

## **PRODUCING WOOL TO BUDGET USING THE 'MEASURE AS YOU GROW' APPROACH - WOOLPRODUCER EXPERIENCE**

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### **SUMMARY**

In 2000, seven woolproducers farming in the Kojonup region of Western Australia ran trials to begin to explore a 'Measure as you Grow' approach for managing wool production. The woolproducers in this project nominated the target fibre diameter, staple length and staple strength that they wanted the flock to achieve at shearing in 12 months. For each flock, a single staple was cut from a random sample of 20 sheep every month. The average fibre diameter of pooled 2 mm snippets cut from the base of each staple was plotted against average staple length to build a picture of the monthly variation in fibre diameter; a running picture of the fibre diameter profile along staples. Using this approach the woolgrowers can detect real movements in fibre diameter of about 1 micron (least significant difference in fibre diameter between months is 0.8 microns at 95% confidence level). Estimates of pasture feed on offer (FOO, kg DM/ha) and pasture growth rate (PGR, kg DM/day) were used to estimate the average feed intake of flocks each month. As the season progressed and both FOO and PGR increased a range of methods were used to increase grazing pressure to manage feed intake and fibre diameter change. At shearing, the average wool characteristics of 25 g midside samples and greasy fleece weights from a random sample of 50 sheep from each flock were used to estimate the production. The method used to restrict feed intake of flocks over winter and spring varied from strip grazing through managing stocking rate to maintain a constant amount of FOO to running large flocks in a tight rotation. In all cases the managed flocks produced more wool per ha that was of lower FD and higher staple strength than controls or previous experience with the same class of sheep. This paper presents 3 of the 7 case studies that demonstrate the wide range of management strategies used.

*Keywords:* wool, sheep, management, staple length, fibre diameter, fibre diameter profile

### **INTRODUCTION**

The average variation in fibre diameter (FD) from minimum to maximum along the FD profile of staples drawn from 370 sale lots, shorn between September 1997 and September 1998 and sold at auction in Fremantle, was 6.1 microns (C.M. Oldham pers. comm.). This is in general agreement with many published FD profiles from experimental flocks run at pasture in WA (Stewart *et al.* 1961; Purser 1980; Thompson *et al.* 1997; Peterson *et al.* 2000). Peterson *et al.* (2000) reported that staple strength (SS) of young Merino sheep was significantly increased by restricting feed intake on green feed after the break of season compared to sheep grazed at the district average stocking rate. Restricting feed intake after the break of season increased the SS because it reduced the rapid increase in FD associated with the onset of the new season green pasture; i.e. it 'flattened' the annual FD profile. Thus, restricting intake in winter/spring also resulted in a reduced mean FD and the strategy proved economical since both the quality (FD and SS) and quantity (kg/winter grazed ha) of wool grown was improved simultaneously. However, it was not clear whether commercial woolproducers could reproduce these results routinely to a predetermined budget (fibre diameter, staple length and staple strength) and whether it would be more profitable than their current grazing strategy. In May 2000, seven woolproducers farming in the Kojonup region of Western Australia ran trials to begin to explore these questions using a 'measure as you grow' approach for monitoring wool production (Oldham *et al.* 2002). This paper presents 3 of the 7 case studies.

### **MATERIALS AND METHODS**

The woolproducers in this project nominated the target FD, staple length (SL) and SS that they wanted the flock to achieve at shearing in 12 months. For each flock, a single staple was cut from a random sample of 20 sheep every month. The staples were posted to Australian Fibre Testing in York, WA. The average fibre diameter of pooled 2 mm snippets cut from the base of each staple was plotted against average SL to build a picture of the monthly variation in FD; a running picture of the FD

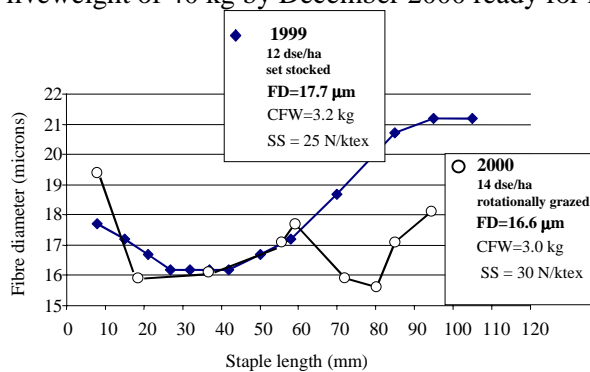
profile along staples. Updated graphs of the FD profile were faxed to the woolproducers within 36 hr of the laboratory receiving the greasy staples. Using this approach the woolgrowers can detect real movements in fibre diameter of about 1 micron (least significant difference in fibre diameter between months is 0.8 microns at 95% confidence level; Oldham *et al.* 2002).

