The influence of fibre strength on staple strength and wool processing performance is not well understood despite the importance of staple strength in determining wool price. Fibre diameter and intrinsic fibre strength are thought to be the prime determinants of fibre and staple strength (Hunter et al. 1983). In order to measure these fibre properties, the Single Fibre Analyser (SIFAN) was manufactured by BSC Electronics (Western Australia) to measure the diameter profile along single wool fibres prior to extending the fibre to break.

Diameter profiles of single fibres were validated against the conventional technique of measuring mean fibre diameter (MFD) from 2 mm snippets, guillotined consecutively along a staple (Hansford et al. 1985). Using 1 staple from the mid-side of a fleece, 2 mm snippet diameter profiles of 40 sheep were measured using the Optical Fibre Diameter Analyser (OFDA). From the same mid-side of each sheep, 30 fibres were carefully removed from 3 staples (10 fibres/staple) and mounted on the SIFAN under 7 mN of tension to remove fibre crimp. The SIFAN measured diameter every 40 μm along a fibre. The MFD of the 30 fibres measured by the SIFAN was compared with those calculated from 2 mm snippets.

There was good agreement between OFDA and SIFAN estimates of MFD from each sheep (SIFAN \(= 0.83 (±0.07) + 3.11 (±1.33) \) OFDA, \( r^2 = 0.77 \)). The mean difference and 95% confidence limits between OFDA and SIFAN estimates of MFD were \(-0.11 \mu m \) and \(±1.60 \mu m \). The results confirm the ability of the SIFAN to accurately measure the diameter of single fibres and therefore determine the relationship between changes in diameter along fibres and staple strength.

**Figure 1. Relationship between the difference in OFDA and SIFAN derived estimates of staple MFD, and the mean of the 2 estimates for 40 sheep**
