

USING FLEECE MEASUREMENT TO IMPROVE FARM INCOMES

Part 2: Selecting an Appropriate Measurement System

Fleece Measurement can be used in different ways to improve farm incomes:

- **Picking winners:**
selecting sheep for ongoing breeding programs to improve the economic value of the flock;
- **Removing losers:**
culling the sheep in a mob considered to have the lowest economic value;
- **Splitting lines:**
classing the individual fleeces during shearing into lines that maximise wool cheques; and
- **Marketing rams:**
selling rams at the highest possible price.

These options may be used individually, in various combinations or all at once depending upon the outcome(s) the woolgrower is trying to achieve. However, selecting a **measurement system** that is appropriate for the required outcome(s) requires an understanding of the influence of the key technical factors, **Accuracy**, **Precision** and **Bias** (see Using Fleece Measurements to Improve Farm Incomes Part 1), and their influence on these outcomes.

In an ideal world **Accuracy** and **Precision** would be identical and **Bias** would be non-existent. While this ideal is often technically approachable, this is usually at great cost. Inevitably all measurement systems are compromises that aim to deliver sufficient **Accuracy** and **Precision**, with minimum **Bias** at an **acceptable** cost. These technical issues must be considered when selecting a measurement system.

PICKING WINNERS AND REMOVING LOSERS



When it comes to sheep selection **Accuracy** is not a major factor as one is simply comparing the relative merits of one sheep to another. In contrast the **Precision** defines the degree that one can differentiate the merits of one sheep compared to another, so it is very important. In addition, the precision, in conjunction with the “variation between sheep within a mob”, sets the limit in economic return that can be achieved in sheep selection/culling by limiting the number of selection/culling errors that are made.

For any mob of sheep, using a measurement system with a higher precision (i.e a lower confidence level) means that selection errors will be lower. For high culling rates (picking winners) there is clearly a case for improving the repeatability of the measurement to be sure the best animals are retained. For low culling rates (removing losers) the precision required for an acceptable outcome may be lower.

In these applications **Bias** will also be unimportant provided that it is small or constant in all cases.

SPLITTING LINES



The **Accuracy** of the Fleece Test Result plays a significant role when one is aiming to match the Certified result of the bales produced by the fleece classing process, particularly if the economic viability of using Fleece Measurements for this purpose is dependent upon the predicted outcomes being achieved. It must be remembered that due to the normal diameter trends over a fleece, it is unlikely that sampling at only one site will produce results that agree with the Certified result. The sampling strategy that aims to sample the entire fleece in a random manner will give the best chance of achieving a match. Alternatively a sampling strategy involving 2-3 samples from different locations over the fleeces will also improve Accuracy.

The **Precision** of the Fleece Test Result will influence the ability to correctly class an individual fleece into the nominated diameter grouping. The better the Precision the lower the number of fleeces that will be incorrectly classed into the wrong grouping. It is also generally accepted that precision is also the factor responsible for increasing biases in prediction of the Certified result for finer lots (see Fact Sheet “*Classing Using In-shed Testing – Why do fine lines measure coarser than expected?*”).

Bias will be relatively unimportant if it is small or constant in all cases, and if the bias is known and can be taken into account before making any decisions. Measurement systems that use an average grease correction factor when determining Mean Fibre Diameter will be biased if there is significant variation in grease content between fleeces with “similar” Mean Fibre Diameter. Likewise measurement systems that do not adequately equilibrate the moisture absorbed in the wool fibres to the moisture content in the fibres used to calibrate the system will also be biased. **Bias will always reduce Accuracy.**

MARKETING RAMS



There are many aspects to marketing rams. Increasingly, rams are being offered in catalogues with a suite of measurements such as Mean Fibre Diameter (MFD), Coefficient of Variation of Diameter (CVD), Mean Fibre Curvature (MFC) and Comfort Factor (CF).

The required **Accuracy**, **Precision** and **Bias** of each of these measurements will depend on how much weight is placed on the measurements *per se* by the purchasers. Many Ram Shows are now requiring greater precision for these measurements, and greater integrity in the sampling than has been previously the case.

It is arguably beneficial for Ram Breeders to ensure that the measurements in their catalogues are as Accurate and Precise as is reasonably practicable. If the basis of the measurements is to provide a potential purchaser with information to rank a particular animal within a stud flock, then a sampling strategy based on a single site, with all animals being sampled at the same time, will be sufficient, provided sample preparation prior to measurement is adequate. Generally this will involve adequate cleaning of the samples and conditioning to equilibrium moisture content.

If Ram Breeders wish to provide purchasers with information about the average values for these parameters over the fleece, then the sampling strategy that aims to sample the entire fleece in a random manner would be appropriate. However, in most cases this will be impracticable, so a strategy based on sampling from a number of sites over the fleece should be employed.

Conversely, any purchaser of rams would be well advised to ask the Ram Breeder to explain the measurement system used, so that he is better able to determine how much weight he should place on the measurements when selecting a ram to buy.

SELECTING AN APPROPRIATE MEASUREMENT SYSTEM

Selecting an appropriate measurement system clearly depends upon the intended application of the measurements. Measurement systems consist of four elements:

- **sampling;**
- **sample preparation;**
- **measurement;** and
- **documentation** (including sample identification and reporting).

All these elements should be considered in conjunction with the desired outcomes when selecting a fleece measurement system.

Of course the complexity of this decision-making can be entirely eliminated by simply choosing the measurement system that offers the best accuracy and precision and the lowest bias. If this information is unavailable then selecting the system offering the best precision is the next best option.

Part 3 of this series of fact sheets provides some quantitative information for assessing the services and technologies currently available.

FURTHER INFORMATION

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