1. Pasture responses to ameliorating sandy soil constraints at Western Flat

Project: *Improved grazing production on non-wetting sands* is a collaboration between the Coorong Tatiara Local Action Plan and PIRSA through the Coorong District Council, funded by **Meat and Livestock Australia** (L.FAP.2101; 2020 to 2026).

Sandy soils are a common landscape feature in South Australia, Victoria and Western Australia. Farming on these soils can be challenging due to low water holding capacity, low organic carbon, low nutrient availability, compaction, water repellence and high risk of wind erosion. However, research has demonstrated that improvements in biomass production are possible on these soils when these constraints are overcome.

Building on previous research, **the Improved grazing production on non-wetting sands project** will look at **opportunities to improve the feed base and livestock productivity on sandy soils** by addressing soil chemical, physical and biological constraints.

Three demonstration sites will be established on grazing systems in SA, with a site-specific selection of three to five treatments at each, giving producers a chance to see different interventions in action. New technologies and techniques will be demonstrated in grazing pasture-based systems.

Benefits to producers

This project aims to reduce the overall cost of production per hectare by identifying cost-effective options to produce and convert more feed to increase carrying capacity and livestock production.

The project will give producers an opportunity to look at the effectiveness of different treatments and practices to improve sandy soils, measuring plant growth response, dry matter production and feed nutrition values. It will also test the cost effectiveness of the treatments on sites across the project area.

Project activities

- Three demonstration sites have been identified at Coomandook, Field and Western Flat. Core producers will be regularly involved in the progression of these sites, with a site-specific selection of three to five treatments tested on each.
- Demonstrations on these sites will look at methods of improving the soil, feed base and management to extend the growing season, increase pasture utilisation and optimise fertiliser use.

Progress to date

- The trial site at **Western Flat** [-36.534532 S; 140.708130 E; Image 1] has been mapped using Electromagnetic Induction Sensing (Geonics EM38; Image 2) and elevation (Image 3).
- This information was used to separate the paddock into three production zones: Hilltops, Mid-slopes and Heavy flats (red, yellow and green markers respectively in Image 4).
- Soil samples were collected from these three zones for chemical assessment (APAL) and physical condition was measured using a Rimik digital recording cone penetrometer.

Results from soil sampling show:

- Mild **penetration resistance** (PR <1500 kPa) to 12 cm in Zones 1 and 2, then moderate PR to 50 cm. In Zone 3, PR is moderate below 5cm and severe below 15 cm, having a detrimental impact on deeper layer root growth (Figure 1).
- Very severe **water repellence (MED >3.8)** in all three zones in the top 5 cm, and severe in the 5-10 cm layer.
- Extremely low **OC, nutrient fertility** and **CEC** in Zone 1 (Table 1).
- Increasing **OC**, clay content, **cation exchange capacity** in Zones 2 and 3 (Table 1 and soil images on Pg 3).
- All three zones are severely deficient in phosphorus.

Image 1. Aerial image of the 32ha Demonstration Paddock at Western Flat showing bare soil on the hilltops.

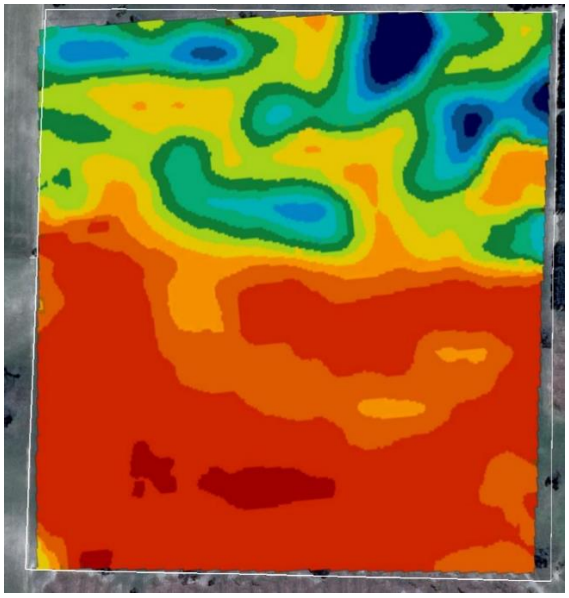

Image 2. Elevation map showing strong correlation between high elevation (blue) with bare soil in Image 1, and low elevation (red) with good ground cover on the flats.

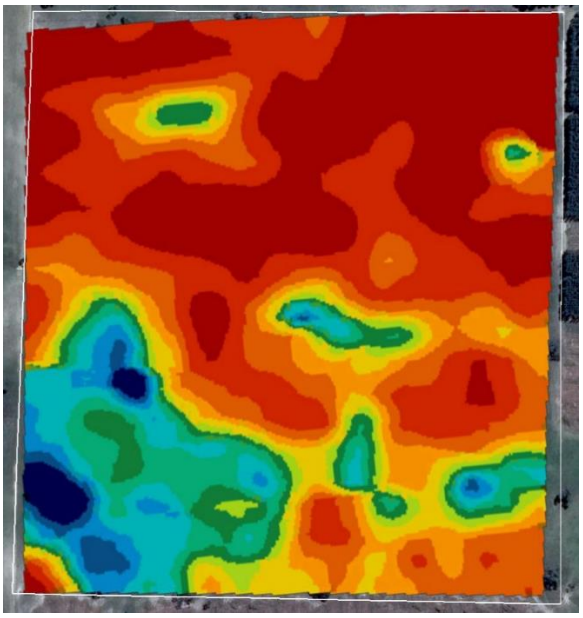

Image 3. Electromagnetic Induction map showing zones of low conductivity (red) on the hilltops and high conductivity (blue/green/yellow) on the stony flats, correlating well with fertility levels (EC, CEC).

