Tall fescue use on dairy farms

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Abstract

Tall fescue (*Festuca arundinacea* Schreb.) is now well proven on New Zealand dairy farms as a pasture species capable of producing high levels of milk production. Compared with perennial ryegrass (*Lolium perenne*) it offers benefits of higher annual and summer growth, higher clover contents in pasture, higher green leaf to stem ratios in summer, reduced plant pulling, better animal health, grass grub (*Costelytra zealandica*) and Argentine stem weevil *(Listronotus bonariensis*) tolerance, tolerance of wet soils, and drought tolerance and growth. Tall fescue can be recommended for dairy farmers in areas where summer growth and quality of ryegrass is reduced by moisture stress or high temperatures, and for those willing to adjust their grazing and establishment practices to suit tall fescue.

Keywords: dairy farms, *Festuca arundinacea*, tall fescue

Introduction

Tall fescue (*Festuca arundinacea* Schreb.) has been used on dairy farms in New Zealand for about 15 years (Martin & Moloney 1988), but its use on dairy farms has increased rapidly in the last 5 years as a result of positive farmer experience.

Tall fescue is often used instead of perennial ryegrass (*Lolium perenne*) by some farmers because of its tolerance to drought (McCallum *et al.* 1992; Milne *et al.* 1993), heat (Reed 1996), grass grub (*Costelytra zealandica*) (McCallum *et al.* 1990) and Argentine stem weevil *(Listronotus bonariensis*) (Prestidge *et al.* 1986). Tall fescue is also more productive over summer and autumn (30–40% higher), and annually (McCallum *et al.* 1992). Tall fescue seed used in New Zealand does not contain endophyte, so pastures will not cause ryegrass staggers or heat stress in cows. Tall fescue pastures also have higher clover contents than those sown with high endophyte perennial ryegrass (Exton *et al.* 1996). Over summer and autumn, tall fescue pastures also tend to have less stem and dead matter than perennial ryegrass. Although tall fescue is renowned for its summer production and drought tolerance, it is also more tolerant of wet soils than perennial ryegrass (Easton *et al.* 1994), and more productive in wet seasons (Kerrisk & Thomson 1990).

The feed quality of some tall fescue cultivars is the same as that of perennial ryegrass (R. Pitman, pers. comm.). However, the quality of tall fescue–clover mixed pasture can be higher than that of perennial ryegrass–clover pastures in summer (J. Shovelton, pers. comm.). When cows are fed the same herbage allowance in a grass-only diet, milk production is the same as on perennial ryegrass (Thomson 1997).

A farmlet trial in Taranaki over 4 years indicated that milk production was significantly higher from tall fescue than perennial ryegrass when total evapotranspiration rate for January and February exceeded 210 mm (McCallum *et al.* 1992). Average evapotranspiration for these months exceeds 210 mm in Pukekohe, Northland, Waikato and Bay of Plenty. This trial underestimated milk production from tall fescue, as 40% of the farmlet was sown in pure phalaris, and the pre-grazing mass of tall fescue exceeded the recommended levels for maximum production.

Persistence of tall fescue varies considerably according to establishment success, environment, fertiliser and grazing management. Experiences of persistency on dairy farms range from 6 (B. Pirie, pers. comm.) to 8 years (McCallum et.al. 1992). Persistence is likely to be better than for perennial ryegrass in situations with loose topsoils, grass grub, summer drought or heat stress.

Cultivars

Grasslands Roa and Grasslands Advance are the only cultivars that have been evaluated for milk production in New Zealand. When fed equal amounts of dry matter in grass-only diets, Advance tall fescue produces the same amount of milk as perennial ryegrass (Thomson 1997). Advance is palatable to cows and easy to control by grazing, but some farmers have had difficulty controlling the stem of other cultivars. AU Triumph has also been used by farmers. Cultivars to be released soon include Quantum, Torpedo and Vulcan.

