

# Outlook 2022 - Sustainability

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**Rural Economy and Development Programme**

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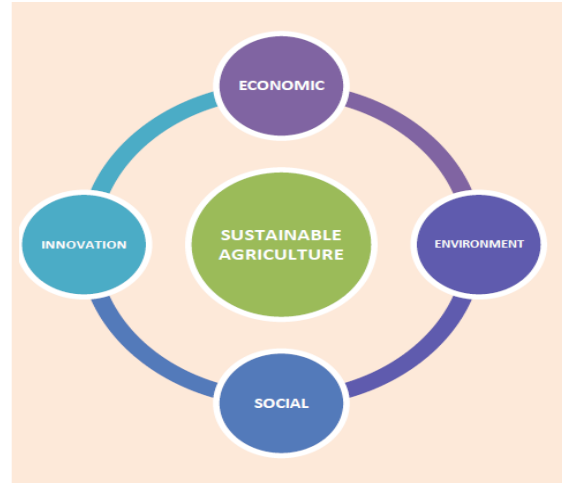
# Overview

- Sustainability conceptual framework
- Methodological approach used for projecting for 2022
- Projections results for 2022
- Summary / conclusion

# Teagasc NFS Sustainability Report

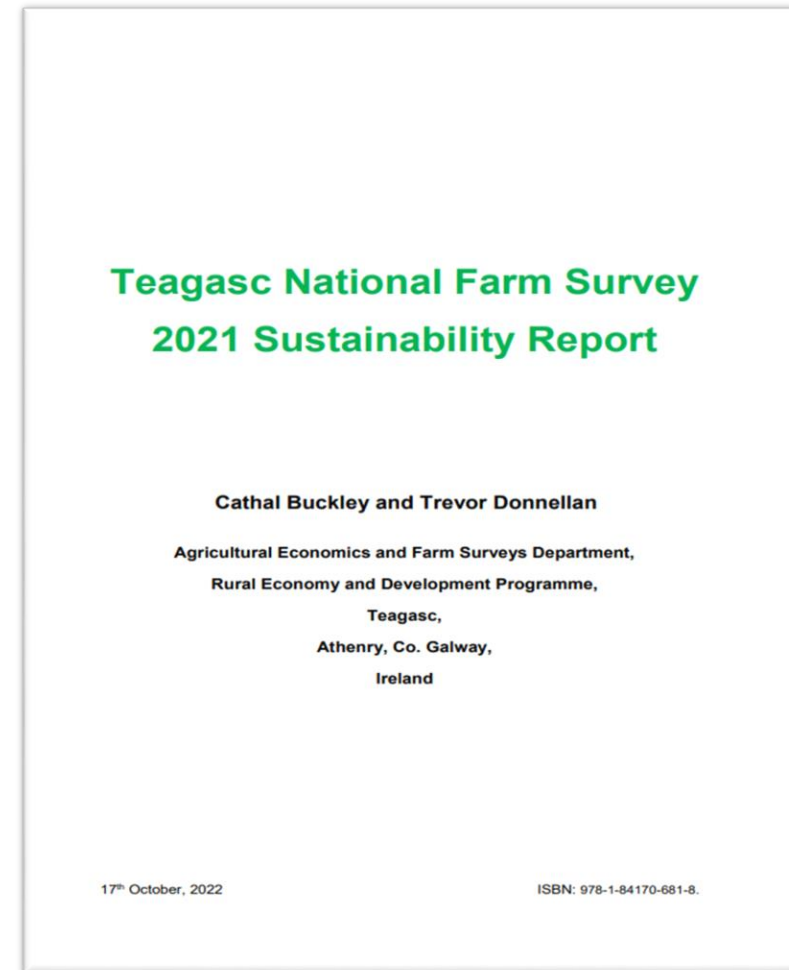
- Farm level sustainability is intersection of:

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



- The 2021 Teagasc Sustainability Report

- Published in October 2022
- 7<sup>th</sup> report since 2013

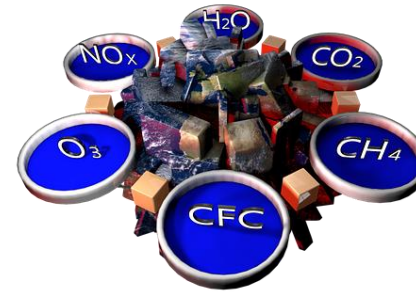


<https://www.teagasc.ie/rural-economy/rural-economy/national-farm-survey/sustainability-reports/>

