

Outlook 2020 - Sustainability

Cathal Buckley

Teagasc, Agricultural Economics & Farm Surveys Department

Rural Economy and Development Programme

December 2nd 2020



Overview

- Sustainability definition
- Methodology
- Projections for 2020
- Summary / conclusion

What is Sustainability?

- "Sustainable development is development that meets **the needs of the present** without compromising the ability of **future generations to meet their own needs.**"

Brundtland Commission, Our Common Future (1987)

- Sustainable agriculture is defined as a practise that meets **current and long-term needs** for food, fibre, and other related needs **of society**, while maximizing net benefits through the **conservation of resources** to maintain other ecosystem services and functions, and long-term human development

(Rao and Rogers, 2006).



Sustainability Definition

- Farm level sustainability is intersection of:

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



Success

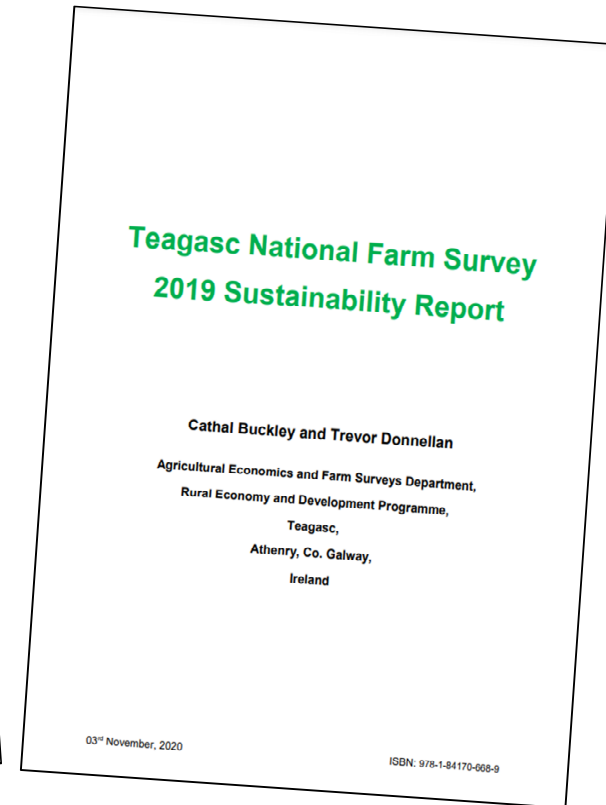
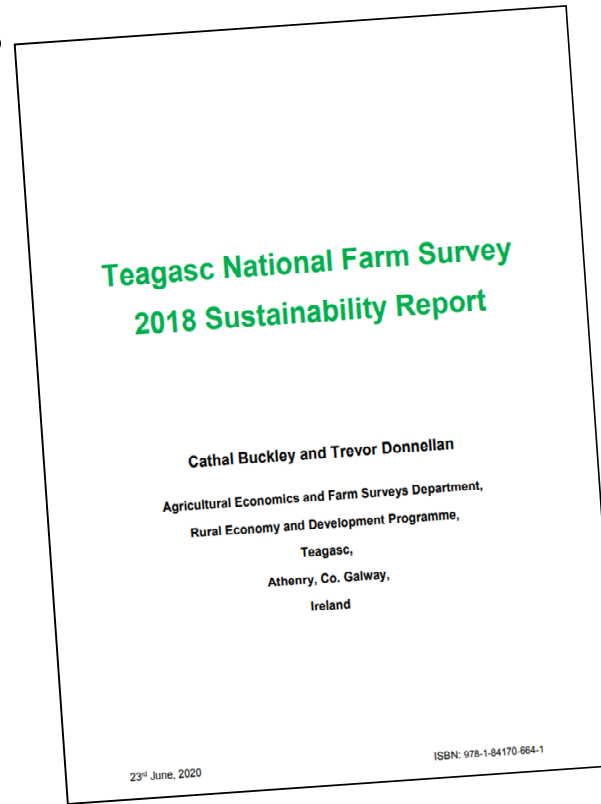


Failure

Teagasc Sustainability Report Series

- Comprehensive range of results

- 4 Farm Systems (Dairy, Cattle, Sheep, Tillage)
- 4 Sustainability dimension
 - » Economic, Environmental, Social & Innovation
 - » 129 indicators for 2019 (most recent year)
- Temporal
 - » Individual year results 2012 to 2019
 - 129 indicators x 6 years
 - » 3 year rolling averages 2012-2019 (longer term trend)

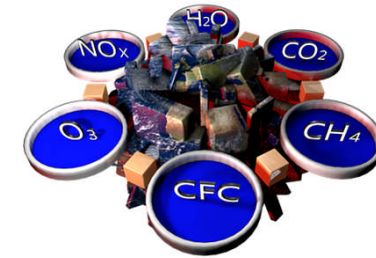


<https://www.teagasc.ie/rural-economy/rural-economy/national-farm-survey/sustainability-reports/>

