An evaluation of kikuyu-clover pastures as a dairy production system. 2. Milk production and system comparisons

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Abstract

Milk production from an irrigated, perennial kikuyu (*Pennisetum clandestinum*) cv. Whittet — Haifa white clover (*Trifolium repens* cv. Haifa) — Safari clover (*T. semipilosum* cv. Safari) pasture was evaluated in 6 treatments, at a range of stocking rates (2.5, 3.75 and 5.0 cows/ha) and nitrogen fertiliser levels (0, 150, 300 and 600 kg/ha N) in an incomplete factorial design. A seventh treatment consisting mainly of annual ryegrass (*Lolium* spp.) pasture was stocked at 5 cows/ha with 400 kg/ha N (5/ANN). Pastures in the study were stocked continuously over 3 years.

Milk production per cow meaned over the 3 years was 4649 kg at 2.5 cows/ha, 4115 kg at 3.75 cows/ha and 3861 kg at 5 cows/ha on perennial pasture, and 4026 kg at 5 cows/ha on annual pastures. Milk yield per ha (MYH, kg) was linearly related to stocking rate (SR, cows/ha) by the equation: MYH = 3712 + 3153 SR ($r^2 = 0.63$; $P<0.05$). Milk yield was not significantly changed by nitrogen fertiliser at 3.75 or 5 cows/ha.

Milk yield per cow (MY) was related to the clover % in the diet (CLD) with CLD in February giving the best prediction for lactation milk yield (MY, kg/cow): MY = 3602 + 47.7 CLD ($r^2 = 0.42$; $P<0.01$). There was a trend for cows stocked at 5 cows/ha on kikuyu-clover pasture to be lighter than those on other treatments. Milk protein % (MP) declined with increasing N fertiliser (NF, kg/ha N) input by the equation: MP = 3.03–0.0002 NF ($r^2 = 0.85$; $P<0.01$).

The lower annual cost of perennial kikuyu-clover pasture, its comparable milk production with an annual ryegrass system and the ability to withstand high stocking rates make it a viable alternative for subtropical dairy systems.

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Introduction

This paper complements the first in the series (Davison *et al.* 1997) and reports animal production from irrigated Haifa white clover (*Trifolium repens* cv. Haifa) — Safari white clover (*Trifolium semipilosum* cv. Safari) — kikuyu (*Pennisetum clandestinum* cv. Whittet) pastures. These pastures were used to investigate an alternative to the widely adopted 'High-N Rye' milk production system (Chopping *et al.* 1982a; 1982b; 1982c) which is used in northern Australia to produce high levels of milk during the winter-spring period. This system is expensive as it requires the annual cultivation and sowing of ryegrass pastures and inputs of nitrogen fertiliser of up to 500 kg/ha N (Chopping and Cuda 1991; Kaiser *et al.* 1993). Data from the present study should allow an economic comparison of milk production from these alternative pasture systems.

The perennial kikuyu-clover pastures were evaluated at a range of stocking rates and nitrogen fertiliser inputs. Milk yields, milk composition, liveweight and reproduction were recorded and the relationship between key pasture and diet variables and milk output were analysed.

Materials and methods

The first paper in this series (Davison *et al.* 1997) gave detailed information on treatments, environment and pasture establishment as well as measurements and results related to the pastures, soil and diet.

Treatments and design

Six treatments, consisting of 3 stocking rates (2.5, 3.75, 5.0 cows/ha) at a range of annual nitrogen fertiliser levels (0, 150, 300 and 600 kg/ha N) in an incomplete factorial design were applied to a kikuyu-clover pasture. Both Haifa and Safari clovers were included in the pasture. A seventh treatment consisted of annual ryegrass-clover pasture, which received 400 kg/ha N and was stocked at 5 cows/ha. Treatments were arranged in a completely randomised block design. Cows on Treatment 7 grazed the annual pasture from June-December each year and then reverted to an adjacent perennial kikuyu-clover pasture which had been stocked by other cows at 5 cows/ha from June-December. Perennial pasture treatments are designated as 2.5/0N, 3.75/0N, 3.75/150N, 5/150N, 5/300N, 5/600N representing the stocking rate and level of N applied and the annual pasture treatment as 5/ANN.