# Environmental Sustainability

## 1. Gaseous Emissions

- Greenhouse Gases
- Ammonia



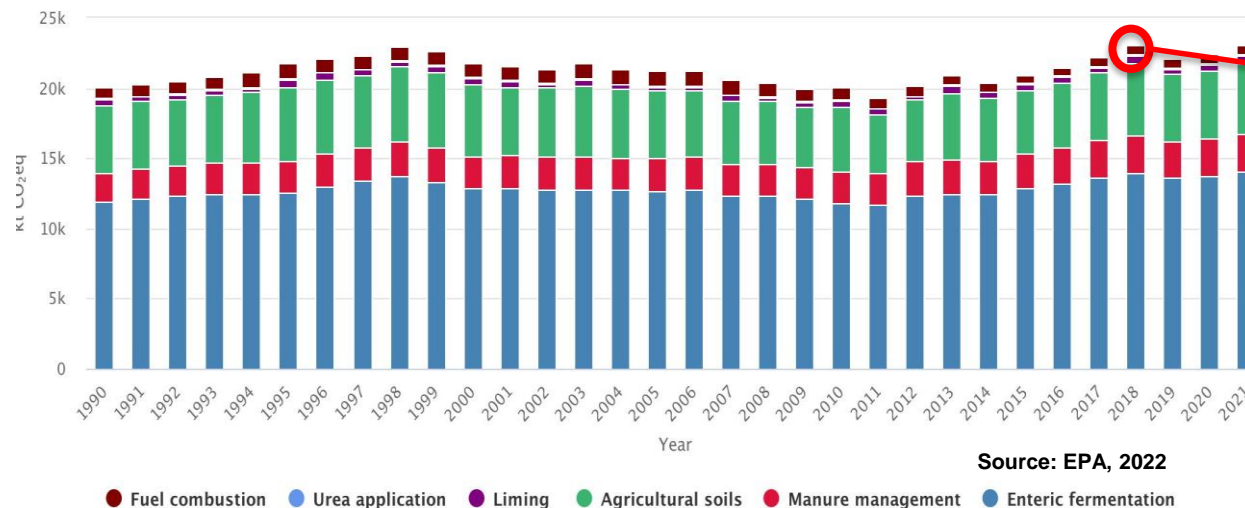
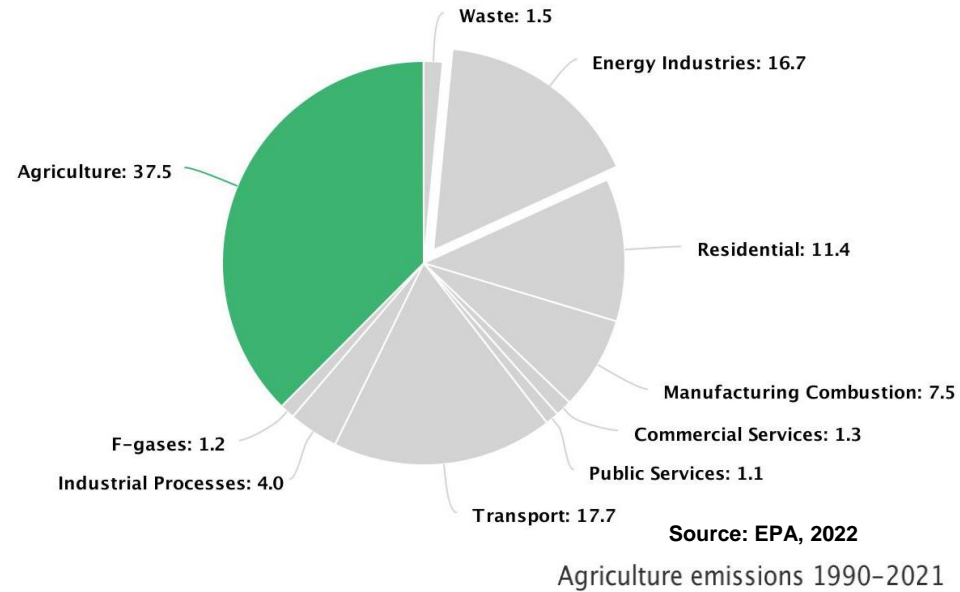
## 2. Risk to water quality

