The Impact of Livestock on Paddock Health

RESEARCH

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Location: Minnipa Ag Centre

Rainfall
Av. Annual: 325 mm
Av. GSR: 242 mm
2009 Total: 421 mm
2009 GSR: 333 mm

Yield
Potential: 5.2 t/ha (W)
Actual: 4.5 t/ha (W)

Paddock History
2008: Wheat
2007: Wheat
2006: Wheat

Soil Type
Red sandy loam

Soil test
Organic C%: 1.18
Phosphorus: 28 mg/kg
Boron: often >12 ppm between 40-60 cm

Diseases
Low levels Rhizoctonia

Plot size
8 sowing widths across paddock

Yield Limiting Factors
Nil

Livestock
Enterprise type: Self replacing merinos
Stocking rate: District practice

Environmental Impacts
Soil Health
Soil structure: Stable
Disease levels: Med – High Rhizo, Low Crown Rot
Tillage type: No-till
Compaction risk: Low
Ground cover or plants/m^2: Grazed to 1 t/ha straw residue
Perennial or annual plants: Annual
Grazing Pressure: Low

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Key messages

- **A long term trial was established at Minnipa Agricultural Centre (MAC) in 2008 to test whether general soil health and fertility can be increased under a higher carbon input system with well managed grazing.**

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 MAC to test whether soil health and fertility can be improved under a higher carbon input system with well managed grazing. This system is being compared against a more traditional ley (low input grazed) system, as well as ungrazed high input and low input systems.

How was it done?

Paddock South 7 on MAC was divided into 4 sections prior to seeding in 2008 (each 8 seeding runs wide) (Figure 1) and soil sampled at 4 points in each section; 0-60 cm for soil nutrients, constraints and water holding capacity, 0-10 cm for RDTS analysis, and 0-30 cm for carbon fractions (see Table 1 for treatments).

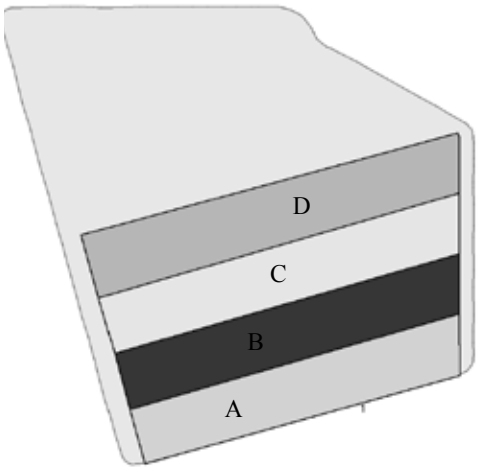

Figure 1 Paddock plan of carbon trial, south 7 MAC, 2008

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 will require supplementary feeding and regular checking

Economic
Infrastructure/operating inputs: High input system has higher input costs
Cost of adoption risk: Low

The intention at the start of 2009 was that treatments A and D would be grazed prior to sowing, however biomass production was so low in 2008 that any grazing would have constituted an erosion risk. It was decided to re-sow to wheat in 2009.

All treatments were direct drilled on 7 May 2009, with Wyalkatchem wheat. All sections received standard weed management throughout season. During the season quadrat cuts were taken at each sample point to assess early dry matter (DM) production and retained crop residue following harvest.

The trial was harvested using the farm header. Yields for each section were determined using yield map data, and grain samples were retained for quality analysis.

What happened?

2009 was the second year of the trial but the grazing treatments are yet to be instituted. The 4 treatments presented in Table 2 represent only traditional and high input systems as no grazing has occurred. The high input system has been more productive in all measured variables. Early DM 2.7 vs 2.1 t/ha, grain yield 4.5 vs 4.1, protein 9.8 vs 9.6, crop residue 4.2 vs 3.2 t/ha.

What does this mean?

The 2009 production has provided the opportunity for grazing over the 2009/10 summer to commence comparative grazing treatments.

Over the next few seasons appropriate analysis will be carried out to measure 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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Table 1 Treatment applied at South 7 carbon management trial, MAC 2009

System	Wheat Sowing Rate (kg/ha)	Nutrients Applied in 2008 (kg/ha)
Traditional ley system - grazed (A)	50	7 kg N, 8 kg P applied as 40 kg/ha DAP
Traditional ley system - ungrazed (B)	50	
High carbon input system - ungrazed (C)	70	25 kg N, 12 kg P applied as 60 kg/ha DAP + 67.5 kg/ha Ammonium Sulphate
High carbon input system - grazed (D)	70	

Table 2 Crop performance in carbon management trial, 2009

System	Early DM (t/ha)	Grain Yield (t/ha)	Protein (%)	WUE* (kg/ha/mm)	Crop residue (t/ha)
Traditional ley system - grazed (A)	2.1	4	9.8	18	2.9
Traditional ley system - ungrazed (B)	2.1	4.1	9.3	19	3.5
High input system - ungrazed (C)	2.4	4.4	10.1	20	4.7
High input system - grazed (D)	2.9	4.5	9.5	20	3.6

** WUE, water use efficiency figures do not take into account available stored soil water utilised.*
Screenings from all treatments were < 2% and test weights > 83 kg/hL.

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