SOFIE: 1st Summit of the Organic and Organo-mineral Fertiliser Industry in Europe. Brussels 5 June 2019

What does agronomic science tell us about the value to farmers and to soil of organic amendments

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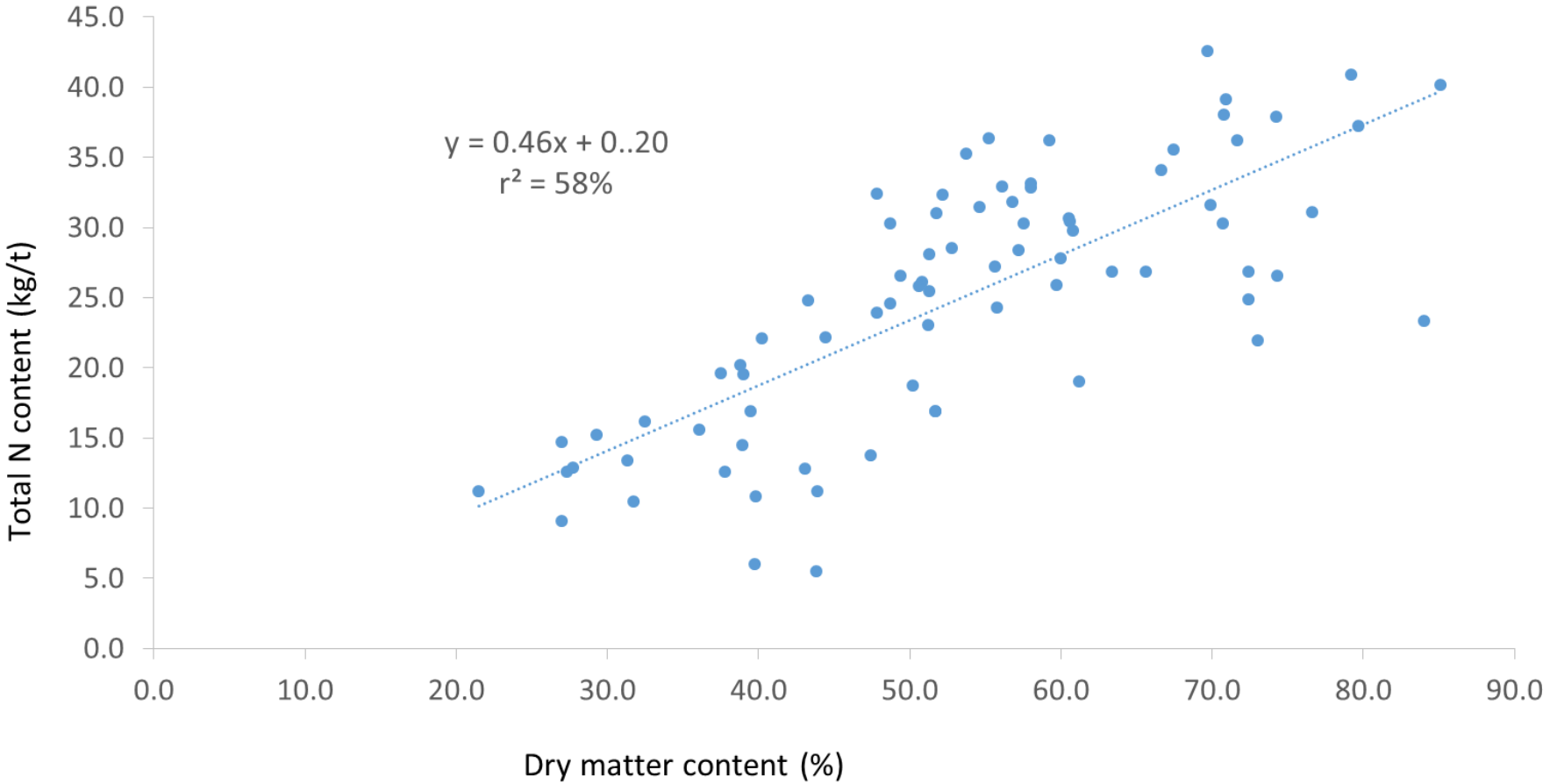
Key factors controlling utilisation of organic fertilisers

1. What is the nutrient content?
2. How available are the nutrients for crop uptake?
3. Accuracy and evenness of application
4. Integrate into nutrient management plans (and reduce inorganic fertiliser applications)

