Methane Emissions from Suckler Beef
An update from RumenPredict

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Challenges for Global Agriculture

➢ Feeding a rapidly increasing global population projected to rise to ca. 9.8 bn by 2050

➢ International pressure to reduce the environmental footprint

Food Wise 2025

THE IRISH TIMES
Thu, Jul 25, 2019

NEWS   SPORT   BUSINESS   OPINION   LIFE & STYLE   CULTURE

Environment ❯ Heritage & Habitat | Renewable Ireland

Ireland 'can't reach' target to cut carbon emissions by 2020

Climate Change Advisory Council chief says recession is only thing that has cut emissions

Wed, Jul 25, 2018, 15:46

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International and National Mitigation Commitments

- COP 21 (UNFCCC Paris Agreement)
  - International commitment aiming to limit global warming to well below 2° C and pursuing efforts to limit it to 1.5° C

- EU 2020 – reduce GHG by 30% based on 1990 levels
  - Ireland to reduce national GHG by 20%
  - Target missed: Irish reduction 4-6%

- EU 2030 – reduce GHG by 40% based on 1990 levels
  - Ireland to reduce national GHG by 30%
  - Requirement for a 2% decrease in national GHG/year 2020-2030

- National climate action plan - carbon neutrality by 2050
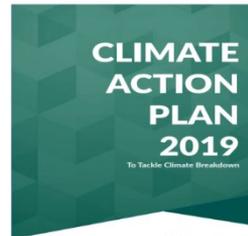
Irish Greenhouse Gas Emissions

- In 2018 agriculture accounted for 34% of national GHGs

- Emission arising from enteric fermentation account for 58.9% of agri emissions
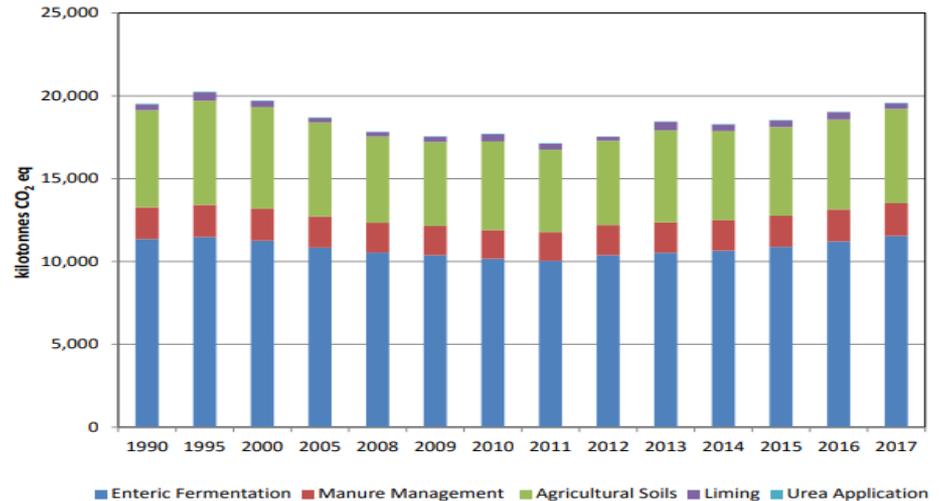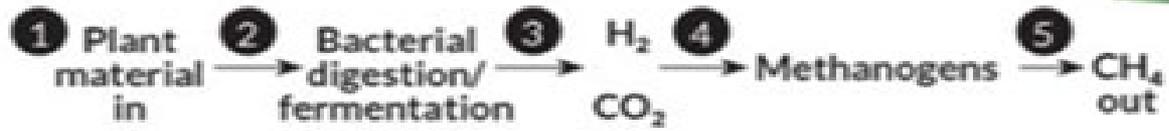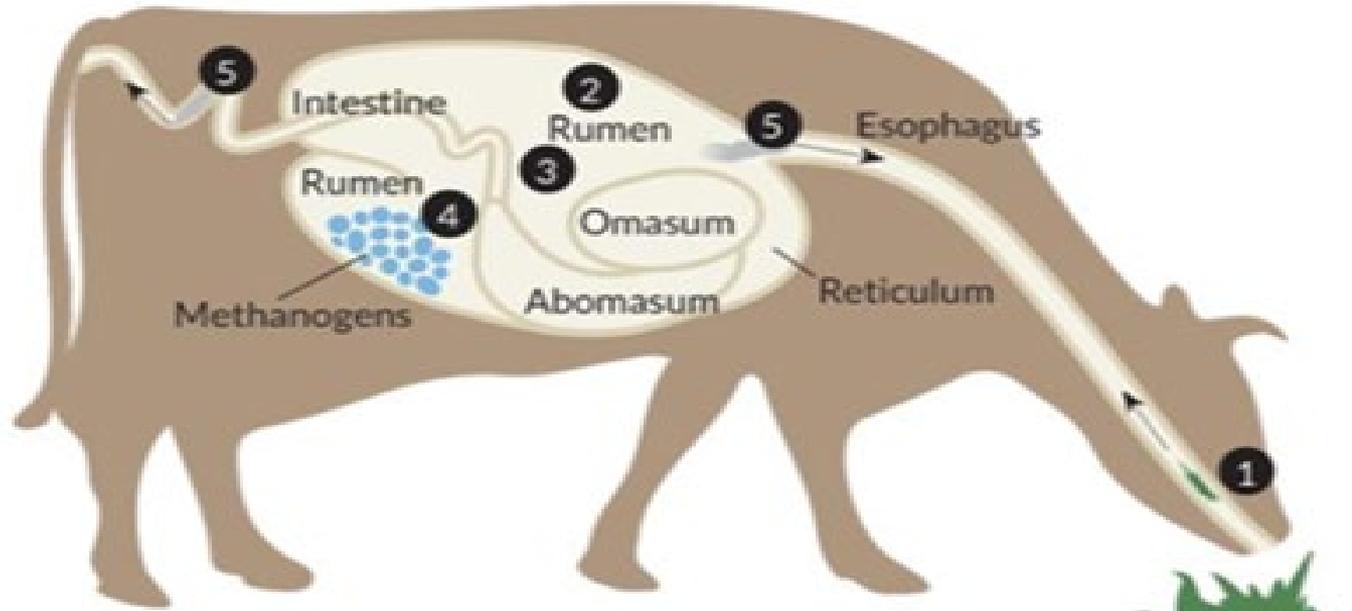
- 19% of Ireland's overall GHG emissions

