



RiskWi\$e in the HRZ: Nitrogen, Rotations & Preliminary Learnings

The SCF RiskWi\$e trial, a GRDC investment led by the Grower Group Alliance, has now entered its third year, building on two seasons of data to refine understanding of nitrogen (N) strategies and crop rotation decisions in WA's high rainfall zone (HRZ). The project continues to test three rotations:

- Double Break: Wheat → Canola → Legume → Barley
- No Legume: Wheat → Canola → Barley → Canola
- Single Break: Wheat → Canola → Barley → Legume

Under three N strategies based on rainfall deciles:

- Nil Nitrogen
- Decile 5 (to imitate a low risk/low-risk N strategy)
- Decile 8 (to imitate a higher risk N strategy)

Nitrogen measurements in each year of the trial are comprehensive and extensive so that a full nitrogen balance can be determined for each treatment. SCF are also overlaying economics and carbon emission profiles over for each treatment to better understand profitability and sustainability risks.

2025 RAINFALL

After a dryer than average summer period, the heavy March 2025 rainfall was a welcome relief, but we were curious to know what this would do to the pre-seeding soil nitrogen levels! The March rainfall has been followed by over 270mm of growing season rainfall to date, placing the current season at about decile 6. While these conditions have supported crop growth, they also highlight the potential for N loss through leaching in sandy HRZ soils between harvest and the following season's seeding.

WHAT WE'VE LEARNED SO FAR (2023 & 2024)

Across the first two years of the trial, higher N rates produced the highest yields in most rotations and were consistently linked to increased grain protein, often lifting grain grades and prices. However, Decile 5 N fertiliser rates frequently achieved the best balance between profit and risk, delivering solid returns without the exposure of higher risk.

The 'No Legume' rotation has proved to be the most financially volatile, in comparison to rotations with legumes, which has increased stability in both nitrogen levels and profitability. This was somewhat driven by the bumper lupin yields in year one of the trial.

Canola demonstrated greater profitability shifts in optimal N rate under changing canola price scenarios, whereas cereals were more stable in their profit response. Low and nil N treatments carried the lowest financial risk but also resulted in reduced gross margins.

Economic modelling showed that high N strategy produced the greatest returns in the 'Double Break' and 'No Legume' rotations, while in the 'Single Break' rotation, the Decile 5 (low risk) rate more effectively balanced profit and risk.

Importantly, modelling also revealed that a $\pm 30\%$ change in fertiliser prices or a 20% swing in grain prices could shift the profit-maximising N rate by 20kg/ha or more. From an emissions perspective, legume rotations lowered total greenhouse gas emissions, while no-legume rotations recorded lower emissions intensity due to higher yields.



2024 → 2025 SOIL NITROGEN CHANGES

Soil tests taken post-harvest 2024 and pre-sowing 2025 provided further insight into the nitrogen-banking capacity of sandy HRZ soils. Lupin plots recorded the highest residual N. In addition, the lupin stubble’s slow release of N will likely mean pre-sowing figures underestimate the lupins ongoing contribution of the lupins to soil nitrogen.

Across all treatments, an average 25% loss in soil profile N was observed pre-sowing., This is likely due to the 120mm rainfall event in March 2025 ‘washing’ or leaching N from the soil profile. Despite this, all treatments retained at least 60kg/ha soil N pre-sowing—indicating a measurable capacity for N banking, and the risk of over-fertilisation in drier years.

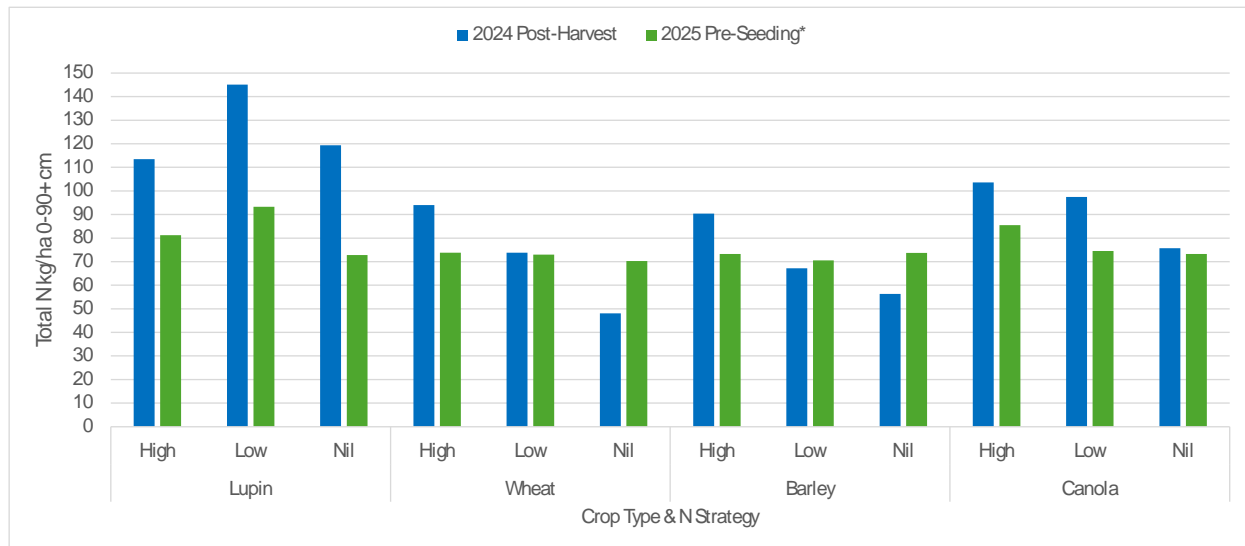


Figure 1: Showing the total nitrogen content of the soil profile post-harvest and pre-seeding by crop type and fertiliser strategy. *2025 crop type is based off the 2024 growing season.

TAKEAWAYS HEADING INTO 2025

With only two seasons of results so far, takeaways remain preliminary and may evolve as rotations progress, seasonal conditions vary, and the dataset expands. However, here’s a start:

- Adopt adaptive N strategies – adjust application rates based on pre-seeding soil tests, seasonal forecasts, and in-season monitoring.
- Consider legume inclusion – lupins reduce profit volatility and lift soil N reserves, even if the immediate-year profit gain is small.
- Manage for market shifts – canola is more sensitive to determining optimal N rate as the canola price swings, requiring more aggressive in-season adjustments than cereals.
- Monitor N carry-over – account for residual nitrogen at the start of the season to avoid unnecessary fertiliser use.

As the RiskWi\$e trial heads into its third year, it will build a clearer picture of the long-term effects of rotation and N strategies, helping growers make more informed, profitable, and sustainable fertiliser decisions in the HRZ. This comprehensive trial is a first for our region and will build a robust data set that can be referred to by farmers, agronomists and researchers well into the future.