

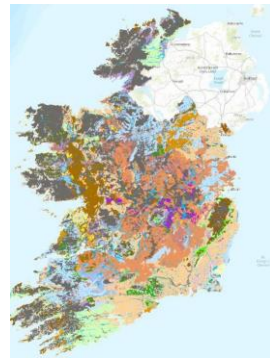
Nutrient tips to save money and reduce emissions on your farm

Patrick Forrestal and team

Environment, Soils and Land Use Department
Crops, Environment and Land Use Programme
Johnstown Castle
Co. Wexford

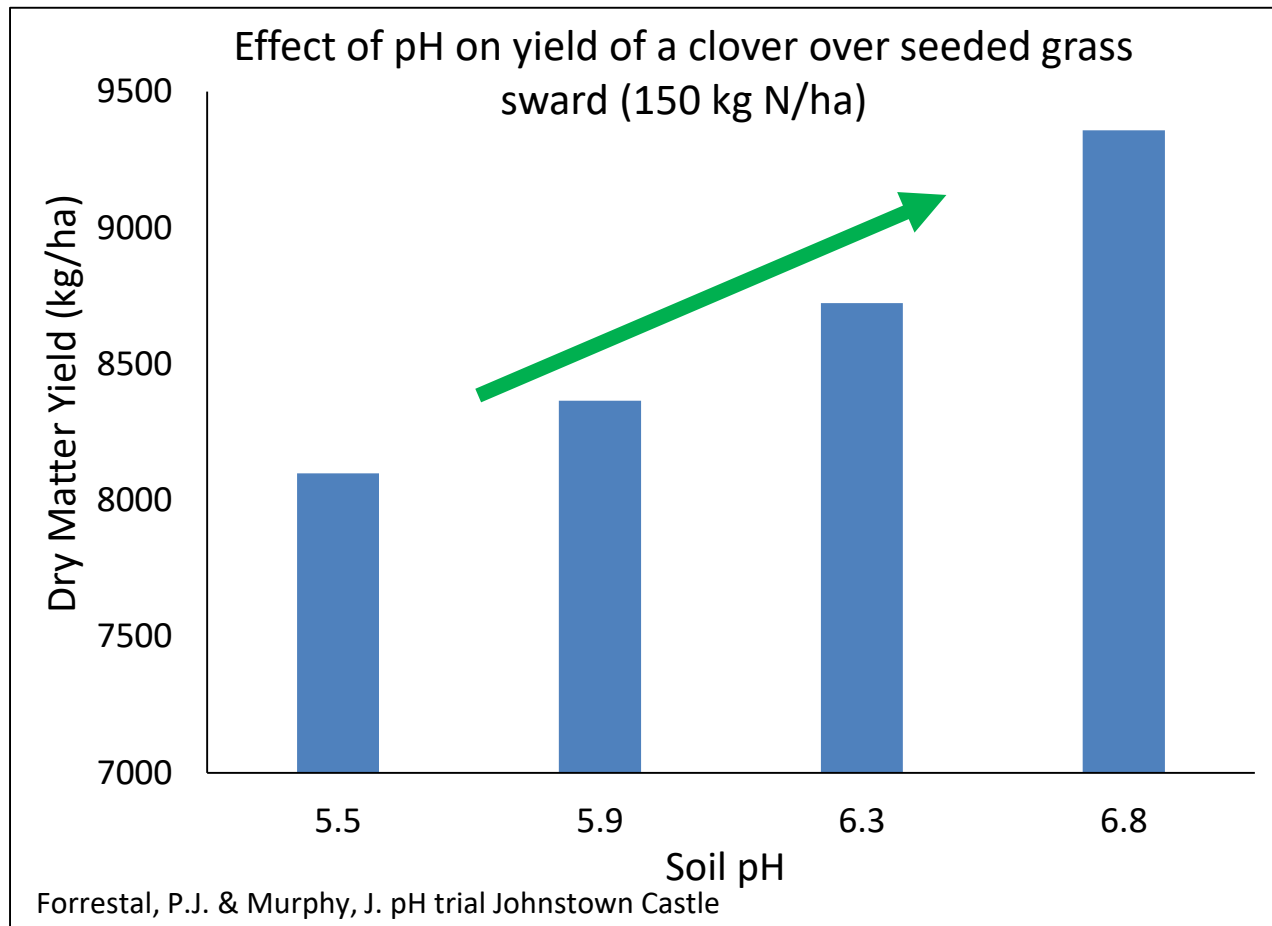


Use your knowledge of your farm its soils, aspect, exposure and drainage



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“Grow” your own nitrogen – reduce need for fertiliser N



**Tip: Give
existing clover
boost with
lime**

**Tip:
Establishing
clover? – lift
pH first**

You will be well paid for managing N at current prices!
75 kg N/ha = 9700 euro on a 50 ha farm

