SOiL CRC

Performance through collaboration

CASE STUDY

Australian farmers and their advisers use a range of tests, observations and other assessments to evaluate the health of their soils. 'Matching soil performance indicators to farming systems' (2.1.006) provides new insights into which of these soil indicators farmers are using, and why. The project has addressed knowledge gaps for researchers, providing important context around how farmers are choosing to monitor soil health.

Matching soil performance indicators to Australian farming systems

Researchers from Federation University, the University of Newcastle and Charles Sturt University surveyed Australian farmers, agronomists and industry stakeholders to determine which soil indicators they use, how often, what information they provide and why they choose to work with them.

Findings from the survey showed that:

- Chemical tests and visual appraisal of crops and soil are widely used in all agricultural enterprises.
- Biological tests are the least used, with farmers expressing concerns and uncertainties about the use and interpretation of biological tests.
- Farmers conduct soil tests regularly and see a value in testing.
- Farmers' choice of soil indicators is largely driven by in-person interactions such as those with advisors and agronomists, at field days, and staff at farmer groups.
- Tests and assessments are chosen for their relevance to the farming enterprise, ease of sampling and assessment, and suitability to land use.
- Farmers that are not soil testing said barriers include cost, and not knowing how to undertake the tests or use the results.
- Advisors are highly influenced by education and training.

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Matching survey results to broader datasets

The project team examined data from the *Visualising Australasia's Soils* (VAS) portal to see if it could be matched to survey results, providing broader insights.

The review revealed that VAS contains vast sets of data that can be used in assessments of soil health and performance. Most soil data in the VAS portal is from topsoil observations and laboratory analysis assessments as part of agronomic research trials, soil monitoring, soil type, and general soil fertility and health assessment.

Researchers cross-analysed survey responses with data in the VAS portal to explore which indicators best suited specific management goals in different landscapes and agricultural systems.

Use case shows potential of data to improve soil performance

The team did a more detailed assessment and produced a use case for how this data could help to better understand farmers' use of soil indicators when managing grasslands for soil performance. Publicly available soil data from two adjacent southeast Australian river catchments was used to develop a spatial data-driven framework that identifies the soil groups associated with pasture health and soil performance.

"The use case showed that soil data can provide valuable insights into soil performance and indicators in use across Australia," said Project Leader Dr Nathan Robinson, a Senior Research Fellow at Federation University's Centre for eResearch and Digital Innovation. The project team developed a novel framework in the assessment of soil performance, potentially valuable to widespread areas of Australia's agricultural zones. The Digital Soil Mapping approach proved an effective framework for identifying key soil attributes that affect agricultural productivity (e.g. net primary productivity) – pinpointing critical locations for highly productive or less productive soils.

"Using publicly available data means the framework can be scaled across vast areas of Australia's agricultural zones," Dr Robinson said.

Next steps to provide soil indicator guidance

This project has addressed existing research gaps about soil indicators in Australian agriculture. Findings from the project have contributed new insights from the perspective of farmers and other stakeholders in the agriculture sector. These could be used to develop relevant and locally tailored soil quality assessment schemes.

Dr Robinson said the foundational information and findings gathered by the project can help growers, advisers and scientists identify what soil indicators work best and where.

"The research is being extended as part of a new Soil CRC project aimed at producing an enduring resource on key soil indicators," he said.

This phase will deliver co-design workshops with project members from West Midlands Group, AIR EP, Holbrook Landcare Network, Southern Farming Systems and Central West Farming Systems.

"Members will work together to identify combinations of soil type, climate, land use and management practices that will inform soil performance metrics, corrective actions, and management options," Dr Robinson said.

Domain experts, leading agronomists and farmers will be critical to developing fit-for-purpose soil indicators tailored for their region.

A key part of the next project phase will be linking soil indicators to actionable decisions and leveraging existing research and development (including that of the Soil CRC), to provide farmers with guidance for maintaining and improving soil health and performance.