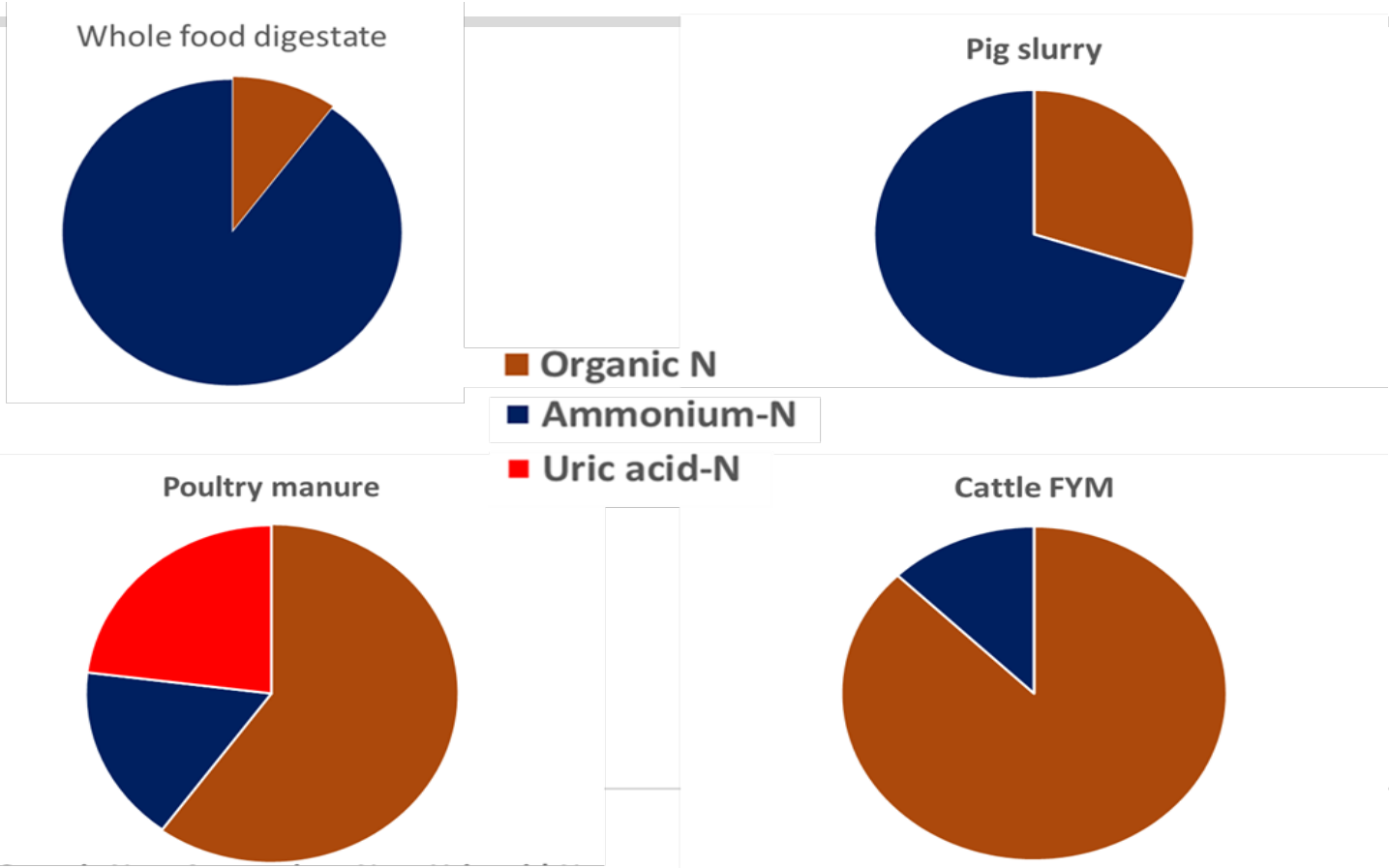
Organic materials are valuable sources of nutrients

Manure type	Dry matter (%)	Total N	Total phosphate	Total potash	Total sulphur
		Kg/m^3 or t			
Cattle slurry	6.0	2.6	1.2	2.5	0.7
Whole digestate	4.1	4.8	1.1	2.4	0.7
Green compost	60	7.5	3.0	6.8	3.4
Digested biosolids cake	25	11	11	0.6	8.2
Poultry manure	60	28	17	21	8.2