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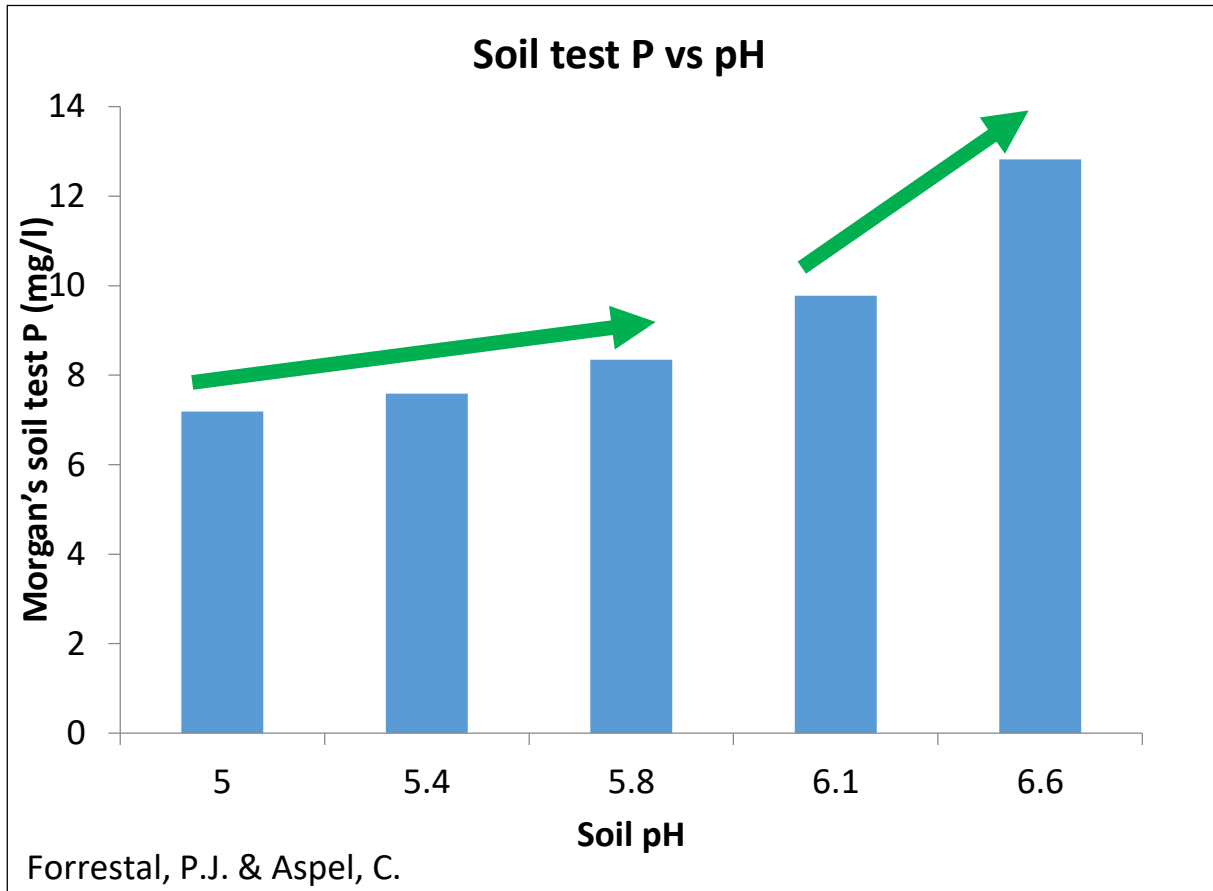
Do you know the pH of each field on the farm?

- If the answer is no prioritize soil testing or dig out your last soil sample results.
- Spread lime as required
- 7-10 days after slurry ok
- Not ideal before slurry
- Preliminary indications ok with protected urea



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Liming acidic mineral soils increases soil P availability



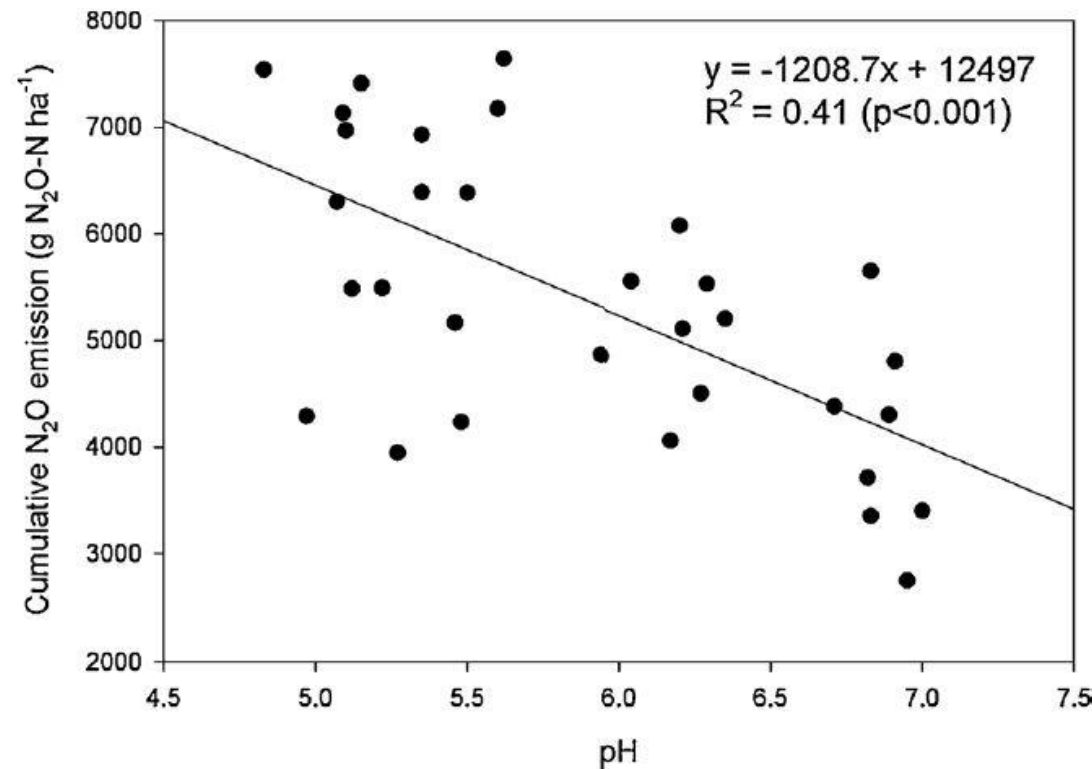
**Tip: Unlock
the P you
already have
with lime**

6kg (12 units) of P costs a similar amount to a tonne of lime



Increasing soil pH reduces fertiliser derived N₂O emissions in intensively managed temperate grassland

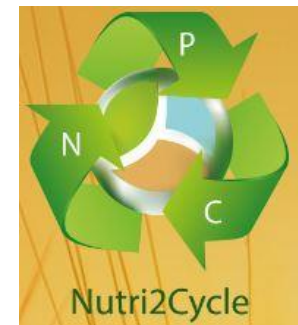
Ognjen Žurovec*, David P. Wall, Fiona P. Brennan, Dominika J. Krol, Patrick J. Forrester, Karl G. Richards



Tip: correcting soil pH can also help reduce greenhouse gas emissions

Fig. 4. Relationship between cumulative N₂O emissions and average soil pH for each lime treatment plot, including the equation and R² of the linear regression.

