Improved Irish Nitrous Oxide Emission factors and mitigation measures

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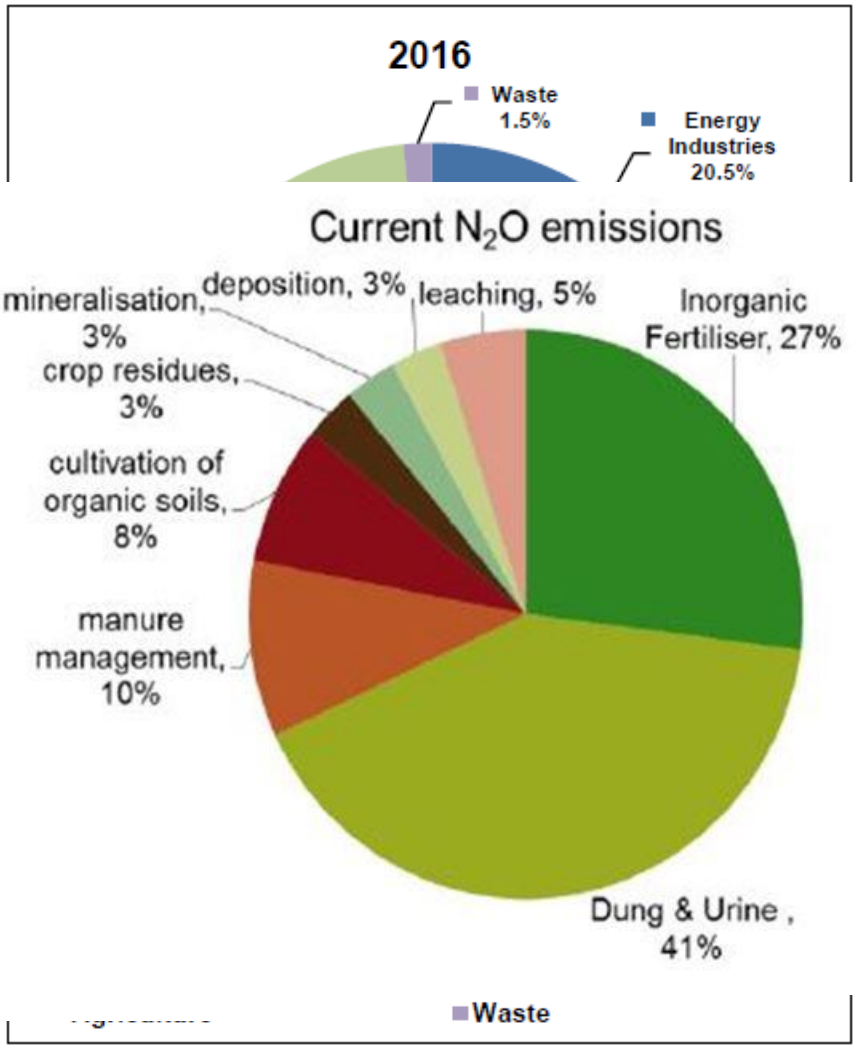
Introduction

- Agriculture 32% National Emissions
- Agricultural soils and manure (N_2O) 40% agricultural emissions
- Fertiliser and dung/urine main N_2O sources

