

The Signpost Series
'Pointing the way to a low emissions agriculture'

Reducing Slurry Emissions



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Ammonia – The Challenges

Ammonia

- 98% of ammonia emissions from Ag
 - 1% reduction to 2030
 - 5% from 2030 onwards
 - Ammonia mitigation can be synergistic or antagonistic with GHG mitigation

Ammonia Policy

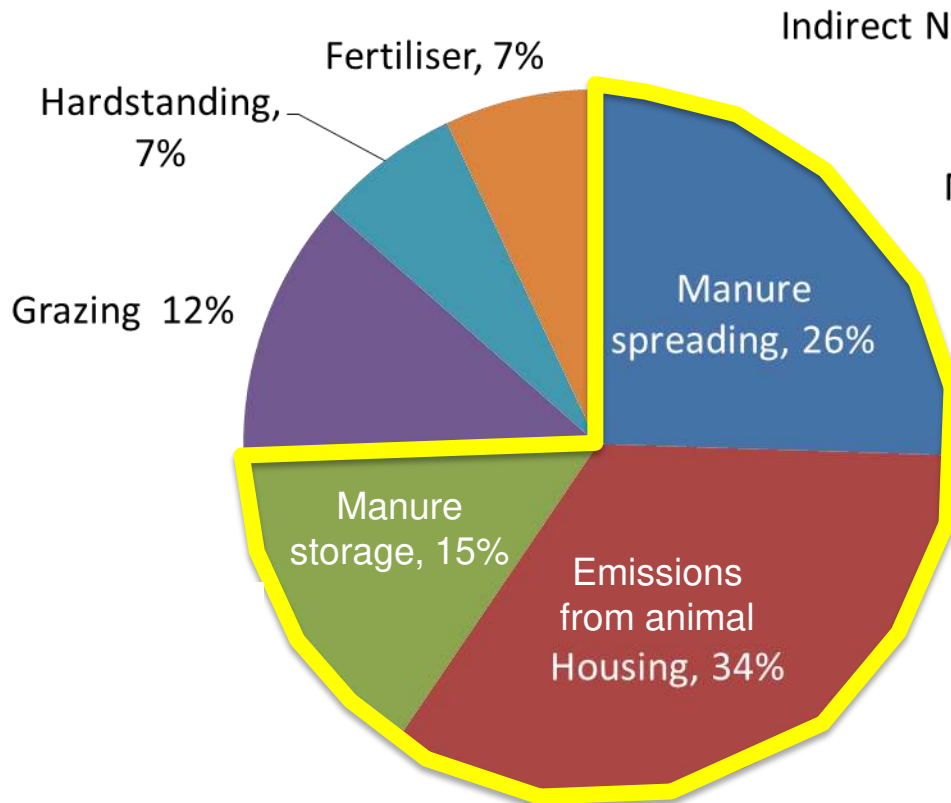
- EU Clean Air Package 2030
 - EU ammonia Ag. emissions reduction 27%
 - Ireland ammonia Ag. emissions reduction 5%

