Peter Lund

Ruminant Methane Mitigation Conference

Art of the possible by 2030 and beyond

#MethaneBFS23

ADOPTION BY INDUSTRY & THE INVENTORY – A NORTHERN EUROPEAN (DANISH) PERSPECTIVE

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BSAS
Nov 2023
15 min. incl questions

TOP 5 CONTRIBUTORS TO DANISH AGRI GHG

1. Enteric fermentation, mainly from ruminants, CH_4 (33%)

2. Manure management, CH_4 (20%)
3. Inorganic N fertilizer, N_2O (10%)
4. Manure on soil, N_2O (9%)
5. Crop residues, N_2O (8%)

Nielsen et al. (2022)

CH_4 IS HIGH ON THE PUBLIC AGENDA

A (significant) CO_2-tax is on its way (2030: 750-1100 DKR / t CO2-eq [88-129 £])

Not decided how the revenue should be used, a significant premium for use of Bovaer is one suggestion from the Government

Very passionate discussions in media and social media.

- Whether it is possible to use CO_2-eq to compare CH_4 and CO_2 emissions?
- Are cows contributing to global warming?
- If the number of cows in Denmark should be reduced?
- Animal welfare in relation to the use of feed additives?

DANISH NATIONAL INVENTORY

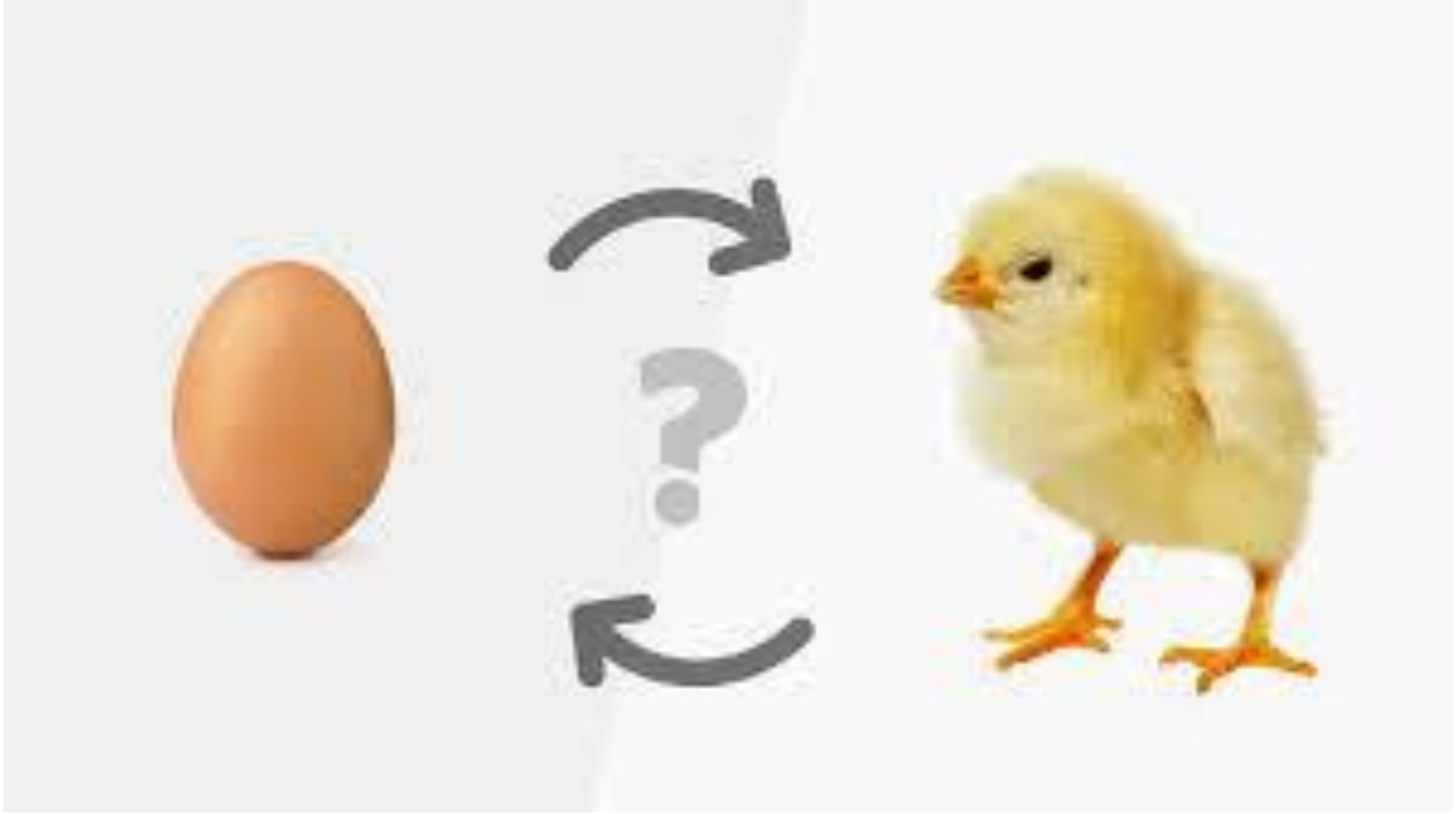
Methane (kg/cow/y) = **GEI** (MJ/d) x 0.01 x **Ym** (%) x 365 (d/y) / 55.65 [MJ/kg CH_4) (IPCC)

