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Section 6

Livestock

The Impact of Livestock on Paddock Health

Roy Latta and Jessica Crettenden
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RESEARCH

Searching for answers

Location: Minnipa Ag Centre
Rainfall
Av Annual: 325 mm
Av GSR: 242 mm
2010 Total: 410 mm
2010 GSR: 346 mm
Pasture Dry Matter Production
Potential: 10 DM t/ha
Actual: 4.9 DM t/ha
Paddock History
2009: Wheat
2008: Wheat
Soil Type
Red sandy loam
Soil Test
Organic C%: 1.18
Phosphorus: 22.8 mg/kg
Plot Size
8 sowing widths across paddock
Yield Limiting Factors
Nil
Livestock
Enterprise type: Self replacing merinos
Stocking rate: Rotational grazing and District practice
Environmental Impacts
Soil Health
Soil structure: Stable
Compaction risk: Plus and minus grazing treatments
Ground cover or plants/m^2: Grazed to 2 t/ha pasture residue
Perennial or annual plants: Annual
Grazing Pressure: High (8 DSE/ha) and medium (3 DSE/ha)

Key messages

- **The high input pasture treatment provided the opportunity to carry 8 DSE/ha with an estimated gross margin of $240/ha, however it was unable to utilise plant available water above 50% of potential water use efficiency (WUE).**

Why do the trial?

A well run mixed farming enterprise of cropping and livestock can be as profitable as a continuous cropping business for most districts across Eyre Peninsula, but carries less risk, as shown by a profitability analysis in the Eyre Peninsula Grain & Graze and Farming Systems projects. However, as livestock graze they remove large amounts of plant biomass which would otherwise have been ground cover then decomposed into the soil and thus contributed to the carbon pool.

In high rainfall areas the benefits of retaining stubble have been shown to improve soil carbon levels and microbial health. In low rainfall areas stubble retention helps reduce erosion and can help plant establishment in poor moisture conditions at sowing, but in an environment where biomass production, soil moisture and microbial activity levels are lower, a clear relationship with soil health is still to be established. Value adding to stubbles by grazing is usually regarded to be of greater economic value.

A broadacre trial was established on Minnipa Agricultural Centre (MAC) to test whether soil health and fertility can be improved under a higher carbon input system with or without grazing. This system is being compared against a more traditional ley (low input grazed) system, as well as a low input ungrazed system.

How was it done?

Paddock South 7 on MAC was divided into 4 x 3.5 ha sections prior to seeding in 2008 (Figure 1). Traditional ley system - grazed (A), Traditional ley system – ungrazed (B), High carbon input system – ungrazed (C) and High carbon input system - grazed (D). Sampling (soil, plant and grain) is carried out at 4 set points in each section. Refer to EPFS Summary 2009, pg 118 for 2008 and 2009 treatments and data collected.

Water Use:
Runoff potential: Low
Resource Efficiency:
Energy/fuel use: Standard
Greenhouse gas emissions (CO_2, NO_2, methane): Cropping and Livestock
Social/Practice
Time (hrs): No extra
Clash with other farming operations: standard practice
Labour requirements: Livestock may require supplementary feeding and regular checking
Economic
Infrastructure/operating inputs: High input system has higher input costs
Cost of adoption risk: Low

In 2010 there was a pasture phase imposed on all the treatments, initially the stubble on plots A and D were grazed from 24 to 31 March. Soil chemical analysis and water use efficiency estimates were made from soil water content (SWC) measurements collected on 23 March and 24 November (SWC only). Annual medic (Angel @ 5 kg/ha with 30 kg/ha of DAP) was sown on 22 April on Plots C and D, the high carbon input ungrazed and grazed sections respectively. Further grazing of plots A and D occurred from 16 to the 30 August and then 23 November to the 14 December. Biomass production figures were collected pre and post all grazing events. Medic seed pods were collected, processed and seed yields estimated pre and post the November – December grazing event. Selective chemical grass control was applied to all treatments.

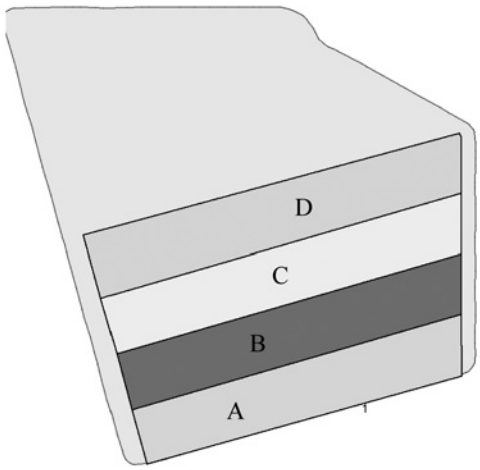

Figure 1 Paddock plan, South 7 MAC

What happened?

2010 was the third year of the trial and the first with a pasture phase.

Table 1 presents the chemical soil analysis, soil water content (SWC), biomass production and the estimated water use efficiency (WUE) of the 4 treatments.

Organic carbon percentage has not increased from the 2008 site mean of 1.2 and 0.6% in the 0-10 and 10-60 cm soil profiles respectively. Treatments did not use the available soil water and with 345 mm April-October growing season rainfall (an estimated 230 mm of plant available water) biomass and WUE figures were relatively low, however 55 mm in late October coincided with the onset of senescence of the annual medic.

Table 1 Organic carbon, soil water content, total biomass production and estimated WUE in 2010

System	Organic C (%)		SWC (mm 0 - 60 cm)		Biomass	WUE
	0-10 (cm)	10-60 (cm)	Mar 2010	Nov 2010	DM t/ha	kg DM/ha of PAW
Traditional ley system - grazed (A)	1.1	0.6	27	40	1.8**	
Traditional ley system - ungrazed (B)	1	0.5	21	38	3.9	17
High input system - ungrazed (C)	1	0.6	24	32	4.9	21
High input system - grazed (D)	1.2	0.5	23	36	3.8**	

** WUE, water use efficiency figures take into account 345 mm of growing season rainfall and soil water content in March and November.*
*** WUE was not calculated as no physical measurement of biomass loss due to grazing was made.*

Table 2 Comparative maintenance of plant residues over 12 months in response to grazing and pasture inputs, and livestock grazing days over the three March, August and November/December grazing periods

System	Plant residue (t/ha)		DSE grazing days			
	Dec 2009	Dec 2010	Mar 2010	Aug 2010	Nov 2010	Annual DSE/ha
Traditional ley system - grazed (A)	2.9	2.1	200 [a]	120 [c]	750 [e]	3
Traditional ley system - ungrazed (B)	3.5	3.1				
High input system - ungrazed (C)	4.7	4.2				
High input system - grazed (D)	3.6	3.3	200 [b]	1200 [d]	1500 [f]	8

[a]40 days grazing with 5 sheep @ 1 DSE, [b]14 days grazing with 28 sheep @ 1DSE, [c]14 days grazing with 7 sheep @ 1.2 DSE, [d]14 days grazing with 70 sheep @ 1.2 DSE, [e]21 days grazing with 24 sheep @ 1.5 DSE and [f] 21 days grazing with 48 sheep @ 1.5 DSE

What does this mean?

