Air Quality Challenges for Industry
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Ammonia Emissions from UK Agriculture

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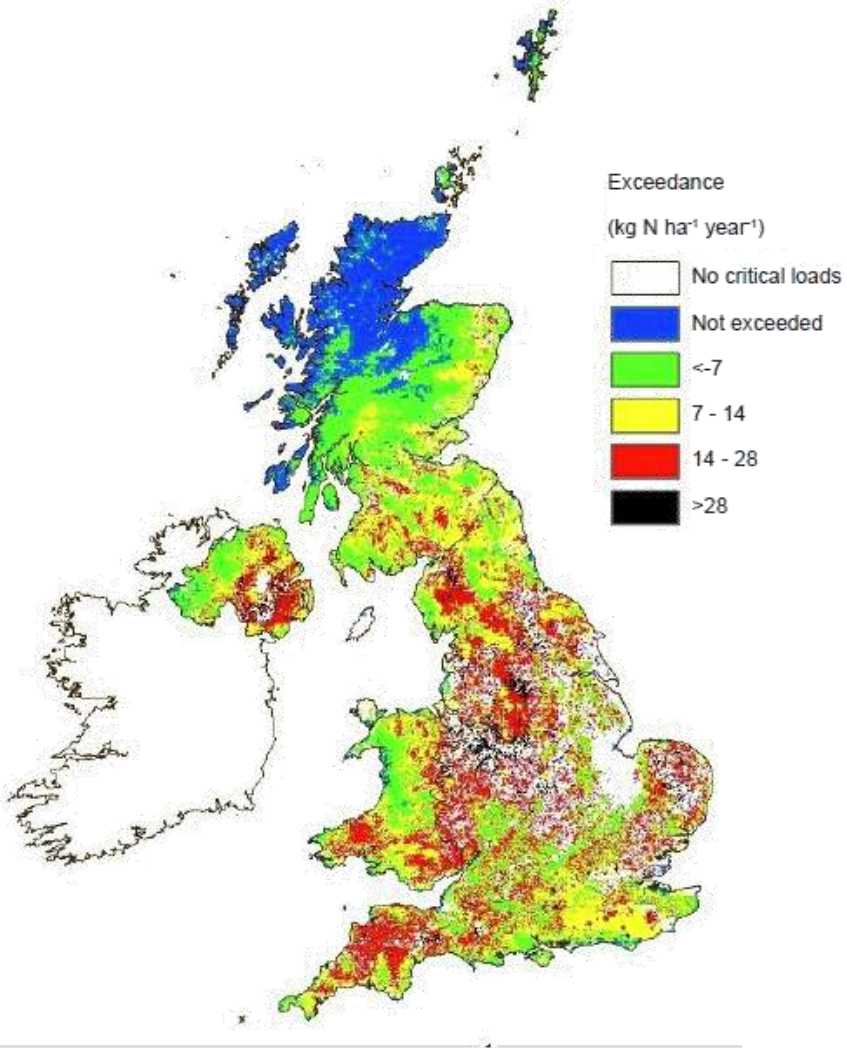
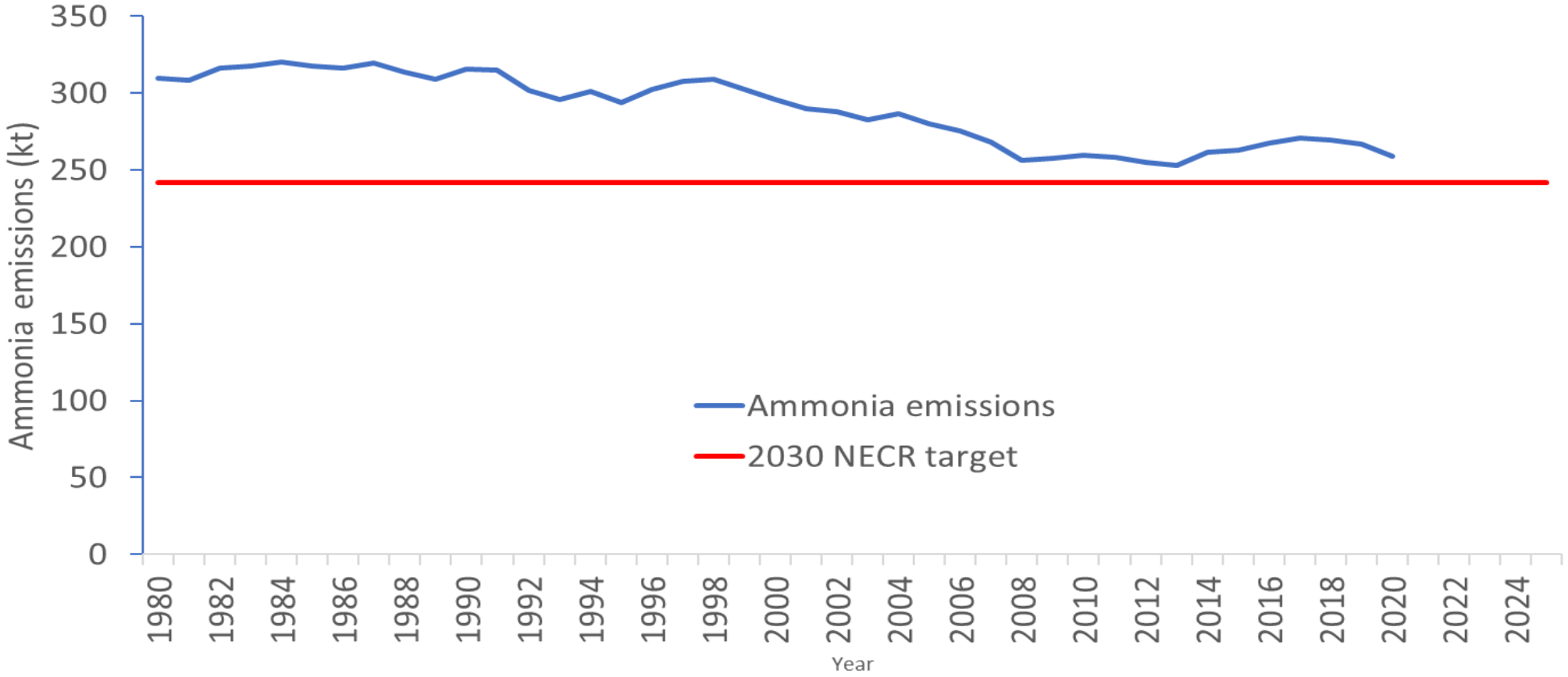
Ammonia is a significant pollutant

