ROTHAMSTED RESEARCH

EVALUATING LONG-TERM EFFECTS OF ORGANIC AMENDMENTS ADDITION ON CROP YIELDS AND NITRATE MINERALISATION RATES

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ENVIRONMENTAL DEGRADATION

- **Problem**: environmental degradation that results from excessive application of fertilisers.
  - Indiscriminate use of agrochemicals has degraded soils, polluted surface and groundwaters, and contaminated air;
  - Soil has extremely slow formation and regeneration processes;
- **Solution:** development of novel approaches to quantify N mineralisation to better analyse residual effects of Organic Amendment additions.

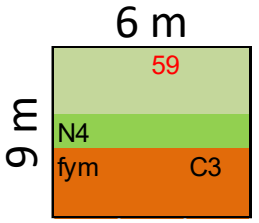
AIM OF THE WORK

To improve organic fertiliser use in agricultural context in terms of application rates and timing of usage.

STARTING POINTS

- **Short-term** responses to Organic Amendment (OA) application are highly variable;
  - Nutrient availability following amendment application is difficult to predict
- **Nutrients** from organic amendments must be **mineralised** in the soil before becoming available for plants;
  - Influenced by a complex set of factors – source/properties/method of application of OA; site-specific soil chemical, physical and biological properties, others…
- **Yields** are often **similar** between fields with a history of organic amendment use.

FOSTERS TRIAL



- **4 Organic Amendments + Control** – Anaerobic Digestate, Compost, Farmyard Manure, Straw
- **5 Nitrogen rates applied** (rates depend on the crop) – N0, N1, N2, N3, N4
- **Crops** – Winter Wheat, Spring Barley and Oil Seed Rape

FOSTERS TRIAL

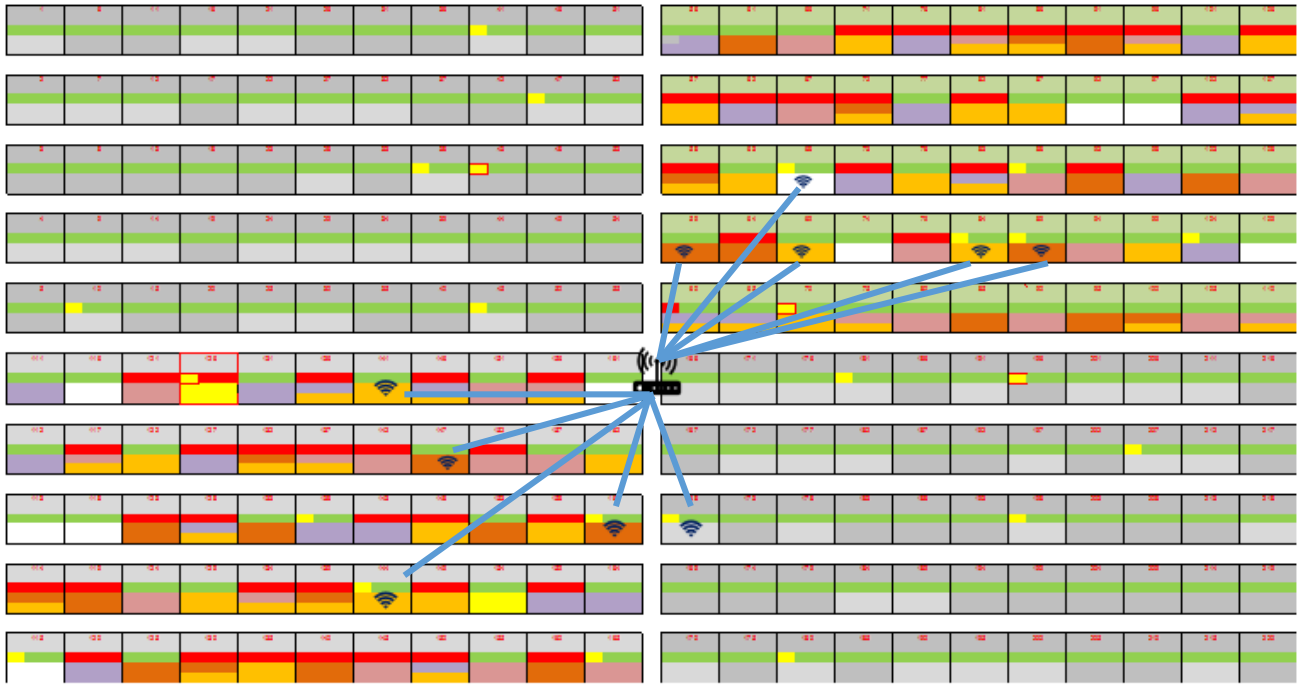
Why Fosters?

