Focus on lamb survival

GENE TALK

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Recent comment in the rural media has questioned whether we have "got it right" for lamb survival.

For an informed debate and to improve understanding we need to look at the facts and examine what is being done by New Zealand sheep breeders.

It has been suggested that farmers accept high rates of lamb losses as inevitable. This is not the case. Interactions with sheep farmers and sheep breeders regularly find that lamb survival is an issue they rate as important, so they are concerned.

Focus on genetic improvement of this trait was brought when lamb survival, as a separate trait, was added into the then new SIL system, more than 10 years ago. Research into lamb survival has been a key investment priority for much of the past 10 years. These things are often missed or forgotten when isolated severe environmental events strike farmers.

Before SIL, lamb survival had not been available as a separate trait to sheep breeders. Some genetic evaluation systems had the option to use number of lambs weaned (a combination of number of lambs born and lamb survival), an issue I look at later in this article.

No two years are alike and so the challenges to lambs surviving can vary considerably between years. These factors contribute to the low accuracy (heritability) for this trait compared with other traits we want to improve.

Lamb survival is one of the hardest traits to improve due to the low accuracy with which we can estimate genetic merit for this trait. This is because most of the variation we see in lamb survival (>95%) is not genetic. And because farmers are concerned about lamb survival, they may intervene to help lambs that are struggling, which acts to mask the genetic variation in lamb survival that we are seeking to characterise in a breeding programme.

Further to this, no two years are alike and so the challenges to lambs surviving can vary considerably between years. These factors contribute to the low accuracy (heritability) for this trait compared with other traits we want to improve.

Despite these drawbacks, several capable breeders have considered the information presented to them about the genetics of lamb survival and adopted reliable systems to record lamb survival and minimise non-genetic biases in the data. Some of these breeders are demonstrating consistent and significant genetic gain in their flocks (see example in graph).

SIL has been advocating collection of good lamb survival data for the past 10 years. In 2009 we introduced the lamb survival trait to the SIL-ACE (our largest, across-flock) evaluation where a threshold was applied for exclusion of data if average survival rate was high. Study of this data led us to conclude that high lamb survival rates usually indicated incomplete recording of lamb deaths relative to lamb births.

This policy led to more accurate assessment of lamb survival in those flocks with better quality data. Since August 2010 the number of flocks genetically connected for lamb survival in SIL-ACE has risen from 117 to 183, a 56% increase. This increase is due to more

flocks having better data.

Flock X depicted in the graph has made a gain of around 3% for lamb survival (SIL SUR eBV) during the past 10 years. The industry average line (from SIL-ACE) is lower, just under 1% for the same period, partly reflecting historically incomplete data. Since evaluation systems before SIL did not assess lamb survival, it didn't matter if lamb deaths were not recorded accurately.

We freely admit this graph depicts one of the best SIL flocks for genetic gain in lamb survival, but many others are making good gains as well. Remember that in the context of a selection index, some of the gains that might be made in lamb survival are not got because selection pressure is being put on other traits as well.

This brings me to a second issue – is number of lambs born a good measure of "production" when lamb survival has such a big impact on production. SIL is frequently asked why it does not simplify things by assessing traits like number of lambs weaned a ewe or total weight of lamb weaned a ewe. Let's look at this last one in more detail.

It is obvious that total weight of lamb weaned each ewe is a good assessment of efficiency or profitability on a flock basis, enabling between farm or between year assessments of relative performance to be made. In that context it is a useful concept.