## 3. Biodiversity Indicator



# Gaseous Emissions - Agriculture

Agriculture sector emissions share 2021

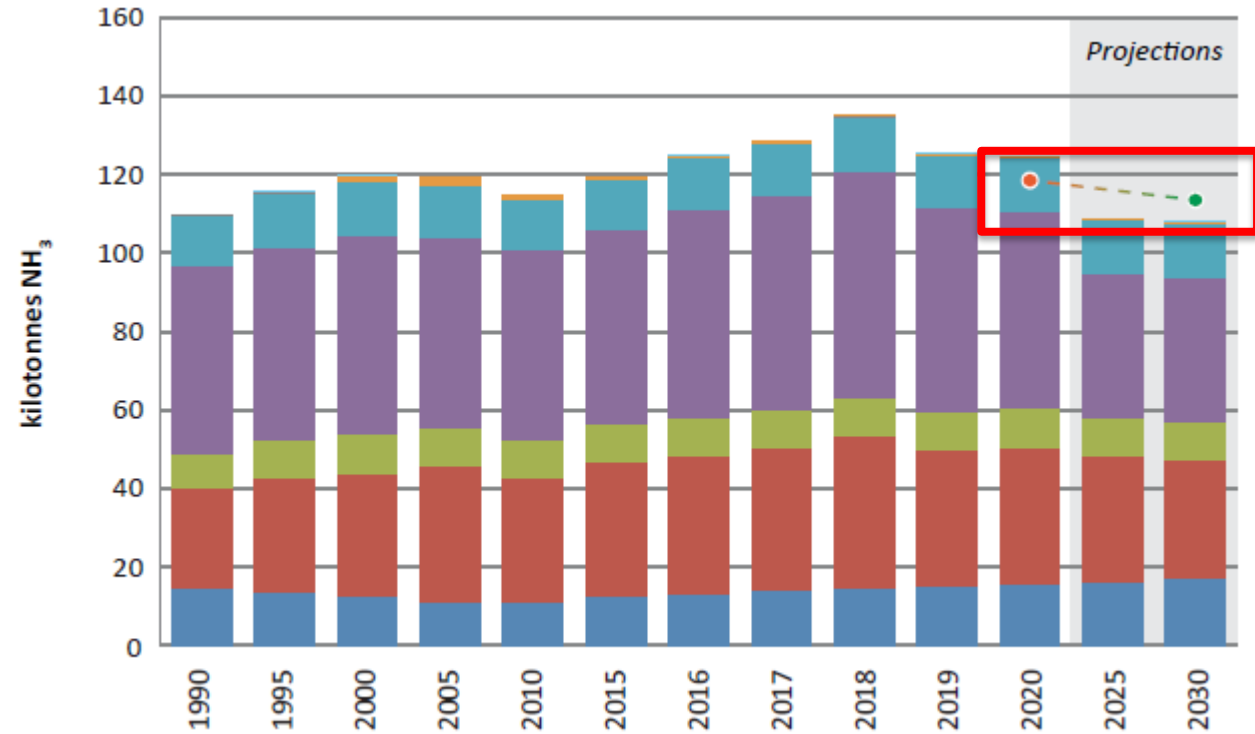
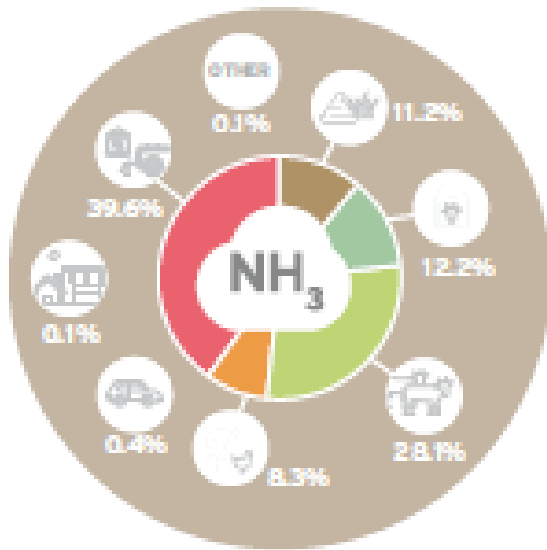


## Climate Action Plan 2021: GHGs

- Sectoral GHG reduction targets for 2030 (compared to 2018)
  - Agriculture: 25%
- Carbon neutrality by 2050

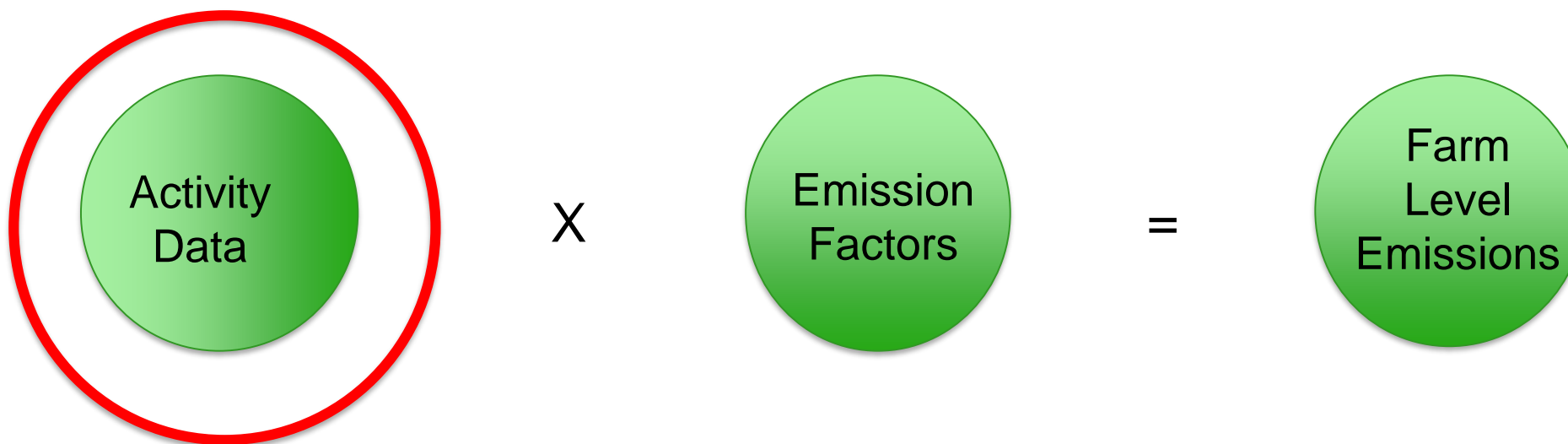
# Gaseous Emissions - Ammonia

99.4% of Ammonia Emissions generated from Agriculture (EPA, 2022)



Source: EPA, 2022

# 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

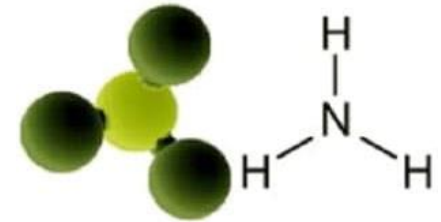
## ■ GHG - All in common currency of CO<sub>2</sub> equivalence