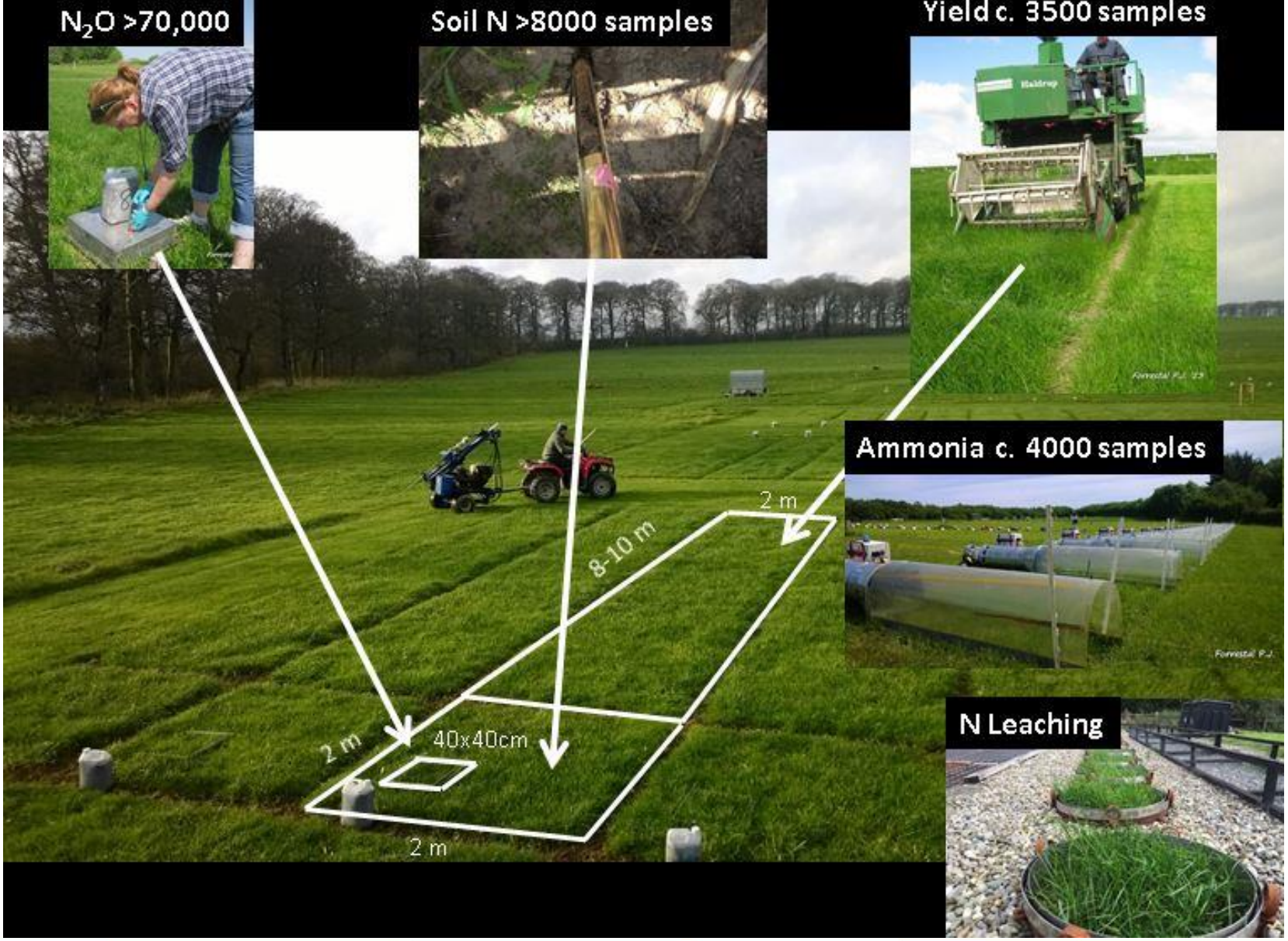
- Objectives
  - Establish national emission factors
  - Evaluate potential mitigation options



