Potential production of irrigated dairy forages on coastal NSW

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Introduction

The recent droughts in Australia have highlighted to the dairy industry the importance of irrigation water. Fodder production for the dairy industry is the second largest user of irrigation water in Australia. There are numerous species that can be used as a source of fodder, although basic information on seasonal and annual water use and nutrient characteristics are lacking for some forages.

Methods

A field experiment was conducted on a brown dermosol at the University of Sydney, Camden (34°3'S, 150°39'E), over three years to evaluate the dry matter yield (DMY), water use efficiency (WUE) and nutrient content, of 30 forages under optimum and two levels of deficit irrigation. A neutron probe was used to determine irrigation scheduling requirements, as well as water extraction down the soil profile. At a 30 mm soil water deficit, the optimum treatment was refilled to field capacity (100%), while the two water deficit treatments received 33% and 66%, respectively, of the water applied to the optimum treatment. Each forage was harvested at the optimum stage of growth for determination of DMY and quality. Fertiliser was applied to replace nutrients removed at each harvest, except for legumes where no nitrogen was applied. Seasonal WUE was calculated by dividing dry matter produced, by the sum of rainfall, irrigation and change in soil moisture content.

Results and Discussion

Mean annual DMY ranged from 7 to 29 t DM/ha, with maize (*Zea mays*) having the highest yield (Figure 1). The perennial grasses, tall fescue (*Festuca arundinacea*), prairie grass (*Bromus cartharticus*) and kikuyu (*Pennisetum clandestinum*) had the next highest yields at about 25 t DM/ha. While perennial ryegrass had the highest production in year 1 at 28.4 t DM/ha, by year 3 production had dropped to only 15.3 t DM/ha, mainly due to decline in perennial ryegrass plant density. In contrast, prairie grass had the most consistent yield over the 3 years, varying from 27.3 t DM/ha in year 1, to 24 t DM/ha by year 3. There were large differences in annual WUE between forages, with maize having the highest WUE at 43 kg DM/ha.mm, which was two-fold greater than perennial ryegrass at only 21 kg DM/ha.mm (Figure 1). During the summer the DMY from maize was over four times that of perennial ryegrass or white clover (*Trifolium repens*) and WUE was almost three times higher. While there was a significant decrease in annual dry matter production for most forages under deficit irrigation, WUE was not significantly affected for only lucerne (*Medicago sativa*) and sorghum (*Sorghum bicolour)* grown over the summer, as the decrease in yield was directly proportional to water used. This highlights the need to select the correct forage species when a deficit irrigation strategy is likely.

Conclusion

In the extremes of climate experienced in Australia there is no single forage that provides an abundance of feed of sufficient quality throughout the year for dairy cows and which is also WUE. Depending on rainfall, irrigation capacity and livestock requirements, a number of different forages can be used to fill the feed budget. Substantial savings in water can be achieved if the right species is selected for a particular season. However, in summer there is a tradeoff between WUE and nutritive value with C4 forages (kikuyu, maize) generally having a lower nutritive value.

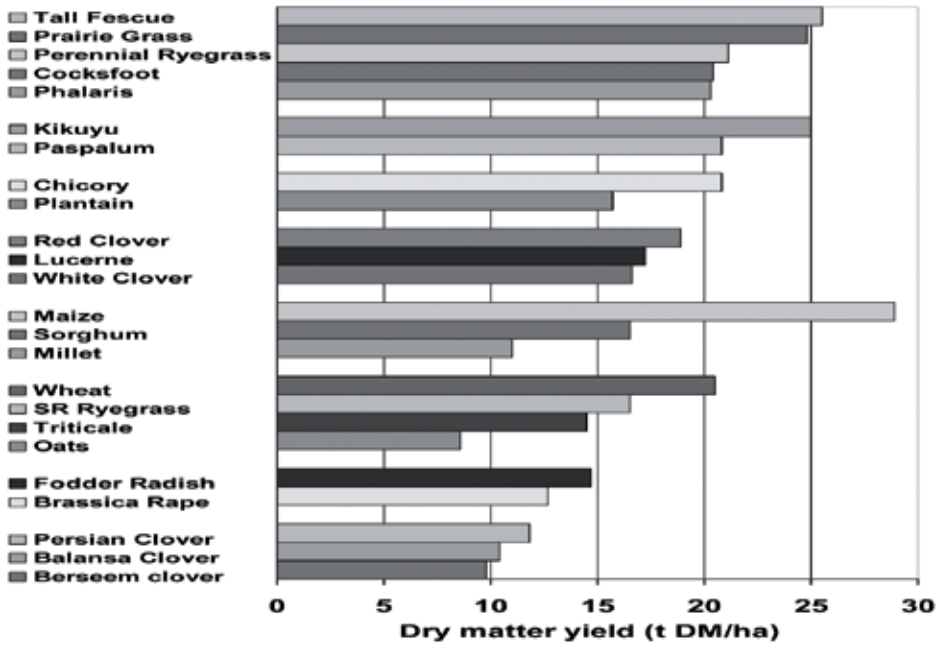

Figure 1 Mean annual dry matter yield of 24 forage species over 3 years (although the annuals obviously grew for only part of the year and therefore provide the opportunity to plant a second crop).

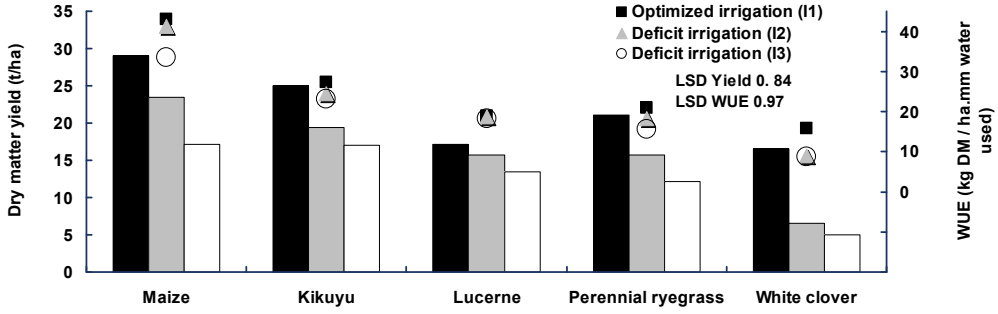

Figure 2 Mean annual dry matter production (t DM/ha) (columns) and water use efficiency (kg DM/ha.mm water used) (symbols) of five selected forages