

rD&E Progress Report

2025

Annual Report

Stubble Management

Project code:

Prepared by:

Liam Guthrie

Liam.guthrie@scfarmers.org.au

Stirlings to Coast Farmers Inc.

Date submitted
to GRDC:

Once completed this template is to be submitted **in Word format** via the 'Grains Investment Portal' - <https://access.grdc.com.au/>.



KEY MESSAGES

- No treatment consistently outperformed the untreated control across all trials.
- Nitrogen was generally not limiting, reducing the potential for product-driven responses.
- Biological products (Res+, Digest-It) did not consistently improve stubble breakdown or reduce disease loads.
- Nutritional treatments (particularly UAN) showed occasional yield or establishment benefits, but these were inconsistent.
- Broadscale trials provided clearer trends than small plots, particularly for establishment.
- Untilled plots had a higher plant tissue total N% compared to the tilled plots – possibly due to N tie-up in the tilled plots (faster OM decomposition). This translated to minor yield differences at South Stirling as well.
- Seasonal conditions and system factors (tillage) had a greater influence than chemical treatments on stubble management.

SUMMARY

Stubble management is a significant issue in Western Australia, particularly in the high rainfall zone, where it is not uncommon for cereal yields to reach over 7 t/ha with the resulting stubble loads being up to 10 t/ha.

To address this, two small plot trials, in South Stirling and Frankland River, and two broadscale trials, in West Kendenup and South Stirling, were implemented in 2025 to investigate different biological, nutritional and tillage treatments for managing stubble loads.

In the small plot trials, treatments included RES+, Digest-It, UAN, granular NS and liquid NS, across two tillage systems (standing stubble and tilled stubble). While treatment responses were limited at the small-plot scale, outcomes from this work have informed the progression of the project to broadscale, farmer-managed strip trials.

With support from a GRDC investment, the 2026 phase will consist of paddock-scale strip trials comparing RES+, Digest-It, UAN (60 L/ha) and an untreated control across four replicates. This approach is intended to improve the detection of treatment effects under commercial conditions and support both quantitative assessment and visual evaluation of treatment responses for grower extension activities.

BACKGROUND

This is a high amount of stubble residue left post harvest and is an increasing concern for local growers due to poor establishment of following crops, nitrogen (N) tie-up, disease carryover issues and seeding operation inefficiencies such as blockages, hair pinning, poor soil throw, and bulldozing. As a result, plant establishment has become increasingly difficult, particularly in canola.

Traditionally, high stubble loads in the region have been removed by burning. However, there

has been a move away from burning due to a combination of social license issues and farming system concerns. Burning increases the risk of erosion and nutrient loss and decreases soil moisture.

Growers are also concerned with Nitrogen (N) tie-up from retained crop stubble. Although cereal stubbles contribute very little N to the following crop, stubbles are a source of carbon and N is required from the soil to breakdown this high carbon material.

Previous GRDC research has examined the additional nitrogen (N) required to overcome early N immobilisation caused by cereal stubble, suggesting that an extra 5–6 kg N/t of residue may help reduce this issue. Further investigation is needed to determine whether applying nutrients and an enzyme-based stubble “digester” during the summer fallow period, alongside mechanical stubble treatments such as tillage, can accelerate stubble breakdown. This may improve winter crop establishment—particularly in canola—while reducing early-season nitrogen tie-up. Visual observations could also be used to assess whether these treatments reduce the carryover of stubble-borne diseases.

OBJECTIVES

This project explores the effectiveness of different stubble management/break down options (chemical and mechanical) in the Albany Port Zone and assesses how these treatments impact on soil nitrogen ‘tie-up’ and establishment of the following winter crop.

METHOD

Two small-plot trials were established at South Stirling and Frankland River, with stubble treatments applied in early March and crops sown in early April. The trials assessed biological and nutritional stubble management strategies under two stubble conditions: standing and tilled. Treatments were arranged in a fully randomised, blocked design, with 16 treatment combinations and three replicates per block.

Two broadscale trials were also implemented in South Stirlings and Kendenup, to assess the effect, if any, of Res+ vs no Res+, on establishment, plant nutrition (via tissue testing), NDVI or yield. Both sites had different layouts as they were adapted after the tillage treatments did not go ahead.

Treatments for the small plot trials were as follows:

- Res+ – one application early March & late March (1.2l/ha each)
- Res+ - Later application (late March) – 1.2l/ha – slight change due to Adama recommendation
- Digest-it (Bio-Ag) – one application (with rainfall) - 3l/ha + 20L/UAN
- UAN (50L/ha) – 21kg N/ha – February 2025
- UAN – Rate determined by stubble load (60l/ha)
- Liquid NS (74L/ha)- 21kg N/ha & 5.77kg S/ha – February 2025
- Granular N/S (21kg N/ha, 5.77kg S/ha) – February 2025
- Untreated (control)

Trial Map Treatment Description

Trt	Code	Description
1	CHK	Res 1
2		Res 2
3		DG
4		UAN 1
5		UAN 2
6		L-NS
7		G-NS
8		UTC



Figure 1: Trial layout of standing stubble for the 2025 small plot trials at Frankland and South Stirling.

Trial Map Treatment Description

Trt	Code	Description
1	CHK	Res 1
2		Res 2
3		DG
4		UAN 1
5		UAN 2
6		L-NS
7		G-NS
8		UTC



Figure 2: Trial layout for tilled stubble for the 2025 small plot trials at Frankland and South Stirlings.

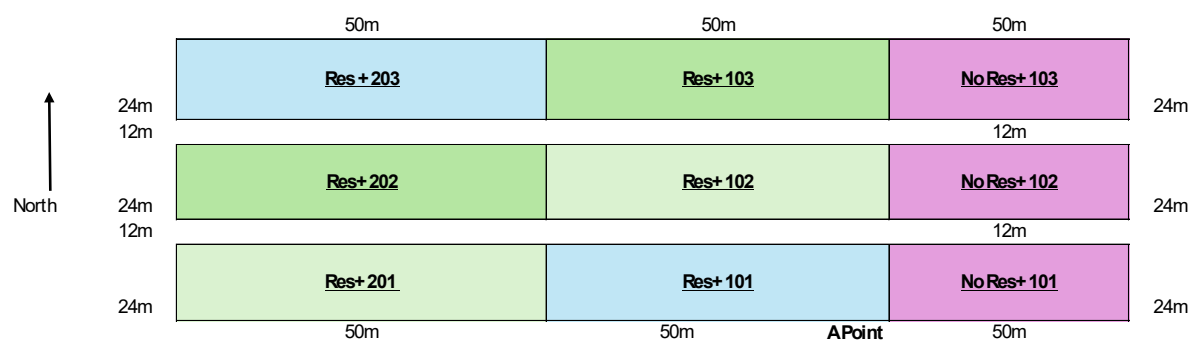


Figure 3: Trial layout for the broadscale trial at South Stirling, 2025.

