Reducing methane emissions: the role of feed additives

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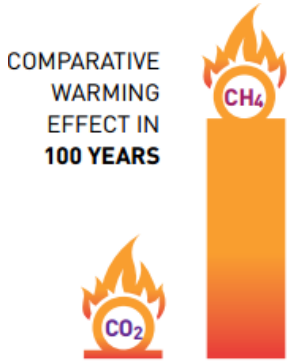
Teagasc
Agriculture and Food Development Authority

Methane emissions

- **Agriculture** is responsible for 37% of Ireland's Greenhouse Gas (GHG) emissions

- Sources of **methane** from **Irish agriculture**:
  - Enteric fermentation (feed digestion) - 56%
  - Stored slurries & manures - 10%

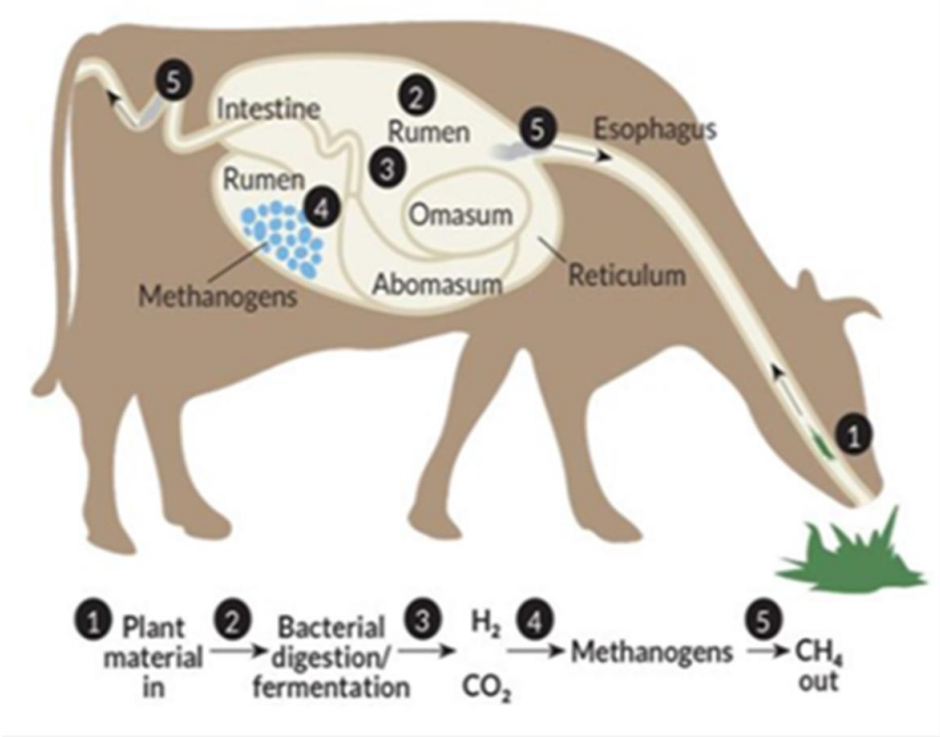
- **Climate Action and Low Carbon Development Bill 2021**
  - 22-30% proposed reduction in Agri emissions on a 2018 baseline by 2030



Duffy et al. 2020

How is enteric methane produced?

- **Methanogenesis in the rumen during feed digestion**



$$CO_2 + 4H_2 \rightarrow CH_4 + 2H_2O$$

Inefficiency: 2–12% loss of feed energy for the animal

How are we going to reduce methane emissions from agriculture in Ireland?

- Improved management practices – Farm efficiency
  - Teagasc MACC
- Breeding strategies (Teagasc and ICBF)
- Feeding strategies – Feed additives

METH-ABATE - Development of novel farm ready technologies to reduce methane emissions from pasture based Irish agricultural systems

- **Feed additives** to mitigate methane emissions – monitoring their effects on animal productivity (cattle and sheep)
  - 3-NOP (Bovaer), seaweeds, oils, halides, yucca extracts, olive feed.

- Encapsulation for **slow release** options at pasture

- **Nutritional and toxicological** composition of meat and milk - to confirm **consumer safety – no residues**

- Teagasc **Life Cycle** (LC) Analysis models

- **Farm level cost effectiveness** will be evaluated - **national farm survey**.