Ym (%) = 7.55 – 0.0343 x **DMI** (kg/d) – 0.0199 x **CF** (g/kg DM) – 0.0014 x **Ash** (g/kg DM) + 0.028 x **NDF** (g/kg DM) – 0.0045 x **Starch** (g/kg DM) (Hellwing et al., 2016)

Ym (%) = 5.78 % in 2020

Input: On farm data on milk production and nutrient composition of diets

INSTRUMENTS – BUSINESS CASE



SIDE EFFECTS & ETHICAL CONSIDERATIONS

Question: If a given new feed additive reduces methane by **50%**, but **1%** of the cows gets sick (malaise) and **0.05%** of cows die, will you then accept this instrument as a stakeholder?

SIDE EFFECTS & ETHICAL CONSIDERATIONS

Question: If a given new feed additive reduces methane by **50%**, but **1%** of the cows gets sick (malaise) and **0.05%** of cows die, will you then accept this instrument as a stakeholder?

It is very clearly stipulated by the Danish Government that:

"Emissions from livestock digestion and manure handling must be reduced, while animal welfare is not impaired”

SIDE EFFECTS & ETHICAL CONSIDERATIONS

Unwanted compounds

Bromoform and other compounds in biological material like seaweed

Effect on methemoglobin and N-compounds in milk from feeding nitrate

EU-regulations and perceptions may differ from other markets

Beef and dairy are global commodities

Pressure on European producers to accepts instruments otherwise seen as problematic.

ADDITIVITY & INTERACTIONS

Methane (kg/cow/y) = **GEI** (MJ/d) x 0.01 x **Ym** (%) x 365 (d/y) / 55.65 [MJ/kg CH_4) x **red%Additive$_1$** x **red%Additive$_2$** x …… x **red%Additive$_n$**

5 additives in play (Bovaer, Nitrate, Fat, Asparagopsis, Essential oils): 32 permutations !

FAT X NITRATE X BOVAER

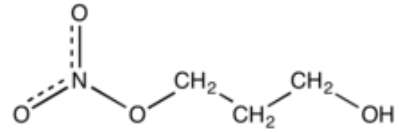
2x2x2 factorial arrangement

- Low/high fat: 3% crude fat vs. 6% crude fat (**Low fat** vs. **High fat**)
- -/+ Nitrate: 10 g/kg DM (**Urea** vs. **Nitrate**)
- -/+ 3-NOP: 80 mg/kg DM (**Blank** vs. **3-NOP**)

