing season. In many flocks there is a tendency for ewes to get too fat which causes some to fail to conceive. In this case they should be placed on short pasture until a few days prior to the breeding season when they may again be put on good pasture before the ram is put with them. Ewes should be gaining at the time they are bred.

USE A PUREBRED RAM

Only purebred rams of the correct type should be used on either grade or purebred ewes. For the grade flock particular attention should be paid to useful points rather than fancy ones. The ram should be thick, blocky, short-legged, wide of back and chest, well fleshed, with a strong masculine head, thick, short neck and good bone. The hindquarters should be full and deep. Such a ram will produce far better market lambs than one that is upstanding, rangy, and narrow. The fleece should also be considered in selecting the ram. It should be dense, fine, and strong, showing plenty of crimp and luster. In selecting a ram, the breed type should not be overlooked. Intelligent selection of a purebred ram requires careful study of the characteristics of the chosen breed. A ram should then be selected that shows breed characteristics, type, and masculinity. If the ewes are small and fine, a ram of more scale should be chosen. If the ewes are large and coarse, a smaller more compact ram should be used, because it is certainly true that the ram is half the flock, and too much care cannot be given to his selection.

Results at the Missouri Experiment Station show that good rams pay. A purebred mutton ram and a scrub ram of unknown breeding were used in 1913 in an experiment with grade western ewes.

Basis of Comparison	Lambs Sired by Purebred Ram	Lambs Sired by Scrub Ram
Weight	59.72 lbs. (3 Mos.)	56.22 lbs. (4 Mos.)
Selling price per cwt.	\$7.35	\$4.50
Value per head	\$4.38	\$2.52

As shown in this table, the lambs sired by the purebred ram were worth \$1.86 per head more than those sired by the scrub ram. With fat lambs now selling higher than they did in 1913, the difference would be even greater. This compares very closely with the difference of \$1.90 per head obtained with a similar experiment conducted at the

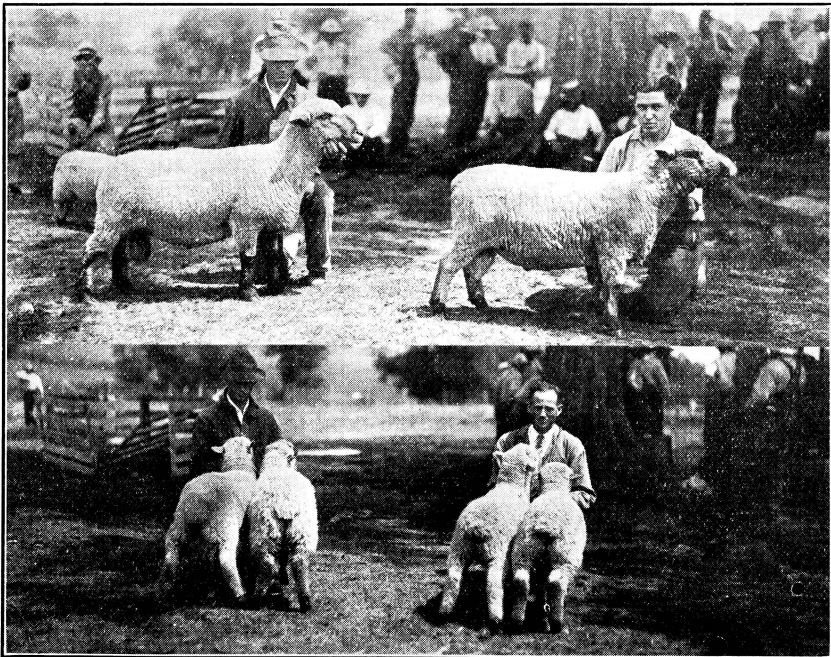


Fig. 2.—Lambs Sired by Purebred Ram (on right) brought \$1.76 per head more than lambs sired by Grade Ram (left).

