



# Environmental Sustainability

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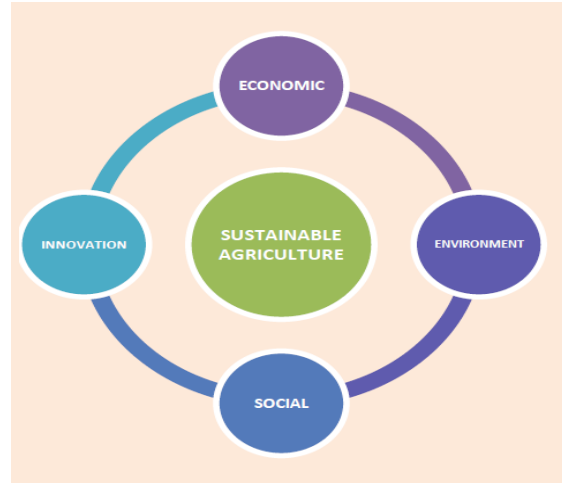
# Overview

- Sustainability conceptual framework
- Methodological approach used for projecting for 2024
- Projections results for 2024
- Summary / conclusion

# Teagasc NFS Sustainability Report

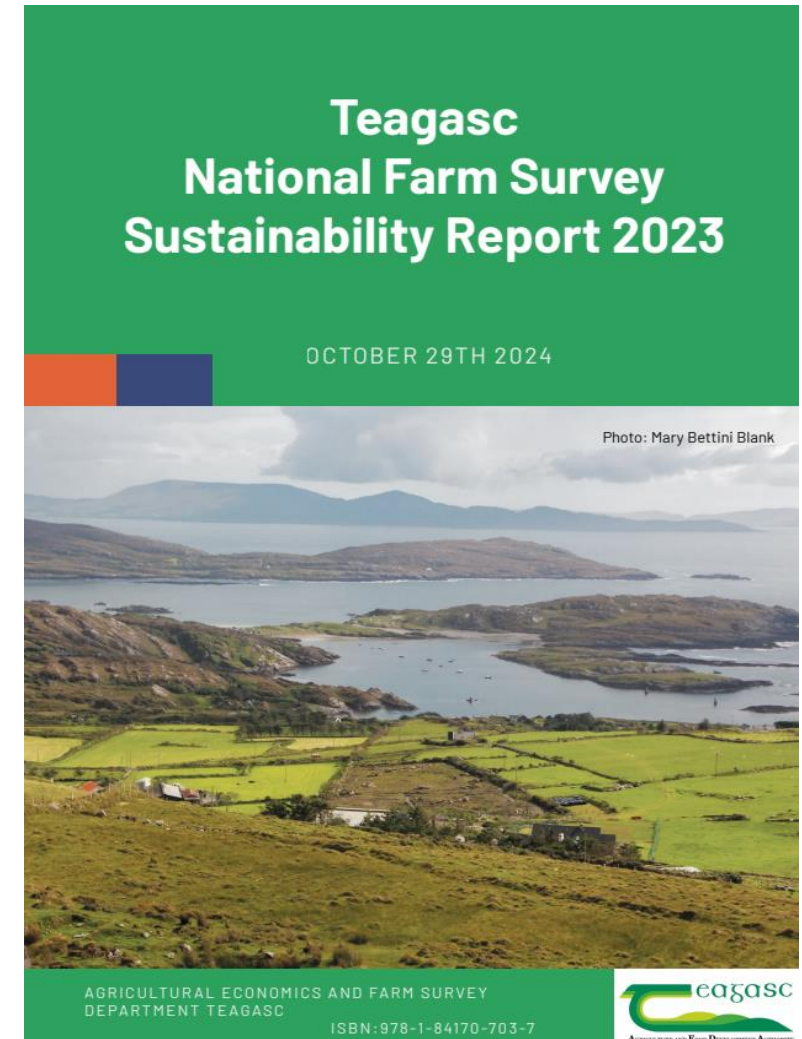
- Farm level sustainability is intersection of:

1. Economic
2. Environmental
3. Social
4. Innovation



- The 2023 Teagasc Sustainability Report

- Published 29<sup>th</sup> of October 2024
- 9<sup>th</sup> report since 2013

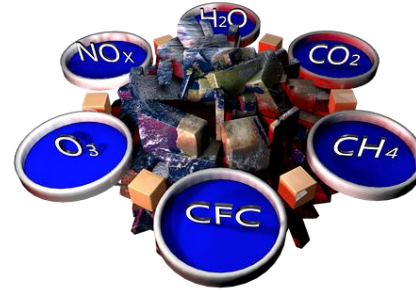


[Teagasc NFS Sustainability Report \(pdf\)56](#)