The 2010 pasture phase has resulted in a lower crop residue carryover than 2009 and was unable to utilise plant available water above 50% of potential water use efficiency irrespective of treatment; plus or minus grazing, improved sown annual medic or a self regenerating pasture, however reducing the available water by the 55 mm late October event, which coincided with the onset of senescence of the annual medic and may not have been available. If that was the case the WUE figure would increase to above 60% of potential.

The 2010 high input pasture production treatment provided the opportunity to carry 8 DSE/ha with an estimated gross margin of $30/DSE, $240/ha from grazing.

Over the next 3 seasons measurements will be continued to be carried out to assess any changes to soil or crop performance in the farming systems, followed by financial assessment to evaluate the merits of each system.

Acknowledgements

We gratefully acknowledge the help of Mark Klante, Trent Brace and Brett McEvoy for their assistance.

Livestock

Forage Crops for Grazing at MAC 2010

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RESEARCH

Searching for answers

Location: Minnipa Ag Centre
Rainfall
Av Annual: 325 mm
Av GSR: 242 mm
2010 Total: 410 mm
2010 GSR: 346 mm
Paddock History
2008: Wheat
2009: Wheat
Soil Type
Red sandy loam
Plot Size
20 x 1.5 m x 3 reps
Yield Limiting Factors
Nil
Environmental Impacts
Soil Health
Soil structure: High organic carbon
Compaction risk: Low to medium
Social/Practice
Time (hrs): Sowing pre normal seeding
Clash with other farming operations: Standard management
Labour requirements: Labour to shift sheep
Economic
Infrastructure/Operating inuts: Grazing benefits requiring electric fence, portable trough
Cost of adoption risk: Low

Key messages

- **Simulated grazing up to early tillering on cereals caused only a minor reduction in grain yield.**
- **There are broad leaf field crop alternatives, forage peas and vetch, that as a monoculture or as component of a cereal or oilseed mixture can increase total (anthesis) biomass production.**
- **There are further opportunities to develop farming systems around the multipurpose break crops on upper Eyre Peninsula.**

Why do the trial?

Increasing variation in rainfall patterns may require consideration of multi purpose crops for mixed farming systems. There are a range of alternative field crops that may produce more biomass than current wheat cultivars and can provide options in terms of enterprise diversification, i.e. grazing/stored forage/grain or sometimes combinations of all three.

The aim of this trial is to provide data to assist in decision making when planning to use a field crop as a potential resource for grazing, hay and/or grain based on seasonal conditions, while in some cases utilising the benefits of a break crop within the cropping rotation.

How was it done?

In paddock North 12 on Minnipa Agricultural Centre, field crop varieties (species, varieties and sowing rates are listed in Table 1) were sown into 20 x 1.5 m plots replicated 3 times on 31 May. Sowing rates were adjusted to establish 150 plants/m^2 of cereals, 75 of pulses and 50 of canola. DAP @ 60 kg/ha was applied at seeding, no further fertiliser or weed control was applied.

Plant counts, early biomass production and simulated grazing on 1 replicate (mowing) was carried out on 5 August and biomass production measurements were repeated on 28 September (approximately at anthesis) with grain harvest completed on 3 December from both the mown and unmown plots.

What happened?

Established plant numbers were 10 – 20% below targeted density. The barley and the forage pea produced the highest early biomass production, the winter wheat, Naparoo, canola and vetch the lowest. At anthesis the vetch oat and vetch canola mixtures produced the highest biomass yield, the winter wheat the lowest. Grain yield from the barley was highest, the vetch and canola lowest. Grain yield following mowing in August was similar to the unmown plots in the wheat, barley and oats, and was reduced by the greatest amount in the triticale, forage pea and barley.

Table 3 presents the estimated gross margins from sowing cereals for grazing, cutting hay or grain recovery in good seasonal conditions.

What does this mean?

The study has evaluated a range of crops that can provide both a risk management strategy in a mixed farming enterprise along and in some cases with a disease break and N input in the rotation. It has supported previous studies with cereals that have shown that grazing into early tillering on cereals will have only a limited impact on grain yield. These results were enhanced by 350 mm of growing season rainfall (66, 68 and 72 mm in August, September and October respectively).
This study has also shown that there are broad leaf alternatives, forage peas and vetch, that as a monoculture or as component of a cereal or oilseed mixture can increase total (anthesis) biomass production. The results suggest that there are further opportunities to develop farming systems around the multipurpose break crops on upper EP.

Table 1 Field crops sown and sowing rate (kg/ha)

Crop	Variety	Sowing rate (kg/ha)
Wheat	Naparoo & Gladius	50
Barley	Barque	50
Oats	Wintaroo	50
Triticale	Rufus	70
Canola	Tarcoola	4
Forage Peas	Morgan	70
Vetch	Blanchefleur	16
Oats + Forage Peas	Wintaroo + Morgan	25 + 35
Oats + Vetch	Wintaroo + Blanchefleur	25 + 8
Canola + Vetch	Tarcoola + Blanchefleur	2 + 8

Table 2 Plant establishment (plants/m²), Zadocks growth stages on 5 August and biomass production (DM t/ha) on 5 August and 28 September, and grain yield (t/ha) in 2010

	5 August			28 September	Not mown	Mown
Variety	plants/m²	Zadocks GS	DM t/ha	DM t/ha	Grain Yield (t/ha)	
Naparoo	130	1/5 - 2/5	0.4	1.9	2.9	2.6
Gladius	122	1/6 - 2/2	0.6	3.9	2.7	2.4
Barque	133	1/6 - 2/2	1.0	4.5	3.4	2.7
Wintaroo	126	1/5 - 2/4	0.7	5.3	2.6	2.6
Rufus	125	1/6 - 2/1	0.7	5.4	2.9	1.8
Tarcoola	38	7	0.4	3.9	0.8	0.6
Morgan	64	10	0.9	3.6	2.8	1.9
Blanchefleur	69	6	0.5	5.4	1.6	1.6
Wintaroo + Morgan	102		0.7	5.3	2.8	2.5
Wintaroo + Blanchfleur	106		0.6	7.7	2.7	2.5
Tarcoola + Blanchfleur	60		0.7	6.7	2.5	2.2
LSD (P=0.05)			*0.2*	*3.1*	*0.7*	

Table 3 Gross margin ($/ha) estimates from each component of the multipurpose enterprise

	[a]5 August ($/ha)	[b]28 September ($/ha)	[c]Unmown grain yield ($/ha)	[d]Mown grain yield ($/ha)
Naparoo	16	-107	603	528
Gladius	24	39	559	458
Barque	40	88	538	402
Wintaroo	28	148	302	297
Rufus	28	153	319	158
Tarcoola	16	42	274	124
Morgan	36	21	278	148
Blanchefleur	20	204	102	100
Wintaroo + Morgan	28	146	277	243
Wintaroo + Blanchfleur	24	400	266	231
Tarcoola + Blanchfleur	28	319	231	184

[a] Grazing value was calculated by multiplying the DSE (based on 1 kg DM/DSE/day) by $30 (gross margin/DSE) and dividing by proportion of year.
[b] The 28 September hay production gross margins are based on collecting 65% of total available biomass with a $115-130/t value and $249/ha variable costs.
[c] Grain value calculated as $250/t wheat, $194/t barley and $150/t oats, triticale and all feed grains (forage peas, vetch and mixtures), and $535 canola with total variable costs from Farm Gross Margin Guide.
[d] The mown grain yield figures represent only 1 replicate and should be treated with caution.