Environmental Sustainability

1. Gaseous Emissions

- Greenhouse Gases
- Ammonia



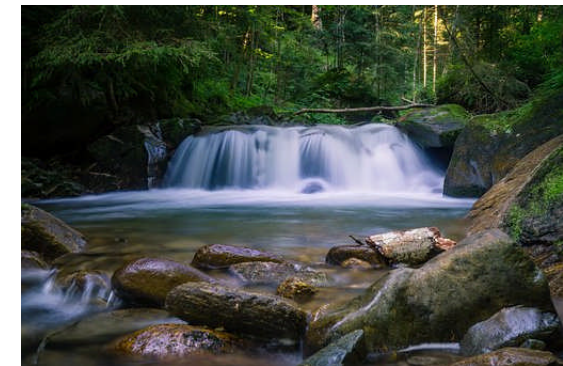
2. Risk to water quality

- Use of nitrogen & phosphorus

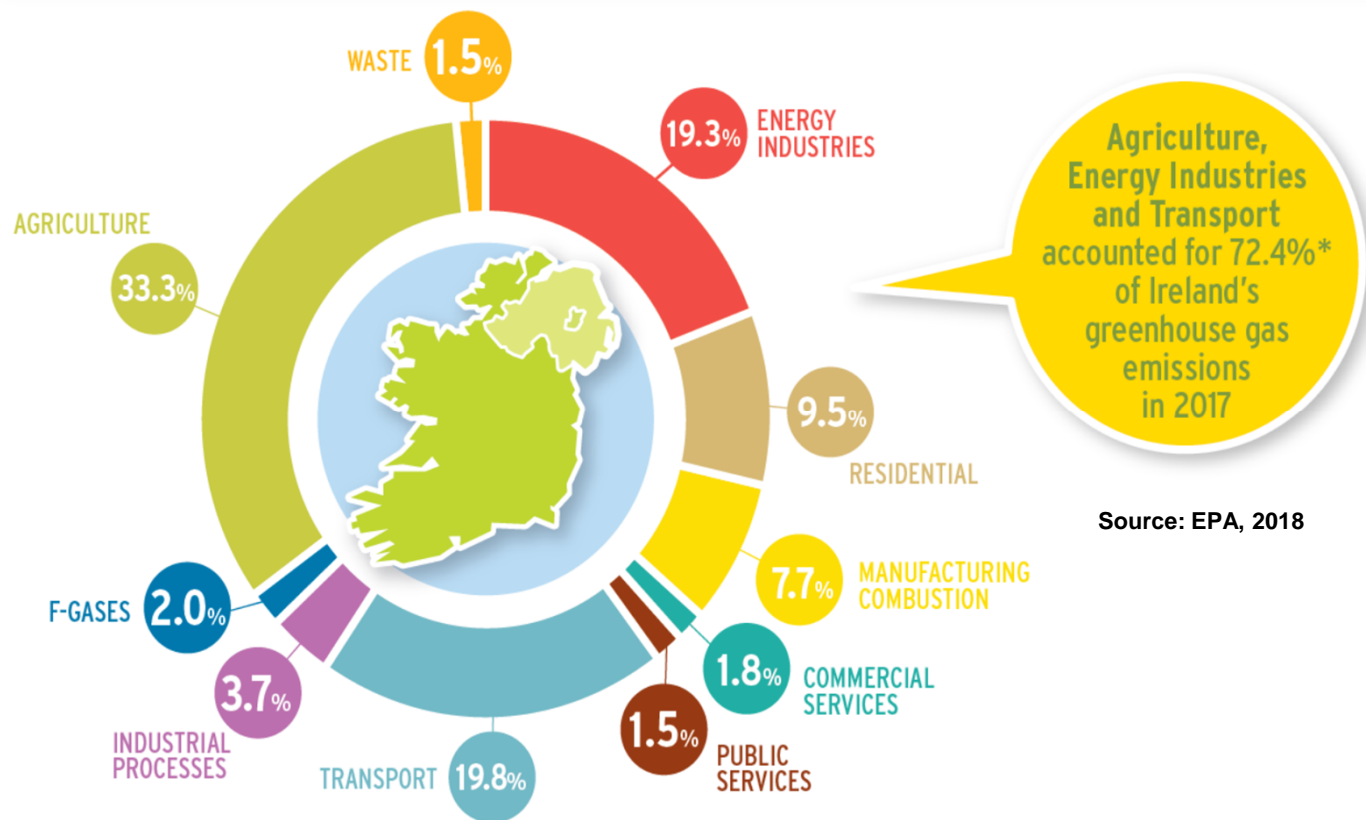


3. Biodiversity Indicator

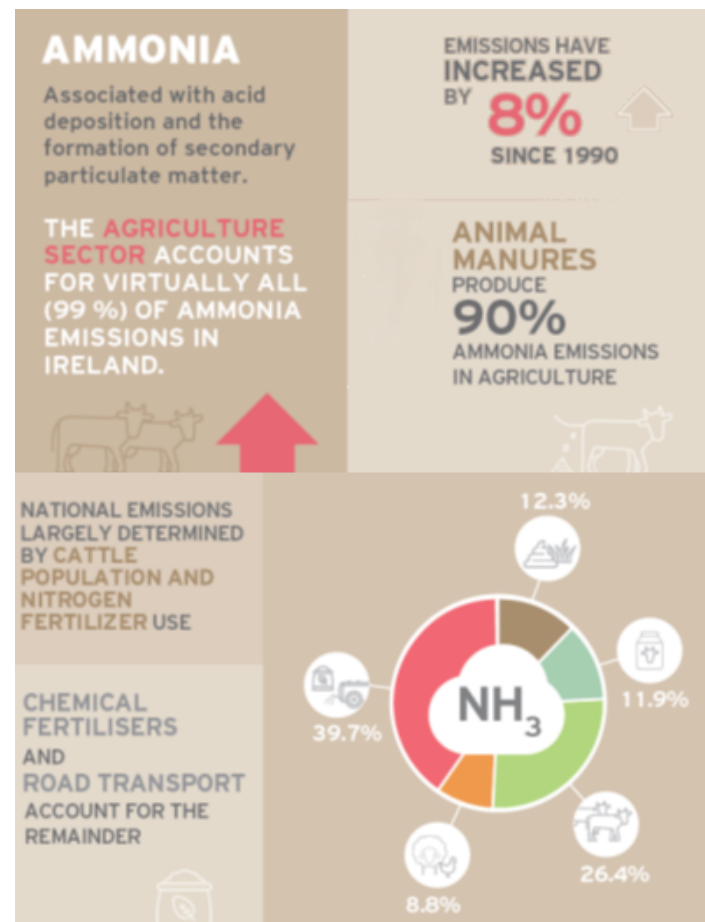
- In development



Gaseous Emissions - Agriculture

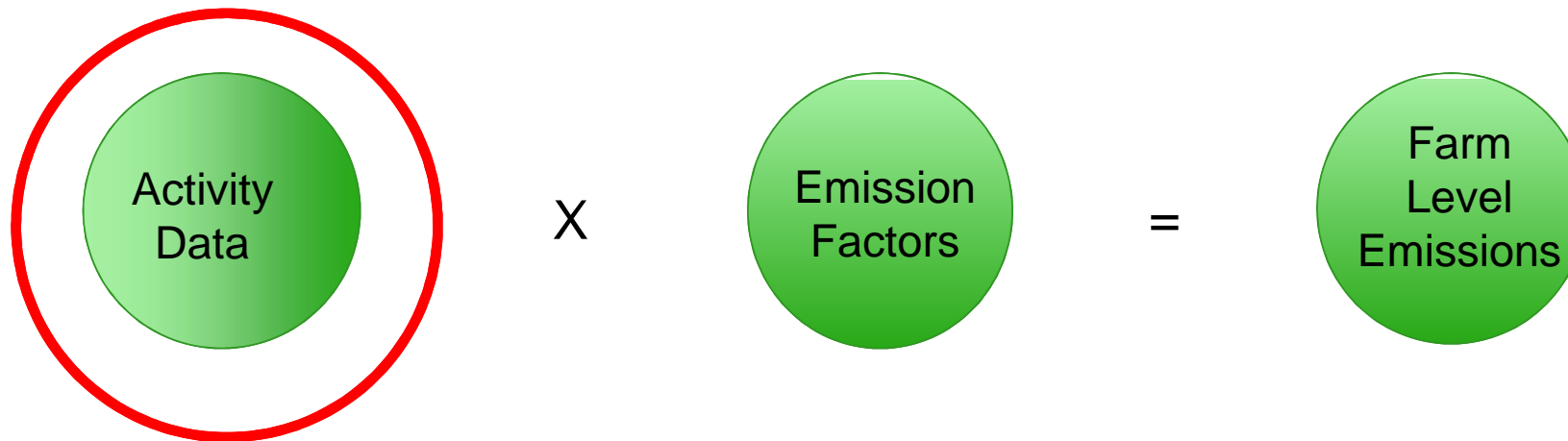


Source: EPA, 2018



Source: EPA, 2018

Emissions – How are they calculated



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

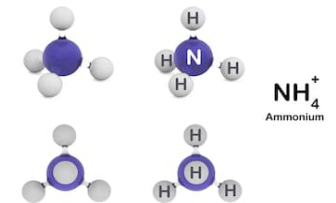
Methodological approach – Emission Factors

- GHG - All in common currency of CO₂ equivalence
 - » IPCC based national inventory approach for all farm types
 - » Replicating approach used by EPA at national level



- Ammonia

- » 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 850+farmers representing over 90,000 nationally
- 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)



