

Pulse plots at
Agrii's Stow Longa

CASE STUDY: AGRII YEAR 2 (ARABLE RESEARCH TRIALS)

How do different pulse crops influence the following wheat crop?

In 2024-5 Agrii continued its small-plot trials to explore how pulse crops and nitrogen strategies can improve the performance and sustainability of following winter wheat crops.

The trials at Agrii's Stow Longa Technology Centre site in Cambridgeshire investigated how winter beans, peas, spring beans, chickpeas and haricot beans influence the nitrogen needs and yield potential of a following winter wheat crop (KWS Palladium).

Despite an exceptionally dry season, the findings provide insight into optimal use of nitrogen, product choice and the value of pulses in arable rotations.

Nitrogen rates

Four nitrogen rates were tested across wheat crop plots: 145, 160, 175 and 190kg N/ha, all delivered across three splits. The trial also compared two nitrogen fertilisers – one with a nitrogen stabiliser (Agrii-Start N Enhance) and one without (Nitram).

Autumn and spring soil mineral nitrogen (SMN) tests showed predictable reductions caused by winter rainfall, but importantly highlighted high residual nitrogen in the 30-60cm layer, demonstrating the contribution pulses make deeper in the profile.

Yield results

The high rainfall experienced at the Stow Longa site in 2024 meant the Soil Nitrogen Supply (SNS) following beans was 2 and the recommended nitrogen rate was 190kg/ha. However this rate did not consistently produce the highest yields.

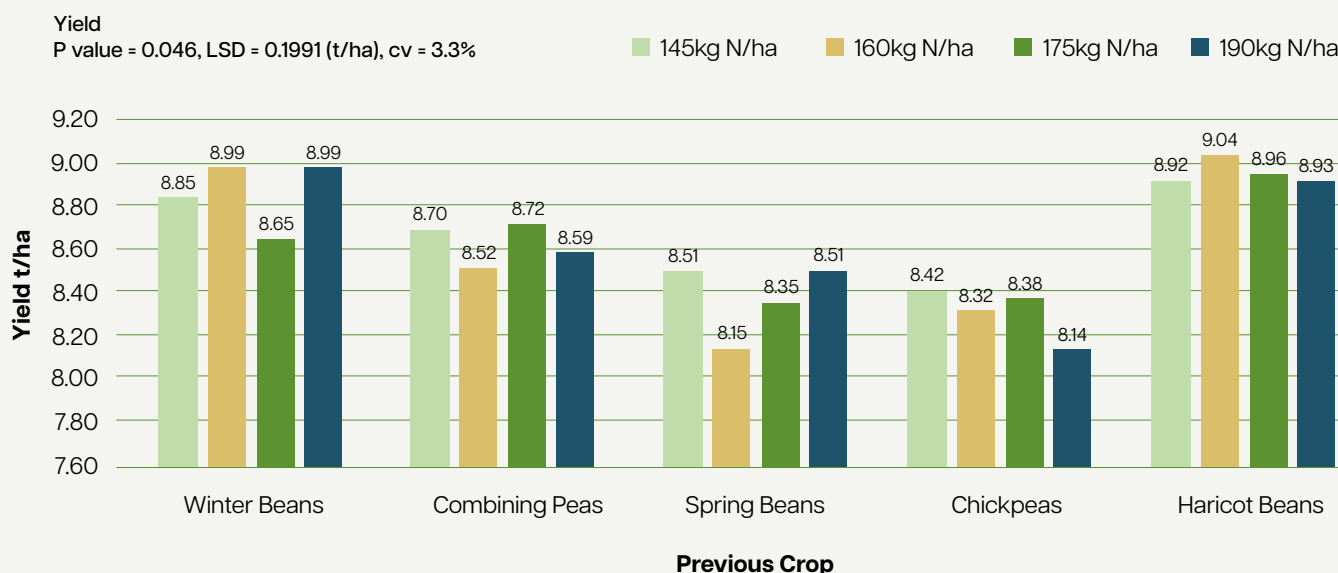
In fact, across all previous pulse crops, grain yield was largely maintained at lower nitrogen rates, with no consistent yield increase at 190 kg N/ha. This suggests that nitrogen inputs above 145 or 160 kg N/ha did not deliver additional yield benefits, particularly following winter beans and haricot beans, and that optimum nitrogen rates after pulses may sit below RB209 guidelines especially in dry seasons.

The top-yielding wheat plots were those following winter beans and haricot beans followed by peas (see Figure 1).



“The findings of the NCS trial reinforce the importance of tailoring nitrogen to the season and previous crop” Lucy Cottingham, Agrii's UK Digital Agronomy Development Manager

Figure 1: Yield x Previous Pulse Crop x Nitrogen Rate



Gross margins

Gross margins (see Figure 2) aligned closely with yield results. The wheat following the haricot beans provided the highest return on investment with the wheat following winter beans close behind.