Livestock

Enrich - Identifying Forage Shrub Options for Eyre Peninsula

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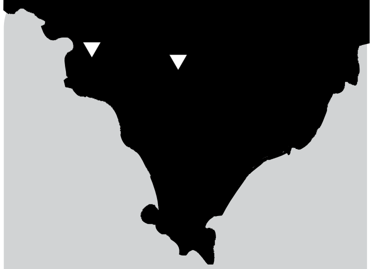
Searching for answers



Location: Minnipa Ag Centre
Rainfall
Av Annual: 325 mm
Av GSR: 242 mm
2010 Total: 410 mm
2010 GSR: 346 mm
Paddock History
2008: Wheat
2009: Wheat
Soil Type
Red sandy loam

Location: Piednippie
Tim and Trecina Hollitt
Rainfall
Av Annual: 379 mm
Av GSR: 305 mm
2010 Total: 456 mm
2010 GSR: 377 mm
Soil Type
Grey calcareous sandy loam

BOTH SITES
Plot size
Plant spacing 2 metres within rows and 3 metres between rows
Environmental Impacts
Soil Health
Soil structure: Stable
Compaction risk: Nil
Ground cover or plants/m^2: Forage shrubs
Perennial or annual plants: Perennial
Grazing Pressure: Nil
Water Use
Runoff potential: low
Resource Efficiancy
Energy/fuel use: Standard
Greenhouse gas emissions (CO_2, NO_2, methane): Cropping and livestock
Social/Practice
Time (hrs): Extra livestock management
Clash with other farming operations: Standard management
Labour requirements: Livestock will require feed rotation or supplementry feeding and regular checking
Economic
Infrastructure/Operating inuts: High cost of establishment
Cost of adoption risk: Low

Key messages

- **Trials of potential new fodder shrub species at Minnipa and Piednippie have shown generally strong establishment and early growth.**

Why do the trial?

There are opportunities on Eyre Peninsula for a more resilient crop-livestock system that allows for a highly flexible cropping program whilst maintaining a substantial livestock enterprise. Often this involves finding ways to gain greater grazing value and a more reliable forage base from soils that can be marginal for cropping. This has led to an interest in research that is aimed at identifying better perennial species than what is already available in low rainfall areas.

How was it done?

Fifteen species of perennials (Table 1) were planted at Minnipa as tubestock in July 2009, after the sites were deep ripped (30-50 cm deep) and weeds chemically controlled. Fourteen of the 15 species were planted in monoculture, and *Convulvulus remotus* (Pink Bindweed) was planted as a mixture with *Atriplex nummularia* (Old Man Saltbush). Each species was planted in plots of 36 seedlings, with each species replicated 4 times to account for soil, weed and germplasm variation across the site. The site was not grazed in 2010 to allow the shrubs time to establish. In autumn 2011 livestock will be introduced to both sites to quantify shrub performance under grazing. Ongoing measurements (Table 2) over the life of the trial will monitor shrub survival and growth. The Piednippie site was also established in 2009 using similar methods and includes mostly similar species (Table 1).

What happened?

Measurements taken at both sites have shown that *Atriplex nummularia* has been the fastest growing shrub, with good establishment and survival. However the biomass production results give advantage to the taller shrubs with the height x width x depth calculation used. A width x depth x height calculation would benefit the ground cover types such as *Atriplex semibaccata* (Creeping Saltbush).

What does it mean?

Measurements of shrub survival and growth will continue next year at Minnipa and Piednippie with livestock to be introduced to the site and more meaningful data of shrub performance under grazing will be collected. Grazing preferences by sheep for the different shrub species will also be assessed. This is an important consideration since diet selection by animals can tell us about nutritional and 'extra-nutritional' effects of plants that we cannot easily measure in the laboratory. Assessments of conventional forage quality will also be conducted and together with the survival and growth data, will provide more conclusive information on which to base forage shrub selection for the Eyre Peninsula environment. Shrub size and its early growth performance are important traits, but are not the only criteria to be considered when including new forage species into grazing systems.

Acknowledgements

We gratefully acknowledge the help of Tim and Trecina Hollitt for the opportunity to use their site for the project and the EPNRM for their assistance.

Table 1 Botanical and common names of the forage shrub species planted at the Minnipa and Piednippie Enrich field trials in 2009

Botanical Name	Common name/s	Location
Atriplex amnicola	Swamp Saltbush/River Saltbush	Both
Atriplex cinerea	Grey Saltbush/Coastal saltbush	Piednippie
Atriplex nummularia	Old Man Saltbush	Both
Atriplex nummularia / Convulvulus remotus	Old Man Saltbush + Pink Bindweed	Minnipa
Atriplex paludosa	Marsh Salt Bush	Piednippie
Atriplex rhagodioides	Silver Saltbush	Both
Atriplex semibaccata	Creeping Saltbush	Both
Chameacytisis prolifer	Tree Lucerne	Both
Chenopodium nitrariaceum	Nitre goosefoot	Both
Enchylaena tomentosa	Ruby Saltbush	Both
Eremophila glabra	Emu Bush/Tar Bush	Both
Eremophila maculata	Spotted Emu Bush	Piednippie
Medicago strasseri	Tree Medic	Both
Rhagodia crassifolia	Fleshy Saltbush	Both
Rhagodia parabolica	Fragrant Saltbush/Mealy Saltbush	Both
Rhagodia preissii	Mallee Saltbush	Both
Rhagodia spinescens	Thorny Saltbush	Both

Table 2 Plant establishment and survival from an initial 36 tubestock and average biomass production (average individual plant height x width x depth/100) at Minnipa and Piednippie