# Environmental Sustainability

## 1. Gaseous Emissions

- Greenhouse Gases
- Ammonia



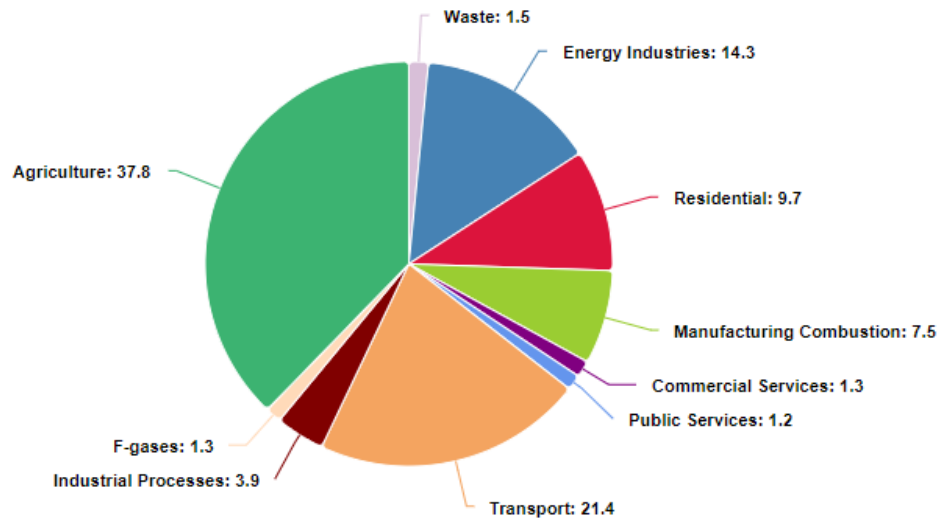
## 2. Risk to water quality

## 3. Biodiversity



# Gaseous Emissions - Agriculture

Greenhouse gas emissions share by sector in 2023

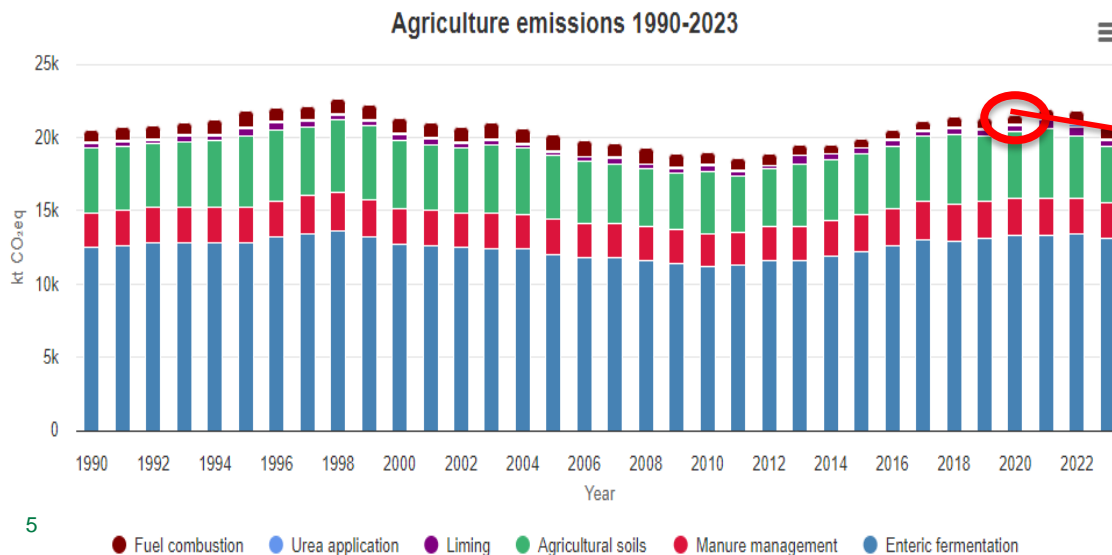


Source: EPA, 2024

## Climate Action Plan 2021: GHGs

- Sectoral GHG reduction targets for 2030 (compared to 2018)

- Agriculture: 25%



22.4 Mt in 2018 to 16.8Mt in 2030

- Carbon neutrality by 2050

Source: EPA, 2024

# Gaseous Emissions - Ammonia

99.4% of Ammonia Emissions generated from Agriculture (EPA, 2024)

