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SA DROUGHT HUB

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Optimising crop nutrition for drought resilience in Yorke Peninsula's calcareous soils

PROJECT PARTICIPANTS: Northern Sustainable Soils, Trengove Consulting.

This project was part of the GRDC Riskwi$e program. Additional funding was provided by the South Australian Drought Hub to expand the reach of RiskWi$e to Yorke Peninsula grain growers.

Outcomes

- Improved understanding of crop nutrient responses on highly calcareous, low nutrient availability soils of the southern Yorke Peninsula.
- Provided insights to better inform nutrient decision-making, helping to improve the likelihood of upside returns (input optimisation, yields and ROI).
- Extension of findings to growers and advisers sharing similar soil environment on the Western Eyre Peninsula (Coorabie).
- Efficient and effective activities to support RDEA&C and uptake by end users.
- Increased availability and accessibility of, and capacity to use and adopt, knowledge that can be applied to improve drought resilience across the medium term.

Project background

Highly calcareous sandy soils across southern Yorke Peninsula present significant nutrient management challenges, with high salinity and sodicity, low phosphorus availability, poor nitrogen cycling and trace element deficiencies which can limit crop establishment, yields and productivity and increase financial risk.

In addition, these soils often have poor water-holding capacity, reducing the moisture available to crops during dry periods and increasing their vulnerability to drought. Building on research undertaken in 2024, the Refining crop nutrition strategies for building drought resilience in highly calcareous soils in southern Yorke Peninsula project investigated practical nutrient management strategies to improve fertiliser efficiency, crop performance and profitability on these challenging soils.

Project Lead

Sam Trengove, Trengove Consulting

"Highly calcareous soils present a challenge for growers on the southern Yorke Peninsula because nutrient availability can be limited, even where fertiliser inputs are relatively high.

Our research across two seasons demonstrated the importance of targeting fertiliser investment to deliver a measurable production and economic benefit.

We were able to demonstrate consistent yield responses to phosphorus, particularly at moderate application rates, while additional manganese and potassium applications were found, surprisingly, to provide no meaningful yield benefits under the conditions tested.

The trials also highlighted the potential of chicken litter as an alternative nutrient source, although subsequent research showed that synthetic fertilisers supplying equivalent nutrients could achieve similar grain yields.

The key message for growers is that more fertiliser does not necessarily mean more production. By better understanding the nutrient constraints of their challenging local soils, growers can make more informed fertiliser decisions, reduce unnecessary input costs and manage their financial risk under variable seasonal conditions.

Additionally, the establishment of this body of work has helped create opportunities for collaboration with other organisations across the Southern region, supporting further research, development and extension.

For example, Trengove Consulting will be able to continue work on phosphorus management in the region through a new investment led by Agriculture Victoria focused on high phosphorus-fixing soils. There is also complimentary research investigating herbicide residues and iron deficiency in calcareous soils with SARDI, while SAGIT has since funded a project on improving nutrient management on highly calcareous soils of southern Yorke Peninsula.

It is important to recognise that the initial investment through SADH has played a key role in this subsequent activity, attracting additional research investment and capability into the region. It is also recognised that these soils have many co-occurring constraints and that there is more work to be done in understanding the best management of these constraint complexes."

LOCAL RELEVANCE:
Supporting local growers in a unique band of soil and environmental conditions.

KNOWLEDGE GAINS:
Local nutrient management decision-making improved by demonstrating potential for yield and economic benefit.

EXTENSION AND RESOURCES:
Trial results, crop walks, flyers and social posts were developed and distributed –knowledge sharing across the project and between regions.

7
BARLEY TRIALS CONDUCTED
(2024 AND 2025)

3
STICKY BEAK CROP WALK EVENTS
MARION BAY 2024, 2025 & COORABIE (WESTERN EP) 2025

66
GROWERS ENGAGED ON YORKE PENINSULA AND WESTERN EYRE PENINSULA

16
CONSULTANTS AND INDUSTRY REPRESENTATIVES REACHED THROUGH STICKY BEAK CROP WALKS.

30+
CONTACTS RECEIVED THE 2024 & 2025 TRIAL RESULTS BOOKLETS

Click here for more on this project



Crop walk event with growers at Marion Bay. (Photo: Cameron Franklin, Trengove Consulting)

Project activities

Trengove Consulting established four barley crop trials at Marion Bay, South Australia, during the 2024 growing season, in a partnership between the GRDC RiskWi$e program and the SA Drought Hub.

The primary nutrient constraints investigated included phosphorus (P), manganese (Mn) and potassium (K), alongside the broader nutrient package of nitrogen (N), sulphur (S), zinc (Zn) and copper (Cu).

