Perennial Pastures

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Take home messages

- *Establishment of perennial pastures is relatively expensive and represents a high risk activity during years with very low spring rainfall.*
- *Ideally Lucerne and pasture grasses should be established by sowing early in paddocks with low weed populations, such as may occur after several years of a well managed cropping program.*
- *Press wheels will improve establishment in some soil types.*
- *Establishment of Lucerne and pasture grasses in poorly prepared, unproductive paddocks is not recommended. Grazing shrubs (eg saltbush) is an alternative and preferable option in such situations.*
- *Perennial, temperate grass pasture species have very poor tolerance of drought conditions during the spring of their establishment year. To date, no varieties of fescue, phalaris or cocksfoot have been identified as suitable for recommendation in the <400mm rainfall districts.*
- *Some potential exists for sub-tropical grasses which have a good level of drought tolerance after establishment. However, ideal conditions are required in early summer for their establishment.*

Introduction

When the word "pastures" is mentioned, some growers think of the annual pastures such as medic and clovers. There are many other types of pastures that could be grown in the Wimmera Mallee region, such as perennial grasses and legumes or woody perennials, such as saltbush. Perennial pastures have different characteristics to the annual pastures. If managed correctly perennials can potentially be quite profitable in many farming systems either as a source of feed during critical times or as an alternative option for land considered relatively unproductive for cropping. They can also be a management tool for dealing with herbicide resistance. The real benefit comes in the years following the establishment year, where stands can be grazed two to three times a year, depending on establishment and seasonal conditions. The biggest challenge is ensuring establishment is successful, given the high up-front cost and risk associated with sowing these pastures.

In 2006, as a component of the NLP funded "Making Conservation Pay" project, a range of perennial pastures are being investigated for their potential fit in the Wimmera Mallee region. In 2006, twenty growers were identified to participate in this project establishing a range of perennial pasture species on-farm, with the aim of using these pasture paddocks as demonstrations to encourage the further expansion of perennial pastures in the Mallee Wimmera region. Throughout this project,

pasture growth and establishment will be recorded. If establishment is successful, grazing data and management will be recorded. This three-year project, began in 2006 and is planned to finish at the end of 2008.

Method

A total of 27 demonstration paddocks (ranging from 4 to 30ha each) have been sown and/or are being established to perennial pastures on 20 properties across the region. Of these sites, four (sites 7, 19, 21 and 22) were either established in 2006 or were selected for inclusion in this project as existing demonstration sites. These four sites include two saltbush stands, one stand of lucerne and one stand of phalaris. In total, 286 hectares (ha) were either farmer sown (where suitable equipment was available), or sown by the BCG using a pasture seed broadcaster followed by farmer harrowing. The larger paddocks were divided to allow the comparison of alternate perennial species at the same site. That is, a paddock of 45ha has been subdivided into five paddocks (listed as sites 10a, 10b, 10c, 10d and 10e in Table 2).

The paddocks were selected based on either the paddock proximity to stock water or the paddocks proximity to other paddocks used by the farming enterprise for livestock. Soil type and paddock history also influenced paddock selection.

EM mapping is being used to provide information on the relative profitability of pasture production on a range of soil types. 141ha were EM mapped in 2006 and the remaining 145ha were EM mapped in 2007. Pasture growth is being monitored by taking three 1m2 dry matter cuts, at regular intervals, at each of ten sample points in the seven most successfully established paddocks.

During 2007, 225ha were sown, with a further 32ha to be sown with subtropical grass species, in the November/December 2007 depending on summer rainfall. A further 29ha were successfully established in, or prior to, 2006. For saltbush in particular, the established stands allow monitoring and demonstration of mature plants that would not have been achieved with plantings conducted within the time frame of this project.