Animal management

In March 1984, 28 multiparous and 14 primiparous Holstein-Friesians were blocked into groups of 7 animals on the basis of previous milk yield and calving date, or in the case of heifers, on liveweight and calving date. Within blocks, animals were randomly allocated to the 7 treatments in Year 1. A grazing rotation of 1 week grazing — 3 weeks spelling was used on the 4 paddocks of each treatment throughout the 3 years of the experiment. Cows calved from mid-March to mid-May each year and experimental animals grazed their treatment paddocks from April 18, 1984 to February 26, 1987. In Years 2 and 3, animals that either failed to conceive or were culled, were replaced in February at the end of the lactation. Two new heifers were assigned to each treatment each year. As far as possible, cows remained on the same treatment throughout the study.

Animals were milked twice each day with water and shade available in each paddock and at the dairy. During months when bloat was observed, an anti-bloat oil was added to the water troughs for the first 2 days of the rotation and the occurrence, severity and treatment of bloat were recorded. All mating was by artificial insemination over an 8-week period in June-July each year and reproductive performance was recorded.

Supplementation

Cows in all treatments received molasses at the rate of 3.5 kg/d fed communally in treatment paddocks. Dicalcium phosphate (23.7% Ca, 18.8% P) and coarse salt (NaCl) were mixed with the molasses (75.5% DM, 6% crude protein, 1.1% Ca, 0.6% Mg, 0.5% S) to provide cows with 60 and 30 g/d, respectively.

Measurements

Milk yield of individual cows was recorded at each milking on 5 days each week. Milk fat % and lactose % (Fossomatic — Milkoscan 203) were measured once each week and solids-not-fat % (hydrometric — British Standard 734 Part 2) once a fortnight on a composite sample (400 ml) of morning and afternoon milk. Milk protein % was calculated by the formula: protein % = SNF% — (lactose % + 0.72) (Mitchell *et al.* 1978). More detailed analysis of milk protein and non-protein nitrogen content (AOAC 1980) was carried out on individual cows in May, July, October and December. Cows were weighed once each week prior to calving, within 24 h post-calving and subsequently once each fortnight during lactation.

Statistical analyses

The statistical analyses isolated the effects of 7 treatments which included different combinations of nitrogen fertiliser, stocking rate and pasture type. The error term was estimated from the animal-to-animal variation after allowing for replicates and treatments. Analyses were done for separate years, across years and for seasons, where there were obvious differences between seasons and interactions of season with treatment. Genstat 5 (1989) was used to derive linear regression prediction equations for milk yield and fat-corrected milk (FCM). FCM was calculated using the equation derived by Overman and Gaines (1948).

The across-years analysis of liveweight and liveweight changes for different periods of the lactation was done by a balanced factorial design with treatment and year as factors. Post-calving weights were used as covariates for all responses except pre-calving and post-calving weights. Logistic regression was used to determine if treatment had an effect on pregnancy rate.

Results

Milk yield and composition

Milk yield per lactation in the perennial pasture treatments averaged 4649, 4115 and 3861 kg/cow at 2.5, 3.75 and 5.0 cows/ha across all years and 4026 kg/cow for the annual pasture treatment at 5.0 cows/ha. Across all years, milk yield per cow at 2.5/0N was significantly ($P<0.05$) higher than for all other treatments (Table 1). The addition of nitrogen fertiliser at both 3.75 and 5.0 cows/ha had no significant effect ($P>0.05$) on milk yield per cow in any year or across years. Lactation length was not affected by treatments in any year, mean lengths being 303 (± 1.5, s.e.), 298 (± 1.8) and 296 (± 2.3) d for 1984, 1985 and 1986, respectively.

Table 1. Lactation yields for each year of the experiment and the mean across 3 years.

