# THE EFFECT OF FEED ON OFFER DURING SPRING ON LIVEWEIGHT CHANGE IN BROAD AND FINE WOOL MERINO WETHERS

*M. W. HYDER*[A], *A.N. THOMPSON*[B], *P.T. DOYLE*[C] *and K. TANAKA*[A]

[A] Sheep Industries Branch, Dept of Agriculture, Albany, W.A. 6330
[B] Dept of Animal Science, Waite Agricultural Institute, Glen Osmond, S.A. 5064
[C] Dept of Agriculture, Institute of Sustainable Irrigated Agriculture, Kyabram, Vic. 3620

## SUMMARY

One year old broad (Bungaree, mean fibre diameter ± se: 25.4 ± 0.12 μm) or fine (Peppin, 20.7 ± 0.09 μm) wool Merino wethers grazed annual pastures maintained at different amounts of feed on offer (FOO) (800, 1100, 1400, 2000, 2800 kg DM/ha) or set-stocked at the district average (8 sheep/ha) in spring 1992 and 1993. No difference in liveweight change between genotypes occurred and, within genotypes, differences in liveweight (LW, including wool) were small for animals grazing ≥ 2000 kg DM/ha. However, FOO alone did not consistently account for changes in sheep LW. Broad wool animals produced more ($P<0.05$) wool than fine wool animals, and less wool ($P<0.05$) was produced on 800 kg DM/ha compared to other treatments for both broad (1992: 6.31 vs 6.92 kg; 1993: 6.49 vs 7.14 kg) and fine (1992: 5.03 vs 5.67; 1993: 5.28 vs 6.09 kg) wool sheep.
*Keywords:* feed on offer, sheep, genotype

## INTRODUCTION

In Mediterranean environments, rapid spring pasture growth and conservative set-stocked grazing regimes often lead to amounts of feed on offer (FOO) that are non-limiting for liveweight (LW) gain and wool growth (Purser 1981).

There is limited data on the relationships between FOO as annual based pastures and production of different classes and genotypes of sheep. Hyder *et al.* (1994) and A. N. Thompson (unpub. data) maintained FOO at predetermined amounts during spring by adjusting sheep numbers to account for changes in pasture growth rates, and examined the effect on LW change of different age wethers. The effects of FOO on LW change varied between weaner and adult sheep, while within each age group, greasy wool production (TGW) did not differ when FOO was ≥ 2000 kg dry matter (DM)/ha.

Variations in wool growth rate between genotypes appear to be due largely to variations in the efficiency of conversion of feed into wool rather than to variations in intake of feed (Saville and Robards 1972). The 2 experiments tested the hypothesis that there would be differences in LW change between broad and fine genotypes in response to declining FOO.

## MATERIALS AND METHODS

The experiments were conducted during spring in 1992 (year 1: from 5 August for 106 days) and 1993 (year 2: 22 July for 126 days) on the Manurup Annexe of Mount Barker Research Station (34°38'S, 117°32'E). The features of the climate have been described by Thompson *et al.* (1994). The annual pastures comprised about 50% and 58% subterranean clover and 45% and 38% annual grasses prior to year 1 and 2, respectively. The pasture was topdressed with 90 kg/ha of superphosphate in autumn of both years. Pasture pests were not controlled.

Treatments included adjusting sheep (hogget) numbers to achieve target FOOs of 800, 1100, 1400, 2000 and 2800 kg DM/ha through spring or set-stocking at the district average stocking rate (8 sheep/ha). The 6 grazing and 2 genotype treatments were randomly allocated in 2 blocks, with 1 genotype replicate per block, giving 24 individually grazed plots. Treatments in each plot were the same in both years.

Prior to the commencement of each experiment, plots were set-stocked at 8 hoggets/ha but extra hoggets were added to the 800, 1100 and 1400 kg DM/ha treatments to condition the plots to between 1500 and 2000 kg DM/ha. These extra animals were also used during the experiment to adjust sheep numbers in each plot to achieve the target FOO. Adjustments were based on weekly FOO measurements and anticipated pasture growth rates for the following week. FOO for each plot was assessed weekly using a calibrated visual appraisal technique (Thompson *et al.* 1994). Treatments ceased when low FOO treatments could not be maintained when stocked at 8 sheep/ha.