Oklahoma Station. One farmer in Monroe county, Missouri, purchased a registered ram to replace a grade ram. He bred thirteen of his ewes out of a flock of 49 to the grade ram. They were the first 13

ewes that came in heat and as a consequence, the earliest lambs that were dropped in the flock were sired by the grade ram. Even with this age advantage the lambs sired by the scrub ram showed \$1.76 less profit per head than the lambs out of the same kind of ewes but sired by the purebred ram. The picture used as Figure 2 shows the two rams and a typical pair of lambs sired by each.

A ram lamb should not be used for breeding purposes except in rare cases. A well matured yearling can take care of 30 to 40 ewes, while a mature ram may be used on 40 to 50 ewes.

The ram, with a ewe or a few lambs for company, should be separated from the ewe flock during the day and provided with some good clover hay, fresh water, and grain consisting of two parts oats and one of bran. The grain ration should be given the ram for at least a month before breeding time begins. The amount of grain to be fed should be regulated in accordance with the feeder's judgment. Care must be taken to distinguish between thrift and excess fatness. Ordinarily one pint of the grain mixture twice a day will be enough, but the size, age, and condition of the ram will require some variation in the amount fed. The ram should be provided with a cool, darkened place during the day in the breeding season.

It is best to turn the ram with the ewes at night and take him away during the day. If only one ram is being used on the flock and he is not a tried breeder, it is advisable to paint the ram on the brisket between the fore legs, and after 15 days paint his brisket some other color which will leave a definite color on the wool of the ewes. A still different color may be put on the third time and if all ewes return after being bred two or three times another ram should be secured at once. Lamp black, Venetian red and Prussian blue may be used with linseed oil to paint the ram's brisket. This may prevent losing a year's return from the flock. Many breeders prefer to shear their rams in August, before the breeding season begins. This is of particular advantage to sheep raisers in South Missouri where unusually early lambs are desired.

WINTER FEED AND CARE

If good results are expected from the lamb crop, the bred ewes must be handled carefully during the winter prior to lambing time. The flock should be treated for stomach worms again after the first hard freeze. They should be changed rather gradually from grass to dry feed. It is best to start feeding some hay before snow makes it absolutely necessary to do so. The winter ration should have as its foundation a leguminous hay such as clover, alfalfa, lespedeza, or soybeans, cut at the correct time. Bred ewes require a ration that furnishes protein, minerals, and vitamins. Ewes should gain slightly all through the period of pregnancy a total gain of from 10 to 20 pounds per head.

Roughage rations that have given good results are:

No. 1	No. 2
2 pounds clover hay	2½ pounds clover hay
2½ pounds corn silage	2 pounds corn stover

It may be advisable to feed the following grain mixture, beginning four or five weeks before lambing:

Corn 6 parts	By weight
Oats or bran 3 parts	
Soybean oil meal or	
Linseed oil meal 1 part	

The amount to feed will vary from ½ to 1½ lbs. per head daily. After lambing the grain mixture should be increased to approximately 1½ pounds per head per day. The amount of grain needed both before and after lambing will depend on the size and condition of the ewe and available pasture.

Probably the most important single item in the ration of the bred ewe during the winter is clover hay. Results obtained at the Missouri Experiment Station in comparing clover with timothy hay for ewes prior to lambing time have shown that clover greatly increased the percentage of strong lambs, increased their weight at birth, and speeded up their rate of gain in weight during the first 30 days after birth. All of the lambs from the clover hay lot were strong, while one-third of the lambs from the timothy hay lot were very weak or dead when dropped.

Each year a great many of the best ewes in Missouri die shortly before lambing time from a commonly known pregnancy disease due to improper feeding and lack of exercise. If ewes are fat they should be forced to take exercise. This can be accomplished during open weather by letting them graze or by scattering their coarse roughage over the pasture where it will be necessary for them to walk a considerable distance from the shed in order to get it. They should receive feeds containing sufficient protein and feeds that are not constipating. In the absence of legume hay some linseed oil meal and wheat bran should be given. One-tenth of a pound of linseed oil meal and one-half pound of bran per day for each ewe will be sufficient before lambing time.