Activity Data Projections – 2020

1. Animal Inventories

- CSO June survey 2019 vs 2020

2. Chemical Fertiliser Sales

- Sales data DAFM Sept 2019-October 2020

■ Apply these changes to farms with the Teagasc NFS

- Using 2019 as the base year

Animal Numbers June 2019 vs 2020

Animal inventories	2019 vs 2020
Total cattle	+1.47%
Dairy cows	+4.18%
Other cows	-1.64%
Bulls	-4.92%
Cattle: 2 years and over	+0.66%
Cattle: 1-2 years	-2.82%
Cattle: under 1 year	+5.43%

(CSO, 2020)

Chemical Fertiliser

	2018-2019*	2019-2020*	% change
Straight CAN	121,502	122,167	0.55%
Straight Urea	44,765	43,976	-1.76%
Protected Urea	11,012	19,984	81.48%
NK Compounds	3,848	3,600	-6.44%
NP Compounds	2,204	2,003	-9.12%
NPK Compounds	179,404	184,625	2.91%
Other N Fertilisers	3,323	3,162	-4.84%
Total	362,734	376,355	3.75%

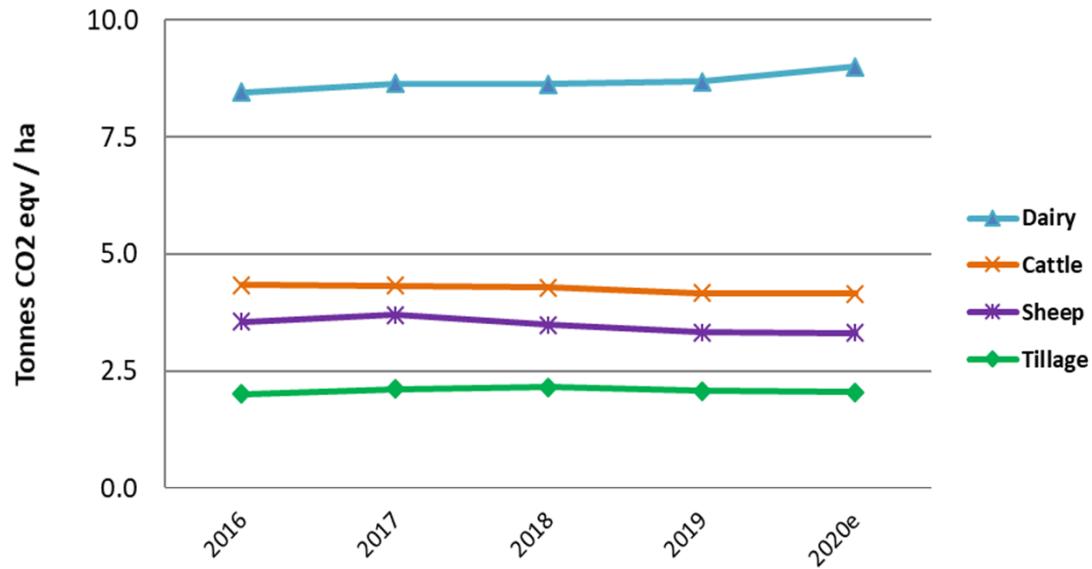
* September to October sales year (DAFM,2020)

GHG National Inventory Accounts

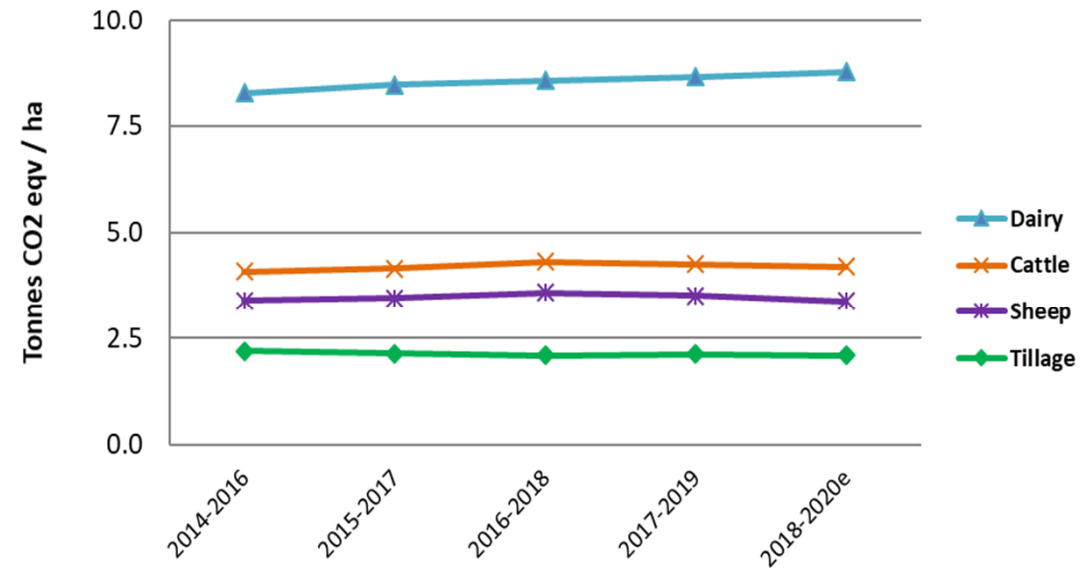
3. Agriculture (CO2 eq)	National Emission Profile IPCC Approach 2018 (% by Gas CO2 eqv)	% Teagasc NFS - 2018 Profile (% by Gas CO2 eqv)
3.A Enteric Fermentation (CH4)	58%	57%
3.B Manure Management (CH4 & N2O)	10%	11%
3.C Rice Cultivation	-	-
3.D Agricultural Soils (N2O)	30%	30%
3.E Prescribed Burning of Savannas	-	-
3.F Field Burning of Agricultural Residues	-	-
3.G Liming	2%	2%
3.H Urea Application	0%	0%
3.I Other Carbon-containing fertilizers	-	-
3.J Other	-	-
Total Emissions	100%	100%

