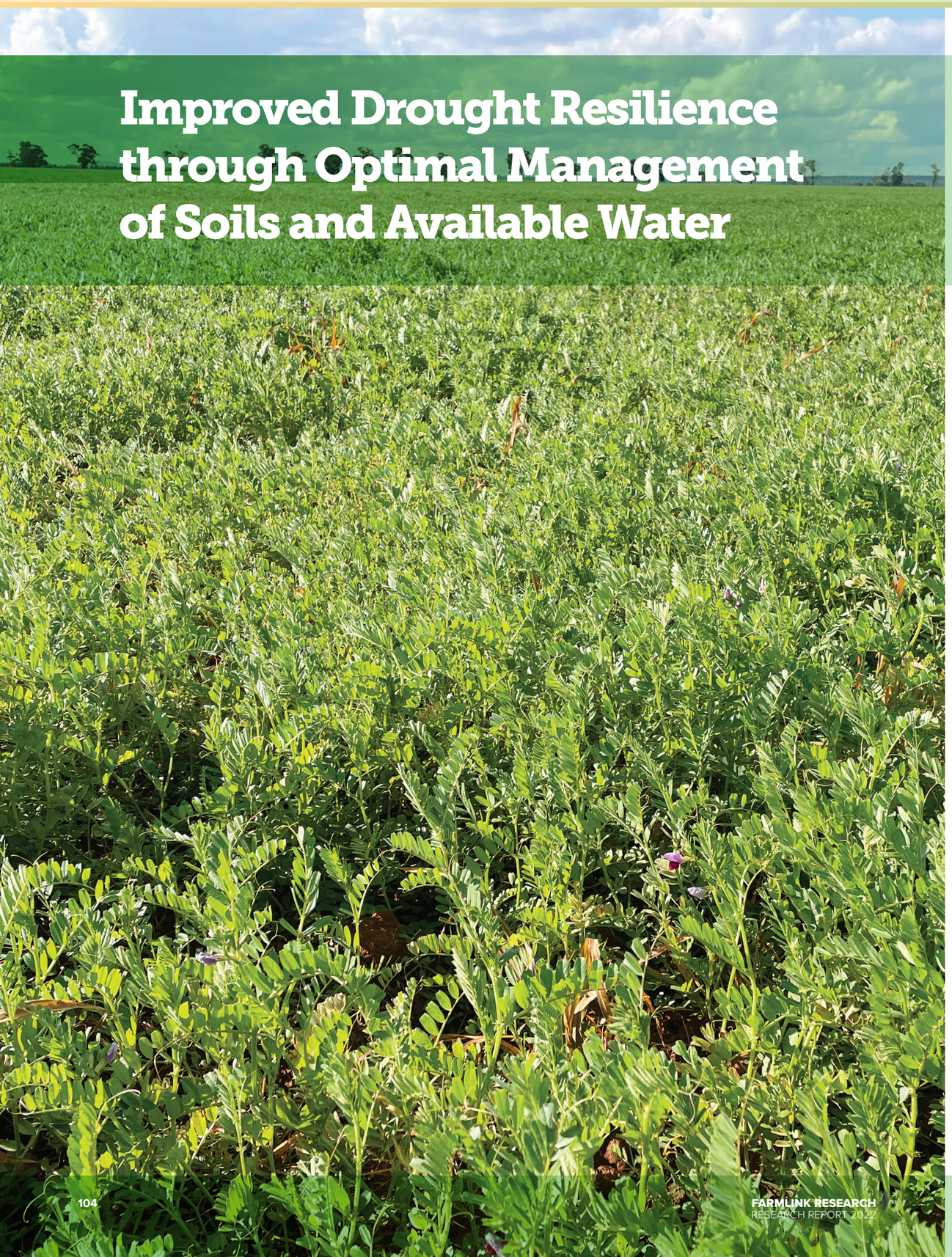
Improved Drought Resilience through Optimal Management of Soils and Available Water



KEY POINTS

- Sowing slow maturing crops earlier in the year may lead to higher crop water use efficiency.
- Measuring residual mineral nitrogen in the soil from the previous years crop can aid in preventing excess application of fertiliser. Therefore, increasing profitability and decreasing environmental losses.
- Including legumes in cropping rotations may help to increase soil organic carbon, nitrogen, and soil moisture retention.
- Case studies will be produced for each of the demonstration sites in future.

Project title	Improved Drought Resilience through Optimal Management of Soils and Available Water
Funding partners	GRDC, Australian Government Future Drought Fund, Southern NSW Innovation Hub
Project partners	Riverine Plains, CWFS, Southern Growers, CSU, CSIRO, NSW DPI
Trial Site Locations	Harden, Tallimba, Eurongilly
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INTRODUCTION

The project ‘Improved drought resilience through optimal management of soil and water’, covers central and Southern NSW regions with 12 demonstration sites.

The purpose of the project is to improve the management of natural capital through increased water use efficiency, soil organic carbon and nitrogen utilisation, which in-turn, is crucial to environmental and economic resililience in drought.

The purpose of the sites is to demonstrate strategies that have been previously researched by CSIRO and NSW DPI, as part of their small-plot farming systems research trials. This project looks to study the three core areas in which the original study is focused but within a large-scale production farming system. These three core areas of study include the use of diverse legume rotations, nitrogen banking and early sowing of crops.