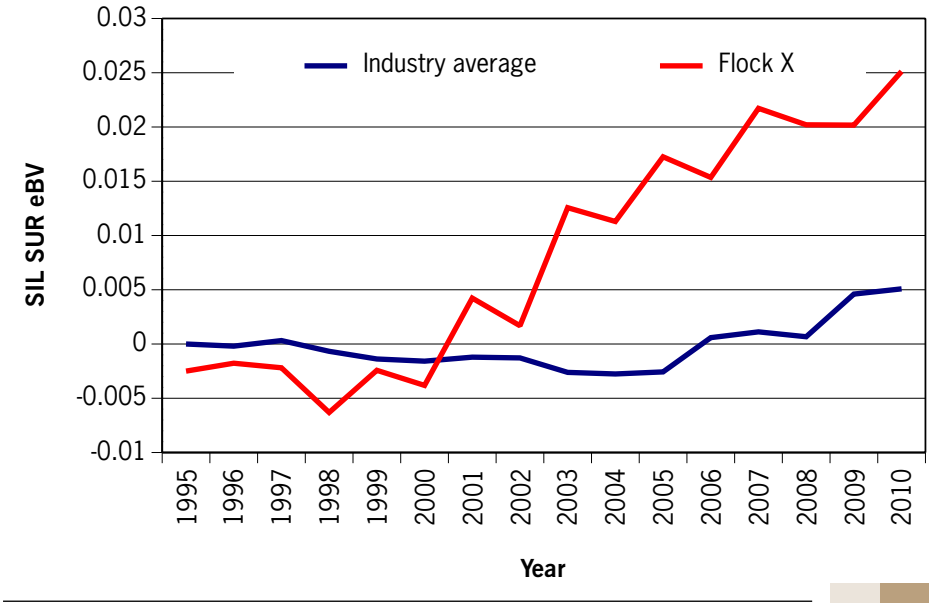
"Aggregated traits" have weaknesses – they don't tell you where a "failure" or a lift in performance is coming from. Was improved performance due to more lambs, better survival, better growth or a combination of these?

In the genetics setting it has more weaknesses, well known to animal breeding experts for many years. Firstly, traits such as NLB and lamb survival are discrete traits – individual animals are born in litter sizes of one, two or three, but not 1.4, 1.7 or 2.2, and lambs are either alive or dead, not somewhere in between. This means a slight mishap and a ewe goes from having two lambs to one, halving her productivity. Most often the reason for the loss is non-genetic (remember that it is only around 5% heritable). Consequently the best information on genetic merit comes from looking at patterns in families.

Culling individual ewes in a breeding programme based on total weight of lamb they wean is ruthlessly applied by some breeders. It will mean a significant proportion of the animals kept are genetically inferior to many of those culled, slowing genetic improvement.

Another weakness is that, genetically, two different things contribute to lamb survival and two different things to lamb growth. For lamb survival, "thrift" of the lamb and ewe "mothering ability" are different in that the genes for lamb thrift are exhibited by the lamb while those for mothering ability are expressed by the ewe. Likewise for lamb growth, the lamb expresses genes that affect its potential for growth and the ewe expresses genes that influence her milk production which in turn affects lamb growth.

Figure 1: Genetic Trend in Lamb Survival



Separating genetic merit into key component traits is the best way to lift overall productivity in managed improvement programmes.

So for total weight of lamb weaned each ewe there are five components of interest (corresponding SIL eBVs are in brackets) – number of lambs born (NLB), lamb thrift (SUR), ewe mothering ability (SURM - Survival Maternal), lamb growth to weaning (WWT) and ewe milking ability (WWTM - Weaning Weight Maternal). All these traits vary in how heritable they are which affects the accuracy with which we can assess genetic merit for each.

If we were to bundle them all together as one trait, total weight of lamb weaned each ewe, there are three downsides. Firstly, we weaken the accuracy of assessing overall genetic merit by bundling low heritability traits with higher heritability traits. Secondly, it is not obvious where genetically superior performance is coming from. Thirdly, there is a risk that improvement in the aggregate trait (total weight of lamb weaned a ewe) might be due to improved performance in some components along with reduced performance in others eg, increased weight of lamb weaned each ewe coming from number of lambs (NLB) and milking ability (WWTM) but no improvement in lamb growth (WWT) while lamb thrift (SUR) actually decreased.

In management a phrase sometimes used is "you can't manage it if you don't measure it". That definitely applies here. Any experienced breeder will tell you that while selection indexes are useful, they need to also look at the balance of merit across traits within the index. So while total weight of lamb weaned each ewe is a useful index of productivity in some situations, it is a lot less useful in genetic improvement.

For the same reasons, SIL uses NLB, SUR and SURM to define genetic merit for number of lambs weaned a ewe, not the aggregation of these.

SIL data shows that some sheep breeders in NZ are achieving significant improvements in lamb survival.

Separating genetic merit into key component traits is the best way to lift overall productivity in managed improvement programmes.

To find ram breeding flocks that can provide good genetic information on lamb survival, use the FlockFinder tool on the SIL website (www.sil.co.nz) which searches through SIL flocks participating in the SIL-ACE evaluation.

Beef + Lamb New Zealand is committed to providing better access to better information. Initiatives in the area of sheep genetics for lamb survival are one good example of this.

To send feedback, you can email silhelp@sil.co.nz or telephone 0800 silhelp (0800-745-435).

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