Experimental broad wool (year 1: n=96, liveweight (LW, mean ± se) 38.8 kg ± 0.33, mean fibre diameter (FD) 25.4 ± 0.12 pm; year 2: n=96, LW 32.7 kg ± 0.23, FD 22.1 ± 0.10 μm) and fine wool (year 1: n=96, LW 30.8 kg ± 0.27, FD 20.7 ± 0.10 pm; year 2: n=96, LW 30.4 ± 0.27, FD 19.8 ± 0.12 μm) wethers were stratified on a LW and FD basis and randomly allocated to treatments (8 sheep/plot). These sheep grazed together prior to, and at the conclusion of, each experiment.

The experimental sheep were weighed fortnightly during the experiment, weather permitting. In year 1, liveweight change (LWC, g/h/d) for period 1 (days -14 to 37) and period 3 (days 98 to 117) were calculated from difference between 2 weighings, while for period 2 (days 37 to 98) they were estimated by linear regression using 5 weights. In year 2, LWC for periods 1 (days -3 to 50), 2 (days 50 to 8 1) and 3 (days 81 to 126) were estimated using linear regression. Total greasy wool (TGW) grown between shearings (year 1: 342 days; year 2: 362 days) was measured for individual animals.

Analysis of variance of a block design, with main effects of FOO and sheep genotype, was used to examine the effect of grazing treatment on LW, LWC and TGW. Univariate repeated measures analysis was used to include the effects of time on LW.

## RESULTS

The average FOO for the 6 treatments was 790, 1070, 1360, 2000, 2490 and 4490 kg DM/ha in year 1, and 1020, 1190, 1400, 1870, 2530 and 4080 kg DM/ha in year 2. The average FOO for each of the 3 LW change periods is presented in Table 1. For the 800 kg DM/ha target FOO, the measured value was significantly lower ($P<0.05$) in period 2 of year 1 compared to year 2. In the set-stocked treatment, average FOO was higher ($P<0.05$) in periods 2 and 3 of year 1, but lower ($P<0.05$) in period 1, compared to the corresponding periods in year 2. Differences between years for other treatments were not significant. For both years, a target FOO of around 2800 kg DM/ha was not achieved until period 2.

**Table 1. Average feed on offer (FOO) (± SEM) for 3 liveweight change (LWC) periods in year 1 and year 2**

| Target FOO (kg DM/ha) | FOO (kg DM/ha) | | | | | |
|---|---|---|---|---|---|---|
| | Year 1 | | | Year 2 | | |
| | Period 1 | Period 2 | Period 3 | Period 1 | Period 2 | Period 3 |
| 800 | 1070 (59) | 620 (81) | 630 (44) | 1240 (73) | 1050 (38) | 760 (46) |
| 1100 | 1250 (22) | 950 (83) | 1090 (130) | 1350 (34) | 1250 (45) | 980 (36) |
| 1400 | 1500 (13) | 1270 (95) | 1240 (35) | 1490 (43) | 1510 (45) | 1240 (43) |
| 2000 | 1790 (45) | 2130 (109) | 2020 (178) | 1840 (66) | 2070 (50) | 1810 (20) |
| 2800 | 2100 (141) | 2660 (284) | 3080 (99) | 2290 (71) | 2640 (95) | 2730 (103) |
| Set stocked | 2250 (128) | 5430 (404) | 9420 (395) | 2860 (166) | 3640 (257) | 5610 (165) |
| SED (P=0.05) | 118.4 | 206.9 | 219.2 | 123.8 | 157.0 | 123.7 |

In year 1, LW of both genotypes increased significantly ($P<0.05$) for all but the 800 kg DM/ha treatment during period 1 (Figure 1). During period 2, significant ($P<0.05$) increases in LW occurred for both genotypes grazing all treatments. In period 3, LW of both genotypes decreased ($P<0.05$) for set-stocked animals.

In year 2, LW increased significantly ($P<0.05$) for both genotypes grazing all treatments during period 1. LW plateaued in period 2 for 800 to 1400 kg DM/ha treatments, but increased ($P<0.05$) for other treatments. In period 3, LW of broad wool sheep grazing all treatments decreased ($P<0.05$), but decreased only ($P<0.05$) on 800 and 1100 kg DM/ha treatments for fine wool sheep. There were no significant LW differences between broad wool animals grazing treatments ≥ 2000 kg DM/ha in either year, or fine wool sheep grazing treatments ≥ 2000 kg DM/ha in year 2.