The absence of legume hay also makes it necessary to supply more protein supplement such as soybean oil meal or linseed oil meal, and a mineral mixture of equal parts (by weight) of finely ground limestone, steamed bonemeal, and salt. This mineral mixture is to take the place of salt, and should be kept before the ewes at all times in a dry place.

Silage free from mold can constitute all of the roughage for bred ewes if they are fed from ¾ to ½ pound daily of protein supplement such as soybean oil meal or linseed oil meal plus the mineral mixture.

It should be the aim of sheep raisers to supply a ton of choice legume hay for each 7 ewes.

Hay for bred ewes should be green and leafy.

Bred ewes do not need a particularly warm place during the winter but they do need a dry place in which to sleep. A shed open to the south on well drained ground makes an excellent shelter.

Plenty of water should be provided during the winter season. Ewes can live during winter with a remarkably small amount of water, but if they are to be healthy and their lambs are to be strong, they must have plenty of water—preferably water pumped from a well just prior to the time it is offered the ewes.

Care should be taken during the winter season to protect the wool. Chaff and hay seeds should not be shaken down on the backs of the sheep from the lofts of barns and sheds.

DOCKING AND CASTRATING LAMBS

The best time to dock and castrate lambs is when they are seven to ten days old. For the sake of convenience both operations may be performed at the same time. A bright clear day with the prospects of several more to follow is the best kind of weather in which to do the work as the wounds heal faster than when the weather is damp and cold. The operations should be performed only under sanitary conditions, using plenty of a reliable disinfectant such as lysol. The lambs should be driven into a small pen so that they can be caught without becoming excited. Clean, freshly bedded pens should be provided for the lambs after the operation.

One man should hold the lamb by gathering its four legs together, setting the lamb on its rump on a board or barrel which is about waist high and holding the lamb tightly against the body.

In castrating, the lower half of the scrotum should be cut off with a sharp knife. With the thumb and forefinger on the upper end of the scrotum, expose the testicles by pressing against the abdomen. Slowly pull out the testicles and adhering cord by grasping them with the fingers or a pair of pliers. The wound should be disinfected with a 5 per cent solution of carbolic acid or 2% solution of lysol. In fly time a mixture of one ounce of iodiform to one pound of boric acid powder may be made and some dusted on the wound to repel flies. After the operation the lambs should not be disturbed. In a few hours they will be up and ready for their feed.

The reasons for castrating lambs are:

1. Wether lambs tend to fatten more readily than ram lambs. They develop a fuller loin and leg and less neck and shoulder than ram lambs, thus producing a carcass better developed in the high-priced cuts.
2. Wether lambs are preferred by the buyers, and on most of the markets at the present time buck lambs are docked \$1.00 per hundred weight by the packer buyer regardless of quality or condition.
3. Ram lambs are restless and annoy the entire flocks.
4. Packer buyers estimated that from 75 to 85 per cent of all the

cull lambs received on the St. Louis market in 1926 and 1927 were ram lambs.

5. If lambs are carried into the summer or fall, thin wether lambs can be fed out or sold for feeders. Buck lambs can only be sold on the market at a discount.

Of the two operations, castrating is more important than docking. However, there are a great many advantages of docked over undocked lambs. The reasons for docking are as follows:

1. It gives the lambs a neater, blockier appearance.
2. Docked lambs are cleaner and less likely to become infested with maggots and screw worms.
3. Long-tailed lambs are not wanted for feeders.
4. Long tails interfere with the breeding of ewes retained in the flock.
5. The carcass from a docked lamb has a neater appearance.

