



The role of digestate in the location of AD plants & the industry's future

Will McManus, WRAP

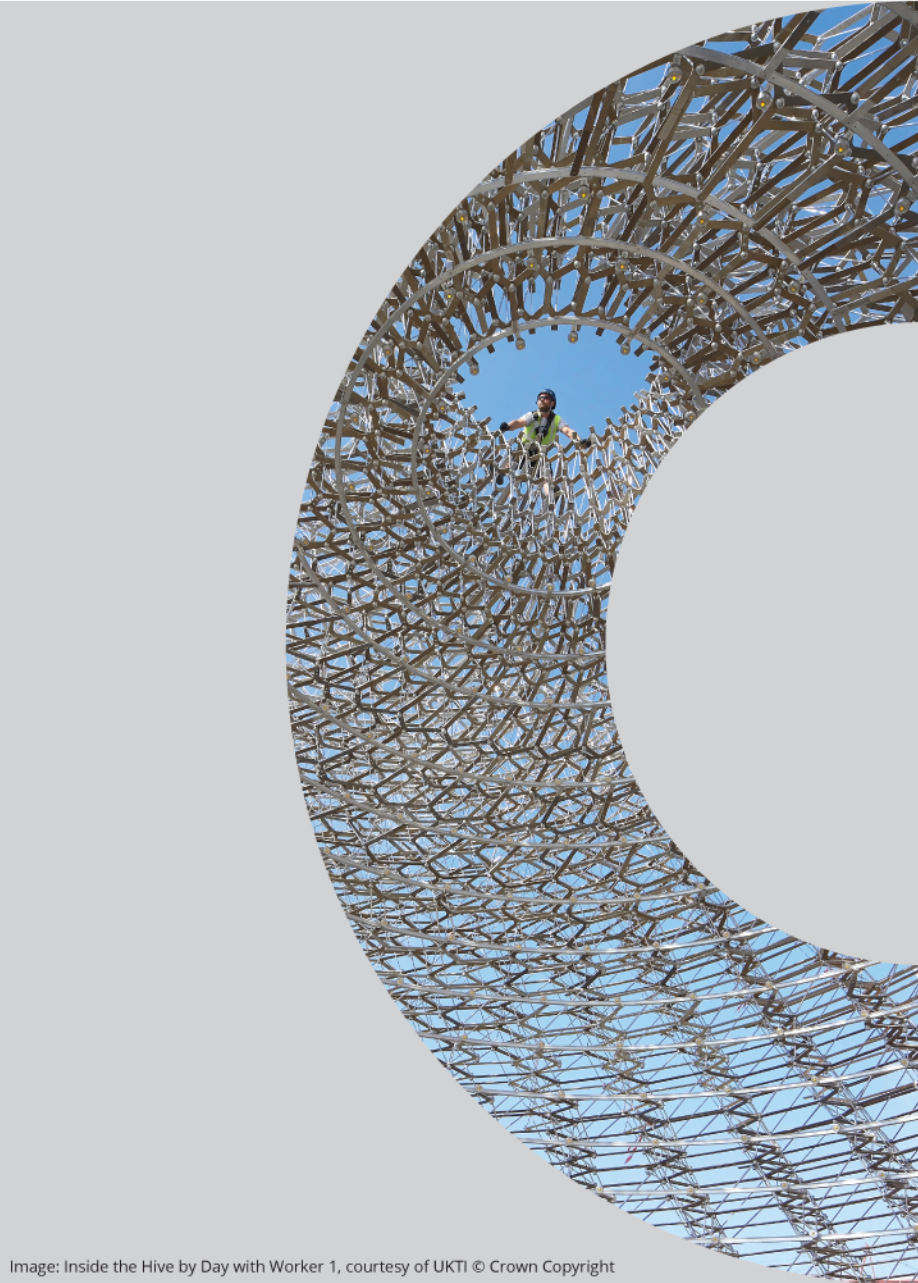


Image: Inside the Hive by Day with Worker 1, courtesy of UKTI © Crown Copyright

WRAP's **vision** is a world in which resources are used sustainably

WRAP's **mission** is to accelerate the move to a sustainable, resource-efficient economy through:

re-inventing how we design, produce and sell products.

re-thinking how we use and consume products.

re-defining what is possible through re-use and recycling.

- Location of AD sites influenced by a number of factors
 - Using digestate is just one of these
 - Is it commercially significant?
- Changing financial drivers in the sector
- Understanding digestate's fertiliser replacement value is a useful part of the equation



- Five year research programme
- 22 experimental sites across England, Scotland and Wales
- **WP1:** To quantify the effects of repeated compost and digestate applications on soil and crop quality
- **WP 2:** To quantify the nitrogen supply characteristics of contrasting digestate products
- **WP 3:** farmer focussed training



DC-Agri - world leading research

A little context...

FOOD WASTE REDUCTION | SUSTAINABLE ELECTRICS | SUSTAINABLE TEXTILES

Food waste reduction

Our extensive knowledge makes us the go-to organisation for food waste prevention in the UK. This expertise is now being recognised under new legislation. We work with the UK to prevent waste in the food supply chain, as part of the United Nations 'Think Eat Serve' campaign and are bringing together the voluntary and regulated sectors to build a global network focused on making grocery products more sustainable.

[Start exploring](#)

Exploring what's possible

WRAP's work is underpinned by **groundbreaking, evidence-based research**. Our studies give us unique market and behavioural insight and help prioritise action to tackle the significant carbon, water and waste impacts of the UK's food and drink supply chain.

We turn this research into practical support for businesses, local authorities and consumers – creating transferable learning and replicable approaches for implementing resource efficiency.

[Learn more](#)

20%

Food and drink accounts for 26% of UK's CO₂e emissions.

