South West NRM

Case Study

Soil constraints in SW WA high rainfall pastures

Introduction

Soil constraints such as nutrient deficiency, disease or soil acidity can all reduce farm productivity and resource use efficiency.

Addressing a single constraint in isolation when more than one constraint exists can be ineffective, especially if the untreated constraints are more limiting. Therefore, it's important for farmers to assess a range of potential constraints to ensure their most limiting factors are addressed.

Beef producers in the South West of Western Australia typically assess a limited number of soil constraints. Surveys suggest that the majority soil test to a depth of ten centimetres, but do not test any deeper and therefore have a poor understanding of subsoil pH. Other tools such as tissue testing for micronutrient deficiencies, assessing compaction or checking root health are typically not used. This increases the risk that unknown factors are limiting production and producers are not maximising resource use efficiency or profitability.

A survey of multiple soil constraints on 24 beef-producing farms in South West Western Australia was conducted in 2019 to understand which constraints are limiting productivity and what monitoring techniques could be cost-effectively implemented.

The survey found that sub clover productivity was likely to be affected by several constraints, and monitoring sub clover root health and nodulation could be a useful monitoring tool.

Nodulation of sub clover roots by nitrogen-fixing bacteria (rhizobia) was assessed by carefully digging and washing roots and scoring nodule health by comparing the number and colour of nodules to a published scheme. Nodule scoring found that sub clover nodulation was scarce, rare or ineffective at 42% of sites.

One reason for poor nodulation was the high incidence of root rot disease, a complex of root pathogens that can reduce clover density, productivity and nodulation. The effects of disease, such as stubby dark roots, was obvious in root samples and estimated to be severe at two-thirds of sites.

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Disease can be exacerbated by soil compaction, found to be severe at 28% of sites at a depth of ten centimetres. Nutrient deficiencies and poor soil biological activity could also affect the plant's resilience to disease.

Another factor affecting nodulation could be low levels of molybdenum, found at 35 percent of sites from tissue testing. This appears to be due to a lack of molybdenum maintenance, which is required every 5 to 10 years in WA soils.

Another issue may be soil pH, which was typically below optimal levels (5 to 8) for sub clover rhizobia, with 34% of sites below 4.5 and typically decreasing in the 10–20 cm layer on sandy soils. This low soil pH also reduces the availability of nutrients, most notably phosphorus and molybdenum.

The project highlighted the value of checking sub clover roots for signs of poor nodulation or root health and using sub clover roots as an indicator of soil health.

Digging up plant roots in winter or early spring can double as a general assessment of compaction. Secondary tools such as tissue testing and deeper soil tests can also be useful.

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Australian Government | National Landcare Program

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