Ammonia Source

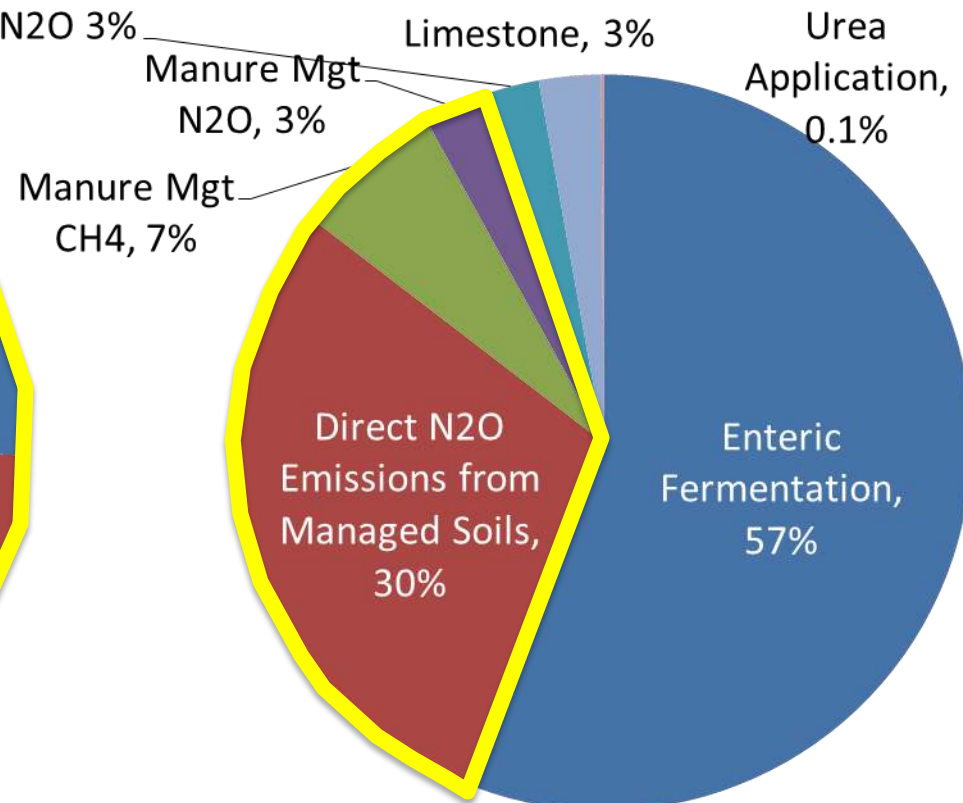


IRL Ammonia & GHG emissions profile

Ammonia



GHG

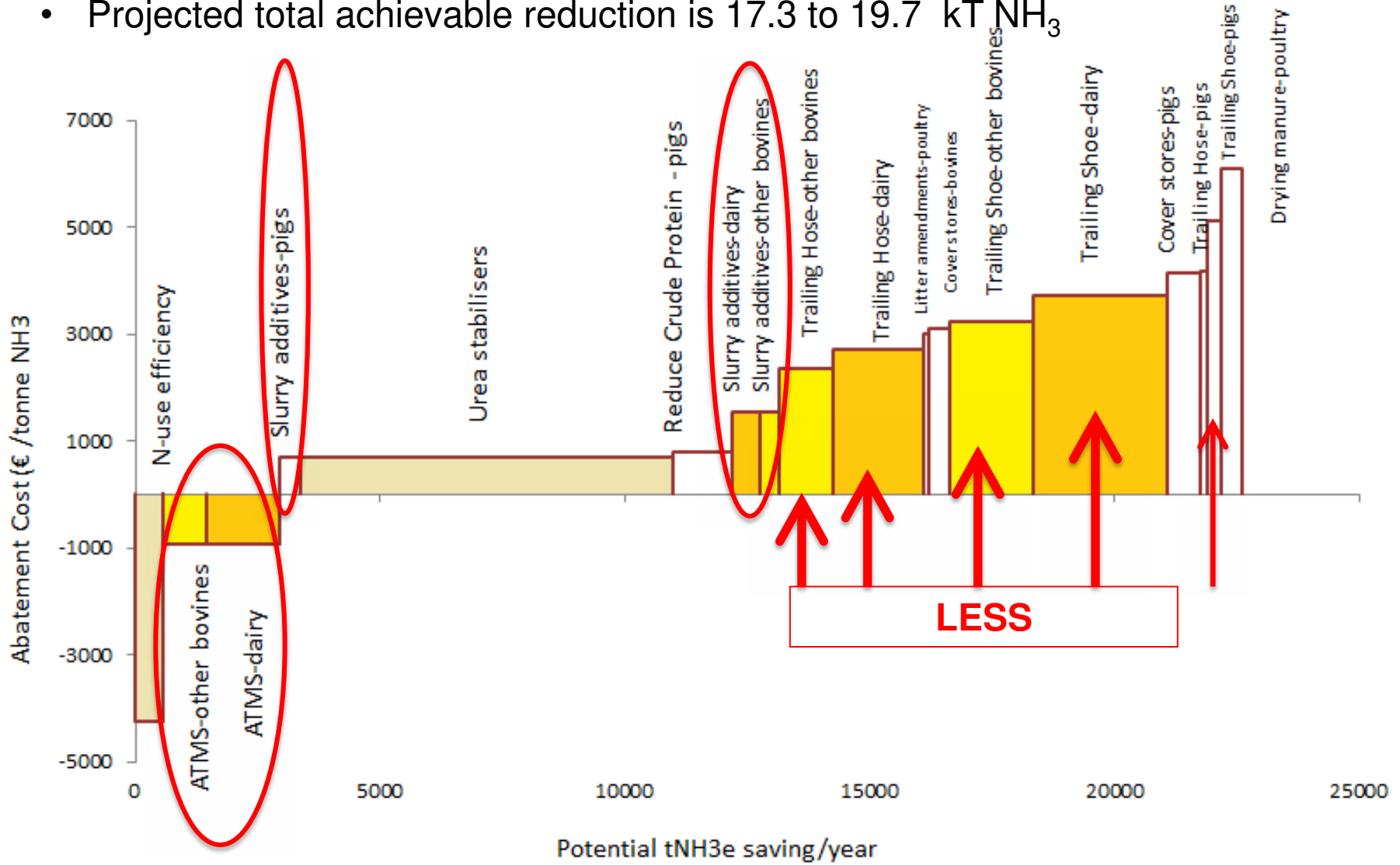


Emissions related to manure management

Areas we can identify for potential gaseous emission mitigation?

Ammonia MACC

- Projected total achievable reduction is 17.3 to 19.7 kT NH₃



Teagasc 2015, An Analysis of the Cost of the Abatement of Ammonia Emissions in Irish Agriculture to 2030