Stocking rate	Nitrogen fertiliser	Milk yield			
		1984–85	1985–86	1986–87	Mean
(cows/ha)	(kg/ha N)	(kg/cow)			
2.5	0	5124	3924	4899	4649
3.75	0	4576	3732	4077	4129
	150	4432	3944	3927	4101
5.0	150	4231	3629	3767	3876
	300	4400	3283	3650	3778
	600	4335	3700	3753	3930
5.0 (annual)	400	4455	3740	3883	4026
s.e. mean		240	335	254	170
LSD (P=0.05)		ns	ns	734	492

Cows stocked at 2.5 cows/ha had the lowest milk fat %, but there was no effect of treatment on lactose % or protein % of milk ($P>0.05$) (Table 2). When milk protein % (MP) was plotted against mean dietary crude protein % (DCP) over the 4 seasons, there was a linear decline as dietary crude protein increased (Figure 1). MP was also inversely related to the annual nitrogen fertiliser (NF) inputs (kg/ha). The equations were:

$MP = 3.61 (\pm 0.16) - 0.032 (\pm 0.008)\ DCP$
($r^2 = 0.75$; $P<0.01$)

$MP = 3.03 (\pm 0.01) - 0.0002 (\pm 0.00004)\ NF$
($r^2 = 0.85$; $P<0.01$).

Yield of milk components followed similar trends to total lactation milk yield (Table 2). The more detailed nitrogen analysis of milk indicated no effect of treatment on total nitrogen %, non-protein nitrogen %, protein % or casein % of milk. There was, however, a trend towards increased total nitrogen and protein content of the milk from May-December (Table 3).

Milk yield and stocking rate

Lactation data were used to test relationships between milk yield (per cow and per ha) and stocking rate. Milk yield per ha (MYH, kg) and fat corrected milk yield per ha (FCMH, kg) were linearly related to stocking rate (SR, cows/ha). There was no significant relationship ($P>0.05$) between stocking rate and milk yield per cow.

$MYH = 3712 (\pm 1439) + 3153 (\pm 377)\ SR$
($r^2 = 0.63$; $P<0.05$)

$FCMH = 2870 (\pm 983) + 3072 (\pm 360)\ SR$
($r^2 = 0.64$; $P<0.05$).

Table 2. Across-years means of yield and percent of milk fat, lactose and protein for each treatment.

Stocking rate	Nitrogen fertiliser	Milk fat		Lactose		Protein	
(cows/ha)	(kg/ha N)	(kg/cow)	(%)	(kg/cow)	(%)	(kg/cow)	(%)
2.5	0	157.1	3.39	217.8	4.69	139.5	3.00
3.75	0	148.3	3.62	194.4	4.73	125.1	3.04
	150	155.9	3.79	194.9	4.76	124.1	3.02
5.0	150	137.4	3.58	181.1	4.68	116.4	3.02
	300	129.9	3.46	180.0	4.77	112.7	2.98
	600	136.6	3.49	185.8	4.73	114.9	2.92
5.0 (annual)	400	145.3	3.61	192.6	4.77	118.8	2.95
s.e. mean		5.9	0.09	8.2	0.04	4.8	0.04
LSD (P=0.05)		17.1	0.24	23.5	ns	13.9	ns

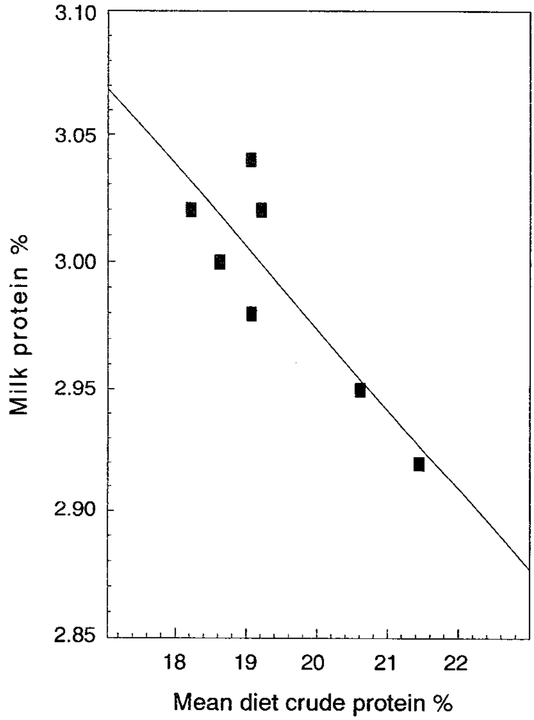

Figure 1. Relationship between lactation milk protein % and mean dietary crude protein %: y = 3.61–0.032 x (r^2 = 0.75; P<0.01).