Image 4. Three specific zones were selected for sampling: Zone 1 – Hilltops, red markers; Zone 2 – Mid-slopes, yellow markers; and Zone 3 – heavy flats, green markers.

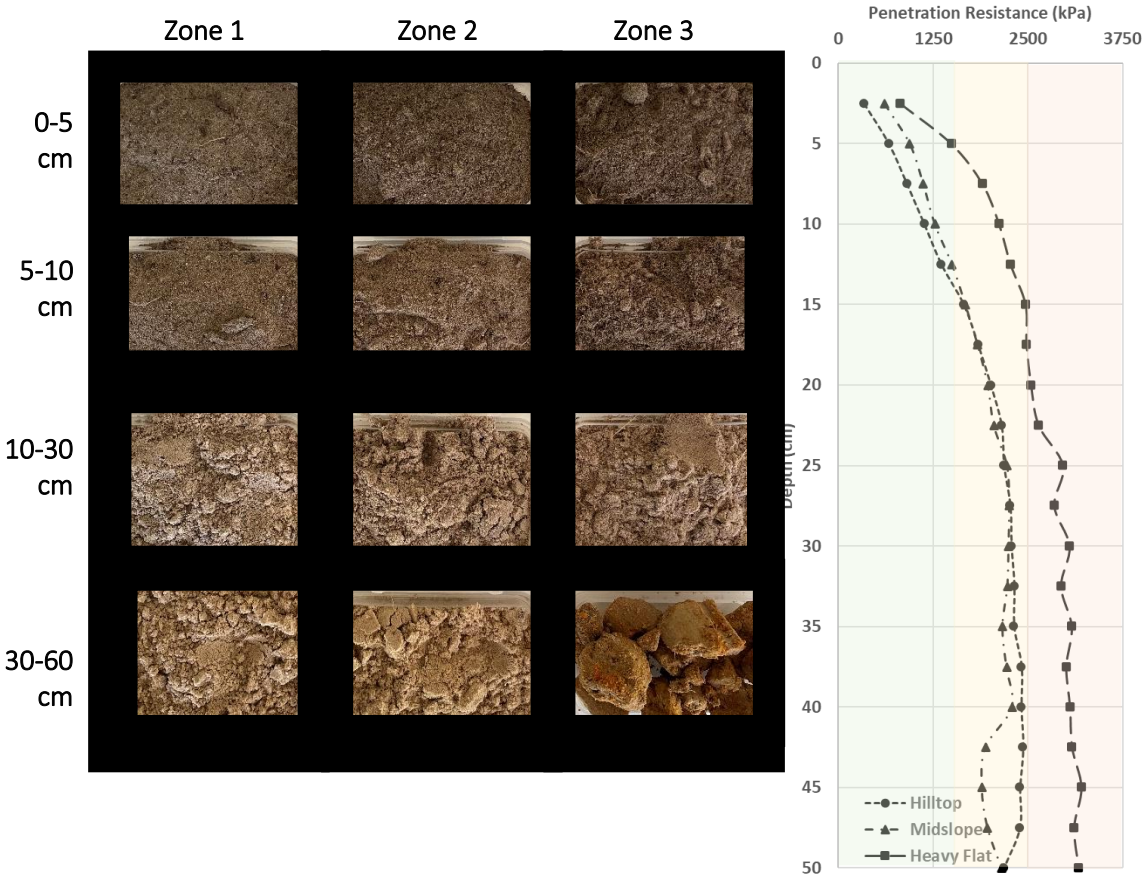

Figure 1. Penetration resistance measured in moist soil in three zones at Western Flat.

Table 1. Soil chemical data for composite samples collected for each of the three zones at Western Flat.

	Depth cm	pH_{Ca}	$EC_{1:5}$ dS/m	OC %	Min. N	Col P mg/kg	S	Exch. K mg/kg	CEC Cmol+/kg
Zone 1	0-10	5.22	0.02	0.8	2.2	<5	7.1	20	1.82
	10-30	5.26	0.01	0.32	<1	<5	2.9	11	0.92
	30-60	5.61	<0.01					7	0.56
Zone 2	0-10	5.18	0.03	1.38	4.7	<5	5.5	32	3.16
	10-30	5.01	0.02	0.41	<1	<5	2.7	17	1.28
	30-60	5.41	0.02					13	0.7
Zone 3	0-10	4.71	0.03	1.07	2.5	<5	5.5	23	2.17
	10-30	4.53	0.02	0.54	<1	<5	2.7	14	1.19
	30-60	5.41	0.09					184	13

Amelioration priorities in Zones 1 and 2	Amelioration priorities in Zone 3
• Overcome water repellence • Increase WHC • Increase organic carbon and CEC • Boost N, P and K • Supply trace elements	• **Reduce compaction** in lower depths • Overcome water repellence • Boost organic carbon and CEC • Boost N, P and K • Supply trace elements

For more information:

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