15

million tonnes

The sector produces 15 million tonnes of food waste.

[Learn more](#)

Bringing organisations together

We have the unique ability to bring together multiple stakeholders and accelerate change in behaviour in ways that neither governments nor individual companies can working on their own.

The Circular Economy aims to improve resource efficiency and reduce the carbon impact of the UK grocery sector, involving manufacturers, retailers and consumers.

The Hospitality and Food Service Agreement supports the whole sector – hotels, hospitals, schools and restaurants – in reducing waste, recycling more and saving money.

The restoration of the River Great Ouse and the **London Olympic** size swimming pools from 2007 to 2012.

The Product Sustainability Forum was established to explore the environmental impacts of products across their lifecycle. The forum works with similar international sustainability initiatives to achieve this goal.

Optimising the supply chain

Packaged Products

We work with key stakeholders to innovate and optimise grocery packaging, and reduce its carbon impact. This involves lightweighting, using recycled content, designing products with recyclability in mind, and changing product sizes to better accommodate consumer needs. We also created the **On-Pack Recycle** brand, to help inform consumers what they should do with their packaging once used.

[Learn more](#)

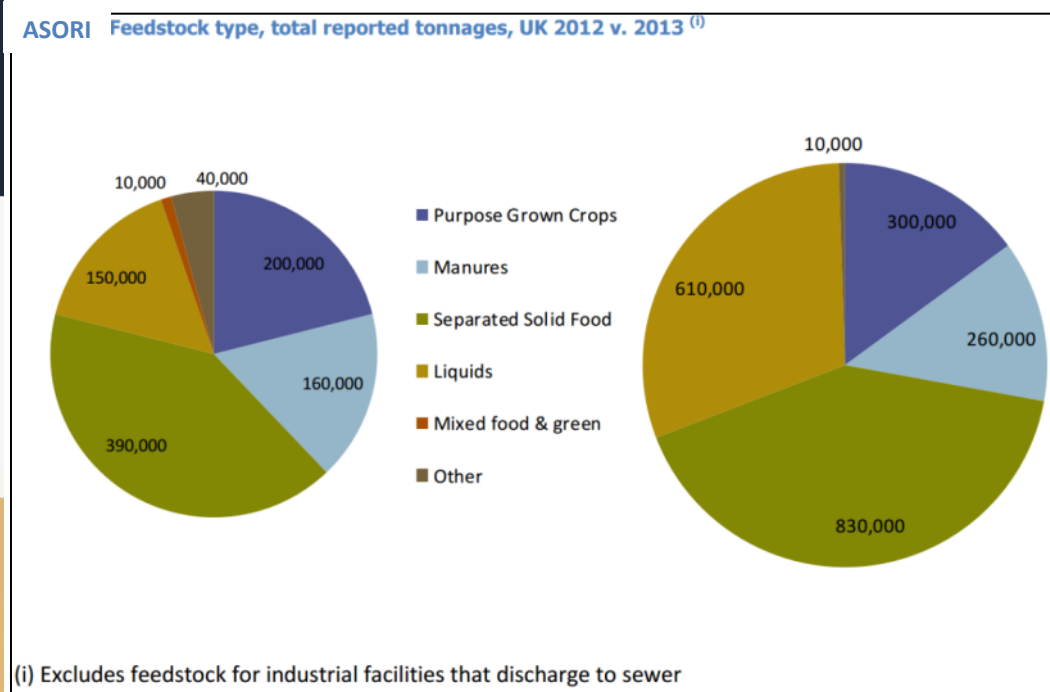
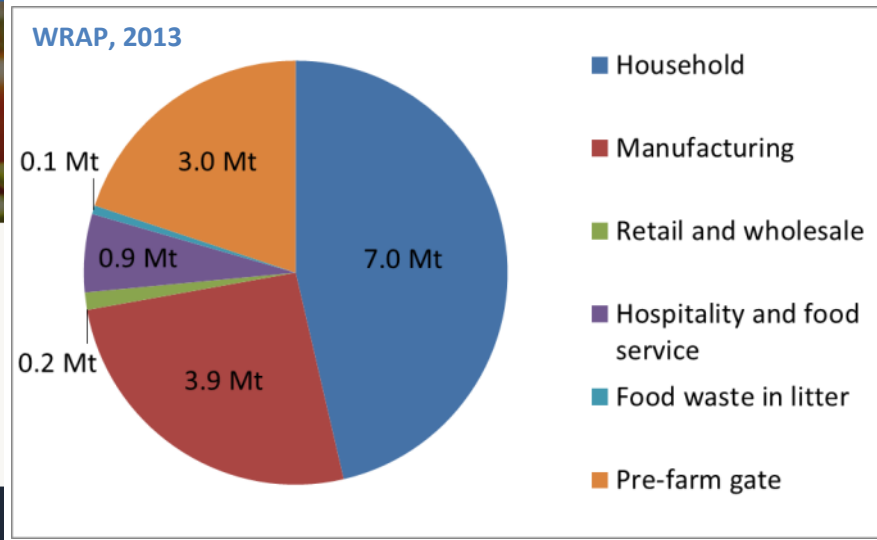
Encouraging consumers to waste less

WRAP's consumer campaign, **Love Food Hate Waste**, helps raise awareness of the issue of food waste and offers easy ways for individuals to reduce the amount of food they throw away. Since its launch consumers have saved £1.3 billion by not buying food that would otherwise go to waste.

Our partners – retailers and brands, local authorities, and community groups – confidently use our ready-made resources as they're based on extensive evidence. And working with the grocery industry, we're making it easier for consumers to tackle their food waste and get the most out of what they buy: pack sizes that are better suited to today's households and improved labelling.