Table 3. Across-years nitrogen analysis of milk at 4 times during the lactation.

Milk component	Month			
	May	August	October[1]	December[1]
Total nitrogen %	0.4344	0.4515	0.4813	0.5153
s.e. mean	0.0034	0.0035	0.0048	0.0062
Non-protein nitrogen %	0.0276	0.0326	0.0335	0.0346
s.e. mean	0.0002	0.0003	0.0004	0.0005
Protein %	2.596	2.673	2.857	3.070
s.e. mean	0.022	0.022	0.029	0.040
Casein %	2.112	2.198	2.296	2.444
s.e. mean	0.020	0.021	0.024	0.043

[1] Mean of 2 years only.

Prediction of milk yield

A number of pasture and diet variables were used as independent variables to predict whole lactation milk yield for the 6 perennial pasture treatments. The pasture botanical variables considered were total DM on offer, green dry matter (GDM) on offer, kikuyu DM on offer, kikuyu %, clover DM on offer and clover %. Diet botanical variables were kikuyu leaf % and stem %, total clover %, kikuyu leaf % + clover %, dead % as well as the crude protein % of the diet. Correlations between milk yield (MY, kg/cow) and these variables were determined first for each season and the variables with the highest correlations with milk yield used individually and in pairs to predict milk yield. The best predicter of whole lactation milk yield per cow was clover % in the diet (CLD). The across-season and within-season equations are presented below.

Across seasons:

MY = 3495 (± 253) + 31.6 (± 12.7) CLD (r^2 = 0.24; P<0.05)

Within seasons:

February: MY = 3602 (± 156) + 47.7 (± 13.1) CLD (r^2 = 0.42; P<0.01)

May: MY = 3744 (± 175) + 30.9 (± 13.3) CLD (r^2 = 0.21; P<0.05)

October: MY = 3427 (± 324) + 22.7 (± 10.8) CLD (r^2 = 0.17; P<0.05).

Liveweight

Liveweight changes using post-calving weight as the covariate were analysed for the periods: post-calving to mid-August; mid-May to mid-August; mid-August to changeover; post-calving to drying off; and post-calving to changeover. Changeover date was the day in mid-February when replacement animals were included for the start of the next year of the experiment. There was no significant effect (P>0.05) of treatment on liveweight change for the period mid-May to mid-August in any year. However, treatments did produce significantly different (P<0.05) liveweight changes from mid-August to changeover in both 1985 and 1986. In 1985, treatment 5/600N had the lowest increase of 72 (± 10.3) kg, with others averaging 101 (± 4.2) kg, whereas in 1986, treatments 3.75/150N and 5/300N at 71 and 53 kg, respectively, supported lower increases in liveweight than treatments 2.5/0N (105 kg) and 5/ANN (115 kg).

Treatments had no effect (P>0.05) on pre-calving weight (mean 608 ± 5 kg) or post-calving weight (mean 552 ± 5 kg) within any year or across years. Drying-off weight was lower (P<0.05) in 1986–87 (533 kg) than in 1984–85 (561 kg) and 1985–86 (553 kg). This was influenced by the lower weights of cows at the highest stocking rate in the perennial pasture treatments. At the end of the experiment in 1987, cows at 5/300N were significantly lighter (P<0.05) than cows in 2.5/0N, 3.75/0N, 3.75/150N and 5/ANN, while cows in 5/150N were lighter (P<0.05) than those in treatments 3.75/150N and 5/ANN (Table 4). Cows in treatment 5/ANN gained liveweight from July, which was 1–2 months earlier than cows on the perennial treatments. From May–December, cows at 5 cows/ha on perennial pastures tended to be lighter than cows at 2.5 or 3.75 cows/ha (Figure 2).