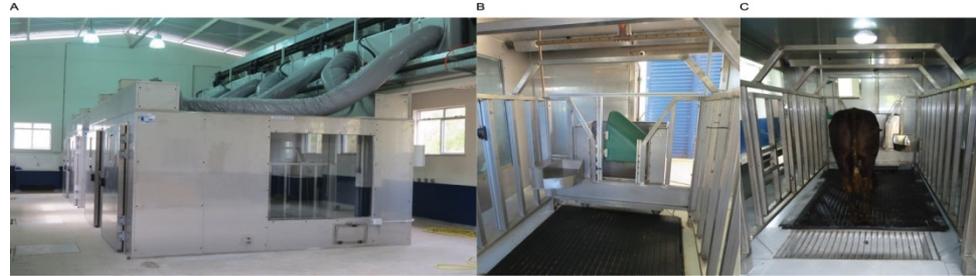Figure 5.1 Total Emissions from Agriculture by Sector, 1990-2017

(EPA, 2019)

Methane

Measuring Methane Output

- Methods to measure methane output:

  - Respiration chamber

  - SF_6 tracer method

  - GreenFeed system

- Reporting methane output:

  - Daily methane output (CH_4 g/ day)

  - Methane yield (CH_4 g/ kg of DMI)

  - Methane intensity (CH_4 g/ kg of carcass weight)

Methane Mitigation Strategies for Irish Beef

- ~~Reduce livestock numbers~~

- Diet
  - Supplementary additives
  - Improvements to pasture quality

- Animal selection
  - Identify and select animals with reduced methanogenic potential
  - Select animals for increased feed efficiency
  - Permanent and accumulative benefits
  - Biology ?

