



## Predicting hauteur from the fibre diameter profile

*Andrew Peterson, Research Officer, Department of Agriculture*

### What is hauteur and why is it important?

When wool is scoured, carded and combed, the end product is called wool top. Wool tops are the raw product bought by a spinner and the basic ingredient for creating yarn. The two most important properties of wool top are the mean fibre diameter and the hauteur. The hauteur is defined as the average length (in millimetres) of fibres in the top and typically can range from 50 to 90 millimetres. The hauteur is strictly specified by the spinner client, and determines the quality and fineness of the yarn during spinning. In general, the longer the hauteur, the more valuable the top at any given mean fibre diameter, although over-long tops can be discounted.

### How do we currently predict hauteur?

Hauteur can be predicted for processing consignments using the TEAM equation. This equation uses the measurements of staple length, staple strength, mean fibre diameter, proportion of mid-breaks and vegetable matter content to predict the hauteur of the consignment. The TEAM equation has not been designed to predict the hauteur of individual sale-lots or fleeces.

### The new hauteur prediction formula

The Western Australian Department of Agriculture has developed a formula for predicting hauteur using the fibre diameter profile. There are a number of ways that fibre diameter profiles can be measured but the most popular is using the OFDA2000 instrument. The more diameter measurements along the staple, the more precise the estimation of hauteur will be. The OFDA2000 typically measures fibre diameter every 5 mm along the staple so that a 100 mm staple will contain 20 individual profile measurements. As few as 10 measurements per profile can be used to reliably estimate hauteur. The formula should not be used for staple lengths outside the range of 60 to 125 mm, and wools broader than 26 microns.

### Why an alternative to the TEAM equation?

With the easy access to fibre diameter profiles, wool producers can now measure the changes in fibre diameter along the length of the staple. It is far easier to manage the fibre diameter profile than to try to simultaneously manage the fibre properties used in the TEAM equation. By predicting hauteur straight from the fibre diameter profile, the wool producer has a good estimate of the hauteur of the bales before they leave the farm. What's more, it is now possible to prepare lines of wool for a given hauteur specification by bulking fleeces together with a narrow range in estimated hauteur. In the future, this will be useful in engineering processing lots straight from the farm.

### How does it work?

The equation uses three terms, calculated from the fibre diameter profile, in what is called a multiple linear regression. It uses mean fibre diameter, position of minimum diameter, and a value called Model2. The Model2 term is calculated by simulating all the possible breaks in the fibre diameter profile that would occur during the carding phase of top-making. The probability of a break is determined by the diameter at each section along the fibre diameter profile. The equation was derived from the actual hauteur measurements of 287 wool tops where the raw wool fibre diameter profiles had previously been measured. The equation was then validated on a further 144 processing consignments and shown to be as accurate and precise as the TEAM equation. These details are published in a refereed scientific paper presented at the Hamilton Wool Conference (Victoria, Australia) in October 2002.

## What should the hauteur prediction be used for?

The hauteur can be estimated from an average fibre diameter profile for a flock, or from an individual staple. A similar result is obtained whether the prediction formula is applied to an average flock profile, or to individual staple profiles and the hauteur values are meaned for the flock. The prediction is primarily designed to help wool producers manage the hauteur of their sale-lots by manipulating the fibre diameter profile. The prediction has not been designed to be a sheep selection or breeding tool, since the prediction has not been tested on the processing results of single fleeces. However, future work may show that the prediction can be used as a reliable estimate of hauteur for single fleeces.

**For further information contact: Andrew Peterson (08) 9368 3662.**



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