[Learn more](#)

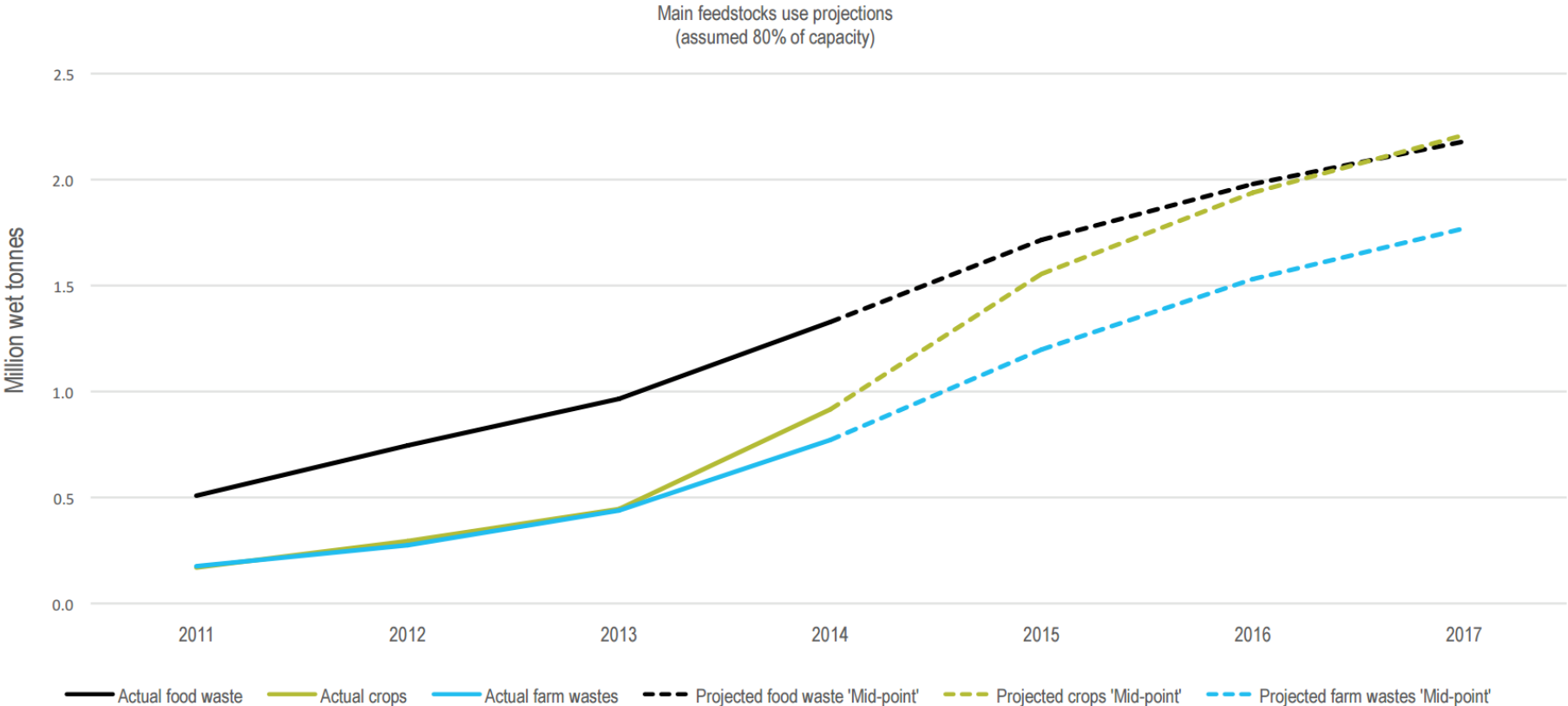
Closing 'the loop'



Food waste arisings & utilisation in AD



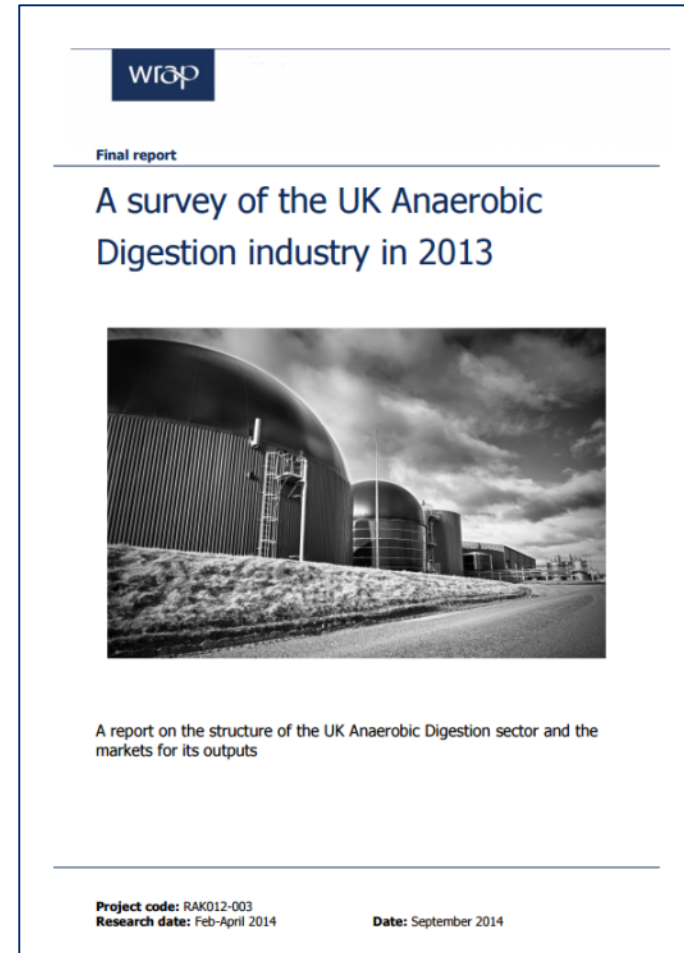
Extract from ADBA's Market Report, 2015



Feedstock projections



- ASORI 2013 figures on the value of digestate supplied to agriculture
 - *average cost to operator of £3.73 per tonne*
 - *range of -£13 to +£3 per tonne*
 - based on limited data

