

Hostile soils the target of major new research effort

CALCAREOUS soils which significantly limit crop yields and grower profitability across large parts of the south-eastern Australian cropping region are the subject of a major new collaborative research initiative.

The Grains Research and Development Corporation (GRDC), in conjunction with the Cooperative Research Centre for High Performance Soils (the Soil CRC), has announced the start of the \$6.75 million investment which aims to boost understanding of the constraints to crop yield and profitability on highly calcareous soils and develop novel management practices to address these barriers.

The three-year investment, comprising two separate but complementary projects, involves research partners Primary Industries and Regions South Australia (PIRSA), New South Wales Department of Primary Industries (DPI) and CSIRO. The SA Grain Industry Trust (SAGIT) is also supporting the initiative through the Soil CRC.

The investment builds on previous research into calcareous soils, which occur across 60 per cent of the cropping area in the GRDC southern region, mainly in low rainfall zones. Calcareous soils are strongly alkaline, contain free lime (calcium carbonate) and are particularly common in subsoils on SA's upper Eyre Peninsula, lower Yorke Peninsula, Mid North and the SA and Victorian Mallee.



Calcareous subsoil at 30 cm depth. (PHOTO: Dept of Environment, Water & Natural Resources, SA)

Calcium carbonate in the topsoil

Calcareous soils exist in other parts of Australia, but mainly in the subsoil, which restricts root growth after crop establishment and tillering. In contrast, the highly calcareous soils on the Eyre and Yorke Peninsulas and in the South-East of SA contain large amounts of calcium carbonate in the topsoil and this often increases with depth, so that crops start to struggle before they can get established. This is further exacerbated if the topsoil is sandy and dries out quickly, unlike calcareous soils in other areas which tend to be loams or clays that retain moisture.

While the investment is primarily focused on highly calcareous soils (more than 1.5 million hectares of cropping land in SA alone is considered highly calcareous), the research

outcomes are expected to have application to all calcareous soil types.

GRDC Manager Soils and Nutrition – South, Stephen Loss, says the GRDC and Soil CRC recognised that while calcareous soils have been the focus of research efforts over many years, there is an opportunity to expand upon existing knowledge and to provide growers with a suite of tactics to help overcome the constraints.

“Growers and advisers report that crops grown on highly alkaline, calcareous soils produce 35–45 per cent lower gross margins than crops grown on other less hostile soils,” Stephen says.

“The aim of this new investment is to identify the most important constraints to crop growth on highly calcareous soils, increase our understanding of the relative impact of these, and then boost crop profitability through improved soil and crop management practices.

“The work will involve a scoping study and field survey informed by grower engagement, laboratory and glasshouse experiments investigating the underlying mechanisms impairing the availability and uptake of nutrients and water, and a number of field trials to develop improved management practices.

“Input and involvement by growers, advisers and farming systems group will be critical in informing the direction of the investment and ultimately in ensuring its success.”

Stephen says issues around highly calcareous soils have been further raised by the GRDC's southern region Grower Network (formerly Regional Cropping Solutions Network), and the impact was discussed at length with growers and advisers during the GRDC Southern Region Panel tour of Eyre Peninsula in September last year.

Apart from poor uptake of nutrients, other constraints to crop growth on calcareous soils include sodicity, nutrient toxicity relating to their extreme alkalinity, poor water holding capacity, physical impediments to root growth, persistence of residual herbicides, low soil biological activity, root diseases, weeds and snails.

These factors combined with dry conditions often result in poor crop establishment, vigour, and grain yield, and water-limited yield gaps on these soils are often more than 50 per cent.

■ The first project is managed by the Soil CRC with co-investment from the GRDC and delivery through PIRSA and NSW DPI and two grower groups – Agricultural Innovation and Research Eyre Peninsula and MacKillop Farm Management Group. This project will involve mechanisms studies, field validation, soil water relations and development of decision support tools.

Chief Executive Officer of the Soil CRC, Michael Crawford, believes it is an important co-investment from the GRDC in the Soil CRC.

“The Soil CRC brings a broad range of expertise to the project with the combined strengths from university, state government and farmer group participants from across Australia,” Michael says.

■ A linked GRDC project investment led by CSIRO and managed by the GRDC will look at the interactions between soil water, root diseases and nutrient cycling.

The two investments are aiming to bridge the yield gap by 20 per cent through the development of novel soil and crop management practices. ■