- » 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 821 farms in 2021 representing over 83,771 nationally
  - Reports on main land based systems – Dairy, Cattle, Sheep & Tillage
- Data capture for environmental modelling
  - Animal numbers by category (e.g. Dairy Cows)
  - Crops grown (e.g. barley, wheat, oats)
  - Fertilisers applies (e.g. CAN, urea, protected urea)
  - Lime applied
  - Manure management practices (housing, storage, landspreading)
  - Technology Adoption



# Activity Data Projections / Assumptions – 2022

- Animal Numbers & Chemical Fertilisers applied are key parameters – Type and quantity
- 1. Animal Inventories
  - CSO June survey 2021 vs 2022
- 2. Chemical Fertiliser Sales
  - Sales data DAFM Sept 2021-October 2022
- 3. Technology adoption
  - Gaseous Emissions Mitigation
    - » LESS use to increase in line with historical trends
- Apply these changes to farms with the Teagasc NFS
  - Using 2021 as the base year

# Cattle Numbers June 2021 vs 2022

Animal inventories	2021 vs 2022
Total cattle	0.51%
Dairy cows	1.42%
Other cows	-2.88%
Bulls	-4.17%
Cattle: 2 years and over	2.38%
Cattle: 1-2 years	2.01%
Cattle: under 1 year	-0.54%

<b>Enteric Fermentation EF Co-efficients</b>	<b>2021</b>
<b>Animal Category</b>	
Dairy cows	120.19
Beef cows (Suckler Cows)	72.27
Dairy heifers	53.60
Beef heifers	57.10
<b>Cattle &lt;1 year</b>	33.23
Cattle < 1 yrs - male	34.70
Cattle < 1 yrs - female	31.88
<b>Cattle 1 - 2 yrs</b>	55.02
Cattle 1 - 2 yrs - male	58.09
Cattle 1 - 2 yrs - female	51.41
<b>Cattle &gt; 2 yrs</b>	28.72
Cattle > 2 yrs - male	33.97
Cattle > 2 yrs - female	20.28
Bulls for breeding	91.38

# Sheep Numbers June 2021 vs 2022

Animal inventories	2021 vs 2022
Total sheep	6.39%
Ewes	3.27%
Rams	-1.76%
Other sheep	7.55%

# Chemical Fertiliser - Nitrogen

	2021*	2022*	% change
<b>Total</b>	399,160	343,193	-14%
<b>Straight CAN</b>	140,127	109,548	-21.8%
<b>Straight Urea</b>	40,687	52,823	29.8%
<b>Protected Urea</b>	20,540	31,282	52.3%
<b>NK Compounds</b>	2,947	2,632	-10.7%
<b>NP Compounds</b>	2,404	1,670	-30.5%
<b>NPK Compounds</b>	189,071	142,078	-24.9%
<b>Other N Fertilisers</b>	3,384	3,160	-6.6%

\* September to October sales year (DAFM,2022)

# 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, 2022

# Liming Rates

- Lime sales increased by 50% in 2021 to 1.3 million tonnes
- Lime applied also increased by circa 18% between 2021 and 2022 January to September (DAFM, 2022)
  - 12% Carbon in Lime – 120kg of CO<sub>2</sub> per tonne of Lime
- Increased soil fertility / nutrient use efficiency
  - Only captured in GHG inventories if chemical N is reduced on the back on improved soil fertility