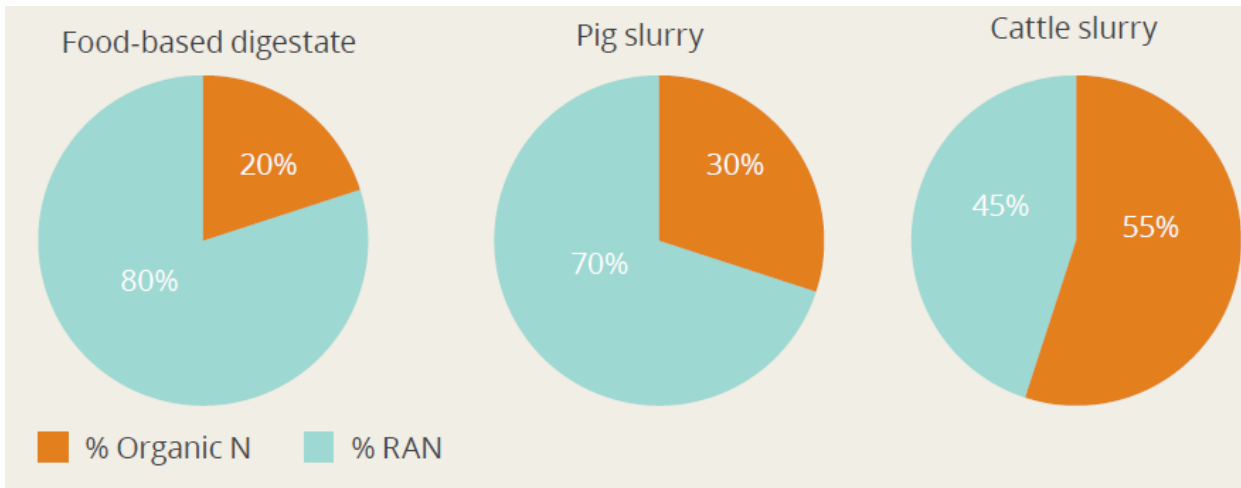
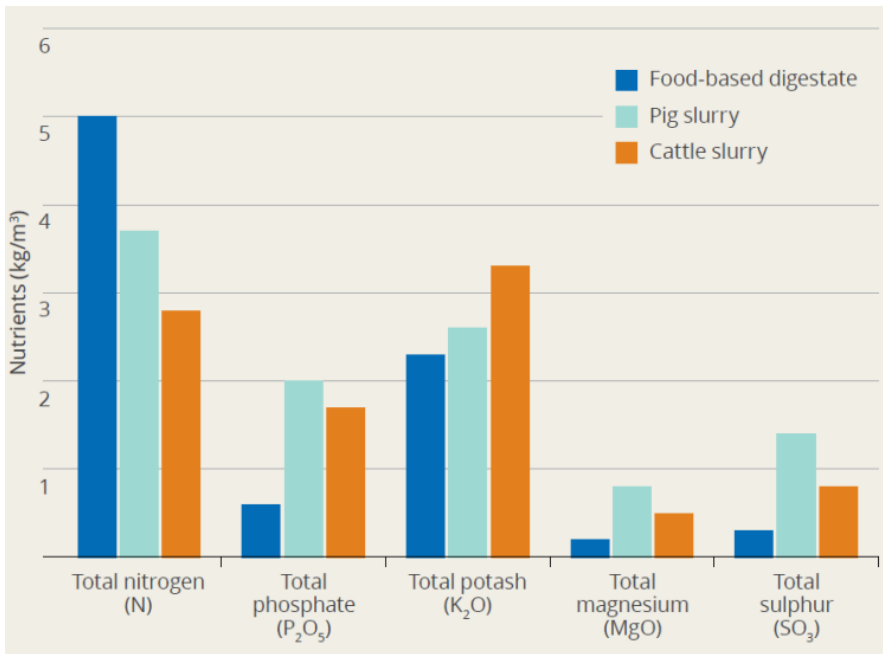


