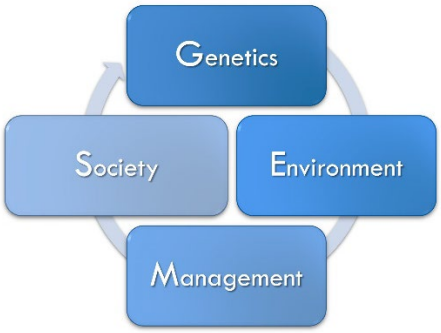
Sheep GEMS News Brief 2 – May 2024
It is all about the interactions

As a reminder, GEMS stands for Genetics, Environment, Management and Society. In Sheep GEMS we are interested in the interactions among these elements of a production system. As our starting point, we focused on the first three bits, namely Genetics, Environment and Management. An initial study with Katahdin sheep shows how these elements work together.



We based **genetics** on body weights, fecal egg counts, and FAMACHA scores recorded at around 90 days of age in over 3,500 Katahdin lambs from 17 flocks participating in the National Sheep Improvement Program (NSIP). FAMACHA scores provide a subjective assessment of anemia and are scored from 1 to 5 relative to the color of the membrane within the eyelid. A score of 1 is red, a healthy animal, while a score of 5 is pale, an anemic animal. Both fecal egg counts and FAMACHA scores are useful indicators of a lamb's genetic ability to cope with a gastrointestinal nematode (GIN) infection, particularly *Haemonchus contortus. H. contortus* is the most common blood-feeding parasitic nematode found in sheep and goats in the U.S.

We based **environment** on the climate of the geographic location of a flock. Using data from the National Weather Service, we captured yearly averages for rainfall, snowfall, and temperature associated with each flock's location over a 30-year timeframe. We also obtained the site's elevation.

We based **management** on results from an online survey of Katahdin producers, including those who provided performance data. The primary aim of the survey was to quantify differences in management practices including grazing systems, GIN impacts, selection strategies to mitigate parasitism, feeding regimes, and other husbandry strategies for the flock. Forty NSIP Katahdin producers completed the survey.

We wondered if we might better describe the unique characteristics of a flock by combining their environment and management practices rather than considering them separately. Their combination was more informative. The dominant factors affecting the performance of animals were temperature, rainfall, grain supplementation on pasture, and the age at which animals were turned out to pasture. Nine groupings or, so-called eco-management clusters, captured the main differences among the flocks' climates and management practices. Unsurprisingly, clusters with hotter temperatures, greater rainfall, and pasture-born lambs had higher parasite loads. Those clusters with lambs turned out to pasture at older ages had less parasitism.

We then tested if specific sire families or genetic lines performed differently depending on the eco-management clusters in which their lambs were reared. They did perform differently. The **interaction** between sire genotype and cluster explained 12% of the variation in fecal egg counts and FAMACHA scores, and 19% of the variation in body weights. Accounting for those substantial interactions in our breeding programs may well allow for more reliable selection decisions and rates of genetic progress.

Still, we do not want to get ahead of ourselves. Our work so far has involved one breed with a focus on parasitism. Recently, as part of Sheep GEMS, we conducted a much more comprehensive survey

involving several breeds engaged in NSIP. Analyses of those results are underway and will be the focus of a future project update.

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