Margins for the two products were effectively identical at £1,130.79/ha for Agrii-Start N Enhance and £1,133.11/ha for Nitram. However, where the stabilised product (Agrii-Start N) excelled was environmental impact. Analysis of results revealed that a switch from Nitram to Agrii-Start N Enhance could cut carbon emissions by as much as 36%. This is because of the Nutrisphere-N which stabilises the Nitrogen, and reduces the risk of volatilisation, leaching and nitrification.

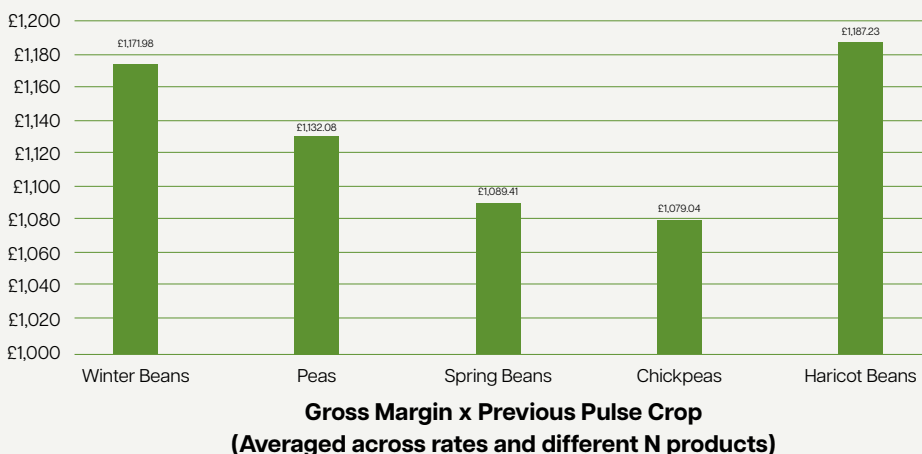
The dry year effect

The 2025 season was particularly dry (see Figure 3), which would have had a major impact on nitrogen responsiveness. The wheat crop lacked the moisture required to fully use higher nitrogen rates. As a result, response curves were flatter and less predictable than in wetter seasons. Optimum nitrogen was also lower than expected, and the differences between the different nitrogen treatments were narrower.

Conclusion

Overall, yields were influenced more by previous pulse crop than nitrogen rate, with little yield improvement from nitrogen rates above 145-160 kg N/ha.

Figure 2: Gross Margins based on feed wheat prices



Lessons for growers

The findings of Agrii's trials add further evidence for more efficient nitrogen strategies after pulses:

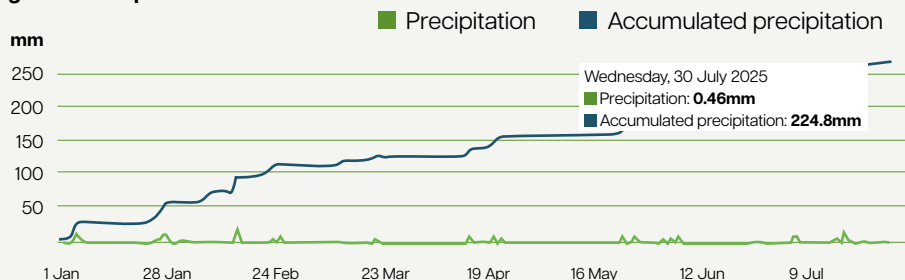
- Winter beans and haricot beans provided the biggest nitrogen and yield benefit to the following wheat.
- The RB209 rate of 190kg N/ha may be higher than necessary after pulses,

particularly in dry years. A rate of 145 kg N/ha performed best for yield (averaged across all the pulses in the trial).

- Agrii-Start N Enhance increases yields and reduces carbon footprint.

Pulse crops, together with stabilised nitrogen products, create a complementary system with lower emissions, improved nitrogen retention, stronger margins and more resilience to seasonal variability.

Figure 3: Precipitation and hail



Next steps

For the third year of trials Agrii will continue with the four Nitrogen rates (145, 160, 175 and 190) with focus only on use of Agrii-Start N Enhance. The trials will look at two and three split programmes but with both programmes starting at GS25. This follows the results from year one which showed early Nitrogen promoted higher biomass and subsequently increased yield – even where residual nitrogen left from the previous pulse crop was considerable.

NCS Project

Nitrogen efficient plants for Climate Smart arable cropping systems (NCS) is a four-year £5.9m research programme aiming to enable UK farming to bring about a reduction of 3.4MtCO₂e p/a or 54% of the maximum potential for the industry through increased production and use of pulses. Led by PGRO it involves 200 UK farms and 17 partners. The project is funded by the Farming Futures R&D Fund: Climate smart farming, part of Defra's Farming Innovation Programme. Defra is working in partnership with Innovate UK who are delivering the programme.