Market value of digestate

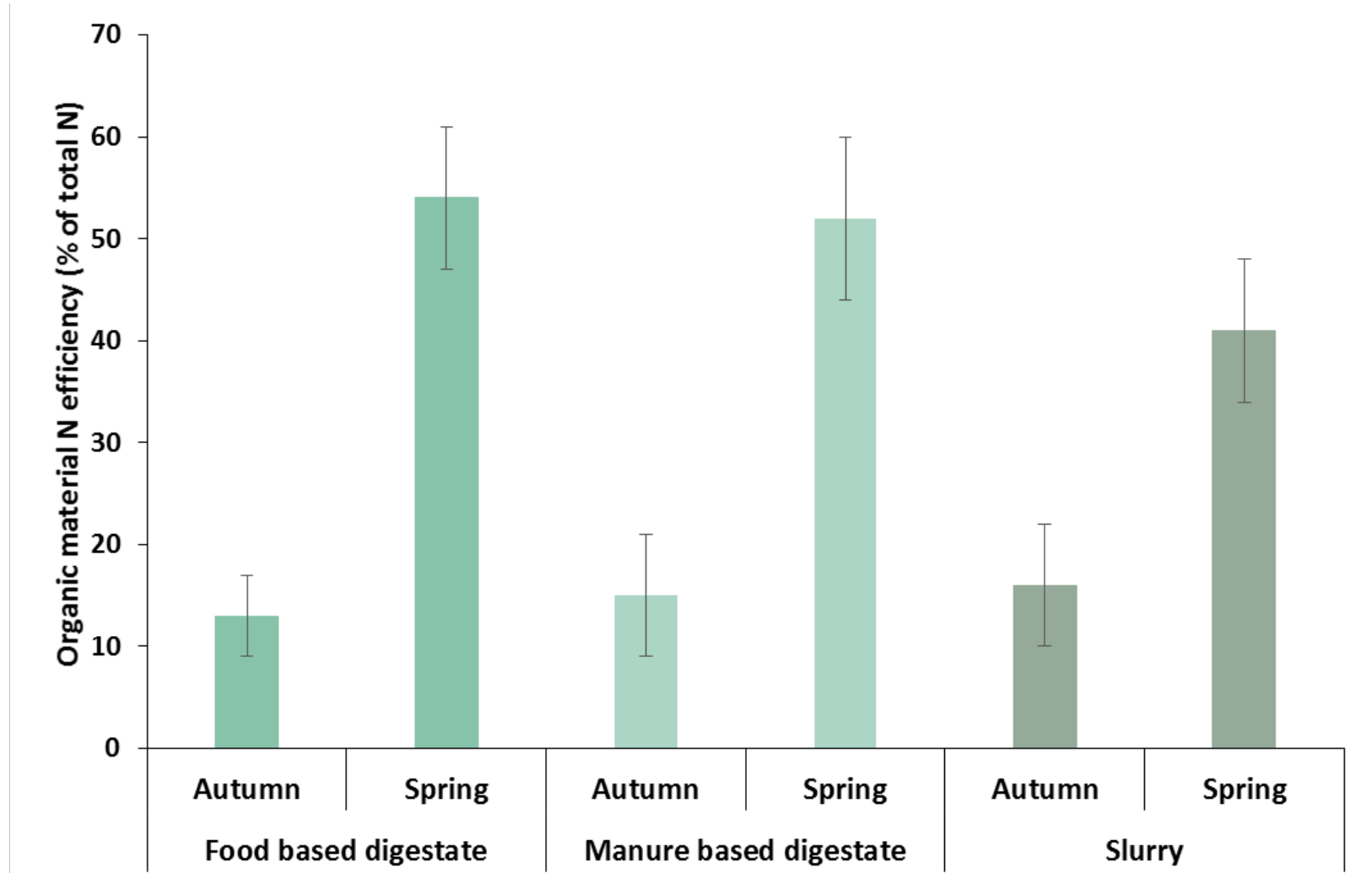
DC-Agri results

DC AGRI

'Typical' nutrient content of food-based digestate and comparator organic materials