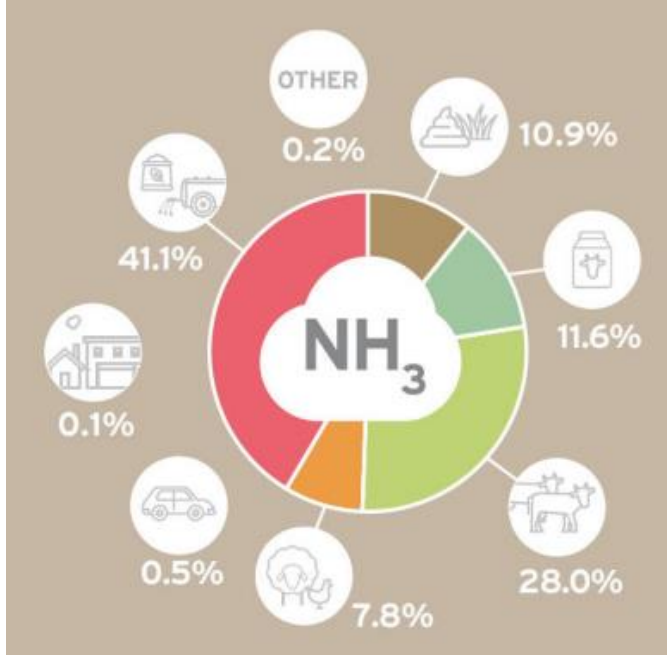
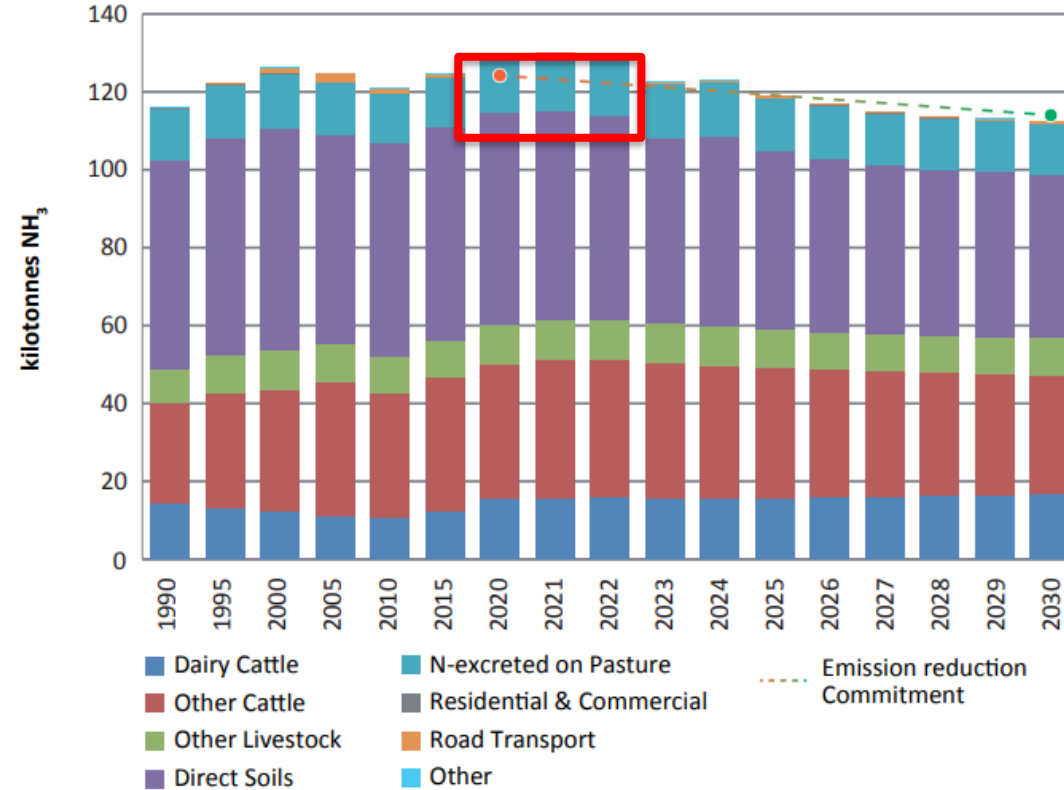
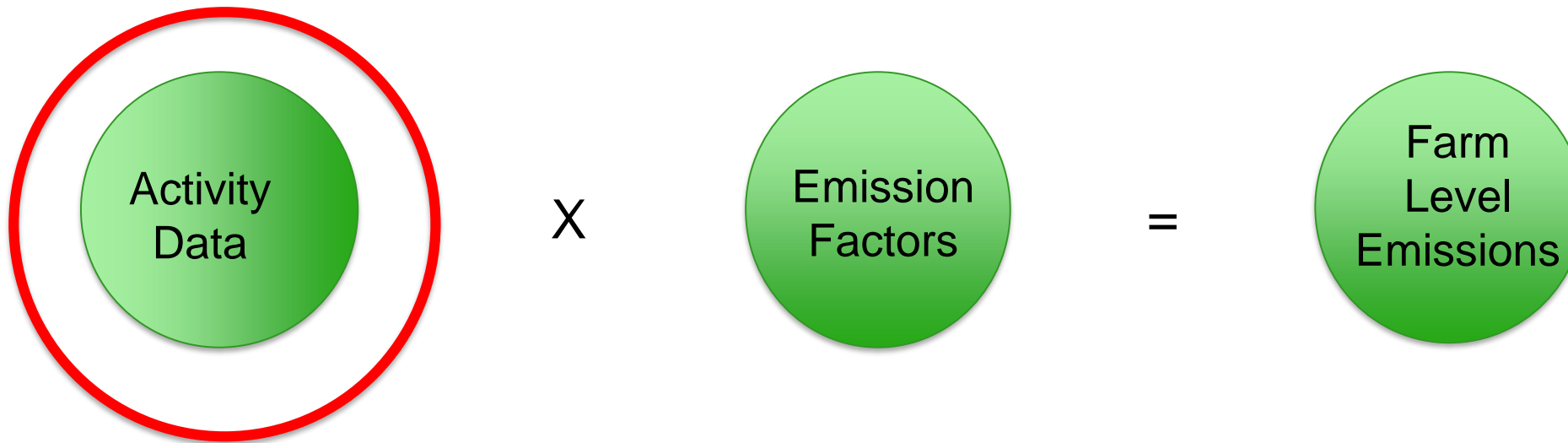


Figure 4: Trend in NH<sub>3</sub> emissions 1990-2030 (WAM) and emission reduction commitments 2020-2030



Source: EPA, 2024

# Emissions – How are they calculated



- Activity Data

- Farm Practice (e.g. animal numbers, chemical fertilisers & manure management)

- Emission Factors

- Scientific evidence from lab/field experiments, national level if possible (peer reviewed)

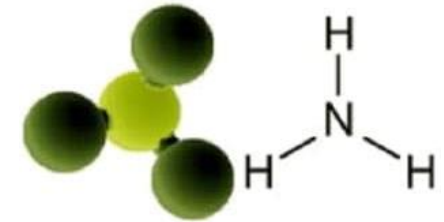
# Methodological approach – Emission Factors

- GHG - All in common currency of CO<sub>2</sub> equivalence
  - » IPCC based national inventory approach for all farm types
  - » Replicating approach used by EPA at national level
  - » CO<sub>2</sub> equivalent in the base gas (1=1)
    - Methane (CH<sub>4</sub>) 1 tonne = 28 tonnes of CO<sub>2</sub> equivalent
    - Nitrous Oxide (N<sub>2</sub>O) 1 tonne = 265 tonnes of CO<sub>2</sub> equivalent



- Ammonia (NH<sub>3</sub>)

- » National inventories approach for all farms
- » Replicating approach used by EPA at national level for reporting under the EU NEC Directive





# Methodological approach – Activity Data

- Activity data from Teagasc National Farm Survey
- NFS conducted by Teagasc since 1972 (part of EU Farm Accountancy Data Network)
  - Sample of 808 farms in 2023 representing over 84,723 nationally
  - Reports on main land based systems – Dairy, Cattle, Sheep & Tillage
- Data captured for environmental modelling
  - Animal numbers by category (e.g. Dairy Cows)
  - Crops grown (e.g. barley, wheat, oats)
  - Fertilisers applied (e.g. CAN, urea, protected urea)
  - Lime applied
  - Manure management practices (housing, storage, landspreading)



