Developments in Sheep

by DAMON A. SPENCER

THE PIONEER phase of our sheep industry has passed. There are no more free grazing lands. Most sheep now graze on owned or leased pastures or ranges or national forests. Stock and equipment and operating expenses are so high that any wasteful method means failure; success comes only through the best scientific practices.

For much of the newer science in sheep raising we now look to a comprehensive program of research and improvement like the one in progress at Dubois, Idaho. Near that community, in the heart of the sheep country, President Wilson in 1915 withdrew from settlement 28,160 acres of sagebrush land for use by the Department for experiments in breeding and grazing sheep. President Harding withdrew 16,650 acres of high summer-grazing lands in Montana, about 40 miles northeast of Dubois, in 1922 for a similar purpose. Other smaller areas and parts of the nearby Targhee and Salmon National Forests are also used in the work. In 1937 the agricultural experiment stations of the 11 Western States and Texas and the Department organized the Western Sheep Breeding Laboratory. Its headquarters and primary facilities are on the lands of the United States Sheep Experiment Station near Dubois. Julius E. Nordby, of the Department, directs activities of the station and laboratory. Rambouillet sheep are used in the work of the laboratory; the flocks at the station include Columbias, Targhecs, and Corriedales.

One of the earliest and most important accomplishments at Dubois was the development of the Columbia breed, which some sheepmen consider the perfect sheep. It was an answer to the growing demand for mutton and lamb at a time when the costs of sheep production were rising, a situation that created a need for animals efficient in producing both meat and wool. Cross-breeding was employed in various ways, including the
mating of fine-wool ewes of the Merino and Rambouillet breeds to coarse long-wool mutton rams of the Lincoln, Leicester, Cotswold, and Romney breeds to get rapid-growing market lambs and whitefaced ewe stock.

In 1912 the Department started experiments in cross-breeding range sheep at Laramie, Wyo. Lincoln × Rambouillet crossbreds were selected as the most promising for sheep and wool production in the Rocky Mountain region. Both ewes and rams of this cross were mated, and thereafter their descendants were also mated without backcrossing to either parent stock. Sheep resulting from this cross-breeding were the foundation of the Columbia breed, which is now liked in both range and farming areas.

Other useful new breeds developed during the same period include the Panama and the Romeldale. The Panama was founded by James Laidlaw, of Muldoon, Idaho, through cross-breeding Lincoln ewes and Rambouillet rams; the Romeldale was originated by A. T. Spencer, of Gerber, Calif., through his cross-breeding of Rambouillet ewes with Romney rams. Both breeds were established by mating the crossbreds and rams and their descendants without backcrossing to either parent stock.

Later, at Dubois, the Department began the development of a fixed strain to satisfy the need for animals suited to ranges intermediate in their production of forage. Excellent ewes resulting from the crossing of Lincoln × Rambouillet ewes and Corriedale rams and inbreeding of their descendants, also some selected Lincoln × Rambouillet ewes, were mated with choice Rambouillet rams. The offspring resulting from that breeding and their descendants were then inbred to form the Targheer strain, named after the Targhee National Forest. The Targhees produce good wool that grades uniformly as Half-Blood. They are relatively plump and are good producers of lambs under range conditions.

**Rambouillets for Western Ranges**

Breeding sheep for the western ranges has depended largely on the Rambouillet, the breed that the State and Federal sheep-breeding specialists agreed to concentrate on when they organized the laboratory at Dubois and began the program of improving sheep for the West. The program includes systems of breeding aimed at locating strains in the Rambouillet that possess combinations of genes that will improve strains of Rambouillets with which they are crossed. Such breeding is between strains of the same breed; Rambouillets are not crossed with other breeds. In these efforts we have found that size and body weight are directly associated with satisfactory weights of lambs. At the Dubois laboratory, under range conditions, 303 Rambouillet ewes were studied for lifetime lamb production over a period of 5 years. Ewes that averaged 119 pounds during their lifetime produced an annual average of 55 pounds of weanlings. Ewes that averaged 125 pounds produced 60 pounds of live lambs, and
ewes averaging 135 pounds produced 69 pounds of live weaned lambs. In other words, Rambouillet ewes of good size and weight are needed for maximum production of lambs under range conditions.