Potential Management Solutions

lowering Ammonia emissions

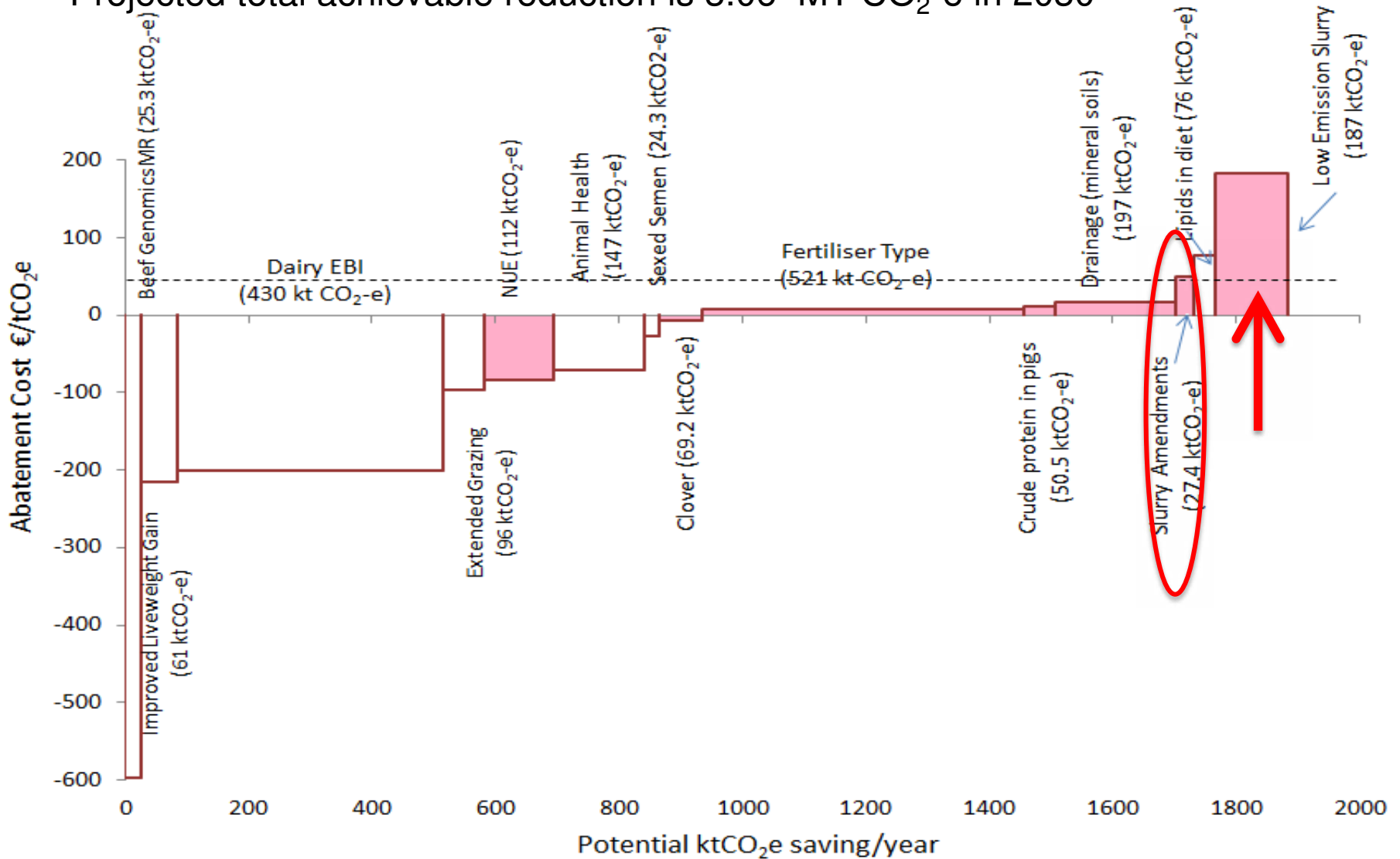
kT NH₃ abated

- Protected urea (*switch 50% CAN to Protected Urea**) **7.7**
- Low-emission slurry spreading (dairy slurry) **2.7**
- Low-emission slurry spreading (non-dairy slurry) **1.7**
- Alt. time manure spreading (dairy slurry) **1.5**
- Alt. time manure spreading (non-dairy slurry) **0.91**
- Reduce Crude protein pigs **1.3**
- Increase Nitrogen use-efficiency **0.57**
- Cover slurry stores pigs (& outdoor cattle slurry) **0.68**
- Slurry amendments/ additives **0.57**