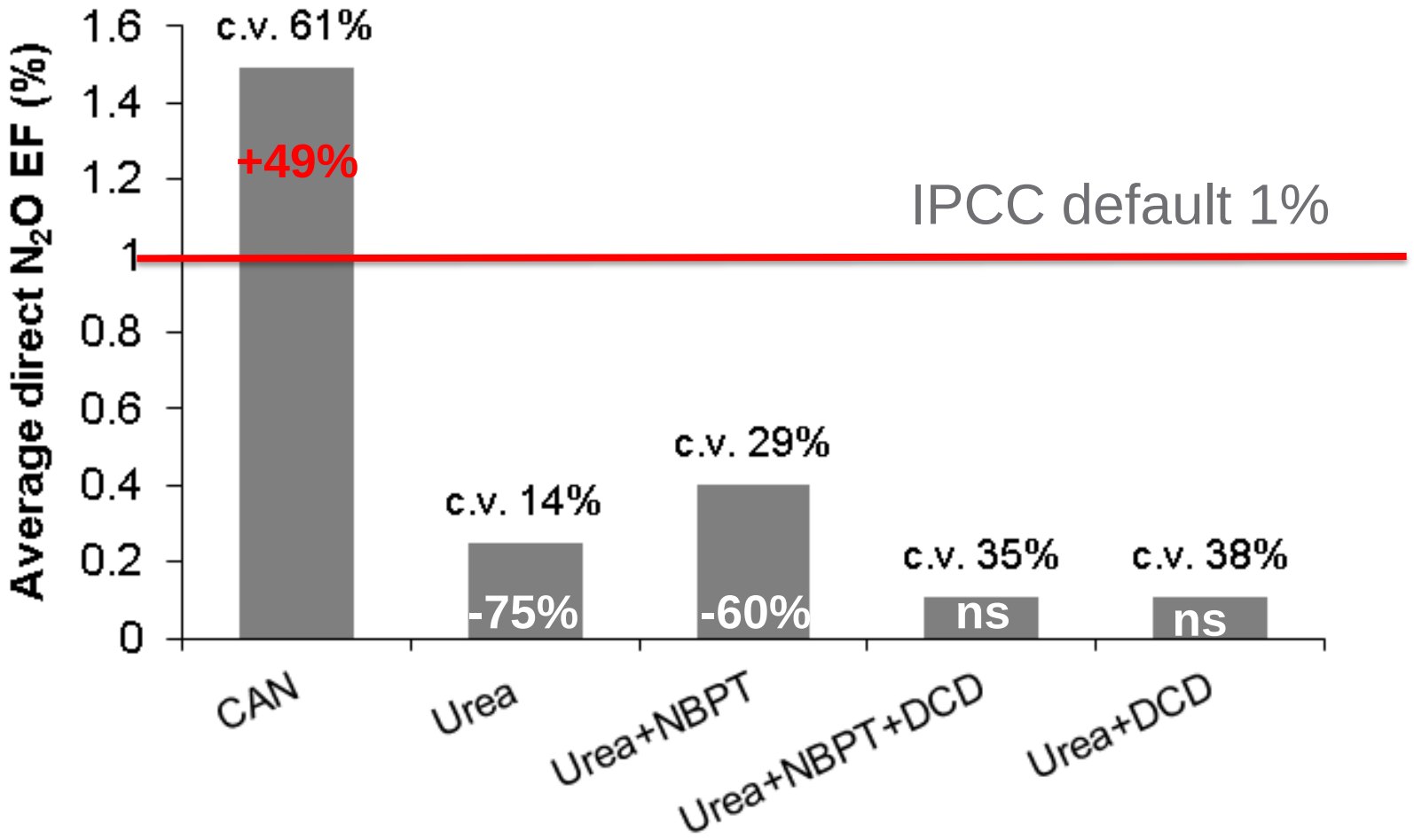
Arable

Spring Barley

Grassland

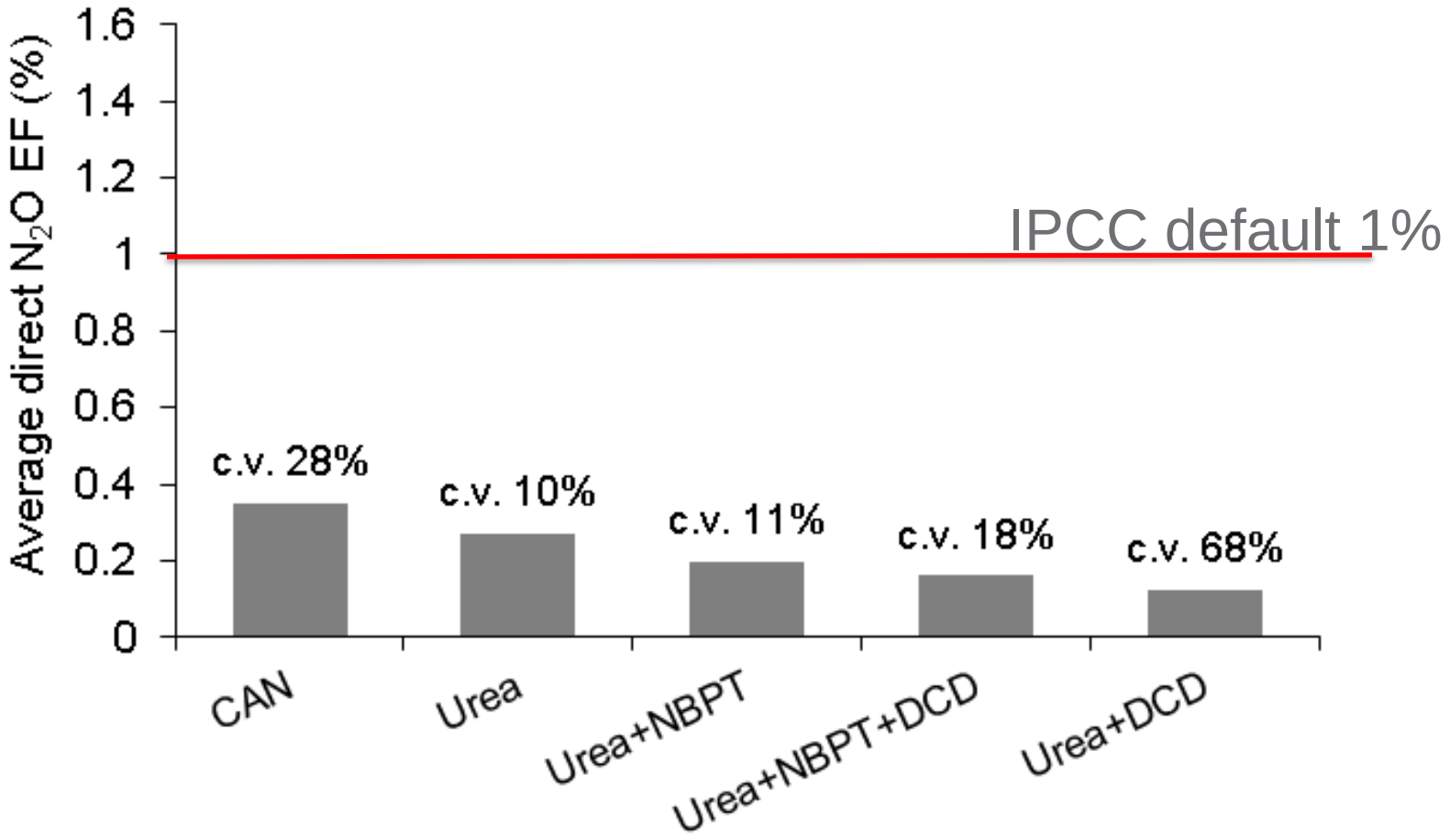

N_2O >70,000
Soil N >8000 samples
Yield c. 3500 samples
Ammonia c. 4000 samples
N Leaching
2 m
8-10 m
2 m
40x40cm
2 m