GHG emissions per hectare

Ag. based Co2eq ha - Yearly average

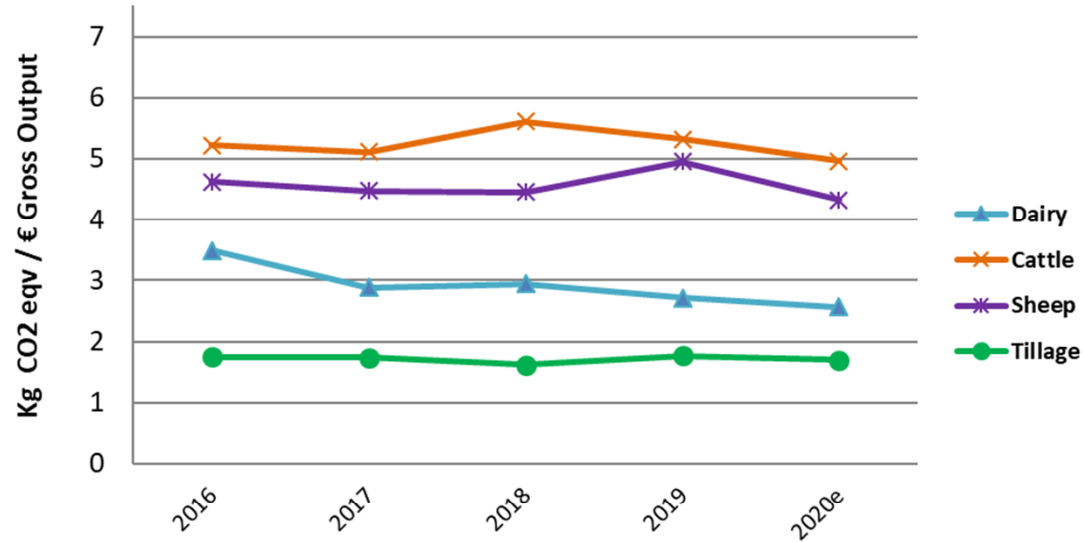


Ag. based Co2eq ha - 3 year rolling average

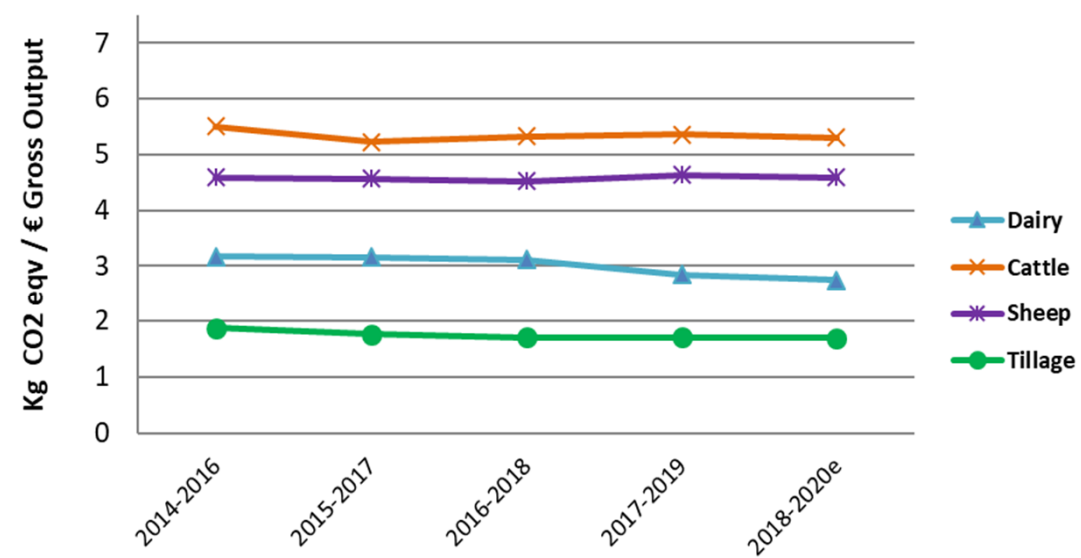


GHG emissions per € output generated

