Impact of Teagasc research results on policies on agricultural gas emissions.

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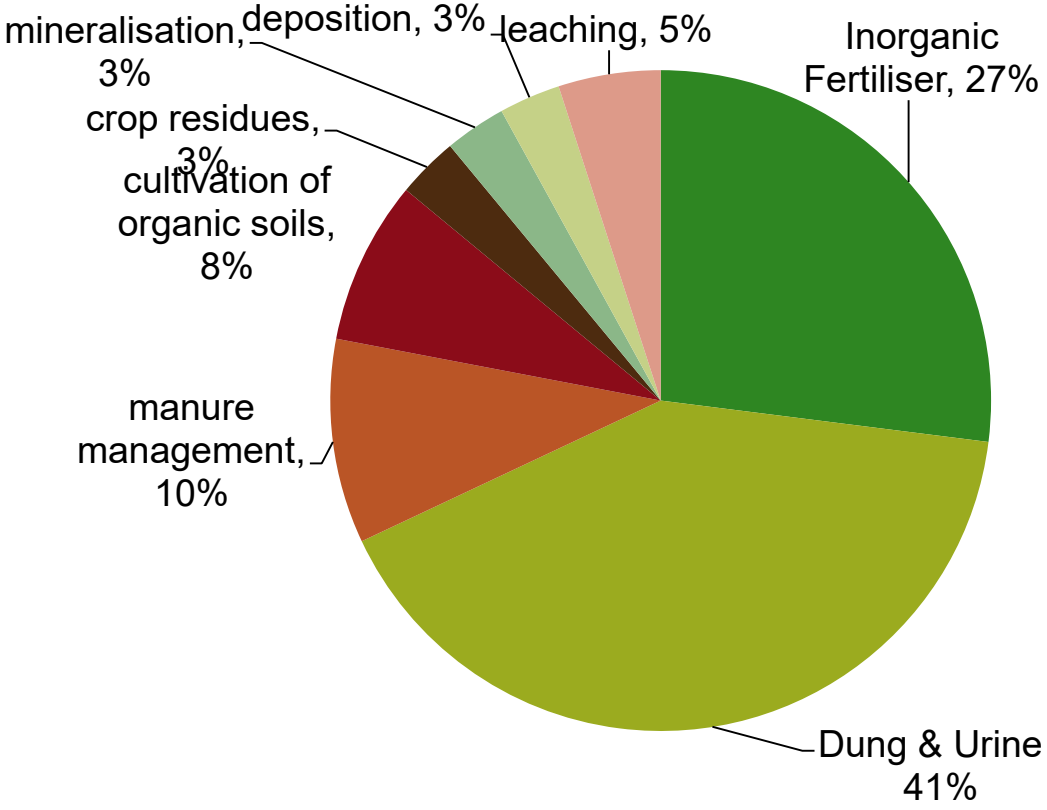
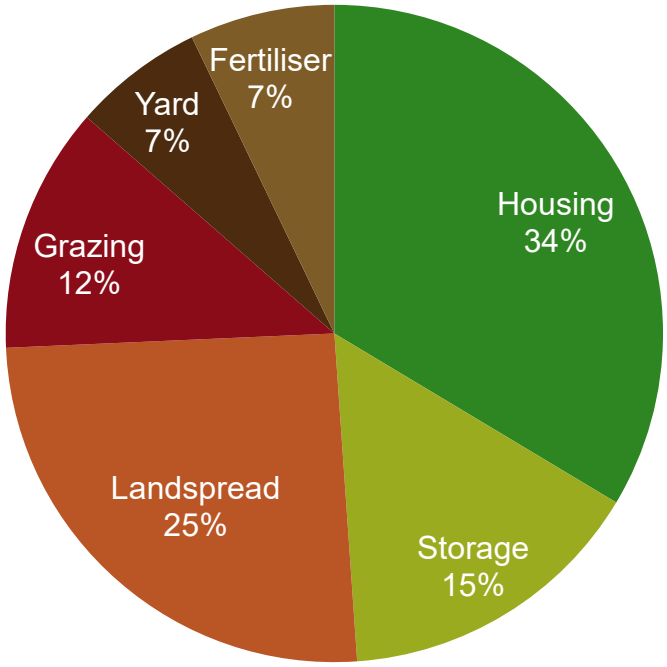
National N_2O and NH_3