Grassland fertiliser N_2O



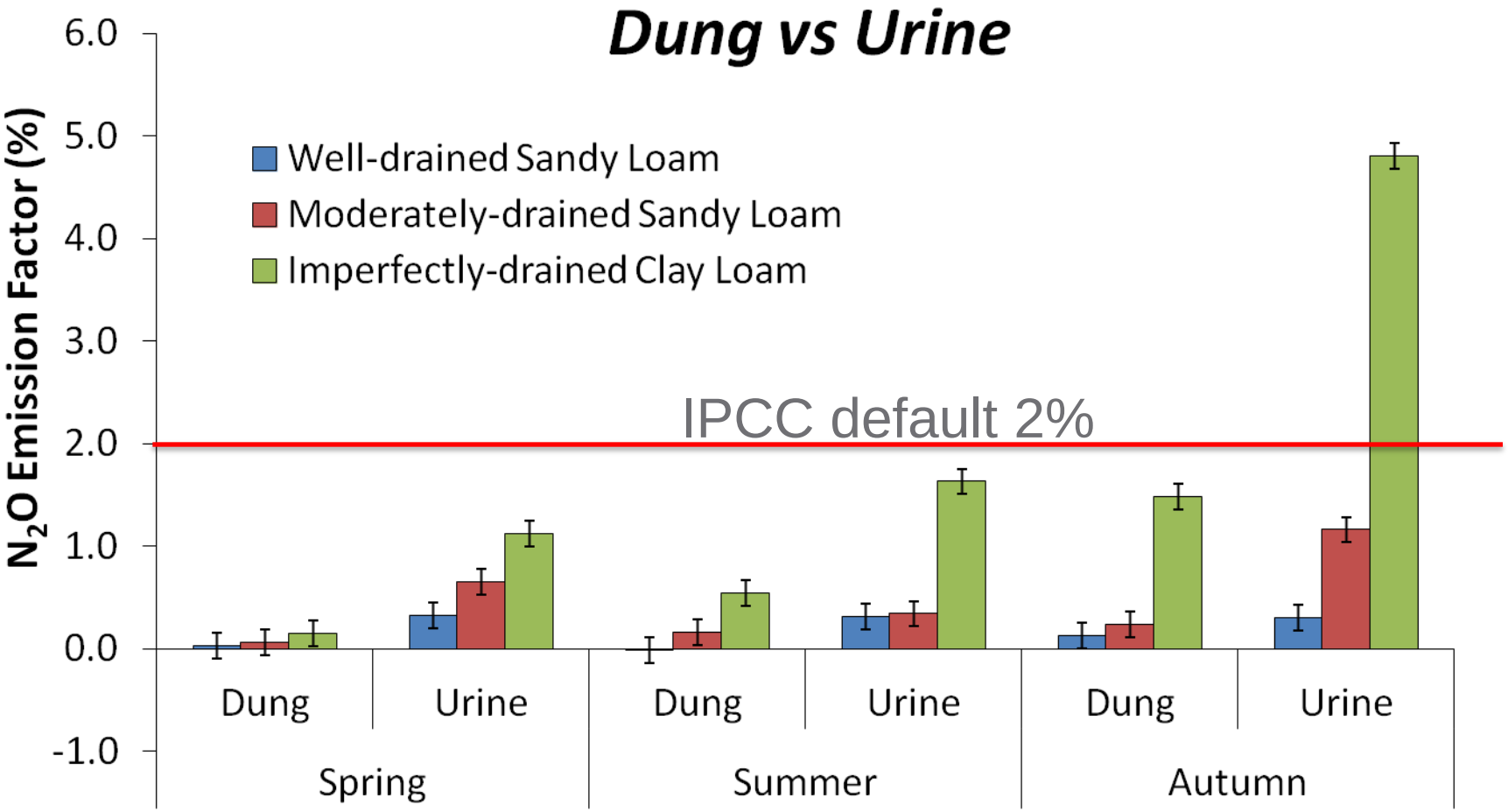
Adapted from Harty *et al*. (2016) *Science of the Total Environment*. 563-564: 576-586

Spring Barley Fertiliser N_2O



Adapted from Roche et al. (2016) Agriculture Ecosystems and the Environment Agriculture 233 229–237