Other cultivars have been imported into New Zealand owing to the increased demand for seed and an inadequate supply of Advance. Cultivars include Cajun

(a re-selection from AU Triumph for increased seed production), Fescmore (a fescue–ryegrass hybrid with poor persistency) and Dovey.

All the cultivars described above are European (or summer-active) types. Winter pasture growth of Advance tall fescue, however, is the same as that of perennial ryegrass (Exton *et al.* 1996; Kerrisk & Thomson 1990; Shaw 1997).

The rest of this paper records key observations made by three farmers with considerable experience of using tall fescue.

Farmer Experiences

Brian and Julie Pirie (Ngatea)

We milk 145 cows on 49 ha on the Hauraki Plains 18 km west of Ngatea. Average annual rainfall is 1134 mm. Total production in 1995/96 was 53 000 kg milksolids (MS) or just under 1100 kg MS/ha and 365 kg MS/cow. Before we took over the property in 1993, the previous owner had sown AU Triumph tall fescue-based pastures since 1989. In our first spring we planned to replace the tall fescue pastures as we thought tall fescue was not suited to dairy farms, and we were having trouble controlling it. We changed our minds the next autumn when we discovered differences between tall fescue and ryegrass.

Most of the farm has a soil that consists of 0.5–1.0 metres of loose peat over a marine clay. The ryegrass has shallow roots and the loose peat dries quickly in summer, resulting in poor growth. In autumn the drought-weakened roots do not hold the plants in the soil when leaf growth gives the cows something to pull on. Ryegrass pastures need to be resown every 1 to 2 years, depending on climate.

We learnt that the tall fescue plants had deeper and stronger roots that allowed the plants to grow better than ryegrass in summer. The strong roots also prevented pulling in autumn. Tall fescue provides us with more grazing from October to May, and at least the same as ryegrass from June to September. The tall fescue pastures survive for at least 6 years, but we have had to replace some after 8 years. As of 1997 we have 33% of the farm in tall fescue-based pastures.

Table 1 Grazing management.

Season	Tall fescue		Ryegrass
	Grazing frequency (days)	Pre-grazing mass (kg DM/ha)	Grazing frequency (days)
Winter	40–60		60–90
August–September	25		45
October–December	15	2300–2500	20
January–April	21	2800	28–35

Grazing management

Grazing and fertiliser management is crucial to get the best out of tall fescue. We know of other farmers who have been disappointed with tall fescue, but that is because they have grazed or fertilised it incorrectly.

From spring to summer, tall fescue is grazed more frequently than our ryegrass (Table 1) because it regrows faster. If tall fescue is left too long between grazings (pre-grazing mass of 2800 kg DM/ha, or leaves begin to droop), palatability declines and cows may even reject AU Triumph as it is not as palatable as Advance. We also avoid grazing too closely (< 1600 kg DM/ha residual) as this can damage the crown and reduce regrowth. Trials in Taranaki have shown that spring pasture growth of tall fescue is optimised with high cutting heights (5.5 cm) and cutting frequencies of 15 days (Kerrisk & Thomson 1990).

Advantages

Using this grazing system we have no problem controlling spring growth, and the Advance in particular does not go to seed. We mow pastures only occasionally. A side benefit of grazing tall fescue paddocks more often is that we reduce grazing pressure on ryegrass in the summer, and minimise damage to it. Milk production usually increases when the cows graze tall fescue paddocks, and never decreases.

Russell and Bev Powell (Taranaki)

Our farm is located beside the Tasman Sea just south of Okato, Taranaki, where we milk 200 cows on 70 ha. Our soils are sandy close to the beach and heavier loams further inland. Annual rainfall averages 1424 mm and the weather is often dry enough between January and March to reduce pasture growth.

We first tried tall fescue in 1990 in an attempt to find a pasture that was less affected by summer dry periods. We now have half of the farm in tall fescue, and in autumn 1998 this will increase to 60%.

