

Chapter 6

Establishing and managing recent cultivars in arable dryland pastures

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INTRODUCTION

Grass and legume species/cultivars available to farmers in the summer dry east coast of New Zealand, other than the traditionally used perennial ryegrass/white clover, fall into 3 categories:

1. drought tolerant species/cultivars which will maintain production later into summer and respond quickly after drought, e.g. cocksfoot, tall fescue, lucerne, prairie grass.
2. species/cultivars which will maximise production in winter and spring, e.g. prairie grass, phalaris, subterranean clover.
3. species/cultivars compatible with summer crop programmes e.g. annual ryegrasses.

Establishment and management requirements for these species in arable dryland differ considerably from that of perennial ryegrass/white clover. These requirements, which must be understood if time and money is not to be wasted when using these alternative species, will be discussed for each species in turn. Table 6.1 summarises the sowing time, depths and rates (alone and in mixtures) recommended for dryland.

Where conventional tillage is used to establish pasture species, the aim is to have a fertile, fine, firm, weed free seedbed by the time of sowing. For successful establishment, the soil should also be warm and moist. Without irrigation, sowings in dryland are usually restricted to autumn, with the use of a summer fallow to build up soil moisture levels essential for rapid establishment. This reduces dependence on autumn rains which may come too late for good establishment of clovers, annual ryegrasses and slow establishing grass species.

Direct drilling can be considered as an alternative means of introducing species, particularly where pastures have 'run-out'. There are problems in conserving soil moisture for autumn overdrilling, so overdrilling should be done in late July — early August. It is also necessary that any weed grasses in

damaged pastures (e.g. insect damage) be removed by herbicides or by heavy stocking prior to overdrilling.

GRASSES

Ryegrass

Ryegrass has been the major pasture grass used for many years by dryland farmers and will probably continue to be so. All ryegrass cultivars are very fast to establish so frequent grazing during this period is needed to avoid suppression of clovers and, if sown in the mixture, slower growing grasses. Ryegrass production is best under rotational grazing systems and high soil fertility conditions.

Persistence of perennial ryegrass under dryland conditions depends on a high *Lolium* endophyte status of the cultivar and correct summer/autumn grazing management. To prevent serious pasture damage, pastures should not be bared for long periods during the summer, and new autumn tillers and regrowth must not be grazed. At this time of the year, lucerne hay, silage or Matua prairie grass can be used to feed stock and flush ewes.

Short rotation hybrid ryegrass (Manawa), biennial ryegrasses (Paroa, Moata) and annual ryegrass (Tama), none of which possess endophyte, have poor summer survival in this region due to poor summer tillering and Argentine stem weevil attack. Manawa should not be included in a mixture intended as a perennial pasture. Some lines of Ariki, a long rotation hybrid ryegrass, that do have high endophyte levels can be incorporated in a perennial pasture mixture. Annual ryegrasses should only be used as a source of winter-early spring greenfeed, so it is essential that they are sown as early in autumn as possible. Tama may be overdrilled (10 kg/ha) into lucerne to increase winter production but good results depend on early autumn rains.

Prairie Grass

Matua, the only commercially available prairie grass cultivar, is best grown on well drained soils since its persistence can be reduced by winter wet soil

Table 6.1 Sowing requirements for establishing new cultivars in **dryland** pastures.

Species/Cultivar	Time	Depth (cm)	Rate (kg/ha)	
			Alone	In Pasture Mixture
Annual Ryegrass				
Tama	early autumn	1-1.5	30	NR
Biennial Ryegrasses				
Paroa	early autumn	1-1.5	20-30	NR
Moata	early autumn	1-1.5	30	NR
Hybrid Ryegrasses				
Manawa, Ariki	autumn	1-1.5	NR	10
Perennial Ryegrasses				
Ruanui, Nui, Ellett	autumn	1-1.5	15-20	see text
Cocksfoot				
Wana	autumn	1-1.5	10-12	5-6
Prairie Grass	early autumn	2	40 broadcast	see text
Matua	(spring)		(30 drilled)	
Tall fescue				
Roa, S170	autumn	1-1.5	25-30	NR
Phalaris	autumn	1-1.5	6	3
White clover	autumn	0.5-1.5	NR	3
Subterranean clover	autumn	0.5-1.5	NR	1-2
Red clover				
Pawera	autumn	0.5-1.5	NR	6
Turoa, Hamua	autumn	0.5-1.5	NR	3
Lucerne	spring	0.5-1.5	5-6	NR

NR = Not recommended

conditions. A soil pH of 6.0-6.5 and good soil fertility will give the best results. It is essential that autumn sowings of Matua be early, into a warm seed bed, since later sowings into colder soils will result in lower establishment and initial growth. Early spring sowings can be successful, but stands must not be overgrazed during the first summer. Matua seed *must* be treated with fungicide before sowing. Treatments should be **Baytan** F17 (active ingredient [a.i.] triadimenol) at 1.3 g/kg seed (0.2 g a.i./kg seed) to control head smut, and thiram or **captan** at 5 g a.i./kg seed, to control soil-borne fungi. These chemical treatments will increase seed costs by 5-10% but this extra expense is easily offset by increased establishment. White clover should be sown with Matua, while red clover, and low rates of perennial **ryegrass** (less than 5 kg/ha), can also be included.