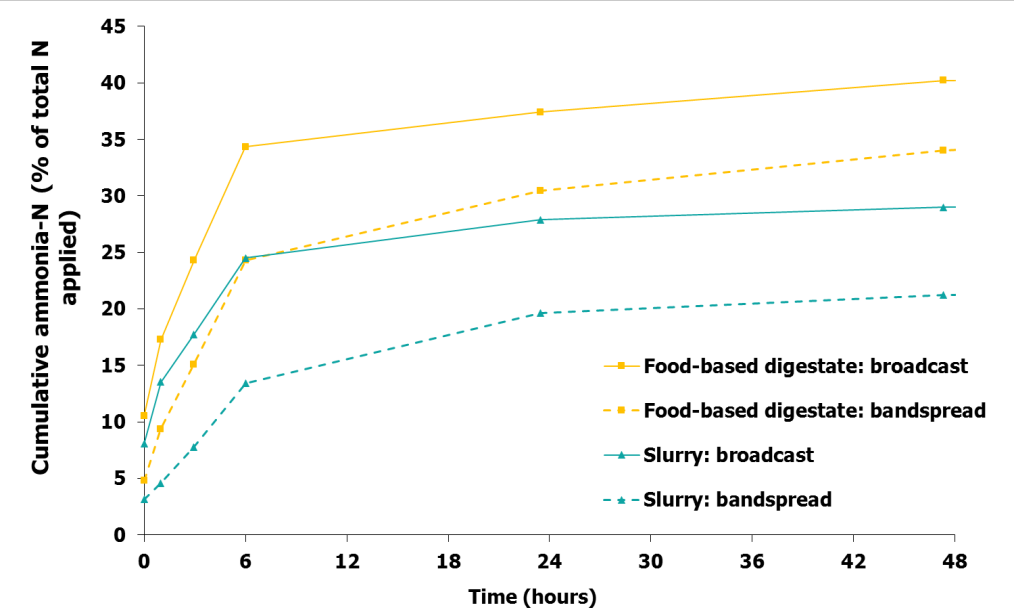
Relationship between poultry manure dry matter and total N content