# Activity Data Projections / Assumptions – 2024

- Animal numbers & chemical fertilisers applied are key parameters – Type and quantity

## 1. Animal Inventories

- CSO June survey 2024 vs 2023

## 2. Chemical Fertiliser & Lime Sales

- Sales data DAFM Sept 2023 - June 2024\*\*
- Lime Sales January – May 2024\*\*

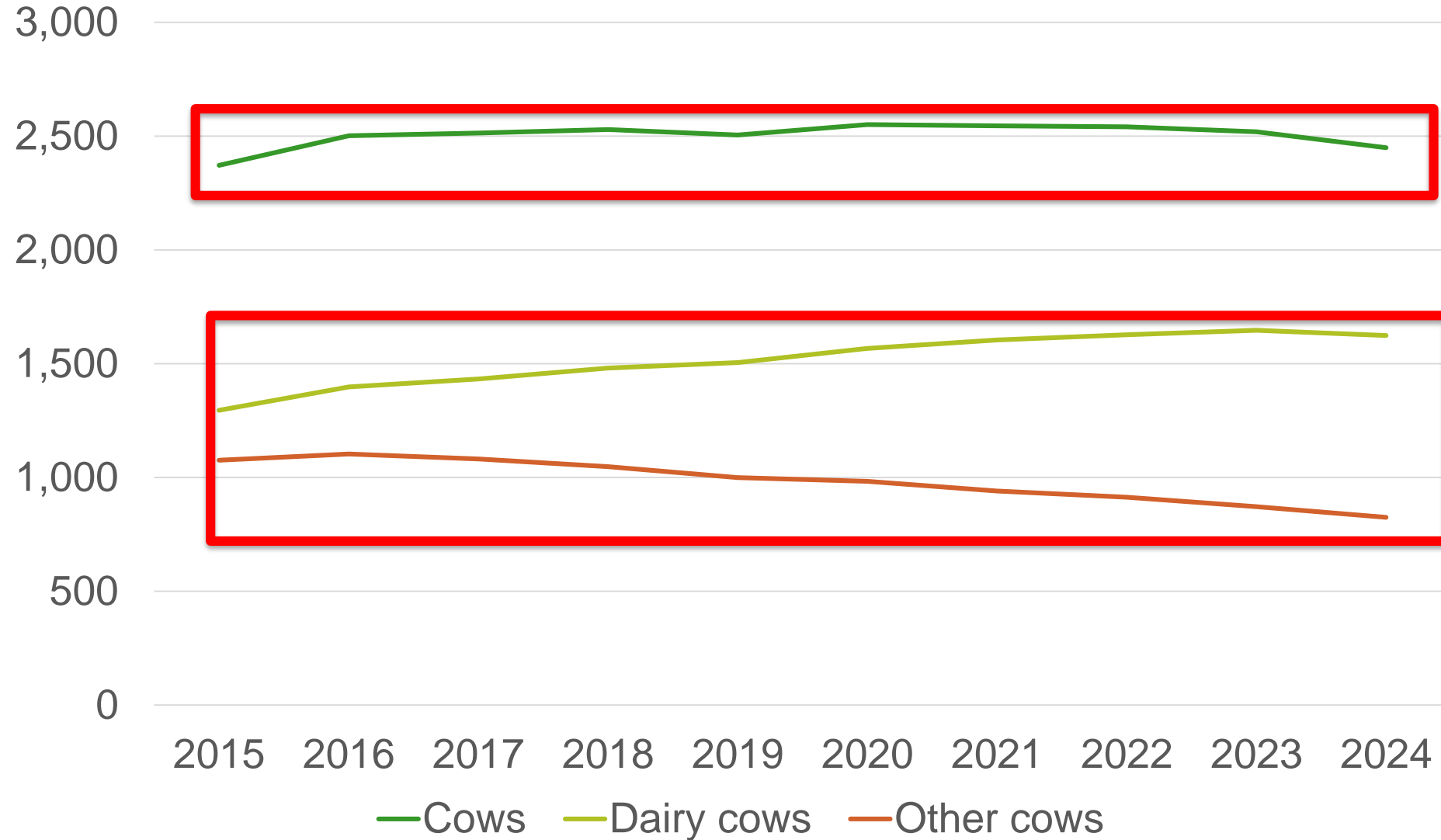
- Apply these changes to farms with the Teagasc NFS
  - Using 2023 as the base year

# Cattle Numbers June 2024 vs 2023

Animal inventories	2024 vs 2023	% of population
Total cattle	-2.2%	100%
Dairy cows	-1.4%	22%
Other cows	-5.4%	12%
Bulls	+5.6%	1%
Cattle: 2 years and over	+2.6%	11%
Cattle: 1-2 years	-3.4%	26%
Cattle: under 1 year	-2.3%	28%

Source: CSO, 2024

# Cow Population in Ireland 2015 to 2024



Source: CSO, 2024

# Enteric Fermentation

Enteric Fermentation EF	2022
<b>Animal Category</b>	0.25%
Dairy cows	121.43
Beef cows (Suckler Cows)	73.67
Dairy heifers	55.57
Beef heifers	59.08
<b>Cattle &lt;1 year</b>	34.84
Cattle < 1 yrs - male	36.62
Cattle < 1 yrs - female	33.27
<b>Cattle 1 - 2 yrs</b>	54.41
Cattle 1 - 2 yrs - male	56.99
Cattle 1 - 2 yrs - female	51.18
<b>Cattle &gt; 2 yrs</b>	27.98
Cattle > 2 yrs - male	32.73
Cattle > 2 yrs - female	20.18
Bulls for breeding	96.26