Bio-based fertilisers, slurries?



Struvite
Precipitated from
P rich waste streams



Ash

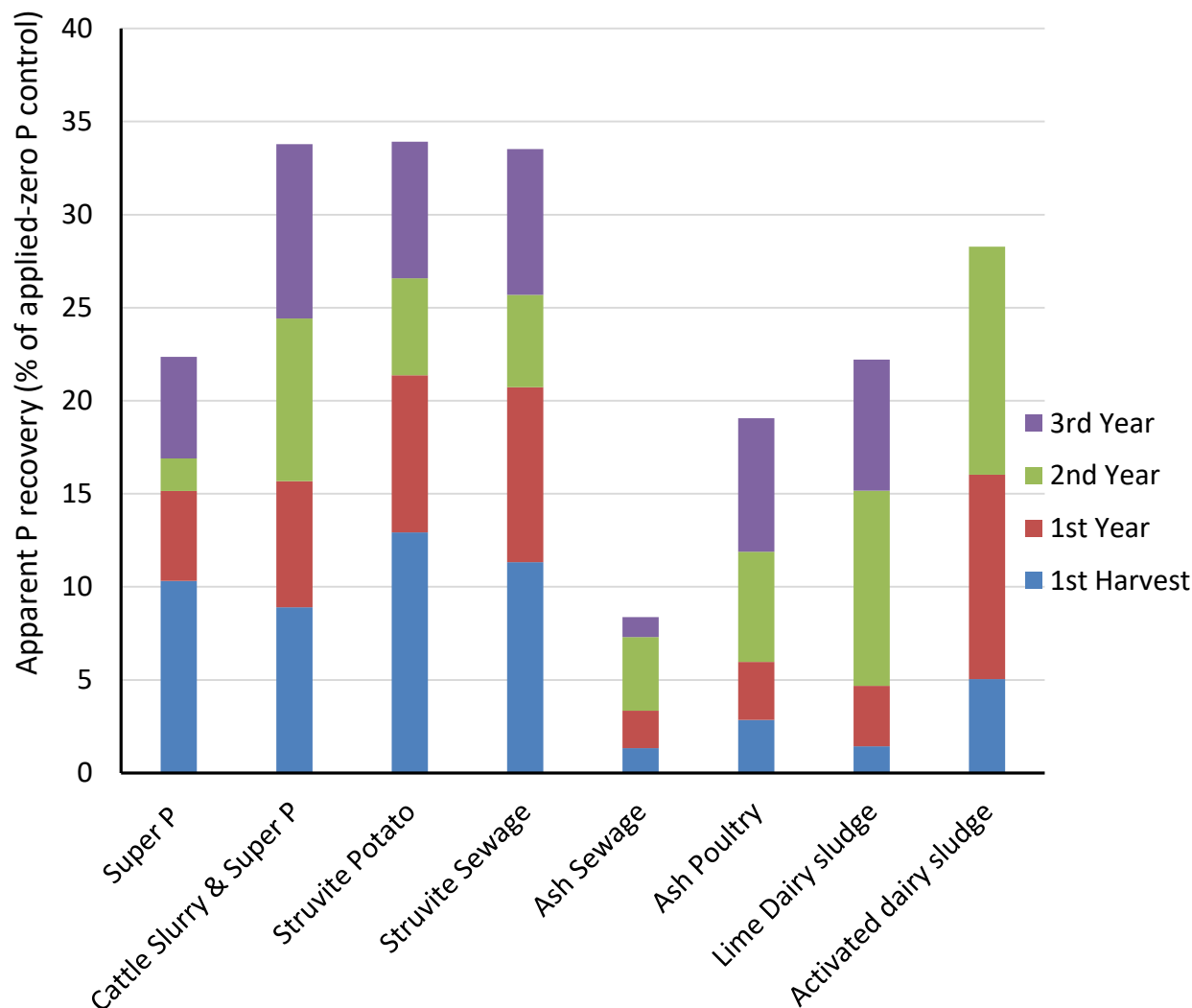
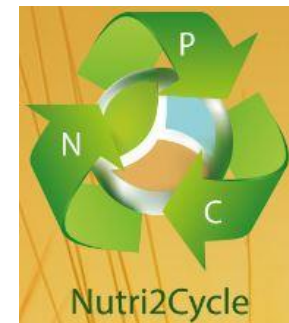


Dairy processing
sludge

**Tip: what is
available
locally?
Making best
use of slurry**

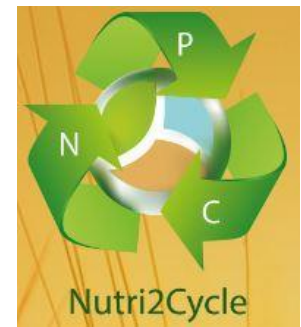


Multi-year P availability?