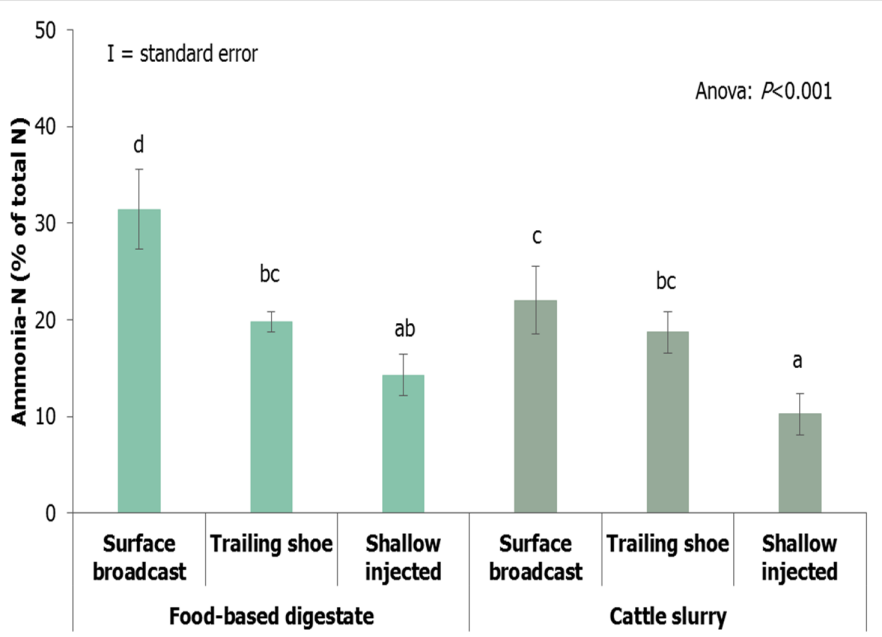


Manure readily available N content



Ammonia emissions from contrasting application techniques

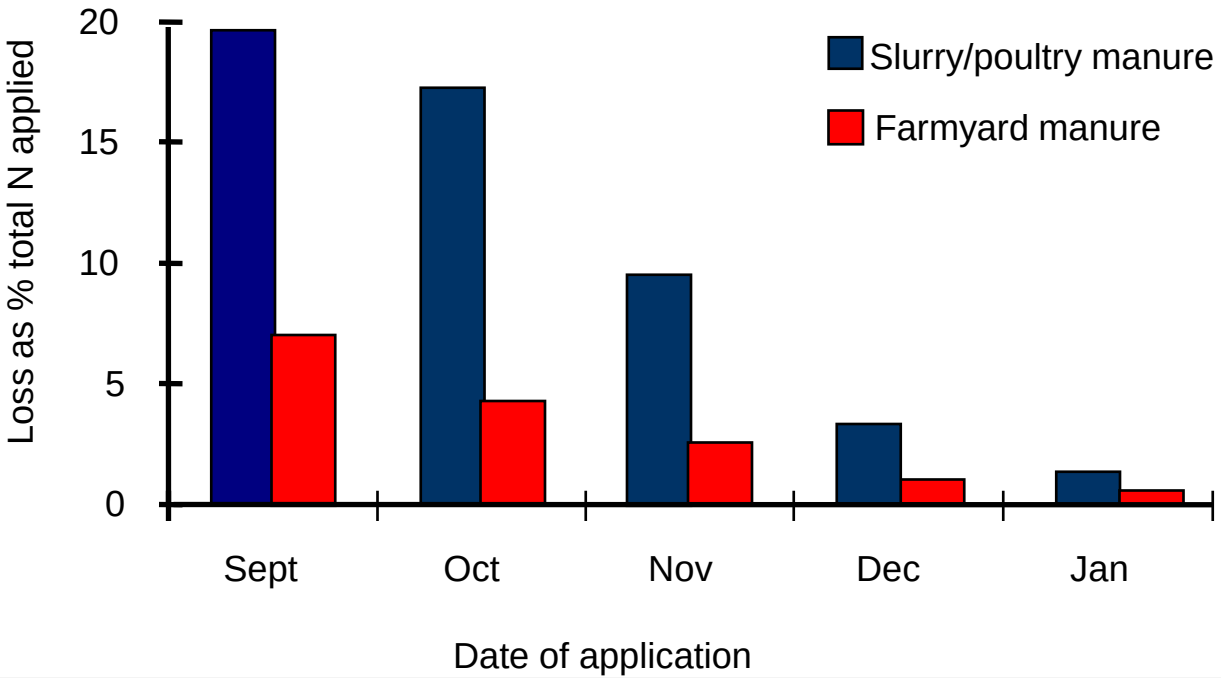




Source: DC-*Agri*

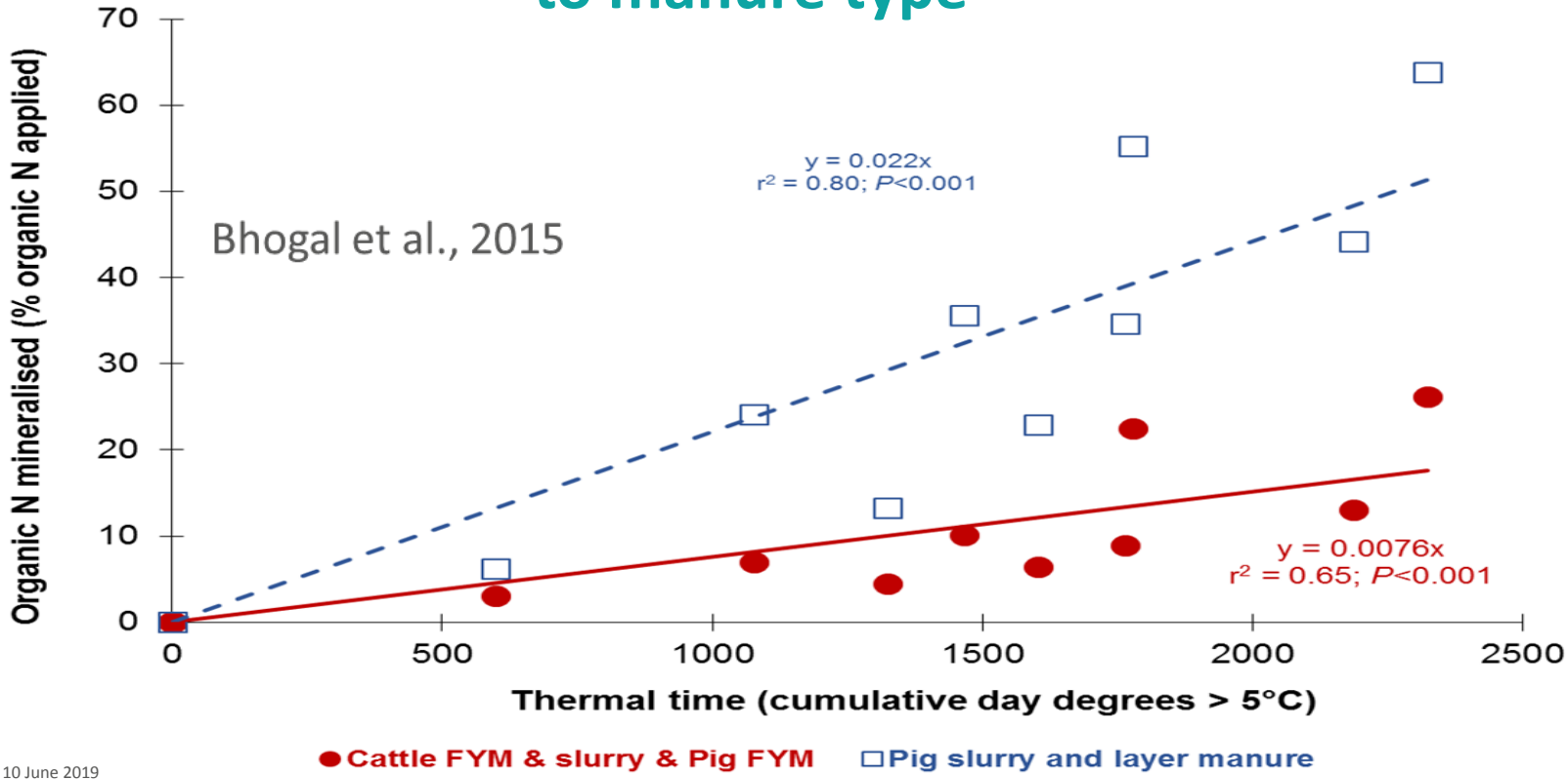
Slurry bandspreading / shallow injection allows even application over known bout widths