Spring Barley Fertiliser N_2O



Adapted from Krol et al. (2016) Science of the total environment 568 327–338

New National N_2O Emission Factors

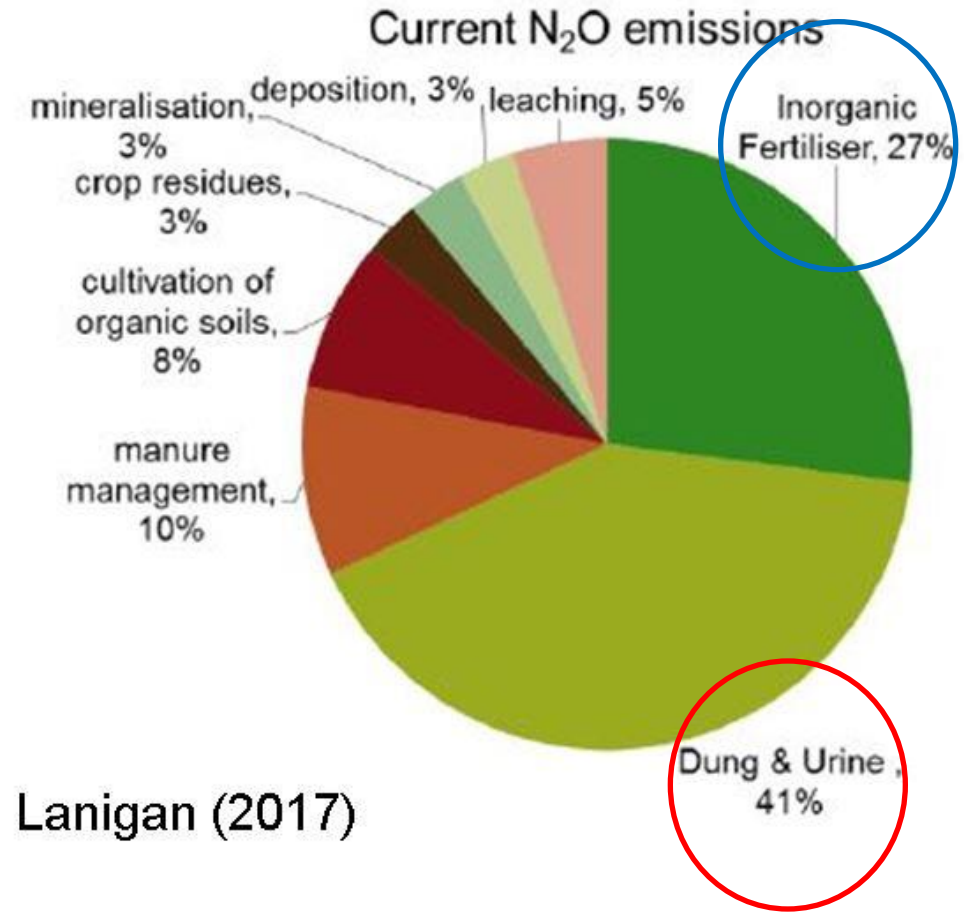
	Default EF%	Irish EF %	EF range %
GRASSLAND FERTILISER			
CAN	1	1.49	2.74 – 0.87
Urea	1	0.25	0.40 – 0.18
Urea+NBPT	1	0.40	0.21 – 0.69
SPRING BARLEY FERTILISER			
CAN	1	0.42	0.35 – 0.49
Urea	1	0.29	0.27 – 0.31
Urea+NBPT	1	0.22	0.20 – 0.23
GRASSLAND ANIMAL DUNG/URINE			
Dung	2	0.31	0.02 – 1.48
Urine	2	1.18	0.31 – 4.81