We found it important to increase the length of staple in fleeces of Rambouillet sheep. This we accomplished by selecting rams and ewes of especially good length of staple. Mr. Nordby reported that their yearling progeny have consistently produced fleeces measuring one-third of an inch longer and averaging 0.45 pound more in clean wool than have progeny of the flock as a whole. What the improvement means in money is indicated by the fact that in 1943 Strictly Combing fleeces averaged $5.87 and the shorter French Combing fleeces brought only $5. All fleeces were grown under the same conditions at Dubois.

J. M. Jones and co-workers of the Texas Agricultural Experiment Station reported that smooth “C” type Rambouillet ewes produced a longer wool staple than did the wrinkled “B” type ewes of similar ages. They found that the staple length of 2,274 fleeces from “C” type averaged 2.28 inches, compared to 2.05 inches for 365 fleeces from “B” type ewes. Wool manufacturers, especially those making worsted goods, are willing to pay extra for fine wools having good staple length.

Two other desirable qualities that sheep breeders work for are open faces (that is, not excessively covered with wool), and absence of skin folds, which are unprofitable and a nuisance.

Open-faced Rambouillet ewes at Dubois have each produced more than 10 percent more pounds of live lambs a year than wool-blind ewes. In 1942 about 17 percent of the Rambouillet lambs had open faces, 40 percent had partly open faces, and 43 percent had wool over their entire faces, compared to 11, 40, and 49 percent, respectively, in 1941. The open-faced ewes weighed about 5 pounds more after shearing than those that were wool-blind. When open-faced rams were mated with open-faced ewes, about half of the offspring were opened-faced, and the rest had partly covered faces.

The Texas Agricultural Experiment Station and the Department have cooperated in analyzing the inheritance of the skin-fold character in Rambouillets. The results of that project show that culling the wrinkled sheep and selecting for mating only the animals without excess skin folds can be effective in gradually eliminating this monstrosity. The workers at Dubois have been successful in similar efforts. The average score for skin folds on the necks of all the Rambouillet weanling offspring from inbred lines changed from 2.2 to 1.7 in about 4 years, a score of 1 representing complete absence of skin folds and a score of 5 indicating maximum skin-fold development. Rambouillet lambs with practically no skin folds increased from 28 to 58 percent between 1938 and 1944.

Another example of what can be done through selective breeding is the research on the inheritance of defective jaws. In experiments con-
ducted from 1937 to 1944 with Rambouillets having overshot jaws, the workers at Dubois found that when one or both parents were defective, 16.4 percent of the progeny were defective, compared to 1.4 percent of the progeny in a flock in which all the sheep of breeding age were normal. Sheep breeders, therefore, can best cope with the problem by not mating sheep having bad jaws.

Feeding and Management

Sheep get most of their feed from pastures and ranges that supply a variety of forage plants. It seldom pays to feed grain to breeding sheep or even to suckling lambs when they can have enough succulent herbage. On plenty of good forage, sheep can be kept thrifty and lambs can be raised to a market finish without grain. If grain is fed, about 100 pounds a year for a ewe and her lambs is the most that is likely to be profitable. Feeding sheep from stack, mow, and bin may be necessary during deep snows and extreme droughts, or when pastures and ranges are overstocked, or other conditions adversely affect grazing. Research in the use of grazing forage has been going on since 1923 at Dubois.

We have learned how important it is to detect range deterioration before it becomes far advanced. Studies with flocks on fenced pastures and with large bands on ranges in Idaho have yielded signs by which we can detect range depletion early enough to make corrections in management. The condition of the sheep may not accurately reflect the condition of the range. Deterioration of forage cover and soil may be noticeably progressing before the weights of ewes and lambs decline. Reseeding ranges, along with sagebrush eradication, is a way to increase forage twofold to tenfold on spring-fall ranges. As with stands of native forage species, correct grazing management of reseeded stands is imperative. These studies are providing valuable information on intensity of use and methods of grazing reseeded stands, as well as information on where, when, and how getting sufficient phosphorus from their feeds or grazing forages.

In various sheep-producing regions, the level of phosphorus in the blood of sheep has been noted as an important element in their nutrition. Lack of phosphorus is associated with unthriftiness in sheep and low profits from their production. The question arose concerning the availability of phosphorus in the forages of the western ranges, where about two-thirds of our sheep are produced. A project to investigate this problem was initiated in 1938 by the Idaho Agricultural Experiment Station and the Department. In 4 years, blood samples were collected from about 40 Columbia ewes that were kept by the Department at Dubois under intermountain conditions providing typical spring, summer, fall, and winter grazing. The ewes were wintered on alfalfa hay and fed some grain after lambing. Blood samples were taken from the jugular veins of the
DEVELOPMENTS IN SHEEP

ewes at the close of the fall-range, winter-range, winter-feed-lot, lambing, spring-range, and summer-range periods. The samples were centrifuged and the plasma was analyzed at the University of Idaho.