	Plant establishment and survival				Biomass production	
Minnipa	12 Nov 09	4 Feb 10	7 Apr 10	29 Oct 10	7 Apr 10	29 Oct 10
Atriplex amnicola	32	34	33	32	529	447
Atriplex nummularia	35	35	35	35	936	2776
Atriplex rhagodioides	36	36	36	31	499	1717
Atriplex semibaccata	22	20	22	15	219	159
Chameacytisis prolifer	34	33	34	10	6	93
Chenopodium nitrariaceum	29	30	28	27	156	412
*Convulvulus remotus**	16	14	mv	7	mv	mv
Enchylaena tomentosa	30	29	29	29	80	185
Eremophila glabra	31	23	24	16	16	51
Eremophila maculata	12	5	4	2	4	10
Medicago strasseri	26	27	27	23	6	87
Rhagodia crassifolia	22	21	24	19	36	292
Rhagodia parabolica	31	32	32	32	155	891
Rhagodia preissii	24	26	27	25	132	786
Rhagodia spinescens	35	35	35	34	125	703
	Plant establishment and survival				**Biomass production**	
Piednippie	1 Nov 09	21 Jan 10	3 Apr 10	31 Oct 10	3 Apr 10	31 Oct 10
Atriplex amnicola	31	31	31	31	271	305
Atriplex cinerea	31	27	29	20	100	322
Atriplex nummularia	36	36	36	35	272	1711
Atriplex paludosa	35	35	35	35	57	197
Atriplex rhagodioides	36	36	36	36	91	536
Atriplex semibaccata	32	31	31	27	217	286
Chameacytisis prolifer	36	34	34	6	5	30
Chenopodium nitrariaceum	26	25	29	17	3	184
Enchylaena tomentosa	35	34	34	31	37	101
Eremophila glabra	34	27	26	21	14	71
Medicago strasseri	29	26	28	25	14	121
Rhagodia crassifolia	26	25	26	22	18	154
Rhagodia parabolica	35	35	35	32	36	219
Rhagodia preissii	32	32	32	30	120	751
Rhagodia spinescens	36	35	35	27	62	163

* *Convulvulus remotus* growing with *Atriplex nummularia.*

Evaluation of Perennial Forage Legumes on Eyre Peninsula

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RESEARCH

Key messages

- **The evaluation of alternative perennial legume forages has commenced at 4 sites on EP in 2010.**
- **The production and persistence of Tedera, Cullen and Sulla are being compared to Lucerne.**

Why do the trial?

The use of perennial legumes on Eyre Peninsula is largely restricted to lucerne which is not well adapted to shallow constrained soils common across much of the region. However the benefits of a perennial legume phase within an intensive cropping system for soil rehabilitation and economic weed management is well documented.

As part of a national program to identify alternative perennial legumes to lucerne suitable for incorporation within cropping systems, there are possibly at least 3 options adapted to areas within the Eyre Peninsula environment.

Research in South Australia has shown Sulla *(Hedysarum coronarium)* to be a highly productive, short lived perennial/biennial legume. The individual plants live for 2-3 years, but it will regenerate readily from seed. It is used for grazing or hay production and contains condensed tannins that make it bloat-safe, increase protein digestion and make Sulla less attractive to insects. These tannins also provide a reputed anthelmintic effect which may reduce worm and nematode burdens. Sheep grazing Sulla have been recorded to have less dags, considered to be a result of the tannin content.

Western Australian research is suggesting that *Bituminaria bituminosa var albomarginata,* or Tedera, as it is more commonly known in its native Canary Islands, has the potential to offer a solution to lucerne's shortcomings in Australian farming systems. Lucerne may survive summer drought by its deep roots accessing a water supply and decreasing evaporation by shedding its leaves. The result of this on many EP soils is that fodder quality is lost with the dropping of the leaves and often the plant dies in the more constrained, shallow soils. Tedera is shallow-rooted and reputedly it is very drought tolerant and does not drop its leaves.

The third option *Cullen australasicum*, a native perennial legume, has been as persistent and productive as lucerne in studies to date. These results suggest that Cullen species will have adaptations to both survival and productivity traits that make them suitable for use or further development as perennial pastures in a low rainfall, Mediterranean climate.

These 3 genera briefly described above were considered worthy of evaluation to compare to lucerne at a range of Eyre Peninsula sites in 2010.

How was it done?

Six lines of forage perennials (Lucerne 1, Sulla 1, Tedera 3 and Cullen 1) were established at four Eyre Peninsula sites in 2010 to represent four rainfall and soil type regions; Minnipa (325 mm), Rudall (350 mm), Edillilie (400 mm) and Greenpatch (450 mm). Soil types varied from calcareous sandy loam to slightly acidic, shallow duplex.

The trials were hand sown in 3 x 2 m plots; Minnipa 2 June, Edillilie 22 July, Rudall 30 July, then resown on 18 September and Greenpatch 11 October. There were 4 replicates sown at Minnipa but only 2 at the other three sites due to a seed supply constraint.

What happened?

More than 400 mm of 2010 rain at Minnipa established all perennials and allowed up to 3 biomass samplings (Table 1). At Rudall insects devastated initial emergence, however a total of almost 500 mm rain allowed plots to be resown quite late in the season, resulting in low established plant densities (Table 1). The wet winter/spring conditions at Edillilie (annual total of almost 600 mm) and Greenpatch (annual total of almost 700 mm) resulted in the waterlogging of newly emerged seedlings at Edillilie and the deferment of the establishment at Greenpatch until 11 October.

Table 1 Plant establishment (plants/m²) and total biomass (DM t/ha) at the four forage perennial sites sown in 2010

	Minnipa		Rudall	Edillilie		Greenpatch
	(plants/m²)	(DM t/ha)	(plants/m²)	(plants/m²)	(DM t/ha)	(plants/m²)
Tedera 27	17	1.3	5	9	0.6	9
Tedera 37	12	0.8	4	5	0.6	8
Tedera 42	10	1.2	4	6	0.9	7
Lucerne	10	4.1	3	8	1.0	6
Cullen	24	2.2	7	5	0.2	18
Sulla	15	4.1	4	21	3.4	17

Dry matter production was measured at 10% flowering of the individual trial entries. This resulted in Lucerne being sampled 4 times (27 October, 24 November, 18 December 2010 and 12 January 2011), Cullen was sampled 3 times, on all but the 18 December, Sulla twice (27 October and 24 November) and all 3 Tedera lines only once (24 November). Sulla and Lucerne produced highest production in the year of establishment at Minnipa, however Cullen established the most plants.

Low numbers of plants established at Rudall with late sowing date did not allow any measurable biomass production. At Edillilie increased densities of Sulla, in extended waterlogged conditions, was reflected in higher biomass production compared to other entries. At Greenpatch establishment was delayed due to waterlogged conditions and only very preliminary establishment measurements were taken in 2010.

What does it mean?

In support of previous documentation, trial indications are that Sulla will produce large amounts of biomass during the spring period in "wet" conditions, but will become dormant in the summer. Lucerne continues its productivity in conditions of adequate water availability, as has been the case in spring and early summer 2010. The Tedera has established well, albeit at relatively low numbers, and while its production and growth has been slow, compared to lucerne, the trial requires a long dry period to ascertain any benefits in persistence it may have over lucerne, especially on constrained soils. The Cullen established in reasonable numbers and being a native is seemingly adapted to a Mediterranean climate and therefore should persist over the summer/autumn period.

Both the Tedera and Cullen are only partially developed lines and as such will continue to be progressed through an intensive selection process in terms of establishment, management, persistence and animal production issues. However, these trials will give some indication as to the potential role of "improved" lines of these pasture species in the EP environment and farming systems.

Acknowledgements

Plots with Matthew Dunn at Rudall, Shane Nelligan at Edillilie and Arnd Enneking at Greenpatch.

Benchmarking the Genetic Potential of Sheep Flocks on Eyre Peninsula

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RESEARCH

Key messages

- **The Minnipa self replacing merino flock is being included in the national "Sheep Genetics" database with the aim to provide Eyre Peninsula sheep producers with a benchmark to judge their flock performance at a national level.**

Why do the trial?