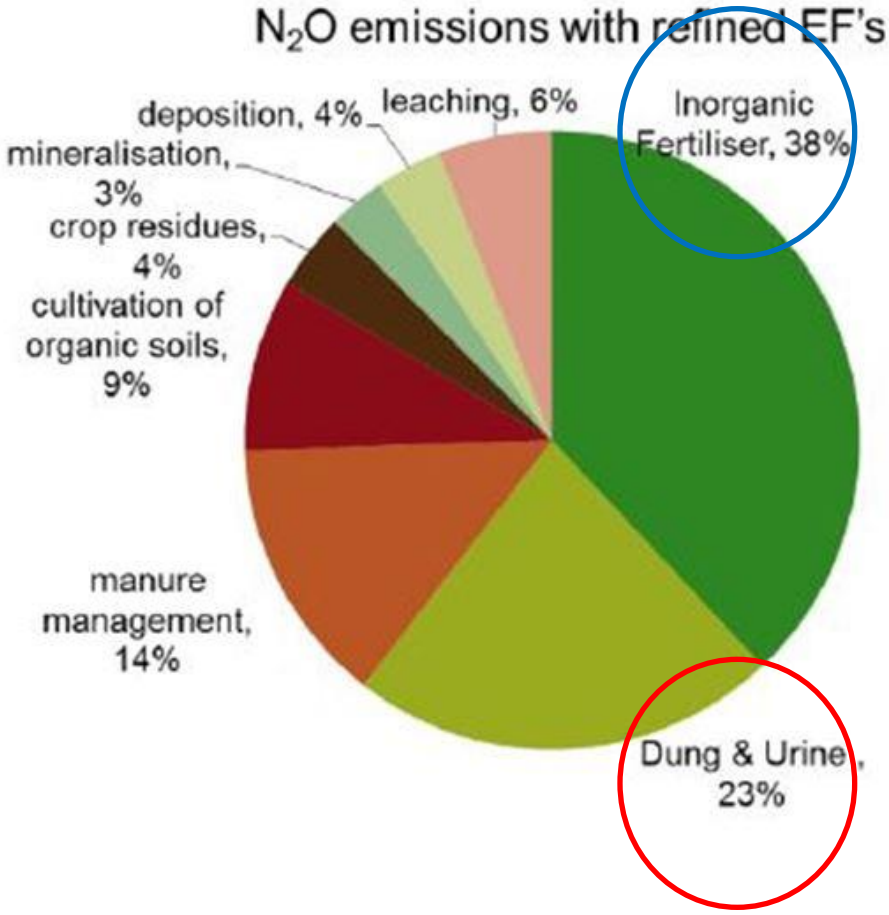
Harty et al. (2016) Science of the Total Environment. 563-564: 576-586.

Roche et al . (2016) Agriculture Ecosystems and the Environment Agriculture 233 229–237.

Krol et al. (2016) Science of the total environment 568 327–338.

