



White Dorper/Romanov ewe with triplets born on pasture under the Easycare concept.

Conceptualization, creation and development of Easycare sheep at USMARC

Our vision for Easycare sheep is to genetically improve production efficiency, health, and well being in pasture-lambing systems. These goals will be achieved by developing a maternal line with these attributes:

- Raise twins and triplets on pasture without the need for human intervention
- Balance prolificacy with ewe mothering ability and baby lamb behavior to improve lamb survival
- Produce hair to eliminate shearing
- Have short tails to avoid docking
- Be polled to avoid injury and the need to remove horns
- Be less susceptible to diseases.

Prior producer efforts to increase ewe productivity on pasture have often failed because the observed survival of twin-born lambs on pasture is usually much less than single-born lambs—and the survival % of triplets is lower still.

These observations were often based on breeds with levels of prolificacy ranging from 1.5 to 1.8 lambs for mature ewes. At these modest levels of prolificacy, the innate genetic ability to rear twins and triplets is often masked because too many ewes give birth to single lambs.

Hence, genetic improvement of number reared is biologically constrained by the number born. To address this issue, USMARC scientists used Romanov germplasm (a breed with at least a twofold increase in prolificacy).

- We evaluated 5 types of Romanov crossbred ewes lambing on pasture without human intervention, to identify crossbred types that balanced prolificacy and maternal ability (behavior and milk production) to improve survival of twin- and triplet-born lambs.
- The result? Survival to weaning of twins born to 2- and 3-year-old ewes averaged 90% of lamb born—compared to 86% survival of single-born lambs. Moreover, 47% of these crossbred ewes that gave birth to triplets raised their entire litters naturally in the absence of labor or supplemental feed.

Conclusion? The solution to improving lamb survival and increasing ewe productivity while minimizing human intervention lies in using specific genetic resources that are well adapted to low-input, pasture-lambing production systems.

These initial experimental results supported the creation of a prolific maternal line of hair sheep that can successfully raise twins and triplets on pasture...

The initial strategy was to use direct and maternal breed and heterosis effects to create a composite flock with approximate optimal levels of performance for lowly-heritable fitness traits (fertility, prolificacy, lamb survival, seasonality, health, and longevity).

- Due to the documented reproductive superiority of Romanov, the genetic foundation of the maternal line was based on 50% Romanov germplasm.
- The remaining genetic composition was chosen to complement the Romanov for ewe productivity while also requiring less labor and focusing on well-being issues—because healthy ewes require less labor/ewe.
- Our trials demonstrated that White Dorper x Romanov crossbred ewes were more productive than Katahdin x Romanov crossbred ewes—whereas Katahdin excel for wool shedding, parasite tolerance, and hoof soundness.
- These tradeoffs justified similar contributions of each breed. Therefore, 25% Katahdin and 25% White Dorper constituted the remainder of the maternal line. This breed composition will achieve 62.5% of potential heterosis effects, which markedly improve health and increase longevity.

Once the maternal line was created, the next step was to select for both qualitative traits and highly-heritable quantitative traits within the composite flock.

1. In this phase scientists focused on presumably moderate to highly heritable traits. In 2006, we started recording wool shedding scores on ram and ewe lambs, and used this information along with color (white), horns (polled), and prion genotypes to select ram lambs.
2. As an insurance policy against decimation of the flock due to scrapie, we increased the frequency of the R allele at codon 171 of the prion gene from 0.23 in 2009 to 0.55 in 2014-born lambs.
3. In 2010, we started genotyping for TMEM154, a gene affecting susceptibility to OPP virus, and increased the frequency of the favorable haplotype from 0.51 to 0.71 for lambs born in 2014.
4. Importantly, rams reared as twins or triplets were favored over single-reared lambs.

- Selection based directly on rearing status identifies ewes and lambs with behavioral characteristics that support lamb survival and well-being when subjected to real-life environmental risks that often exist on farms and ranches.
- In contrast, selection solely to increase number born would decrease lamb survival.
- While selection to decrease number born might increase lamb survival in a pasture-lambing system, this approach would require more land to produce the same number of lambs; hence, sustainability of sheep production is less if number born is decreased.

5. Older ewes are culled from the population as young ewes are kept for breeding.
6. Culling was initially practiced to eliminate ewes of the F1 generation, favoring ewes with stabilized heterosis effects.
7. Subsequently, ewe culling has been based on wool-shedding scores and number weaned within contemporary groups.

Based on breed composition, heterosis effects, selection protocols, and culling practices, we expect this sheep to gradually become:

- Shedding
- White
- Polled
- Short tailed
- Resistant to scrapie
- Less susceptible to OPP
- Relatively free of genetic defects

There is no selection pressure to directly increase weight or number born, whereas selection of twin- and triplet-reared rams should gradually improve lamb survival without the need for human intervention.

Because several traits are incorporated into the selection strategy, we expect improvement of individual traits to be relatively slow, but overall progress to be about 2% per year, with little risk of antagonistic correlated responses.

This maternal line addresses several health and well-being issues, such as stress and pain associated with shearing of wool, docking of tails, removal of horns, and effects of OPP infection.

We have started to record fecal egg counts and to consider potential to add parasite tolerance to the suite of traits for selection.