In addition to these large demonstration sites a replicated small plot trial was sown in 2006 to initially investigate sub-tropical pastures, such as Green Panic, and their suitability to the region. The trial was sown at the Hopetoun site (Site 06) with wide points on 17.5cm row spacing with rolling harrows. Seven sub-tropical species were evaluated at two different sowing rates (3kg/ha and 6kg/ha). Plant establishment counts and dry matter were recorded on the

Results

After an exceptionally good start to the 2007 season in the Mallee Wimmera region, severe rainfall deficiencies occurred in June, August and September (see Table 1); with the exception of the western Wimmera area (Nhill site). The effects of the lack of August and September rainfall was especially pronounced on the heavier soils of the eastern Wimmera and eastern Mallee where widespread drought and crop and pasture failure occurred.

The good early season rains led to very good weed germination that enabled most site hosts to conduct pre-sowing weed control. The majority of the pasture paddocks were sown in mid June (Table 2), with little subsequent rainfall (see Table 1).

Annual grass control in paddocks sown to perennial grasses species was not possible because of the lack of herbicide options available to cope with the resulting weed competition. Some of the demonstration paddocks have little vegetative growth and are exposed to wind erosion over the summer months. Worst affected areas are Ballapur and the area around Dumosa, which unfortunately was also the site of the main pasture demonstration trials.

Table 1: Rainfall figures (mm) for some of the sites used in this project across the Wimmera Mallee region up to October in 2007.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Nhill	67	36	5	54	94	17	63	36	24	14	53	43	504
Hopetoun	15	19	29	24	92	15	37	4	12	5	48	29	327
Sea Lake	51	3	14	48	45	12	18	5	4	5	43	33	280
Berriwillock	40	6	17	48	39	16	30	6	4	5	43	33	281
Manangantang	53	0	17	49	38	6	25	0	4	0	43	41	277
Jil Jil	43	3	32	29	45	17	30	3	13	2	16	39	270
Dumosa	35	0	24	34	21	10	20	5	9	4	11	42	215
Birchip	44	13	34	30	58	13	26	4	6	7	20	50	304
Narraport	50	9	40	28	61	13	29	6	5	5	15	44	304
Donald	65	15	20	37	71	14	45	6	12	4	46	58	393
Charlton	30	16	41	29	57	16	37	6	6	2	15	44	300

In general, pasture seed that was broadcast onto a cultivated seed bed and incorporated by harrowing (the standard method) had lower levels of establishment compared to paddocks sown with press-wheels. The broadcast method had the advantage of improved timeliness of sowing (due to equipment mobility); few growers possessed pasture seeding equipment with press wheels and small seed boxes. The average plant establishment across all demonstration sites was 48 pasture plants per square metre, with a range from 13 to 126 (see Table 2). The target population will vary between pasture species however, for lucerne the target population is 40 plants/m2. Of the species sown, reasonable plant establishments were achieved by lucerne, fescue and cocksfoot; establishment of phalaris was particularly poor (Table 2).

Pasture monitoring at ten sampling points in each of the seven paddocks commenced in January 2008 but data was not available at the time of this publication. This information will be used to provide guidelines for the expansion of perennial pastures across the Mallee Wimmera and allow validation of pasture models to support future decision making regarding the economics of perennial pasture production.

Due to the majority of the pastures in 2006 failing and the prospect of a wet summer, a subtropical pasture variety trial was sown at Hopetoun, on a sandy loam with clay at depth with moderate subsoil constraints (EC > 0.5dS at 50cms). Subtropical pastures are generally grown in the summer dominant rainfall zone of northern NSW and southern QLD for cattle and sheep grazing. The purpose of this trial was to investigate whether any of these pasture species would be suitable for the southern Mallee and northern Wimmera. Seven pasture species were sown at two rates (3kg/ha and 6kg/ha) on 10th November, 2006. Plant densities were assessed on 13 March and biomass production measured on 29 May 2007 (Table 3).