There were no significant differences in LWC between genotypes in either year so the data has been pooled (Table 2). FOO (kg DM/ha) significantly affected LWC (g/h.day) in period 1 (equation 1) and 3 (equation 2) in year 1, and period 1 (equation 3) and 2 (equation 4) in year 2.

Equation 1: $LWC = -294.2 + 0.37\ FOO - 6.98 \times 10^{-5}\ FOO^2$ ($n=24$, $r=0.86$, $P<0.001$, $RSD = 37.1$)

Equation 2: $LWC = 66.1 - 0.06\ FOO + 3.79 \times 10^{-6}\ FOO^2$ ($n=24$, $r=0.60$, $P<0.01$, $RSD = 83.6$)

Equation 3: $LWC = -254.0 + 0.35\ FOO - 6.34 \times 10^{-5}\ FOO^2$ ($n=24$, $r=0.85$, $P<0.001$, $RSD = 36.1$)

Equation 4: $LWC = -189.0 + 0.21\ FOO - 3.10 \times 10^{-5}\ FOO^2$ ($n=24$, $r=0.87$, $P<0.001$, $RSD = 38.2$)

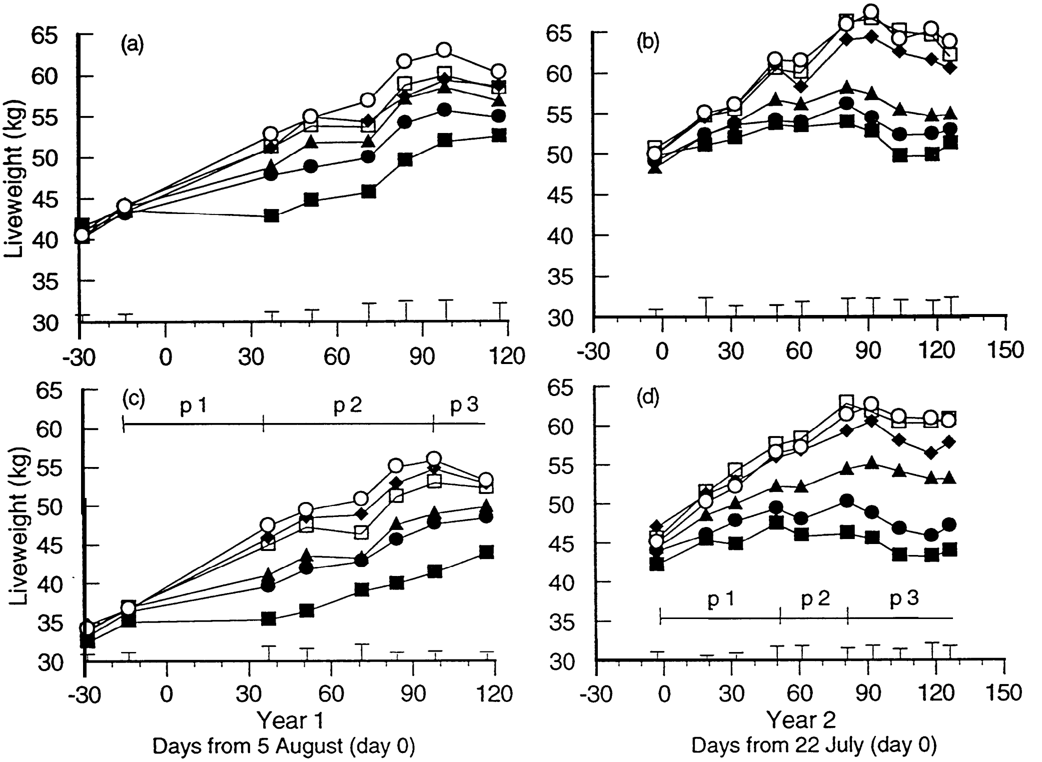


**Figure 1. Liveweights of broad (a,b) and fine (c,d) wool sheep grazing pastures maintained at different amounts of feed on offer (800 n; 1100 1; 1400 s; 2000 u; 2800 o; set-stocked 8/ha m) during spring in year 1 and year 2. Vertical lines denote SED**

