



# Some Ideas About Crossbreeding Sheep

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Why do commercial producers crossbreed sheep-or any animal, for that matter? There are two reasons. First, no breed of sheep is best in all characteristics. If a producer combines the best characteristics of several different breeds, he has a chance to get a better combination than he could get with any one breed. This is called breed complementarity.

As an example of this, the Finnish Landrace sheep are extremely early maturing and have a very high lambing rate. They do, however, have relatively poor conformation, and the wool is of poor quality. Rambouillet sheep, on the other hand, produce excellent wool, but they do not have a high lambing rate and they are slow maturing. Neither of these two breeds excels in growth rate and carcass conformation. The meat breeds are also used to sire market lambs because they are growthier and produce excellent carcasses. The meat breeds are not well adapted to many conditions under which sheep are raised, however.

Another reason for crossbreeding is that sometimes, heterosis results from breed crossing. Heterosis is also known as hybrid vigor. As an example of this, crossbred baby lambs on the average are more vigorous and have a higher livability than purebred lambs. They also have a higher early growth rate. Crossbred females come into productivity at an earlier age and on the average are more fertile and adaptable to a wider range of conditions than purebreds. (See Table 1 and 2). This is why, in many cases, crossbred ewes are recommended for commercial production.

If crossbreeding is the mating plan chosen, one needs to have a good evaluation of the existing breeds to know which breeds excel for specific traits. This information should be planned into the mating program so that each breed is used in that place in the total breeding program where it will make the greatest contribution. In commercial production, some values are a bit different than in purebred production. The productivity of the commercial sheep enterprise is much more dependent upon how well adapted and how productive the ewes are than the rams. It is the ewes more than the rams that determine when mating will occur, the conception rate, how many lambs will be born, and whether the lambs get started off with a good milk supply. The ewes also produce the majority of the wool from the flock. What a producer would like to have in the ewe flock is a combination that gives high productivity as well as good quantity and quality of wool.

The best rams used in commercial production are those that are (1) fertile at the time of year when one wants to breed the ewes, (2) aggressive so that they will find and impregnate those ewes that are in heat, and (3) sire the kind of lambs that the market desires. There is one more very important characteristic to some producers relative to the rams. Anyone

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**Table 1. Average Heterosis Effects in the Crossbred Lamb<sup>a</sup>.**

Trait	Level of heterosis (%)
Birth weight	3.2
Weaning weight	5.0
Prewaning daily gain	5.3
Postweaning daily gain	6.6
Yearling weight	5.2
Conception rate	2.6
Prolificacy of the dam	2.8
Survival: birth to weaning	9.8
Carcass traits	approximately 0
Lambs born per ewe exposed <sup>b</sup>	5.3
Lambs reared per ewe exposed <sup>b</sup>	15.2
Weight of lamb weaned per ewe exposed <sup>b</sup>	17.8

<sup>a</sup> From the review: Notter, g. 1978. Breed utilization for meat production in sheep. *Animal Breeding Abstracts*. 46:131-143.

<sup>b</sup> Pruebred ewes mated to a differend breed of ram to produce crossbred lambs.

**Table 2. Average Heterosis Effects in the Crossbred Ewe<sup>a</sup>.**

Trait	Level of heterosis (%)
Fertility	8.7
Prolificacy	3.2
Body weight	5.0
Fleece weight	5.0
Lamb birth weight	5.1
Lamb weaning weight	6.3
Lambs born per ewe exposed	11.5
Lambs reared per ewe wxposed	14.7
Weight of lamb weaned per ewe exposed	18.0

<sup>a</sup> From the review: Notter, g. 1978. Breed utilization for meat production in sheep. *Animal Breeding Abstracts*. 46:131-143.

who is going to raise ewe replacements should use the breed of ram that will combine well with the ewe flock to produce the kind of ewe lambs that he wants to use as replacements.

These ideas have led to classifying breeds of sheep as *ewe* breeds or *ram* breeds. This means that some breeds

are better adapted for use in the female side of the sheep enterprise, and some breeds are better adapted to sire market lambs but may not transmit those traits which make highly productive ewe flocks.

## **Making a Good Ewe Flock**

A list of the breeds of sheep that are thought of as being good ewe breeds would start with (1) Rambouillet sheep such as there are in Texas (2) several kinds of Whitefaced Western sheep, (3) the Dorset breed, which is a white-faced meat breed that will breed and lamb out of season better than most other breeds, and (4) Polypay. One could also place the Suffolk and Hampshire breeds in this category, only if you were looking for a spring lambing ewe, even though they are very often used as a ram breed. There are other breeds, but the ones mentioned here are the ones most commonly considered.