Subtropical pastures become dormant over winter (with the onset of frost events) and regenerate in spring once moist soil reach temperatures of 18°C or greater in the topsoil (0-10cm depth). Pasture dormancy over the winter months ensures that moisture can be stored in the soil profile until they regenerate in spring. In 2008, the plots will be subjected to grazing and their tolerance to grazing recorded.

Table 2: Plant establishment counts for individual pasture species at demonstration sites.

Site No.	Location	Area (ha)	Sowing Date	Species 1	Plant Counts (per m^2)	Species2	Plant Counts (per m^2)
Site01	Nhill	10.1	28/6/2007	Lucerne	TBM	Chickory	TBM
Site02	Manangatang	7.4	28/6/2007	Lucerne	TBM	Panic	TBM
Site03*	Sea Lake	18.1	14/06/2007	Lucerne	43	Phalaris	8.5
Site04	Birchip	6.8	16/06/2007	Lucerne	TBM		
Site05	Wilkur	4.2	13/06/2007	Lucerne	70		
Site06*	Hopetoun	10.4	13/06/2007	Lucerne	12	Fescue	0.0
Site07	Tchum Lake	10.0	2003	Saltbush	TBM		
Site08	Ballapur	5.5	13/06/2007	Lucerne	19	Cocksfoot	51.4
Site09	Corack	11.8	19/06/2007	Lucerne	10	Cocksfoot	13.3
Site10a	Nullawil	8.7	27/05/2007	Saltbush	TBM		
Site10b	Nullawil	8.7	16/06/2007	Lucerne	32		
Site10c	Nullawil	8.7	10/07/2007	Lucerne	54	Panic	TBS
Site10d	Nullawil	8.5	16/06/2007	Lucerne	23	Phalaris	0.0
Site10e	Nullawil	8.8	16/06/2007	Lucerne	28	Cocksfoot	79.5
Site11*	Donald	14.7	14/06/2007	Lucerne	9	Phalaris	7.2
Site12*	Tchum Lake	16.3	16/06/2007	Lucerne	0	Fescue	0.0
Site13	Tchum Lake	15.2	TBS	Saltbush	-		
Site14a	Jil Jil	10.4	20/06/2007	Fescue	126		
Site14b	Jil Jil	10.0	20/06/2007	Phalaris	38		
Site15	Berriwillock	30.1	20/06/2007	Lucerne	30.1	Peas	
Site16	Kinnabulla	10.4	13/06/2007	Lucerne	28	Cocksfoot	76.8
Site17	Narraport	8.0	12/06/2007	Lucerne	29		
Site18	Charlton	7.7	20/06/2007	Lucerne	23	Chickory	6.6
Site19	Morten Plains	17.3	2006	Phalaris	13		
Site20	Morten Plains	14.8	TBS	Panic	TBM		
Site21	Hopetoun		2003	Lucerne	TBM	Barley	TBM
Site22	Corack East	11.5	2005	Saltbush	TBM		

** Failed establishment in 2006 and re-sown in 2007; TBM – to be monitored*

The 2006/07 summer/autumn period was exceptional wet at this site, with 240mm of rainfall falling in the period Jan – May. Significant differences occurred for biomass production between the varieties (Table 3). Production varied from 4504kg/ha for Petrie to zero for some varieties which either failed to establish (Swann) or failed to survive the summer months (Marc). Differences in sowing rate did not result in differences in dry matter production, despite higher plant numbers and more even

than pasture stands at the higher sowing rates. Given the relatively high cost of seed ($20 per kg for Gatton), the lower seeding rate would be recommended at this stage, pending further results.

Table 3: Plant counts (13 March 2007) and dry matter production recorded at plant senescence (29 May 2007) for subtropical grasses sown at two sowing rates (3, 6kg/ha) at Hopetoun in November 2006.

