Turning pastures into profit: optimising pasture utilisation and stocking rates

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Abstract

Guidelines generated by the Lifetime Wool Project for the management of pregnant and lactating ewes will be used in closed-system 'farmlets' located on two adjacent paddocks at the Mt Barker Research Station, WA, to increase pasture utilisation and stocking rate. The guidelines provide key condition score (CS) and feed on offer (FOO) targets during pregnancy and lactation, and have the potential to maximise pasture utilisation and stocking rate for a given season. The farmlets (each approx 20 ha in area) are fenced into small paddocks: Farmlet 1 contains annual pastures and perennial pastures [kikuyu, lucerne and tall fescue] grown separately and in mixtures. Farmlet 2 contains only annual-based species [subterranean clover, annual grasses, capeweed]. The aim of the demonstration is to compare, over 5-7 years, the production, profitability and sustainability of the two systems managed to optimise pasture utilisation using a combination of grazing management and agronomic tactics. It is predicted this combination will allow stocking rates to approach the theoretical potential for the Plantagenet Shire (20-25 DSE/ha). Management decisions will be made by concensus between a producer advisory group and research, technical and extension personnel. Standard pasture (kg DM/ha) and animal (kg meat-wool/ha) production data will be collected, and all inputs, including labour, recorded for both systems for an economic analysis. 2005 was designated a pilot year to establish the infrastructure for each farmlet and refine measurement techniques. Despite establishing 51% of the area to perennial pastures in 2005, Farmlet 1 has managed to carry a similar stocking rate to Farmlet 2 (12.5 DSE/ha).

Key Words

Lifetime wool, condition score, pasture utilisation, perennial grasses, lucerne, subterranean clover

Introduction

Pasture utilisation under continuously set stocked regimes is generally low (<40%), especially where stocking rates (SR) are conservative and determined by poor seasons (Allden, 1980). Methods for calculating the potential SR, using rainfall (French 1991) or estimates of yearly feed intake (Grimm 1998), suggest the potential is 2-3 times the district average SR. Results from the Lifetime Wool Project suggest the potential SR could be even higher if ewes are managed to achieve target condition score (CS) during the reproductive cycle (Hyder 2006). This involves using feed budgeting principles to attain boundary feed on offer (FOO) levels which supply a daily intake to achieve the desired animal production response (Curnow 2006). At these FOO boundaries, pasture utilisation during the growing phase will be significantly increased compared to that under set-stocking (Hyder 2004).

A grazing systems demonstration comparing lamb production from annual *vs*. annual+perennial pastures has been established at the Mount Barker Research Station in Western Australia ($34^0$38'S, $117^0$32'E). Central to the demonstration is the concept of the breeding ewe representing the 'engine room' of each system, so managing ewes to defined nutritional targets underpins all management decisions. The demonstration comprises two adjacent paddocks fenced internally to represent mini farms or "farmlets". One farmlet contains annual pastures and perennial pastures: kikuyu (*Pennisetum clandestinum)*, lucerne (*Medicago sativa*) and tall fescue (*Festuca arundinacea*) grown separately and in mixtures. The other farmlet contains only annual species (subterranean clover (*Trifolium subterraneum* L.), annual grasses (*Lolium rigidum* Gaudin, *Hordeum leporinum* Link, *Bromus spp*., *Poa annua* L), and capeweed (*Arctotheca calendula* L. (Levyns)). Each farmlet is treated as a closed system, and all inputs (including labour) and outputs are recorded. Management decisions are made by consensus between a producer advisory group and research, technical and extension personnel. Two agricultural high school graduates

assigned as trainees to the demonstration for a 12 month period will learn valuable research skills at the pasture/animal production interface.

The aim of the demonstration is to simulate the purchase of a conservatively stocked property in the Mt Barker district and compare, over 5-7 years, the increase in production, profitability and sustainability of two pasture systems (annual+perennials *vs*. annual) managed to optimise pasture utilisation and SR using a combination of grazing management and agronomic tactics. The tactics employed should permit stocking rates to increase from the average district SR (9 DSE/ha) to the theoretical potential for the Plantagenet Shire (20 DSE/ha).

