NSIP Concept #4:

Breeding Group Structure

Overview

Anytime more than one ram is used in a breeding program, careful consideration of individual matings will help producers reach their flock goals for the next generation. Generally, there are two major approaches to pairings: ***Positive Assortative Mating***, which simply means breeding the best ram for a specific trait to the best ewes for the same trait to produce progeny with superior EBVs for that trait; and ***Negative Assortative Mating***, breeding two animals whose strengths and weaknesses complement one another producing progeny with more intermediate EBVs. In practice, breeders often use a combination of both approaches to achieve their management and marketing goals. Purposeful structuring of breeding groups allows producers to "dial up" or "dial down" certain traits to meet flock goals and to better predict the outcome of these matings.

Assembling Groups

The EBVs of a lamb at birth, often referred to as "pedigree" EBVs, are equal to the average of its parents' EBVs for each trait and are easily calculated as:

Expected Pedigree EBV = ½ (Ram EBV + Dam EBV)

When structuring breeding groups, most NSIP producers use the calculation above to determine what the progeny's pedigree EBVs would look like with each potential pairing. It is important to note that progeny do not always equally inherit the expected performance genetics from each parent. Some lambs will perform better than the average of their parents and some will fall short, some will perform more like their dam, and some more like their sire. Excel spreadsheets are often used as an efficient way to calculate pedigree EBVs. Once progeny EBVs are calculated, animals can then be sorted based on the traits needed to improve your flock. Ideally, each ram is paired with an equal number of the highest performing ewes, as well as lower performing ewes, so that each ram's breeding group is a fair representation of the flock. If one ram is given all the low performing ewes and the other ram is given all the high performing ewes, the accuracy of each ram's EBVs may be unnecessarily constrained or inflated. To further increase accuracy, breeding groups for each ram should yield at least 10-15 lambs per sire, and 20 or more per sire is better.

Strategies and Importance

Before determining which ewes will be mated to a particular ram, it is important to consider your flock goals, inbreeding coefficients, as well as other concerns such as phenotype and Scrapie genotype. Although

Table 1

Animal	NLB	NLW	Index
Sire	0.09	0.16	107.2
Dam	0.15	0.06	102.9
Progeny Pedigree EBVs	0.12	0.11	105.1

some breeders take a more random approach, most choose pairings that maximize a particular trait or group of traits without going backwards on others. For example, if you have ewes that struggle to wean triplets, and even twins in some years, you may consider using a ram that complements these traits to bring number born and number weaned more in line with one another and improve the potential reproductive performance of their offspring (Table 1).

Table 2 offers another example of "negative assortative mating" which produces progeny with more intermediate EBVs. In this example, a producer has concerns for both parasite resistance and reproductive performance. Here, a ram that excels in reproductive traits, but has only average EBVs for parasite resistance (PFEC), is mated to a ewe that has deficiencies in reproductive traits, but that possesses superior FEC EBVs. With this mating, offspring are expected to perform better than their dam in reproductive traits and better than their sire for parasite resistance. Such a mating strategy is common as a ram that excels in all desired traits is not always available. The advantage here is that extremes in EBVs are dampened and the progeny's overall EBVs become more balanced. The disadvantage is that improvement in both of these traits will take more time. However, if the same ram was bred to the most prolific ewes in the flock without consideration of FEC EBVs, the progeny would be expected to have high reproductive EBVs, but could succumb to parasite challenges resulting in an economic disadvantage.

Table 2

Animal	WFEC	PFEC	NLB	NLW	Index
Sire	-30.9	-51.1	0.18	0.20	108.5
Dam	-85.1	-91.2	0.06	0.04	102.4
Progeny Pedigree EBVs	-58.0	-71.2	0.12	0.12	105.5

Some producers choose to focus selection on rapidly advancing genetic progress in a single trait. In this example, a ram that is superior in one (or two traits) is mated to a ewe that is also exceptional in the same trait(s). This positive assortative mating (Table 3) produces progeny that also possess exceptional EBVs in the desired traits, but can overlook other traits that also may have economic importance in your flock.

Table 3

Animal	BWT	MWWT	WWT	PWWT	WFEC	PFEC	NLB	NLW	Index
Sire EBVs	0.31	-0.04	3.21	7.90	10.1	-22.1	0.09	0.05	100.6
Dam EBVs	0.42	0.3	3.00	5.98	-43.0	-78.9	0.15	0.15	107.0
Progeny Pedigree EBVs	0.36	0.13	3.11	6.94	-16.4	-50.5	0.12	0.10	103.8

Many producers prefer an approach that balances multiple traits simultaneously even though genetic progress in some traits will be slower. It is important to weigh the advantages and disadvantages of each pairing while thoughtfully using EBVs to meet your flock goals.