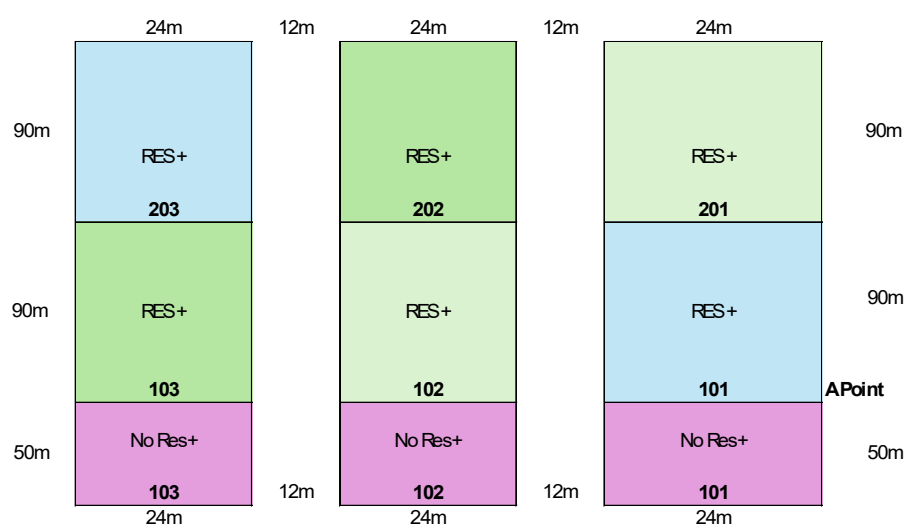


Figure 4: Trial layout for the broadscale trial at Kendenup, 2025.

RESULTS

Baseline Soil Results - Frankland

Baseline soil nitrogen (0–30 cm) ranged from 20 to 49 kg N/ha, indicating moderate and variable nitrogen supply which is typical of HRZ systems, and suggests the site was likely responsive to applied nitrogen. Soil pH (CaCl₂) ranged from 5.3 to 5.6, which is adequate for canola but at the lower end of optimal, particularly in the subsurface. Sampling was conducted shortly after early autumn rainfall, meaning some early mineralisation may have already occurred, however nitrogen supply is still likely to increase further as the season progresses.

Table 1: Total Nitrogen (kg N/ha) 0-30cm, Frankland, 2025.

Site	Total Nitrogen (kg N/ha) 0-30cm
A	42.55
B	49.2
C	32.75
D	20.45

Table 2: pH Levels 0-10cm, 20-30cm, Frankland, 2025.

Site	pH Level (CaCl ₂) 0-10cm	pH Level (CaCl ₂) 10-30cm
A	5.3	5.35
B	5.4	5.6
C	5.4	5.25
D	5.6	5.35

Potentially Mineralisable Nitrogen (kg/ha)

Potentially mineralisable nitrogen (PMN) was assessed at both the South Stirling and Frankland River trial sites to determine whether stubble management (nutrition or enzyme) or treatment application (standing vs tilled) influenced soil nitrogen mineralisation potential.

At the South Stirling site, PMN levels varied between treatments and stubble management systems. However, there was no clear or consistent treatment effect across the biological or nutritional treatments assessed (Figure 5). In several cases, PMN values differed between the standing and tilled stubble systems, although the variability between replicates suggests that many of these differences were not statistically significant. The Res2 treatment recorded the highest PMN values in the standing stubble, while several treatments, including L-NS and UAN1, recorded moderately higher PMN levels under the tilled system. Overall, PMN levels were relatively modest across treatments at this site, indicating limited separation between treatments in terms of their impact on nitrogen mineralisation potential.

At the Frankland River site, PMN values were generally more variable across treatments compared with South Stirling. While some treatments showed higher PMN levels in either the standing or tilled stubble systems, the variability between replicates was also relatively large (Figure 6). As a result, no consistent or statistically reliable treatment effects were observed. In particular, the untreated control recorded relatively high PMN levels in the standing stubble, while the L-NS treatment recorded comparatively high values in the tilled stubble. However, these responses were not consistently observed across other treatments.

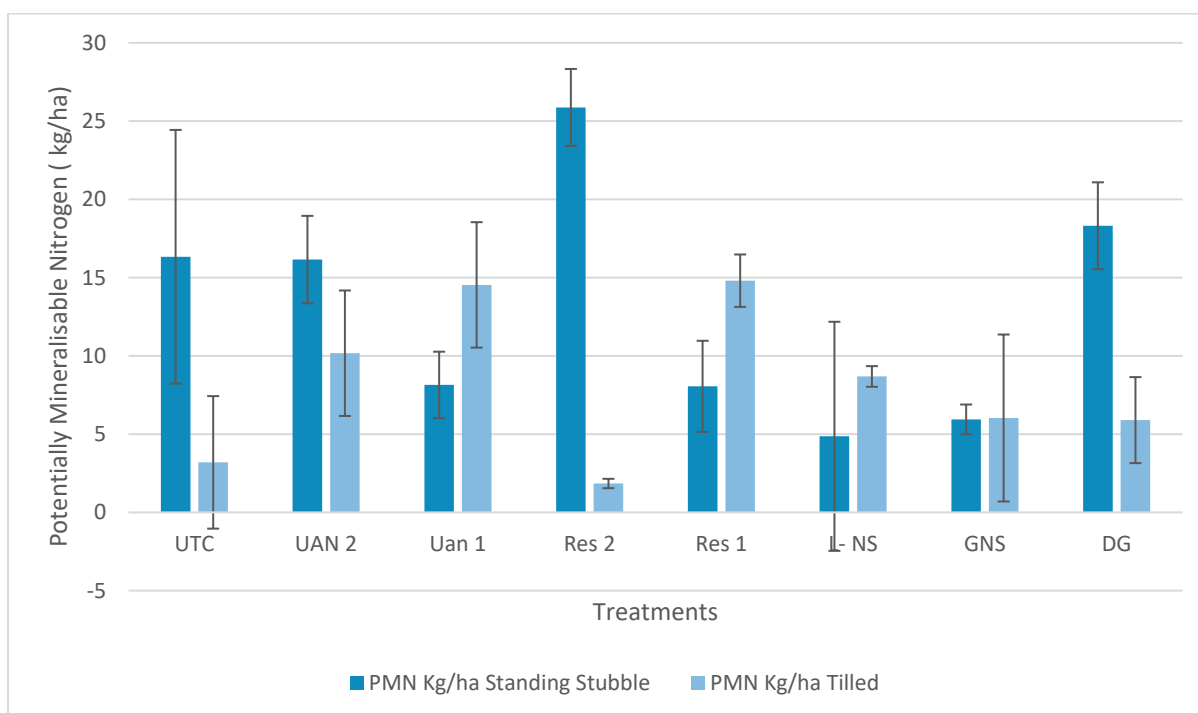


Figure 5: Potentially Mineralisable Nitrogen (kg/ha) South Stirling, 2025.