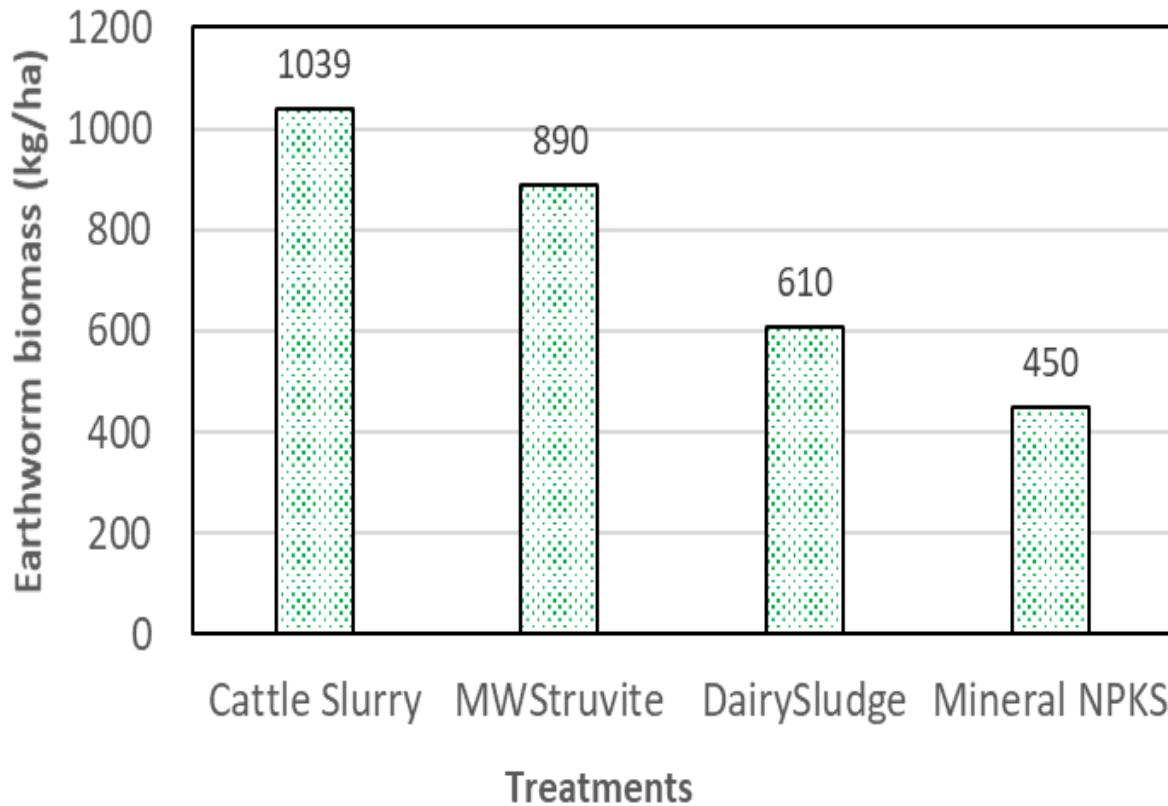


Tip: better P recovery with slurry and fertiliser P together in longer term

Soil biological health?



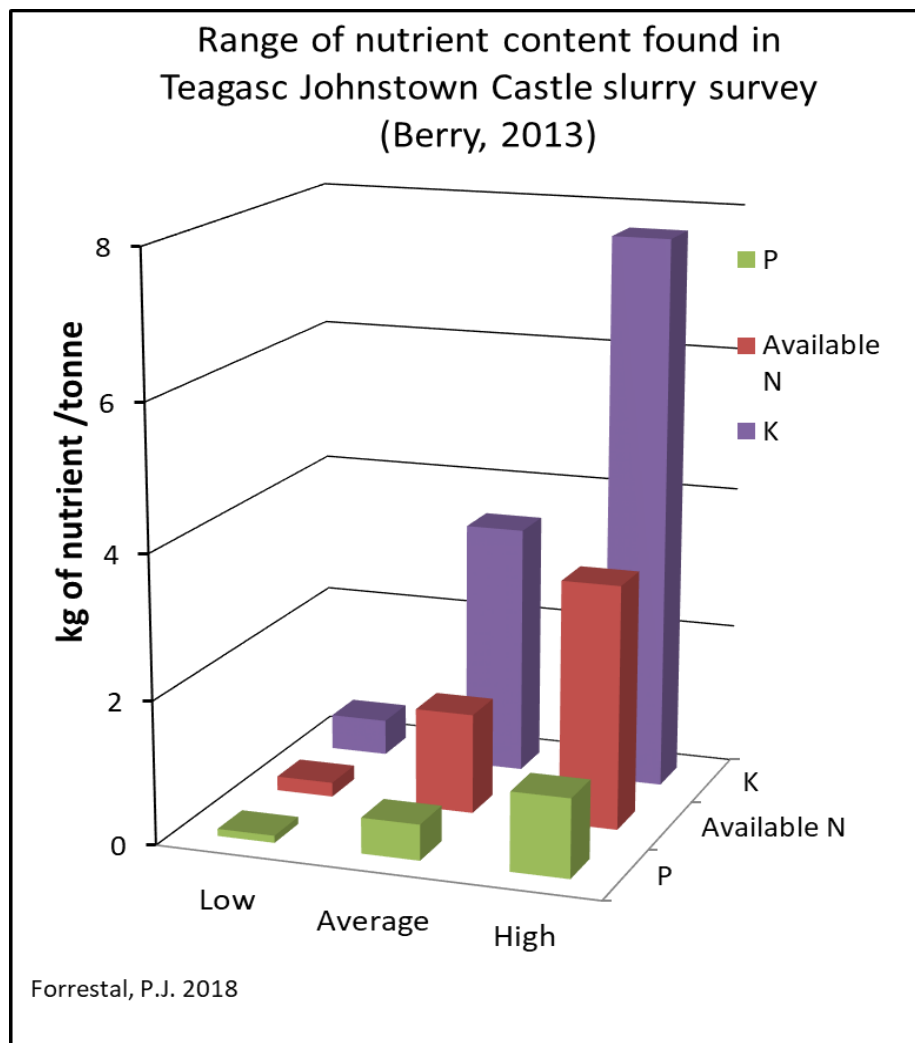
Earthworm Biomass



Doherty & Forrestal et al., 2021

Tip: beneficial effect of slurry and biobased on earthworms vs mineral fertiliser only

What is your slurry nutrient label? test it



Tip: Test your slurry, large variability

Tip: Direct it to where it is needed

- Soil test
- Silage ground-K
- P benefit

Meeting the challenge of getting the correct nutrient rate on each field for each crop