Greenhouse Gas MACC Agricultural mitigation

- Projected total achievable reduction is 3.06 MT CO₂-e in 2030



Teagasc 2018, GHG Marginal Abatement Cost Curve for agriculture for 2021-2030

Potential Management Solutions

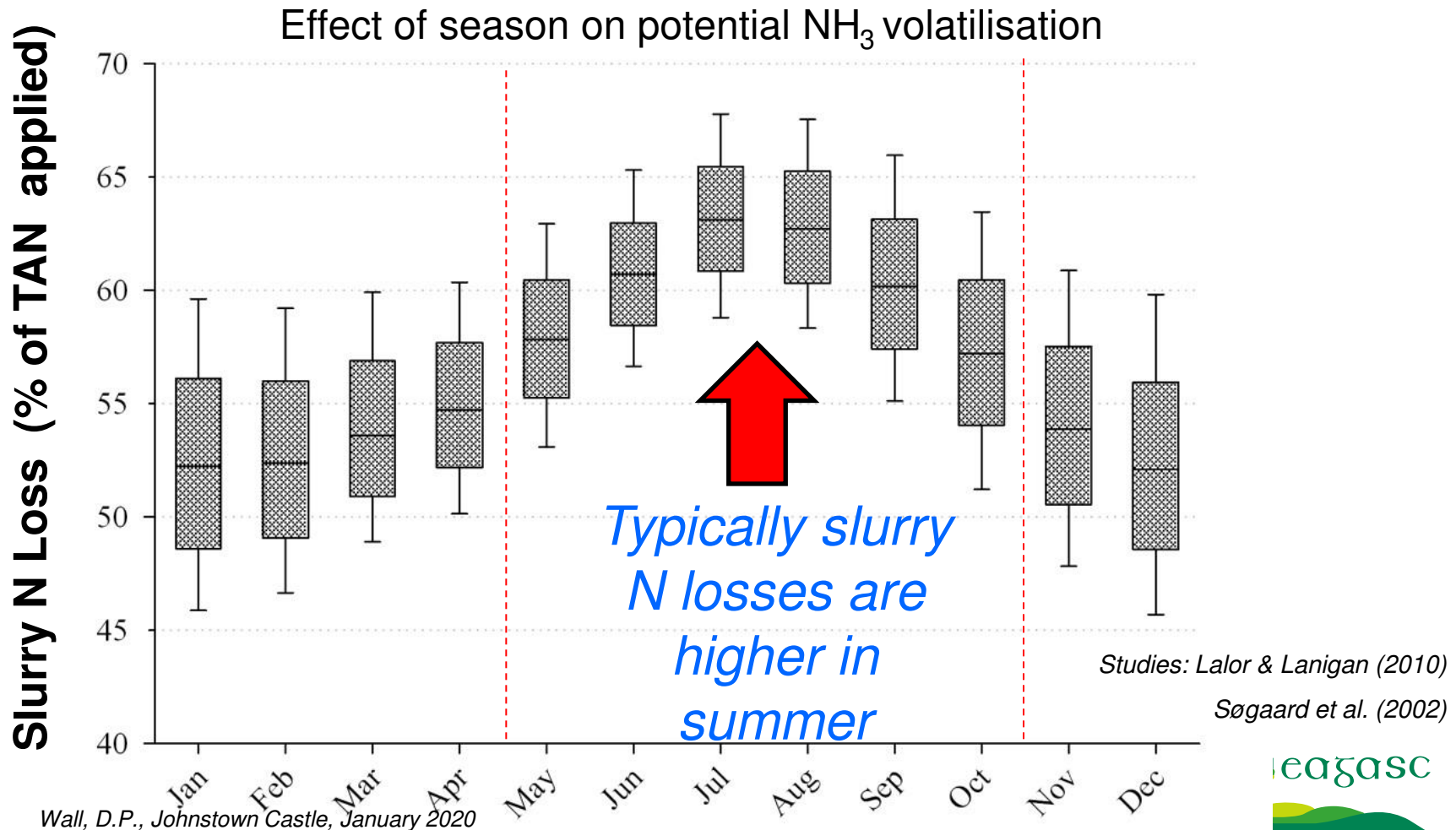
lowering agricultural GHG emissions

	Mitigation Mt CO ₂ e
✓ Soil & N management mitigation options	~<u>1.2</u>
▪ Protected urea (<i>switch 50% CAN to Protected Urea*</i>)	0.52
▪ Draining wet mineral soils (<i>1/3 poorly drained mineral soils</i>)	0.20
▪ Low-emission slurry spreading (<i>50% slurry with LESS</i>)	0.12
▪ Increase Nitrogen-use efficiency (<i>Liming soils to pH 6.3</i>)	0.10
▪ Extended grazing (<i>20% grassland area: 250d dry & 149d wet</i>)	0.07
▪ Inclusion of Clover (<i>25% beef area and 15% dairy area</i>)	0.07
▪ Slurry amendments/additives (<i>20% slurry treated</i>)	0.03
✓ Animal performance mitigation options	~<u>0.62</u>