kg Co2 eqv emitted per € output -1 year basis



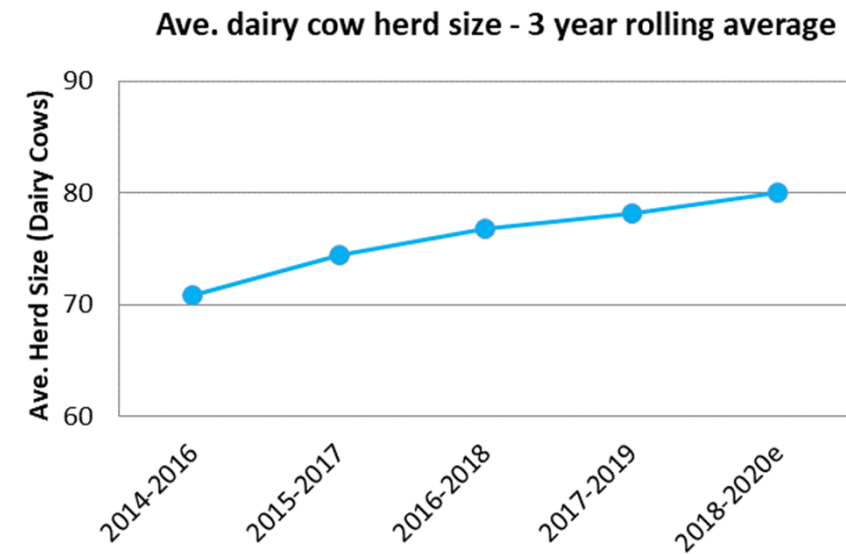
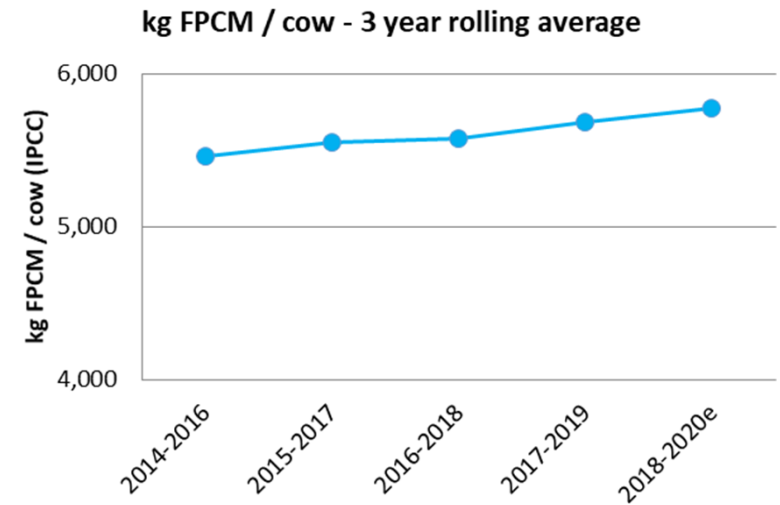
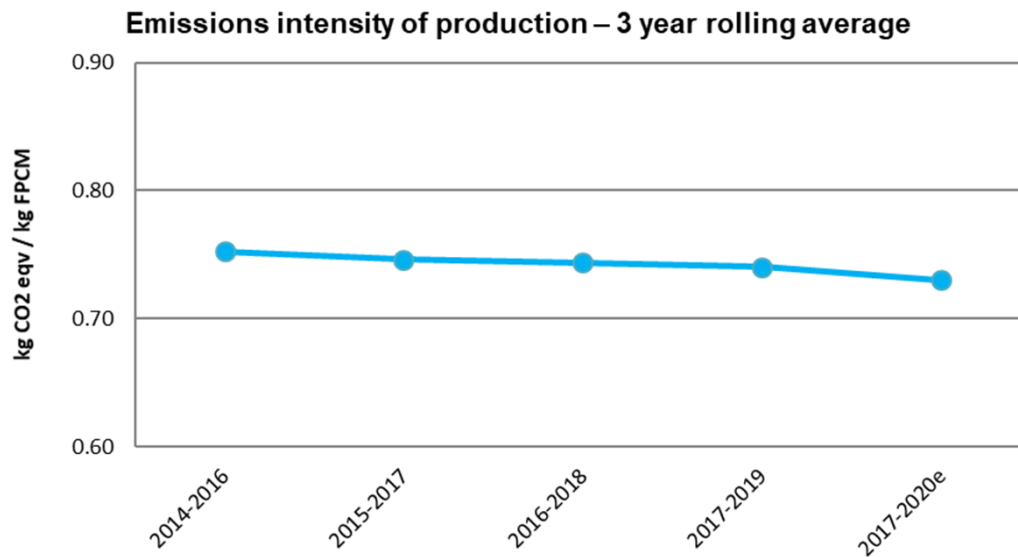
kg Co2 eqv emitted per € output - 3 year rolling average