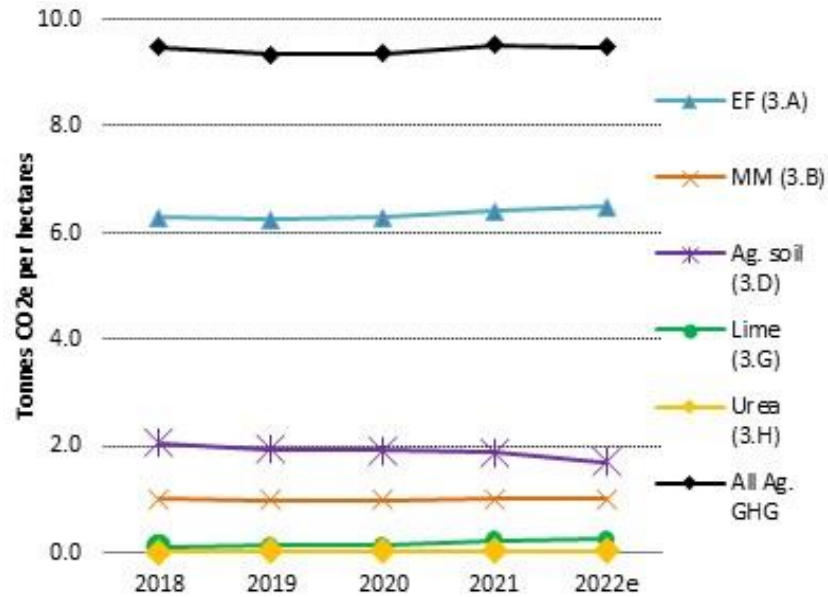


# GHG emissions profile for Agriculture in ROI 2021

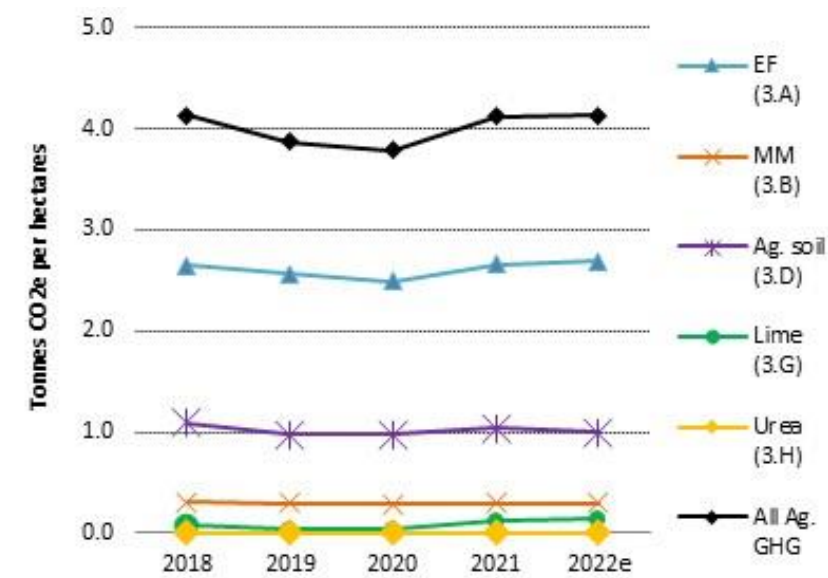
3. Agriculture (kt CO <sub>2</sub> eq)	2021	%
3.A Enteric Fermentation (CH <sub>4</sub> )	14,013	62%
3.B Manure Management (CH <sub>4</sub> & N <sub>2</sub> O)	2,707	12%
3.C Rice Cultivation	-	-
3.D Agricultural Soils (N <sub>2</sub> O)	5,031	22%
3.E Prescribed Burning of Savannas	-	-
3.F Field Burning of Agricultural Residues	-	-
3.G Liming (CO <sub>2</sub> )	597	3%
3.H Urea Application (CO <sub>2</sub> )	102	0%
3.I Other Carbon-containing fertilizers		
3.J Other		
<b>Total Emissions (kt CO<sub>2</sub> eq)</b>	<b>22,451</b>	<b>100%</b>

