

NSW DROUGHT RESILIENT MIXED FARMING SYSTEMS LONG TERM TRIALS IN THE RIVERINE PLAINS

KEY MESSAGES

- **Demonstration trials at Corowa and Burrumbuttock are investigating the effect of brown manuring, hay and different annual pasture species on biomass production nodulation and nitrogen fixation, as well as moisture carryover to the next crop.**
- **At Corowa, early vetch biomass production was relatively low, but the crop rebounded to produce a reasonable hay yield.**
- **The combination of drier conditions and different species growth habits likely affected the amount of biomass measured at Burrumbuttock by mid September.**
- **Acidic topsoils and dry conditions likely limited nitrogen fixation at both sites, limiting the potential for nitrogen accumulation.**
- **Follow-up soil sampling in 2026 will highlight any differences in carry-over moisture and soil nitrogen between treatments.**

WHY THIS WORK MATTERS

Mixed farmers across the Riverine Plains are constantly balancing risk and opportunity. They need cropping and livestock systems that remain productive through dry conditions, patchy rainfall and rising input costs. This makes every paddock decision critical: what to sow, how to manage it, and whether it can deliver more than one benefit within the rotation.

This challenge is the focus of the *Long-term trials of drought resilient farming practices in NSW* project, led by Riverine Plains. As part of this project, two demonstration sites were established on mixed farms near Corowa and Burrumbuttock to investigate the role of annual grazing legumes in crop rotations within mixed farming systems.

Riverine Plains' Field Trial Manager, Matt de Roos, explained that the demonstration site at Corowa is comparing the effects of brown manuring vetch and when it is cut for hay, while the Burrumbuttock site is looking at the effects of three different annual grazing legume species, including vetch, Persian clover and Arrowleaf clover.

"In both demonstrations, which each run for three years, we're assessing the impacts of these treatments on soil nitrogen, soil moisture and subsequent crop production in mixed farming systems," he said.

"By looking at the soil and crop benefits of including annual grazing legumes in crop rotations, Riverine Plains is aiming to support practices that improve drought resilience, reduce the reliance on costly nitrogen fertiliser, maintain soil moisture and provide valuable livestock feed in mixed systems," he added.

These demonstrations support a central replicated trial site established at Charles Sturt University's Wagga Wagga Campus, consisting of replicated 'mini farms' that represent different farming systems. Riverine Plains is using findings from these central hub trials, and input from farmers and advisors, to shape the paddock-scale demonstrations.

EXPLORING THE ROLE OF ANNUAL LEGUMES IN MIXED FARMING

VETCH AT COROWA

WHAT WE DID

On 20 May 2025, Benetas vetch was sown in a 73 ha irrigatable centre pivot paddock, which was then managed by the farmer as a hay crop. Within this paddock, eight brown manure and hay cut demonstration boxes measuring 3 x 3 m² were established at the edge of the centre pivot, with four irrigated treatments within the centre pivot area and the other four treatments in the dryland section. Although irrigation was available, it wasn't applied during the 2025 growing season.

Biomass samples were collected early in August, before the paddock was cut for hay. Nodulation assessments were also carried out, with plants scored from 1–5.

Soil samples were collected in late January 2026 to determine treatment impacts on nitrogen and moisture.

WHAT WE FOUND

Seasonal conditions

Dry conditions and extended periods without rainfall created challenging conditions in 2025. The Corowa demonstration site received slightly higher and timelier in-season rainfall (197 mm, May to November), than the Burrumbuttock site, supporting stronger growth and higher biomass production.

Biomass & below-ground assessments

In mid August, vetch biomass was relatively low and variable, with averages ranging from 1.3–3.0 t DM/ha across the treatments.

“Although biomass was relatively low in mid August, and the vetch appeared slow to get going, the farmer reported that the paddock rebounded to produce an average 3.7 t/ha of baled hay,” said Matt.

Below ground, the picture was more nuanced.

“While nodule formation was relatively low overall, nodulation was noticeably higher in the irrigated demonstration strips than the dryland strips, likely because residual moisture and soil conditions were more favourable for rhizobial function.

“Soil testing also showed nitrogen was concentrated in the 0–10 cm depth within the profile, with much lower levels from 10–90cm, which was possibly linked to the previous year's irrigated canola crop,” added Matt.

Acidic topsoil (pH CaCl₂ 4.1–4.7) across the 0–30 cm depths may have influenced nodulation and limited the crop's ability to fix nitrogen effectively.

“Overall, the first year's results from Corowa suggest that vetch can rebound to produce a good hay yield, even when early growth is modest.

“It also highlighted that legume performance is affected by seasonal conditions and soil constraints, that are not obvious from above ground” added Matt.

In 2026, the trial site will return to a grain crop, with follow-up measurements to include establishment, biomass, pre-sowing soil sampling, yield and grain quality.

COMPARING VETCH AND CLOVERS AT BURRUMBUTTOCK

WHAT WE DID

In 2025, a randomised strip trial was established in May within a 32 ha paddock near Burrumbuttock. The trial involved sowing 9 m x 600 m strips, each containing a different annual grazing legume species—vetch, Persian clover and Arrowleaf clover— with each strip replicated twice to compare their effects of on soil nitrogen and moisture.

Due to limited feed availability elsewhere on the farm, the paddock was grazed by 180 ewes and lambs for 26 days over late winter, before biomass cuts were taken in mid September. Nodulation assessments were also completed during the season to see how the various species treatments responded.

The paddock was sprayed out at the end of September, before livestock were returned to the paddock to graze the remaining biomass.

Soil samples were collected in late January 2026 to determine treatment impacts on nitrogen and moisture.

WHAT WE FOUND

Seasonal Conditions

At the Burrumbuttock site, 181mm rainfall was received from May–November. Dry conditions stalled early growth through the colder months, with the different pasture species never fully making up that lost ground.

Biomass & below-ground assessments

Biomass cuts in mid September showed vetch as the strongest performer of the three annual legumes, having roughly 50 percent more biomass after grazing than the Arrowleaf clover and nearly 60 percent more biomass after grazing than the Persian clover.

Matt explained that this was probably due to the different growth habits of the species.

“Persian clover is known for its ability to produce good spring feed, while Arrowleaf clover tends to produce more bulk in late-spring and early summer, while vetch was able to produce more bulk by September than the other species.



“We also noted a high proportion of other species, including grasses and other grazing weeds, present at varying levels across each treatment,” he added.

Below ground, although nodules were present across all treatments they were generally small, which indicated that nitrogen fixation was limited, likely due to the drier seasonal conditions.

“Soil testing identified an acidic subsurface layer between 5–15 cm, which may have also contributed to slower growth and poorer nodule development as a result of suboptimal conditions,” explained Matt.

“Overall, the Burrumbuttock demonstration site highlighted how annual legumes can provide flexible options under challenging seasonal conditions, in this case contributing nitrogen for next year’s crop, while also providing a grazing option for livestock in 2025,” added Matt.

In 2026, the site will be sown to wheat, with further measurements to determine the legacy effects of these annual pasture species.

Looking ahead

While these are only the first-year results, the longer-term value of the trials will come from following those paddocks through the next season.

The key questions now are practical ones: how much benefit carries through to the following crop, how consistent those benefits are across seasons, and how can annual pasture legumes offer more than one return—either as feed for livestock, support for nitrogen management, or as another tool for building resilience in an increasingly variable climate.

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