Dairy based Ag. GHG emissions - Components

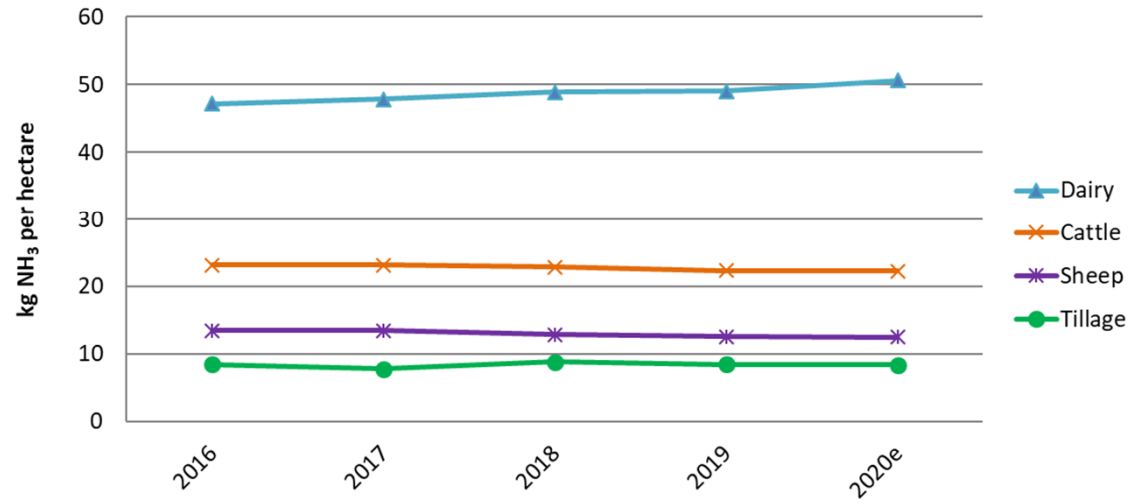
Dairy absolute GHG emissions equation = 3 Components

- (1) kg of milk produced per cow *
 - (2) CO₂e per kg of milk *
 - (3) No. of cows
- Kg of Fat & Protein Corrected Milk (FPCM) milk = Standardized to 4% fat and 3.3% protein.

