Outlook 2022 - Sustainability

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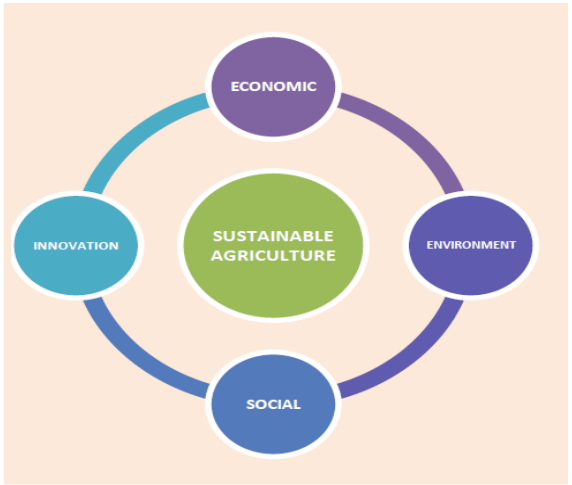
Teagasc
Agriculture and Food Development Authority

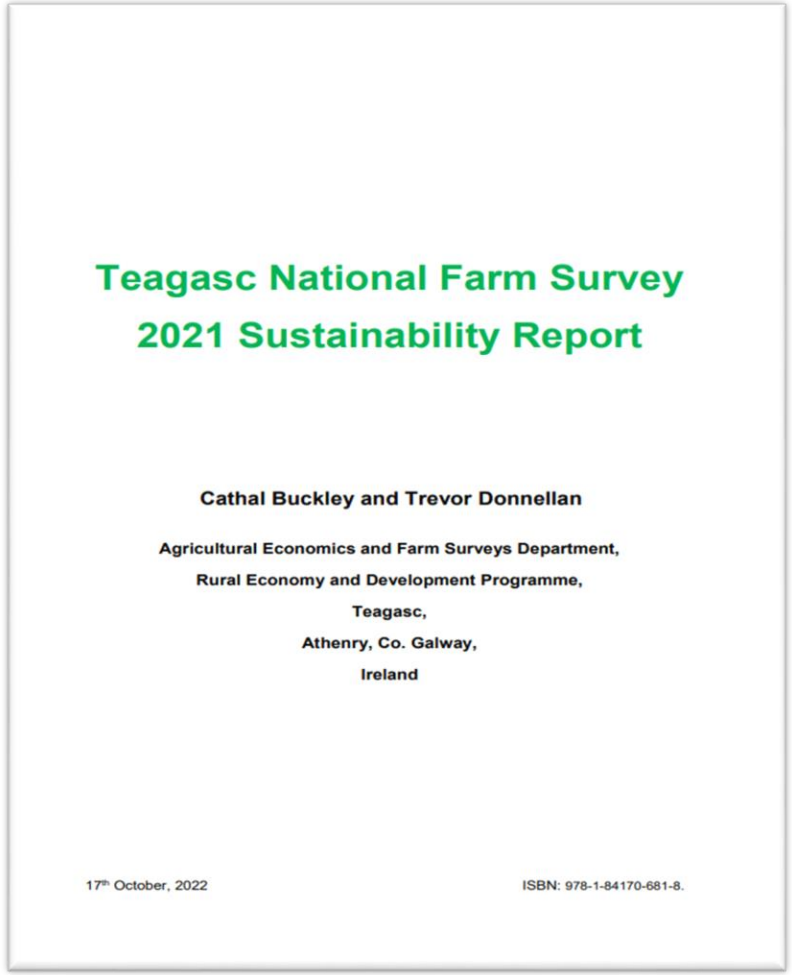
Overview

- 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




Teagasc National Farm Survey
2021 Sustainability Report

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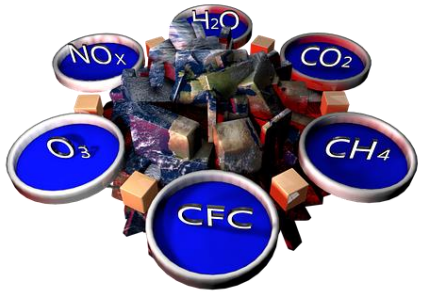
- The 2021 Teagasc Sustainability Report
  - Published in October 2022
  - 7th report since 2013