Spring application timings minimise nitrate leaching losses

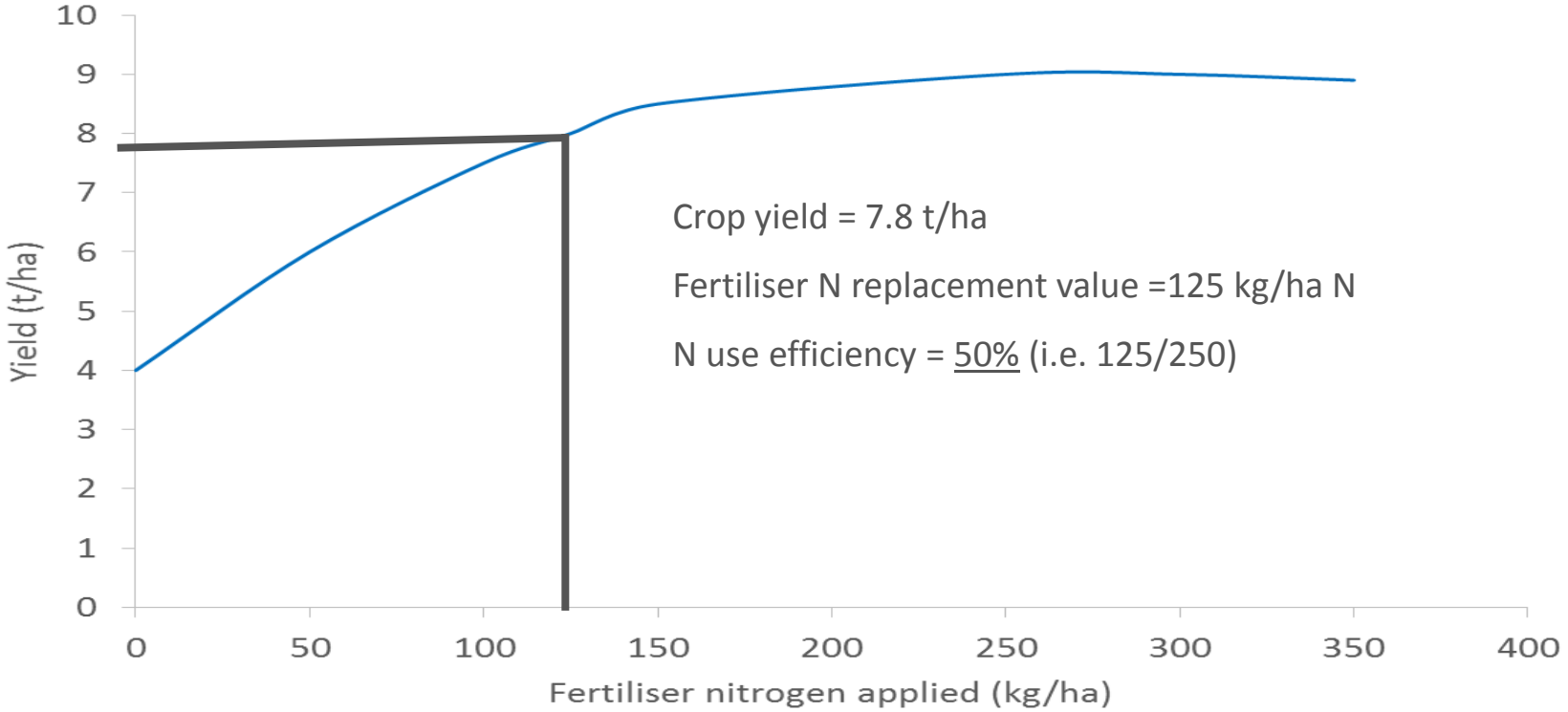


Source: Chambers *et al* (2000)