In docking a lamb, the same method of holding may be used as described for castrating. The skin on the tail should be pushed toward the body of the lamb then the tail severed by cutting at a joint 1 inch from the body. The surplus skin will be an aid to healing. Lambs docked with a knife should be watched to prevent excessive bleeding. Squeezing the dock for a few seconds between the thumb and forefinger will reduce the flow of blood. If a rubber band or string is to be used to prevent bleeding it should be removed a few hours later. Care should be taken not to run the lambs or get them excited either before or after operation as this may cause excessive bleeding. Hot pinchers may be used for docking lambs and are to be recommended in view of the increasing need for sanitation as a preventive of stiff lamb disease. This also prevents bleeding. The pinchers should not be heated beyond a very dull red color, or otherwise the dock is badly burned and will not heal as quickly as when the work is done with a knife.

CREEP FEEDING GRAIN TO SUCKLING LAMBS

The reasons for feeding grain to suckling lambs are as follows:

1. The finish or fatness of the lambs can be materially increased by feeding grain.
2. On the average, lambs will be ready for market at a younger age when prices are higher.
3. The most economical gains are made with grain while the lamb is getting its mother's milk.
4. The shrinkage will be less in shipping.
5. The number of culls can be greatly reduced.

A strong, healthy, solid-mouthed ewe will give plenty of milk for a single lamb if she is on good pasture, and the lamb may do just as well without grain as with it. On the other hand, with the ordinary farm flock in Missouri, where some of the ewes may be old, others rather young, several of them have twins, and where the pasture is

short, the grain given the lambs will, without question, cause the lambs to fatten more evenly and be ready for market earlier, and will pay well for the cost of feed and labor.

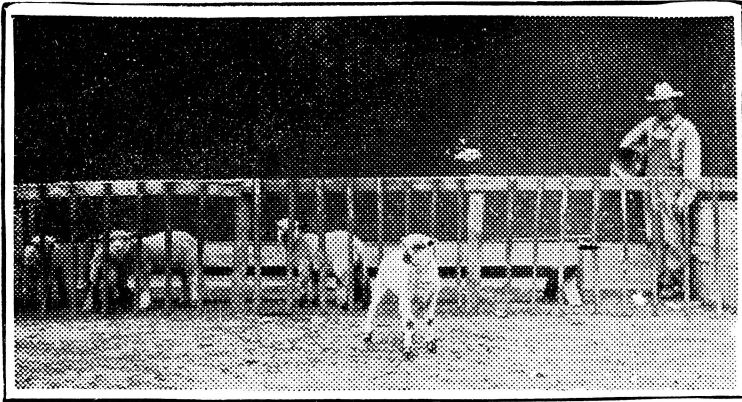


Fig. 3.—Creep Feeding Pays.

A warm, sunny place in the barn or shed should be selected for the creep. There should be troughs for grain and small racks for hay inside the creep. The troughs should be from 9 to 12 inches wide and 4 inches deep. Six-inch boards, supported at each end, should run the full length of the troughs 10 inches above the bottom. Since lambs will start eating when around two weeks old, the creep should be ready by the time the first lambs are at that age. The troughs should be cleaned daily and the feed given in small amounts at first. After the lambs learn to eat grain the best plan in most cases is to feed them twice daily what they will clean up in about fifteen minutes. Lambs two months old will eat from $\frac{1}{2}$ to $\frac{3}{4}$ pounds of grain daily. Crushed or ground grain may be best for the first six weeks; after this the feed should be gradually changed to the whole grain.

Lambs may be started on 2 parts ground corn, 2 parts ground oats, and 1 part bran. When they are six weeks old the ration may be changed to 9 parts shelled corn and 1 part linseed oil meal. If the lambs are getting good legume hay the grain ration may be shelled corn. Lambs will go off feed very much like cattle when grass first becomes good but they should, by all means, be induced to start eating the grain again and be fed until marketed. Some feeders separate the lambs from the ewes and shut them in a pen at night with grain before them. This greatly increases the grain consumed and solves the problem of small ewes creeping where the larger lambs can.