# Sheep Numbers June 2024 vs 2023

Animal inventories	2024 vs 2023
Total sheep	-8.8%
Ewes	-12.0%
Rams	-10.9%
Other sheep	-5.1%

Source: CSO, 2024

# Chemical Nitrogen Fertiliser Sales (September to June\*)

	2023*	2024*	% Change
<b>Straight CAN</b>	58,128	59,572	2.5%
<b>Straight Urea</b>	33,332	27,582	-17.3%
<b>Protected Urea</b>	25,766	40,798	58.3%
<b>NK Compounds</b>	1,412	3,820	170.5%
<b>NP Compounds</b>	983	1,089	10.8%
<b>NPK Compounds</b>	103,299	98,002	-5.1%
<b>Other N Fertilisers</b>	4,478	5,456	21.8%
<b>Total</b>	227,398	236,319	3.9%

Source: DAFM, 2024

# Chemical Nitrogen GHG Emission Factors

GHG linked Emission factors	(kgN <sub>2</sub> O-N/Nkg)	EF Multiple
CAN	0.0140	1.0
Straight Urea	0.0025	5.6
Protected Urea	0.0040	3.5

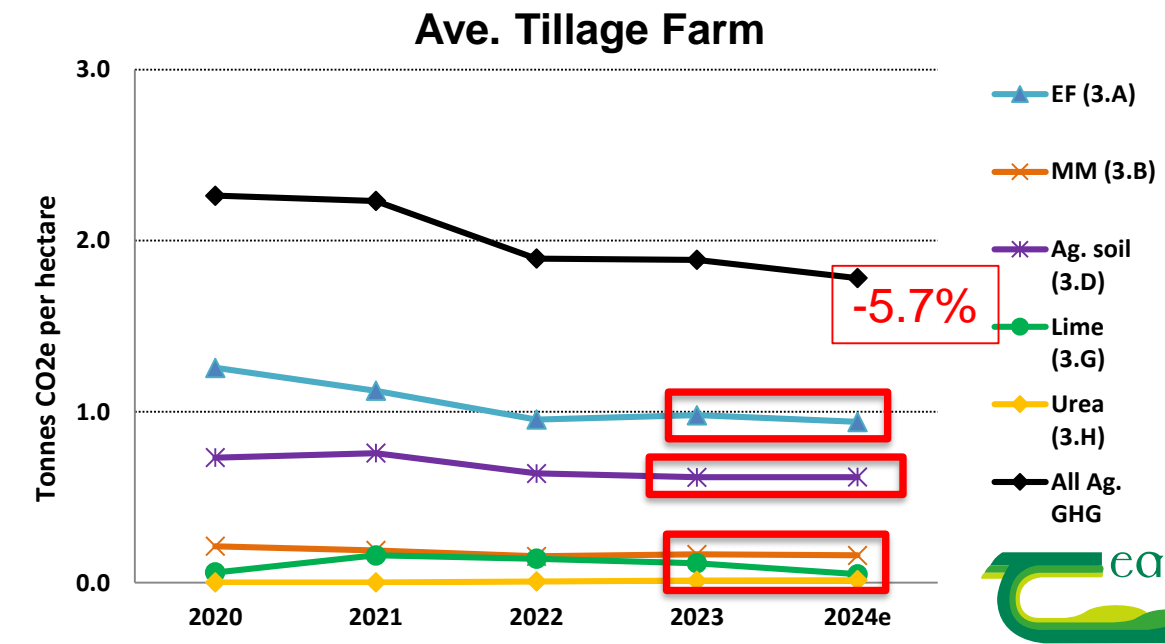