We have steadily increased the area of tall fescue because we have found that, compared with ryegrass pastures, it grows better in summer (based on observations of grazing frequency and residuals), has no growth disadvantages at other times of the year, and has less stem and seed-head production after spring. Our tall fescue pastures grow better than ryegrass in the winter, although this may be owing to the use of Grasslands Kara cocksfoot (*Dactylis glomerata*) and Grasslands Maru phalaris (*Phalaris aquatica*) in the mix, and the fact that the ryegrass pastures are older.

Tall fescue persistence is good, and any paddock regrassing has been done only to correct soil drainage problems.

Milk production on our farm has increased steadily from 46 700 kg MS in 1990/91, to 78 000 kg MS in 1996/97 (1070 kg MS/ha and 395 kg MS/cow). In 1994/95 we began feeding maize silage grown on the farm; in 1995/96 we also fed limited amounts of meal and grain, but now feed grass and maize silage, and minerals only. Maize silage is fed for 1 to 2 months at the end of lactation, with the balance of the 140 tonnes fed in early lactation.

The combination of tall fescue pastures and maize silage has allowed us to increase the lactation length by 3 weeks at the end of the season, with improved cow condition and pasture cover at drying off. This year we maintained twice-a-day milking until drying off, as cows were still milking well in late May (43% of this effect is owing to the maize silage).

Establishment

Although plant breeding has improved seedling vigour (Fraser & Lyons 1994), tall fescue can be slower to establish than perennial ryegrass. As a seedling it is a weak competitor with weed grasses (perennial ryegrass, *Poa annua*), and establishes poorly when sown in cold soils and/or sown too deep. For these reasons, management at establishment is more critical than with perennial ryegrass.

Successful establishment is most likely when weed plants and seeds have been effectively removed from the old pasture, seed is sown into warm soils (15°C) at a depth of 15 mm, cultivated seed-beds are fine and well consolidated, subsoils have moisture, weeds emerging after sowing are controlled well, soil fertility is good, and early grazings are well managed.

We have sown tall fescue after summer greenfeed crops in earlier years, and after maize silage crops in the last two seasons. The pastures are sown as soon as possible after the crops are removed, with sowing dates usually between 20 and 30 March.

The maize ground is re-cultivated to level the ground and remove weeds. The soil is levelled, harrowed and rolled, seed sown with a roller drill, and the seed-bed rolled again. Autumn maintenance fertiliser is applied before sowing (contains 15–20 kg N/ha), 100 kg/ha DAP and MCPB applied after first grazing, then urea applied at 20–30 kg N/ha two or three times over the first winter and spring. Paddocks usually receive one grazing before calving (20 July), and are grazed regularly by milking cows by October.

We used Roa (40% of paddocks), AU Triumph (27%) and Cajun (4%) fescues in earlier years, but now use Advance mixed with cocksfoot and phalaris. We use higher sowing rates (30 kg/ha) of tall fescue than recommended rates of 18–24 kg/ha because we believe we get a stronger establishment with fewer weeds, and the extra costs are easily recovered in the first year.

Fertiliser

Soil phosphate on the loam soils is 32 (Olsen P), potassium 6 (quick test) and pH 5.8 (in water).

Maintenance fertiliser is applied in spring and autumn with 400 kg/ha Nitrolife 15% each time, providing an annual supply of 41 kg N/ha, 62 kg P/ha, 60 kg K/ha, 60 kg S/ha and 160 kg Ca/ha. Soil phosphate levels have risen slowly in recent years, so we estimate that about 50 kg P/ha per year is required to maintain levels on our tall fescue pastures.

Nitrogen is also applied strategically, with the total annual amount (including the 41 kg N/ha applied in maintenance fertiliser) not exceeding 200 kg/ha. Summer applications of nitrogen to the tall fescue pastures are very valuable. After the first rain after a dry period in summer, 25 kg N/ha is applied and we receive rapid growth 2 weeks later, allowing us to stop supplementary feeding with silage. Ryegrass growth responses to summer nitrogen are small and unreliable. Response rates from tall fescue are high owing to warm temperatures.