# Projections for 2022 for GHG emissions tonnes per hectare NFS Farms – IPCC Category

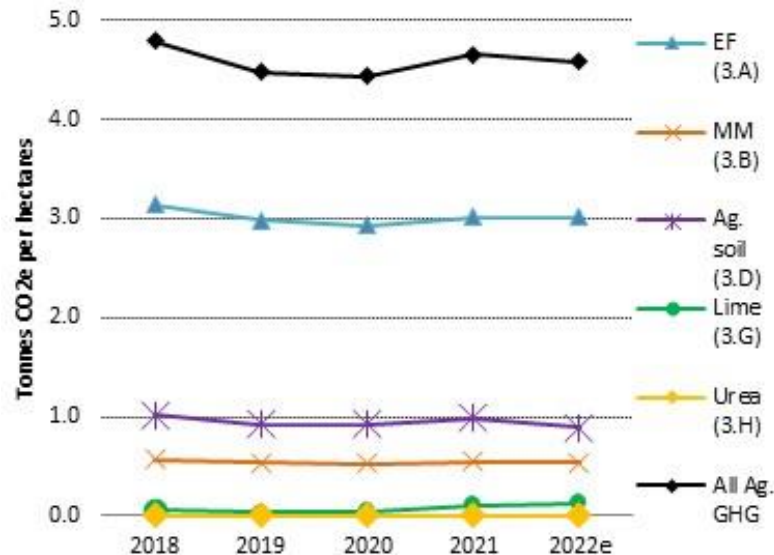
## Ave. Dairy Farm



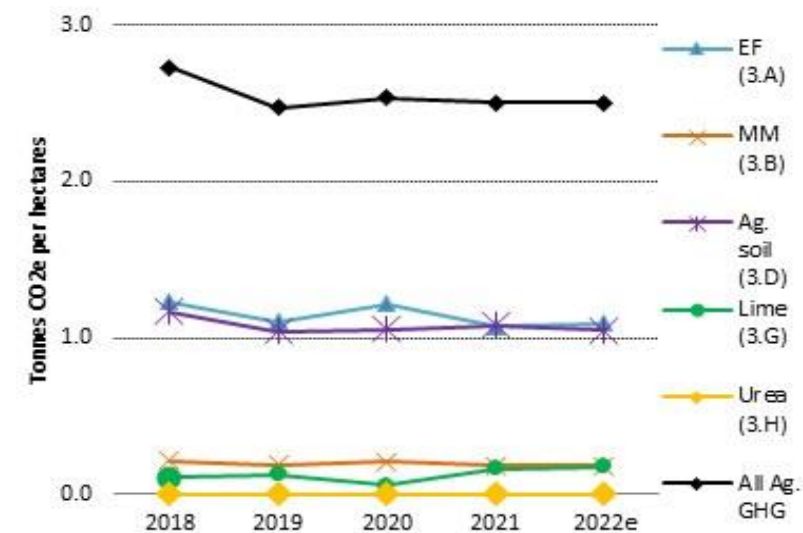
## Ave. Sheep Farm



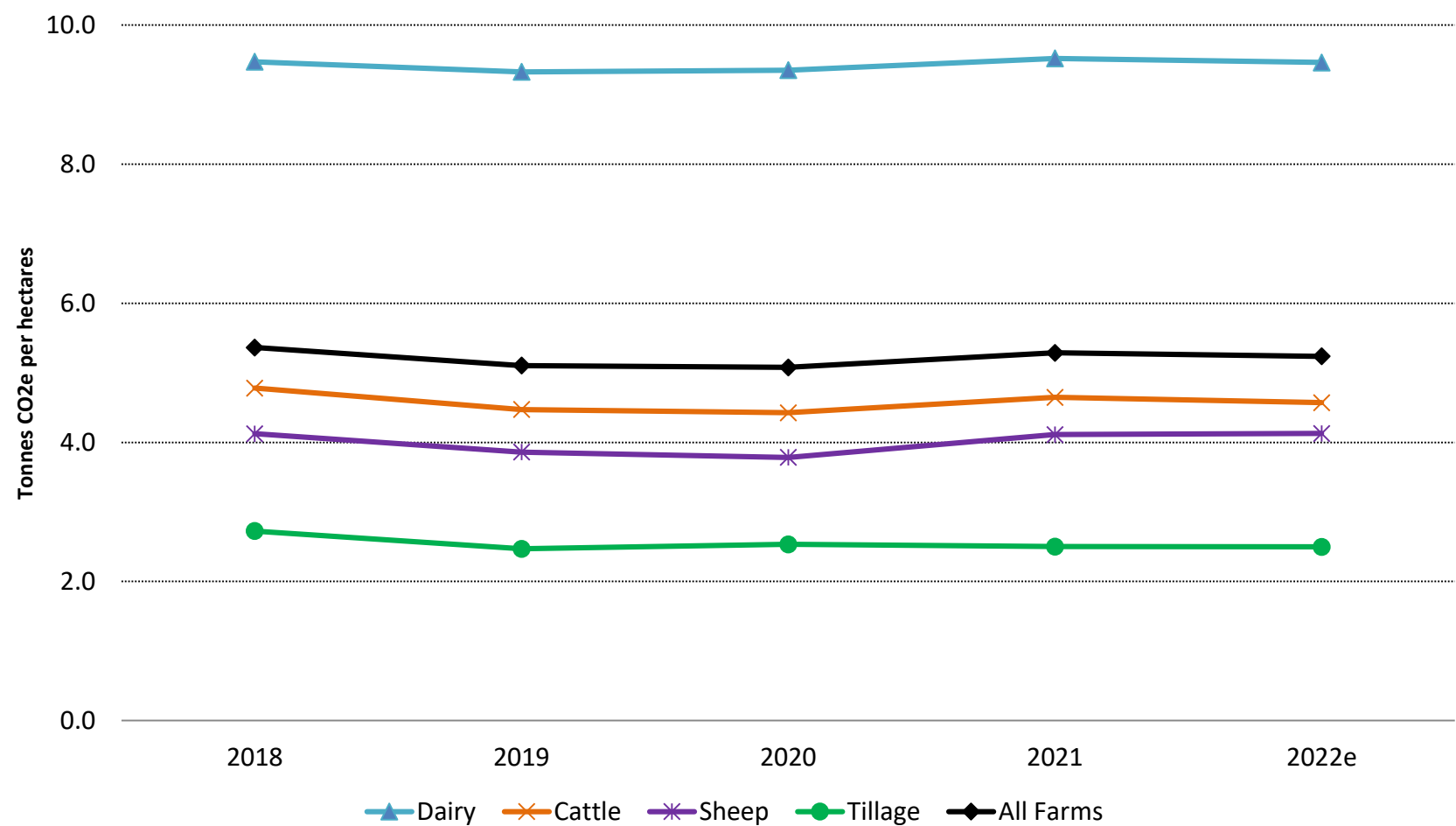
## Ave. Cattle Farm



## Ave. Tillage Farm



# GHG tonnes emissions per hectare by Farm System



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

Total NH <sub>3</sub> emissions (kilotonnes NH <sub>3</sub> )	2020	%
Cattle (Manure Management + Grazing)	95.0	77%
Pigs	6.3	5%
Sheep (Manure Management + Grazing)	2.7	2%
Poultry	4.9	4%
Horses	1.8	1%
Mules	0.1	0%
Goats	0.0	0%
Chemical Fertilizer	11.4	9%
Other	0.4	0%
National Total	122.7	100%