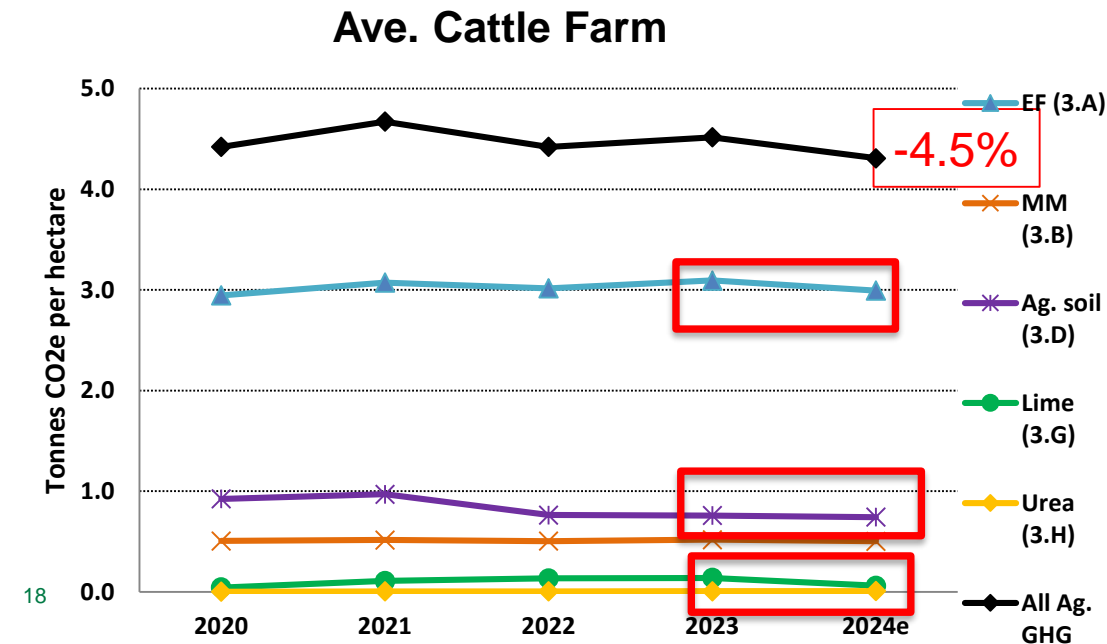
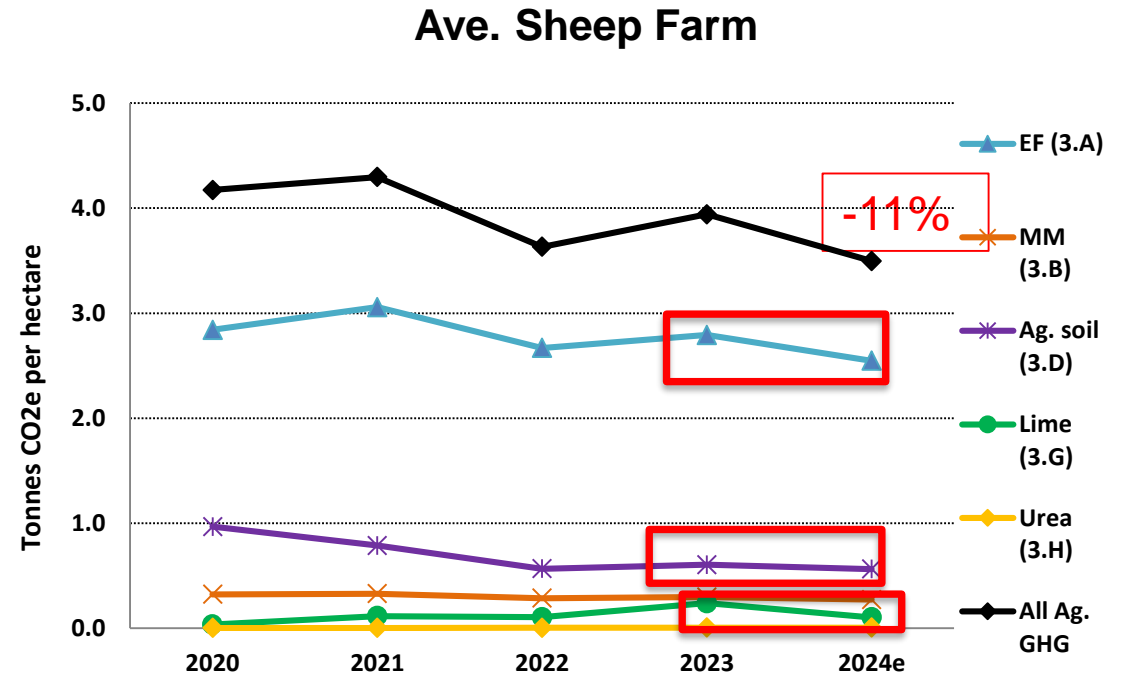
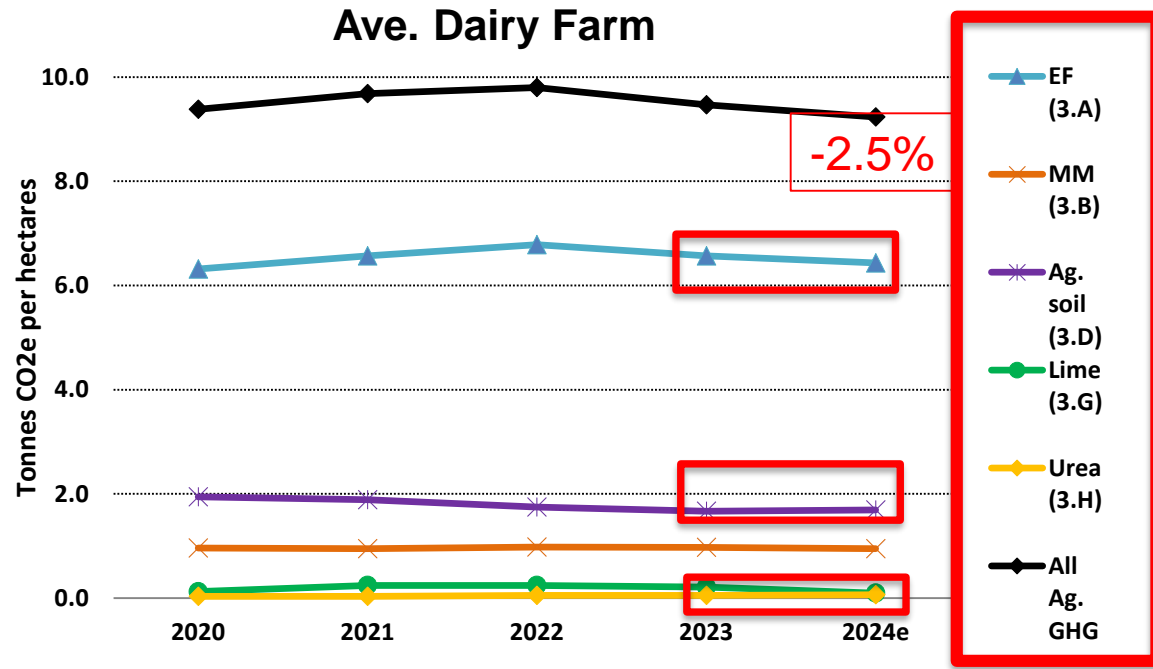
Source: EPA, 2024



# GHG emissions profile for Agriculture in ROI 2022

3. Agriculture (Mt CO <sub>2</sub> eq)	2022	%
3.A Enteric Fermentation (CH <sub>4</sub> )	14.58	65%
3.B Manure Management (CH <sub>4</sub> & N <sub>2</sub> O)	2.72	12.1%
3.C Rice Cultivation	-	-
3.D Agricultural Soils (N <sub>2</sub> O)	4.38	19.5%
3.E Prescribed Burning of Savannas	-	-
3.F Field Burning of Agricultural Residues	-	-
3.G Liming (CO <sub>2</sub> )	0.64	2.8%
3.H Urea Application (CO <sub>2</sub> )	0.13	0.6%
3.I Other Carbon-containing fertilizers	-	-
3.J Other	-	-
<b>Total Emissions (Mt CO<sub>2</sub> eq)</b>	<b>22.4</b>	<b>100%</b>