The Rambouillet breed is found in large numbers in west Texas, with some also in the Rocky Mountain region. This breed can be characterized as medium in size, producing generally excellent fine wool, more willing to breed out of season than most other breeds, but characterized by having a relatively low lambing rate and only average in growth rate and carcass composition. The fact that they are available in large numbers makes them a logical breed to start a cross-breeding program in many areas. Because they are readily accessible to Oklahoma and will breed out of season, they are the breed that crossbreeding systems usually begin with in Oklahoma and in the Southwest.

The Whitefaced Western breeds (Columbia, Panama, and Targhee) are all a mixture of Rambouillet or Merino and Lincoln. The Targhee is one-fourth Lincoln, three-fourths Rambouillet and the other breeds are half finewool and half Lincoln. These breeds do not exist in large numbers in the Southwest but are sometimes imported from Colorado when range ewes are needed. They do not lamb as well during the fall, and this is a principle drawback in Oklahoma and other regions where fall lambing is desired. Some may be a bit larger in size than Rambouillets. They are slow to mature sexually, as are the Rambouillets, and they produce a one-half blood to medium wool that is not as good as Rambouillet wool, however it is better wool on the average than that produced by the meat breeds.

The reproductive rates of the Whitefaced Western breeds may be a bit better than Rambouillet, but they are not highly productive in terms of number of lambs born. Their carcass composition may be better than the Rambouillet, but they are not as heavily muscled as the meat breeds.

The Dorset breed does not exist in large numbers in the United States but must be considered when one thinks of ewe breeds because of a willingness to breed out of season and a higher lambing rate and milk production than most range ewes. It is a medium wool breed with a fleece that is dry and not of extremely high quality. Dorsets are medium in size and have good conformation. When rams of this breed are crossed with Rambouillet or other Western Whitefaced breeds, a crossbred ewe is produced that is generally more productive under farm conditions and will breed over a longer period of the year than the range breeds that were used in the cross.

The Polypay is a four breed cross consisting of a combination of one-fourth Targhee, one-fourth Dorset, one-fourth

Rambouillet, and one-fourth Finnsheep. Polypays are medium sized, white-faced sheep that breed very well out of season. The ewes are good prolific mothers that produce lambs with above average growth and carcass quality. Polypays can also be utilized effectively in accelerated lambing programs.

The Suffolk and Hampshire breeds are large in size and have a lightweight fleece. They are quite productive sheep in terms of numbers of lambs born. Under hot, dry conditions such as those found in Texas, these breeds are hardier than some of the other meat breeds.

Many commercial flocks of sheep in the United States, however, are based primarily on Suffolk breeding, and except for the large size which causes a high intake of feed by the ewes, they can be good producers of lambs under winter and spring lambing conditions. Suffolks are often crossed on range ewes of one kind or another, and this cross generates a rather productive crossbred ewe. These crossbreds will not lamb in October and November as well as Dorset x Western crossbred ewes, but they will lamb well in December through May or June. They produce a large number of twin lambs and the ewe's milk well.

## **Combining Breeds to Make a Good Ewe**

Some of these breeds have been studied extensively at the Southwest Livestock and Forage Research Station at Ft. Reno, and in other states, for the past twenty to twenty-five years. Pretty accurate predictions about most breeds and breed crosses may be made based upon knowledge of the breeds and producers' experiences. The Dorset x Rambouillet crossbred ewes have been studied extensively and can be well characterized as compared to straight Rambouillet ewes. When lambing in the fall following forty days of breeding in May and June, about 80-85 percent of Rambouillet ewes will conceive and lamb as opposed to 90-95 percent of Dorset x Rambouillet crossbreds. When Rambouillets lamb, about 20-35 percent of them will have twins. When the crossbred ewes lamb, 40-55 percent of them will have twins.

When these same two kinds of ewes are lambing in January, the percent of ewes that lamb as well as the number of lambs born per ewe lambing increases considerably. One would expect about 95 percent of either kind of ewe to lamb. Of the Rambouillet ewes that lamb usually about 40-45 percent will have twins. The Dorset x Rambouillet crossbred ewes that lamb will twin at a rate of 60-75 percent. Considering all conditions under which Rambouillets have been compared to Dorset x Rambouillet crossbred ewes, the crossbreds have produced some 20-30 percent more live lambs raised than the Rambouillets. The growth rate of lambs out of the crossbreds and Rambouillets is about the same. There are also no large differences in carcass desirability between the two. Therefore, it is easy to recommend the Dorset x Rambouillet crossbred ewes for sheep production conditions in Oklahoma.

Efforts have been made to determine whether the Finnish Landrace will improve the productivity of the ewe flock. Studies have involved ewes that are various mixtures of one-fourth Finnish Landrace with different combinations of Dorset and Rambouillet for the other three-fourths of the ewe. When lambing in the fall, the ewes that are one-fourth Finnish Landrace do not lamb nearly as well as those that are combinations of Dorset with Rambouillet. Of the ewes that do lamb in the fall, however, the ewes that are one-fourth Finnsheep have

a few more lambs. When lambing in January through March, the ewes that are one-fourth Finnish Landrace have a high productivity as do the ewes that are combinations of Dorset and Rambouillet.