Nitrogen Loss from Slurry

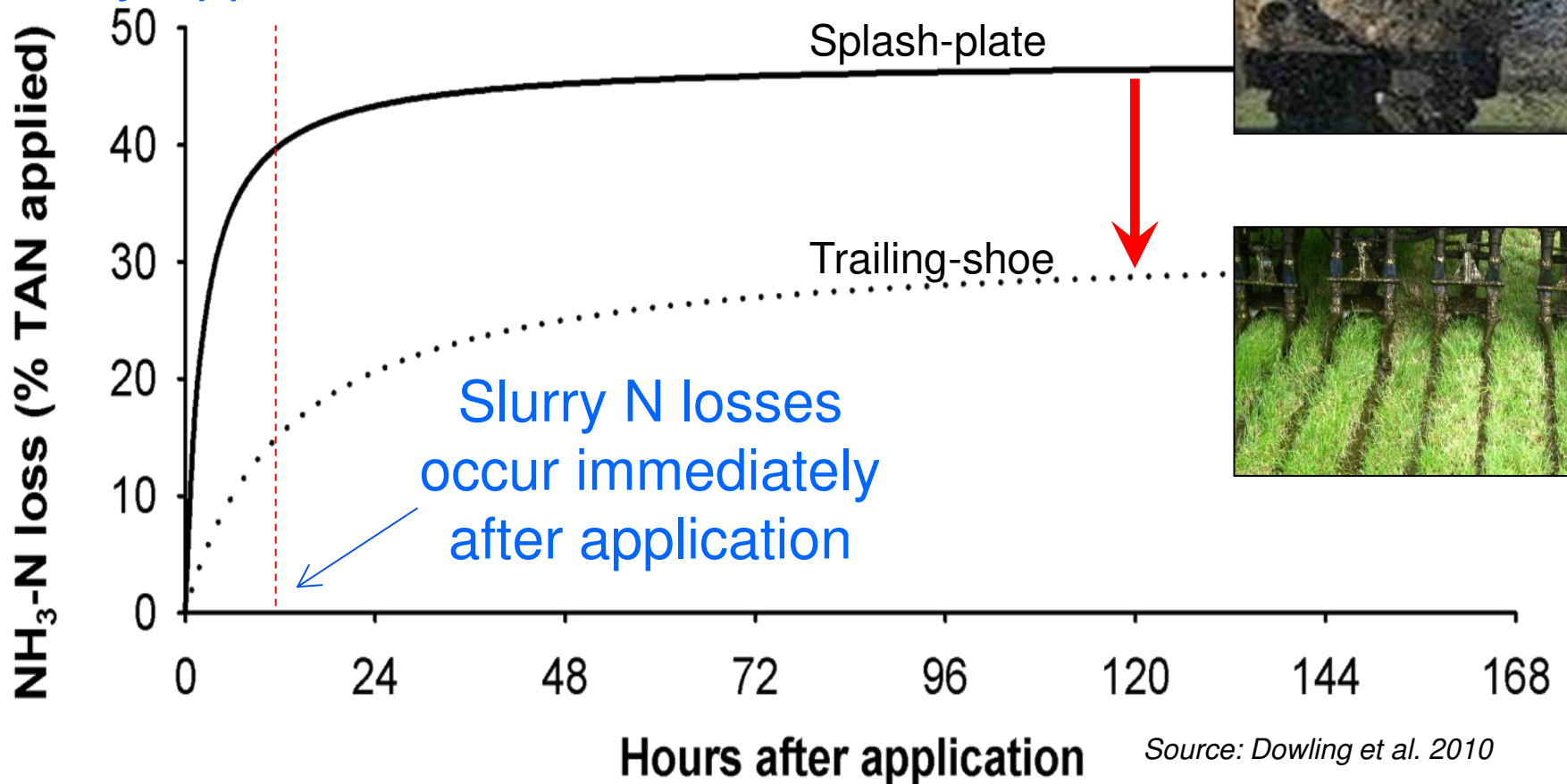
Losses depend on soil and climatic conditions

- Ammonia emissions **increase** in dry, sunny & windy weather
- Majority of N loss occurs within 24 hours after application



Reducing Ammonia Loss – LESS?





Slurry Application method



In this example: Trailing-shoe reduced emissions by 36% compared to Splash-plate

Total ammonia emission reductions of up to 65% found with other studies

Nitrogen Fertiliser Replacement Values

Application Method	Splash Plate / Broadcast	Dribble bar / Bandspreader	Trailing Shoe	Shallow Injection
				
NH₃ Abatement¹	0%	30%	60%	70%
Total slurry N % availability²	27%	35%	43%	46%
Available N from 11m³ Cattle slurry³	7 kg N	9 kg N	11 kg N	12 kg N
Value Nitrogen €⁴	€6.00	€7.70	€9.40	€10.20

1, Ammonia loss abatement potential of different LESS methods as per ammonia gas inventory (EPA)

2, Total slurry N availability for different slurry spreading methods, based on ammonia loss abatement.

3, Available N in 11m³ (1000 gallons) cattle slurry using different spreading methods. Typical total N in cattle slurry is 2.4 kg N/m³, as per Teagasc Green Book (Wall and Plunkett 2016)

4, Economic value (€) of N in 11m³ slurry based on protected urea price of €0.85/kg N

Synergies & antagonisms

Ammonia vs. GHG's

- Reducing ammonia emissions
 - reduce **INDIRECT** N₂O (*GHG*) emissions.
- Altered timing & technique for land-spreading of manures
 - can increase **DIRECT** N₂O emissions
- LESS and SPRING spreading of manures
 - will reduce Ammonia and also total N₂O emissions
- Reducing CP% in diet will reduce both N₂O & Ammonia
 - limited application where animals are at pasture
- Slurry amendments added during manure storage
 - reduce both methane (*GHG*) & ammonia from slurry storage