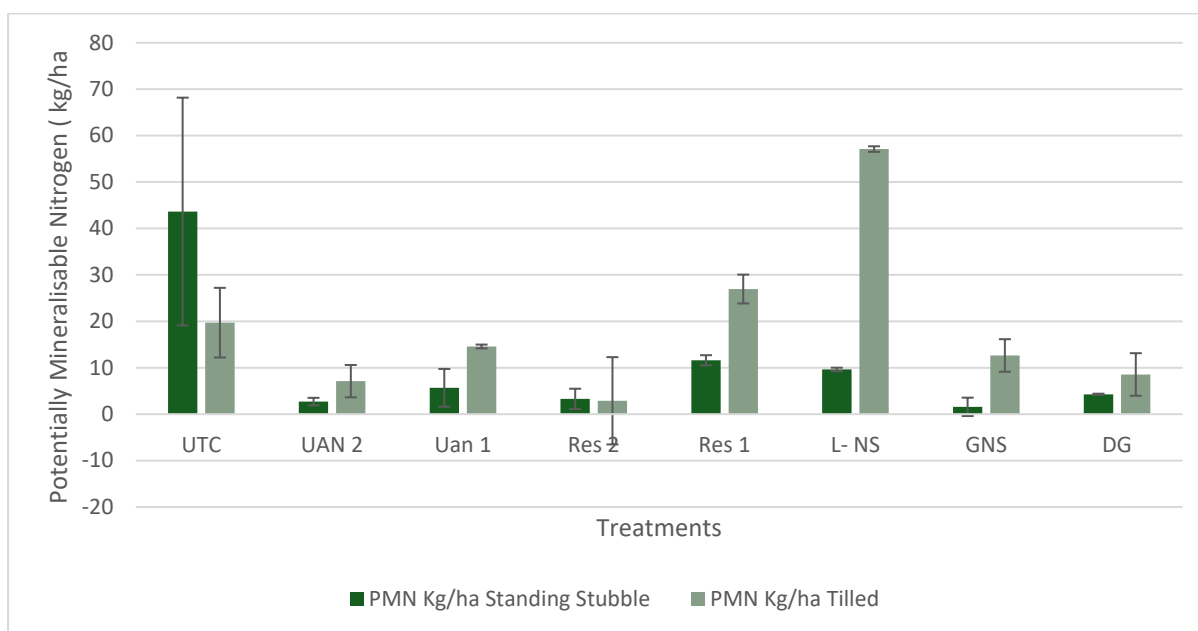


Figure 6: Potentially Mineralisable Nitrogen (kg/ha) Frankland, 2025

N-Wise Testing

An N-Wise test is a soil biological test that estimates the soil's capacity to mineralise nitrogen from organic matter during the growing season. In simple terms, it tells us how much N the soil can "release" naturally, not what is available at the time of sampling.

For Frankland, the estimated nitrogen mineralisation was higher in the standing stubble compared to tilled stubble across all treatments, indicating a strong capacity for nitrogen supply at this site

(Figure 7). While some variation between treatments was observed (e.g. UAN2, L-NS and Res1), there was no consistent treatment effect, with differences likely reflecting site variability.

Overall, the results indicate a high inherent capacity to mineralise nitrogen, aligning with adequate tissue N levels and limited yield response to treatments. This suggests that nitrogen was unlikely to be limiting, and that crop performance was more strongly influenced by stubble management rather than treatment effects.

It should be noted that these values represent a laboratory estimate of potential nitrogen mineralisation, rather than actual nitrogen release under field conditions. As such, they indicate the capacity of the soil to supply nitrogen, not the exact amount that would become available to the crop during the season.

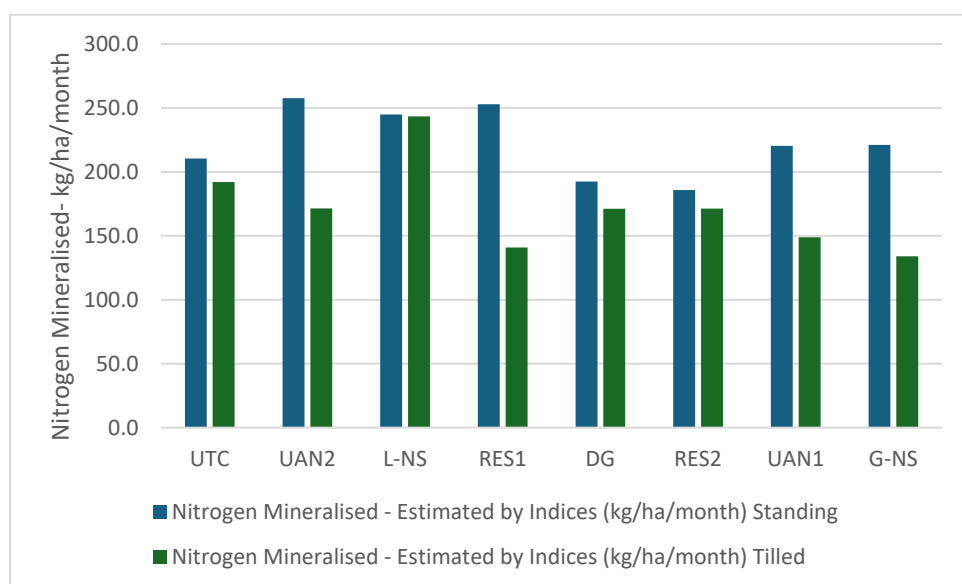


Figure 7: Nitrogen Mineralised. Estimated by Indices (kg/ha/month) standing and tilled, Frankland, 2025.

Estimated nitrogen mineralisation showed similar levels between standing and tilled stubble systems at South Stirling, with no consistent advantage of one system over the other (Figure 8). While some variation between treatments was observed (e.g. higher values in UAN1 and G-NS in the standing stubble plots, and UAN2 and Res1 in the tilled plots), there was no clear or consistent treatment effect, with differences likely reflecting site variability.

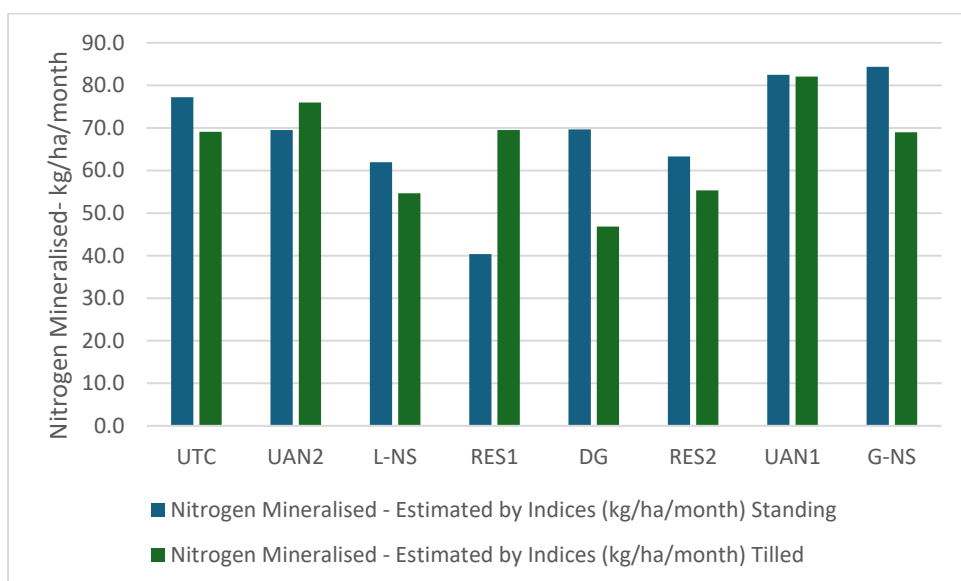


Figure 8: Nitrogen Mineralised. Estimated by Indices (kg/ha/month) standing and tilled, South Stirling, 2025.

Stubble Disease Loading

Stubble samples collected from each treatment were analysed by SARDI using qPCR to quantify pathogen DNA, expressed as kDNA copies per gram of sample. Of the two barley stubble diseases assessed, Net Form Net Blotch (NFNB) was only detected at Frankland River, while Yellow Leaf Spot (YLS) was only detected at South Stirling. For this reason, only one disease is reported for each site.

Prior to analysis, three extreme outliers were removed as the readings were substantially higher than the remainder of the dataset and likely not representative of treatment effects. Despite this, considerable variability remained between replicates, reflected in the large standard errors across many treatments.