- **Matched nutrient control (nil treatment)**

  Helps us understand if the yield increase is only due to the fertiliser or if the fertiliser and organic amendment act together

- **Several different organic amendments with different chemistries**

SENSORS TRIAL

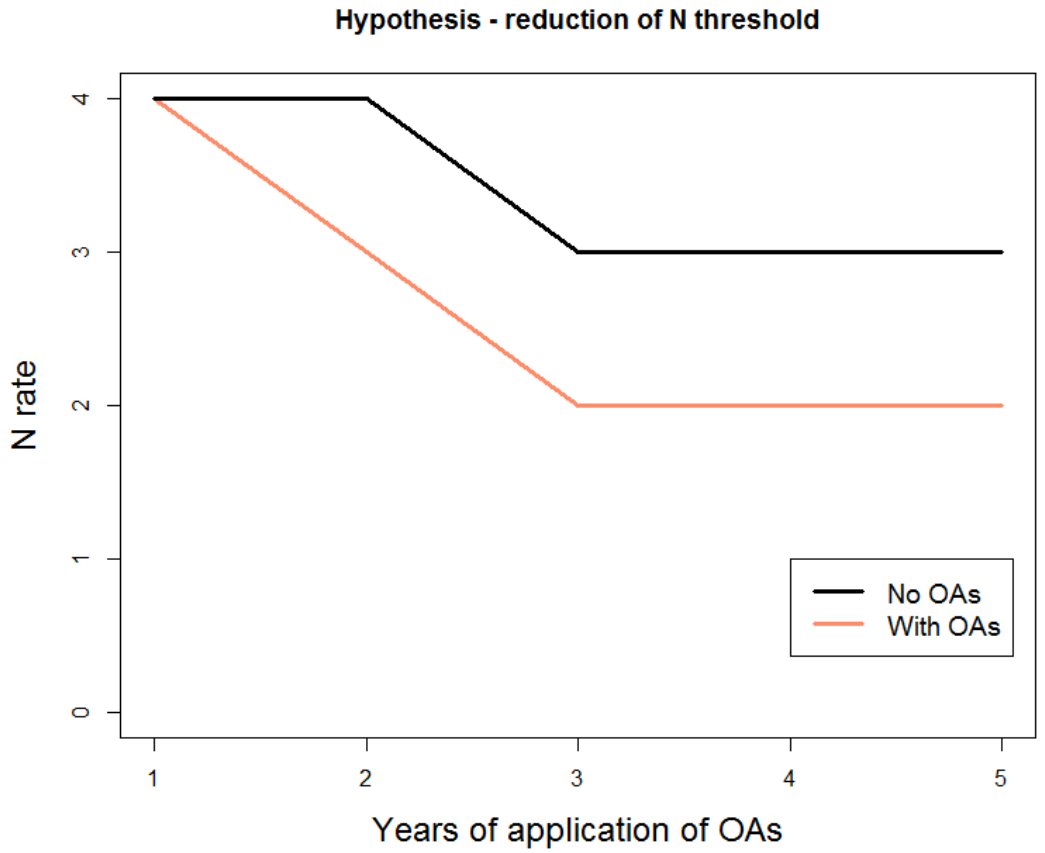


- 2 OAs tested – farmyard manure and straw – good and poor quality of amendment according to C/N ratio
- 2 rates of N – N0 and N4 (highest and lowest rates)
- Control – no amendment and N0