For sheep breeding in Australia, there is a national database run by "Sheep Genetics" and two performance recording schemes "LAMBPLAN" and "MERINOSELECT" that evaluate the genetic merit of stud stock based on Australian Sheep Breeding Values or ASBVs. ASBVs can be used to compare the genetic merit of animals irrespective of where they are run in Australia.

The ongoing plan is to include the Minnipa flock within the program to help:

- educate ram buyers of the merits of ASBVs so they seek out, and buy rams from, breeders that are members of Sheep Genetics "LAMPLAN" or "MERINOSELECT".
- encourage more breeders to become members of Sheep Genetics "LAMPLAN" or "MERINOSELECT" and to offer ASBVs on sale rams.
- encourage more breeders to use ASBVs when buying stud sires or semen.

How was it done?

In 2010 we commenced, with the Minnipa sheep flock, to demonstrate that:

"a combination of visual selection and measurement can be used to breed a fast growing, plain bodied animal, with good constitution, conformation and wool quality while maintaining, or improving, fleeceweight and fibre diameter. It is envisaged that the flock can be successfully managed without the need for mulesing".

The flock is to be fully pedigreed, with both ewe and wether progeny measured for bodyweight, fleeceweight and fibre diameter. Wether progeny will be sold at 10-12 months of age. Ewe hoggets will be visually classed before being admitted into the breeding flock.

The first 2 matings, 2010 and 2011, will be used to benchmark the flock and assess traits that may need improving. In each year existing rams will be used, supplemented with 2 rams from the Turretfield flock to provide genetic linkage.

In subsequent years rams will be purchased from local Eyre Peninsula studs on the basis of visual assessment and ASBVs, concentrating on traits identified as important in the flock's breeding objective.

Once the genetic potential of the Minnipa flock has been benchmarked within the Sheep Genetics MERINOSELECT database it is possible that the flock could be used to benchmark other flocks, bloodlines or breeds on Eyre Peninsula.

What happened?

In 2010 the 2009 ewe hoggets were assessed both visually and through objective measurement to assist selection, results are presented in Table 1.

The MAC flock of 316 ewes were single sire mated in 8 randomly selected groups of approximately 40 ewes from February with each lamb subsequently identified to a specific ram and ewe. The performance of the eight rams in respect to lambing weights (July/August drop), lambing percentage weaned (mid-November) and weaning weights is presented in Table 2.

Table 1 September 2010 average, maximum and minimum greasy fleece weight (kg), fibre diameter (µm) and body weight (kg) of 115 2009 drop ewe hoggets at 15 months of age with 11 months wool growth, sown in 2010

Greasy fleece weight (kg)	Fibre diameter (µm)	Body weight (kg)	Visual Culls (%)
5.1 (3.3 - 7.5)	17.5 (14.4 - 21.5)	63 (40 - 71)	30

Table 2 Average birth and weaning weight (kg), and percentage lambs weaned (%) from the eight single sire mating groups.

Group	Birth weight (kg)	Weaning weight (%)	Weaned percentage (%)
1	6.0	32	110
2	6.2	30	118
3	6.5	30	116
4	8.7	33	78
5	5.7	30	92
6	6.3	27	118
7	6.6	33	103
8	5.8	28	129
Average	6.4	30	117

What does it mean?

There is a wide variation in the production performance of the 2009 drop hoggets that was addressed with a 30% culling rate that included a mix of visual and objective measurement.

We have collected initial measurements from the 2010 drop lambs. Further bodyweight gain over summer and wool quality and quantity in June measurements will be collected after which the wethers and culled ewes will be sold.

Acknowledgements

Trent Brace for his livestock management support and MAC staff Brett, Naomi and Linden for support in the shed and sheep yards.

SARDI

SOUTH AUSTRALIAN RESEARCH AND DEVELOPMENT INSTITUTE

A Review of Sheep Management in 2010

Brian Ashton
Sheep Consultancy Service Pty Ltd, Port Lincoln

INFORMATION

Key messages

- **The sheep business is now completely different to what most people are used to.**
- **Sheep prices doubled in 2000 and have now doubled again (approximately).**
- **Wool prices are approaching what they were in 1988 – in US$ terms.**
- **Sheep sales now earn more than wool, but wool is still a major income earner in most flocks.**

Background

The year of 2010 has been a steep learning curve for many sheep producers. After many frustrating years, sheep are now really earning their place on the farm. We have not experienced returns like this since the wool boom year of 1988. Farmers who have been on the farm less than 22 years are in completely new territory.

Now is an ideal time to completely review your approach to the sheep enterprise.

What was done?

Four farmer groups on Eyre Peninsula attended the FarmReady workshops "Sheep planning to reduce farm risk". These farmers discussed the key things that affected the profitability of their enterprise. They realize that to make the most of the current good times they may need to do things very differently to what they have done in the past.

What we found out

Together with the change in returns, good seasons also bring some problems with sheep management and 2010 was no different.

Most people are spending time and money drenching sheep. But, to manage worms on your farm, the first step is to WORMTEST at least the weaners (before they are drenched). This is a measure for how the worm control program for your whole flock is going.

Ten farmers with good WORMTEST results indicated they have a good control program (or were lucky). They averaged 90 strongyle eggs per gram of dung. The best result was from sheep that had been drenched 18 months earlier and still had zero eggs.

Twelve farmers had high WORMTEST results. It is really good that these people tested or they would have had a severe worm problem (some did). They averaged 1,400 eggs per gram. The highest results were two lots of lambs and a mob of ewes with 2,400 to 3,400 eggs per gram.

Sheep usually suffer some production loss above 250 eggs per gram – although sheep in good condition can tolerate more worms.

People also need to rotate between drench groups and use the best drench available in the group chosen.

Mineral deficiencies, flystrike, foot abscess and lupinosis are all issues in wet years. Successful farmers attend to these issues before they cost time and production loss.

In good seasons everyone can carry more stock. However, the real test is how many you can carry in the poor years. In good years it is worth thinking about how you will cope with the next dry one because it will creep up on us. Preparation makes all the difference.

Several group members conducted FEEDTESTS on pasture. The results confirm that rank pasture is lower in quality and short rapidly growing pasture is higher in quality.

The best FEEDTEST was of Tall wheat grass, which is often not a high quality feed. This was short, rapidly growing pasture and was 31.6% protein and 12.7 MJ of energy. This compares to a test of pure medic that was about 30 cm high. It had 30% protein and 10.7 MJ of energy. Of course, the medic stand has other benefits to the farm system such as self regeneration, nitrogen fixation and as a disease break.

One farmer had a paddock of vetch to finish his lambs on. From past experience the 900 lambs would have lasted about three weeks on the paddock. Instead an electric fence was used and the area was strip grazed. The lambs were allowed about 3 ha at a time and the fence was moved twice a week.

The farmer's comment was the result was "unreal". About double the expected grazing was achieved. The fence took about 20 minutes to move with the use of a "Rappa" unit on the back of a four wheel motorbike.

