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As I suspect many of us do, I am often planning my fall breeding even while I am still drying off spring lambs. Some lambs are so promising right from the get-go, just keep on improving, and how can we resist planning fall breedings for those lambs! I certainly can't! My breeding assignments may change over the summer as I see how the different lambs are growing out, but I am always thinking and planning for fall. Likewise, as we see how an individual performs over the years, our breeding plan for that animal will change as we learn more about their genetics. We know a great deal more about an animal's breeding potential at four years certainly, than we do at four months. Yet, if we have a ewe with great fertility and mothering for example, but who is weak in fleece, we experiment with which rams will best improve fleece on her lambs. Or if we have a ram who throws beautiful, meaty offspring, but whose mother has too many singles, we breed him to ewes with better than average fertility and watch to see how his daughters do at lambing when it is their turn. Each time we make a cross and see results, we learn a little bit more about the potential of that animal, and how best to use it.

But what do we do when we have a truly outstanding animal that seems better than all the potential mates? A ram who throws beautiful stocky lambs, is a good father of daughters, AND has a rich and lustrous fleece? Or the ewe who has proven herself to be a dependable producer of fat, sassy twins, slips a silky fleece, and also stands to be milked? Who do we breed them to? Are we starting to feel that no matter WHO we assign them to, that we are "breeding them down"? We worry that the next generation will be watered down from their outstanding parent and indeed, each successive generation away from that individual dilutes the genetics by another half. Lambs are 50% of their mother, but then the grand-lambs are only 25% of their grandmother, and their lambs are only 12.5% of our now great-grandmother, and soon it seems, that wonderful package of genetics is dissipated.

This is when we should look at line breeding, in order to fix a collection of traits firmly within your flock genetics, rather than let it get lost over time. Line breeding is a breeding tool used all during human history, and with all livestock species, hunting dogs, beef cattle, milking goats, whoever, and it is a tool that you should consider using this fall. When I talked breeding with an old family friend, I asked him for advice about my ewe Solee. She was six at the time and was really showing herself to be the star of the flock. Twins every year, always born without assistance, face forward, fat and sassy, and never a problem at lambing or any other time of the year. Her daughters were showing her breeding as well, following the mother's footsteps, and I decided I needed to stockpile her lambs toward the eventual day when Solee would have to retire. The previous fall, Solee had been bred to Lars, and given me her best set of twins to date. Big and brawny, full of chest, with long, deep torsos and calm, easy tempers, they were clearing a successful breeding.

My dilemma was, should I breed Solee to Lars again since these lambs were so outstanding? Or should I breed her to a new ram so I could spread Solee's genes around the flock? When Dean asked me to list the pros and cons of each breeding choice, my friend asked if I had ever tried breeding her offspring with each other.

WASN'T THAT IN-BREEDING, I ASKED?

No, it would be line-breeding, Dean said, as long as they were only half-siblings, and he gave me the reference to a wonderful book entitled "The Basis of Line Breeding. A Practical guide with Illustrations" by J.H. Lents, published 1991, by PAW Publishing out of Allen KS. (If you would like to track down a copy, the Library of Congress number is 91-90167.) A Hereford breeder, Lents had been breeding cattle for 20 years at the time of the book's publication. According to Lents, the fundamental cross in a line breeding program is of a half brother to a half sister. The shared parent is the outstanding individual of course, and the other two parents should be unrelated to each other. Call our star flock member "A." Remembering that each lamb is 1/2 of each parent, her half-sibling offspring would all be 50% A and 50% of the unrelated sires, we'll call them B and C. So we can describe the offspring as 1/2A1/2B and 1/2A1/2C. If you breed these two half siblings, the lambs each get 1/2 of their genes from each of their parents, and doing the algebra, we see that the lambs from that linebred cross are 1/2 of (1/2A1/2B) plus 1/2 of (1/2A1/2C), coming to 1/4A1/4B1/4A1/4C. Adding up the fractions, you will see that the lambs are only 1/4 each of the less desirable sires B and C, but are still at 1/2 of our very desirable A. And when you breed those lambs to another "A" line out of unrelated sire D, they come up to be 1/2A,1/8B,1/8C,1/4D; and they will still be at 50% of A. And that is the beauty of line breeding. By starting with half-siblings out of otherwise unrelated lines, we can breed forward endlessly, and still stay at 50% of our desirable ewe A. This notion graduates further when each ram is outstanding, as you create many half-siblings within each generation, but as you can see from our ewe "A" example, line breeding from your ewe standard is the first pivot. This is where the adage the ram is half the flock falls into place in practice. They key per ewe would be to breed her to a different ram each year, and to hang on to the half siblings. You will be able to start line breeding in year two, breeding her new lambs to equally well selected yearling half-sibs. Then in year three, you have her newest lambs, her yearlings, and two year-olds, PLUS the lambs who are the results of last year's line breeding, all at that magical 50% of "A." Note that if we breed back a generation, for instance ram AB back to A, we have then crossed over into inbreeding, resulting in an animal that is 75% A and 25% B. Anytime the percentage of any one animal goes over 50%, you are inbreeding; by definition, line breeding will never take you higher than 50%. While arguably still a potential tool for improvement, inbreeding is more dangerous genetically and will not be discussed here.