At Frankland River, NFNB DNA levels showed no consistent treatment effect across the biological or nutritional products tested (Figure 9). However, there was a minor tendency for the tilled treatments to have higher NFNB DNA loads compared with the non-tilled treatments across several plots, including the untreated control and UAN treatments. Despite this trend, variability between replicates was high and differences between treatments were inconsistent.

At South Stirling, the opposite pattern was observed for YLS. Across several treatments, non-tilled stubble generally showed higher YLS DNA levels compared with tilled stubble, suggesting that retaining standing stubble may have maintained slightly higher pathogen loads (Figure 10). As with the Frankland River site, no biological or nutritional treatment consistently reduced pathogen DNA levels relative to the untreated control.

It should also be noted that currently no validated thresholds exist to associate DNA levels of NFNB or YLS detected in stubble with disease risk in the following crop. Unlike soilborne pathogens assessed through PREDICTA® B, these qPCR results should therefore be interpreted as relative comparisons between treatments rather than indicators of disease risk.

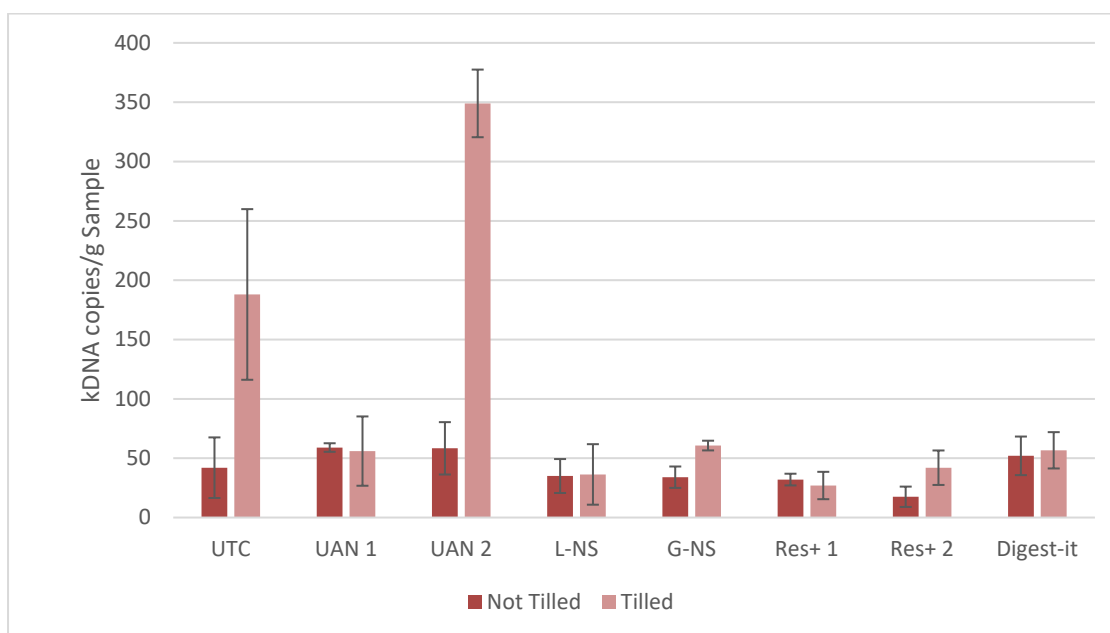


Figure 9: *Pyrenophora teres f teres* (Net Form Net Blotch), Frankland, 2025.

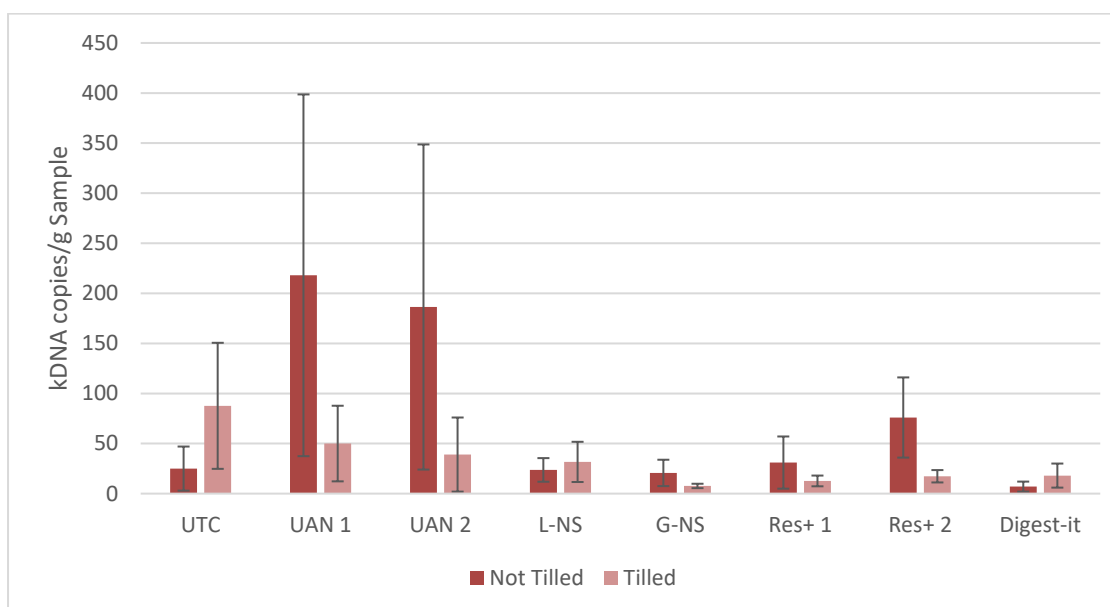


Figure 10: *Pyrenophora tritici-repentis* (Yellow Leaf Spot), South Stirling, 2025

Stubble Mesh Bag Assessment

Stubble decomposition was assessed using a mesh bag method. Approximately 0.5 m² equivalent of cereal stubble from each treatment area was placed into mesh bags immediately following treatment application and positioned under the soil surface within the respective plots. The bags allowed soil contact and microbial activity while preventing loss of residue material. At seeding, the mesh bags were retrieved, and the remaining stubble was oven dried, sieved to remove soil contamination, and weighed to quantify the remaining stubble mass. Differences in recovered stubble weight were used as an indicator of relative stubble decomposition between treatments.

The mesh bag assessment indicated limited differences in stubble decomposition between treatments at both trial sites (Figure 11). When compared to the untreated control (UTC), none of the biological or nutritional treatments consistently reduced the remaining stubble mass at the time of collection. The Res+ treatments (Res+1 and Res+2) also did not demonstrate a measurable improvement in stubble breakdown relative to the control. While some variation in remaining stubble weight was observed between treatments and between the Frankland River and South Stirling sites, these differences were inconsistent and did not indicate a clear treatment response. Overall, the results suggest that environmental conditions (rainfall and temperature) and site-specific factors likely had a greater influence on early-season stubble decomposition than the applied treatments.

