

SGS Wool Testing Services

Info-bulletin

Fleece and core test diameter relationships

Introduction

Growers who have used fleece or midside test results to select lines of wool, either pre-shearing or at shearing, have sometimes noticed that there is a difference between what they expected from each line, and what was shown on the core test certificate for that line. In particular, they noticed that their finest line was often coarser than they'd expected.

When on-farm testing became widely available, the volume of fleece testing tripled or quadrupled, and growers with little experience of objective lot preparation also began to notice discrepancies.

The discrepancies acquired their own name - in some cases the problem was known as "micron creep" and in others as "diameter shrinkage". Both terms are descriptive but quite misleading. They came from the observation that the range between the certified finest and coarsest lines was almost always less than the expected difference from fleece testing.

The cause of "micron creep" or "diameter shrinkage"

Every measurement has associated with it some degree of random error, caused by variations in the sampling or testing that cannot be controlled. Certification testing uses very prescribed methods to control these errors, with the effect that the 95% confidence limits on a 20 μm line are $\pm 0.35 \mu\text{m}$.

Fleece testing relies on sampling from a fleece, and unlike certification testing, there is seldom any replication, and often relatively little quality control. After all, fleece testing is intended to be economic, and at perhaps \$1.50 per test as compared with more than \$ 50 per certificate test (although this includes other measurements), it's not surprising that the precision is quite a bit worse. Nevertheless, at about ± 1 to 1.2 μm , these 95% confidence limits are adequate for the originally-intended purpose of selecting animals for breeding or culling.

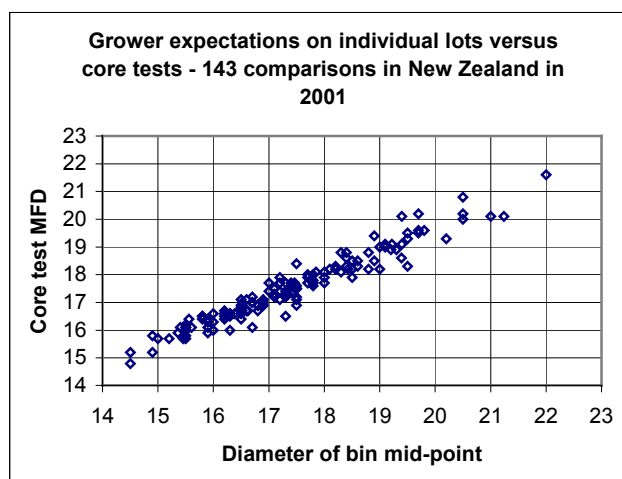
If one imagines a scenario where the fleeces are being objectively lotted to 1 μm bins, and the precision of each measurement is 1 μm , it is quite clear that some fleeces will be assigned to the finer bin than they should be and some will end up in the coarser bin than they should. On average of course, this will balance out, with each bin receiving some correct fleeces, some finer than they should be and some coarser than they should be.

The finest bin will, however, not balance, because there are no fleeces being assigned in error from the next bin down. In consequence this bin will contain more fleeces that should in an ideal world have been assigned to the next bin up. In other words the "true" diameter of the bin will be coarser than the expected diameter, and when the core test comes back, it is likely to show a coarser result. The same thing happens in reverse with the coarsest bin.

These factors have been known for many decades in other industries, and one of the first documented reports of this problem was for the objective assignment of Canadian wheat to quality grades based on NIR measurements.

The actual cause of micron creep or diameter shrinkage is therefore imprecision of the measurement. The more precise the fleece test measurement, the less the error, but in practice, at the moment, most fleece testing has similar levels of precision.

Some idea of the magnitude of the error can be obtained by plotting the core test results against the midpoint of the classing bins. A plot for OFDA2000 classing is shown below:



Other factors

Other factors can affect the accuracy of core test predictions from objective classing. In the case of OFDA2000 on-farm measurements, the site on the animal from which the sample was taken can have a significant effect on the accuracy and precision of measurement. The recommended sample site is the left midside, which is the same as recommended in the fleece testing standard AS/NZS 4492.

Where flocks do not have a history of the use of objective selection, there could be large differences in fleece weights and yields off individual animals, and if this is not taken into account, bin contents could be slightly different to expectation. Similarly, the degree of skirting could have an effect.

It is also difficult to predict the contents of classing bins at the ends of the lines where fleeces 'less than' or 'greater than' specific cutoffs are assigned. Unless the actual diameters of these fleeces are used to calculate an average, this could add to the errors due solely to imprecision of the testing.

Conclusions

If appropriate care is taken, bin expectations should be within 0.3 to 0.5 μm of the core test result. There will be occasions, however, when this difference will be exceeded, and especially in the finest and coarsest lines.