Forage options for dairy cows

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Keywords: Double-crop, triple-crop, forage rotation, intercropping, dairy.

Introduction

To remain competitive internationally, the Australian dairy industry will need to increase milk production per unit of land by producing and utilising more from home-grown feed. In the context of decreasing land availability but increasing feed cost per unit of land, increasing production and utilisation of home-grown feed is crucial to increase milk production in pasture-based dairy farms (Fariña *et al*., 2011). Pure pasture-based systems can achieve a maximum of ~20 t dry matter (DM)/ha/yr, although in practice top commercial farmers hardly exceed 15-16 t DM/ha. A strategy to increase productivity of forages is to select adequate combinations of forages alone or combined (intercropped) in a forage rotation. It was hypothesised that ≥25 t DM/ha may be achieved from a double-crop wholly grazeable forage rotation. Similarly, ≥40 t DM/ha may be achieved from a forage rotation using adequate forage options and intercropping management when grown for both grazing and conservation. The aim of this study was to investigate high yielding grazeable or a combination of grazeable and conserved double-crop forage options for dairy cows.

Methods

Four field experiments were conducted in plots (5 m x 5 m) under non-limiting irrigation from 2008–2010 at Camden, NSW to investigate forage options for grazing only (FOG) and for both grazing and conservation (FOGC). The soil of the site was a combination of brown chromosols and black vertisol. In FOG, four legumes namely cowpea (*Vigna unguiculata* L. Walp cv. Caloona), fababean (*Vicia faba* L.), lablab (*Lablab purpureus* L. Sweet cv. Rongai) and soybean (*Glycine max* L. Merr. cv. Intrepid) were grown during summer followed by maize (*Zea mays* L. cv Pioneer 31H50) intercropped with either forage rape (*Brassica napus* L cv. Goliath) or Persian clover (*Trifolium resupinatum* L. Shaftal type cv. Maral), or maize only (followed by annual ryegrass; *Lolium multiflorum* Lamm.) in the autumn-winter period. Legumes were sown on 19/12/2008 and summer crops sown on 20/2/2009 after harvesting legumes. In all treatments, the maize crop received 100 kg N/ha and was harvested at 8-leaf stage (simulating grazing and to allow intercropped forages to grow). Clover did not receive any N fertiliser, but forage rape and ryegrass received 300 and 100 kg N/ha respectively, applied in equal split allocations after each harvest. Total water (rainfall and irrigation) received by legumes and summer crops were 304 and 629 mm, respectively.

In FOGC, maize was sown (9/10/2009) as a sole crop or intercropped with either soybean or lablab in summer and harvested (25/01/10) at a mature stage for silage. Each treatment received 300 kg N/ha. Immediately after harvesting, a subsequent maize crop was sown intercropped either with forage rape, ryegrass or soybean. Soybean was overshadowed by the maize and failed to grow so ryegrass was sown in this treatment. Maize was harvested at 8-leaf stage and intercropped crops were allowed to grow and harvested regularly. Maize received 140 kg N/ha, and forage rape, ryegrass and soybean treatment received 250, 155 and 180 kg N/ha, respectively. Total water received by each of the summer and autumn-winter treatments was 604 and 611 mm, respectively. In all forage options (both years), the experimental design was a Complete Block Randomised Design with 3 blocks (replicates). Data were analysed by ANOVA.

Results

In FOG, yield of cowpea (7.4 t DM/ha) in summer and maize-forage rape (17.9 t DM/ha) in autumn-winter was higher than other options, which provided 25.3 t DM/ha grazable forages in a nine-month growing cycle (Fig. 1). In FOGC, yield of maize-lablab (27.5 t DM/ha) in summer for conservation followed by maize-forage rape (18.7 t DM/ha) for grazing in autumn-winter provided 46.2 t DM/ha from double-intercrop rotation in a year (Fig. 2). This yield from double-crop was similar compared to the forage yield obtained from a triple-crop complementary forage rotation (CFR) reported by Islam and Garcia (2012). Apparent irrigation water use efficiency of grazeable (Fig. 3) and grazeable plus conserved (Fig. 4) forages were 56 and 51 kg DM/mm water, which were also similar to that reported by Islam et al. (2012) for a triple-crop CFR.