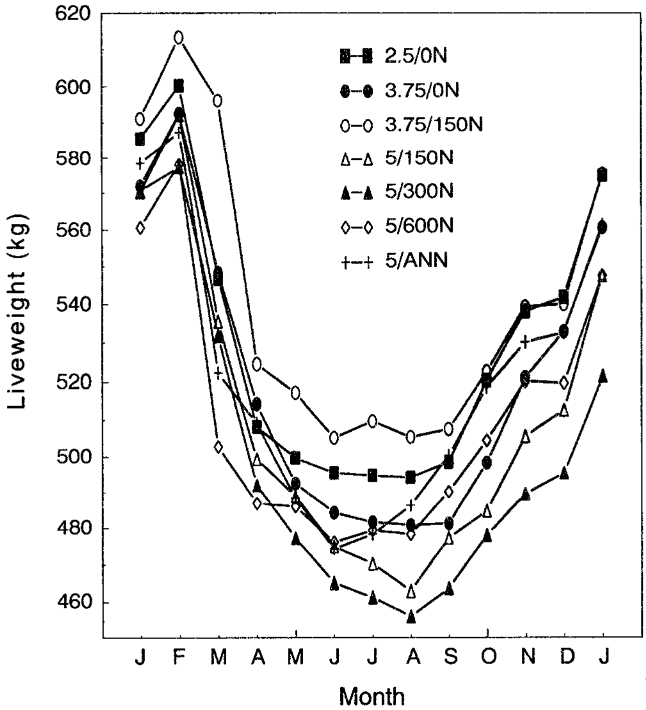

Figure 2. Changes in liveweight at 4-week intervals meaned across 3 years for cows on kikuyu-clover and annual ryegrass pastures.

Table 4. Liveweight for each treatment at the changeover date in February with post-calving liveweight as the covariate.

Stocking rate	Nitrogen fertiliser	Changeover liveweight		
		1984–85	1985–86	1986–87
(cows/ha)	(kg/ha N)		(kg)	
2.5	0	595	575	575
3.75	0	569	593	571
	150	571	581	587
5.0	150	573	580	530
	300	542	554	516
	600	587	557	554
5.0 (annual)	400	552	600	588
s.e. mean		14	14	17
LSD (P=0.05)		ns	ns	49

Reproduction

Pregnancy rates were similar on all treatments both within and across years, mean pregnancy rates being 71.4, 78.6 and 83.3% for 1984, 1985 and 1986, respectively. Corresponding pregnancy rates for primiparous cows were 92.9, 78.6 and 93%.

Bloat

In the first year, 31 cases of bloat were recorded, involving 15 separate cows. Of these cases, 11 were treated with an anti-bloat oil, and 1 with a trochar and canula, whereas the rest were untreated. Nearly all cows came from treatments 2.5/0N, 3.75/0N and 3.75/150N, which also had the highest clover yields. Thirteen cases were observed in August 1984 and 7 in December. Only 2 cases of bloat were observed in the second year and none in the third.

Discussion

Milk production

Milk yield per cow on the perennial pasture stocked at 5 cows/ha was similar to that on the ryegrass pasture system. At the lower stocking rates, milk production per cow was higher than at heavier stocking rates, but milk output per ha was lower. Milk production per cow at 2.5/0N and 3.75/0N was well above the average for Holstein-Friesian cows in the Queensland Department of Primary Industries Herd Recording Scheme for 1987–88 of 3887 kg/cow. The higher absolute liveweight and lower liveweight losses at 2.5 and 3.75 cows/ha during early and mid-lactation coincided with the period of lowest pasture availability in winter and also the period of re-mating. This is one important reason to maintain annual stocking rates below 5 cows/ha on kikuyu-clover pastures. However, this study and 2 previous studies in northern Australia on ryegrass and clover indicate a stocking rate of around 5 cows/ha is feasible when grazing annual pastures during winter and spring (Table 5). The perennial kikuyu-clover system had a higher milk output per cow, but in general, a lower output per ha than ryegrass-clover pastures. In the study of Chopping *et al.* (1982a), all cows were replaced each year in the experiment, often due to low reproductive performance, suggesting the

Table 5. A comparison of milk production from irrigated pasture systems in northern Australia.