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

Environmental Sustainability

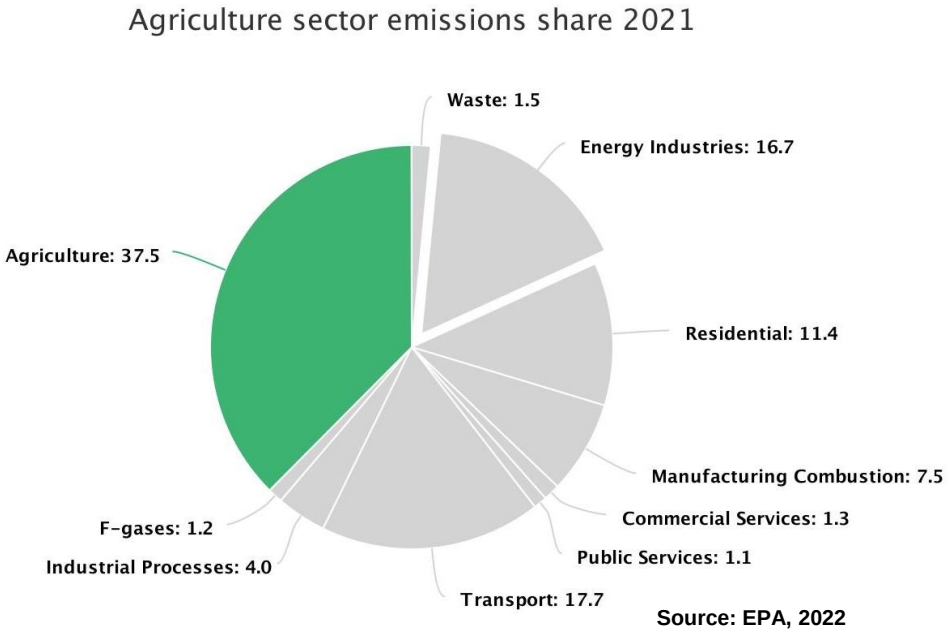
1. Gaseous Emissions
   - Greenhouse Gases
   - Ammonia

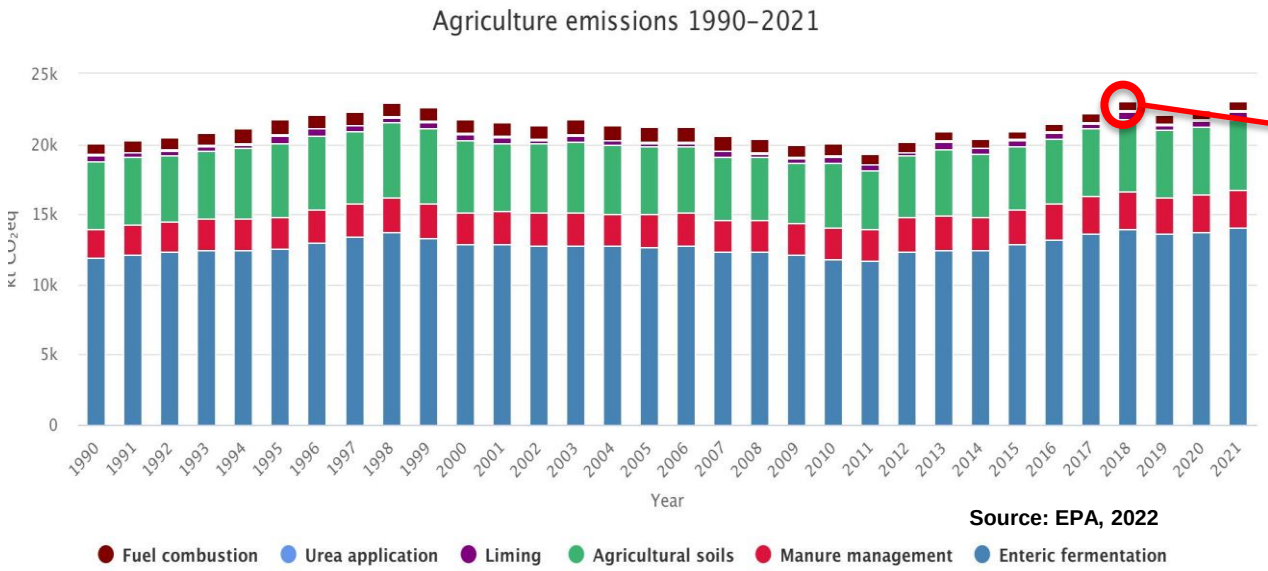


2. Risk to water quality

3. Biodiversity Indicator

Gaseous Emissions - Agriculture





Climate Action Plan 2021: GHGs

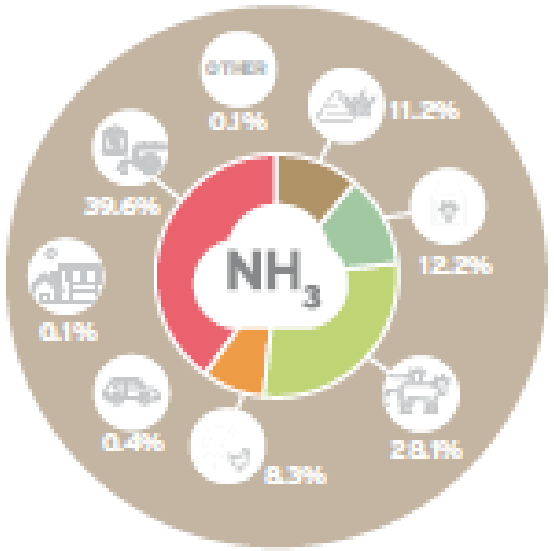
- Sectoral GHG reduction targets for 2030 (compared to 2018)
  - Agriculture: 25%