Methods

The layout of each farmlet is shown in figure 1. 2005 was designated a 'pilot study' year where the infrastructure [e.g. fences, water troughs] was established in each farmlet, new (perennial) pastures sown, and methodologies for animals/pasture measurement developed. In Farmlet 1, 12.4 ha (51% of the total area) was sown to perennials: lucerne [SARDI 10, 4.9 ha, sown 4 May 2005 @ 8kg/ha], kikuyu [Whittet, 4.53 ha, sown October 2005 @ 1kg/ha], tall fescue [Quantum Max P, 3.0 ha, sown 4 May 2005, 10kg/ha]. 'Purchase' of each farm (Farmlet 1: Annual+Perennials, 24.5ha; Farmlet 2: Annuals, 18.8ha) occurred when Merino ewes, which had been mated to Merino rams (14 Feb-21 Mar), fed 'off-farm' to follow a target CS profile, and scanned at day 74 to identify single and twin bearing ewes, were randomly allocated to farmlets on day 74 of pregnancy (15 May; 110 and 85 ewes, respectively). This represents a stocking rate of 9 DSE/ha for both farmlets (assuming 1.5 DSE per breeding ewe). Feedlots were constructed in each farmlet to allow for destocking if the lower limit for wind erosion risk were reached (1 t DM/ha anchored pasture or 50% groundcover). 25% of each farmlet was sown to annual crops as is district practice.

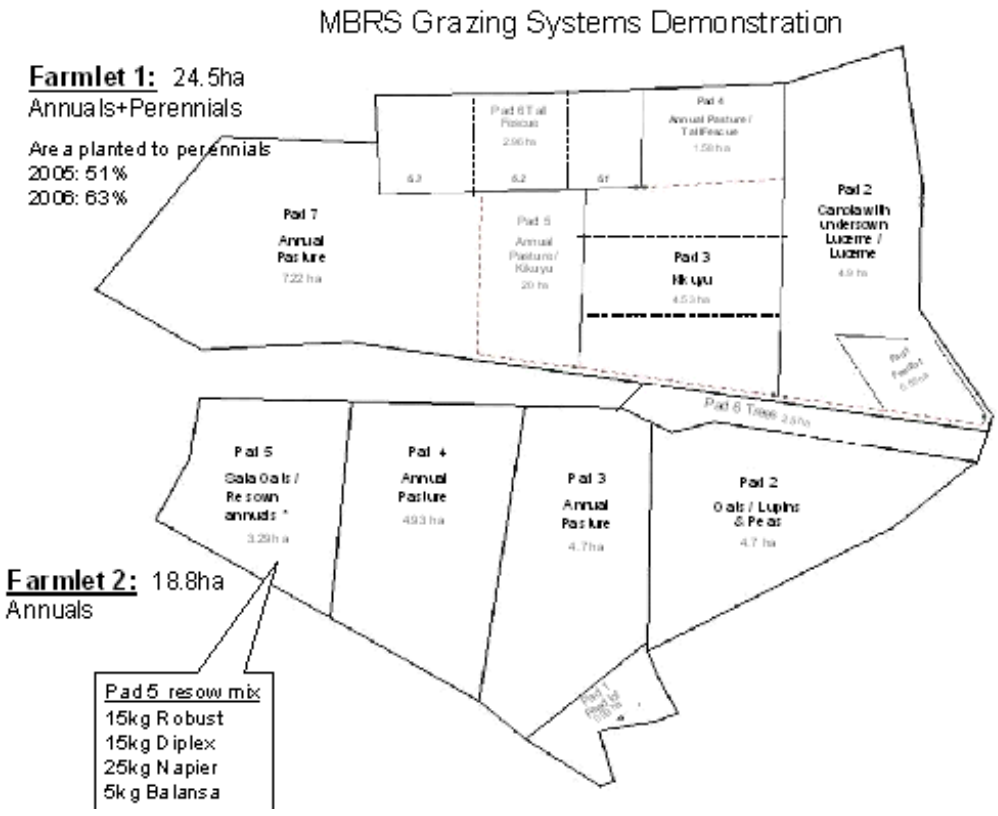

Figure 1: Layout of grazing systems farmlets at Mt Barker Research Station

Ewes were monitored for liveweight/condition score (CS) at 4-8 weekly intervals or at times when sheep were yarded for husbandry operations. Feed on offer (FOO, kg DM/ha) was assessed using a calibrated visual method at 4-6 weekly intervals during the growing season, and pasture cages used to estimate pasture growth rate (PGR, kg DM/ha/d) (Thompson *et. al* 1994). Annual dry matter production was estimated by summing the growth between short time periods of 21 to 28 days. Pasture utilisation during the growing season (PU%) was calculated by subtracting the peak spring FOO from total DM production to estimate the amount consumed, and expressing this as a proportion of the total DM produced for the season. Stocking rates were calculated using estimates of metabolisable energy intake (MEI, MJ ME/d) from short-term changes in liveweight in comparison to MEI for maintenance of a 50kg wether (Hyder 2006).