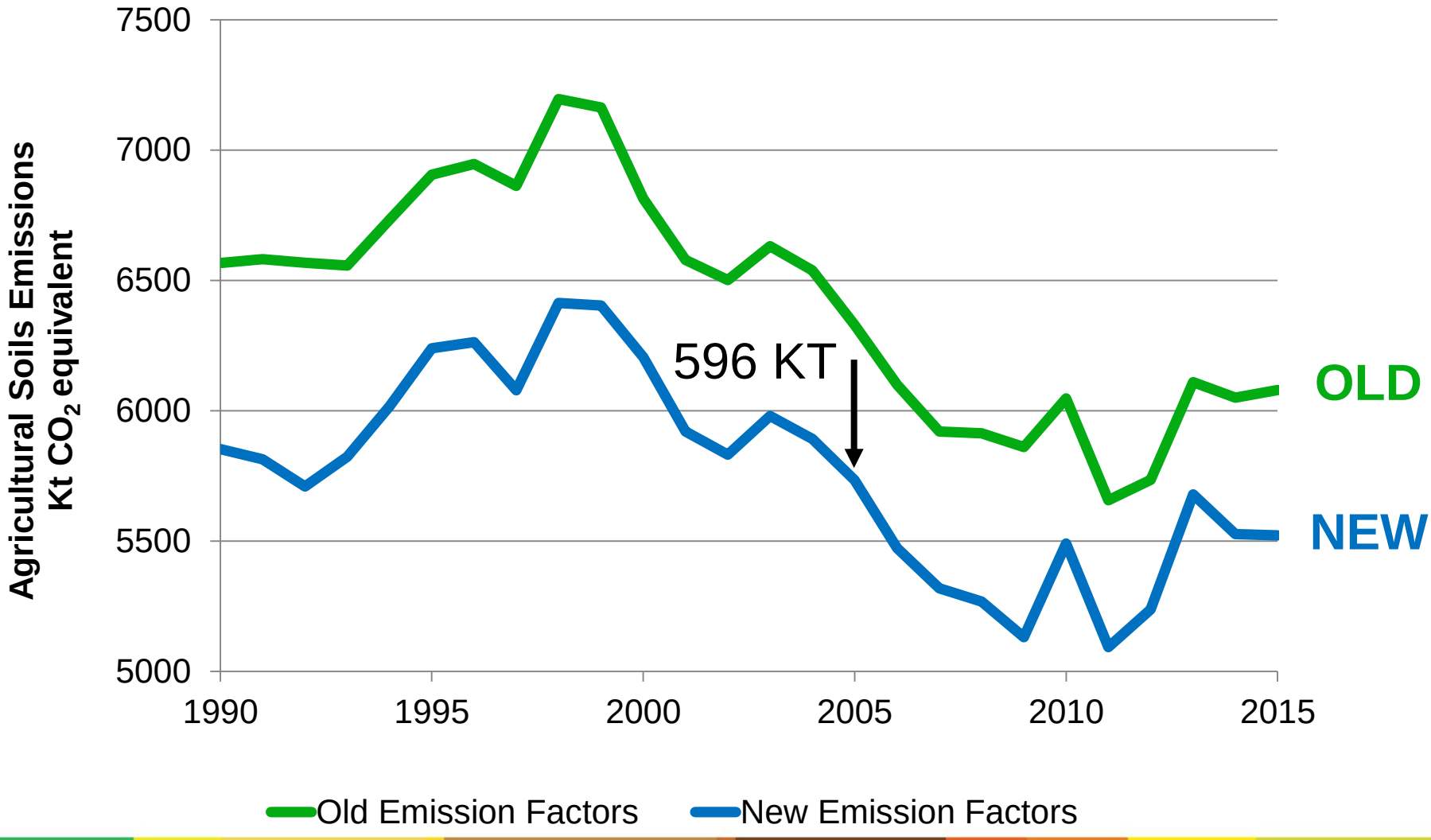
Revised national inventory - new EFs





Lanigan (2017)

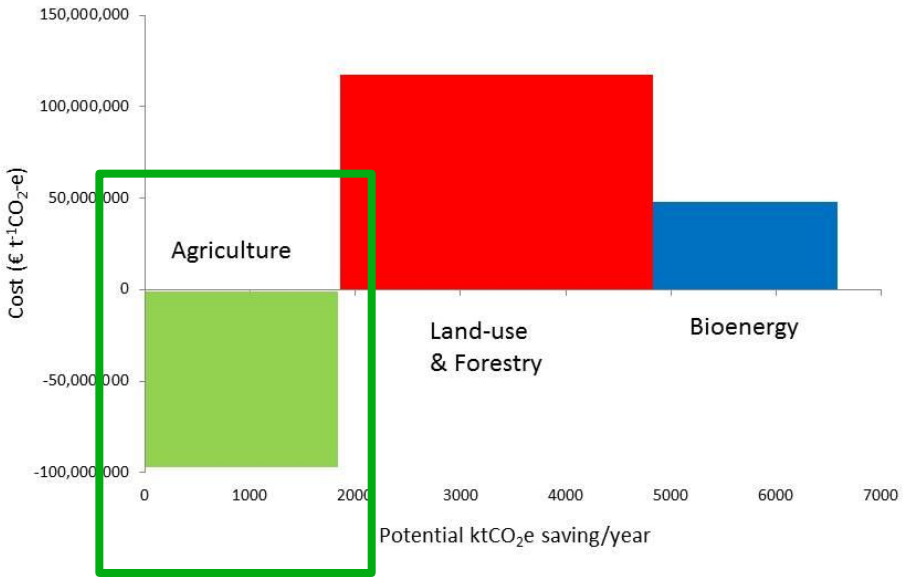
Impact of New Emission Factors



Agricultural GHG Mitigation

- Reduction and offsetting by agriculture >6 MT $CO_{2\text{-}e}$ yr^{-1}
- Agricultural mitigation 1.85 Mt $CO_{2\text{-}e}$ yr^{-1}
- Fertiliser Types largest potential mitigation measure
- Replacing 50% CAN with urea+NBPT

  -0.521 Mt $CO_{2\text{-}e}$ yr^{-1}



Adapted from: Lanigan and Donnellan (2018) An Analysis of Abatement Potential of Greenhouse Gas Emissions in Irish Agriculture 2021-2030, Teagasc, Ireland.

Conclusions

- Refinement of national emission factors
  - Reduced overall emissions
  - Resulted in fertiliser becoming the main N_2O source
  - Enabled mitigation measures to be incorporated
- New Emission Factors now used to report to IPCC

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