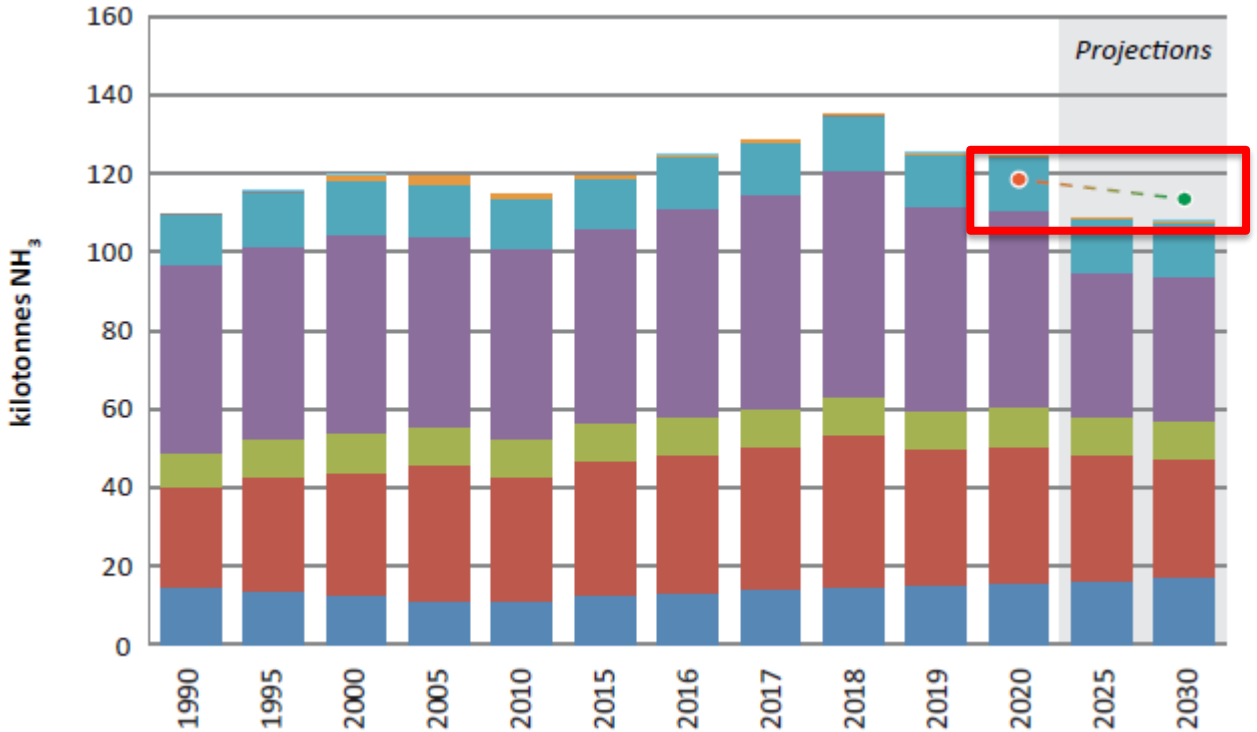
22.4 Mt in 2018 to 16.8Mt in 2030

- Carbon neutrality by 2050

Gaseous Emissions - Ammonia

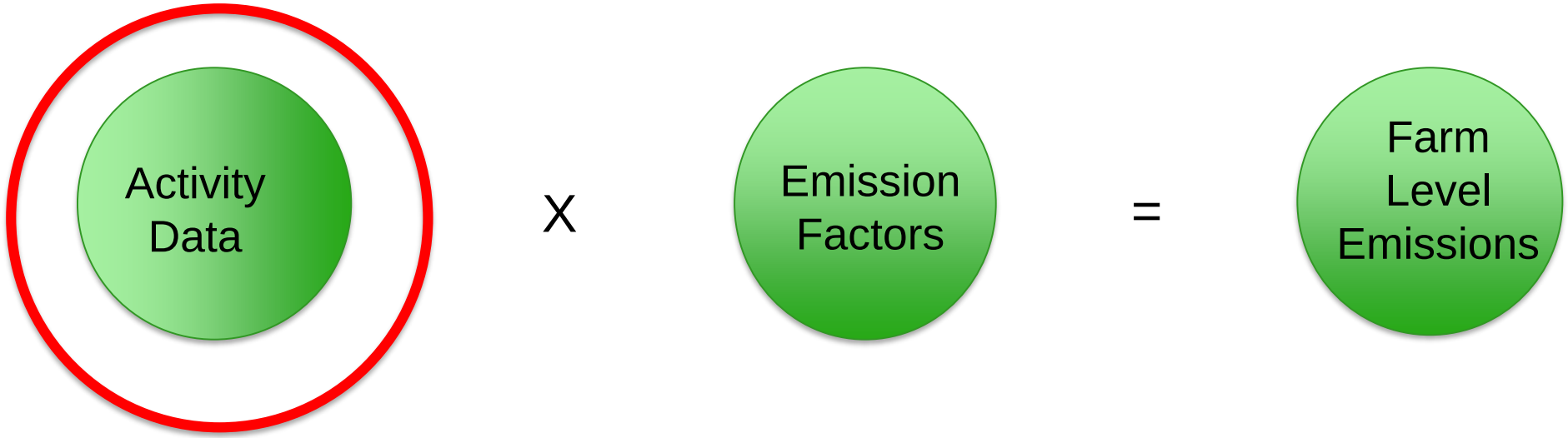
99.4% of Ammonia Emissions generated from Agriculture (EPA, 2022)





Source: EPA, 2022

Emissions – How are they calculated

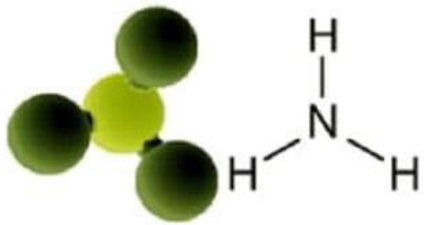


- Activity Data
  - Farm Practice (e.g. animal numbers, chemical fertilisers & manure management)
- Emission Factors
  - Scientific evidence from lab/field experiments, national level if possible (peer reviewed)

Methodological approach – Emission Factors

- GHG - All in common currency of CO_2 equivalence
  - » IPCC based national inventory approach for all farm types
  - » Replicating approach used by EPA at national level
  - » CO_2 equivalent in the base gas (1=1)
    - Methane (CH_4) 1 tonne = 28 tonnes of CO_2 equivalent
    - Nitrous Oxide (N_2O)1 tonne = 265 tonnes of CO_2 equivalent

- Ammonia (NH_3)
  - » 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%