# Activity Levels - Revisited

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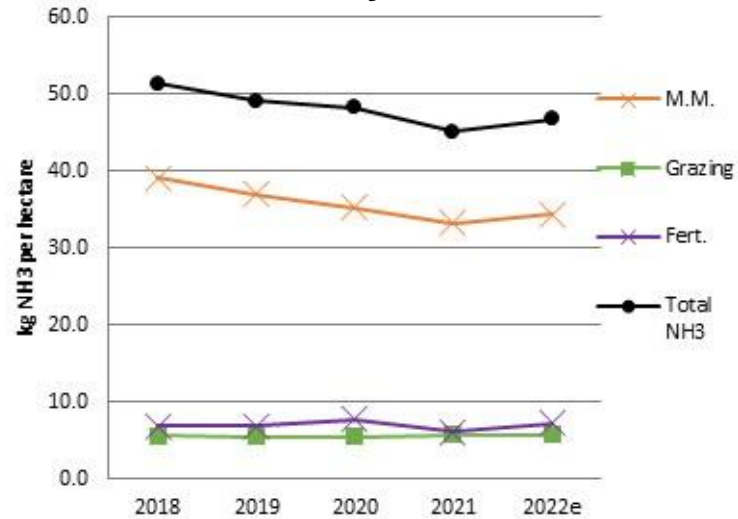
# NH<sub>3</sub> Emission Factors

N Excretion Rates (kg/head/yr)	2021
Animal Category	
DairyCows	110.22
Cows Excluding Dairy Cows	75.04
Dairy Heifers	72.44
Other Heifers	76.58
Cattle 0 - 1 yrs male	35.03
Cattle 0 - 1 yrs female	32.42
Cattle 1 - 2 yrs male	73.72
Cattle 1 - 2 yrs female	69.77
Cattle > 2 yrs male	46.07
Cattle > 2 yrs female	44.57
Bulls	86.68
Ewes Lowland	12.573
Ewes Upland	9.374
Rams - lowland	11.383
Rams - upland	9.769
Other Sheep>1 - lowland	12.893
Other Sheep>1 - upland	9.916
Lambs - lowland	3.675
Lambs - upland	4.322

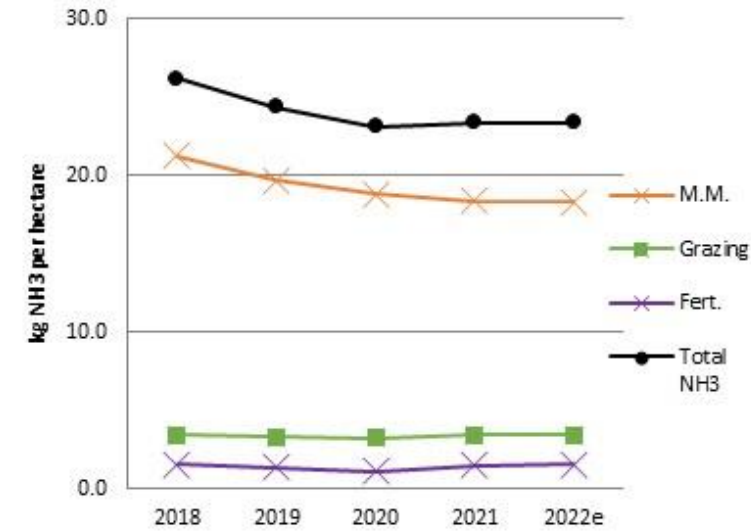
Ammonia Emission factors - Chemical N fertiliser	(NH <sub>3</sub> - g per kg)	EF Multiple
Straight Urea	155	1.0
CAN	8	19.4
Protected Urea	33	4.7