Electric fencing can dramatically improve pasture utilization. There are many excellent units available, from small solar powered units to large, mains powered units.

Economics

Returns from sheep are good but how good? You need to calculate how much you are making and compare it with your other enterprises and with your neighbours.

The simple calculation is;
Total income from sheep (wool, sheep sales)

Add Increase in the value of sheep on-hand (if you increased your flock size)

Less Decrease in the value of sheep on-hand (if you decreased your flock size)

Less Direct sheep costs (include the opportunity cost of conserved fodder)

Less Overhead costs (the sheep proportion of all other costs)

= Sheep enterprise profit

Calculate the winter grazed area (arable area not cropped and a proportion of non-arable area)
= Sheep profit per winter grazed hectare

Compare this to the profit per hectare from crops on similar ground (sheep usually get the "problem" paddocks). If it is too hard to calculate the sheep proportion of overhead costs just work on gross margins. However, remember that sheep generally have low overhead costs and that sheep returns are more stable.

This would be a great discussion point at your Agricultural Bureau or Farm Group meeting.

More detailed benchmarking programs are available. For example, the MLA Cost of Production Calculator, search in; MLA.com.au COP.

Sheep planning

Many people could plan their enterprise better. If you are in doubt, ask for help.

The planning steps, once you have clear goals;
Monitor - Measure, or at least observe, how you are going
Record - Keep good records so you can look back
React - Act on the information before it is too late
Progress - Remember, and learn, from your experiences

Where to from here?

Future sheep prices are uncertain, however it is well worthwhile improving your sheep management to reflect the returns you are now getting.

There will never be a better time to improve your sheep management.

Acknowledgements

Members of the four FarmReady groups "Sheep planning to reduce farm risk".
The Australian Government for FarmReady Reimbursement Grants.

Can Silage Reduce the Cost and Risk of Fodder Conservation

Bruce Heddle
Minnipa

INFORMATION

Searching for Answers

Location:
Minnipa
Farmer: The Heddle Family
Rainfall
Av. Annual: 350 mm
Av. GSR: 250 mm
2010 Total: 381 mm
2010 GSR: 345 mm
Paddock History
2009: Wheat
2008: Wheat
2007: Medic
Soil Type
Red and grey calcareous sandy loam

Why did we try making silage?

Conserving fodder to even out the feed supply is an expensive process and can have a severe negative impact on the profitability of a livestock enterprise. However, it also provides important flexibility and some real agronomic advantages in a mixed farming system. Therefore, we have been looking for cost effective ways of gaining these advantages, reducing the risks associated with hay making and maximising the nutritional value of the conserved feed. The majority of fodder conserved for use 'on farm' around the world is stored as silage, yet it has been largely ignored as an option on Eyre Peninsula since the late sixties, so we wondered if it does in fact have a role in our system.

Why now?

- We had a large reserve of hay on hand already (from 2009) and faced another opportunity to conserve fodder.
- Livestock returns are strong.
- Physical removal of pasture has been an excellent way of managing weeds, especially where we have a long history of using selective herbicides.
- If the process is done well, silage has the longest storage life of any conservation option – up to twenty years by many reports.
- It uses the equipment we already use or had access to for hay and reduces the time that the fodder is exposed to damage by rain.

How did we do it?

- The paddock was dry sown with 44C73 Canola at 3 kg/ha, 5 kg/ha of Angel medic and had the background medic stand left in it. I was unable to get control of the mice at plant emergence so ended up with a patchy canola but exceptional medic establishment.
- DAP was applied at 25 kg/ha with the seed.
- Targa® was applied when the grass was at very early tillering.
- Thanks to an excellent growing season, growth was exceptional, with much of the medic in the canola 450 mm to 600 mm high. Medic seems to grow extremely well with canola.
- The pit was dug with an excavator to be 1.5 m deep, 6 m wide and about 20 m long with an access ramp one end.
- We started cutting with a mower conditioner on 25 September (about one week earlier than we would have started cutting hay) and raked on 27 September.
- Commercial silage inoculant was sprayed onto the windrows immediately in front of the baler.
- Silage was baled into 1.9 m x 0.8 m x 0.9 m big square bales at about 50% moisture starting on 29 September, carted and stacked immediately and covered with 200 micron silage cover within 6 hours. This is a critical point in the process – plenty of labour and equipment with no breakdowns are important. A breakdown at this point was stressful and has probably compromised part of the stack.
- The stack ended up about 1 metre above ground level and is covered completely by at least 400 mm of soil.

What happened?

- Silage dramatically increased the 'dry' yield of fodder per hectare. Losses from the row are noticeably reduced because the cut material is wet and tough rather than dry and brittle. As usual, the hay rows were rained on, turned and as a result yielded around 30% less.
- Every part of the process seemed 'time critical', especially when we were completely inexperienced. However, the much shorter timeframe from start to finish is a major advantage and more experience would make the whole process more straightforward than making hay.
- Because each bale is largely water, they are heavy and hard on equipment. Sale and transport are simply not an option so some flexibility in end use is foregone.
- Surprisingly, almost no slumping of the stack has occurred yet. Hopefully the biological process that provides the preserving environment has worked – it may be a pit full of expensive compost!
- As the stack cannot be opened at all to inspect it because it must remain airtight, it will not be possible to judge the feed value of the stored fodder or the success of the exercise until we need it. This is a problem and we may use half of the stack soon simply so we can decide whether to pursue the concept further.

What does this mean?

- Reducing the cost of conserving fodder and increasing the feed value is a challenge that impacts significantly on the profitability of feeding livestock.
- The dairy industry puts far more focus on these issues and we can probably learn much from them.
- Herbicide dependency, no-till and more profitable livestock enterprises are significant changes over the last few years, and have 'changed the game'.
- Contract wrapped round bale silage would be an easier and more cost effective way of investigating the role of silage without a large capital investment.
- While silage in general has significantly lower costs per unit of feed, energy and protein, it is not without its challenges and we still have a lot to learn.

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Alternative Pasture in the Upper North

Charlton Jeisman
Rural Solutions SA, Jamestown

RESEARCH

Try this yourself now

Location:
Upper North
Farmer: Gilmore Catford
Upper North Farming Systems
Rainfall
Av. Annual: 325 mm
Av. GSR: 233 mm
2010 Total: 379 mm
2010 GSR: 255 mm
Yield
Potential: 3.2 t/ha (W)
Actual: 3 t/ha Wheat (farmer Paddock)
Paddock History
2009: Fallow
2008: Fallow
Soil Type
Alkaline, red clay loam
Plot size
15 m x 2.2 m x 4 reps
Livestock
Enterprise type: Crossbred lambs
Stocking rate: 4 DSE/ha
Type of stock/breed: 1st cross Merino
Water Use
Water use efficiency: 11.7 kg/ha/mm

Key messages

- **Amount and quality of feed are important considerations when grazing livestock.**
- **Trade off between dry matter produced and nitrogen fixed by legumes.**
- **Barley and canola/vetch had fastest early growth rate to mid August.**
- **Oats/vetch and canola had the fastest growth rate between August to September.**
- **Alternative pastures produced more dry matter overall than current medic varieties.**

Why do the trial?