The woolproducers recorded flock numbers and paddock movements. They also recorded visual estimates of pasture feed on offer (FOO kg DM/ha) each week if the flock remained in the same paddock for an extended period or at the start and finish of grazing if they moved the flock. Woolproducers undertook to base their assessments of FOO on a minimum of 30 recorded observations that reflected the full variation across paddocks. Pasture growth rate (PGR kg DM/day) was measured using 10 pasture cages (50 cm x 50 cm) read for FOO and shifted monthly during winter and spring in a typical grazed pasture but not necessarily the paddock being grazed by the trial flock. The pasture cages were read each month by a trained technician. The woolproducer and the technician scored and cut 10 quadrants (0.1 m<sup>2</sup>) each month, covering the full range of FOO observed on the same day that the pasture cages were read, in order to calibrate their estimates of FOO for seasonal changes in the moisture content and appearance of the pastures. Knowledge of the change in FOO during grazing, PGR, and stocking rate was used to estimate the average feed intake of pasture by flocks each month (g DM/hd/d). As the season progressed and both FOO and PGR increased a range of methods were used to increase grazing pressure to manage feed intake and FD change. At shearing, the average wool characteristics of 25 g midside samples and greasy fleece weights from a random sample of 50 sheep from each flock were used to estimate the production of the flock for the year. The average price at auction for merino fleece wool over the last 5 years, or the actual price received, has been used to calculate the return.

## RESULTS

### Case studies

**Roger and Marie Bilney.** The Bilneys have a fine wool flock they have been breeding for 5 years, using artificial insemination and performance tested sires. In 2000, they decided to try to further improve wool income by monitoring FD of 1999-drop ewe weaners every month and restricting feed intake to avoid FD blowout over spring. The objective was to increase SS and reduce FD in fine wool 15 month-old ewes compared to the performance of the same age group in 1999 (25 N/ktex and 17.7 µm respectively for SS and FD when shorn in mid November 1999). In addition, they set a target liveweight of 40 kg by December 2000 ready for mating in February 2001.



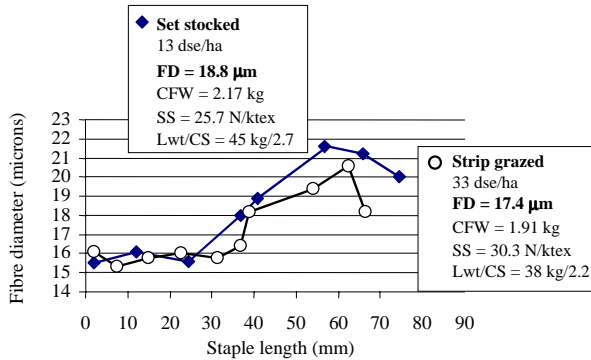
**Figure 1. Changes in FD along the staples of Bilney's fine wool hoggets in 2000 compared with a hypothetical FD profile that matches the actual mean FD achieved by similar sheep in 1999 and follows well-established seasonal changes in wool growth under pasture conditions in WA**

The flock was fed in a feedlot over the break-of-season and then rotated through a series of small paddocks with extra sheep added to further restrict intake depending on the monthly change in FD. On 7 June, 1300 young sheep were added to the initial core flock of 263 fine wools and the new flock was grazed around a group of 5 small paddocks (12 to 30 ha) at stocking rates from 108 to 43 sheep per ha. The flock was moved each 3 to 9 days depending on FOO. Adjusted estimates of FOO at the start of grazing ranged from 300 to 600 kg DM/ha and FOO at the end ranged from 100 to 300 kg DM/ha. Knowing the FD profile as the season progressed also provided useful information of the wool characteristics prior to sale.