+

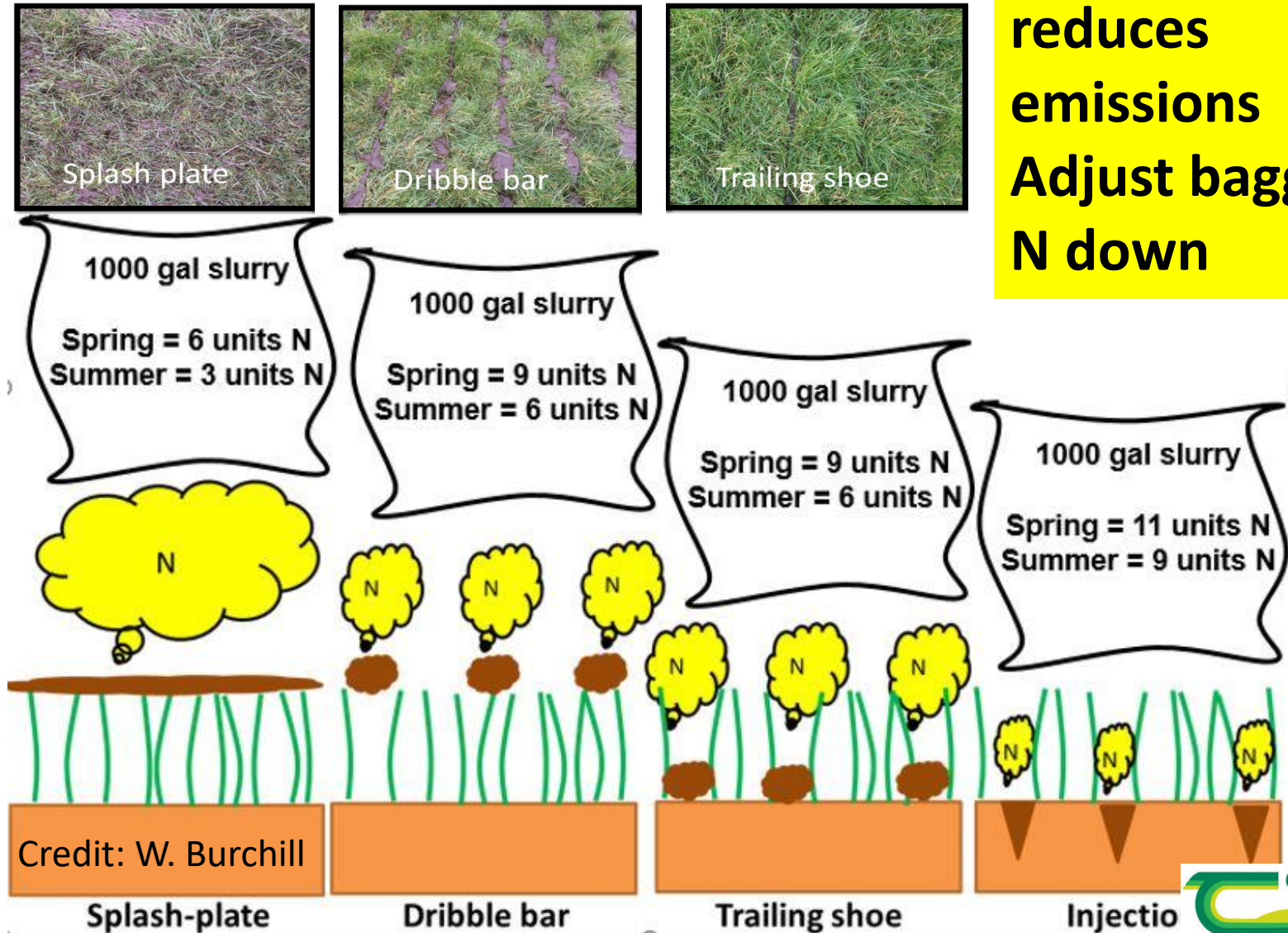


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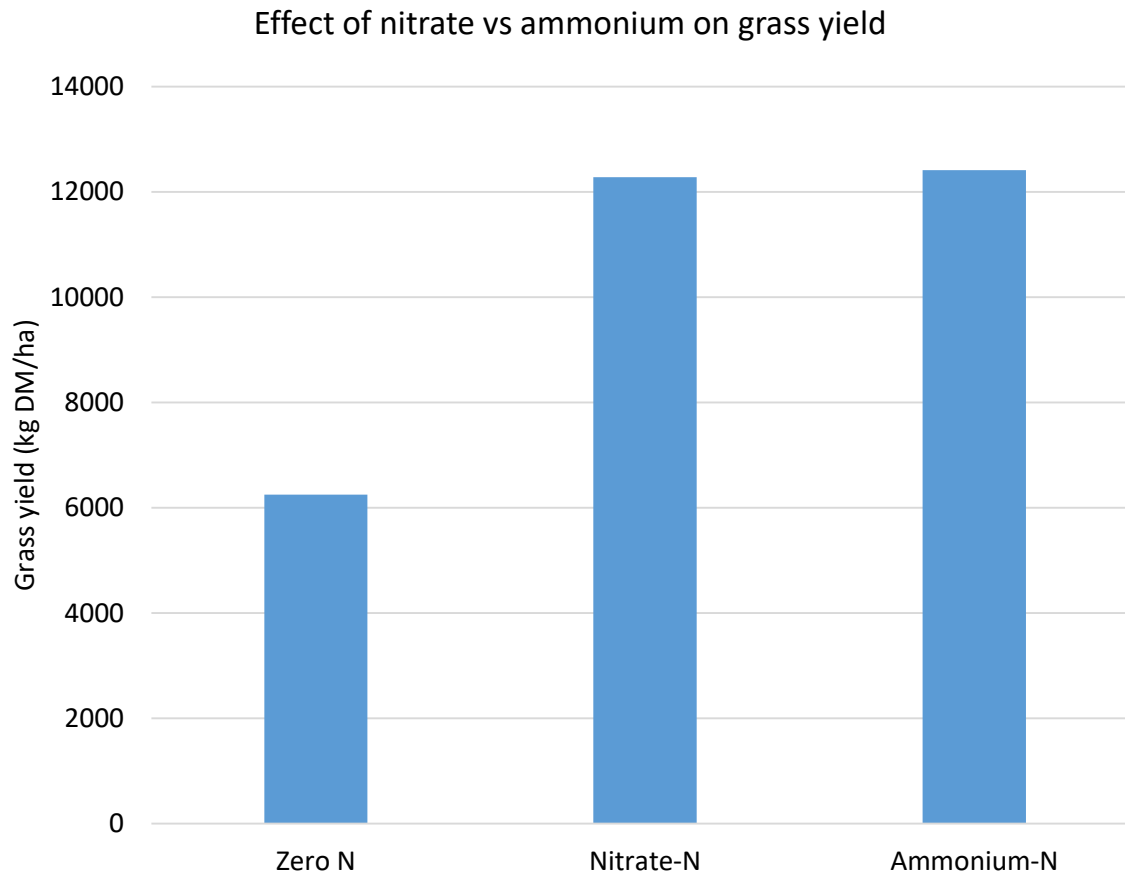


