Kangaroo Island soil health report: results from 2019/20/21 soil tests

Background

From 2019 to 2021 Agriculture Kangaroo Island (AgKI) received funding and support from the Australian Government National Landcare Program, 'Smart Farms Small Grants' (through the KI Landscape Board) and PIRSA, to assist landholders to undertake soil testing on their properties and provide interpretation of soil test results. Soil test kits are available to all producers from the Kingscote PIRSA Office and soil augers are available for loan. From 2019 to 2021 43 KI farmers submitted 173 soil samples for testing.

Results

Soil pH

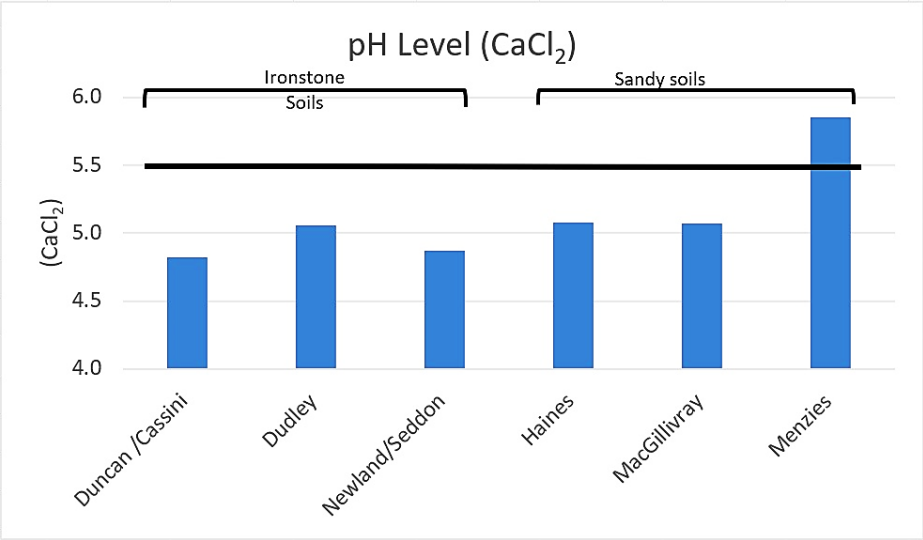
Soil pH is important for optimum production of crops and pastures. If the soil pH falls below pH 5.5 ($CaCl_2$) then nutrients such as phosphorus, magnesium, calcium and molybdenum become less available; microbial activity starts to decline (including *Rhizobia*) and toxic amounts of aluminium can be released into the soil solution (refer to Table 1 for minimum pH targets).

Table 1: **Target for minimum soil pH.**

Land use	**$pH_{(CaCl_2)}$**
Extensive grazing	5.0 – 5.5
Broad-acre cropping /grazing	5.5
Most horticultural crops	5.5 – 6.5

Almost all the soil samples taken during the 2019-2021 seasons were below critical pH levels. Figure 1 shows that the average pH in all Hundreds was below 5.5 (pH $CaCl_2$), except for Menzies. Seven of the eight Hundreds had an average pH of 5.2 or below. At these levels, pH will be limiting farm productivity and profitability and therefore liming should be a high priority.

Figure 1: **Average soil pH ($CaCl_2$) results for each Hundred during the 2019-2021 seasons.**



Salinity

Saline soils are defined as soils that contain a high enough level of soluble salts in the root zone that can adversely affect plant growth. Ideally, soils should have a salinity level of less than 2 dS/m (for salt sensitive plant species). Of the soil samples taken the majority were below 2 dS/m.

Organic Carbon

The organic carbon test is a useful indicator of organic matter status, therefore of overall soil fertility, microbial activity, and the structural stability of the soil. The ideal target level of organic carbon varies with soil type i.e. sandy soils greater than 1% is desired, through to greater than 2% in clay soils. Of the soils tested, all were well above critical values.

