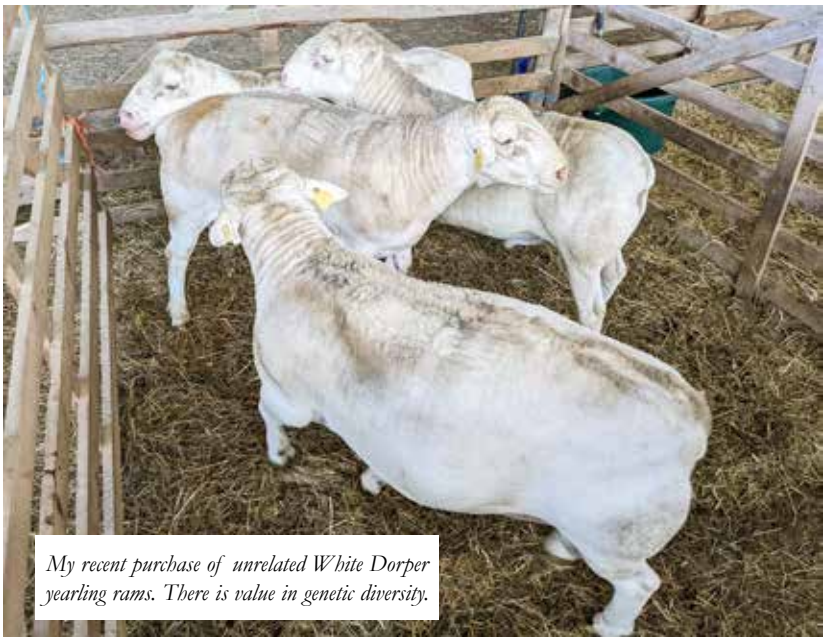


My recent purchase of unrelated White Dorper yearling rams. There is value in genetic diversity.

Linebreeding in Sheep

Benefits and Risks

—Ulf Kintzel

Linebreeding, a practice that is common in breeding cattle, is not a topic as widely discussed in commercial sheep breeding.

Linebreeding is a form of inbreeding, but instead of close inbreeding (mother/son, father/daughter, or brother/sister) it means breeding more distant relatives to each other such as uncle/niece, grandfather/granddaughter, or cousins. The goal is to make favorable genes more alike, such as genes for growth rate or meatiness. It serves the goal of creating a consistent and homogenous (alike) group of breeding stock.

In recent months I have been asked about linebreeding more frequently. I walked away with the impression that many who asked thought that linebreeding is the answer to anything that is missing in their sheep. The practice to keep the top performers of one's ram lamb crop and let them breed the ewes has been promoted and appears to take hold among some sheep farmers. In essence, it amounts to another form of linebreeding. If practiced repeatedly, it will quickly become a dead-end road as the genetic pool becomes smaller and smaller with this version of what I consider to be too close inbreeding. Reduced vigor, growth rate, and size are likely to be the first signs of it.

Linebreeding certainly has its advantages. There can be no doubt about it. However, when I hear the topic being discussed, I rarely hear any mentioning of the risks, just like there weren't any. There surely are downsides and they can be severe.

Since the advantages of linebreeding are quite well-known, and it is often being discussed as the be-all and end-all in animal breeding, I will focus a lot on the potential downsides. This ought not to be understood that I oppose linebreeding. In fact, I practice a limited amount of it myself. I just want to also discuss the other side there is to linebreeding.

To understand linebreeding, it is helpful to understand some basics about genetics. Let's dive into it for a moment: Every sheep carries a set of instructions in its body that predetermine its look and function. These instructions are like an operating manual. They are called chromosomes. Each chromosome holds many instructions. They are called genes. Sheep have 54 chromosomes, arranged in 27 matching pairs. In each pair of these chromosomes, one came from the ram/father, and one came from the ewe/mother. When sheep breed, the ram passes down one chromosome from each pair and so does the ewe. Each lamb then has a full set of 54 chromosomes, half of them coming from the ram and the other half from the ewe.

Without linebreeding, the instructions are likely to be rather diverse. With linebreeding, animals are chosen that share some of the same instructions on both the ram's and the ewe's side so that certain good qualities are more likely to show up in the lambs.

(This is a simplified version of how this all works. Trained biologists and other academics may find fault in my description. Let me give them a shout-out: I am aware. However, I am still factually correct, and I wasn't applying for a job as a professor for biology.)

The expression of certain traits can be located on

Photos by Author

dominant genes, or it can be carried on recessive genes. I will venture a moment into cattle breeding because it gives me a perfect example for a dominant gene: the white head of Hereford cattle. When you breed a Hereford bull to most other cattle breeds, the resulting calves will almost always be born with a white head. So, if a dominant gene is faulty, all offspring will have the same fault. It will be obvious, easy to detect, and can be rather easily eliminated by culling animals with such faulty traits.