Results

2005 was an atypically wet season for the Plantagenet Shire, with the annual rainfall exceeded on only two other occasions since 1913. In summary: break of season 23 March (long-term average 15 May); annual rainfall 830mm (average 605 mm); total DM production from annual pasture 17.8 t DM/ha (average 9.2 t DM/ha); potential SR 35 dse/ha (average 21 dse/ha).

Each perennial was grazed intermittently using a strip grazing technique, and collectively, perennials contributed 37% of the total grazing days (break to break). Pasture hay was conserved from both farmlets (27 and 33 t DM for Farmlet 1 and 2, respectively). Pasture utilisation from annual pastures in Farmlet 2 was 54% under grazing only, but increased to 67% after mowing for hay.

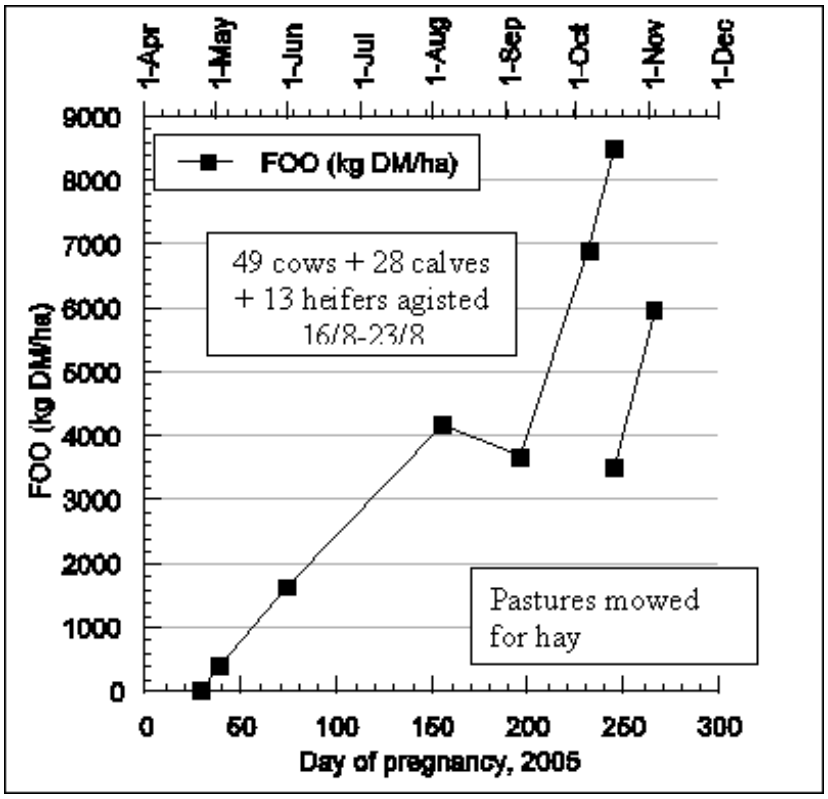

Figure 1. FOO profile for annual pastures in Farmlet 2

The FOO profile for ewes grazing Farmlet 2 is shown in Figure 1. Because 3.2 ha was sown with Saia oats and locked up, the ewes were effectively set-stocked on 9.9 ha of pasture for the majority of the growing season. Green FOO exceeded 2 t DM/ha [the amount required to provide 90% of maximum daily feed intake] from about day 85 of pregnancy. Agistment of cows, calves and heifers in mid-Aug

temporarily reduced FOO which peaked at 8.5 t DM/ha in mid-Oct. Mowing for hay production reduced FOO to 3 t DM/ha but late season soil moisture allowed FOO to double before senescence in November.