Enteric Fermentation EF Co-efficients	2021
Animal Category	
Dairy cows	120.19
Beef cows (Suckler Cows)	72.27
Dairy heifers	53.60
Beef heifers	57.10
Cattle <I year	33.23
Cattle < 1 yrs - male	34.70
Cattle < 1 yrs - female	31.88
Cattle 1 - 2 yrs	55.02
Cattle 1 - 2 yrs - male	58.09
Cattle 1 - 2 yrs - female	51.41
Cattle > 2 yrs	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
Total	399,160	343,193	-14%
Straight CAN	140,127	109,548	-21.8%
Straight Urea	40,687	52,823	29.8%
Protected Urea	20,540	31,282	52.3%
NK Compounds	2,947	2,632	-10.7%
NP Compounds	2,404	1,670	-30.5%
NPK Compounds	189,071	142,078	-24.9%
Other N Fertilisers	3,384	3,160	-6.6%

* September to October sales year (DAFM,2022)

Chemical Nitrogen GHG Emission Factors

GHG linked Emission factors	(kgN2O-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_2 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

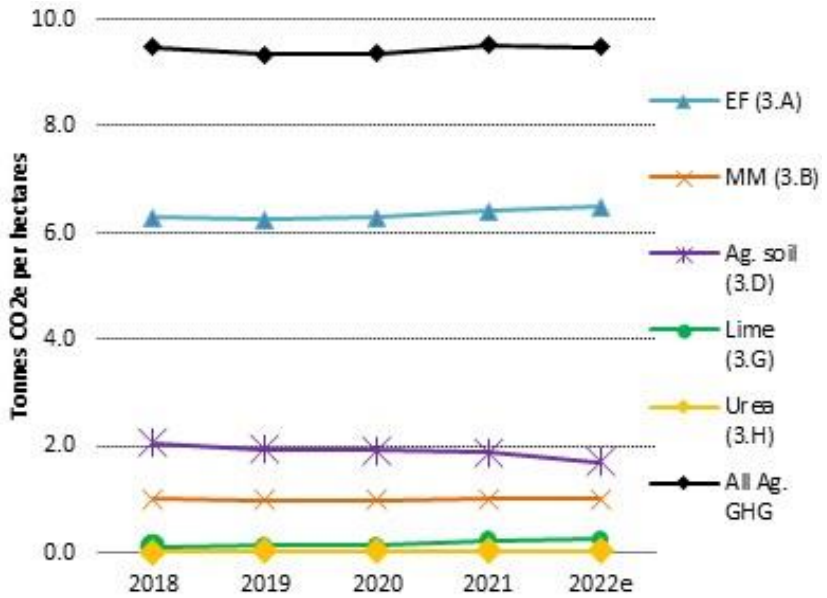
GHG emissions profile for Agriculture in ROI 2021