Broadcasting is currently the best method of sowing Matua. Both the **Vicon** and **Aitchison** oscillating arm or spinner, hopper type spreaders have proved satisfactory while the newer pneumatic spreaders are unsuitable. Light harrowing is required to cover the seed with 2 cm of soil. Drilling Matua is difficult because the seed bridges in the drill. Seed bridging may be overcome by clipping the seed, mixing seed with untreated sawdust, or using an agitator in the seed box. Drilling is easier on dry rather than moist days and if the seed is below 10-12% moisture content.

Grazing during establishment should be light to ensure that strong root development and good

tillering occurs before the summer. Matua should be grazed for only 2-5 days with long spelling between grazings to allow stands to recover to 20 cm height. Grazing during frosty or wet conditions may reduce plant numbers. With the correct grazing management, stands will last at least 6-8 years.

Matua is a high quality feed. Even the seed heads are very palatable. Its production is higher than **ryegrass** in both winter and summer; times when **ryegrass** performance is poor. These features can be used to considerable advantage. Matua should be winter spelled to gain its full winter growth potential, then used as a prelambling feed. During the summer, Matua can provide excellent feed at mating time. For effective use of Matua in this way, it should comprise up to 50% of the farm area.

Cocksfoot

Cocksfoot has slow seedling emergence and early growth. It should therefore be drilled in autumn at a relatively shallow depth, then if sown in a mixture, grazed frequently during establishment to reduce competition from faster establishing grasses. To reduce **ryegrass** competition, no more than 10-15 kg/ha of perennial **ryegrass** should be sown with cocksfoot. Owing to its slow establishment, the full growth potential of cocksfoot will not be seen until 9 - 24 months after sowing.

Cocksfoot cultivars differ widely in growth habit, from the prostrate dense cultivar, **Wana**, to the more erect cultivars, of Apanui, Kara and

Saborto. **Wana** is well suited to the **dryland** region because its low-crowned prostrate nature will result in good persistence, especially under severe grazing. **Wana** also has good rust resistance, giving a high level of green leaf from its good summer/autumn growth. These attributes mean that **Wana** cocksfoot will provide good summer and flushing feed.

Tall fescue

Tall fescue has slow seedling shoot growth, being up to **30%** slower than ryegrass. This is primarily due to slow root development. With sowing in autumn and nitrogen fertiliser use, a good tall fescue pasture can be obtained with 4-6 months. Nevertheless, because of this slow root growth and an erect growth habit, overgrazing and plant pulling can easily occur during the first year. Therefore the time when special care with management is needed, extends to a 12 month period from sowing compared with 4-6 months for ryegrass. The management required in this first year is frequent but light grazings.

Once established, tall fescue is very persistent and will perform well all-year-round, growing further into summer dry periods and recovering quickly after droughts. The best results will be gained by rotational grazing but it is important that the pasture is not allowed to become too long as **herbage** quality will be lost. A rotation length of 6 weeks, or a pasture height at grazing of 20-25 cm, should not be exceeded.

This slow initial growth means that no **ryegrass** should be included in a seed mixture with tall fescue, if tall fescue is intended to be a major pasture component. Cocksfoot, also slow to establish, may be a suitable companion grass. Roa and **S170** are the only tall fescue cultivars currently available. **S170** is slightly faster establishing than Roa, but Roa has higher quality and better acceptability.

Phalaris

Phalaris has a marked seasonal growth pattern. It has good cool season activity, and being virtually dormant during hot dry summers, is persistent through drought. Phalaris also has good tolerance of pests such as grass grub and Argentine stem weevil. In areas where **ryegrass** production and/or persistence is poor, phalaris should be sown with other pasture grasses such as cocksfoot and tall fescue. This will help overcome any palatability and/or phalaris staggers problems that may occur from grazing rapidly growing, strongly dominant phalaris swards after autumn rains. Phalaris can be used as a companion grass for lucerne.

Phalaris should be drilled in autumn. It has good early growth but still slower than ryegrass, so only very low rates of perennial **ryegrass** (less than 5 kg/ha) should be included in mixtures with phalaris. Phalaris should be grazed laxly during establishment but once established will survive under a wide range of management conditions.