SELECTING LAMBS FOR SHIPMENT TO MARKET

Producers should carefully consider the market demands for fat lambs. They should handle the lambs and ascertain whether or not they are fat, before shipment to market. A great many lambs of good quality, sent to market before they were finished and at too light a weight, have sold at cull prices; whereas, if they had been held back and given additional feed for two or three weeks, they would probably have been in condition to bring top prices.

Another factor that showed the necessity of selecting the lambs for market was the dissatisfaction caused, in some cases, by the fact that the buyer in the country would pay the same price for practically all kinds of lambs, giving no premium for really good lambs. In many cases where co-operative shipments were made producers would bring in lambs that were sired by purebred rams, docked and castrated, grain fed, and in excellent condition. The good lambs would be put in with other lambs that were sired by scrub rams, a great many of them not docked and castrated, and if these inferior lambs were barely good enough to get out of the cull class the entire load would sell together when they reached the terminal market. As a consequence, the good lambs helped sell the inferior lambs. The money was taken out of the pocket of the careful producer and put in the pocket of the man who did not care to take the trouble of improving his lambs. This naturally led to dissatisfaction and caused producers generally to conclude that there was nothing in the lamb improvement work, that they did not need a good ram, and did not need to dock and castrate, since their lambs brought as much per hundred weight as those of their neighbors.

In past years sheep producers in the State probably have shown keener interest in the lamb grading work than in any other phase of the Missouri Plan of Sheep Improvement. The grading has been an outgrowth of the fat lamb shows and was instituted to demonstrate the validity of the entire plan of sheep improvement. It has enabled the producer of good lambs to secure their value and at the same time has afforded an effective means of teaching the difference between good and inferior lambs. As the lambs were assembled on grading days they were sorted into four grades. The well finished ewe and wether lambs of choice quality were put into the select grade and marked with a blue ring on the head. The good docked and castrated lambs were graded as standard top lambs. These were given a red ring on the head. These lambs were not so fat as the select grade marked with blue ring. The fat buck lambs were marked with a yellow ring, the thin, unthrifty ewe and wether lambs and the thin bucks were graded as culls and marked with a black ring. The thin ewe and wether lambs that were healthy were sent home for additional feeding. Commission firms were requested to sell the lambs according to grade. The following table shows the result of six years of this lamb grading work.

SALES OF GRADED LAMBS, 1928-1933

Year	No. grading days	Av. market top	Select Lambs Blue Mark		Standard Lambs Red Mark		Buck Lambs Yellow Mark		Medium Lambs Green Mark		Cull Lambs Black Mark	
			No.	Av. Price	No.	Av. Price	No.	Av. Price	No.	Av. Price	No.	Av. Price
1928	28	16.10	1,238	16.95	3,412	16.15	703	15.35	....	...	170	9.85
1929	63	14.92	968	15.80	6,962	15.28	929	14.15	....	...	1,290	10.25
1930	68	11.75	1,115	12.40	7,102	12.03	616	10.45	1,828	9.70	716	6.60
1931	90	8.62	2,270	9.42	16,576	9.08	464	8.01	4,638	6.53	415	5.25
1932	93	6.51	3,064	6.87	16,050	6.70	519	5.36	7,170	5.10	556	3.40
1933	..	7.50	1,641	7.89	12,056	7.69	324	6.50	2,330	5.83	253	4.20

After two years of trying out the grades as given above it was deemed advisable to put in another grade to take care of the lambs not quite fat enough to go in the standard or red-marked grade and still carrying too much flesh to go as culls. As a consequence a medium grade has been established and has been found helpful.