3. Agriculture (kt CO2 eq)	2021	%
3.A Enteric Fermentation (CH_4)	14,013	62%
3.B Manure Management (CH_4 & N_2O)	2,707	12%
3.C Rice Cultivation	-	-
3.D Agricultural Soils (N_2O)	5,031	22%
3.E Prescribed Burning of Savannas	-	-
3.F Field Burning of Agricultural Residues	-	-
3.G Liming (CO_2)	597	3%
3.H Urea Application (CO_2)	102	0%
3.I Other Carbon-containing fertilizers		
3.J Other		
Total Emissions (kt CO_2 eq)	22,451	100%

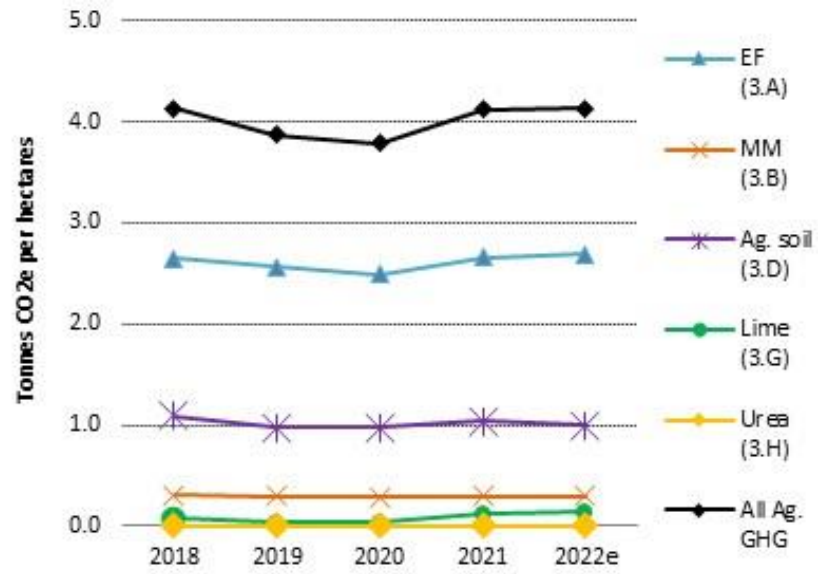
Source: EPA, 2022

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

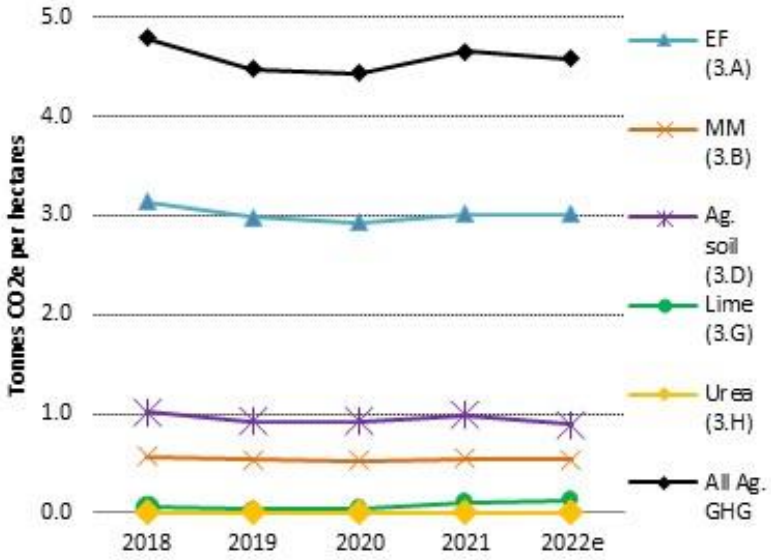
Ave. Dairy Farm



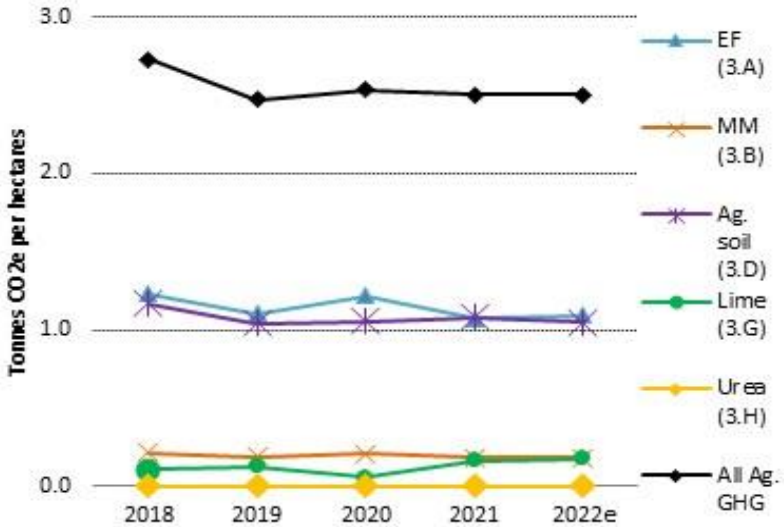
Ave. Sheep Farm



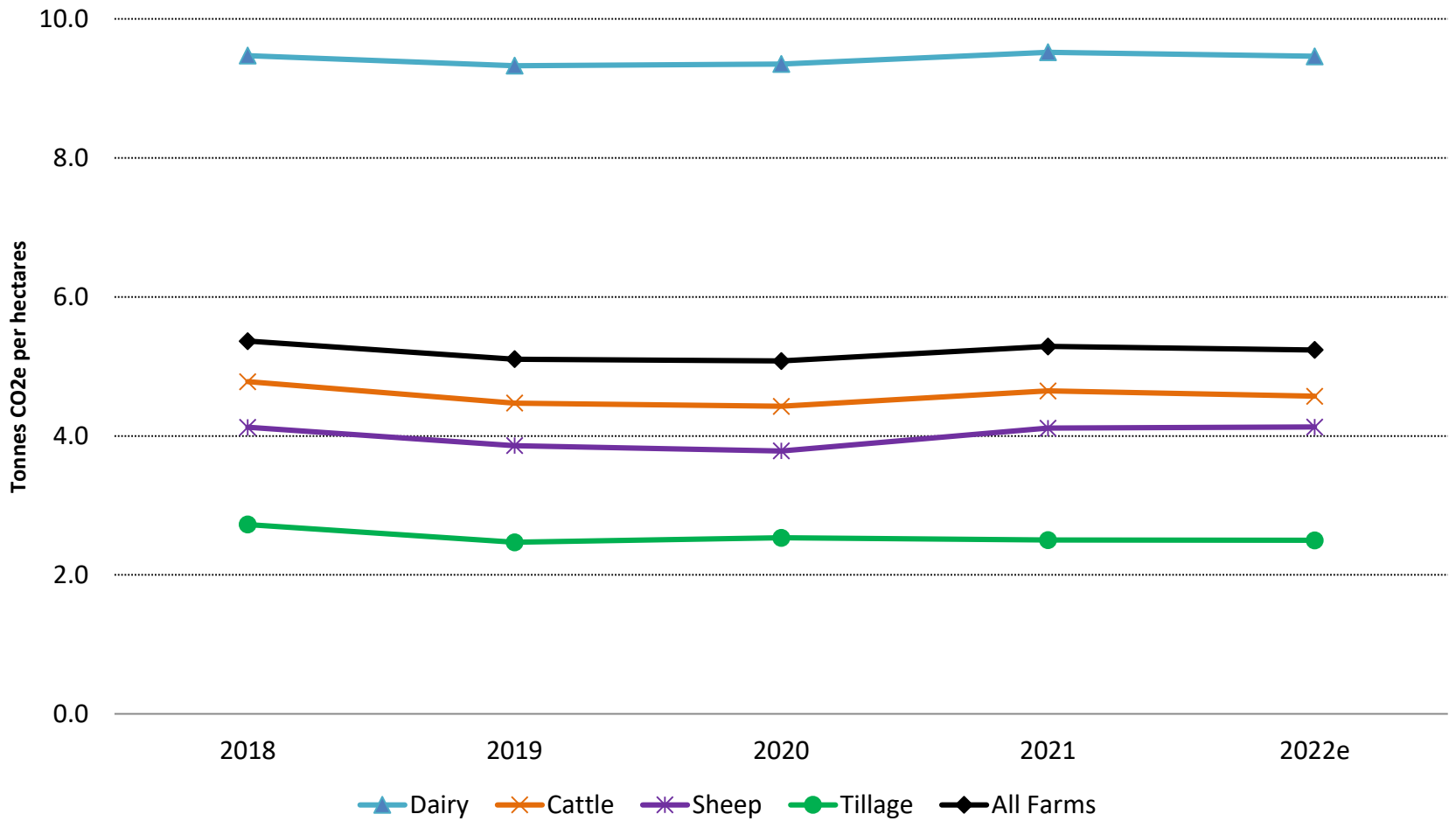
Ave. Cattle Farm



Ave. Tillage Farm



GHG tonnes emissions per hectare by Farm System



NH3 National Inventory Accounts

