ACIDIFICATION OF SLURRY AND DIGESTATE – IMPACTS ON N RECOVERY AND FERTILISER REPLACEMENT VALUE IN ARABLE CROPS

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Introduction

- UK agriculture is responsible for approximately 85% of UK ammonia (NH_3) emissions.
- Ammonia can be harmful to human health, contribute to acid rain and subsequent deposition can damage sensitive ecosystems.
- The UK has set legally binding targets to reduce ammonia emissions by 16% of 2005 levels by 2030.
- Slurry acidification has the potential to reduce ammonia emissions at all stages of slurry management ; housing, storage and spreading.

Methodology

- Experiments set up a three sites; ADAS Gleadthorpe (Sandy soil, Nottinghamshire), ADAS Boxworth (Clay soil, Cambridgeshire) and ADAS Terrington (Silt soil, Norfolk).
- Acidified pig slurry and food based digestate was applied with two application methods: bandspread and surface broadcast to winter cereals and oilseeds.
- Applications were in Spring or Autumn.
- Target application rates were 180 kg/ha total N.
- Nitrogen Fertiliser replacement values were calculated by comparing yield to the N response plots.

Results

Nitrogen Use Efficiency

- Several experimental sites showed higher nitrogen use efficiency on the acidified plots.
- Boxworth Autumn 2019 applications showed improved NUE compared to other sites due to nutrient retentive clay soils (Fig 1).
- Terrington Autumn 2020 applications showed improved NUE due to the early N requirement of OSR (Fig 2).
- Gleadthorpe spring applications of digestate and slurry have higher NUE than unacidified manures (Fig 3 and 4).