Readily available nitrogen (RAN) content of food-based digestate



DC-Agri data: nitrogen use efficiency



Ammonia gas

Volatilisation

Nitrous oxide gas

Nitrogen gas

Plant uptake

Organic N

Ammonium N

Denitrification

Soil Organic N

Nitrification

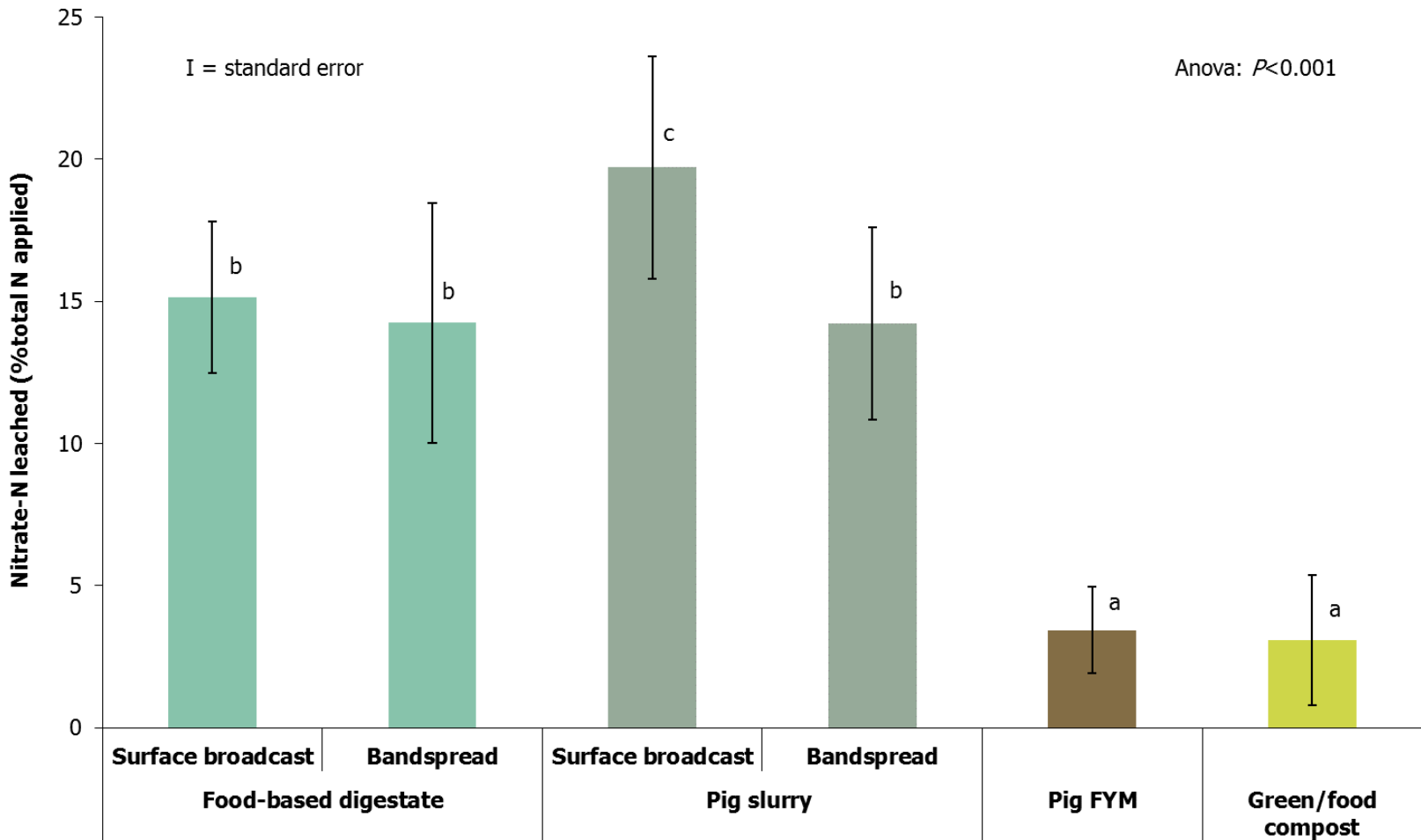
Immobilisation

Nitrate

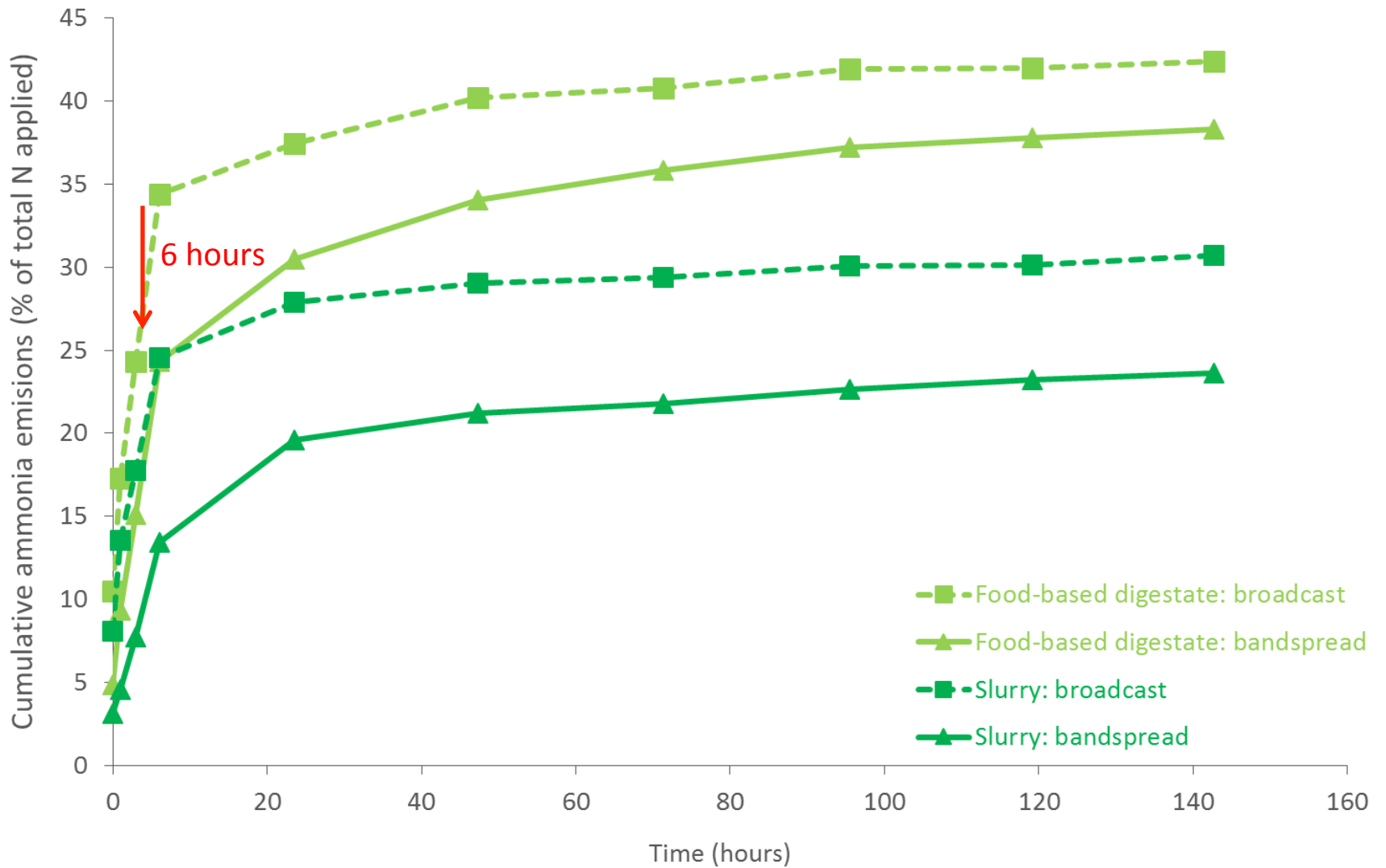
To water ($\text{NO}_3\text{-N}$, $\text{NH}_4\text{-N}$, P, FIOs etc).