Book author Lent had spent his twenty years prior to the date of publication line breeding on one outstanding Hereford line, and at publication was still going strong. He was still producing outstanding individuals, and had no intention to deviate from his breeding plan. With all those years into the program, and many generations away from the original bull, he was still working carefully with outside lines, and by planning his half-sibling crosses, he was able to maintain the influence of that one, outstanding bull, discovered all those years ago. Lent points out that as important to the method as is the half-sibling breeding base, is the willingness to select among the offspring and to cull any unsatisfactory individuals. Of course, any breeding method depends on the quality of your cull string line. All breeding by design is to fix a desirable set of genetic traits from the outstanding individual(s), and indeed it does so very efficiently, but it also can fix some undesirable, recessive traits as well.

If for example, our ewe A is carrying a recessive gene for weak hocks, then in certain half-sibling crosses, two copies of the recessive gene come together and express this trait, i.e., the poor hocks this offspring has to be culled of course, and if possible, both of the generational half sib parents since they clearly carry this recessive gene, but only cull if they are spared from this breeding program and are considered grade animal (meat choices). Make use of running a string of meat critters, always! At a bare minimum, the negative traited lamb should be culled and that particular unsuccessful breeding not be repeated, yet those parents removed (unpaired) from the program as soon as other good half-siblings are collected have some productive value, meat wise. By culling such offspring and half sib parents expressing undesirable traits, culling as such those parents as soon as you can spare them, it is possible to eventually remove this recessive gene or any other from the entire "A" line. There are two key points here: the first, that as line breeding tends to fix desirable traits, it can also bring out undesirable traits, making a strict culling policy a necessary feature of a better farming method. Line breeding can result in more culls than our usual outcross system, at least in the beginning of the program, but on the flip side, can also produce more consistent awesome results down the line. The second key point is that with time, you will be able to remove those hidden, undesirable traits, at the same time that you fix a uniform set of the desirable genetic traits that you first recognized in your "A" individual.

So as you start making your fall breeding plans, consider line breeding. If you have an outstanding ewe or ram and/or other species, plan to start saving half siblings from that individual, with the express purpose of line breeding. If you are fortunate enough to have already saved some half-siblings, try a few half-sibling crosses at estrus. If you are uncomfortable with the idea, or unsure, start small and make only a few crosses this year, and remember that you can always eat or castrate mistakes. When those 1/2A1/4B1/4C lambs, calves, kids arrive in spring, don't forget to hang on to them for your herd! Chances are, they will be very nice looking animals, and you may be under some heavy pressure to sell them. Also, breed your "A" animal to someone new each year, and adding to those offspring your first generation 1/2 sibling crosses, you will quickly collect a number of 1/2 "A" animals with which to continue your breeding program. If you are short on half siblings, you can also work with a half aunt to nephew, or half cousins, or half second cousins, even the half great aunt to great nephew. The number of generations down is not as important as that "half," sideways relationship. While not being quite as effective as the standard half-sibling cross, these crosses are still based on a half relationship and will still work toward fixing the desired set of genetic traits.

The end of my story is that I compromised and bred Solee to Lars again that fall; that first set of twins were really, really nice, and I was excited about getting more of the same. Then I switched Solee to a different ram each year after than, for another 6 working years! I finally had to put Solee down when she was 14 years old, but I still have a wonderful collection of half-sisters, 1/2 nephews, 1/2 cousins, and linebred grandbabies and great-grands, and each breeding season I plan at least a few Solee-line crosses. Now when I look out in the field, I see her wonderful line, still going strong and still producing outstanding individuals, certainly a wonderful legacy from my treasured ewe. I still miss my wise old friend Solee in the barn, but I take joy each spring in seeing her line still alive on the hoof on pasture.

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