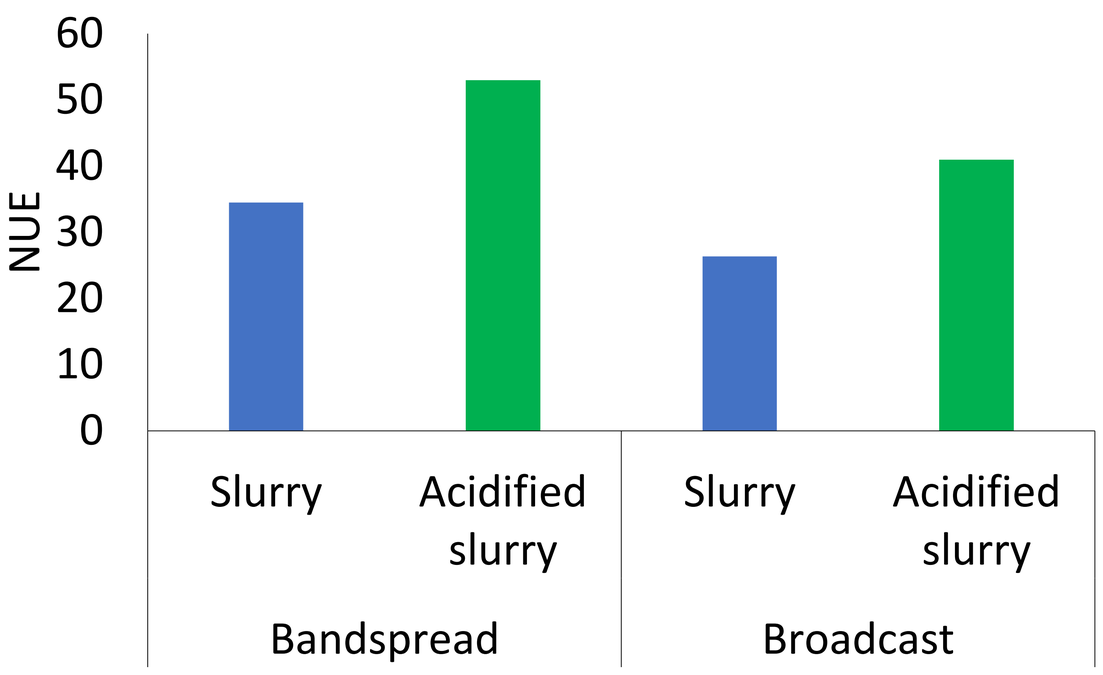

Figure 1: Autumn applications at Boxworth

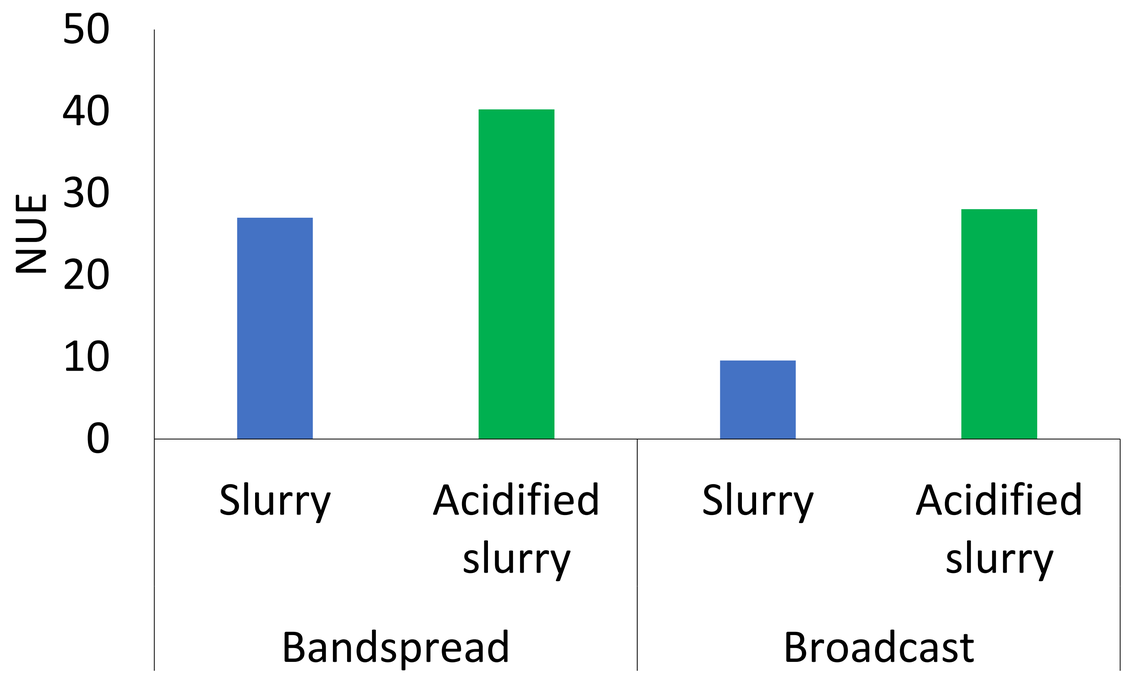

Figure 2: Autumn applications at Terrington

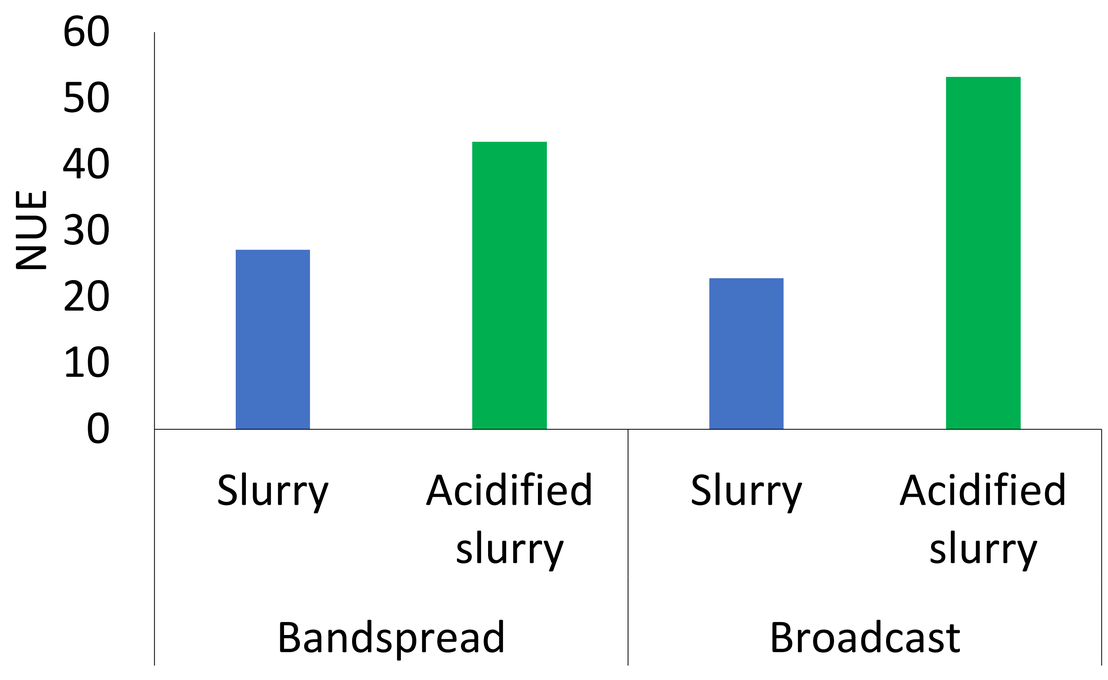

Figure 3: Spring slurry applications at Gleadthorpe

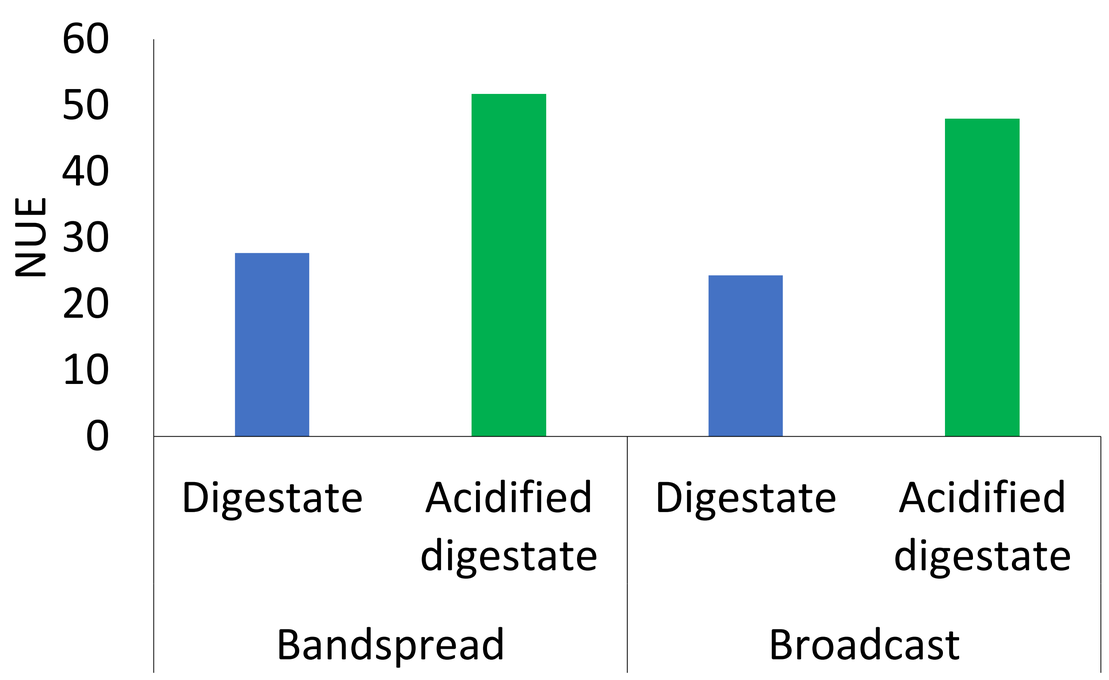

Figure 4: Spring digestate applications at Gleadthorpe

Conclusion

- Reducing slurry and digestate pH to 5.5 reduced ammonia losses by up to 60% (not shown here).
- The saved N was taken up by the crop, increasing nitrogen use efficiencies.
- Improved NUE from acidification was only observed when there is an overall N response and conditions were conducive to N uptake

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