An Roinn Talmhaíochta, Bia agus Mara
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Additives evaluated *in vitro* Rumen Simulation Technique

- Plant/oil extracts
- Olive by-products
- Short-lived reactive oxygen halide species
- Seaweeds
  - *Alaria esculenta* (B)
  - *Himanthalia elongate* (B)
  - *Fucus vesiculosus* (B)
  - *Fucus serratus* (B)
  - *Bifurcaria bifurcate* (B)
  - *Ascophyllum nodosum* (B)
  - *Pelvetia canaliculata* (B)
  - *Asparagopsis taxiformis* (R)
  - *Palmaria palmate* (R)
  - *Chrondus crispus* (R)
  - *Ulva intestinalis* (G)
- Seaweed extracts

GlasPort Bio

The Olive Feed Corporation
Premium Feed made from the worlds best olives

Inform Nutrition Ireland

SEASOLUTIONS

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3-NOP (Bovaer)

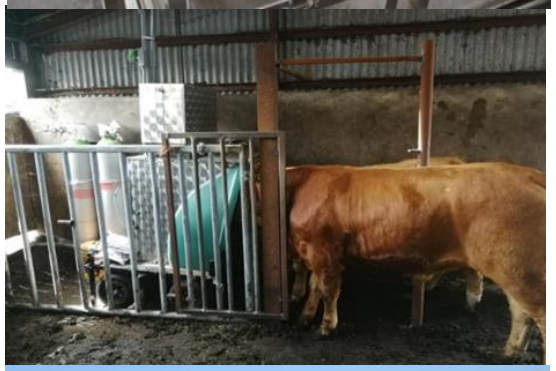

Irish Examiner
Now available without prescription from your local pharmacy
3-NOP can reduce cow methane emissions by 30%
A Dutch company is seeking EU authorisation for a feed additive for dairy cows to reduce their methane emissions by around 30%.
BOVAER® CAN HAVE A TREMENDOUS POSITIVE IMPACT FOR US, FOR THE PLANET, AND FOR FUTURE GENERATIONS
Bovaer®
One burp at a time
Cows make methane
Methane traps heat
Bovaer® reduces methane
30%
How it works
Bovaer® saves 1 tonne of CO2 equivalent per cow every year
Results of trial with methane inhibitor Bovaer®
Reduction methane production per cow
Common ration for dairy cows across the Netherlands* 40% maize silage 60% grass silage 36%-38%
Ration for dairy cows, more common in the northwest of the Netherlands* 100% grass silage 27%-29%
Ration for dairy cows, more common in the southeast of the Netherlands* 80% maize silage 20% grass silage 35%-40%
CH4
DSM

Irish animal trials

- **Sheep:** May-September 2021
  - Agolin, Mootral, oils, halides, seaweed, seaweed extract

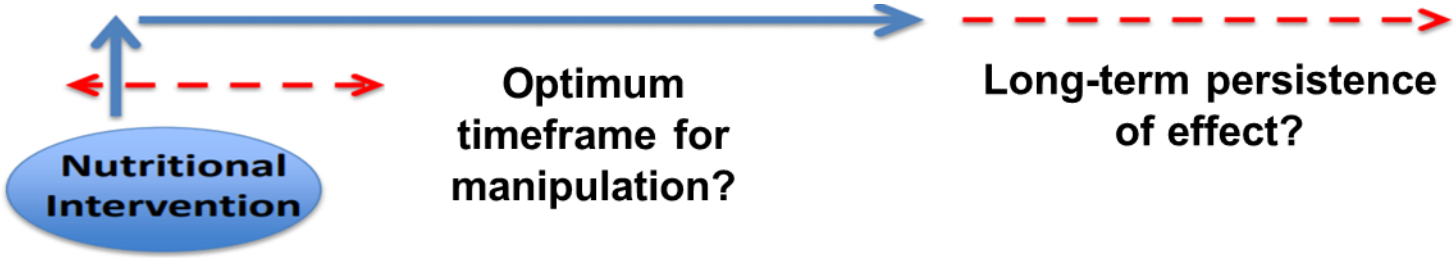
- **Beef:** commencing 2022
  - *Ad lib* grass silage + concentrates
  - Treatments: Control, 3-NOP, plus most promising additives from sheep study

- **Dairy:** commencing 2022
  - Grazed swards (Grass + clover)
  - Treatments: Control, slow-release 3-NOP and most promising additive from sheep study



Early life intervention

- **First month of life** presents a time-frame during which the rumen microbiome becomes established



- Lasting effects on rumen functionality including methanogenesis, which can extend into later life

- **Meale et al. (2021)** - Early-life administration (oral dose) of dairy calves with 3-NOP from birth-to-14 weeks of life

- Reduction in methane emissions, which persisted to 12 months of age

- Cumulative reduction of circa 150 kg of CO2eq per head in these cattle during the first year of life

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INRAE la science pour la vie, l'humain, la terre

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Summary

- Methane is a potent agricultural GHG
- National and international commitments to significantly reduce methane emissions
- Promising feed additives being assessed under a systematic approach, for methane mitigation potential
- Slow release for application at grazing
- Potential for early life intervention

Thank you for your attention