Species	Variety	Plant Counts (plants/m^2)		Dry Matter (kg/ha)		Mean
		3kg/ha	6kg/ha	3kg/ha	6kg/ha	
Panicum maximum	Gatton	142	204	2796	1988	2392
Panicum maximum	Petrie	177	250	4540	4468	4504
Panicum coloratum	Bambatsi	177	209	1119	903	1011
Panicum coloratum	ATF-714	171	229	793	681	737
Digitaria milanjiana	Strickland	193	275	1180	1667	1423
Bothriochloa bladhii ssp. glabra	Swann	0	0	0	0	0
Desmanthus virgatus	Marc	121	138	0	0	0

** Analysis of variance was performed using transformed data (not presented), where variety differences were significant at P<0.001 but differences between sowing rate were not statistically significant.*

Subtropical pastures become dormant over winter (with the onset of frost events) and regenerate in spring once moist soil reach temperatures of 18°C or greater in the topsoil (0-10cm depth). Pasture dormancy over the winter months ensures that moisture can be stored in the soil profile until they regenerate in spring.

Figure 1: Gatton panic at Hopetoun in April 2007

Figure 1b. Gatton panic flowering

Commercial practice

Perennial pastures have many benefits to farming systems in the Wimmera Mallee. Some of these benefits include filling the feed gaps that exist in the livestock/cropping systems, providing an alternative option for resistant weed management, and reducing groundwater recharge (hence reducing salinity through the more effective use of summer rainfall). However, two of the challenges to growing successful perennial pastures are the establishment phase and weed control.

Establishment success is unreliable in the Mallee environment, particularly on heavy soil types, due to the frequency of dry spring conditions. For successful establishment it is essential that weeds are controlled prior to commencing the pasture phase; that is, weed control commences in the season(s) prior to sowing the pasture. Annual grasses and broadleaf weeds are highly competitive against the slow growing and establishing perennial species. Delaying the time of sowing to ensure acceptable control on these weeds would dramatically increase the likelihood of the perennial establishing. Whilst there are opportunities for controlling grass weeds in lucerne, and lucerne can be used as a means of managing resistant grasses), the options for in-season control of grass weeds in the perennial grass pastures is limited, especially in the year of establishment.

Establishment success can also be improved through the use of press-wheels, which are a great water harvesting tool to improve germination and establishment, and should be used in preference to seed broadcasting and harrowing.

Subtropical grasses provide an alternative to the more traditional perennial pasture species, but should be viewed as strictly experimental and opportunistic at this stage. Successful establishment is highly dependent on good late spring/early summer rainfall; with seed costs of approximately $60 per ha (for a 3kg/ha sowing rate), there are clear financial risks in the establishment year. Decisions on sowing should take into consideration the amount of subsoil moisture coming out of the winter period, the summer weed seed bank in the paddock, soil temperature (greater than 18ºC) and the seasonal forecasts for the summer months, with a wetter than average period being required.

Grazing management guidelines are provided in the Prograze Reference Manual. Perennial pasture species ideally should be rotationally grazed; hence paddock size needs to be considered, with large paddocks probably not suitable unless temporary fences can be erected. If dry matter production is below approximately 400kg/ha for leguminous and below 600kg/ha for non-leguminous pastures, dry sheep will not maintain condition. 500kg/ha. Some new skills need to be learnt to successfully manage perennial pasture species, including an ability to estimate the carrying capacity (carrying period) of the different perennial pasture species and the intensity of grazing that the species can successfully endure. This project will be addressing these issues in 2008, the final year of the project.

For growers considering perennial species and/or woody scrubs then Lucerne and saltbush are probably the most reliable options, with Lucerne best suited to the better soil types (Lucerne is relatively salt sensitive) and saltbush best able to cope with the poorer soils. Saltbush is an option for unproductive land and can be used to fill feed gaps (eg immediately prior to the availability of stubbles, autumn period) but may require the use of supplementary feeding if weight gain is required or ewes are being prepared for joining. Like the other perennial species, saltbush is most productive if rotationally grazed.