- About 85% of ammonia emissions come from agriculture with livestock systems the main contributor
- Ammonia increases particulates in air which are harmful to human health
- Over 90% of sensitive SACs and SSSIs in the UK exceed their critical loads for total nitrogen deposition
- Ammonia is a significant component (approximately 65%) of total nitrogen deposition in the UK
- Recovery is slow



Source: Defra's Clean Air Strategy

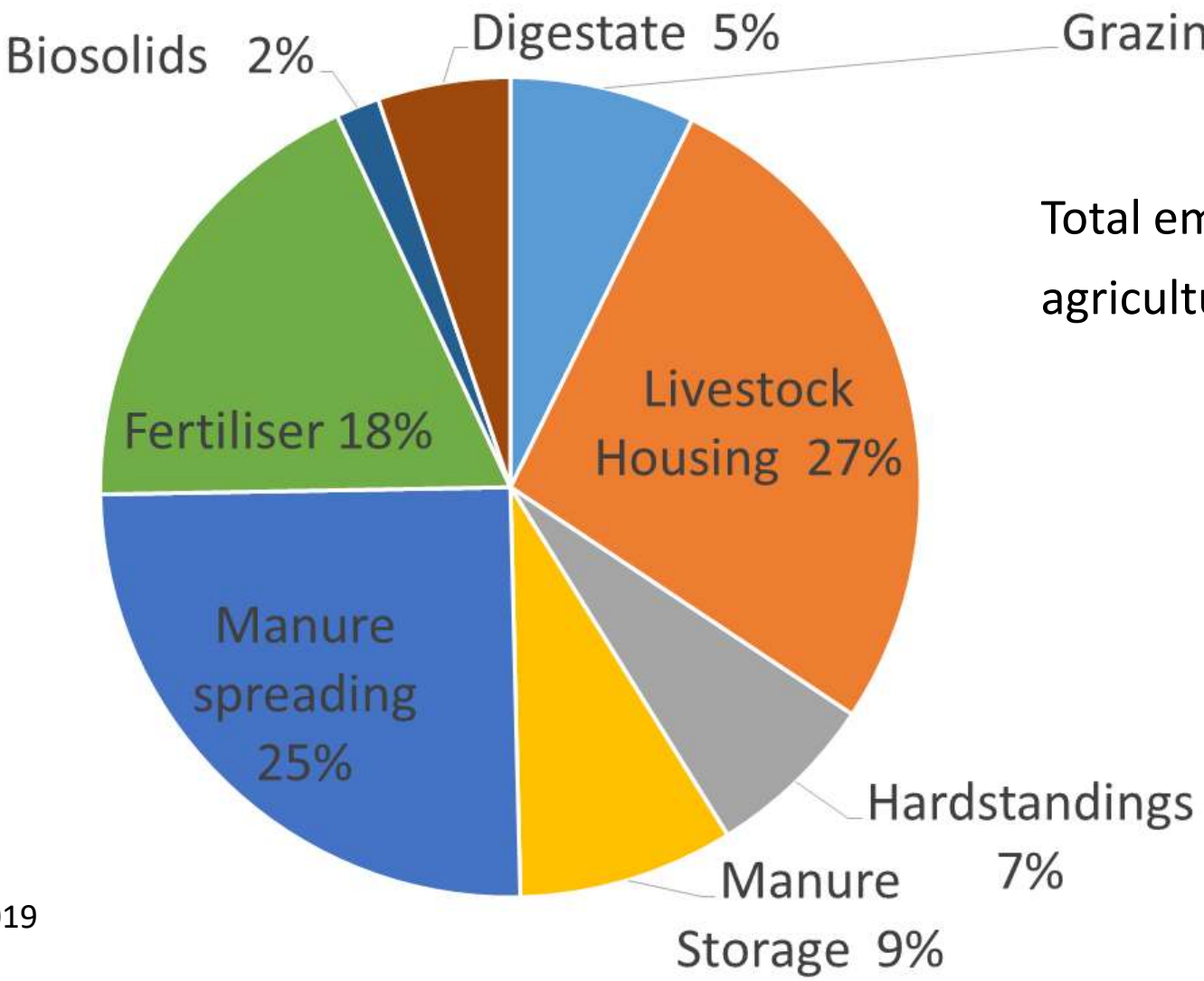
Ammonia emission reduction targets



Source: UK Informative inventory report 2020

- National Emissions Ceilings Regulations have set a target of 242 kt ammonia emission by 2030
- Reductions achieved by fewer animals and reduced fertiliser use
- Main focus on manure management

Ammonia emissions from UK agriculture



Total emissions from UK agriculture 245,000t.

Source: Misselbrook and Gilhespy 2019

Ammonia emission control is expensive

Ammonia emission mitigation across the manure management continuum

Housing:

- Building design
- Reducing area of ammonia emitting surfaces
- Scrubbers on vents of controlled ventilation systems

Storage:

- Covers

Land spreading:

- Precision application techniques
- Rapid soil incorporation

What about acidification ?

Acidification affects the NH_4^+ /NH_3 equilibrium:

$$NH_3(g) + H^+(aq) \longleftrightarrow NH_4^+(aq)$$

- Widely used in Denmark (10-20% of pig slurry acidified.)

- Has potential to reduce emissions from the whole manure management continuum.