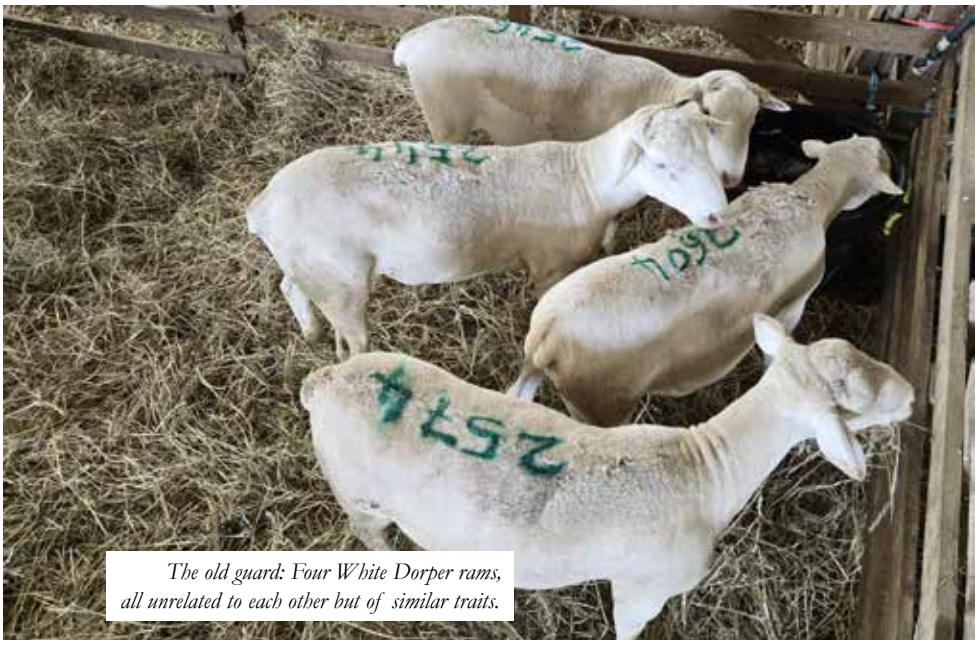
However, many genetic flaws or disorders are located on recessive genes. A parent can be a carrier, but the disorder will not be expressed. Both parents would have to have the defective gene for an undesirable trait to be expressed. However, when you have a broad gene pool without inbreeding and without linebreeding, the chance of faulty traits being expressed in the next generation is slim because the chance of both parents from completely different bloodlines having that defective gene is low. Life goes on with lambs that might again be carriers but without any signs of any disorder. The genetic flaw causes no problems in a real-world sense.

If there are carriers of defective genes, linebreeding makes it more likely that the resulting lamb crop will show the disorder. The closer ram and ewe are related, the higher the chances are that both have the faulty gene. Very close linebreeding, called inbreeding, like breeding a father to his daughter or a son to his mother, can bring all kinds of problems because the likelihood of defective recessive genes being carried by both ram and ewe are high.

How close can one inbreed/linebreed without negative risks? Where can or should one draw the line? There really isn't a clear-cut line. I can illustrate where I draw the line, though. I must talk about dogs for a while to do that. My extensive experience and knowledge in linebreeding is not in sheep; it is in German Shepherd dogs, as I am a breeder of the sheep herding kind of that breed for almost 40 years. In dogs you have an additional component: the temperament. Shyness, aggression, stubbornness, and so forth in a dog can easily be expressed in most of the offspring when an ancestor exhibited these traits and close linebreeding to that ancestor occurs.

Here is an abbreviated explanation of how linebreeding in my world is calculated: The first (1) generation removed from a particular animal are the parents, the second (2) are the grandparents, the third (3) are the great-grandparents, and the fourth (4) are the great-great-grandparents. 3-4 linebreeding is common, which means the same animal is a great-grandparent on the male side of the pedigree and is a great-great-grandparent on the female side of it. Or it can be the other way around (4-3), which is the same in practical terms. That kind of linebreeding is rather safe, provided that the common ancestor was of sound mind and body, yet it still brings the benefits of it. That is what I currently practice with one ram, which is linebred on my most influential White Dorper ram, "Nelson," a ram of South African descent with unsurpassed growth rate. However, he only breeds a portion of my ewes, while I have eight more rams that are unrelated to him, breeding other groups of ewes.

I wish to retain genetic diversity because there is a benefit to a broad genetic pool, meaning having sheep out of various rams. No matter how well a ram is known and how well he has produced, it is impossible to know all of him. There may be challenges in the future that the offspring with similar genes of such a ram has problems coping with. Heat or cold sensitivity, a lack of parasite resistance, a lack of disease resistance to a disease you haven't even encountered yet, or a lack of resistance to foot scald or footrot come to mind. The list of such possibilities is long. When you now have a flock of ewes that was linebred very close to a certain ram, enjoying



The old guard: Four White Dorper rams, all unrelated to each other but of similar traits.

the many good traits he has brought to your flock, you may also now have a flock that is entirely or at least mostly susceptible to that certain disease, or parasite, or environmental impact. You don't know what will happen in five or ten years from today. A diverse gene pool will likely offer you at least some animals to select from that will cope with the problem you may encounter better than others.

Then why is linebreeding so highly recommended anyway? Because it is relatively easy to reliably establish good traits and to get a consistent flock. The alternative is selection. It is infinitely harder. You must select sheep of similar traits despite different genetics. The appearance, the physical look alone, will not tell you the whole story. For that you need more experience, data, a good eye, and—so I claim—a feel for it all.

Of course, you can also rely on a good breeder who knows all this, has the experience, and owns genetically diverse breeding stock. They then can supply you with rams for many years that suit your breeding goals without risking the use of rams that are too closely related to each other. Does this statement sound self-serving? Yes, it does!

Ulf owns and operates White Clover Sheep Farm and breeds and raises grass-fed White Dorper sheep without any grain feeding and offers breeding stock suitable for grazing. He is a native of Germany and lives in the U.S. since 1995. He farms in the Finger Lakes area in upstate New York. His website address is www.whitecloversheepfarm.com. He can be reached by e-mail at ulf@whitecloversheepfarm.com or by phone during "calling hour" indicated on the answering machine at 585-554-3313.