We learned that seasonal trends in blood phosphorus level were fairly definite and that variations between seasons were significant. The highest levels were found on the winter and spring ranges; the lowest levels were at lambing time, in the late summer and fall, and in the winter feed lot. Supplemental feeding of cottonseed cake or oats on the winter range or feed lot increased the phosphorus in the blood. Ewes that had lambed had lower levels of blood phosphorus than those that had not yet lambed. Dry ewes had higher blood phosphorus than ewes that were pregnant or were suckling lambs. Ewes that were losing weight tended to have higher blood phosphorus than those that were maintaining their weights or were gaining. Blood phosphorus tended to decrease with the age of the ewes. No definite evidence of phosphorus deficiency was found, except the low blood-phosphorus levels that were associated with factors of season of the year, stage of pregnancy, the number of lambs the ewes were suckling, changes in weight, and advancing age.

The normal levels of blood phosphorus were found to be from 4 to 5 milligrams of inorganic phosphorus per 100 milliliters of blood plasma. The percentages of ewes having blood phosphorus values of 3.5 milligrams or below for the various seasons were 5.3 percent for the fall range, 2.5 percent for the feed lot, 20 percent at lambing, 2.7 percent for the spring range, and 10.0 percent for the summer range. The most critical time for supplying plenty of phosphorus in the diet of breeding ewes is at lambing time. Phosphorus can be fed free choice in a mixture of 2 parts of bone meal and 1 part of common salt by weight, when it appears they are not getting sufficient phosphorus from their feeds or grazing forages.

When feed is scarce and prices high, the producer must practice every economy in his methods of wintering sheep, particularly ewe lambs that are to be replacements in the breeding flocks.

In southern Utah many ewes are somewhat undersized at 18 months, the usual age for their first breeding. Feed is relatively scarce in that locality and lambs are sold as feeders or raised as breeding ewes. The usual practice there is to use the best ranges for ewes and lambs during the summer. After weaning, the ewe lambs go directly to the winter range. The following spring the best ranges are again used by ewes and lambs and the yearling ewes are placed on the less productive and drier ranges. In the following fall the yearling ewes go to the winter range as a part of the breeding bands. Although they are usually in thrifty condition at that time these yearling ewes are somewhat undersized.

The Utah Agricultural Experiment Station investigated the effects of feeding ewe lambs during the first winter of their lives, rather than keeping them on the winter range. In each of the 3 years of the experiment,
125 ewe lambs were obtained from a range operator. Seventy-five of them were fed in the feed lot and 50 were handled like other range sheep. The feeding periods each winter lasted about 6 months. The 75 lambs were fed at a level to insure satisfactory growth without fattening, and the other 50 ewe lambs were subjected to the variations and hazards of the ranges of southwestern Utah.

The lambs that got special feed their first winter made significantly greater gains in body weight (although most of the advantage was lost when the lambs were put on the range the following summer) and in weight of wool, unscoured and scoured, with fleeces of significantly longer staple. There were fewer deaths among them. Further, the percentage of ewes lambing at 2 years, of those alive at breeding age, was 64.7 in the groups that were fed and 45.5 in the range groups—in all, an increase of 42.6 percent more ewes lambing as a result of a little extra winter feed.

**Fluorine in Phosphates for Fattening Lambs**

Fluorine may be toxic when present in considerable quantities in the rations of animals. J. D. Hatfield, C. L. Shrewsbury, and L. P. Doyle, of Purdue University, fed western fattening lambs rock phosphate containing 3.85 percent fluorine as a mineral supplement, in amounts furnishing 1.5, 3.0, and 6.0 milligrams of fluorine per kilogram of body weight a day. The investigators found that the consumption of grain declined and growth was depressed in the lot receiving 6.0 milligrams. As the fluorine intake was increased, the breaking strength per gram of bone went down proportionately, and the percentages of ash and fluorine in the bone increased. The weight of the thyroid gland declined as the amount of fluorine went up.