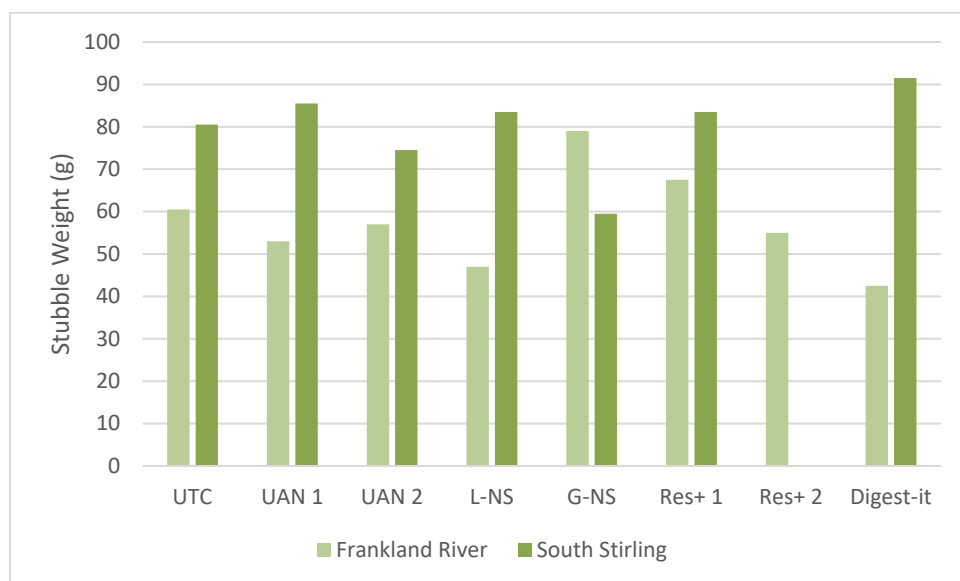


Figure 11: Stubble Mesh Bags, Pre seeding weights, Frankland River and South Stirling, 2025.

Plant Establishment

The canola establishment at South Stirlings (small plot) was generally higher under the tilled stubble system (approximately 24–44 plants/m²) compared to the standing stubble system (approximately 22–35 plants/m²) (Figure 12). Some variation between treatments was observed, with UAN2 higher under the standing stubble and Res2 and DG higher under tilled stubble, however there was no consistent or statistically significant treatment effect, with overlapping error bars across most treatments.

Despite improved establishment in the tilled system, this did not correspond with higher yield, suggesting that plant establishment was not the primary driver of yield differences at this site.

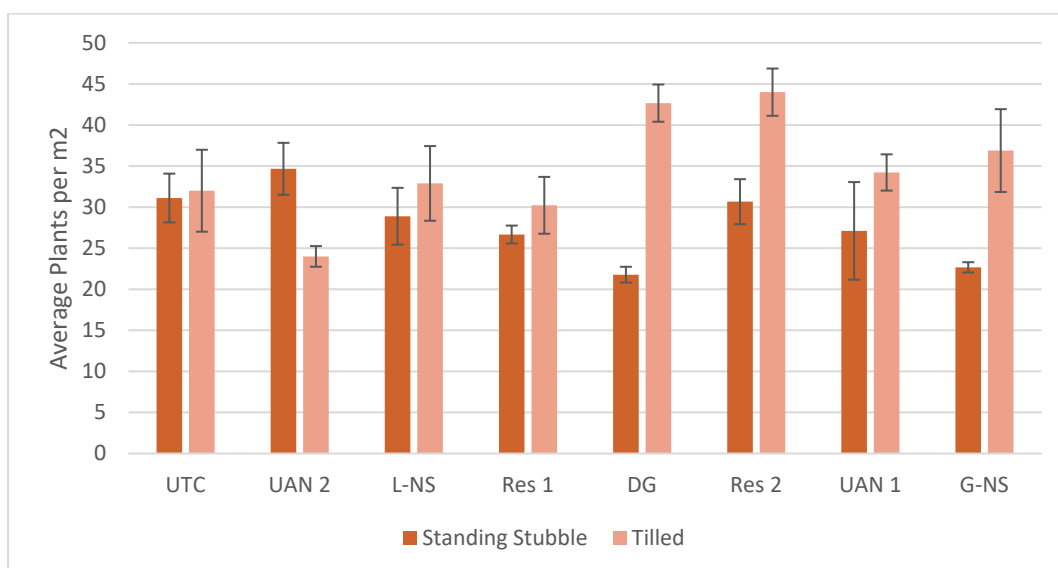


Figure 12: Plant Establishment (small plot trial), Average plants per m2, Standing and Tilled stubble, South Stirlings, 2025.

At the broadscale site at South Stirlings, in the standing stubble plots, canola establishment was higher in the Res+ treatments (24 plants/m²) compared to the non-Res+ treatments (20 plants/m²) (Figure 13). The difference between treatments was consistent with relatively low variability, indicating a clear improvement in establishment with the Res+ treatment. This suggests that, at a broadscale level, the application of Res+ may enhance early crop establishment in standing stubble. These results also show that there is less variability in the broadscale trial compared to the adjacent small plot trial.

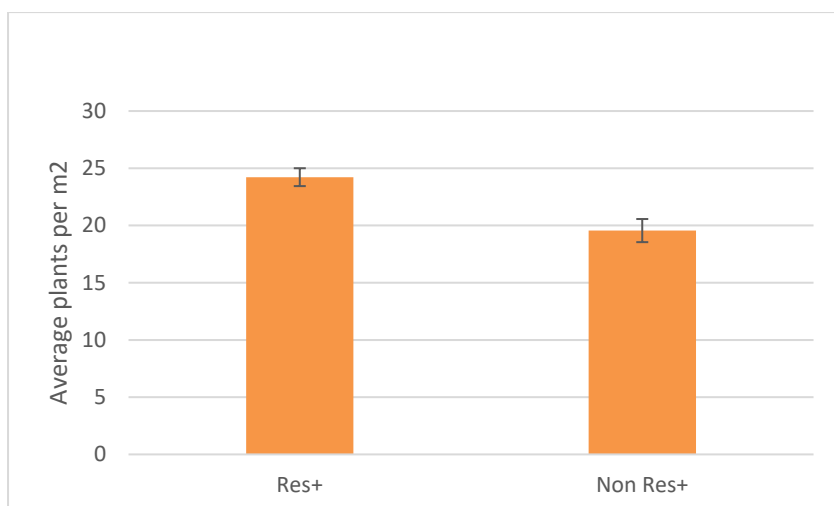


Figure 13: Plant Establishment (broadscale trial), Average plants per m2, Res+ and Non Res+, South Stirlings, 2025.

Canola establishment at the Frankland River site was generally similar between standing and tilled stubble systems, with plant counts generally ranging between approximately 40 and 60 plants/m² across treatments. There was no consistent advantage of one stubble system over the other, with some treatments performing slightly better in the standing stubble (e.g. UAN2), while others were higher under tilled conditions (e.g. L-NS), although these differences were variable.

Across treatments, UAN1 and G-NS tended to produce among the higher establishment levels in the standing stubble, while L-NS recorded the highest establishment under tilled stubble. Conversely, treatments such as UTC and Res+1 were generally among the lower establishment groups across both systems. However, variability between replicates was evident, and no clear or statistically significant treatment effects were observed.

Overall, establishment at this site was relatively high across all treatments, and neither stubble management nor individual treatments resulted in consistent differences in plant establishment.