Use LESS, the N saved is more valuable than ever

Tip: LESS
retains N &
reduces
emissions
**Adjust bagged
N down**



Reduce reliance on nitrate fertiliser



Tip: Nitrate or ammonium gave the same yield but 2.9 times higher N₂O EF from the nitrate

Adapted from: Rahman and Forrester (2021) <https://doi.org/10.3390/agriculture11111141>

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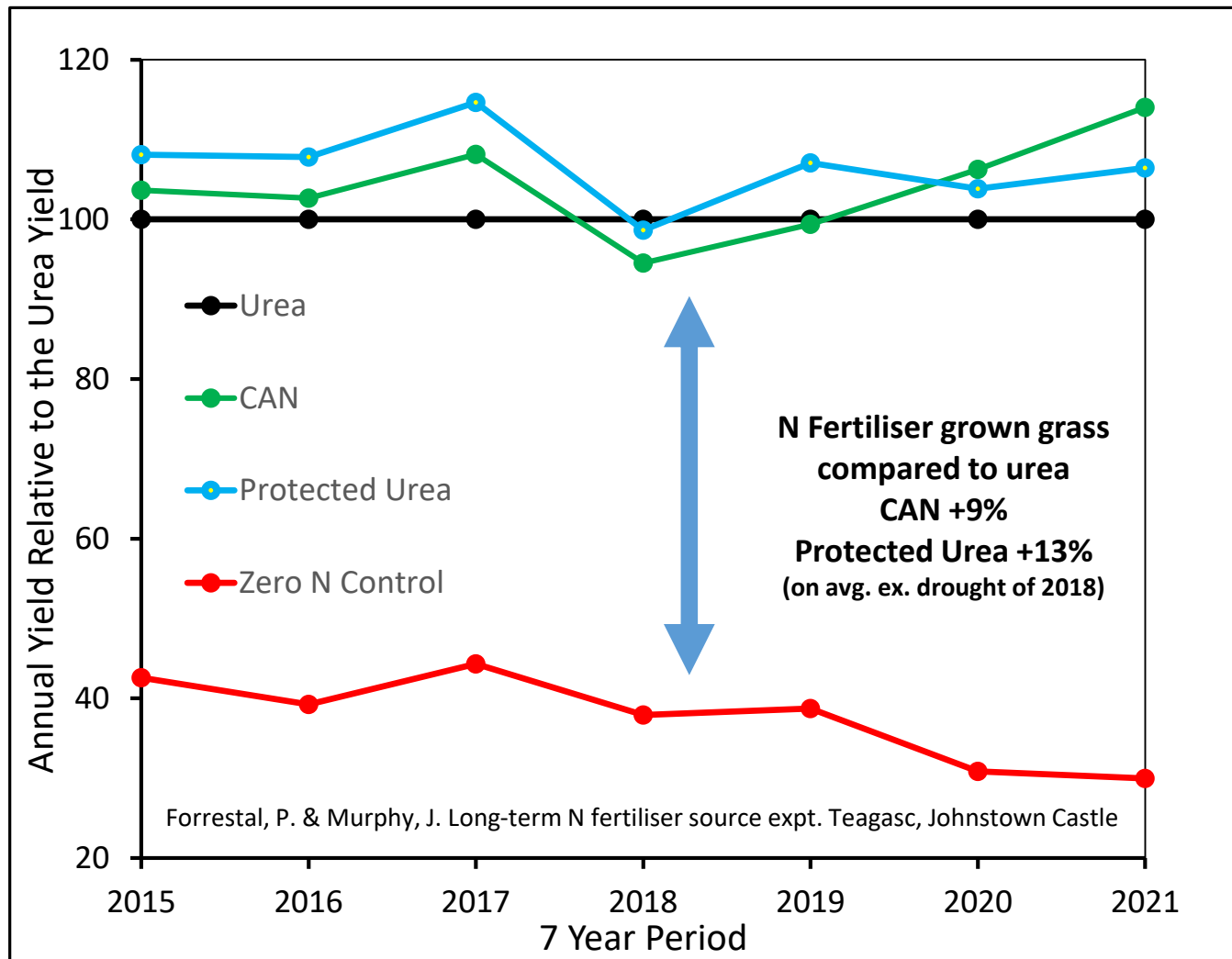
Protected urea

- Standard urea protected from ammonia loss using a **Urease inhibitor**
- Like slurry, urea loses ammonia – that's loss of N you paid for
- Counts toward national emissions
- Urea loses 15.5% on average
- Protected urea c. 3.3%
- C. 12% cut in protected urea rate vs urea possible giving same "effective N"



Tip: Protected urea is like “LESS” for urea but without the equipment and with very high efficacy

Protected urea grows more grass over the long-term with lower emissions




Tip: Protected urea stacks up for the farmer for yield, cost and emissions reduction

Soil Health effect of protected urea?