FarmLink has three sites, located at Eurongilly, Harden and Tallimba. The project ultimately aims to use these demonstration sites to form case studies and marketing collateral to distribute to the wider farming community. This information will be distributed through the farming systems groups and through the SNSW Innovation Hub.

SITE 1: EARLY SOWN CROPS

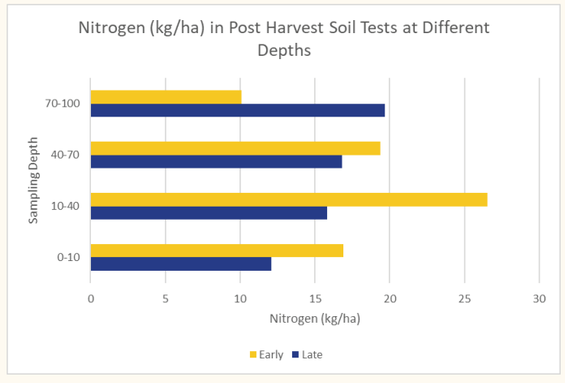
This demonstration site aimed to showcase the benefits of sowing slower maturing crops early. In the CSIRO study, they found that sowing crops earlier in the year allowed for better utilisation of available nitrogen, seasonal rainfall and therefore had better water use efficiency compared to crops sown later.

Located near Junee in Eurongilly, this site features two paddocks side-by-side, one planted early (Late-March) and the other planted late (Mid-April). In 2022 both paddocks were sown to wheat, the early having been sown with Illabo and the late with Sceptre. Both paddocks were treated roughly the same, with the exception of the early sown paddock having been grazed. Due to adverse weather conditions, we were not able to take all the measurements required to monitor the paddocks throughout the year. Notably, we were unable to collect pre-season soil tests or plant counts. However, we were able to collect harvest yield data and post-harvest soil tests.

Measurement	Early	Late
Crop Type	Winter Wheat	Spring Wheat
Variety	Illabo	Sceptre
Sowing time	Late-March	Mid-April
Grazing	Grazed	Ungrazed
Yield (t/ha)	5.3	4.8
Soil Test End of Harvest (0-100cm)		
pH $CaCl_2$	4.84	5.27
Organic Carbon %	1.14	1.5

The early sown crop yielded higher than the late sown crop. In addition to this, the early sown crop also had the benefit of having been grazed, increasing the crops overall profitability. The late sown crop did show higher soil organic carbon and nitrogen results at the end of the season, however as there is no preliminary soil test to determine the preseason OC% or nitrogen content of each paddock, we do not know if there is any correlation. It should be noted that unseasonal rainfall may have contributed to the difference in yield between the two sowing times.

The legacy effect or early and late sowing will be monitored in 2023. This will involve pre-sowing soil tests, plant density counts, post-harvest soil tests, and yield.



SITE 2: NITROGEN BANKING

The second demonstration site aims to showcase the benefits of nitrogen banking. This concept explores the benefits of applying pre-determined nitrogen rates that are not influenced by predicted rainfall outlooks for the season. Each year, the same total N is made available to the crop. This is done by considering current soil nitrogen and applying additional N as needed via fertiliser. This therefore does not deplete soil N but instead opens up the opportunity for any unused nitrogen to be carried on to the next years crop, making a nitrogen bank.

Located near Harden, this demonstration site utilises a single paddock that has been split into three different management zones. The grower at this site has increased their nitrogen rates and has been seeing an overall improvement in yield. In 2022, rates of 175kg/ha to 195kg/ha of urea were applied in three different variable rate management zones. To prove the effectiveness of these applications, a nitrogen rich strip of over 250kg/ha of urea was to be applied to the paddock. However, due to adverse weather conditions, this was not possible.

The aim of 2023 is to apply this nitrogen rich strip and observe whether the nitrogen rates being applied are high enough to achieve a nitrogen banking effect or if the pre-determined N target needs to be further increased. These findings will be compared to baseline information collected in 2022.

SITE 3: DIVERSE LEGUME ROTATIONS

The diverse legume rotations site is located at Tallimba and aims to demonstrate how legumes can be successfully included into a cropping ration, while also monitoring for soil benefits. In their study, CSIRO found that including a legume into a cropping rotation could increase soil moisture, create a break crop a nd contribute mineral nitrogen with less need for nitrogen fertiliser.

Using two paddocks side-by-side, one with a legume (vetch) and one without a legume (oats), measurements were taken throughout the year to monitor their growth rate. Both paddocks were previously in a cereal/pasture rotation.

Measurements were taken throughout 2022 on both paddocks. These included pre-planting soil tests to a depth of one meter in both paddocks, biomass cuts of the vetch, nitrogen15 (N15) analysis of the vetch and reference plants, and harvest yield results.

The vetch was not taken through to harvest and was instead brown manured in October 2022. A portion of the paddock was left un-sprayed and yield results were collected from this location.

In 2023, the paddock sown with vetch in 2022 will be sown with wheat and the paddock sown in 2022 with oats will be sown with vetch. The same measurements that were collected in 2022 will be conducted in 2023 on both paddocks. This will allow for a legacy effect from the vetch to be monitored.

The data collected from the three demonstration sites will be compared to the results collected in 2023 and results will be published. The aim for 2023 will also be to create case studies on each farming enterprise and document their experiences of adopting these practice changes.