Pasture system	Stocking rate	Nitrogen fertiliser	Milk yield[1]		Reference
	(cows/ha)	(kg/ha N)	kg/cow	kg/ha	
Couch	7.0	600	1706	11 942	Chopping *et al.* (1982c)
Ryegrass[2]	7.0	600	2049	14 343	
Rye-clover[2]	7.0	600	2391	16 737	
Clover[2]	7.0	600	2385	16 695	
Ryegrass[2]	5.0	400	2723	13 615	Moss *et al.* (1987)
	10.0	400	2321	23 210	
Kikuyu-clover	2.5	0	3809	7 523	This study
	3.75	0	3289	12 333	
	5.0	150	3036	15 180	
	5.0	600	3090	15 450	
Ryegrass[2]	5.0	400	3186	15 930	

[1] Adjusted for zero supplement intake using 0.8 kg milk/kg molasses (Chopping *et al.* 1980).
[2] Annual stocking rate was lower as cows also grazed other pastures.

stocking rate of 7 cows/ha was too high to support a sustainable system. Cows stocked at 10 cows/ha on ryegrass in the study of Moss *et al.* (1987) lost significant liveweight over the lactation in an unsustainable production system, while cows gained liveweight at 5 cows/ha.

Nitrogen fertiliser

The lack of response in milk yield to additional nitrogen fertiliser indicates that clovers supplied adequate nitrogen to the perennial pasture system. However, the higher quality of clover over the kikuyu and the greater selection of clover in the diet (Davison *et al.* 1997) preclude any exact measurement of this nitrogen contribution. Continuous stocking at 5 cows/ha with 150 kg/ha N was an unstable system, as it led to the ingress of broad-leaf weeds and reduced cow liveweight. The use of 300 or 600 kg/ha N fertiliser at 5 cows/ha increased the total pasture on offer, but produced no extra milk. This was essentially due to cows eating proportionately more kikuyu and less clover. The lower milk protein concentration with increased nitrogen fertiliser has been observed elsewhere (McLachlan *et al.* 1991) and is related to the energy cost of excreting excess soluble nitrogen in the diet (Martin and Blaxter 1964).

Stocking rate and milk production

The perennial kikuyu-clover pasture system has the potential to produce more milk at a given stocking rate than traditional tropical pasture systems (Davison *et al.* 1982). This is attributed to the additional inputs of a highly productive legume and irrigation water. A comparison of regression coefficients of FCM yield per ha with increasing stocking rate showed that the rate of increase in FCM (3072 kg/unit SR) in this study was higher than the 1967 kg/unit SR for raingrown tropical grass pastures receiving 400 kg/ha N (Davison *et al.* 1985) and the 2360 kg/unit SR recorded for a range of raingrown and irrigated tropical pasture systems (Davison *et al.* 1982).

Dietary clover and milk yield

Of the many variables tested, the proportion of clover in the diet showed the most consistent association with milk yield. Clover % in the diet was, in turn, determined equally by clover on offer and clover % in the pasture (Davison *et al.* 1997). Except for spring and early summer, clover on offer was generally less than 500 kg/ha DM and generally comprised less than 15% of total pasture except at low stocking rates in spring (Davison *et al.* 1997). This indicates that reasonable milk production per cow and per ha is achievable at relatively low clover yields.

Ingestion of clover increased both the crude protein % in the diet (Davison *et al.* 1997) and probably the digestibility of the overall diet (Minson 1990). Why this correlation was highest in February when most cows were in late lactation or non-lactating is not clear. However, the treatments with a high clover % in the diet in February had lower stocking rates with nil or low nitrogen fertiliser. These treatments also had the most clover on offer throughout the year and, at 2.5/0N and 3.75/0N, equal proportions of clover in the diet were recorded, except in August when at 3.75/0N it was higher.

Economics

The annual cost of operating a perennial kikuyu-clover sward is approximately $300/ha (or 30%) less than an annual ryegrass system (Table 6). Based on the decline in clover yield and clover intake in the diet over 3 years (Davison *et al.* 1997), additional clover may need to be oversown into the perennial pasture every 3 years. The choice of stocking rate and therefore milk output from the perennial system would depend on the individual farm. It is suggested that a proportion of the irrigation area be grown to annual pasture on farms that need to maintain quota milk supply throughout the year or areas more prone to frost. Milk production at 5/ANN from June–September was approximately 200 kg/cow more than from perennial pastures stocked at 5 cows/ha. A cheaper alternative would be to oversow ryegrass into a proportion of the kikuyu-clover area (Ashwood *et al.* 1993). It also needs to be realised that the true annual stocking rates for the 5/ANN system in our experiment and those of Chopping *et al.* (1982c) and Moss *et al.* (1987), are lower than stated due to the need to graze cows from December–May on additional pasture when the ryegrass is finished.