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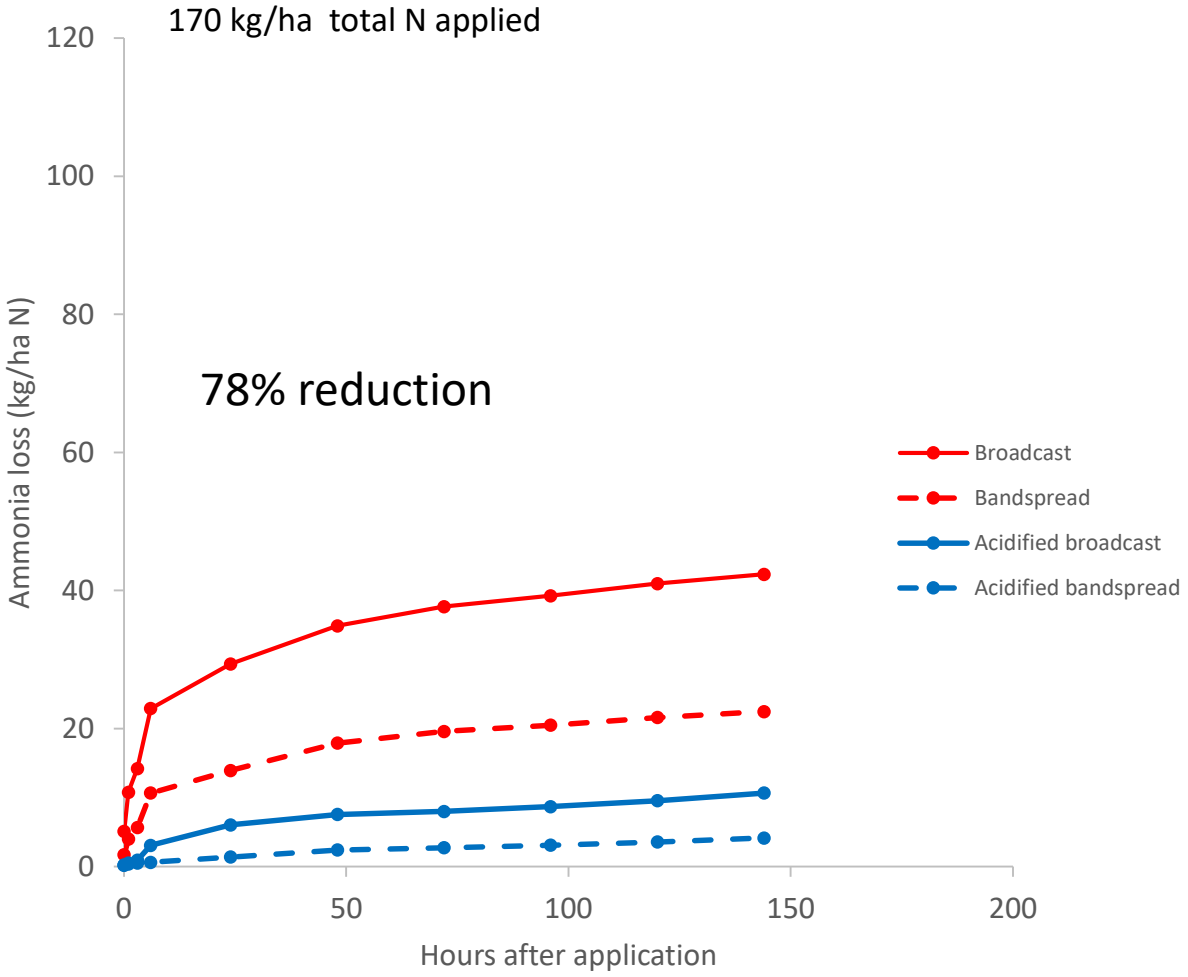
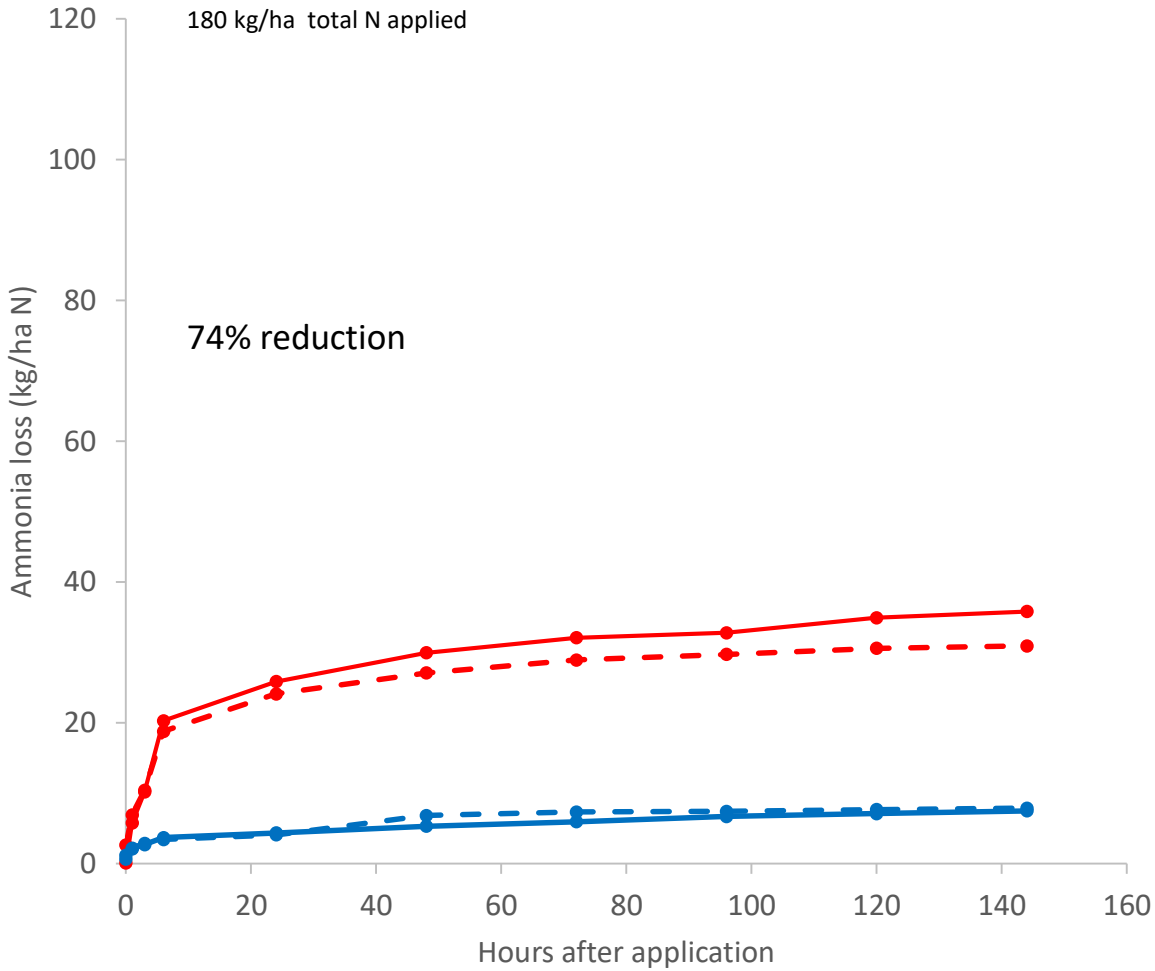
Impact of acidification on ammonia emissions from pig slurry and digestate (Defra project SCF0215)