Total NH_3 emissions (kilotonnes NH_3)	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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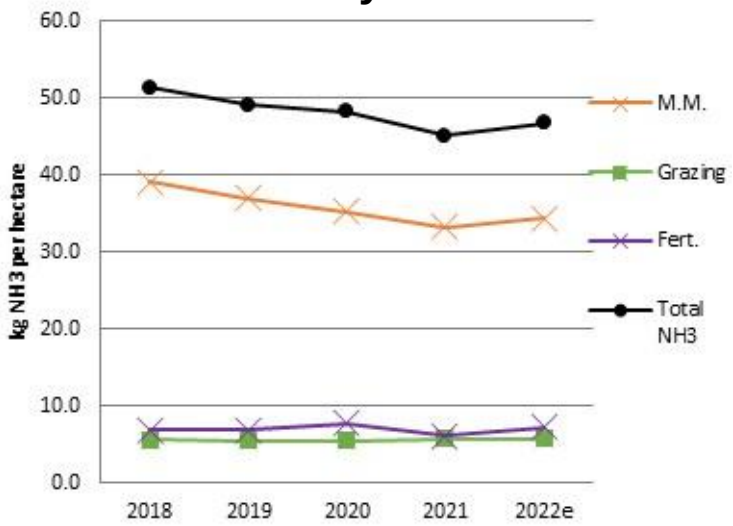
NH_3 Emission Factors

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

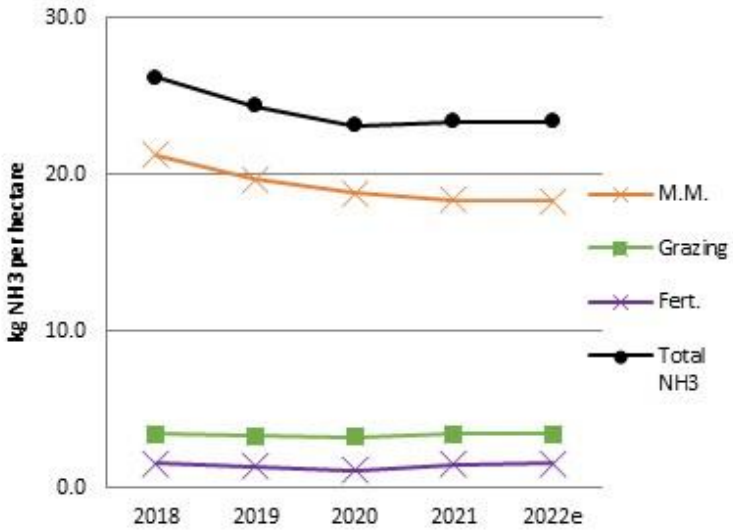
Ammonia Emission factors - Chemical N fertiliser	(NH3 - g per kg)	EF Multiple
Straight Urea	155	1.0
CAN	8	19.4
Protected Urea	33	4.7