Growing season rainfall (measured at nearby Stenhouse Bay) was 254mm in 2024 and 383mm in 2025 (compared to long-term average of 358mm).

The 2024 trials investigated:

- effects of manganese fertiliser application timing, rate and product (soil applied vs foliar)
- application rate and placement of potassium fertilisers
- comparison of liquid and granular P fertilisers and rates
- assessment of alternative nutrient products such as chicken litter and biosolids

The project also assessed organic amendments and carbon coated minerals that have shown promise on comparable soil types elsewhere, helping to determine their suitability for local farming systems

In the 2025 growing season, another three replicated field trials were established in barley paddocks at Marion Bay. These trials focused on:

- the effect of foliar manganese application timing on barley growth and yield
- manganese and phosphorus interactions
- crop nutrient responses to chicken litter and comparable nutrient inputs from synthetic fertilisers

Regular plant assessments were undertaken during the growing season, including Greenseeker NDVI and tissue testing. Grain samples were processed for quality after harvest. The data was analysed to determine statistical differences between the treatments.

Results

The project's findings indicate that:

1. **Phosphorus:** Applying moderate-high rates of phosphorus consistently improved early crop vigour and grain yield. Applying higher rates provided little additional gross margin benefit. P rates of 34 and 22kg P/ha optimised partial gross margin in 2024 and 2025, respectively.
2. **Manganese:** Applying foliar manganese showed no improvement in crop growth, biomass or grain yield across two seasons of trials. Manganese nutrition is typically considered important on these highly calcareous sandy soils. Results from these trials challenged that and indicate there may be scope to reduce manganese inputs in some locations.
3. **Plant tissue testing** in 2024 indicated a negative relationship between plant Mn and P uptake. However, the same effect was not observed in 2025. Further investigation is needed.
4. **Chicken litter:** Applying chicken litter improved early crop vigour. However, synthetic fertiliser supplying equivalent rates of nitrogen, phosphorus, potassium and sulphur achieved similar biomass production, nutrient uptake and grain yield by the end of the 2025 season. This indicates that total nutrient supply was the primary driver of response, rather than other biological benefits of chicken litter such as slow release of nutrients via mineralisation.

   This is a beneficial finding for southern YP growers given the distance to chicken farms makes chicken litter freight expensive. Establishing equivalent performance using synthetic fertilisers recues the risk of incurring unnecessary costs.
5. **Micronutrient additions (Cu, Zn, B, Fe, Mo)** were found to have no measurable benefit at this site.

Benefits

By indicating where inputs may or may not provide a benefit, these results can help improve nutrient management decision-making for growers and advisers on the Southern Yorke Peninsula.

Technical reports and trial summaries have been produced to further support fertiliser efficiency and profitability on these highly calcareous soils.

Similar soil conditions are also found in parts of the Upper South East and Western Eyre Peninsula, providing opportunities for the project findings to inform nutrient management decisions beyond the Southern Yorke Peninsula.

Trengove Consulting staff shared the knowledge gained from Marion Bay with growers at a “sticky beak” crop walk held on 25 September on the far west coast (Coorabie) of the Eyre Peninsula.

"The trials at Marion Bay supported the national RiskWi$e initiative, which had limited prior involvement in the Southern Yorke Peninsula. Learnings will be shared across the five farming systems groups involved with the RiskWi$e Central Action Research Group – Hart Fieldsite Group, Upper North Farming Systems (UNFS), Northern Sustainable Soils (NSS), Mid North High Rainfall Zone (MNHRZ) and Murray Plains Farmers (MPF).

SA Hub Lead

Rachel May, Farming Systems Specialist – Adoption Officer

“The SA Drought Hub invested in locally relevant extension to help growers better understand these nutrient constraints and identify fertiliser strategies that deliver the greatest production and economic benefits.

By investigating nutrient responses across consecutive seasons, the project aimed to provide growers and advisers with practical evidence to optimise fertiliser inputs, avoid unnecessary expenditure and make more informed decisions under variable seasonal conditions.

The goal was to improve nutrient use efficiency, support profitability and strengthen the resilience of cropping systems to drought.

By supporting locally relevant trials and demonstrations across two growing seasons, the Hub has helped generate practical evidence about which nutrient management strategies deliver production benefits and where additional inputs may not be justified.

These findings will provide local growers and advisers with greater confidence to make fertiliser decisions that balance productivity, input costs and seasonal risk. This will contribute to more resilient cropping systems and farm businesses for the area.”

For more information about this project and to read the Technical Reports in full, visit the SA Drought Hub project page.

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