Those ewes that are one-half Dorset and Rambouillet have been just as productive as the ewes that were one-fourth Finnish Landrace, however. When lambing in June, which practically no one does, it was found that the ewes that are one-fourth Finnish Landrace actually are a bit superior to those ewes that have no Finnish Landrace breeding. These sheep came from Finland, where they were often lambing in very late spring or early summer, and it is believed that is why they may be better suited to early summer lambing than the other breeds in this country.

The other breed that has been most extensively crossed with Rambouillet ewes for crossbred flocks in Oklahoma is the Suffolk. As indicated earlier, these ewes do not lamb as well in October and November from May-June breeding as do Dorset x Rambouillet crossbreds. If one is lambing in January-February, however, they do an excellent job of lambing and of rearing their lambs.

Ewes that are of the Whitefaced Western breeds mentioned earlier will or should lamb well in Oklahoma in January to March. As indicated earlier, when such ewes are crossed with Dorsets, productivity of the resulting ewes should increase somewhat. If ewes like this were crossed with Suffolk and the crossbred ewe lambs raised, one would also expect that they would lamb well in the January to March period.

## Good Sire Breed Combinations

The breeds of sheep that are most often thought of as sire breeds are Hampshire and Suffolk. The Suffolk breed is most often used as the sire breed because of the extremely large size, resulting in growthy lambs. Lambs from Suffolks may also be carried to heavier weights without becoming excessively fat as compared to other sire breeds. Suffolk rams are usually fertile during the fall and winter but may not be as fertile or sexually aggressive in May and June.

Hampshire rams produce growthy lambs and also are often used as a sire breed. Hampshires may be a bit thicker and produce lambs with a better conformation than Suffolks, but they also tend to fatten at a lighter weight. Therefore, one-half Hampshire lambs may not be carried to such heavy weights as one-half Suffolks before becoming too fat. Hampshire rams probably should be used if the ewe flock is Suffolk x Rambouillet crossbreds and all lambs are to be sold for slaughter.

There has been some interest in the use of Hampshire x Suffolk crossbred rams. Some commercial producers in California have been buying and using such rams for many years, and they indicate that one of the reasons they like them better than either Hampshires or Suffolks is that they live longer. There has been research at Ft. Reno with Hampshire x Suffolk crossbreds as compared to purebred Hampshires and Suffolks using them as yearlings in May-June breeding. Under these conditions, the crossbred rams have been much more successful in getting ewes pregnant than have the purebred rams. They appear to be more aggressive in terms of finding ewes that may not be very intensively in heat and mating with them. They may not get more lambs from the ewes that are pregnant; however, they tend to get more ewes pregnant.

All of these tests have been with yearling rams. When these same rams are yearlings or up to two-years-old and the mating is in September and October or January and February, there appears to be no difference in the effectiveness of the crossbred and purebred rams in terms of getting the ewes to conceive.

## Best Sire Breeds for Replacements

If one plans to save crossbred ewe lambs for use in the flock, especially for fall lambing, he must pay attention to what breed of sire he uses. The Hampshires or Suffolks would not rate quite as high for this purpose as they would if one is going to sell all the lambs for slaughter. If on the other hand, the ewes were intended to lamb in January and February, this practice would be more satisfactory. As indicated earlier, if one wants to lamb in the fall, the best breed combination for that purpose is some combination of Dorsets and Rambouillets.

One other factor that may be important has to do with the longevity of the ewes in the flock. It has been thought for many years that Rambouillets tend to be long-lived. Experience and research data indicate that Dorsets x Rambouillet crossbred ewes are also long-lived. Experience has not been as good with straight Dorsets and many people indicate that ewes with too much Suffolk in them often do not live long lives. If one had a flock of ewes that were Dorset x Rambouillet crossbreds and was lambing in the fall, he could breed this flock to Polypay crossbred rams and save replacements from that cross for a generation or two.

The Polypay rams are useful because they can be used for many years without detrimental effects on heterosis and production characteristics. This can be accomplished since they are a four breed cross, consisting of one-fourth Targhee, one-fourth Dorset, one-fourth Rambouillet, and one-fourth Finnsheep.