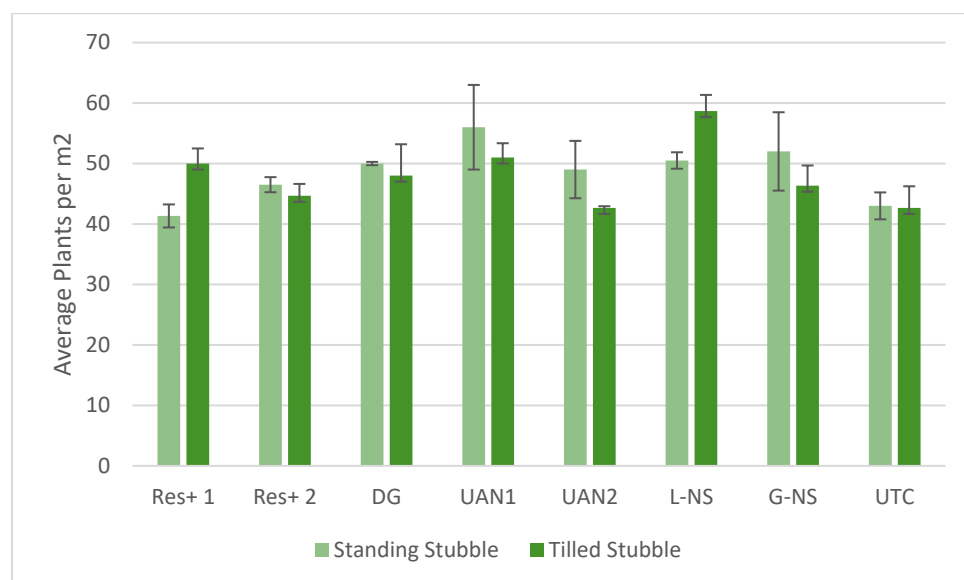


Figure 13: Plant Establishment (small plot trial), Average plants per m², for standing and tilled stubble, South Stirlings, 2025.

At the Kendenup broadscale site, canola establishment was higher in the Res+ treatments (~28 plants/m²) compared to the non-Res+ treatments (~25 plants/m²) (Figure 14). This difference was consistent with relatively low variability, indicating a clear improvement in establishment associated with the Res+ treatment under these conditions.

While the magnitude of the response was modest, the trend suggests that Res+ may provide a benefit to early crop establishment in standing stubble systems at a paddock scale. However, further work is required to determine whether this improvement in establishment translates into consistent yield benefits across seasons and environments.

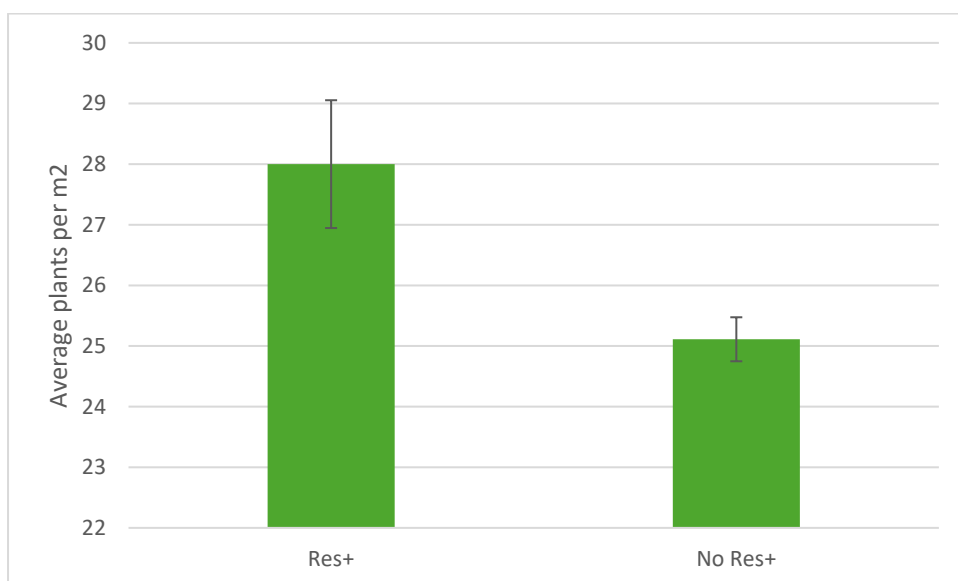


Figure 14: Plant Establishment (broadscale trial), Average plants per m2, Res+ and Non Res+, Kendenup, 2025

Tissue Testing

South Stirling

Tissue nitrogen concentrations at H100 were consistently higher under the standing stubble system compared to the tilled stubble system across all treatments (Figure 15). Standing stubble treatments generally recorded values around 4.6–5.0% N, while tilled stubble treatments ranged from approximately 4.0–4.5% N, indicating improved nitrogen availability under reduced soil disturbance.

Across the biological and nutritional treatments, differences were relatively small and inconsistent. Treatments such as UAN1, Res1 and L-NS recorded among the higher tissue N levels in the standing stubble, while UAN2 and DG were slightly lower, although variation between treatments was minimal. A similar pattern was observed under tilled stubble, with limited separation between treatments and all values remaining within a relatively narrow range.

Overall, all treatments fell within the adequate to optimal nitrogen range (>4.0% N), suggesting that nitrogen supply was sufficient across the trial. The results indicate that stubble management had a greater influence on plant nitrogen status than the individual biological or nutritional treatments tested

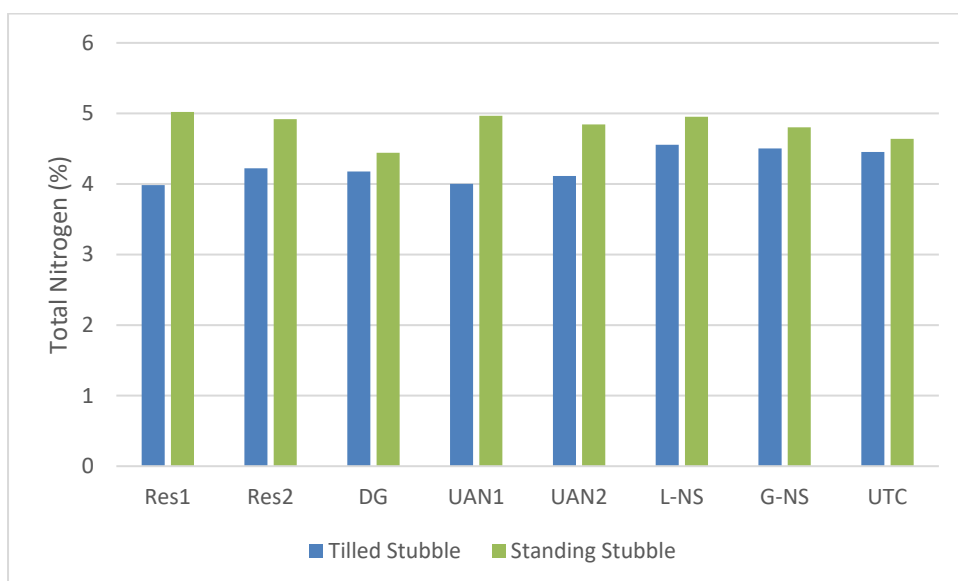


Figure 15: Total Nitrogen (%) South Stirlings, 2025

Frankland River

Like the South Stirling site, tissue nitrogen concentrations were higher under the standing stubble system compared to tilled stubble across most treatments (Figure 16). Differences between biological and nutritional treatments were small, with limited separation observed, although L-NS was lower under tilled conditions.

All treatments were within the optimal to high nitrogen range ($>5.0\%$ N), indicating adequate nitrogen supply. As observed at South Stirling, stubble management had a greater influence on tissue N than individual treatments.