Conclusions

These results demonstrate the feasibility of achieving over 25 t DM/ha of wholly grazeable forages and over 45 t DM for both grazing (autumn-winter) and conserved forages for dairy production from a double-crop rotation of forages. Therefore, there is a potential of adequate selection of forages (alone or intercropped) to increase supply of grazeable and conserved forages as a complementary options of pasture-based dairy production systems.

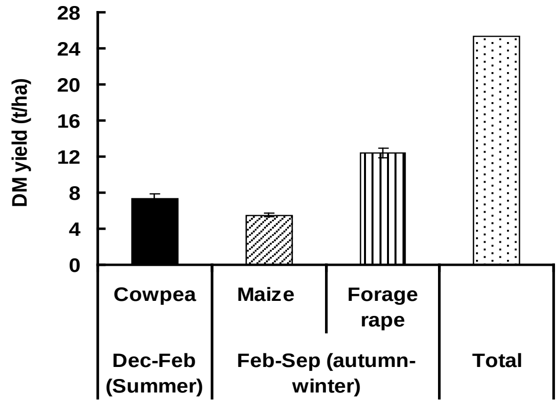

Figure 1. Forage production from forage option for grazing only (growing cowpea in summer followed by intercropping of maize-forage rape in autumn-winter yields 25.3 t DM/ha).

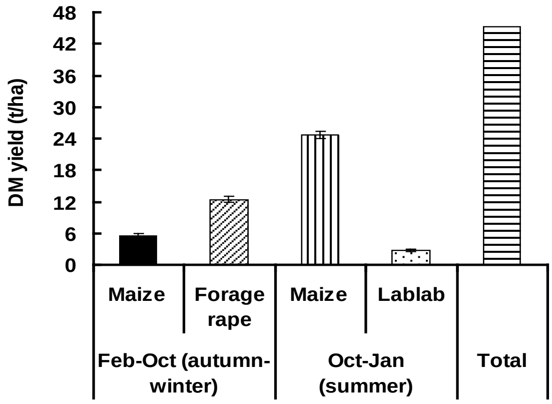

Figure 2. Forage option for grazing and conservation (intercropping of maize-forage rape in autumn followed by maize-lablab in summer yields 45.4 t DM/ha).

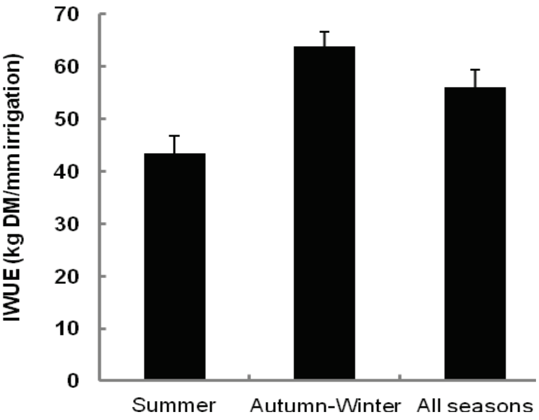

Figure 3. Irrigation water use efficiency (IWUE) of forage option for grazing only.

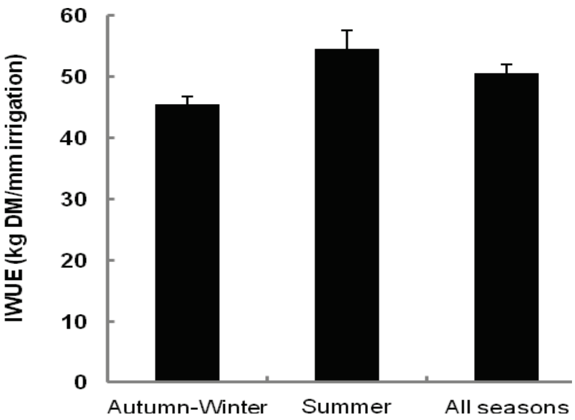

Figure 4. Irrigation water use efficiency (IWUE) of forage option for grazing and conservation.

Acknowledgements

We acknowledge funding from Dairy Australia, NSW Department of Primary Industries, The University of Sydney, and DeLaval.

References

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