The flock reached the target liveweight in December. FD of the fine wool ewe hoggets was reduced from 17.7 µm in 1999 to 16.6 µm in 2000, and although the clean fleece weight decreased by 200 g/hd, the overall fleece value increased by \$16.30 per head (see Figure 1). Increasing stocking rate from 12 to 14 dse/winter grazed ha allowed for 16% extra hectares to be available over spring to be utilised in some other way. Since the season was so poor in 2000, there was no extra area made available, but in a normal year with higher feed available the benefits of restricting sheep would be \$195/ha plus any extra income earned from surplus land. Roger Bilney believes "Stocking sheep heavily over smaller areas increases the area of land available for other uses; e.g. to cut silage, plant

more lucerne or summer crops such as sorghum. The key to maximising profit is to do something productive with the extra hectares that become available". In future the Bilneys may need to sacrifice further reductions in micron to increase SS, since they aim to have hogget wool at 40N/ktex. They believe that there is a need to increase the minimum FD, by supplying more feed in the autumn. The trial is continuing in 2001 with 2000-drop fine wool ewes and 1999-drop adult wethers.

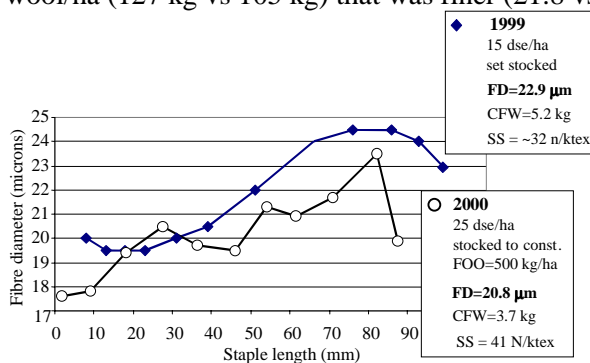
**Roger and Annabelle House.** The Houses have been using strip grazing (stocking rates of 350 to 650 for 1 to 3 days controlled by a movable electric fence) of adult wethers for 9 years to increase wool production per ha and pasture utilisation. In 2000, they decided to try their system with young ewes with the objective of reducing the FD by at least 1 µm, a reduction similar to that previously achieved with adult wethers. They also aimed to increase SS, have the ewes at 45 kg liveweight for joining in February and double the kg clean wool/winter grazed ha.



**Figure 2. FD profile showing average micron at monthly intervals for both strip grazed and set stocked ewe weaners, shorn as lambs in April 2000 and again in February 2001**

Strip grazing decreased the average FD of ewe weaners from 18.8 to 17.4 µm and increased SS by 4.6 N/ktex (see Figure 2.). Although the clean fleece weight was reduced by 260 g/hd through restricting feed intake, the overall fleece value increased by \$8.93/hd. This extra income/hd was achieved at an average stocking rate for the winter/spring period of 33 sheep/ha, versus the set stocked paddock with 13 sheep/ha. At mating strip grazed ewes weaners were 38 kg compared to set stocked at 45 kg. The ewes were scanned for pregnancy in May to measure differences in conception or litter size. While there was no difference between the flocks, there were very few twins and overall conception rate was low at 65% and 69% for the strip grazed and set stocked flocks respectively.

**Derek and Ali Ladyman.** The Ladymans run a 1309 ha property with 27% crop and a Merino flock that is 25% adult wethers (on a dse basis). In 1999, they ran an evaluation that concluded that it was more profitable (+\$112/ha profit) to run adult wethers (97 drop) set stocked at 20 dse/ha from the break-of-season rather than their normal 15 dse/h. The flock at 20 dse/ha produced more greasy wool/ha (127 kg vs 105 kg) that was finer (21.8 vs 22.9 µm) and stronger (34 vs 32 N/ktex).



**Figure 3. Changes in FD along the staples of Ladyman's wethers 2000 compared with a hypothetical FD profile that matches the actual mean FD achieved by the same sheep in 1999 and follows well-established seasonal changes in wool growth under pasture conditions in WA**

In 2000, their objective was to reduce the FD of the same flock of wethers by a further micron while maintaining SS at 35 N/ktex. They planned to achieve this objective by leaving the paddock unstocked at the break-of-season until it reached a FOO = 700 kg DM/ha and then vary the stocking rate to maintain FOO at 700 in front of a core group of 400 tagged wethers. After seeing FD increase in May extra sheep were added and FOO was maintained at approximately 500 kgDM/ha (see Figure 3.). In August and September pasture growth rates were high and even though the stocking rate had been increased to 55 dse/ha, the FD reached 23.5 µm in November. Thereafter, FD profile shows a rapid decline in micron from pasture senescence in early November to shearing in late January (3 µm drop).