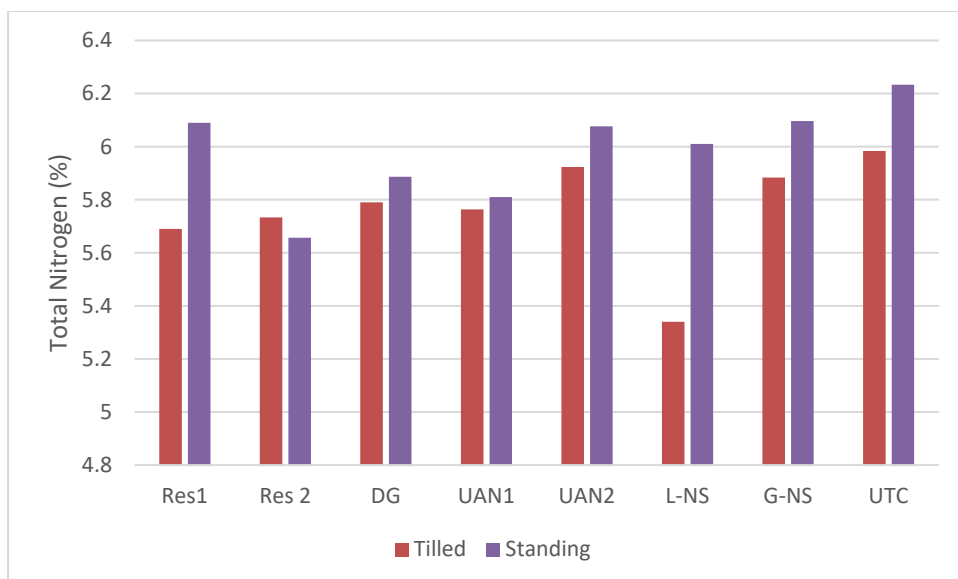


Figure 16: Total Nitrogen (%) Frankland River, 2025

NDVI

NDVI measurements taken during the growing season showed no consistent or statistically significant differences between treatments or stubble management systems. While minor variation was observed across treatments, the level of variability between replicates suggests these differences were not treatment driven. Overall, NDVI results indicate similar crop biomass and canopy development across all treatments, with no clear response to the biological or nutritional applications tested.

Harvest Yield

Harvest yield results for South Stirlings indicated a consistent difference between the two stubble management systems. Across all treatments, yields were generally higher in the standing stubble treatment compared with the tilled stubble treatment (Figure 17).

In the standing stubble treatment, yields ranged from approximately 2.65 to 2.95 t/ha, with relatively small variation between the different biological and nutritional treatments. The UAN2 treatment recorded the highest yield, approaching 3.0 t/ha. The Res1 and Res2 treatments both produced yields of approximately 2.7 t/ha, which were comparable to several other treatments including Digest it (DG), Granular NS (G-NS) and the untreated control. This suggests that in standing stubble conditions, the biological and nutritional treatments evaluated in this trial provided limited separation in yield response.

In contrast, yields under the tilled stubble treatment were lower overall, ranging from approximately 2.25 to 2.55 t/ha. Within this system, Res+2 recorded the highest yield, while Res+1 produced the lowest yield of the treatments assessed. Other treatments including DG and UAN1 produced yields around 2.45–2.50 t/ha, while L-NS and G-NS were among the lower yielding treatments.

When comparing stubble systems directly, the standing stubble system consistently outyielded the tilled system across all treatments, with differences generally ranging between 0.3 and 0.5 t/ha. This indicates that stubble management had a greater influence on yield than the individual biological or nutritional treatments tested within this trial.

Overall, the results suggest that maintaining standing stubble provided a yield advantage at this site, while the biological and nutritional treatments produced relatively small yield differences within each stubble management system.

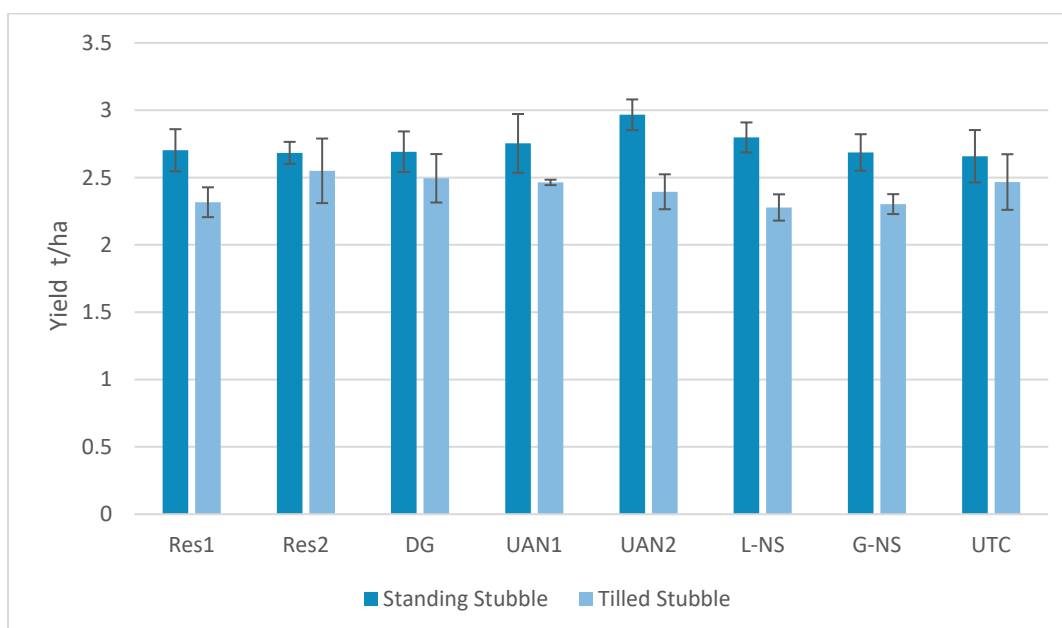


Figure 17: Harvest yield, Tilled and Standing Stubble, South Stirling small plot, 2025.

Soil Sampling Post Harvest

South Stirling

Total soil nitrogen (0–30 cm) in the standing stubble plots at South Stirling ranged from approximately 22 to 35 kg N/ha, indicating moderate nitrogen levels across treatments (Figure 18). The L-NS treatment recorded the highest total nitrogen, while G-NS and UTC were among the lower values, although differences between treatments were relatively small.

Nitrogen was generally well distributed between the 0–10 cm and 10–30 cm layers, with a slight tendency for higher nitrogen in the surface layer in some treatments. However, there was no consistent pattern across treatments, suggesting that variability was likely due to spatial variation rather than treatment effects.

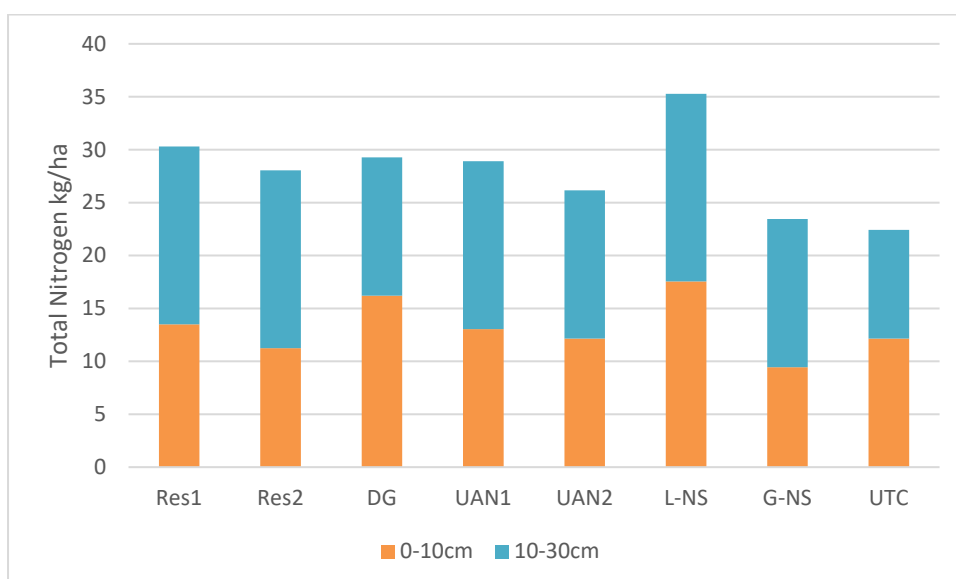


Figure 18: Post Harvest Total Nitrogen 0-10cm, 10-30cm, Standing Stubble, South Stirling, 2025.