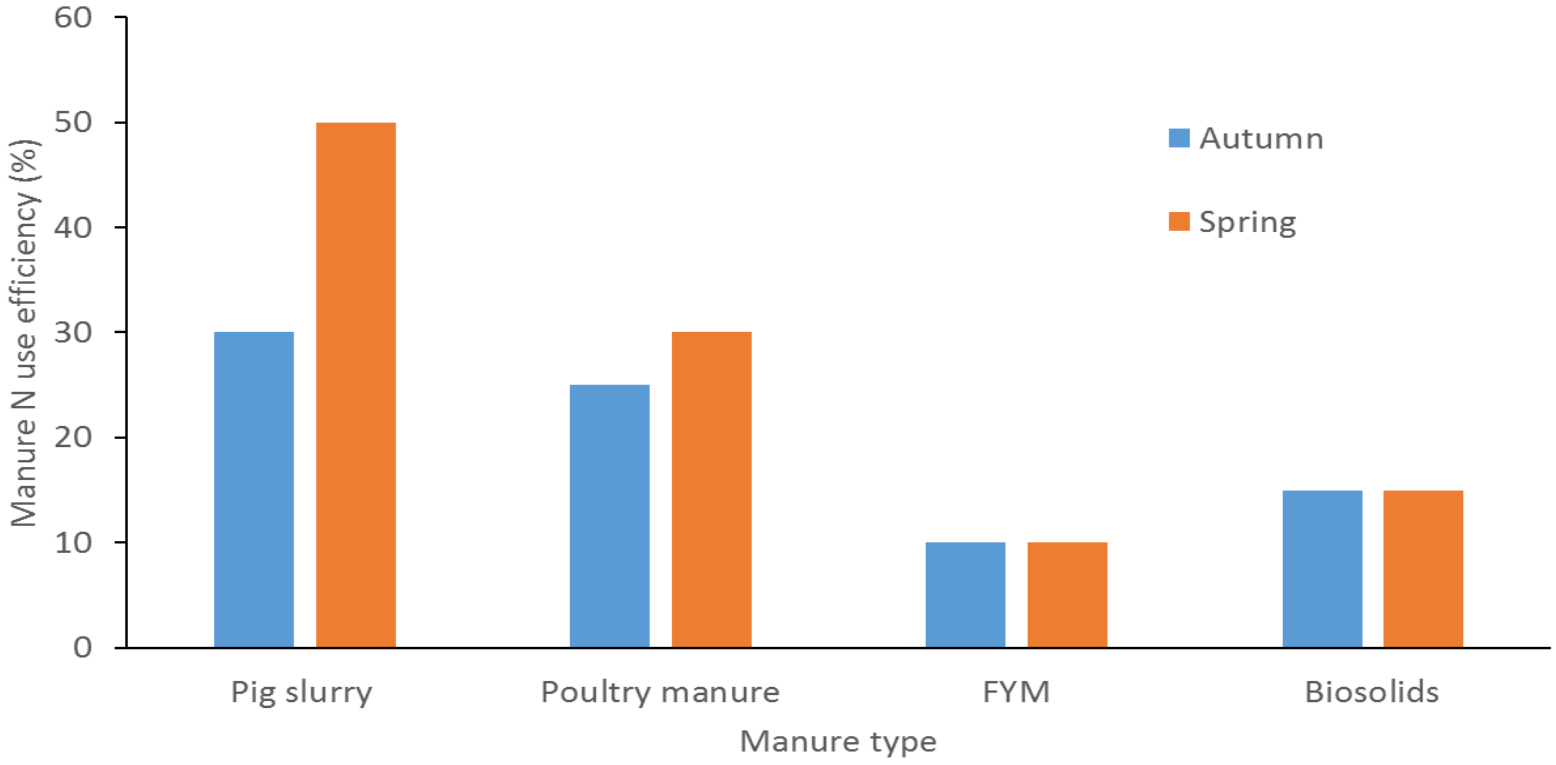
Mineralisation of organic nitrogen varies according to manure type



Calculating organic material fertiliser replacement values (example 250 kg N/ha application)



Effect of application timing on organic material N use efficiency (medium soils)



