

Using genetics to improve the health of a flock

The *heritability* of a trait explains how much of that characteristic a lamb receives from its parents.

So in sheep, the heritability of four legs is about 100% - most sheep end up with 4 legs.

Heritability of traits like the short tail is about 70%. The tail length genes that come from the ram and ewe determine 70% of tail length for a lamb. The environment determines the other 30%. The conditions a lamb experiences in utero or shortly thereafter, will also determine whether its tail is slightly longer or shorter than other lambs from the same parents.

Traits that are highly heritable will spread throughout a flock much more quickly than traits that are less heritable

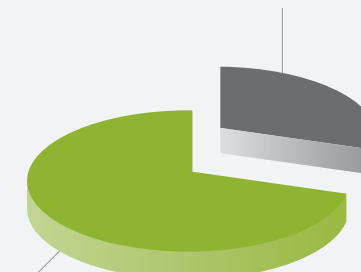
Some traits affect the health of sheep and their offspring, and therefore the productivity (and, even more importantly, the profitability) of the flock. Each of these carry a certain level of heritability. By making the right breeding choices (in terms of the rams your clients use), they can select for these traits and spread the desirable ones throughout their flock.

On the flipside of this page you can see a summary of a range of health traits. There is currently genetic information available for these traits for NZ flocks. The SIL database collects information about these different traits in flocks and rams, so farmers can make better ram buying decisions. (see www.sil.co.nz)

Heritability of tail length



30% from environment



70% from parents

Resistance to internal parasites

Heritability = 25-30%

Most sheep carry internal parasites (worms) but some sheep are affected more by the infection, which in turn reduces their performance.

A sheep's parasite load is measured by faecal egg counts (FEC). WormFEC data is used by SIL to produce FEC eBVs* for lambs (coded as FEC1 & FEC2) and adult sheep (AFEC). Lower FEC eBVs are better, because they indicate a lower rate of infection, showing that the sheep has a stronger **resistance** to the worms.

Note: highly resistance sheep (with high FEC eBVs) may be slightly less productive, possible because those animals are devoting some energy into fighting worms. This can be addressed for selecting sheep with increased productivity eBVs *and* low FEC eBVs.

* SIL characterises genetic merit for traits as *estimated Breeding Values* (eBVs).



Dag score

Heritability = 20%

Dags are a significant cost to sheep farmers due to costs of crutching, dagging and the reduced value of contaminated wool. Dagginess has a low heritability, because a variety of environmental factors can lead sheep to scouring and dag forming (eg. changes in feed, internal parasites, ryegrass staggers and mineral imbalances).

SIL does produce eBVs for dag score in lambs (LDAG) and adult sheep (ADAG) based on dag scores collected on lambs (about 3 months old) and hoggets (about 8 months old). Lower DAG eBVs are better, so farmers would choose these to reduce the incidence of dags in their flock.



Resilience to internal parasites

Heritability = 15%

An alternative to breeding for resistance is to breed sheep for **resilience** – basically, this is the ability of sheep to “tolerate” the worms they carry, so their productivity is unaffected.

Resilience to parasites is measured by ‘days to drenching’ and ‘gain under parasite challenge’. To test for this, lambs are grazed on contaminated pasture and then weighed at frequent intervals. The first lambs to show slowed growth get drenched and all the lambs’ growth rate up to this point is recorded (gain under parasite challenge). Then the date at which each subsequent animal shows slowed growth and needs to be drenched is also recorded (days to drenching).

SIL then produces eBVs for both these traits: RGAIN (liveweight gain up to the first drenching event) and DRAGE (age when first drenched). Ideally farmers would be selecting for fast liveweight gain and a later drench age to spread resilience to parasites through their flock.



Facial eczema (FE) Tolerance

Heritability = 45%

Facial eczema (FE) is a significant disease in parts of New Zealand and is caused by a fungal toxin. It can result in outwards symptoms, as the photo shows, but not in all sheep. All sheep with the disease will experience damage to their liver and bile ducts, often causing death.

Sheep vary in their response to FE because there is genetic variation for tolerance to the toxin.

FE tolerance is assessed by measuring the level of a particular liver enzyme 21 days after exposure to FE. SIL then uses this data to produce a GGT21 eBV, and flocks are also given a “star rating” in the database indicating the level of FE challenge a flock’s animal’s can tolerate. Farmers in FE prone areas would want to choose rams that have high star ratings and with lower GGT21 eBVs to use for breeding increased FE tolerance.