Total soil nitrogen (0–30 cm) was similar between standing and tilled stubble systems, with values generally ranging from approximately 20 to 35 kg N/ha across treatments in the tilled plots (Figure 19). While some treatments differed slightly between systems (e.g. higher values in L-NS in the standing stubble and UAN2 under tilled), there was no consistent trend favouring either stubble management approach.

Nitrogen distribution across depth was relatively even, with both systems showing contributions from the 0–10 cm and 10–30 cm layers, and no clear shift in nitrogen stratification between treatments. Differences observed between individual treatments were variable and likely reflect spatial variability rather than treatment effects.

Overall, starting soil nitrogen levels were moderate and comparable across both stubble systems, indicating that baseline nitrogen supply was unlikely to have driven differences in crop performance observed during the season.

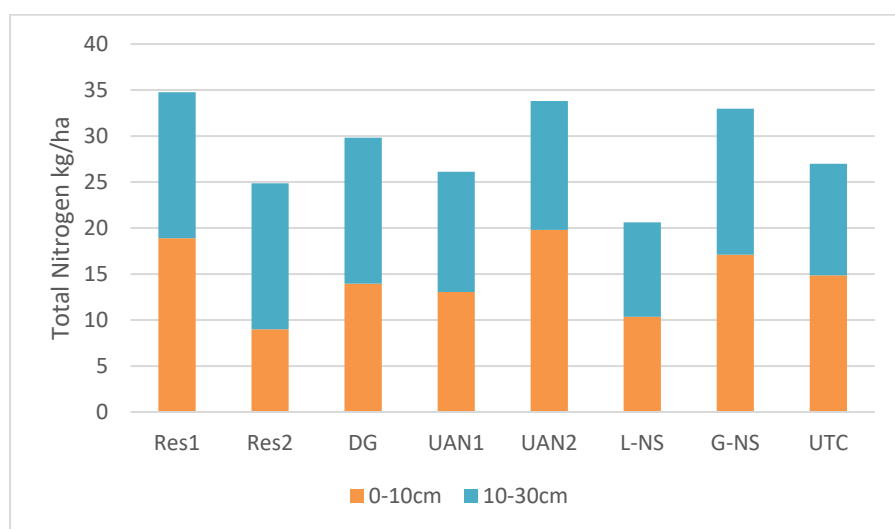


Figure 19: Post Harvest Total Nitrogen 0-10cm, 10-30cm, Tilled Stubble, South Stirlings, 2025.

DISCUSSION

Growers are seeking a “silver bullet” for stubble management; however, while different approaches can achieve similar outcomes, many of mechanical methods (e.g. burning or tillage) present a significant risk of soil erosion in the HRZ. As a result, growers often retain cereal stubble, which can lead to seeding inefficiencies and increased disease loading. Stirlings to Coast Farmers aimed to address these challenges through the implementation of small plot trials at Frankland River and South Stirlings, alongside two broadscale demonstration sites located in South Stirlings and Kendenup. Across all sites in 2025, results indicated a high degree of variability, with no clear or consistent outcome as to which chemical/fertiliser products or mechanical stubble management methods were most effective for improving stubble breakdown.

In the small plot trials, eight treatments were investigated, which included both biological, nutritional and tillage treatments. It should be noted that the treatments were applied to stubble late in the summer fallow period (March) due to project contracting and seeding of the next winter

crop was relatively early given the early break in 2026. This may have affected the opportunity to properly assess some of the treatments applied given their short timeframe to 'act' on the stubble.

Growers were interested in a new product from Adama, "Res+", as a stubble management tool, but the results in this project have shown effectiveness to be variable and generally limited, with only a few minor improvements observed across key metrics of stubble breakdown, disease load, establishment and yield.

Mesh bag assessments at both small plot sites showed no consistent improvement in stubble decomposition from Res+ (Res+1 or Res+2), Digest it (DG), or the other nutrition treatments, compared to the untreated control. Differences between treatments were small and inconsistent, suggesting that environmental conditions (rainfall, temperature) had a greater influence on stubble breakdown than product application.

Across both sites, both biological and nutrition treatments did not reduce stubble-borne disease DNA levels (NFNB at Frankland River and YLS at South Stirling). Variability between replicates was high, and no treatment, including Res+, consistently lowered pathogen levels compared to the control. This indicates that Res+ did not demonstrate a clear role in reducing disease carryover in retained stubble systems.

At the small plot sites, Res+ treatments did not consistently improve establishment, with plant counts generally sitting within the range of other treatments. There was a benefit with a few UAN based treatments, but these were not statistically significant. However, at the broadscale South Stirling site, Res+ showed a clear and consistent improvement in establishment (~ 24 plants/m² vs ~ 20 plants/m²), indicating that under paddock-scale conditions, Res+ may provide some benefit to early crop establishment. At Kendenup, a similar but smaller trend was observed, with Res+ treatments showing slightly higher establishment, although the magnitude of response was limited.

Across both sites, nitrogen supply was generally adequate to high, which was supported by moderate to high baseline soil N, moderate to high N-Wise mineralisation potential and Tissue N levels within the optimal range. Under these conditions, no treatment, including Res+, DG, UAN or N/S products, consistently influenced nitrogen availability or crop uptake. This suggests that nitrogen was not a limiting factor, reducing the likelihood of observing treatment responses.

The tissue test results at both small plot trial sites showed a tendency for higher total nitrogen % in the non-tilled versus tilled plots regardless of the chemical treatments. This may be due to higher nitrogen tie-up in the stubble decomposition process for the tilled plots. Standing stubble had likely not started to decompose at the same rate, reducing tie-up.

At South Stirling (small plot), yield differences between treatments were small, with most treatments—including Res+, DG, and N/S products—performing similarly to the untreated control. UAN2 recorded the highest yield in the standing stubble, suggesting some benefit from higher nitrogen supply in-season. DG and UAN1 were among the better performing treatments under tilled conditions, although differences were modest. Overall, the tillage treatments yielded slightly higher than the untilled regardless of the chemical treatments (similar to N% tissue test results and maybe due to N tie-up).

CONCLUSION

Across all sites in 2025, results indicate that no single treatment provided a reliable solution to managing high stubble loads in HRZ systems. While some modest benefits were observed from nitrogen-based treatments and Res+ under specific conditions, these responses were not consistent across sites or metrics.

What was evident was the higher plant tissue total N% in the standing compared to the tilled stubble in both small plot trials, likely a result of the faster tie-up of N in the tilled stubble due to more advanced decomposition of the organic matter. This followed through somewhat to yield at the South Stirling site.

For growers, stubble management remains a system-level challenge, and the results of this project do not, unfortunately, provide any 'silver bullets'. The treatment timing and seasonal conditions in 2025 may have driven some of the lack of treatment expression in the results.

Further work, particularly at broadscale under commercial conditions, is recommended to better understand how these treatments interact with seasonal conditions and whether more consistent responses can be achieved.

