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Pasture systems for milk production in northern Australia

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Substantial increases in milk production can be achieved using improved pastures. When grazed at lenient stocking rates (< 1,6 cows/ha) milk yields of Friesian cows was *ca.* 4000 l/lactation. Productivity per unit area is increased when fertilizer nitrogen is used to maintain grass pasture. Rye-grass *(Lolium* spp) and clovers *(Trifolium* spp) have been successfully used to boost milk production in winter. These pastures support stocking rates of *ca.* 6 cows/ha over this period and average levels of milk production of 14,5 l/cow/day. Alternatively, the tropical grasses can be supplemented with either molasses or grain.

'n Aansienlike toename in melkproduksie kan verkry word deur verbeterde weiding. Met lae-vlak beweiding (< 1,6 koeie/ha) was die opbrengs van Frieskoeie *ca.* 4 000 l melk/laktasie. Produktiwiteit per eenheidsoppervlakte het toegeneem wanneer stikstof kunsmis gebruik is om die gras weiding te onderhou. Raaigras *(Lolium* spp) en klawer *(Trifolium* spp) is met sukses gebruik om melkproduksie te verhoog gedurende die winter. Hierdie weidings het 'n drakrag van *ca.* 6 koeie/ha gedurende hierdie tydperk en gemiddelde vlakke van melkproduksie van 14,5 l/koei/dag. As alternatief kan die tropiese grasse aangevul word met melasse of graan.

Keywords: Milk production, pastures, supplementary feeding, stocking rate, grazing dairy cows, tropical milk production

Introduction

In common with most developed countries the number of dairy farms in Queensland has declined over the last 30 years, from 25 000 in the early 1950's to 2 600 in 1981. By contrast sales of pasteurized milk are increasing by 4% each year and there is a need for total milk production to be increased.

Annual productivity from pastures

Substantial increases in production can be achieved by making greater use of improved pastures. Tropical grass and legume mixtures can be established at relatively low cost, and when grazed at lenient stocking rates support milk yields in Friesian cows of approximately 4 000 l/lactation. However, when the stocking rate on these pastures is increased there is a sharp decline in the rate of growth of the legume (Table 1). This in turn leads to a reduction in pasture vigour and decreases in animal production. Above 1,6 cows/ha, cows could not maintain live weight over the annual reproductive cycle (Table 1).

Table 1 Effects of stocking rate on milk output and live weight change of Friesian cows and on the growth of a *Panicum maximum* cv. trichoglume and *Neonotoria wightii* cv. Tinaroo mixture (from Cowan & Davison, 1982).

Measurement	Stocking rate (cows/ha) 1,3	1,6	1,9	2,5
Milk output (l/ha/year)	4950	5350	6040	7000
Live weight change (kg/cow/year)	14	2	−33	−28
Net dry matter accumulation				
grass (kg/ha/day)	22	27	14	23
legume (kg/ha/day)	20	18	12	7

Productivity per unit area is increased when fertilizer nitrogen is used to maintain grass pastures. If irrigation is applied to these pastures, the increase can be in the order of five fold (Davison, Cowan & Shepherd, 1982). To demonstrate this increased carrying capacity and milk output, the levels of production from the various pasture systems are shown in Figure 1. Cows grazing tropical grass fertilized with 400 kg N/ha/year produced 8 000 l milk/ha/year when stocked at 3,5 cows/ha. With irrigation, stocking rates of up to 7,9 cows/ha were supported, and milk production was 20 000 l/ha/year (Figure 1). Figure 1 shows how productivity of a unit area of land increases as more intensive systems of pasture production are adopted.

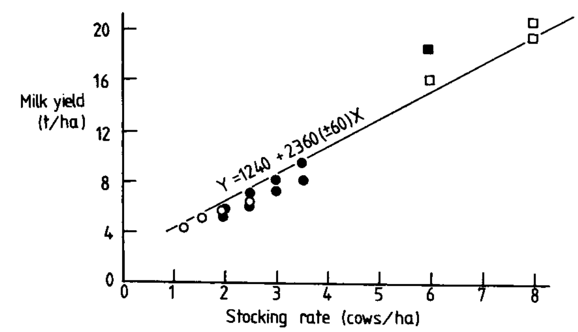

Figure 1 Relationship between number of Friesian cows/ha and milk output for various pasture systems. o, *Panicum maximum* cv. trichoglume and *Neonotoria wightii* cv. Tinaroo mixed pastures; ●, *P. maximum* cv. Gatton receiving 200 or 400 kg N/ha/year; □, *Digitaria decumbens* receiving irrigation and 672 kg N/ha/year; ■, addition of *Lolium* and *Trifolium* spp to an irrigated tropical pasture system.

Winter pastures

Although the annual levels of production from tropical pastures are high, levels of production during winter are markedly reduced. This is caused by a marked slowing down of the growth of pasture at this time; mean rate of growth averages 0,2 of the rate during summer (Chopping, Murray & Bird, 1982).

In all dairying areas of Queensland, from 17° to 27° S, rye-grass *(Lolium* spp), subterranean clover (*Trifolium* spp) and white clovers (*Trifolium* spp) have been used successfully to boost milk production during winter (Chopping *et al.*, 1982). These species are planted annually into prepared seedbeds at 35 kg total seed/ha. Management is intensive, with irrigation each 14 days and a total of 500 kg N/ha applied to rye-grass pastures over a six-month growing season. These pastures support stocking rates in the order of 6 cows/ha over this period and average levels of milk production of 14,5 l/cow/day. The net effect on the annual output of milk is an increase of approximately 2 000 l/ha over that achieved with nitrogen-fertelized and irrigated tropical grasses (Figure 1).

These temperate species have been shown to produce more dry matter and, especially for clovers, to be of higher digestibility than tropical grasses during winter. (Chopping *et al.*, 1982).

Supplementary feeding

Alternatively the tropical grasses can be supplemented with either molasses or grain. These two supplements have caused equivalent responses in milk yield when equal amounts of dry matter are given to cows. The time taken for cows to reach maximum production response to a given level of supplement has varied from 3 weeks for cows grazing at very high stocking rates to 16 weeks for cows grazing at relatively low stocking rates (Davison, Cowan and Chopping, 1982).

For cows in early to mid lactation the response has been linear up to 3,5 kg DM of supplement/cow/day. Beyond this level there appears to be an induced protein deficiency; when soybean meal is added to raise the crude protein content of grain to 16% the response is linear to 6 kg supplement/cow/day (Davison, Cowan and Chopping, 1982).

The milk yield responses to various supplements are shown in Table 2. There are large differences in responses in short term experiments, and most of these differences can be explained by the length of the feeding period, the amount of pasture on offer and the stage of lactation of cows. In experiments continued over a full lactation or longer the mean response has consistently been in the range 1,0 to 1.3 l milk/kg DM of supplement.

Table 2 Responses of dairy cows grazing tropical pastures to supplementary feeds (from Davison, Cowan and Chopping, 1982).

Type of supplement	Length of experiment	Level of feeding (kg/cow/day)	Response (l/kg DM)
Energy (grain or molasses)	20 weeks or less	0 – 3,6	0,3 – 1,7
	full lactation	0 – 3,6	1,0 – 1,3
Energy and Protein (grain/soybean meal)	full lactation	0 – 6	1,1
Minerals			(l/cow/day)
sodium chloride	12 weeks	0,04	1,2
Christmas Island rock phosphate	12 weeks	0,10	1,1

Conclusion

The various options discussed in this paper for increasing production have been shown to be economically viable. They demonstrate a large potential for increasing milk production from dairy farms in tropical and subtropcial Australia.

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