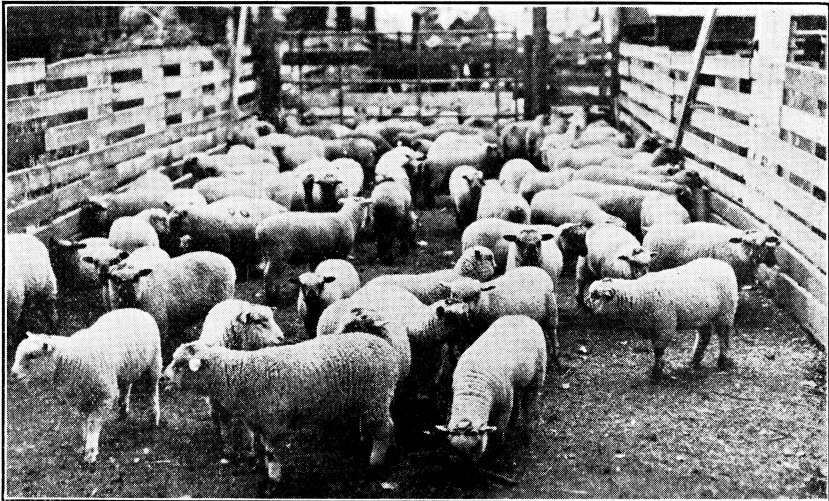


Fig. 4.—Select lambs (blue ring on head) from Carroll county grading day.

Lamb grading has proved to be one of the most effective demonstrations used in connection with the Missouri Plan of Sheep Improvement. It has afforded an opportunity to show a community choice market lambs produced by following the other essentials in the Missouri plan in contrast with buck and cull lambs resulting from haphazard practices. It has been a prevailing condition at grading demonstrations that the best lambs were those that had been docked, castrated, grain fed, sired by registered mutton rams out of thrifty ewes bred early and properly fed and cared for. At most of the demonstrations, lambs of the various grades were selected and marked so that interested farmers could handle them, determine their finish, and fix firmly in their minds the requirements that constitute a choice market lamb. The practica-

bility of this teaching is evidenced by the fact that quite often producers, after watching the grading, handling the lambs and establishing the difference between the various grades through questions, have then returned home, sorted their own lambs and brought in those of select and standard grades.

Aside from assisting producers to determine the difference between top and cull lambs the grading has helped to build a reputation for Missouri lambs at the terminal markets. Packer buyers at one time have been appreciative of graded lambs to the extent that they have paid 50 cents to \$1.00 a hundred more for the standard and select grades than was quoted as the practical top of the market. It has established beyond a question of a doubt that Missouri's spring lambs of quality have no superiors. It is still possible for the reputation of these graded lambs to reach the eastern markets and result in a greater demand for the really good lambs produced on Missouri farms than ever before if enough growers will support a grading program to secure the necessary volume.

CONTROL OF PARASITES

Stomach Worms.—The most common internal parasite affecting sheep and the one that does the most damage is the stomach worm. It inhabits the fourth stomach and is a small threadlike worm from $\frac{1}{2}$ to $1\frac{1}{4}$ inches long and about the thickness of an ordinary pin. It is normally of a greyish-white color but when discovered on post mortem examination usually is of a reddish-brown color due to the blood taken from the sheep. The eggs laid by the mature worm pass out on to the ground, and there, with favorable weather conditions of warmth and moisture, they hatch and the small larvae become sheathed and very resistant to hot weather or severe cold. When the grass is wet with rain or dew these larvae crawl up the grass blades where they are taken into the stomach of the sheep along with the grass and in 18 days develop into mature worms.

Practically all sheep are to some extent infested with stomach worms. When badly infested they show unthriftiness, diarrhea, and later, unless treatment is administered, they become anemic as shown by whiteness of the skin and in the lining of the eyelids. This is due to the blood sucking habit of the worm. Further evidence of advanced stage of the trouble is a soft swelling on the under jaw. Lambs are more seriously affected by stomach worms than older sheep. Where pastures are badly infested and no treatment is administered many of the later lambs die, and the entire flock becomes unthrifty after the advent of warm weather.

Prevention can be accomplished to some extent by a change of pasture; but since it would be necessary to change every two weeks to a clean pasture and the infested pastures probably remain so for a year or more after sheep, goats, and cattle have been removed, it can readily be seen that the control by this means is, in most cases, im-

practical. Even so, the sheep should be shifted from one pasture to another whenever practical.