HO—O—NO_2

3-nitrooxypropanol
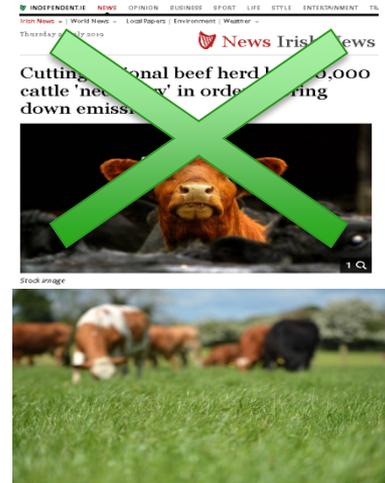
RumenPredict

RumenPredict is a international collaboration which aims to link the rumen microbiome, host genetics and phenotype to benefit mitigation strategies

- FACCE ERA-GAS part of ERA-NET and Horizon 2020

- Budget: €1.5 million

- 36 months

- http://www.eragas.eu/research-projects/rumenpredict

Project Objectives: *Enhance the understanding of the role of diet, host genetics, and rumen microbiome on environmental outputs (GHG)*

Irish RumenPredict Team

Prof Sinead Waters (PI)

Prof David Kenny

Dr Matt McCabe

Dr Alan Kelly

Dr Stephen Conroy

Stuart Kirwan

Paul Smith
(PhD student)

Enhanced understanding of the role of diet, host genetics, and rumen microbiome on environmental outputs (GHG)

## 3 tier approach required to enhance our understanding

1. Identify cattle divergent in their level of feed efficiency and environmental output

   - FCR, RFI, methane

2. Identify key rumen microbes associated with different phenotypes

   - Amplicon and shotgun sequencing

3. Perform a GWAS to identify DNA based biomarkers that link the rumen microbiome and efficiency phenotypes
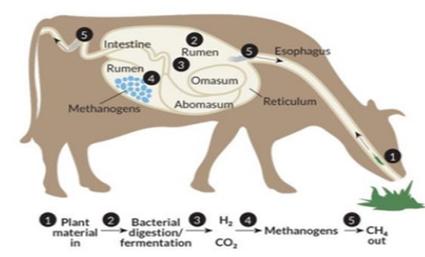
Identify cattle divergent in their level of feed efficiency and environmental output