The target CS profile, and measured CS profiles for ewes from Farmlet 1 and 2, are shown in Figure 2. Ewes were mated in good condition, and despite CS declining to mid-pregnancy, were well above the target condition at day 100. CS throughout lactation was maintained above 3 as a result of green FOO exceeding 2.5 t DM/ha. CS declined for both farmlets post senescence to day 300, then increased with the commencement of supplementary feeding to reach CS~3.1 by mating in March 2006. Scanning in 2005 indicated the reproductive rate (RR) to be 1.36, with 50% ewes single-bearing (SB), 43% twin-bearing (TB) and 7% dries. Scanning in 2006 indicates the RR will exceed 1.5 for both farmlets (43% and 40% SB, and 55% and 58% TB for Farmlet 1 and 2, respectively).

There was little difference between farmlets in annual stocking rate in the establishment year: 8.3 *vs*. 8.5 Farmlet 1 and 2, respectively. Lambs were marked in early September (117% *vs*. 109% for Farmlet 1 and 2, respectively), weaned on 23 November 2005, and lot-fed using oats/lupins/hay during autumn 2006. Despite feed rates approaching 1.4 kg/h/d supplied from self feeders, growth rates of lambs was less than predicted: only 63% and 79% of marked lambs from Farmlet 1 and 2, respectively, reached target sale weight (18.8 kg dress weight) by 27 June 2006. This slow lamb growth rate and conversion efficiency partly reflects a poor genetic base. Hence, 8 Poll Dorset rams were purchased and mated to ewes in March 2006. In addition, 230 large-frame Merino ewes mated to prime sires in December were purchased with the intention to replace a proportion of the current breeding ewes. However, the number replaced will depend on the seasonal conditions for 2006.

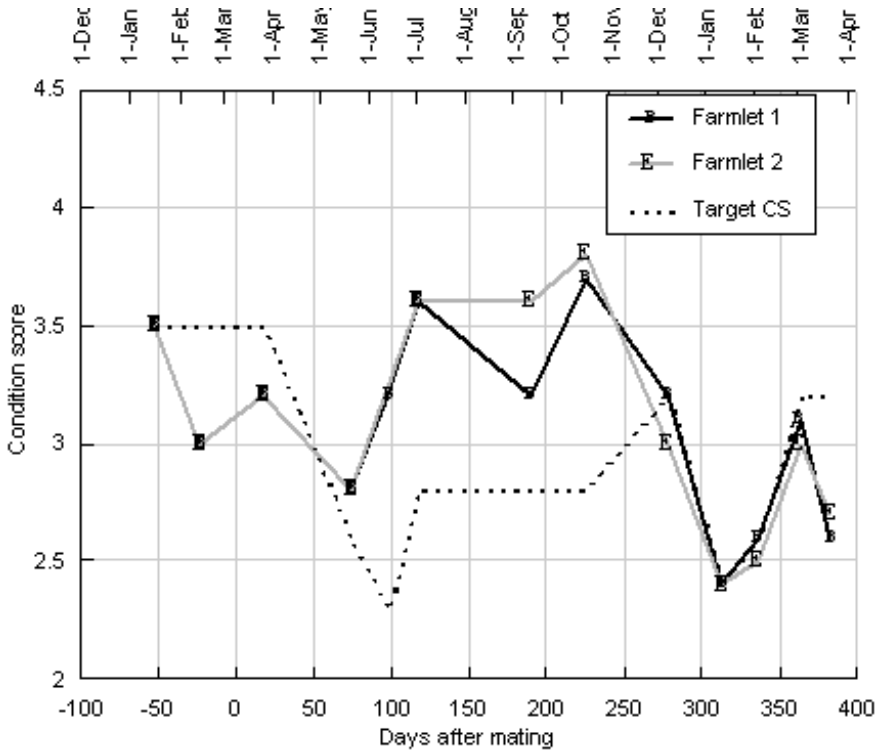

Figure 2. Target condition score profile (dashed line), and measured CS for single-bearing ewes on Farmlet 1-annual+perennial pastures (■) and Farmlet 2-annual pastures (○)

Conclusion

The farmlet comparison will provide valuable information regarding the potential SR and PU for a farm under optimal management of breeding ewes, and should give insight into the potential contribution

perennial pastures could make to the productivity of a prime lamb enterprise in the Plantagenet Shire. The delayed break to the 2006 season and predictions for a dry season will ensure a range of grazing management tactics will need to be employed to reach FOO boundary levels and attain CS targets of breeding ewes. Better breeding ewes and sires should allow lambs to reach target sale weights on pasture and avoid costly feedlotting. The purchase of a RAPPA electric fencing unit will permit better management of FOO, maximise utilisation and allow areas to be shut-up for pasture conservation.

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