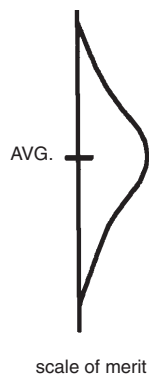
If one had a flock of ewes, some of which were lambing during October-November and the remainder lambing in January, it would not be so difficult to find the proper kinds of rams and to develop mating systems. For example, if one wants to lamb about half of his flock in October and November and the other half in January and February, then he could mate his ewe flock in May and June to rams of the kind from which he would like to save replacements and keep replacements from the fall born lambs. For his August mating to produce January lambs, he could use strictly blackfaced rams or other terminal sire breeds and plan to sell all of the lambs. One needs to remember when talking about lambing in the fall that several breed combinations will lamb fairly well in the fall in Oklahoma, that is, 50-70 percent of the ewes lambing. The problem referred to earlier had to do with the situation where a producer wants most or all of his ewes to lamb in the fall. Under those conditions the Dorset x Rambouillet combinations would certainly be better than anything else.

## Additional Considerations

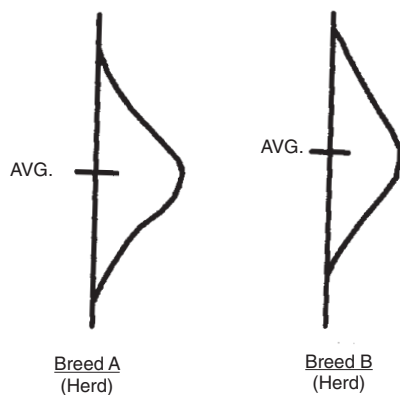
In any system involving the production of livestock, whether it is crossbreeding or straight breeding, it is important to realize that within any breed there is a lot of variation (see Figures 1 and 2). It is just as important with crossbreeding as with other mating systems that good individuals of the breeds be selected and used. The old saying that crossing culls produces culls is true.

A second thought about crossbreeding concerns predicting how breed crosses will perform. Some traits exhibit heterosis or hybrid vigor and some do not. If there is heterosis for a trait, when two breeds are crossed the crossbred individuals will tend to be better for that trait than the average of the two breeds crossed (see Figure 3). Consequently, one might expect that sometimes the crossbreds would be better than the best breed crossed. When crossing two breeds, one ranks high for a trait and one ranks low for some trait, the resulting crossbred may not be as good as the best breed. Crossbreeding should be done only when it is advantageous to do so.

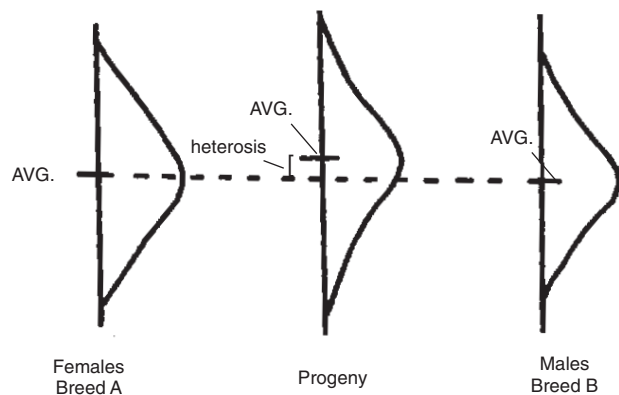
The other situation we find in breed crossing concerns traits for which there is little or no heterosis. Under those conditions the crossbred individuals are expected to be about



**Figure 1. The usual distribution within a typical breed of animals includes a few very good individuals, many that are near the average, and a few that are not good. The trait being measured could be weaning weight, rate of gain, or any other.**



**Figure 2. This comparison of two breeds shows a difference in average merit, but a large overlap, so that the best animals in the poorer breed are well above the average animals in the better breed.**



**Figure 3. When crossbreeding yields higher average progeny, for a specific trait, than the average of the parents, the trait is said to exhibit heterosis (hybrid vigor).**

halfway between the averages of the two breeds crossed. A good example of this is in the case of carcass characteristics. If a very lean breed is crossed with a very fat breed, we find that the crossbreds are about halfway between. There are other characteristics that seem to work about the same way, one of which appears to be lambing rate. If crossing a breed that produces 1.4 lambs per ewe lambing with a breed that produces 1.8 lambs per ewe lambing, one would expect the crossbreds to produce 1.6 lambs per ewe lambing. In the latter example if there were heterosis, the crossbreds would be expected to produce more than 1.6 lambs per ewe lambing.

### Addendum

The productivity of a flock of sheep, or a herd of any kind of animal, depends first upon the genetic potential that is built into the flock through the kinds of animals involved. Whether or not the animals attain their potential depends upon feeding and management. The purpose of this discussion has been to indicate that by judicious use of breeds and the use of good animals in those breeds one can produce a flock of highly productive ewes. It is also obvious from this discussion that if crossbreeding is to be used to produce the kinds of individuals wanted, a lot of planning is necessary in choosing the breeds and animals within breeds to mate and the actual mating plan to get the best job done. The rewards, however, can be very great.

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