- ICBF Progeny Test Centre in Tully Co. Kildare
  - Performance test >500 beef cattle per year
  - Various breeds and sires
  - Measure feed intake, FCR, ADG, meat quality, fat scoring
- Cattle undergo 120 day finishing period
  - 30 day acclimatisation period
  - 90 day feed efficiency period
- Estimate enteric methane production
  - 4 week training period
  - 3 week methane estimation period
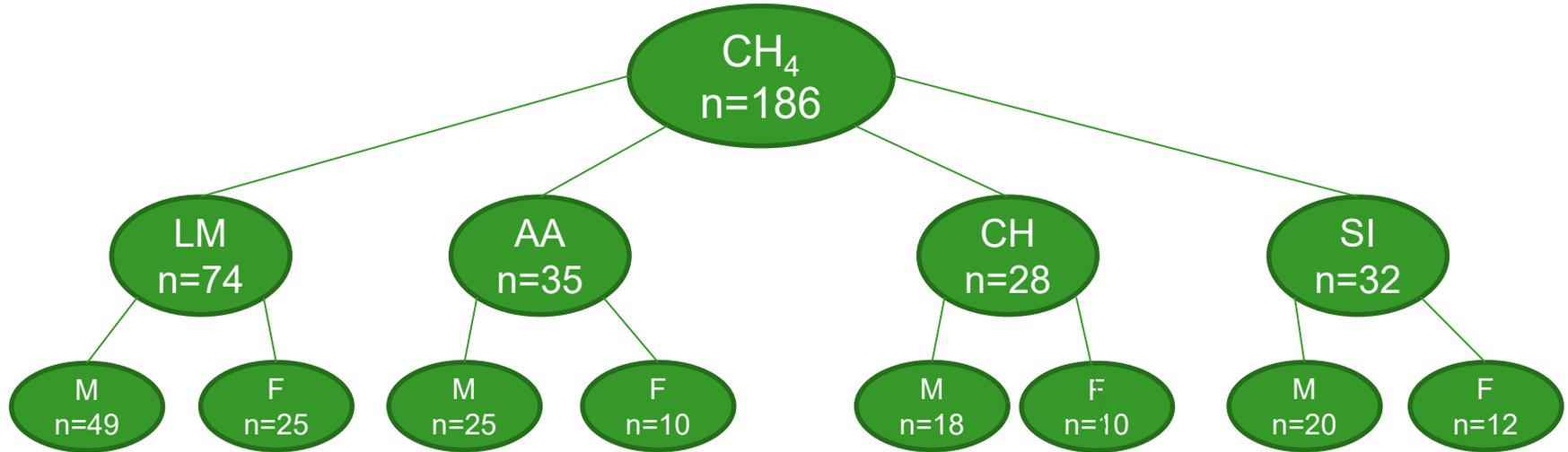 - Rumen fluid, saliva, blood, faecal and urine samples collected
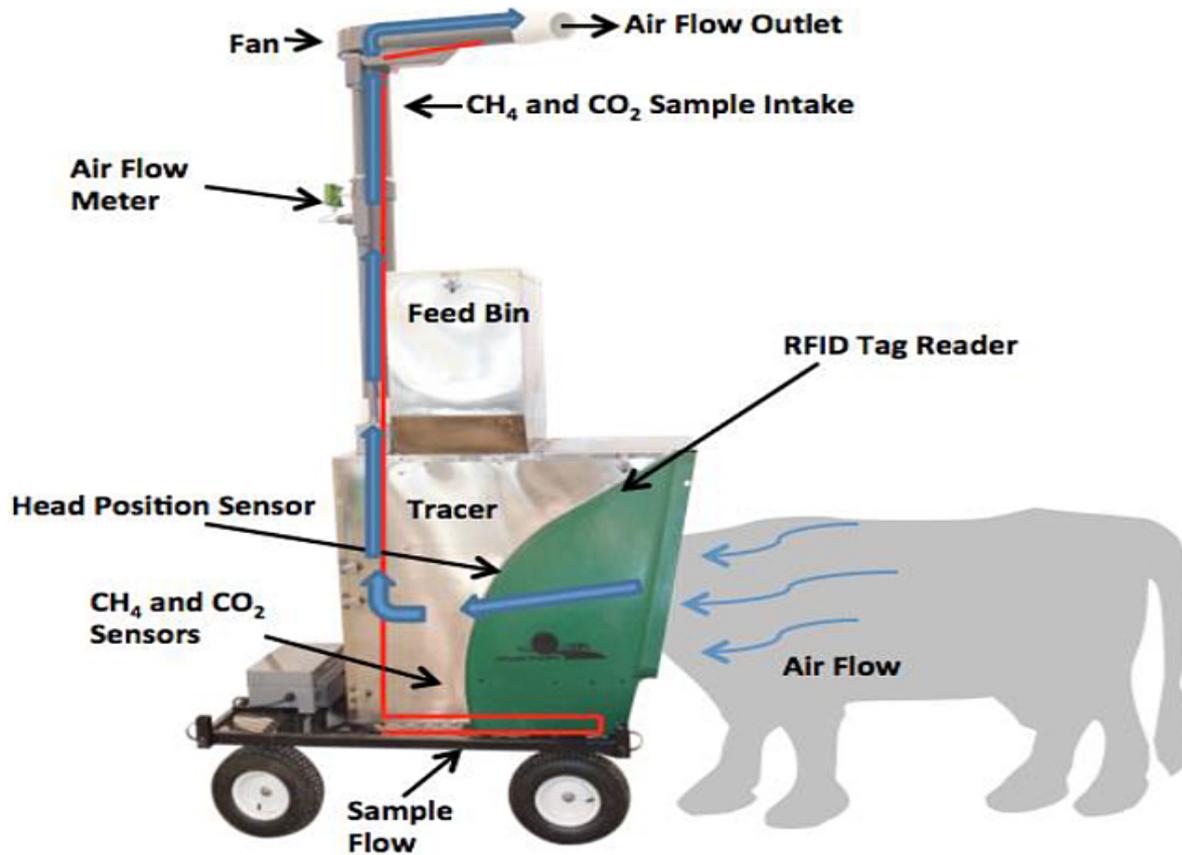
GreenFeed Protocol