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

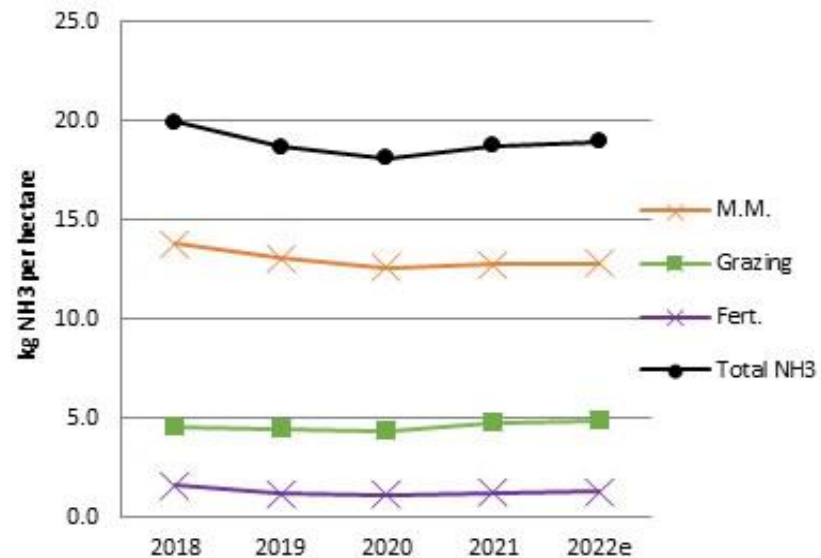
## Ave. Dairy Farm



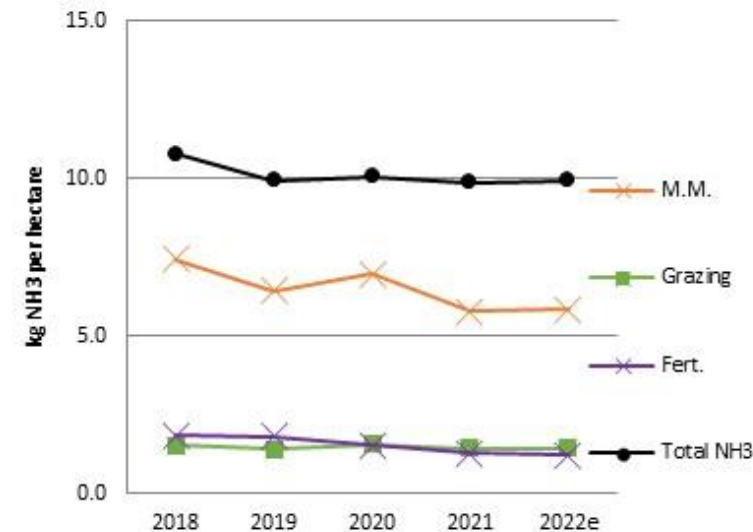
## Ave. Cattle Farm



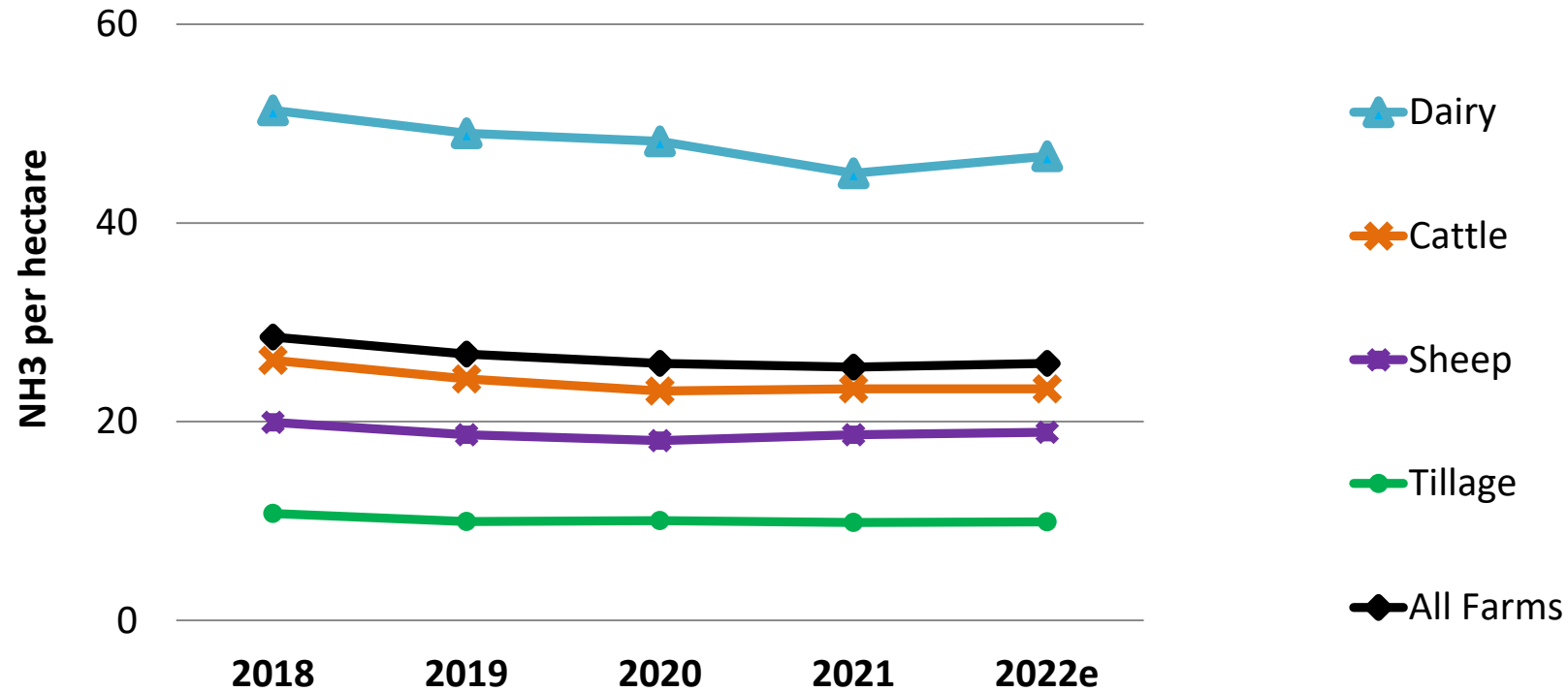
## Ave. Sheep Farm



## Ave. Tillage Farm



# NH3 emissions kg per hectare – Farm System





# Summary / Conclusion

- **Higher animal activity levels in 2022**
  - June cattle number +0.51%
    - » Dairy Cows +1.42%
  - Sheep numbers +6.39%
    - » Ewes +3.27%
- **Reduction in the quantity of chemical N fertilisers applied in 2022**
  - Chemical N sales (Sept-Oct) down by 14%
  - Reduction in CAN positive for GHG emission reductions
  - Increased use of straight urea, positive for GHG but not ammonia
  - Protected urea increased to 9% of total chemical N sales
- **Absolute GHG Emissions in 2022 estimates:**
  - Slight decline on dairy and cattle farms (compared to preceding years)
  - Other farm systems static (sheep and tillage)
- **Absolute NH3 Emissions in 2022 estimates:**
  - Projected to increase slightly on dairy and sheep farms
  - Other farm systems static (Cattle and Tillage)

# Thank You

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