Tier 1 N_2O

- Data source: EPA, 2018



NH_3

- Agriculture – 33% of national GHG emissions, 98% of ammonia emissions
- Using Tier 1 – N_2O comprised 36.5% of agriculture GHG emissions
- Bulk of ammonia from bovine manure management

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GHG Programme Objectives

- Refine N_2O Emission Factors
  - Fertiliser
  - Dung/urine
  - Soil type/land-use
  - Incorporate mitigation into inventories
- Assess abatement options on
  - NH_3 EF's

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IPCC Good Practice

- The largest sources accounting for 95% of emissions are key sources
- Higher tier methodologies should be used for Key Sectors
- Resources are focused on sources with significant impact on total emission estimate
- Best use of available resources
- Reduce uncertainties as much as practical
- **Tier 1** are simple methods with default values
- **Tier 2** are similar but with country specific emission factors and other data
- **Tier 3** are more complex approaches, possibly models. However should be compatible with lower tiers.
- Higher Tiers - need peer-reviewed science

Inventory Refinement

- Until 2018, used Tier 1 emission factors for N_2O
- Tier 1 does not disaggregate in terms of N type, soil type, rate or timing
- Tier 1 PRP does not differentiate between dung and urine

Scale of Experimental Programme

National Tier 2 N_2O Emission Factors

Tier 1 (default):
Fertiliser = 1%
Pasture, range and paddock = 2%

Grassland	EF %	Tier 2
CAN	1.49	1.39
Urea	0.25	0.25
Urea+NBPT	0.4	0.4
Urea+NBPT+DCD	0.11	0.11
Dung	0.31	0.31
Urine	1.18	1.18
Arable	**EF %**	
CAN	0.35	
Urea	0.27	
Urea+NBPT	0.2	
Urea+NBPT+DCD	0.16	

Harty et al. 2016 *Science of the Total Environment* 563, 576-586
Krol et al. 2016 *Science of the Total Environment* 568, 327-338
Roche et al. 2016 *Ag. Ecosystems Environ.* 233, 229-237