Soil Nutrients

Maintaining an adequate nutrient status in the soil is paramount to determining the productivity of the soil. Phosphorus, potassium and sulphur are essential nutrients for plant growth and yield (see Table 2 for target levels).

Table 2: **Target levels for phosphorus, potassium and sulphur**

Soil nutrients	**Target levels**	
	Ironstone Soils	**Sandy Soils**
Phosphorus (Colwell)	35-45 mg/kg	>20 mg/kg
Potassium (Colwell)	>120 mg/kg	>120 mg/kg
Sulphur	6-8 mg/kg	>10 mg/kg

During 2019-2021, almost all samples collected from the Hundreds with predominantly sandy soils, had phosphorus levels greater than 20 mg/kg. Of the Hundreds with predominantly ironstone soils, more than half of the samples had phosphorus levels lower than the recommended level of 35-45 mg/kg (Figure 2).

The majority of soil samples in all Hundreds had potassium levels above 120 mg/kg (Figure 3).

Of the Hundreds with predominantly ironstone soils, the majority of samples had sulphur levels greater than 6-8 mg/kg (Figure 4). The majority of sandy soil samples, except the Hundred of Haines, were also above the critical value of 10 mg/kg.

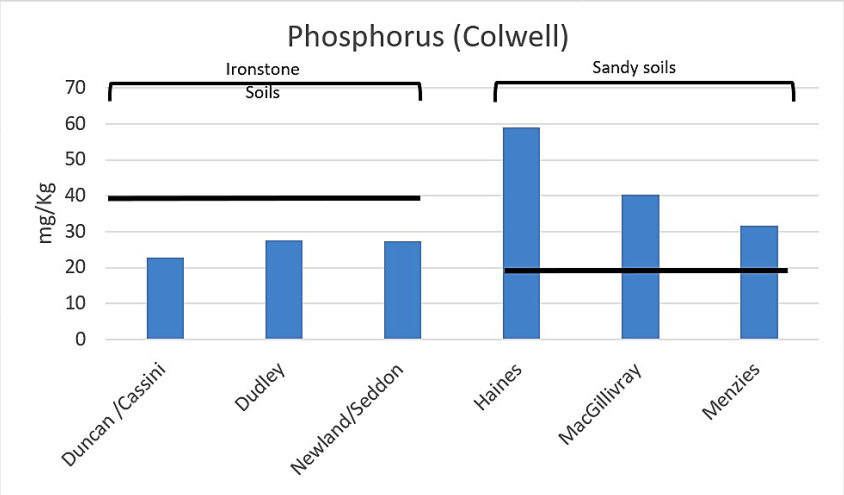


Figure 2: **Average soil phosphorus levels for each Hundred during the 2019-2021 season.**

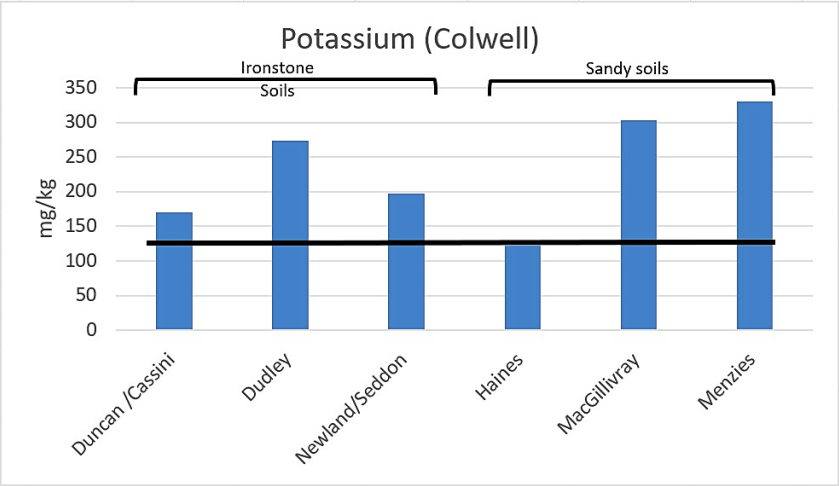


Figure 3: **Average soil potassium levels for each Hundred during the 2019-21 season.**