The Department also made laboratory studies of the problem. The manufacture of defluorinated phosphates on a large scale began in the midst of the war, and the Department undertook feed-lot tests on fattening lambs at Beltsville in an effort to aid manufacturers in standardizing their products. Earlier tests had shown that the temperature of defluorination was important in determining the availability of phosphorus in the product to the animal. In the feeding tests three commercial defluorinated phosphates were found to be nearly as good as bonemeal in availability. The chief measure of phosphorus availability of a product was the level of inorganic phosphorus in the blood serum, although gain in weight, bone composition, and carcass quality were also considered as indices.

Phenothiazine is one of the most important discoveries ever made for keeping sheep healthy. Parasites and parasitic diseases have troubled sheep seriously from time immemorial. Copper sulfate and nicotine sulfate have been used to control several of the internal parasites, but since phenothiazine became available, soon after its discovery was announced
in 1938, it has been more widely used for that purpose than any other
drug. Workers in the Bureau of Animal Industry have found that sheep
will consume sufficient quantities of a suitable mixture of phenothiazine
and salt to result in reasonably effective control of stomach worms and
intestinal roundworms. A satisfactory mixture consists of one part, by
weight, of powdered phenothiazine and nine parts of loose granular salt.
This method of administering the drug saves labor and expense.

\[\textit{Breeding Hampshire Ewe Lambs}\]

Sheepmen generally breed their ewes for the first time when the ewes
are about 18 months old; so they will lamb at 2 years of age. Because
many ewes born early in the spring come in heat in the fall, it has been
reasoned that lifetime production may be increased by breeding them
then. Hampshires, which develop early, seemed well suited for a test
of the idea.

The Department and the South Dakota Agricultural Experiment Sta-
tion collected data on 119 pairs of Hampshire ewes born at the Belle
Fourche Field Station at Newell, S. Dak. The lambs were paired on the
basis of age, weight, and family relationship. One of each pair was
mated as a lamb at the age of 9 or 10 months, and the other was bred
at the age of 18 or 19 months. Eighty-four conceived, and were designated
as group A. The 35 that failed to conceive as lambs were put in group B.
Their pair mates were classified as groups C and D, respectively. Per-
formance was followed for 5 years. Group A lambs were lighter in weight
at 2 years, but they made it up by the third year. Group A produced 89
lambs at 14 to 16 months of age. The total numbers of lambs born in
groups A, B, C, and D were 427, 135, 370, and 140, respectively, and
the totals raised to weaning age were 305, 92, 255, and 102. Average
weaning weights of lambs in the four groups were 67.0, 68.2, 70.1, and
69.0 pounds, respectively. The average weaning weight of lambs from
group A in the first year was 54.3 pounds, the lightest of any group of
lambs. Group A produced a total of 2,572 pounds more lambs at weaning
time than group C. The average annual fleece weights of the ewes in
these groups were 7.9, 8.3, 8.2, and 8.0 pounds, respectively.

Breeding these Hampshire ewes for the first time as lambs resulted in
a material increase in total lamb production, with only a very slight
decrease in wool production. Early breeding appears to be economical
and profitable under conditions where ewe lambs can develop adequately
and where Hampshire or similar breeds can be given extra feed and care
at reasonable cost.

State experiment stations and the Department have under way many
other research projects that will help solve new problems of great impor-
tance to producers of lamb meat, wool, and the fur of sheep and lambs.
Specifically, emphasis is placed on investigations having to do with improving the manufacturing properties of wool, in preparation for the competition between natural and synthetic fibers, and on greater efficiency in the production of lamb meat and wool in all regions that raise sheep commercially and among all important breeds. Research men hope for the same kind of progress in these studies that has been made in producing more wool. The average annual fleece weight of wool in the United States is now about 8 pounds. A century ago it was only 2 pounds.

THE AUTHOR

Damon A. Spencer, as senior animal husbandman in the Bureau of Animal Industry, has been in charge of the Bureau’s sheep, goat, and animal-fiber investigations since 1920. These investigations have included 40 research projects, involving the use of about 10,000 sheep and lambs, about 100 goats and kids, and about 50,000 pounds of wool each year. This research program has included cooperation with nine Federal bureaus and 42 State experiment stations, in finding scientific solutions for practical problems in the sheep, goat, and animal-fiber industries.

FOR FURTHER READING


Jones, J. M., Dameron, W. H., Davis, S. P., and others: Influence of Age, Type and Fertility in Rambouillet Ewes on Fineness of Fiber, Fleece Weight, Staple Length, and Body Weight, Texas Agricultural Experiment Station Bulletin 657, August 1944.