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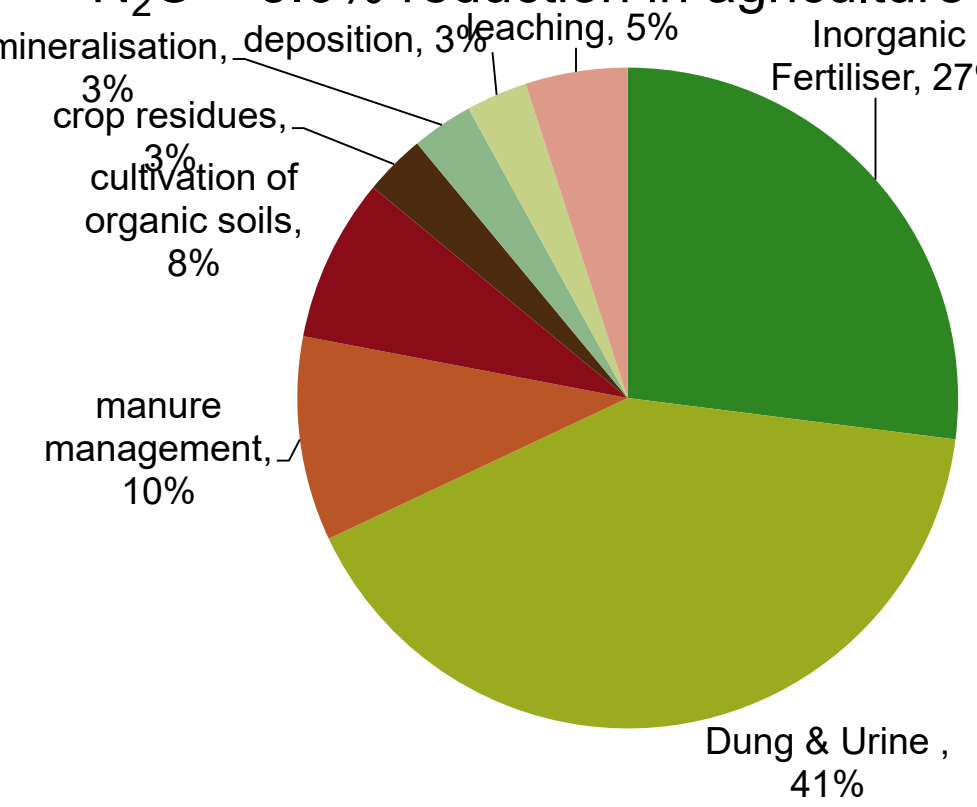
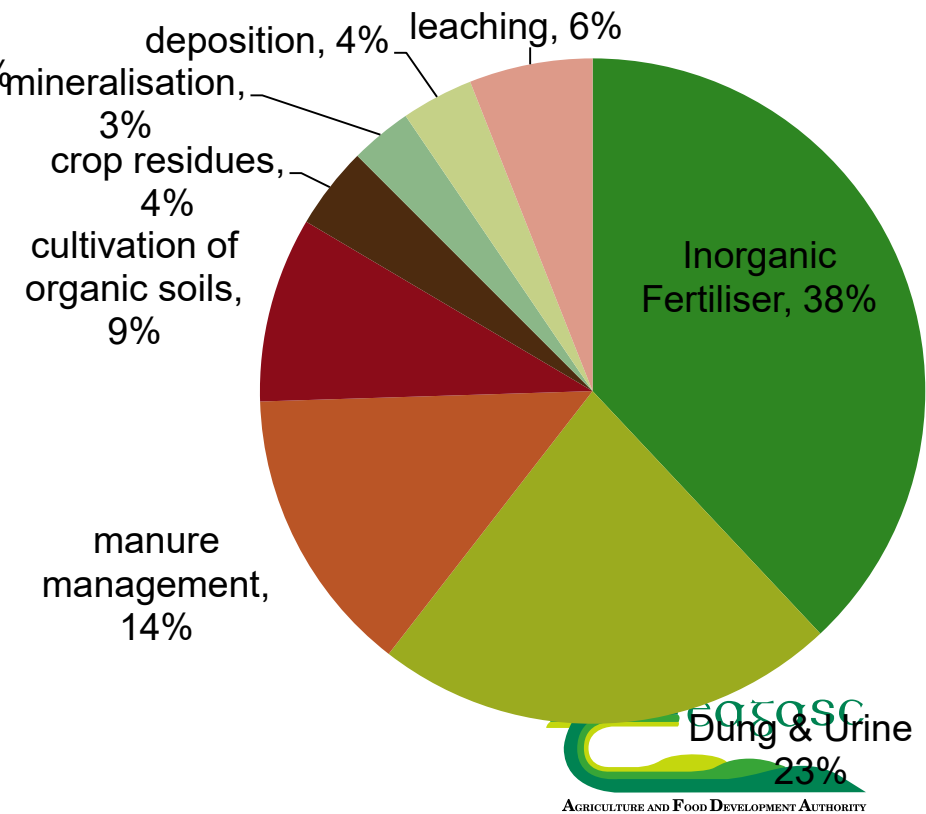
Tier 1 vs Tier 2 Emissions Profile

- Inorganic fertiliser – share of emissions increases from 27% to 38%
- Pasture, Range and Paddock (Dung/urine) – share decreases from 41% to 23%
- Total N_2O emissions reduced by 0.713 $MtCO_2e$ = 10.8% reduction in N_2O – 3.6% reduction in agriculture