# Projections for 2024 for GHG emissions tonnes per hectare NFS Farms – IPCC Category



# NH<sub>3</sub> National Inventory Accounts

Total NH <sub>3</sub> emissions (kilotonnes NH <sub>3</sub> )	2022	%
Cattle (Manure Management (87%) + Grazing (13%))	93.7	74%
Pigs	6.1	5.0%
Sheep (Manure Management (59%) + Grazing (41%))	2.9	2.2%
Poultry	4.9	3.9%
Horses	1.7	1.3%
Mules	0.1	0.1%
Goats	0.0	0.0%
Chemical Fertilizer	18.1	13.2%
Other	0.3	0.3%
National Total	127.8	100.0%

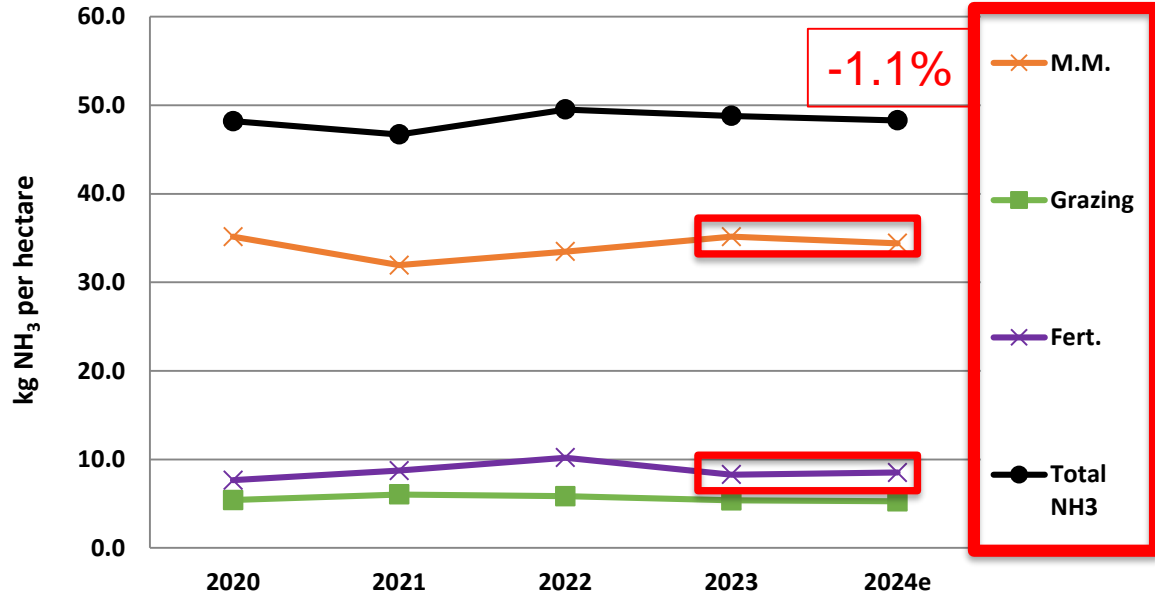
# NH<sub>3</sub> Emission Factors

N Excretion Rates (kg/head/yr)	2022
Animal Category	
DairyCows	109.99
Cows Excluding Dairy Cows	76.76
Dairy Heifers	74.69
Other Heifers	78.83
Cattle 0 - 1 yrs male	37.31
Cattle 0 - 1 yrs female	34.07
Cattle 1 - 2 yrs male	75.97
Cattle 1 - 2 yrs female	70.66
Cattle > 2 yrs male	46.18
Cattle > 2 yrs female	44.34
Bulls	90.21

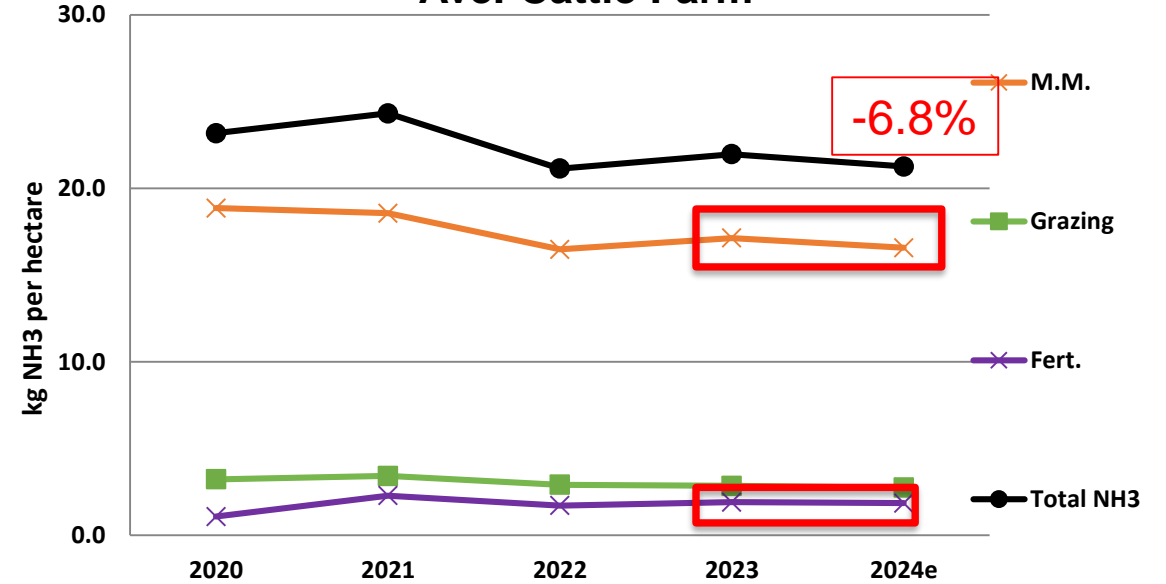
Ammonia Emission Factors Chemical N	(NH <sub>3</sub> - g per kg)	EF Multiple
Straight Urea	195	1.0
CAN	24	8.1
Protected Urea	42	4.6