- Air samples (from N₂O chambers and NH₃ tunnels) were analysed for:
 - N₂O, CH₄ and CO₂
 - NH₃
- Water samples (from Teflon cups)
 - Nitrate-N
 - Total phosphorus
 - *E.coli*





Nitrate leaching losses



Cross-site ammonia emissions curve



Broadcast application

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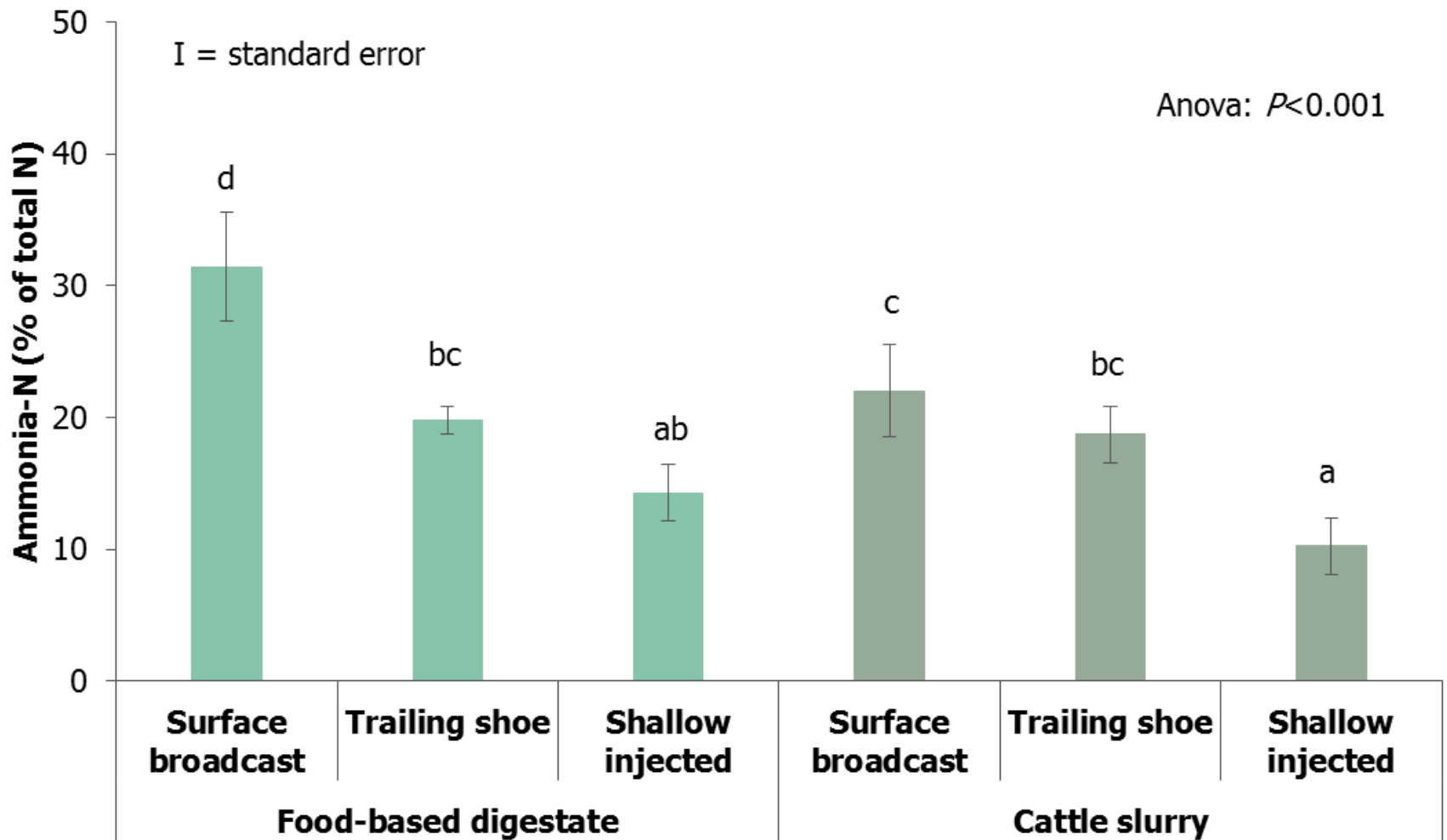
Bandspread application (trailing shoe)

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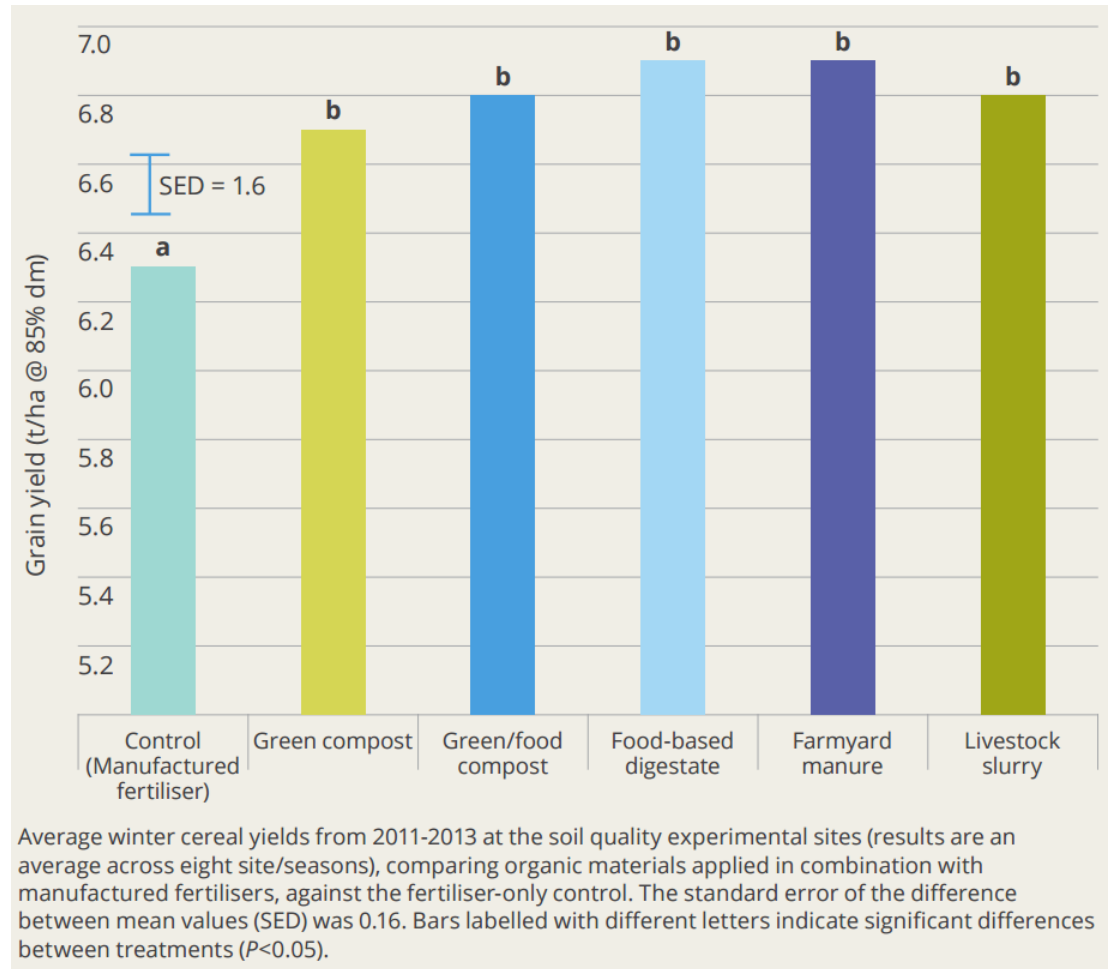
Shallow injection application