Feed quality

We analysed 10 pasture quality samples from tall fescue and ryegrass pastures collected just before grazing, over the 1995/96 season. These showed no significant differences in metabolisable energy (ME), crude protein (CP), acid detergent fibre (ADF), neutral detergent fibre (NDF), potassium, phosphate, sodium and magnesium levels. This is also confirmed by other studies (Shaw, pers. comm.; Milne, pers. comm.; Shovelton, pers. comm.; Pitman, pers. comm.). Calcium levels were lower in tall fescue than ryegrass (3.6 cf. 4.3).

Ray and Marion Shaw (Ohaupo)

We purchased our property 5 km west of Ohaupo (between Hamilton and Te Awamutu) in 1990 and employed a sharemilker for 3 years. The milking area is 74 ha and in 1997/98 we will milk 296 cows (4 cows/ha). Milk solids production in our first year was 59 780 kg MS and in 1996/97 this had increased to 73 690 kg MS (1000 kg/ha and 295 kg/cow).

Our soils are very light sands, and with a rainfall (1208 mm) lower than other parts of the Waikato, our farm can get very dry in summer. This led us to consult Simon Moloney of Grassline®, who recommended a programme for establishing tall fescue "triple mix" pastures (tall fescue, cocksfoot, phalaris and clovers). This programme began in 1993 and we now have 32% of the farm in tall fescue-based pastures.

Milk production

Our aim with these new pastures was to increase milk production by growing more feed of higher quality over summer and autumn, without penalising production at other times of the year.

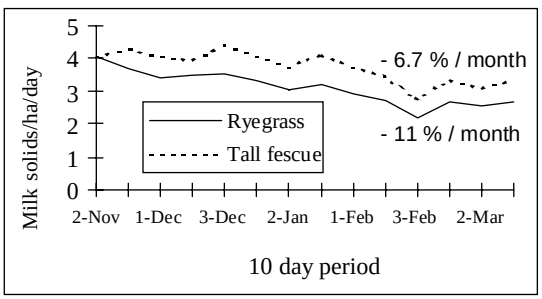
For two seasons we were involved in the More Summer Milk project (Exton *et al.* 1996), to evaluate the potential of tall fescue-based pastures to increase milk production. In November 1994 our cows were split evenly into two herds based on cow production and age. One herd was grazed on ryegrass pastures only and the other on a group of paddocks of which 25% were in tall fescue and 75% in ryegrass. Average pasture age was similar for both treatment and control. The two herds were grazed and milked separately and milk production recorded until the first herd required drying off.

Milk production was 16% higher on the herd grazing tall fescue. The actual advantage to tall fescue was higher than this as the trial finished when the cows on ryegrass had to be dried off (based on milk production and cow condition), but the cows on tall fescue could have been milked for several weeks longer.

The cows were again split into two herds in November 1995 and paddocks for treatments randomly selected. The area of fescue in the fescue treatment had increased to 43%. The tall fescue herd produced 23% more milksolids (Figure 1).

The average rates of milk production decline per month were 6.7 and 11% for tall fescue and ryegrass respectively. The tall fescue rate of decline was equal to the potential decline for fully fed cows of 7% (Exton *et al.* 1996), and we therefore achieved the target initially set in the More Summer Milk project. The ryegrass rate of decline was better than the average for Waikato (14%).

Figure 1 Milk solids production from two pasture types during herd split – R & M Shaw, 1995/96.



The actual advantage of tall fescue was underestimated as we finished the trial prematurely in late March when the tall fescue cows were producing more than those grazing ryegrass, and had higher cow condition and pasture cover. The rainfall in 1995/96 was unusually good, so ryegrass grew better than it normally does in summer.

The tall fescue pastures are very profitable for us. For an establishment cost of $500/ha we get at least $772/ha/year return, a return on investment of 154% per annum.