- The soil microbial communities were assessed in the long-term plots
- No effect of the urease inhibitor on the microbial community composition or diversity
- Paper in review: Duff, Brennan et al.



Sulfur fertilization strategy affects grass yield, nitrogen uptake, and nitrate leaching: A field lysimeter study[#]

Claire Aspel^{1,2}  | Paul N. C. Murphy^{2,3} | Michael J. McLaughlin^{4,5} | Patrick J. Forrester^{1,5}



Tips:

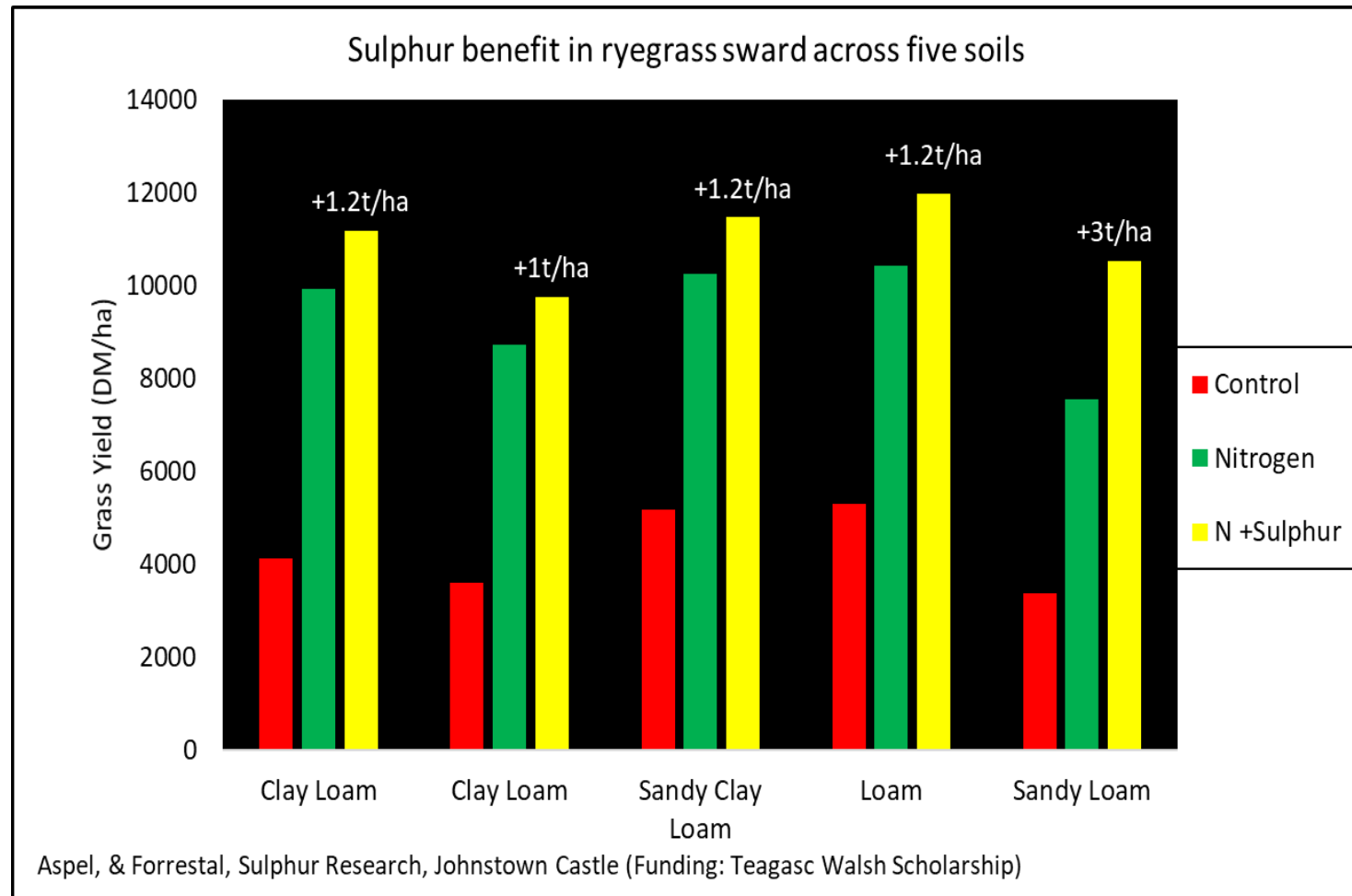
- Up to 2.9 t additional DM with S on a free draining sandy loam soil
- Nitrate leaching reduced by 46% by S
- S kept leachate nitrate <11 mg NO₃-N/L – below the drinking water standard. Was up to 40 mg NO₃-N/L without S
- Slurry S was only 9% available

Reference: Aspel et al, 2021: DOI: 10.1002/jpln.202100133

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S response differs across soils

Tip: Are your soils S responsive?



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Which products should I use?

Containing a urease inhibitor – EU fertiliser regulation

Fertiliser products available on the Irish market containing a protected form of urea (N)							
Company	Product Name	Inhibitor Type & Name	N %	P %	K %	S %	Na %
Grassland Fertilisers (Kilkenny) IFI	IFI Topper N-Sure	NBPT + NPPT (LIMUS)	46	-	-	-	-
	IFI Super Topper N-Sure	NBPT + NPPT (LIMUS)	38	-	-	7	-
	IFI Topper Boost N-Sure	NBPT + NPPT (LIMUS)	29	-	14	3.8	-
Grassland Agro	Eco Urea	NBPT + NPPT (LIMUS)	46	-	-	-	-
	Eco N 38	NBPT + NPPT (LIMUS)	38	-	-	7.6	-
	Eco 29-0-14 +S	NBPT + NPPT (LIMUS)	29	-	14	2	-
	Alzon Neo-N	2-NPT + MPA	46	-	-	-	-
	Alzon Neo-N + S	2-NPT + MPA	40	-	-	6	-
Goulding Fertiliser	Sustain / KaN	NBPT (Agrotain)	46	-	-	-	-
	Sustain / KaN	NBPT (Agrotain)	38	-	-	7	-
	Sustain / KaN	NBPT (Agrotain)	29	-	14	3.5	-
	Sweet Sustain	NBPT (Agrotain)	35	-	-	5	5
NitroFert	Nitro Guard	NBPT + NPPT (LIMUS)	46	-	-	-	-
	Nitro Guard	NBPT + NPPT (LIMUS)	38	-	-	7	-
	Nitro Guard	NBPT + NPPT (LIMUS)	30	-	15	2	-
Target Fertilisers	UreaMax	NBPT + NPPT (LIMUS)	46	-	-	-	-
	UreaMax + S	NBPT + NPPT (LIMUS)	38	-	-	7	-
	29-0-14+4% S Max	NBPT + NPPT (LIMUS)	29	-	14	4	-
Yara (Vera Range)	AMIPLUS	NBPT	46	-	-	-	-
	AMIDAS	NBPT	40	-	-	5.6	-