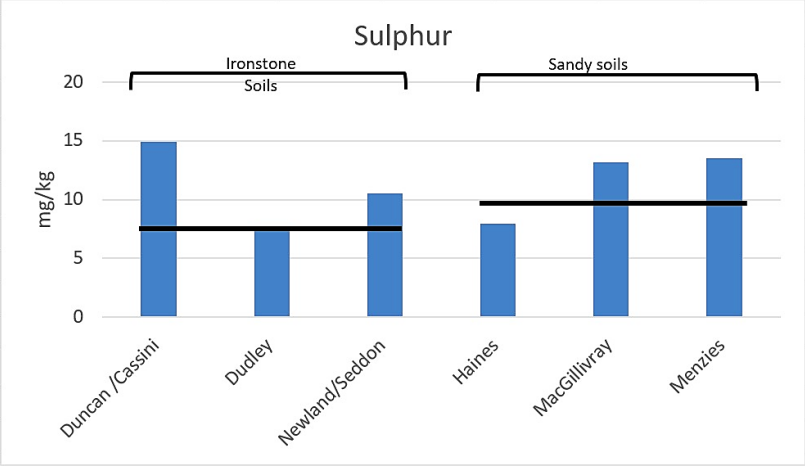


Figure 4: **Average soil sulphur levels for each Hundred during the 2019-21 season.**

Summary

The 2019-2021 soil tests carried out by Kangaroo Island farmers indicate that overall, soils in the area are on target or above for organic carbon, potassium and sulphur.

The average soil phosphorus levels were low in the predominantly ironstone soil Hundreds. Across the Island, soil pH ($CaCl_2$) levels were below critical values. Areas where low pH is occurring will reduce the availability of essential nutrients such as phosphorus to the plant and will result in limiting overall farm productivity.

The most cost effective and practical way to address low pH is through the application of lime. Low nutrient levels can be addressed through the application of fertilisers. Always seek advice from your local agronomist or consultant to ensure you are applying the right fertiliser or lime at the correct rate.

Soil types vary within each Hundred, so care must be taken in the broader interpretation. In addition, the data only reflects the number of samples taken in each Hundred, which may represent only a few properties. The data and resultant graphs can only be interpreted to the point of identifying trends over time.

Summary of average results, range and number of samples for the 2019/20/21 season for each Hundred area.

Table 3: **Summary of results for sandy soils. Note mg/kg is the same as ppm. The number in the brackets refers to the number of soil samples taken per Hd**

	Organic carbon %	Conductivity dS/m	pH ($CaCl_2$)	Phosphorus mg/kg	Potassium mg/kg	Sulphur mg/kg
Haines (22)	2.5	0.08	5.1	59	122	8
MacGillivray(24)	3.4	0.18	5.1	40	303	13
Menzies(39)	2.2	0.26	5.9	32	330	14

Table 4: **Summary of results for ironstone soils**

	Organic carbon %	Conductivity dS/m	pH ($CaCl_2$)	Phosphorus mg/kg	Potassium Mg/kg	Sulphur mg/kg
Cassini/ Duncan(16)	3.9	0.26	4.8	23	171	15
Dudley(46)	2.9	0.14	5.1	28	274	8
Newland/Seddon (26)	3.6	0.14	4.9	27	198	10

Take home messages

- Soil testing is essential for monitoring soil fertility levels.
- Of all the soil samples taken the majority were below critical levels for pH.
- Phosphorus levels were low on some properties particularly with ironstone soils

For further information, contact

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Funding/Sponsors

- AgKI through the Australian Government National Landcare Program Smart Farms Small Grants
- KI Landscape Board through the Australian Government National Landcare Program Smart Farms Small Grants
- PIRSA

Note: The information used was sourced from individual Kangaroo Island farmer soil tests and analysed using CSBP Analytical Laboratory.