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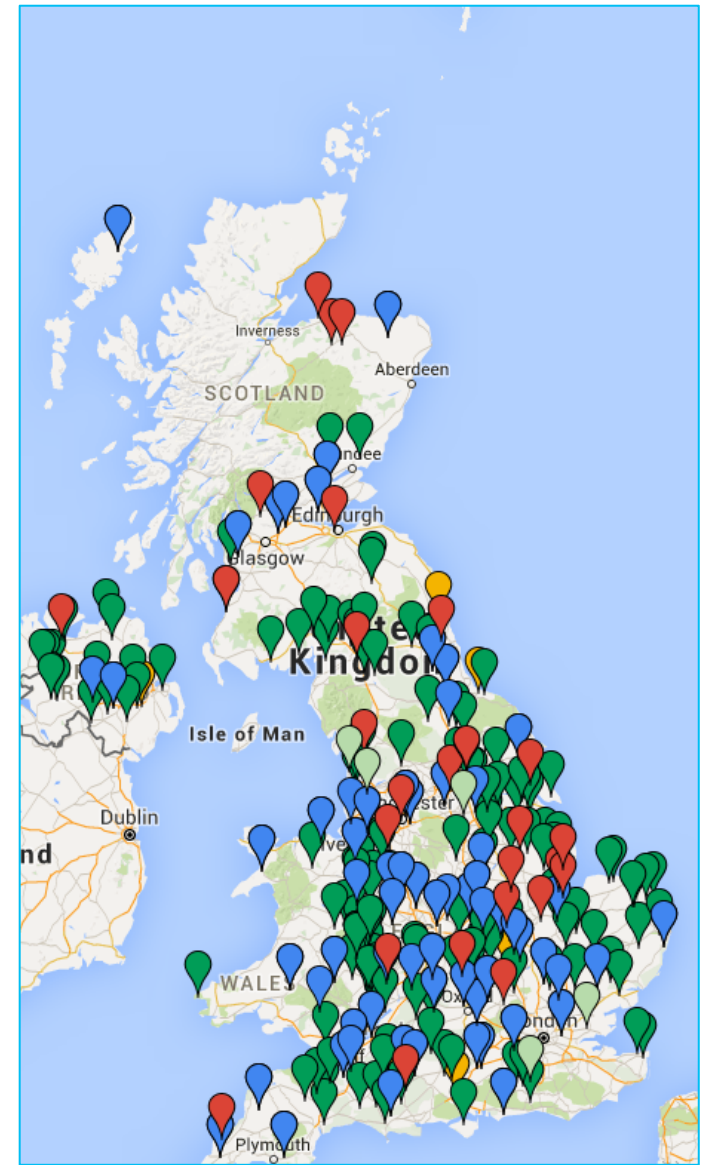


Ammonia losses from application techniques

The benefit was valued at £55-160/ha, taking into account the value of bagged fertiliser saved and the cost of spreading, but not sourcing



How does this relate to the location of AD sites?



	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan
Cereals	Light Green											
Winter Oilseed rape (incl NVZ's)	Dark Green						Dark Green					
Grass	Light Green											
Maize		Light Green										
NVZ Closed period tillage land sandy or shallow soils							Red with dots		Red			
NVZ Closed period grassland sandy or shallow soils								Red				
NVZ Closed period tillage land all other soils									Red			
NVZ Closed period grassland all other soils									Red			
Organic holdings max 150 kg total N/ha to end Feb							Red with diagonal lines					



If a crop is sown on sandy or shallow tillage land on or before 15 September you may apply organic manure between 1 August and 15 September inclusive

Spreading windows = how much storage?

1. Location of AD sites influenced by a number of factors
 - Using digestate is just one of these
 - Is it commercially significant?
 2. Journey from waste collection to renewable fertiliser
 - Minimise length
 - Where to place AD plant on this journey?
 3. Optimising digestate requires investment
 - In the UK, market drivers exist, but aren't strong
 4. Changing financial drivers in the sector
 - Increased pressure on AD businesses
 - Disposal alternatives are expensive
 - Understanding digestate's fertiliser replacement value is a useful part of the equation
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Some final thoughts...

- Translating research into practical advice
 - Trained 3,256 people, helping farmers make informed decisions
 - 35% committed to taking action
- Increased impact by working with the biggest names in farming
- Project legacy & online resources



DC-Agri in action





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For the *DC-Agri* research summary, Good practice guides, and range of training resources