YIELD RESPONSES TO OAs

- **Hypothesis 1**

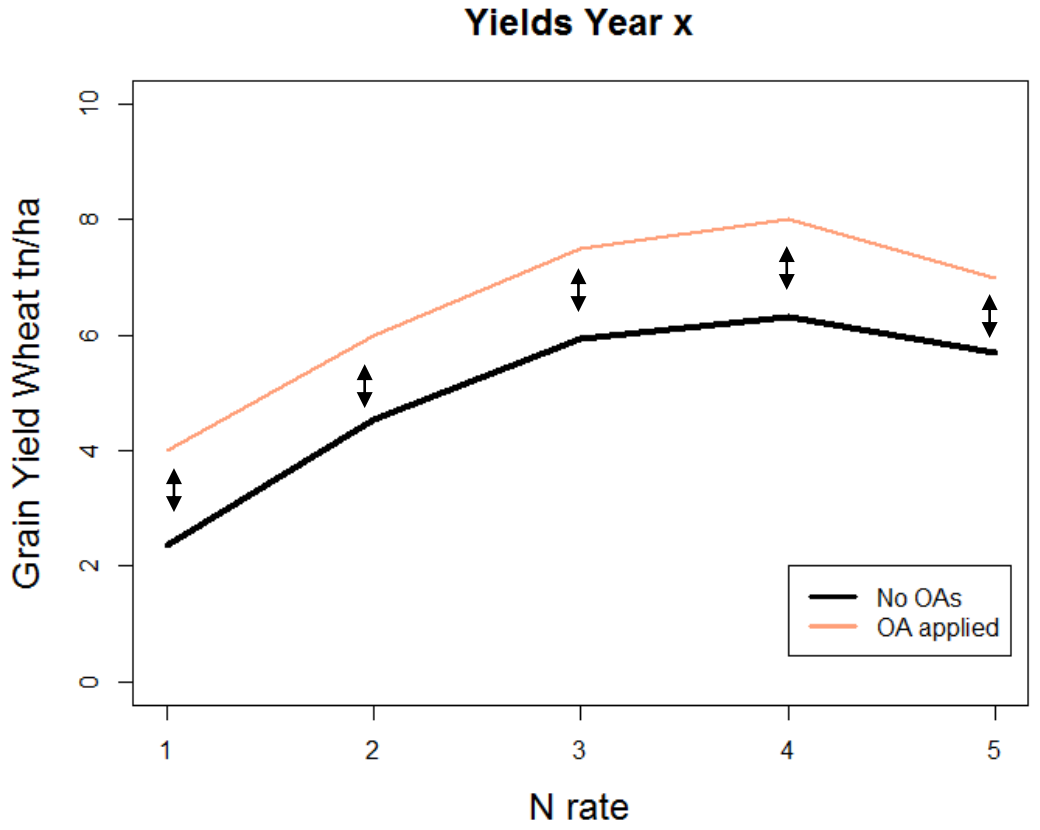
  "The long-term application of Organic Amendments leads to a reduction of the Nitrogen threshold for optimum yields"



YIELD RESPONSES TO OAs

› **Hypothesis 2**

“The application of Organic Amendments with mineral fertiliser leads to an increase of crop yields over the application of the inorganic fertiliser alone”



CONCLUSION

- **Organic amendments** have a "**boosting**" effect on **yields** over the effect of the inorganic fertiliser (analysis of variance);

- The **N threshold** (N rate needed for optimum yields) has **decreased** since the first application of **Organic Amendments** in 2013.

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Thank you for your attention.

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