LEGUMES

Legumes require a shallow sowing depth and any soil nutrient deficiencies should be corrected prior to sowing. Early grazing management of establishing pasture should be frequent and lax to ensure that **clovers** are not suppressed by fast growing grasses (e.g. ryegrass) particularly where red clover is concerned.

White clover is an essential component of all pastures as the base legume. It should therefore be included in all seed mixtures. On very dry sites, subterranean (sub) clover can be added to the seed mixture. Sub clover is an annual, producing feed over the winter and spring, with the spring growth often exceeding that of white clover. On moister areas or soil types, red clover can be a useful addition to a pasture mixture. Red clover has a production peak in summer, producing high quality feed, but for long term production and persistence it needs rotational grazing with long spelling.

Lucerne

Lucerne has been widely used in **dryland** farming for it is a high quality feed and can yield up to 50% more than **ryegrass** pastures. However, to be an effective alternative to **ryegrass/white** clover, it specific management requirements must be understood and a suitable cultivar chosen to overcome insect and disease problems that exist in each specific area (Table 5.1).

In **dryland**, the best time to sow lucerne is September, but October/November sowings can be made on soils of good moisture retention. The soil pH should be above 6.0 to ensure effective nodulation and deep root development, and the **seedbed** fine, firm and free of weeds, especially perennial weeds.

The optimum plant density (30 plants/m²) should be gained by a sowing rate of 5-6 kg/ha. Seed should be treated with a viable inoculant no more than a day before sowing. Cover crops giving a cash return (e.g. barley) may be sown with lucerne easily offsetting the lost lucerne production in the first year. Early grazing management of lucerne stands should be lenient. A quick early grazing is beneficial if weed competition is high. Spraying for aphids can be carried out at this stage.

Most of lucerne's growth occurs in late **spring**-summer with very little winter growth. To overcome the low winter growth, lucerne can be overdrilled in autumn **with Tama** but this is only reliable if irrigated, or rain comes early in autumn. Sowing winter active perennial grasses with lucerne, results in problems of maintaining a productive **lucerne/grass** balance. Phalaris is the only grass that is suited to maintaining this balance. Other grasses may be overdrilled into older lucerne stands that are thinning out.

The grazing management of established **lucerne** is critical. If frequent defoliation occurs, root reserves will be lowered with consequent lower yields, plant death and invasion of weeds. Spelling should be 42 days, reducing to 35 days in the summer and autumn. Grazing durations of up to 14 days causes little harm to the lucerne.

During winter, lucerne should receive a single, short, hard grazing in June by a large mob of sheep, avoiding very wet soil conditions. This will give good aphid, sitona weevil and weed control. Alternative

feed such as annual ryegrasses, Matua prairie grass, or a winter pasture feed bank, should be used before and during lambing. Grazing fresh spring lucerne growth at this time will substantially reduce subsequent lucerne production. The optimum time for the first spring grazing is early-mid October and then rotating the ewes and lambs until weaning. Lucerne may have low sodium levels in spring so provide salt to stock during this period.

Grazing management should control aphids, but if populations build up in late November, spraying is recommended. As a feed surplus develops in late spring-early summer, paddocks can be closed for hay. These paddocks must receive potassic superphosphate to replace lost nutrients. After weaning, lambs can be rotated ahead of the ewes, the lambs utilising the tender shoots and leaves, the ewes cleaning up the stems and weeds. Lucerne that has been attacked by aphids or has diseased leaves may have high oestrogen levels and therefore should not be used for 3 weeks either side of starting tugging.

SUMMARY

Alternative pasture species cannot be treated the same as perennial ryegrass/white clover.

1. It is essential that a summer fallow is used to conserve soil moisture for successful early autumn (prairie grass, annual and biennial ryegrasses) and mid autumn (perennial ryegrass, cocksfoot, tall fescue, phalaris) sowings.
2. Lucerne is best sown in spring.
3. Ryegrass is fast to establish, so low or reduced ryegrass sowing rates should be used when establishing cocksfoot, prairie grass and phalaris.
4. No ryegrass should be used when sowing tall fescue.
5. Prairie grass and lucerne must be rotationally grazed to ensure their survival and production.
6. Other species will survive a wide range of management conditions once established.
7. The peak growth periods of each species should be recognised and used to complement perennial ryegrass at times when perennial ryegrass performance is poor.

FURTHER READING

- Brock J.L. 1983. 'Grasslands Roa' tall fescue: A review. *Proceedings of the New Zealand Grassland Association* 44, 74-80.
- Clark P. 1985. Matua prairie grass establishment. *Proceedings of the New Zealand Grassland Association* 46, 147-150.
- Fraser T.J. 1985. Role of Matua prairie grass in an all-grass system for prime lamb production. *Proceedings of the New Zealand Grassland Association* 46, 157-162.
- Lancashire J.A., Brock J.L. 1983. Management of new cultivars for **dryland**. *Proceedings of the New Zealand Grassland Association* 44, 61-73.
- Langer R.H.M. 1973. Editor. *Pastures and pasture plants*. A.W. & A.H. Reed, Wellington.
- Levy E.B. 1972. *Grasslands of New Zealand*. 3rd Edition. Government Printer, Wellington.
- Vartha E.W., Høglund J.H. 1983. What is the make-up of a **dryland** pasture? *Proceedings of the New Zealand Grassland Association* 44, 204-210.
- Wynn-Williams R.B. 1982. Editor. *Lucerne for the 80's*, Agronomy Society of New Zealand, Lincoln.