Preliminary Results to Date

Breed Composition

Average Emissions

Preliminary results

	Mean (n=186)	Std Dev	CV %
Age (months)	16.6	1.4	8.2%
Weight (kg)	521.1	85.5	16.4%
Feed Intake (kg of DMI)	10.7	1.8	16.9%
Daily Methane (g/day)	233.8	50.9	21.8%
Daily Carbon Dioxide (g/day)	8796.2	1114.7	12.7%
Methane Yield (g/kg DMI)	22.2	4.6	20.7%
Carbon Dioxide Yield (g/kg DMI)	837.7	109.3	13.1%
*Methane Intensity (g/kg BW)	0.4	0.1	21.1%
*Carbon Intensity (g/kg BW)	16.8	1.9	11.1%

Key natural variation in GHG exists

* Proxy for methane and carbon dioxide intensity

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Agriculture and Food Development Authority

Average Emissions (Type)

Preliminary results

|	Heifers (n=56)	Steers (n=130)	Difference %
Age (months)	15.8	17.0	**7.2%**
Weight (kg)	504.8	528.2	**4.4%**
Feed Intake (kg of DMI)	10.1	10.9	**7.1%**
Daily Methane (g/day)	220.4	239.6	**8.0%**
Daily Carbon Dioxide (g/day)	8159.0	9070.7	**10.1%**
Methane Yield (g/kg DMI)	22.1	22.3	**0.7%**
Carbon Dioxide Yield (g/kg DMI)	818.4	845.9	**3.3%**
*Methane Intensity (g/kg BW)	0.4	0.4	**2.7%**
*Carbon Intensity (g/kg BW)	16.2	17.0	**4.7%**

* Proxy for methane and carbon dioxide intensity

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Will Reductions to Methane Production Enhance Profitability?

Methane Yield and €uro Star Replacement Index

Preliminary results

r = -0.22
(P<0.03)
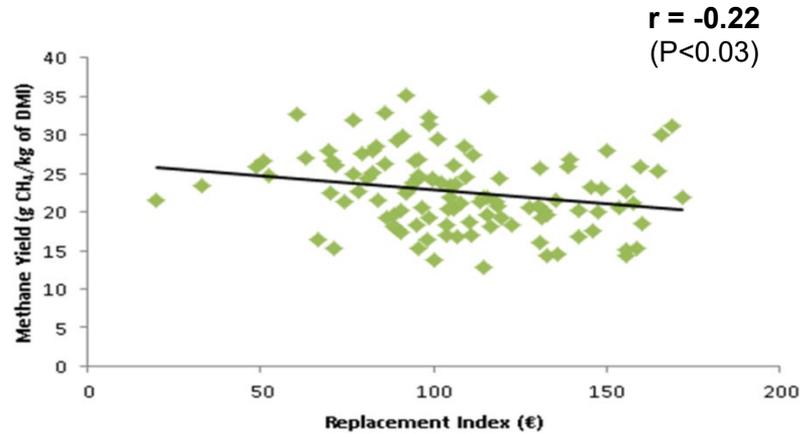
Microbiome **A**pplications for **S**ustainable food systems through

master

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Acknowledgements

- Teagasc
  - Prof Sinéad Waters (PI)
  - Prof David Kenny
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  - Jamie Farry
  - PJ Hegarty
  - Niall Kilrane

IRISH FARMERS JOURNAL

Tully now climate-testing all beef progeny

Thomas Hubert visits the extension to the ICBF's Tully test centre, where all cattle now go through a research project aiming to breed animals with lower greenhouse gas emissions.

ICBF.com Irish Cattle Breeding Federation

'RumenPredict' and Measuring Methane in Tully

Thank You

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