In low rainfall areas, growth and development of annual regenerating medic pastures is often slow due to hard seed content and naturally slow early growth rates. In the Upper North this often occurs under cold conditions resulting in delayed development until warmer temperatures and longer days later in the season enable faster growth rates and more dry matter production. Medic pastures often provide an abundance of feed at a time when growers already have a lot of feed. This trial was established to compare the growth rates and dry matter production of alternative pastures with traditional medic pastures, attempting to provide more feed earlier in the growing season to help reduce the 'feed gap' between late summer and winter.

How was it done?

The treatments included in the trial are shown in Table 1. A range of alternative pastures were selected including some pod retention medic varieties (Cheetah barrel and Jaguar strand). All treatments were sown on 6 May at appropriate seeding depths into soil with a dry surface but moist seed bed. Medic plots were scratched into the surface and were sown in two passes (half seed and fertiliser rate each time) with the second pass being sown 'inter-row' of the first (to simulate a regenerating pasture). DAP was applied at 50 kg/ha to all plots at seeding. The site was treated with 1 L/ha PowerMax and 50 mL/ha Lemat prior to seeding. A follow up application of 500 mL/ha Select, 250 mL/ha Targa and 1% Hasten was applied on 3 July.

Pasture cuts were taken from each treatment at various stages during the growing season to determine dry matter produced per hectare. Each sample was dried and weighed. These measurements were also useful to compare growth rates between treatments. Plots containing oats and barley were harvested on 19 November while all other treatments were harvested on 23 November.

What happened?

Barley and canola/vetch produced the greatest dry matter by 21 August and also had the fastest growth rates of all treatments. Oats/vetch had overtaken barley, canola/vetch and canola by 28 September and remained the highest producer all season (Figure 1). Table 2 includes the total dry matter produced for all treatments until the beginning of November.

After 28 September, growth rates of oats/vetch, peas and Cheetah medic began to plateau while canola, vetch and Angel medic SR2 began to decline, indicating senescence of plant material had occurred. This means less dry matter that livestock could consume. Dry matter of barley and canola/vetch however continued to keep increasing.

Figure 1 shows that canola/vetch had a more steady and consistent growth rate than canola when grown alone. Overall dry matter was the same by 4 November, however the vetch in the mix would have increased the quality of the feed. In terms of plant establishment in the canola/vetch mix, the ratio was approximately 5:1. Although canola plants were superior in this mix, vetch still added value to the pasture.

Table 1 Treatments sown in the Morchard pasture trial 2010

	Treatment	Seeding rate (kg/ha)
1	Jaguar medic	10
2	Tarcoola canola	4.5
3	Wintaroo oats + Morava vetch	Oats: 60 Vetch: 20
4	Angel medic sowing rate 1 (SR1)	10
5	Hindmarsh barley	60
6	Cheetah medic	10
7	Angel medic sowing rate 2 (SR2)	20
8	Oasis juncea	4.5
9	Morgan forage peas	100
10	Jester medic	10
11	Tarcoola canola + Morava vetch	Canola: 2.5 Vetch: 25
12	Morava vetch	30

Of the medic varieties grown, Angel SR2 produced slightly more dry matter by 21 August however by 28 September Angel SR1 had a slight advantage and continued to all season. Cheetah and Jaguar medics (pods retained on plant runner so they can be harvested with a conventional header) competed well with traditional varieties throughout the season, until the last month when they remained greener for longer and maintained their bulk (as is their nature). The higher seeding rate of Angel SR2 (compared with Angel SR1) appeared to cause Angel SR2 to senesce (die off) earlier.

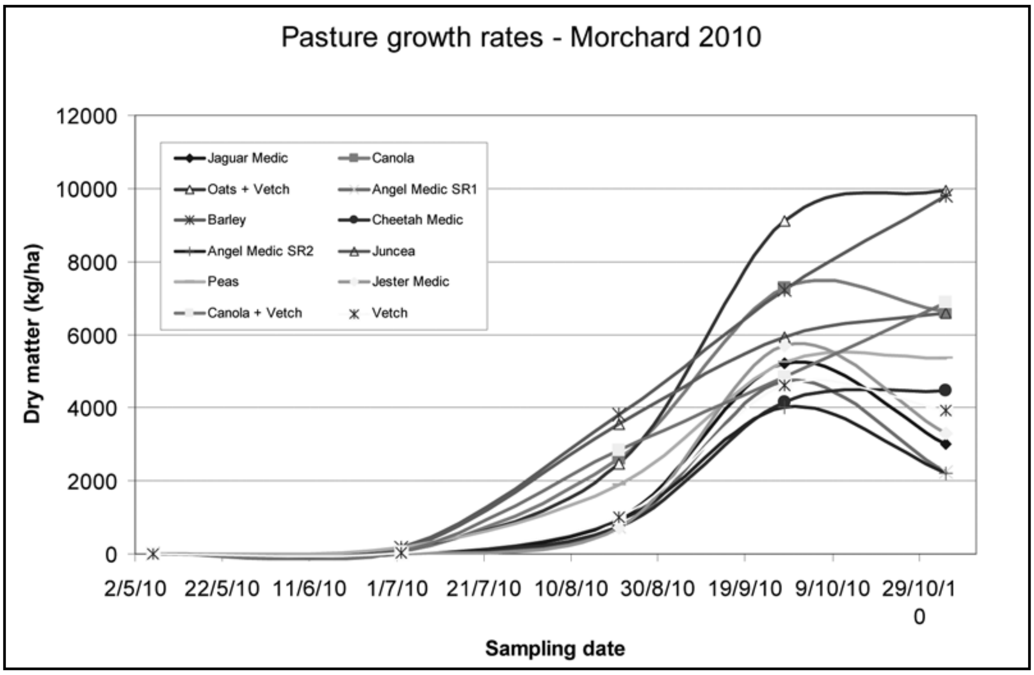

Figure 1 Dry matter production and growth rates for selected pastures grown at Morchard to 4 November 2010.

Table 2 Full results of pasture dry matter production at Morchard up until 4 November 2010

Treatment	Dry Matter (kg/ha)			
	2 July	21 August	28 September	4 November
Angel medic SR1	0.6	748.9	4719.4	2243.1
Angel medic SR2	0.7	914.3	3997.3	2218.8
Cheetah medic	0.7	751.1	4158.0	4479.1
Jaguar medic	0.7	956.7	5217.9	3013.9
Jester medic	0.7	710.9	5710.3	3288.2
Tarcoola canola	64.6	2603.1	7263.9	6604.7
Canola + vetch	68.8	2825.9	4839.8	6879.4
Oats + vetch	145.8	2457.9	9113.6	9949.6
Morava vetch	40.3	998.3	4602.8	3923.6
Oasis juncea	100.7	3562.8	5923.8	6578.2
Hindmarsh barley	159.7	3806.3	7210.8	9794.9
Morgan peas	159.7	1891.3	5238.2	5365.4

What does this mean?