Table 6. A comparison of the annual costs of growing an annual ryegrass and a perennial kikuyu-clover pasture.

	Ryegrass[1]	Kikuyu-clover
	($/ha)	
Machinery	65	25
Seed[2]	125	55
Irrigation (water and pumping)[3]	205	305
Nitrogen (urea)	400	0
Phosphorus (125 kg/ha DAP)	60	60
Potassium (125 kg/ha KC1)	65	65
Capital costs of irrigation	135	135
Bloat control	0	50
Total costs	980	695

[1] Based on Kaiser *et al.* (1993).
[2] Seeding rate 25 kg/ha for ryegrass and oversowing Haifa at 15 kg/ha each 3 years.
[3] Water for 12 months on kikuyu-clover (9 ML/ha) and 8 months on ryegrass (5 ML/ha).

A comparison of systems suggests that 3 of the 4 kikuyu-clover systems would be more profitable than the annual ryegrass system. In Table 7, a comparison has been made between an annual ryegrass system and 4 perennial kikuyu-clover pastures. Pasture operating costs, extra labour for N fertiliser spreading, annual pasture establishment and money invested in land are included as costs. In the annual ryegrass system, an allowance is made for likely liveweight gain and potential income (J.K. Teitzel, personal communication) from the pasture not used by milkers from June–December. While these costs are incomplete, they represent the key elements for comparing systems. The 2.5/0N system appears the least profitable due to high pasture and land costs and low milk output per ha, while the 3.75/0N system appears the most profitable. In terms of total pasture and clover on offer, lack of weeds, maintenance of cow liveweight, milk output and zero N fertiliser use, the 3.75/0N system is also an appealing and biologically stable system. Higher stocking rates at low N fertiliser input could be employed but pasture renovation would need to occur more frequently.

Table 7. A comparison of income, pasture operating, land and labour costs to operate 100 milking cows on annual ryegrass (AR) and perennial kikuyu-clover (KC) systems at a range of stocking rates (SR) and fertiliser inputs.

Pasture system	Annual ryegrass	Kikuyu-clover			
Annual SR (cows/ha)	2.5	2.5	3.75	5.0	5.0
N fertiliser (kg/ha N)	400	0	0	150	600
Land area (ha)	40[1]	40	26.7	20	20
Milk from pasture (l/ha)	15 900	7 500	12 300	15 200	15 400
Total milk output (l)	318 000	300 000	328 410	304 000	308 000
Income:					
Milk ($0.4/l)	127 200	120 000	131 360	121 600	123 200
Liveweight[2]	5 400	—	—	—	—
Costs:					
Base pasture[3]	11 600	27 800	18 560	13 900	13 900
N fertiliser ($0.8/kg N)	6 400	0	0	2 400	9 600
Other pasture (KC)	13 900	—	—	—	—
Sub-total	31 900	27 800	18 560	16 300	23 500
Extra labour[4]	800	0	0	100	400
Land costs ($3 500/ha @ 10%)	14 000	14 000	9 350	7 000	7 000
Total	46 700	41 800	27 910	23 400	30 900
Income less pasture, land and extra labour costs	**85 900**	**78 200**	**103 450**	**98 200**	**92 300**

[1] 20 ha AR, 20 ha KC.
[2] Liveweight (LWT) gain 270 kg/ha @ $1.00/kg LWT for June–Dec period on KC, (J.K. Teitzel, personal communication).
[3] See Table 6.
[4] Extra labour needed for planting and N fertiliser spreading @ $10/h.

Conclusion

The use of perennial kikuyu-clover pastures has application in subtropical dairying systems and will produce commercially acceptable milk yields and liveweight changes without nitrogen fertiliser input at 3.75 cows/ha. Oversowing of additional clover may be necessary depending on clover survival over summer, and strategies to maximise the survival and regeneration of clover in these pastures warrant further investigation.

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