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NH_3 Emission Factors (%TAN)

Category	Method	Emission Factor
Landspread	Broadcast	48% (Summer) 26% (spring, autumn)
	Trailing Hose	28.8% (summer) 20% (spring, autumn)
	Trailing Shoe	19.2% (Summer) 18.2% (spring/autumn)
Storage	Baseline	50%
	Acidification (pH 6.5)	35%
	Acidification (pH 6.5)	15%
Fertiliser Type	Urea	15.5%
	Urea + urease inhibitor	0.8%
Yard	Baseline (old)	75%
	Baseline (revised)	22.5%
	Washed/scraped (1 hr)	6.8%
Housing	Baseline	27.7%
	Baseline (revised)?	19.8%?

Pilot Slurry Storage Facility

Storage facility with 12 tanks, vented sides simulating slatted shed

Pre-cast, storage tanks, 1m^3 capacity

Custom built slatted tanks with removable slats

Gas chambers for NH3 and GHG sampling

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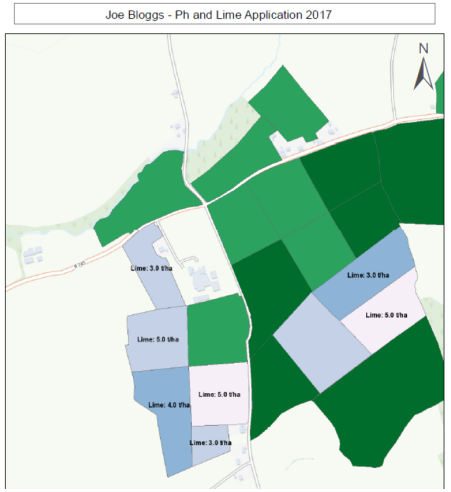
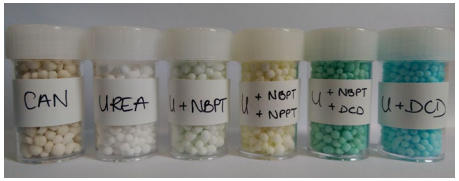
Potential to Reduce Emissions

- Moving to higher Tier N_2O reduces net emissions by 0.7million tonnes CO_2-e
- Shifting 45% of CAN to a stabilised urea product = Reduction of 0.5 million tonnes CO_2-e
- Dissaggregation of dung and urine will allow for feed strategies to be included
- Shifting urea to a stabilised product will reduce ammonia emissions by 3 kT NH_3 - 25% of total potential abatement
- Low emission slurry spreading and chemical amendments will reduce NH_3 by 5kT NH_3
- Allows for robust cost-benefit analysis of measures

Nutrient Use on Derogation Farms

- Intensive soil nutrient sampling & associated Fertiliser Plan
- 50% of all slurry produced on a derogation farm must be applied by the 15th June annually. After this date slurry can only be applied using Low Emission Slurry Spreading (LESS) equipment.
- From 20221, Minister for Agriculture can specify synthetic fertiliser nitrogen to be used on the derogation farms (i.e. urea + urease inhibitors)