Our tall fescue pastures have significantly more white clover than ryegrass pastures (averages of 34.4% and 17.4% respectively). This is a contributing factor to good milk production being achieved on tall fescue pastures. The level in tall fescue is closer to the optimum of 50% for dairy pastures (Harris 1997), and the level in our ryegrass is the same as that found in the average New Zealand dairy pasture (Harris 1997).

Samples of pastures from the exclusion cages were analysed for feed quality. Crude protein levels were higher in tall fescue than ryegrass (26% vs 23%), but there were no differences in fibre, carbohydrate, digestibility or metabolisable energy levels (Table 2). Quality of the fescue consumed by cows was probably higher than recorded as the samples were from 30 days regrowth but cows were eating 16 day regrowth.

The conversion of dry matter to milk seemed to be higher on tall fescue as we obtained 23% more milk, but tall fescue grew only 2.7% more dry matter on 43% of the grazed area (i.e., 23% more milk from 1.2% more feed grown). However, the main reason was probably that the cage cutting method underestimated the growth from tall fescue. The cages were pre-trimmed to a much lower level than we graze to and we are sure that this reduced regrowth rates by 10–25% compared with the grazed parts of the paddock. Our tall fescue pastures produce 18.7 tonnes DM/ha/year, and ryegrass 18.0 tonnes DM/ha/year.

This trial work verified the advantages of tall fescue we had already observed. This difference is less than has been recorded elsewhere (McCallum *et al.* 1992). The tall fescue pastures also grow as well as ryegrass in winter and spring. We have no doubt that tall fescue-based pastures are superior to ryegrass on our farm.

Table 2 Average chemical composition of grass/legume pastures on the Shaw property.

	ME (MJ/kg DM)	Digestibility (% DM)	Crude protein (% DM)	Carbohydrate (% DM)	ADF (% DM)	NDF (% DM)
Tall fescue	12.0	79	26	9.3	32	42
Ryegrass	11.8	77	23	9.7	35	40

Other benefits

Neighbouring farmers have difficulty maintaining cow condition and health in dry

summers owing to underfeeding, ryegrass staggers and facial eczema. We have no animal health problems and we credit the tall fescue pastures for this. Calves grow faster on our tall fescue paddocks, and are safe from ryegrass staggers.

More frequent grazing of tall fescue paddocks means the ryegrass paddocks gets better treatment, which improves ryegrass persistence.

Negatives

Some of our first sowings have become cocksfoot dominant, but this has been solved by advice to sow lower rates of seed (1 kg/ha), and in 1997 we used no cocksfoot seed.

Earlier sowings of Roa tall fescue thinned out after 3 to 4 years, but the climate in the first two years of their life was difficult. Advance is much more persistent for us than Roa and perennial ryegrass.

The tall fescue is damaged by Argentine stem weevil in some seasons. Recovery is generally good, but can be poor where the plant has also been stressed by overgrazing.

Tall fescue develops more and larger clumps than ryegrass, but we don't see this as a serious problem. We wonder whether repeated close grazing between dung patches is weakening the plants and making them more susceptible to Argentine stem weevil damage. The time taken for dung patches to become acceptable to cows varies from 3 to 20 weeks depending on rainfall and earthworm activity (Keogh, pers. comm.).

Conclusions

Tall fescue can be recommended for dairy farmers in areas where moisture stress or high temperatures reduce summer growth and quality of ryegrass, and for those willing to adjust their grazing and establishment practices to suit tall fescue. Successful establishment requires thorough removal of old pasture plants and seeds, warm soils (15°C), shallow (10–15 mm) seeding depths, good nitrogen availability and weed control. Tall fescue pastures need to be grazed more frequently than ryegrass to match growth rates and to prevent grass becoming unacceptable to cows, and to control spring stem growth. Maintenance fertiliser requirements (P, K, S) are slightly higher (0–20%) for tall fescue than ryegrass. Tall fescue is more responsive to nitrogen, particularly during summer and autumn.

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