NH_3 emissions kg per hectare by Farm System

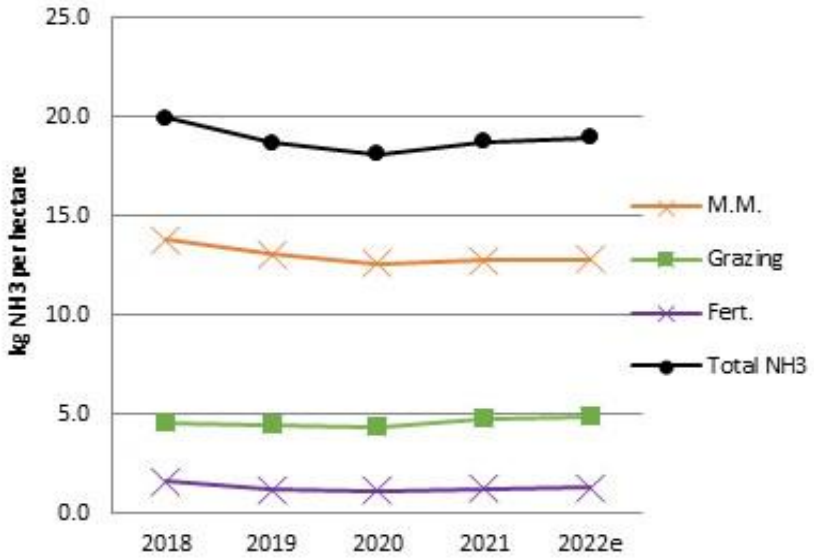
Ave. Dairy Farm



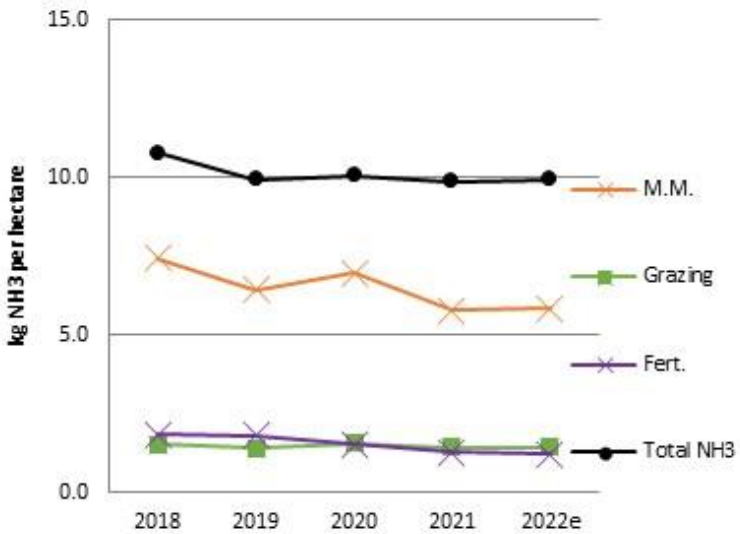
Ave. Cattle Farm



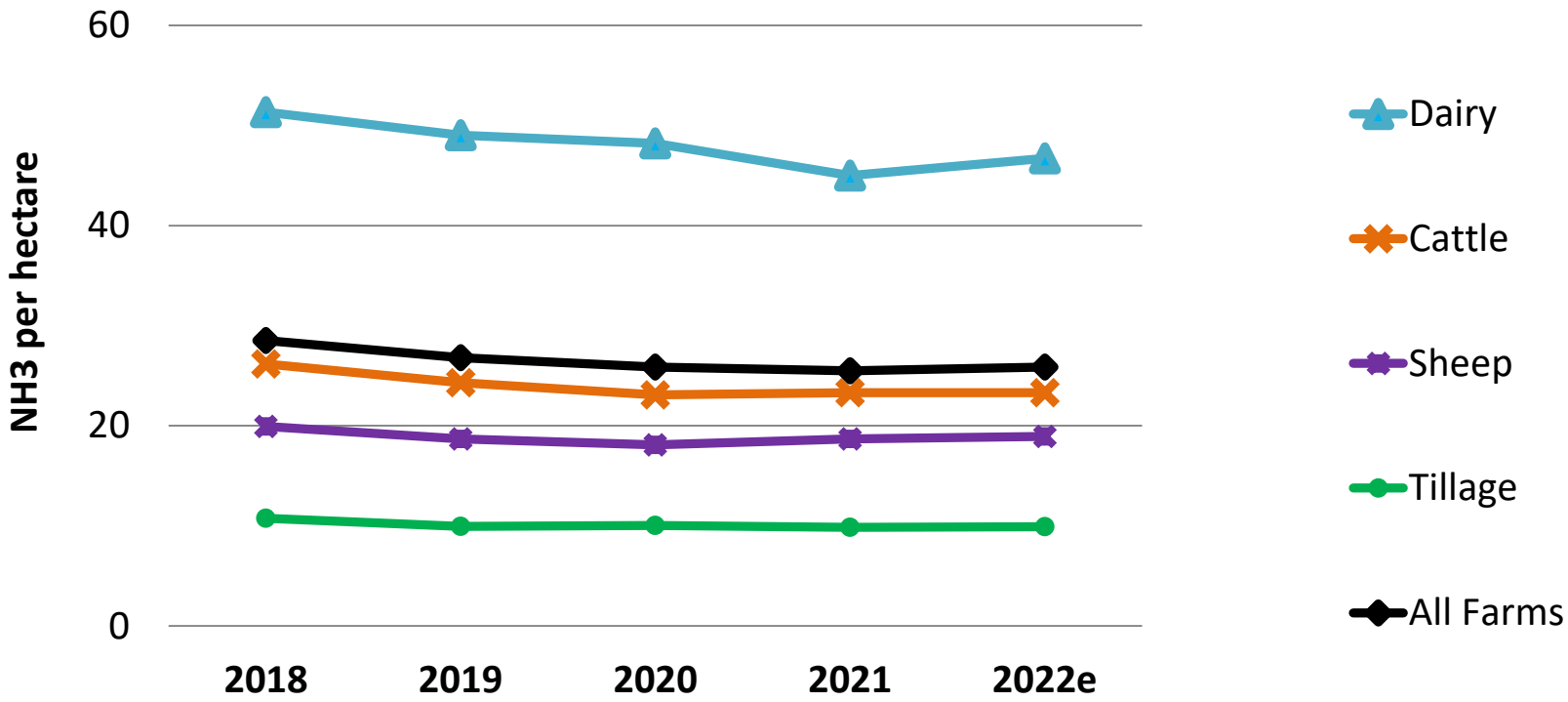
Ave. Sheep Farm



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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