Section 6

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Livestock

The Impact of Livestock on Paddock Health

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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.

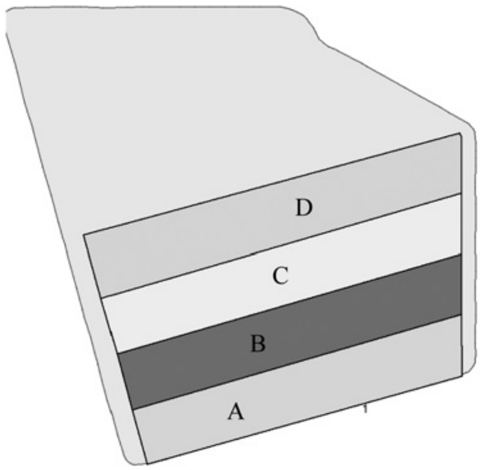

Figure 1 Paddock plan, South 7 MAC

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.

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Livestock

Grain & Graze Profit through knowledge EYRE PENINSULA

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