Discussion

PART III – CULTIVATABLE-DRY EAST COAST

- Q. Will *tall fescue* perform as well as other grasses under a typical farm grazing pressure?
- A. Evaluation in North Island over the past decade indicates excellent performance of tall fescue, with production and persistence at least as good as ryegrass.
- Q. Is soil moisture level a more critical factor than temperature in establishment?
- A. Matua prairie grass is markedly affected by temperature so must be sown in early autumn while the season is still warm, or in spring. Grasses other than **ryegrass** are less tolerant of low temperature levels so earlier autumn sowing pays. These grasses are also less tolerant of low soil moisture levels. In Canterbury, onset of autumn rains varies so much that the traditional practice of summer fallow is still best for conserving soil moisture for autumn sowing. In the North Island some of the newer cultivars such as Roa tall fescue may establish better from spring sowings.
- Q. Can some of these *herbage* species be undersown into arable crops in summer-dry areas?
- A. Undersowing of prairie grass has given harvesting problems with cereal cover crops but has given excellent stands of prairie grass. Deeper-rooted species such as lucerne and red clover tend to suffer less from competition with the cover crop for moisture, and could be worth undersowing.
- Q. Could soil moisture at lower levels be utilised by encouraging root growth down to these levels?
- A. Lucerne, tall fescue and prairie grass are all reputed to be deep-rooted, but investigating this is difficult. Deep soil moisture is more suitable for survival rather than production of pasture plants, except in the case of lucerne. Some pasture species become dormant when surface temperatures are high, despite presence of deep moisture. This is a physiological response to high surface temperature.
- Q. Has chicory potential in *dryland*?
- A. Yes. It can yield 300 kg/ha daily during spring and looks most promising as a crop for silage.
- Q. You came out in favour of low endophyte *ryegrass* because there is a suppression in animal weight gain on high endophyte *ryegrass*, yet farm observation suggests that low endophyte *ryegrass* will not persist in the *dryland* environment due to Argentine stem weevil attack.
- A. My basic premise is that we cannot afford to have anything in a **dryland** system that reduces animal growth rates. We are totally dependent on growing lambs as quickly as possible over the spring period. If you take the high endophyte option you certainly have plenty of pasture, but you are going to have lower pasture intake and consequently lower lamb growth rates, and lambs on the property far later than otherwise; if you have low endophyte **ryegrass** in a dry environment you are likely to have that **ryegrass** affected by Argentine stem weevil. However, it is very easy to over-react to the extent of this damage. Stem weevil damage has certainly been devastating this year but in most instances those pastures are still alive, thinned out certainly but capable of recovery given adequate spelling. This is an area where special purpose Matua prairie grass or **Wana** cocksfoot pastures can give you the opportunity to spell your **ryegrass** during the early autumn period. Ideally in the future we are looking to a nil endophyte **ryegrass**, i.e. one without the animal growth or health (ryegrass staggers) problems, but with resistance to Argentine stem weevil.
- Q. Could chemical manipulation of *ryegrass* pastures be used to overcome the problems associated with high endophyte levels?
- A. Yes. Chemical manipulation for clover dominance undoubtedly could be used as a tool for finishing lambs. If you have a very vigorous **ryegrass** you get a very low clover content and this in itself will cause lower animal live weight gains. It is too easy to get **ryegrass** dominance with **ryegrass** running to seed at the very time that lambs have been weaned and are expecting to be finished. This is about the worst sort of situation you can get in pasture. In one trial, low rates of Roundup herbicide of 350-500 ml/ha for barley grass control in the early spring stopped **ryegrass** and gave a big flush of clover growth. The **ryegrass** eventually recovered without any long-term damage. (See also Part V – North Island Dairying for discussion on endophyte).
- Q. Can you really maintain 16 stock units per ha on *dryland*? This means pasture dry matter production must be around 12-13,000 kg/ha.



Dryland production here in Canterbury is only 6-7,000 kg DM/ha.

- A. We have attained that particular carrying capacity at trial sites that include some very boney areas, although the soils were not as light as a Lismore soil.

A major point is that if you have adequate soil nitrogen available then you will get good pasture production during autumn, winter and spring when there is adequate moisture. Scope for growth in summer is limited, without irrigation.