Treatment is the best means of control. There are a number of so-called stomach worm remedies on the market in the form of powders, medicated salts, capsules, and drenches. Medicinal agents given in the feed or kept before the sheep at all times, can at best accomplish only partial control, and the use of some drugs may be detrimental. The Texas Agricultural Experiment Station Bulletin No. 499, published December, 1934, shows a danger of chronic copper poisoning in sheep that have access to a mixture of salt containing a very small percentage of copper sulphate. This same bulletin also clearly shows no ill effects resulted from the continued and frequent use of 1 per cent aqueous solution of copper sulphate as a drench. While there are many liquid drenches recommended, as yet there is no experimental evidence that proves anything more effective than copper sulphate, which is also the cheapest remedy in use.

The following is a copy of a circular letter that is being used by the Agricultural Extension Service of the Missouri College of Agriculture. Thousands of flocks of sheep have been treated during that time by producers using this circular as a guide. The treatment is not effective in every case, as some producers do not follow the directions carefully. However, when the directions are followed it is estimated that the control measure is 95 per cent effective. The circular follows:

TREATMENT FOR STOMACH WORM INFESTATION IN SHEEP*

Parasitic infestation, particularly stomach worm infestation, causes in Missouri most of the troubles which are encountered in raising sheep. These worms are particularly damaging to lambs but are also present in older sheep. All sheep should be treated for stomach worms.

Symptoms of Stomach Worm Infestation:

1. Dullness and lack of thrift.
2. Diarrhea (Particularly in lambs).
3. Pale eyelids, skin and linings of mouth. (Stomach worms suck blood from the body of the host).
4. Edema or swellings, particularly under jaw and lower portions of body.

Treatment: A satisfactory treatment for this disease is the use of a one and one-half per cent solution of copper sulphate (bluestone in soft water). This solution is made as follows:

Select your bluestone crystals free from white powder. Pulverize the crystals and dissolve two (2) ounces of bluestone powder in 1 gallon of hot rain water. This makes enough to treat 30 full grown sheep. Mix thoroughly, using glass, crockery or enamel ware as containers. (Bluestone cannot be mixed in metal pans or pails.)

Dose sheep as follows:

25 - 35 pound lambs	1 ounce
35 - 50 pound lambs	1½ ounces
50 - 75 pound lambs	2 ounces
Lambs over 75 pounds	2½ ounces
Mature sheep	3-4 ounces (Depending upon size and condition)
Yearlings included as mature sheep.	

No sheep should receive more than 4 ounces of the solution.

*Recommendations by A. W. Uren, Extension Veterinarian.

If there are tapeworms present in the flock the addition of one ounce of nicotine sulphate (Blackleaf 40) to each gallon of the one and one-half per cent solution of copper sulphate will assist in removing these parasites. The dose is not changed by the addition of the nicotine sulphate.

Give slowly with a two or four ounce metal dosing syringe. Keep the sheep quiet while dosing by backing them into a corner. Keep the head about level; if the head is held high the dose may strangle the animal. Fast the animals 18 to 24 hours before treating. However, sheep may have all the water they want to drink during the time they are off feed. Do not allow the animals to eat *or drink* for about four hours after treating. Treatment should be repeated every 28 days throughout the grazing season—every 14 days in badly infested flocks.

Give proper amounts and mix solution correctly. It is possible to kill sheep by careless dosing.

On areas of extreme infestation it may be necessary to treat the sheep for stomach worms every 14 days. In some cases where the sheep do not respond to the treatment it may be that there is tapeworm infestation. By watching the droppings for the tapeworm segments this may be determined.

Sheep grazing on old permanent pastures should receive both drugs at each treatment.