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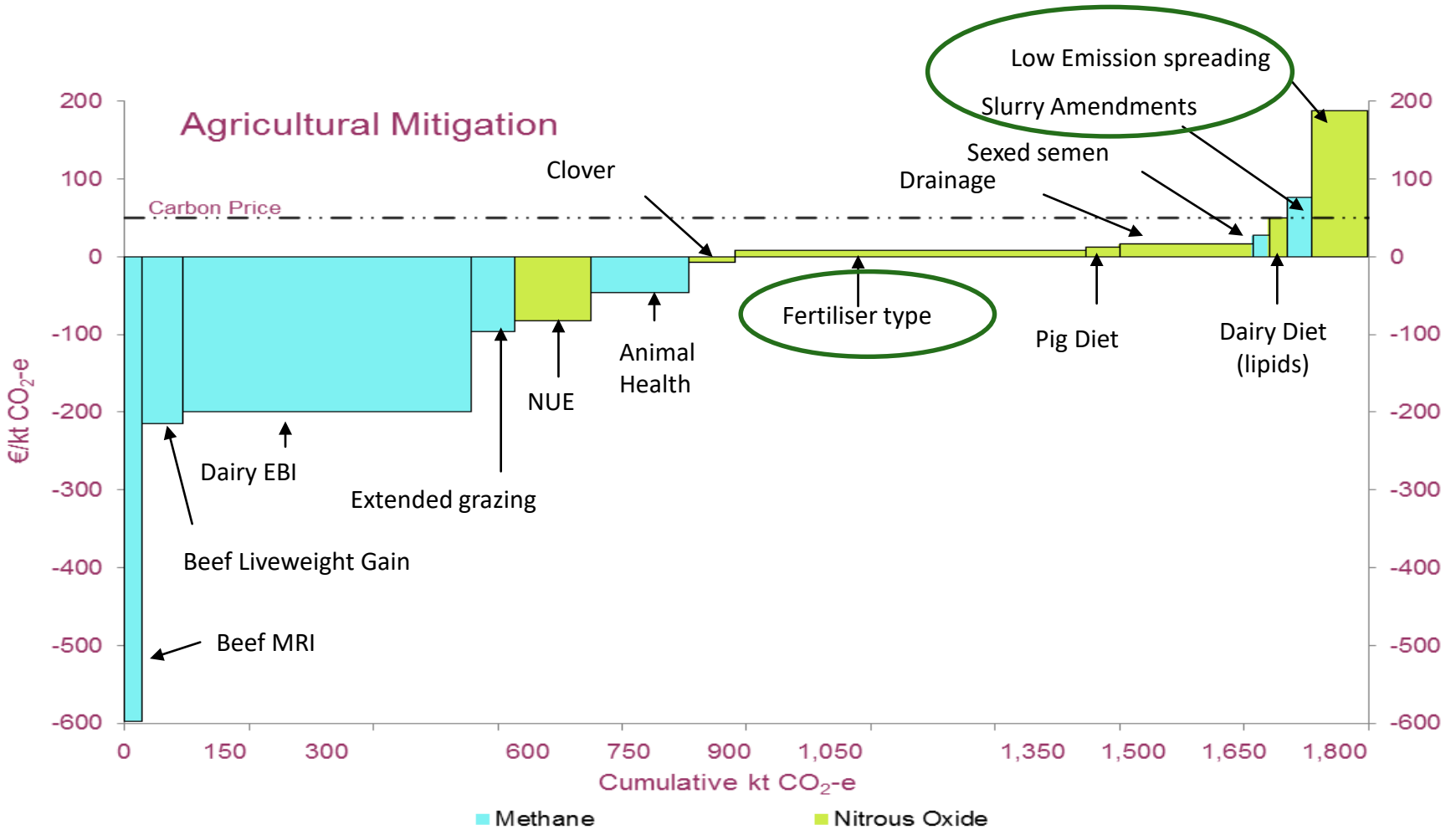
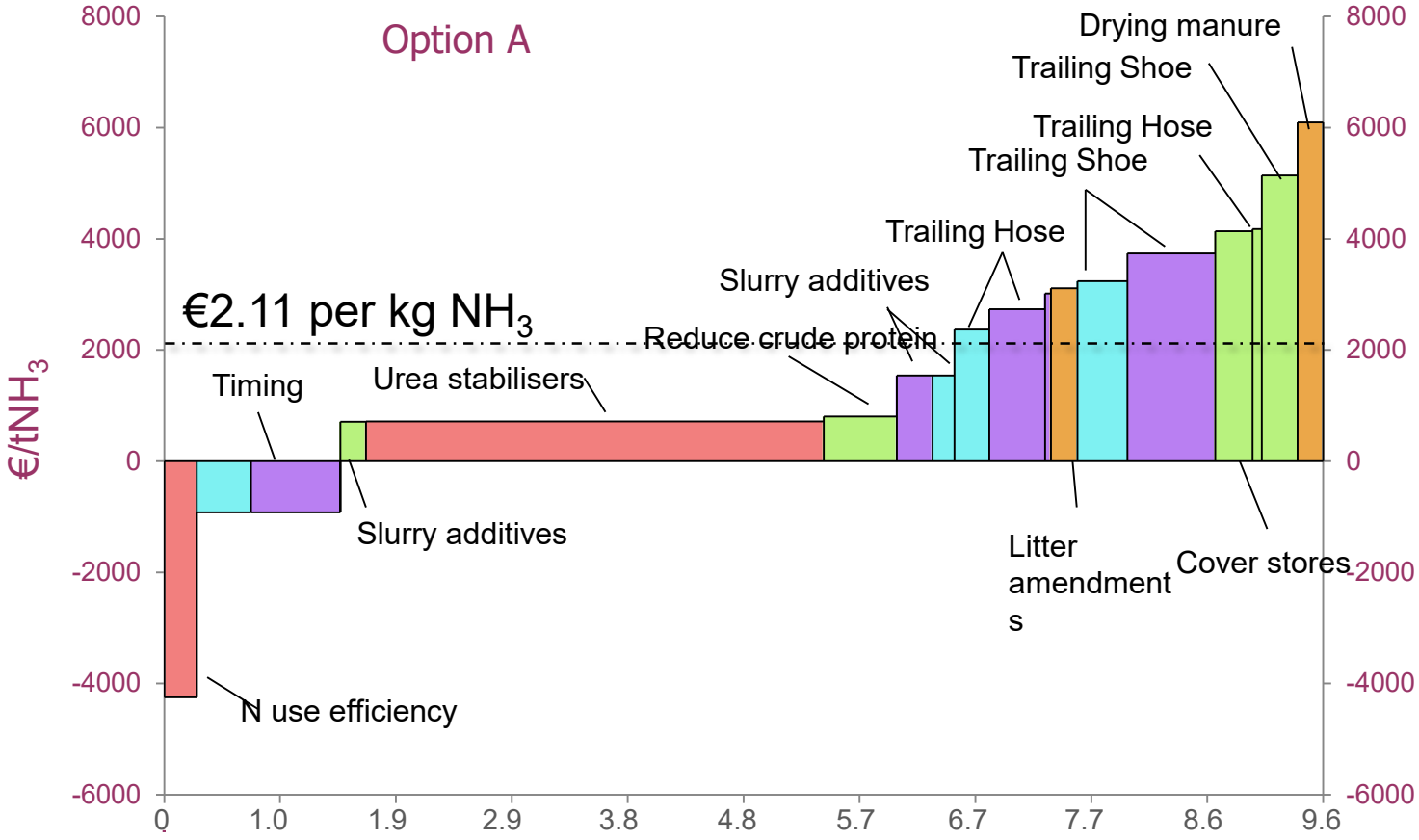
Marginal Abatement Cost Curve (GHG)



Marginal Abatement Cost Curve (Ammonia)



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Higher Tiers = more activity data

- Increased no. of EF's – more disaggregated activity data required.
- Teagasc approach – via National Farm Survey
- Farms surveyed income – now also C-footprinted
- Survey collects data on farm typology (dairy, tillage, etc), animal type/numbers, fertiliser & feed type/amount, housing/turnout date, yields, timing of slurry spreading, etc.
- Will be surveying farm facilities (housing/storage type)
- Need to further disaggregate based on soil type

Conclusions

- Improvements in inventory reporting – increases flexibility of inventories as well as reducing uncertainties
- Can reflect abatement actions and monetarise them
- EF research is expensive
- Requirement for more granular activity data
- Moving to Tier 3 will increase need for data further

Thank you for your attention

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