The Ladymans were extremely pleased with the trial results, since they reduced micron by 1.2  $\mu\text{m}$  (to 20.6  $\mu\text{m}$ ) and maintained a high SS of 41 N/ktex. In 1999, the Ladymans achieved an extra \$112 gross fleece wool income/ha by running an extra 5 wethers set stocked (15 vs 20 dse/ha). The winter of 2000 was exceptionally dry, however, grazing to a constant FOO of around 500 kg DM/ha increased the average stocking rate of the same paddock still further to 25 dse/winter grazed ha, producing a further increase in fleece wool income of \$288/ha. Even with a reduction in fleece weight/hd of 1kg compared to 20 dse, the overall increase in income per head was \$2.63/hd for the core wethers in 2000.

## **DISCUSSION**

In the wool market prevailing in 2000, all of the cooperating woolproducers attempted to manage a reduction in FD and an increase clean wool production/ha while at least maintaining the SS in their experimental flocks. The tactics employed to manage feed supply at the break-of-season and through the following winter/spring were varied as demonstrated by the range in the 3 case studies presented in this paper. However, irrespective of the tactic, all successfully met their objectives relative to their expectation gained from shearing results in past years or a control flock managed conventionally. Similarly, they all reported that the regular monitoring of the change in FD; the use of the 'measure as you grow' approach was easily accomplished and had helped them make timely decisions with respect to feed supply, grazing management and marketing. In stark contrast, the woolproducers found their estimation of FOO in paddocks to be very time consuming, frustrating and relatively inaccurate.

The ability of woolproducers to repeat their performance of 2000 in future years, in which the timing of the break-of-season and subsequent rainfall will produce widely differing amounts and patterns of pasture growth, is not clear. In this series of trials an attempt was made to link all sites and grazing systems across farms by using a trained technician to collect estimates of PGR and calibrate the FOO estimates of the woolproducers, monthly. Knowledge of the change in FOO during grazing, PGR, and stocking rate was used to estimate the average feed intake of pasture by flocks each month (g DM/hd/d). It was hoped that this dataset would improve on and/or confirm the strong relationship reported in the literature between FOO and the FD of wool grown by grazing sheep in spring (Thompson *et al.* 1997).

Estimates of monthly intake of green DM by flocks varied from as low as 350 to >3000 g green DM/hd/d and was poorly correlated with monthly changes in FD. This was in part due to participants not strictly adhering to the protocol for measuring FOO, their variable accuracy in estimating FOO between months and the fact that estimates of PGR were not routinely made in the paddocks being grazed by the experimental flocks. However, without a more accurate and cost-effective method of budgeting feed supply and quality the full potential of the 'measure as you grow' approach will not be realised by woolproducers. With this in mind the 53 woolproducers currently involved in the Precision Wool Production project are also part of a joint project between the Wool Program and CSIRO Livestock Industries that aims to deliver accurate and timely estimates of FOO and PGR for their individual paddocks derived from satellite images and delivered via the Internet (Henry *et al.* 2002).

## **ACKNOWLEDGEMENTS**

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## **REFERENCES**

- HENRY, D., EDIRISINGHA, A., DONALD, G. and HILL, M. (2002). *Proc. Aust. Soc. Anim. Prod.* **24**, (these proceedings).
- OLDHAM, C. M., GHERARDI, S.G., PANANONI, B. R. and YELLAND, M. (2002). *Proc. Aust. Soc. Anim. Prod.* **24**, (these proceedings).
- PETERSON, A. D., GHERARDI, S.G. and ELLIS, M. R. (2000). *Asian-Aust. J. Anim. Sci.* **23** Vol **A**, 469-72.
- PURSER, D. B. (1980). In 'Grazing Animals' (Ed F.H.W. Morley) pp. 159-79. (Elsevier: Amsterdam).
- STEWART, A.M., MOIR, R.J. and SCHINCKEL, P.G. (1961). *Aust. J. Agric. Anim. Husb.* **1**, 86-91.
- THOMPSON, A.N., HYDER, M.W. and DOYLE, P.T. (1997). *Aust. J. Exp. Agric.* **37**, 727-36.