**Table 2. Average liveweight change (LWC, g/day, uncorrected for wool growth) of broad and fine wool sheep grazing pastures at different amounts of feed on offer (FOO) for 3 periods in year 1 and year 2**

| Target FOO (kg DM/ha) | LWC (g/day) | | | | | |
|---|---|---|---|---|---|---|
| | Year 1 | | | Year 2 | | |
| | Period 1 | Period 2 | Period 3 | Period 1 | Period 2 | Period 3 |
| 800 | -6 | 124 | 80 | 76 | -18 | -64 |
| 1100 | 77 | 130 | -2 | 82 | 47 | -72 |
| 1400 | 90 | 140 | -21 | 129 | 59 | -55 |
| 2000 | 153 | 129 | -69 | 181 | 106 | -62 |
| 2800 | 155 | 135 | -64 | 193 | 176 | -63 |
| Set stocked | 187 | 159 | -140 | 208 | 157 | -30 |
| SED (P=0.05) | 14.8 | 20.0 | 57.5 | 43.3 | 20.8 | 29.3 |

In year 1, LW loss on the 800 kg DM/ha treatment during period 1 and LW gain for animals grazing the 800, 1100 and 1400 kg DM/ha treatments during period 2 was greater ($P<0.01$) than for the corresponding periods in year 2. The FOO level x genotype interaction was not significant and there were no significant block effects.

In both years, broad wool sheep produced more ($P<0.05$) TGW than fine wools, and the 800 kg DM/ha treatment reduced ($P<0.05$) TGW for both genotypes compared to treatments ≥ 2000 kg DM/ha (Table 3). There was no significant genotype x FOO interaction.

**Table 3. Total greasy wool production (kg) for broad and fine wool sheep grazing different feed on offer (FOO) amounts through spring**

| Year | | Target FOO (kg DM/ha) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 800 | 1100 | 1400 | 2000 | 2800 | Set-stocked | SED. |
| 1 | Broad | 6.31 | 6.67 | 6.74 | 7.21 | 6.97 | 7.03 | 0.196 |
| | Fine | 5.67 | 6.07 | 6.14 | 6.47 | 6.32 | 6.47 | 0.260 |
| 2 | Broad | 6.49 | 6.70 | 7.16 | 7.08 | 7.55 | 7.22 | 0.269 |
| | Fine | 5.28 | 5.77 | 5.87 | 6.14 | 6.39 | 6.31 | 0.277 |

## DISCUSSION

There was no difference in LWC between the broad and fine wool sheep. Murray *et al.* (1994a) pen-fed sheep from the same sources and found no difference in LWC when they were fed at 1.5% or 2.2% of liveweight or *ad libitum.* Wool production was greater for broad than fine wool sheep on any treatment (Murray *et al.* 1994b), a result which is also reflected in our study.

The average FOO for the 800 kg DM/ha treatment exceeded the target during period 1 of both years and the sheep gained or maintained weight. When sheep of similar weight were shifted abruptly to pasture at 800 kg DM/ha, they lost weight (Hyder *et al.* 1994). It would seem that gradual adaptation to low FOO can alleviate such effects, although other factors such as pasture growth rate and plant density may contribute to effects on LW change. During period 1 of both studies, FOO accounted for the majority of the variation in LWC.

The reasons why significant effects of FOO on LWC occurred in period 2 of year 2, but not in year 1, need to be identified. Pasture conditions may have differed between the 2 periods. In the earlier experiments (Hyder *et al.* 1994; A.N. Thompson unpub. data), pasture conditions could not account for the change in LW of animals grazing low FOO treatments.

For both years, the changes in LW during period 3 were complicated by changes in pasture quality. In 1992, late rains in November permitted continued pasture growth into December on the lower FOO plots, whereas the set-stocked plots stopped growing in early November. In contrast, a dry spell during October and early-November 1993 had a negative effect on pasture quality, which may account for the significant decreases in LW at this time.

It is clear from these results that FOO alone cannot account for changes in LW. However, that the final LW and TGW of either genotype differed little for animals grazing 2000 to 4500 kg DM/ha indicates considerable scope for improved pasture utilisation and higher production per hectare. Effects of FOO on clean wool growth rates and wool characteristics are being assessed.

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