- 20 products
- 6 companies
- N options
- N+S options
- N+K+S options
- Supply issues?
- Order in advance

If in doubt check <https://www.teagasc.ie/crops/soil--soil-fertility/> for the most up to date list

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Cost savings by N fertiliser choice?

Product	E.g. price/tonne	N %	Kg N/tonne	Price/kgN
Urea	920	46	460	2.00
CAN	700	27	270	2.59
Protected urea	970	46	460	2.11

Product	Price of 460 kg N	40 ha at 100kgN/ha
Urea	920	8,000
CAN	1191	10,360
Protected urea	970	8,440

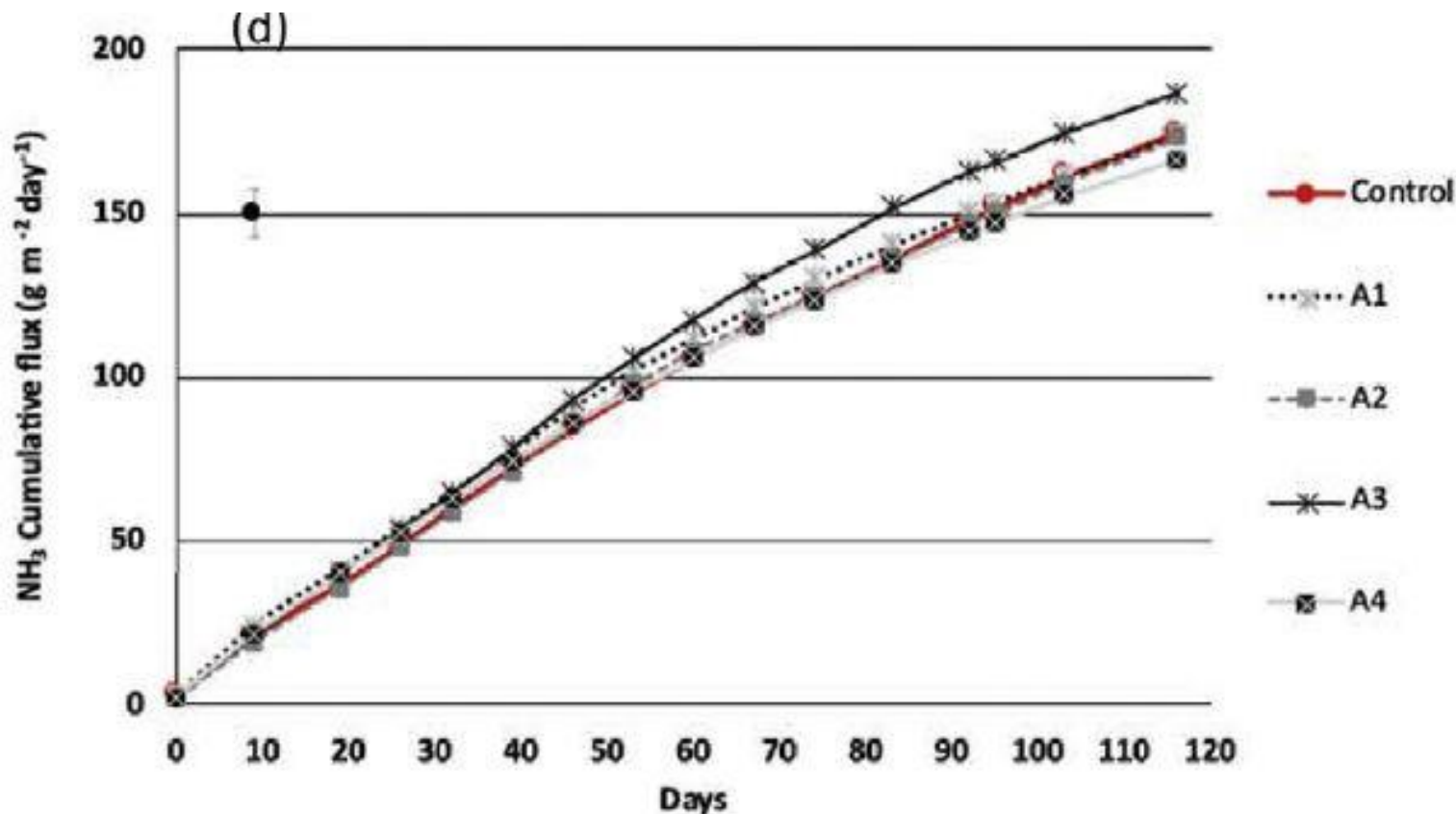
Thank you for your attention

Questions?



Slurry additive testing at Johnstown Castle

Commercially available additives tested had little impact on emissions Kavanagh et al. (2021)



The 4 commercial products had the following active ingredients: sporomusa, flexibacter, cytophaga, bacteroides, clostridium, coccoides, botulinum, ferric chloride and calcium chloride. Identified as A1, A2, A3 and A4 due to commercial sensitivity. Selected due to their popularity in the Irish market and relative availability.

<https://doi.org/10.1016/j.jclepro.2021.126251>

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