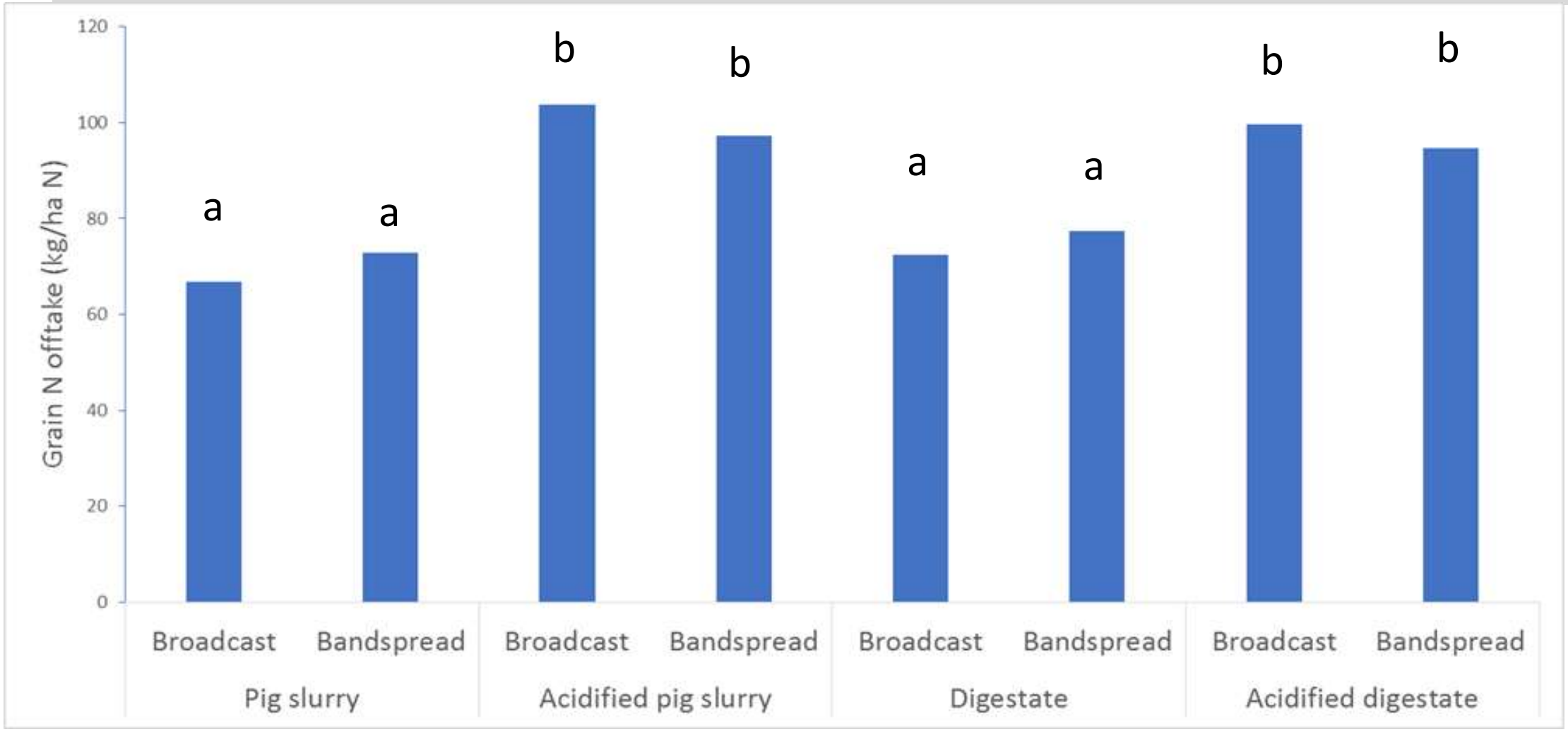




Pig Slurry; pH 7.7 ➡ 5.3

Digestate; pH 7.8 ➡ 5.8

Impact of acidification on crop N uptake (Defra project SCF0215)



P<0.05; letters indicate statistically significant differences between treatments

Summary

- Ammonia emissions from agriculture are a significant source of air pollution
- The processes controlling emissions are well understood
- On farm implementation of practices to reduce emissions is a challenge:
  - Investment in farm infrastructure and machinery
- Reductions in ammonia loss will have benefits in terms of increased nutrient use efficiency