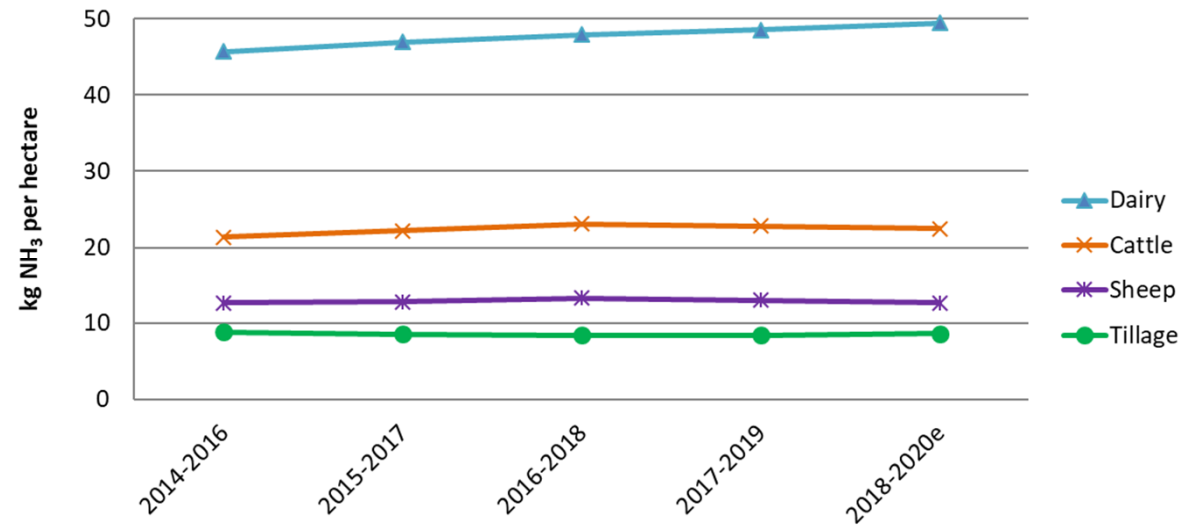


NH₃ emissions per hectare

Ammonia emissions per hectare - 1 Year basis

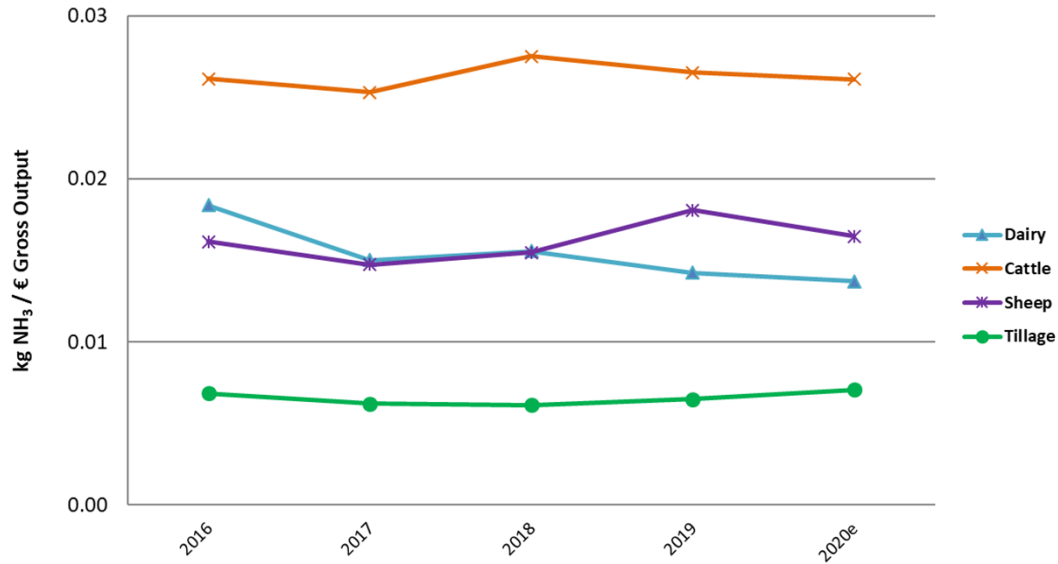


Ammonia emissions per hectare - 3 year rolling average

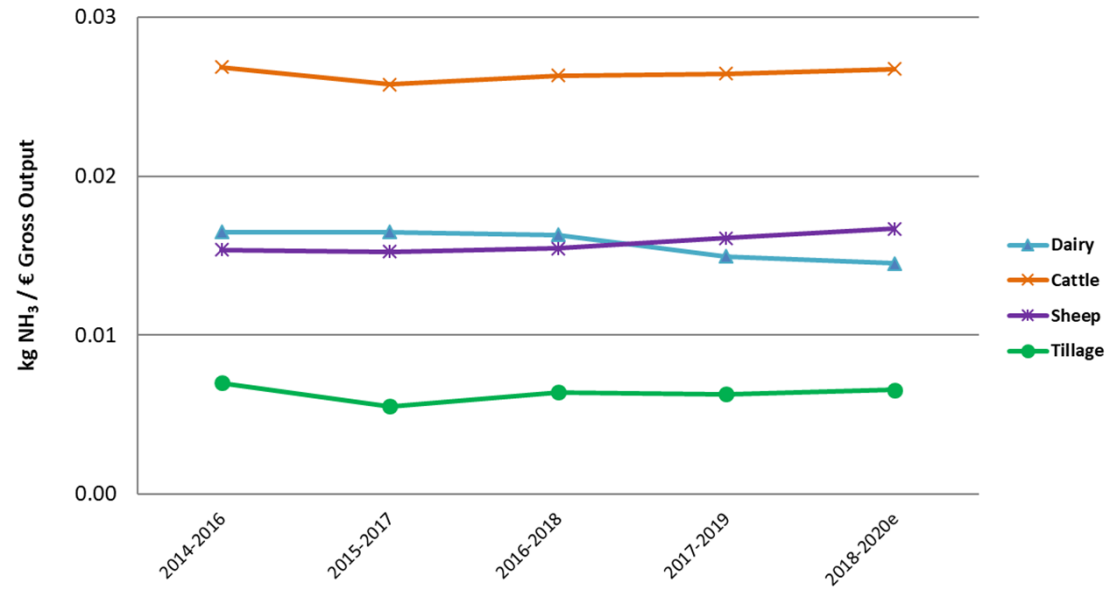


NH3 emissions per € of output generated

Ammonia Emission per € output - 1 year basis



Ammonia Emission per € output - 3 year rolling average



Summary / Conclusion

- **Increased animal numbers and fertilisers applied in 2020**
 - June animal number +1.45%
 - Chemical N sales (Sept-Oct) up by +3.75%

- **Absolute GHG & NH3 Emissions in 2020 estimates:**
 - continued to increase on dairy farms (compared to preceding years)
 - other farm systems static or in decline (cattle, sheep, tillage)

- **Emissions intensity GHG& NH3 per € of output:**
 - GHG – Tillage and Dairy have lower emission per € of output generated vs cattle/sheep farms
 - NH3 – Tillage have the lowest emission per € of output generated, cattle farms have the highest

- **Some encouraging signs:**
 - Sales of protected urea fertilisers increased by 81% year on year
 - Low emission slurry spreading transition? Not included in analysis!

Thank You

cathal.buckley@teagasc.ie

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