# NH<sub>3</sub> emissions kg per hectare by Farm System

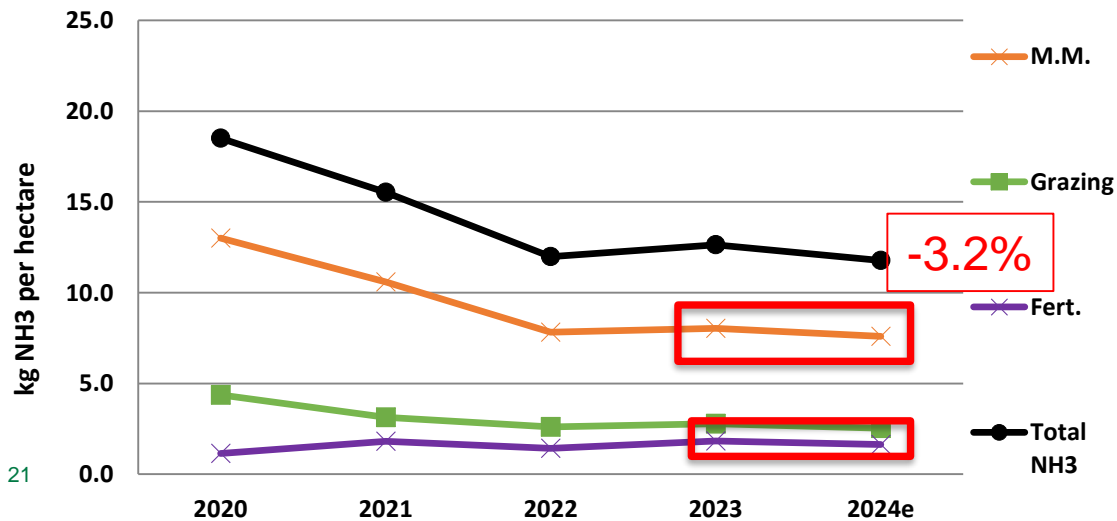
## Ave. Dairy Farm



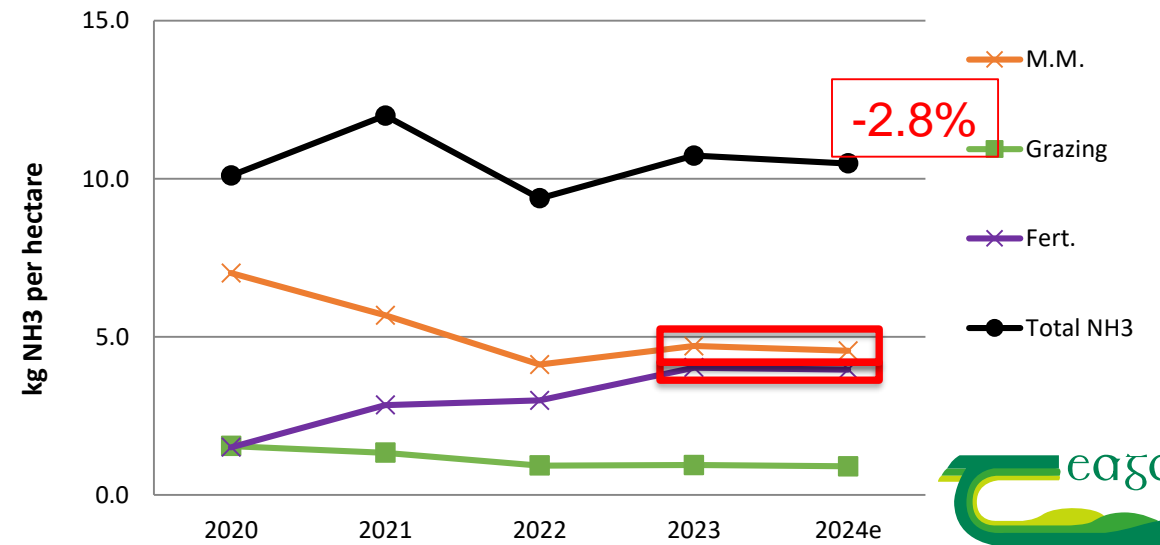
## Ave. Cattle Farm



## Ave. Sheep Farm



## Ave. Tillage Farm



# Summary / Conclusion (a)

- **Lower animal activity levels in 2024 but not across all categories**
  - June cattle number -2.2%
  - Sheep numbers -8.8%
- **Quantity of chemical N fertilisers applied in 2024**
  - Chemical N sales (Sept-June) up by 3.9%
    - » 58% increase in the use of protected urea
- **Lime projected to decline by 56%??**
  - Reduced pulse of direct GHG emissions in short run

# Summary / Conclusion (b)

- **Estimates - Absolute per hectare GHG Emissions in 2024**
  - ↓ 2.5% on Dairy Farms
  - ↓ 5-6 % on Cattle & Tillage Farms
  - ↓ 11% on Farms
- **Estimates - Absolute NH<sub>3</sub> Emissions in 2024**
  - ↓ 1% on Dairy Farms
  - ↓ 2-3% Cattle & Tillage Farms
  - ↓ 7% on Sheep Farms