Some of the alternative pastures (to medics) such as oats/vetch, barley and canola produced more dry matter; however they also required nitrogen to achieve this. Medic and vetch based pastures fix atmospheric nitrogen in the soil; however non legume based pastures cannot do this. Therefore the cost of nitrogen must be factored in.

The benefit of legumes in a rotation is an important consideration, not only for nitrogen fixation but also for a root disease break. In 2010, in low rainfall areas, the benefits of legumes grown in 2009 really showed up in 2010 wheat crops. Therefore if some non-legume pastures are grown to maximise dry matter, the absence of suitable disease breaks and cost of additional nitrogen must be considered.

Barley and canola/vetch had the fastest early growth rates of all treatments meaning these feed sources would have helped reduce the feed gap in this season. While pastures cannot be grazed immediately from emergence, barley and canola/vetch would have provided feed for livestock for around three to four weeks before medic pastures could have been grazed. This would reduce the amount of time spent supplementary feeding livestock to prevent them grazing poor quality pastures in autumn and losing condition.

Areas in plots where dry matter cuts were taken indicated how well these pastures would recover from grazing. All medic varieties recovered well from early and late grazing throughout the season, as did cereals; however Morgan forage peas and canola/vetch pastures only recovered from early grazing.

While medic pastures have feed quality benefits and are tolerant to grazing and trampling, particularly in good seasons like 2010, some alternative pastures have other advantages such as providing abundant feed early in the season and allowing livestock to graze earlier and for longer periods. While medic pasture is high in quality and has benefits for paddock rotations, a grazier must be patient for it to grow bulky enough before it can be grazed.

When pasture production reaches its peak in mid-late spring, growers often struggle to utilise all the available feed due to insufficient livestock. In favourable seasons such as 2010, cutting some paddocks for hay (or making silage) is a good option to ensure plenty of feed is on hand for when grazing options are scarce.

In a drier season or on a different soil type, the above results and trends are likely to be different, however the relative comparisons between different pasture types is likely to remain similar.

Acknowledgements

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Le-Mat – registered trademark of Bayer

RoundUp Powermax – registered trademark of Nufarm

Select – registered trademark of Arysta LifeScience Corporation

Targa – registered trademark of Sipcam Pacific Australia Pty. Ltd.

Hasten – registered trademark of Victorian Chemical Co Pty Ltd.

Demonstrating Pasture Zoning in the Upper North

DEMO

Jodie Reseigh[1], Michael Wurst[2]

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Key messages

- **On farm zoning puts into practice farmer and agronomists' knowledge and intuition combined with relatively cheap technologies such as free maps available from the internet (e.g. Google Earth©) and satellite imagery (e.g. NDVI).**
- **This project is helping farmers put into practice their understanding of how their property can be managed to achieve greater sustainability and production outcomes.**

Why do the trial?

A property can be divided into a number of production zones, through the use of maps (such as Google Earth©), landholder experience and the use of satellite technology. The number of production zones may vary depending on landholder experience and technologies available. Generally three or four production zones/areas are adequate. For example:

- Better cropping areas
- Unviable cropping areas
- Un-arable pastures

These can be further sub-divided where there is significant variation in production. Grazing management of these zones may be managed with a combination of permanent and/or electric fencing and portable watering points.

This demonstration follows from the innovative work that the Upper North Farming Systems Group (EPFS 2009 pp. 169-170) has undertaken implementing best practice grazing management in the low rainfall cereal zone. The aim of this local case study is to demonstrate the benefits of maximum utilisation of the best cropping areas, improved grazing efficiency and increased production from poorer (unviable) cropping areas, whilst maintaining production and ground cover. The initial focus of the trial is in improving production and sustainability in poorer (unviable) cropping areas.

The aim of the farm demonstration is to increase production and sustainability and reduce costs by identifying production zones across a property and managing these zones differently. However, it is important these zones are large enough to be managed.

How was it done?

The demonstration farm in the Upper North used a range of tools and technologies to determine production zones including maps (Google Earth© and farm maps), Normalised Difference Vegetation Index (NDVI), agronomist advice and landholder experience. As a result the farm was divided into three major areas/zones: better cropping areas; unviable cropping areas and un-arable pastures. Better cropping and unviable cropping areas were further subdivided due to significant variation in production (Figure 1). On the demonstration farm, good cropping areas produce an average of 1.8 t/ha; average cropping zones produce an average 1.4 t/ha and unviable/ poor cropping zones average 0.8 t/ha.

1. **Better cropping zone –** These are the highly productive soils on the property and can be intensively cropped with cereals. This zone was further split into two further zones:

   (1A) Good cropping: Cropping and annual pasture rotation; and

   (1B) Average cropping: Cropping and two years pasture rotation.

By separating these two zones, areas may be more intensively cropped without the risk and costs of cropping poorer areas. It is envisaged with the use of precision agriculture that these zone will be further divided and managed more intensively.

2. **Unviable cropping zone/ Poor cropping –** These are areas of the farm which have consistently been cropped over the years but may no longer be producing profitable crops (average < 1.0 t/ha and in some seasons totally fail). In most years these areas will produce enough to cover the variable costs (seed, fertiliser, chemical, etc.), but not all of the overhead costs. It may be more profitable to take these areas out of cropping or only crop them on an opportunistic basis (low inputs). This zone was also split into two further zones:

   (2A) Poor cropping to be improved with native pastures; and

   (2B) Poor cropping to be improved with fodder shrubs.

The native pasture area will be sown with valuable native grass species such as Wallaby grass *(Austrodanthonia* species*)* for both grazing and native grass seed production. The fodder shrub area will be sown with 3 rows of fodder shrubs, with inter-rows of approximately 16 m wide to allow opportune cropping for both grazing and grain production dependent on the year. The best fodder shrub species in terms of production and palatability have been selected from the local ENRICH site. Once established these shrubs will be grazed to maximise production and utilisation. It is envisaged that the fodder shrubs will also provide valuable shelter to livestock in the future.

3. **Un-arable zone –** These areas of the farm have traditionally been set stocked over the winter/spring period. Livestock have selectively grazed the more palatable species and bared out (stock camps) other areas of the paddock. Only the less palatable native grass species, such as Spear Grass (*Austrostipa* species) have generally survived in many areas, and annual grasses and weeds have out competed many of the native species. These areas will be rotationally grazed, either through the winter or throughout the whole year depending on seasonal conditions.

Over the last 3 years, the landholder has undertaken a whole farm program of subdividing large paddocks into smaller units with portable watering points. This un-arable zone contains a mix of pasture species including good native pastures such as Wallaby grasses and Curly Windmill grass *(Enteropogon acicularis)* along with some less productive grass species.

What does this mean?

The project is still in the planning phase and results will be available over the next 18 months with a field day to be held in September/ October 2011.

Through on-farm application the benefits of increased biomass production, improved biomass quality, greater grazing efficiency, maintaining and improving soil cover whilst increasing production and sustainability outcomes results will be demonstrated to landholders, extension staff and the community through field days.

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Figure 1 Assignment of zones to demonstration farm in the Upper North