AHDB Nutrient Management Guide (RB209)

Phosphorus

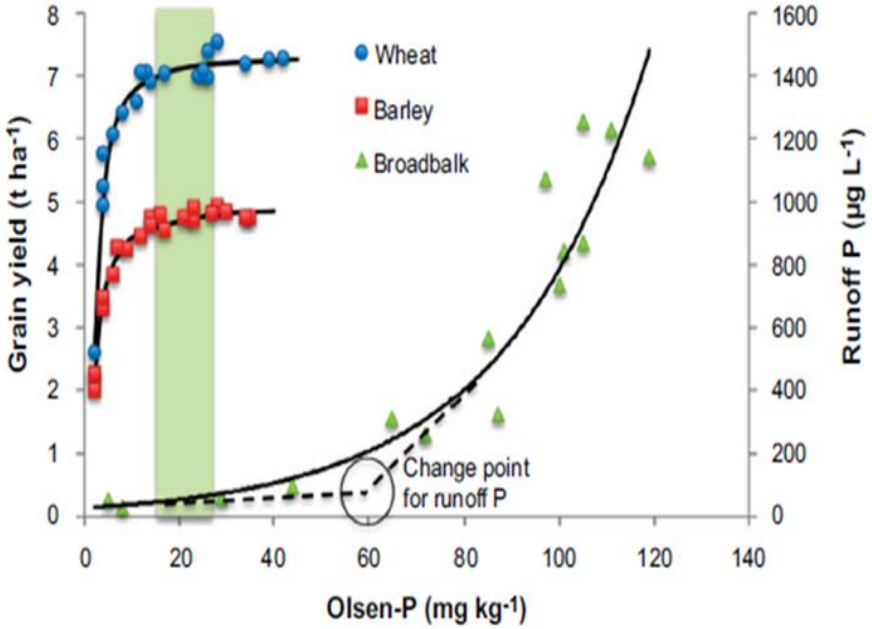
Crop available P is controlled by interactions with cations (mainly iron, aluminium and calcium)

P availability is typically greatest on sandy soils

Water soluble phosphorus content is the best indicator of P availability for plant uptake

Typically WSP content (as % total P):

- Manufactured fertilisers >80%;
- Livestock manures 15-20%
- Biosolids <10%



Poulton *et al.,* 2013, Heckrath *et al.,* 1995 Withers *et al.,* 2017

Don't forget sulphur.....

Organic material	% total SO_3 available
Autumn applied	
Livestock manures	5–10%
Biosolids	10–20%[a]
Spring applied	
Cattle FYM	15%
Pig FYM	25%
Poultry manure	60%
Cattle/pig slurry	35%
Biosolids	20%

Application rates – match to crop demand

Must take nutrient content and crop demand into account

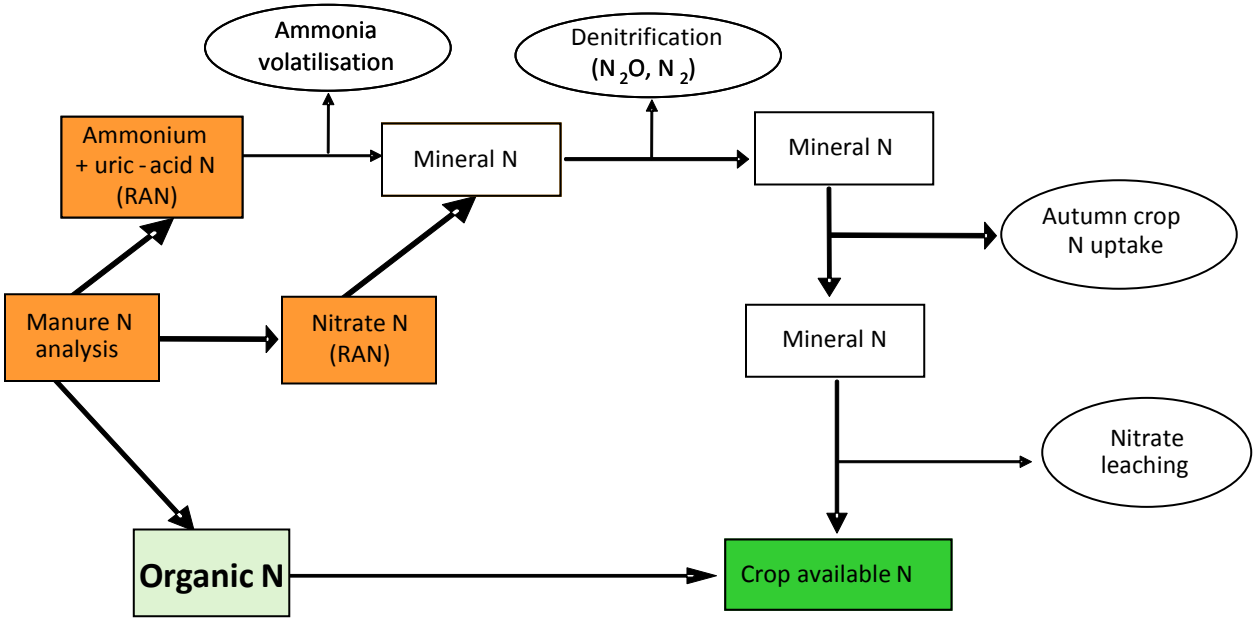
Quantity spread and area:

- Liquids
  - Tanker volume/rate
- Solid manures
  - Weigh trailer full & empty
  - Use estimated densities

Quantifying crop available nutrient supply from organic materials

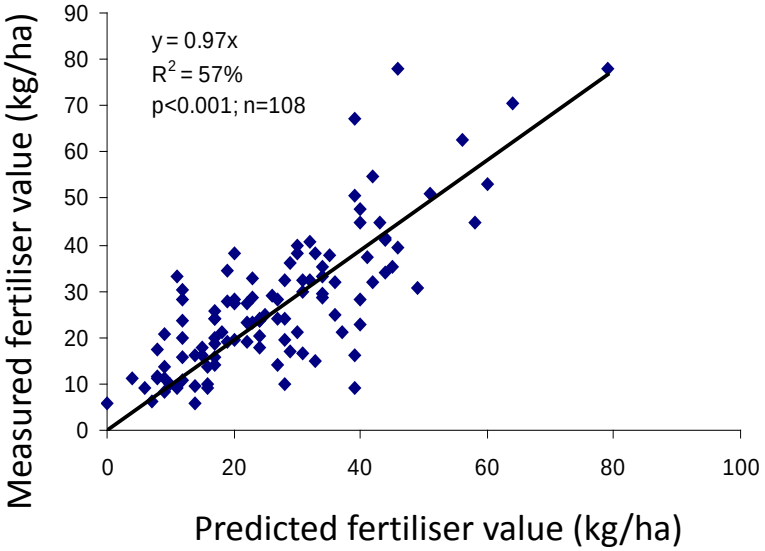
Nicholson et al. (2013) Soil Use and Management 29, 473-484

MANNER-*NPK*

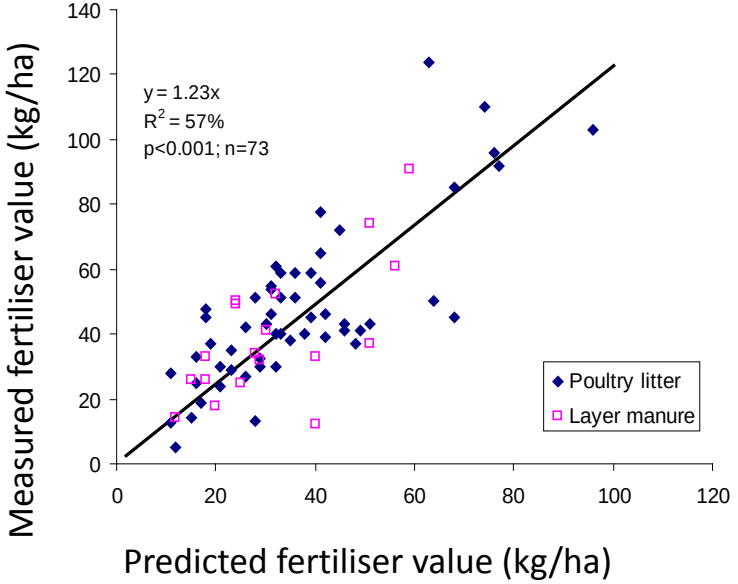

Ammonia volatilisation
Denitrification (N_2O, N_2)
Ammonium + uric-acid N (RAN)
Mineral N
Mineral N
Autumn crop N uptake
Manure N analysis
Nitrate N (RAN)
Mineral N
Nitrate leaching
Organic N
Crop available N

Validation of fertiliser replacement values

Cattle manures



Poultry manures



Summary

- Organic materials are valuable sources of plant nutrients and organic matter
- Need to account for variable:
  - nutrient content
  - nutrient availability
- Minimise losses to the environment to maximise fertiliser replacement values
- Match applications to soil nutrient supply
- Account for crop available nutrient supply when planning manufactured fertiliser applications

Thanks for your attention

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