THE WOOL CROP

Wool is an important by-product in the production of market lambs and deserves more attention than is given it by the average grower. It ordinarily represents about one-fourth of the total return from the flock in Missouri. In the majority of the commercial flocks in the State the wool clip can be improved materially by using care in the selection of the ram and the ewes that are kept.

The same system of feeding and management that is conducive to the production of good lambs will produce desirable fleeces. The strength and length of the wool fibers depends on the continuous thriftiness of the flock. Sheep should be handled in a way that will minimize the amount of burs, dirt, weed and hay seeds, chaff and other foreign material that may become a part of the fleece.

1. Tie all wool with paper twine. Ordinary wool twine (jute) or binder twine (sisal) will leave fibers in the wool that will not take dye like the wool fibers.
2. Put all tags and sweat locks in sacks separate from the good wool. These tags will stain the good wool if tied in the fleece, thereby reducing the value of the entire fleece.
3. Shear when the wool is dry and store in a dry place.
4. Shear on a clean floor or tarpaulin, keeping all dirt and chaff out of the wool.
5. Second cuts should be avoided in shearing as the short wool thus obtained reduces the value of the fleece.
6. Practice a method of shearing that leaves the fleece in one piece after the fleece is shorn.
7. Shear as soon as the weather will permit, nothing is gained by waiting for the "grease". Any additional gain in weight on this due to grease will be lost on the lamb because of the decreased milk supply from the uncomfortable ewe.
8. Keep "burry" wool and "dead" wool separate from the good wool.
9. Demand that wool be bought on a sliding scale and not at a flat price. Produce high quality wool and insist on the buyer paying more for it than for inferior wool.

In tying the fleece it should first be pulled together closely then the breech, neck and sides turned in. The flesh side of the wool should be on the outside. By rolling from the breech end the shoulder wool will be on the outside of the bundle. This is desirable as this is the best wool. As neat and attractive a package as possible should be made.

SUMMARY

In many counties those chosen as school district leaders have assisted their neighbors with the docking and castrating, stomach worm control, and grading work. This cooperation between the sheep men and the Missouri College of Agriculture has resulted in an increase each year in the adoption of this plan of sheep production. The progress that is being made is shown by the following table.

SUMMARY OF RESULTS SECURED FROM THE MISSOURI PLAN OF SHEEP IMPROVEMENT AS REPORTED BY COUNTY AGENTS

Year	No. Farms Adopting Sheep Mgt. Practices	No. Pure-bred Rams Sold at Auction	Total No. Purebred Rams Placed	No. Sheep Treated for Stomach Worms	No. Lambs Docked and Castrated	No. Lambs Creep Fed Grain	No. Lambs Sold on Graded Basis
1926	349	33	158	15,434	8,107	4,475	460
1927	490	180	304	28,500	21,380	8,310	1,454
1928	2,290	225	527	68,255	59,880	17,910	7,880
1929	4,098	335	673	70,287	132,779	42,647	12,155
1930	5,901	284	732	159,023	278,311	91,734	24,649
1931	7,648	458	1,250	176,660	324,119	75,032	24,413
1932	9,230	518	1,370	119,835	369,590	96,075	27,306
1933	11,187	552	1,028	121,310	410,380	111,960	18,604
1934	.....	574	1,394	186,960	552,570	.....	11,154
1935	.....	623	2,047	408,390	796,680	.....	11,557
1936	.....	700	2,535	482,600	1,100,000	.....	24,425
1937	.....	728	2,981	482,380	.....	.....	26,662
1938	.....	542	4,141	.....	.....	.....	.....
1939	.....	614	3,948	410,010	.....	.....	.....

This cooperation on the part of all concerned to improve the quality of lambs has given good results. Better lambs are going to the market each year. It has meant more profit for those who have been following the plan and has also meant the establishment of a reputation for Missouri as one of the foremost states in the production of early lambs of outstanding quality.

UNIVERSITY OF MISSOURI COLLEGE OF AGRICULTURE AND THE UNITED STATES DEPARTMENT OF AGRICULTURE COOPERATING

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