= 8 different diets

Fat: whole cracked rapeseed

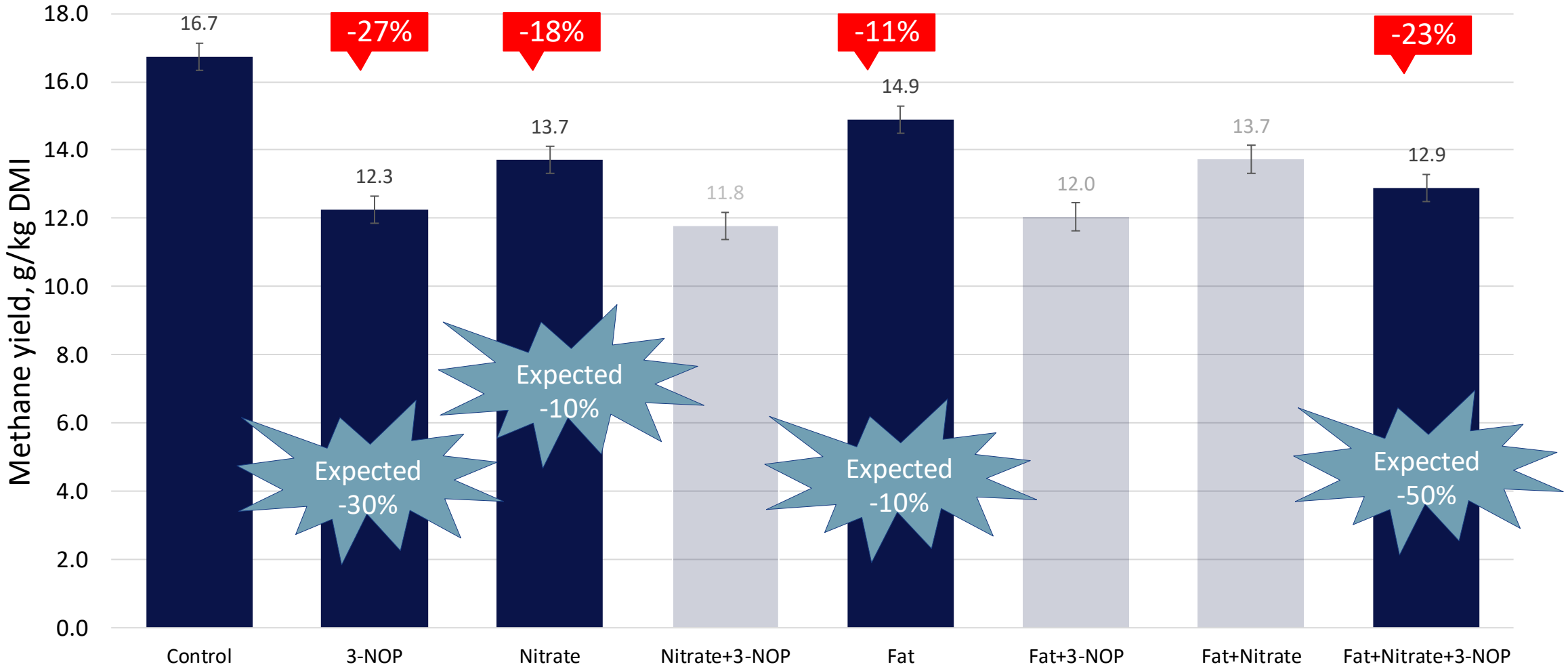
Nitrate: Calcium nitrate; SilvAir ®



3-NOP: Bovaer ®

Maigaard et al. (2023)

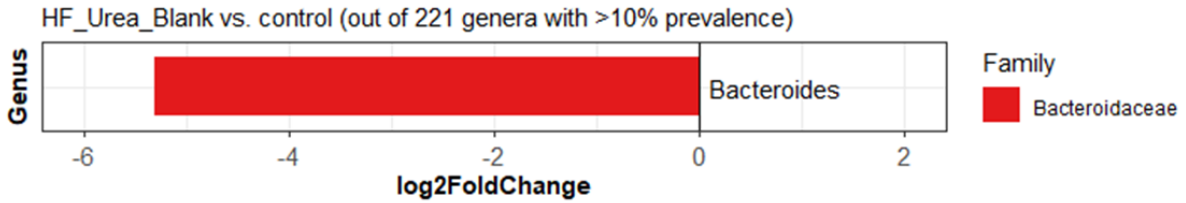
METHANE YIELD, g/kg DMI



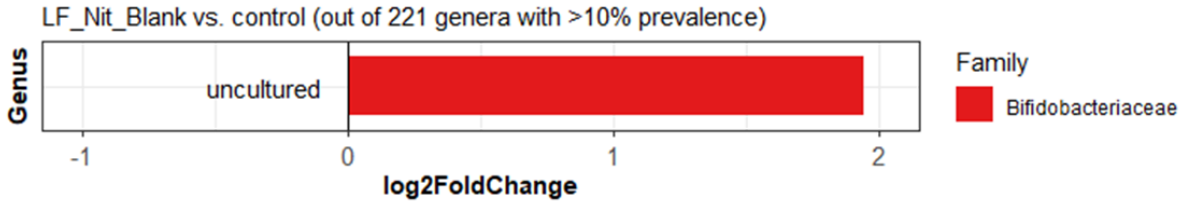
Maigaard et al. (2023)

RUMEN MICROBIOME

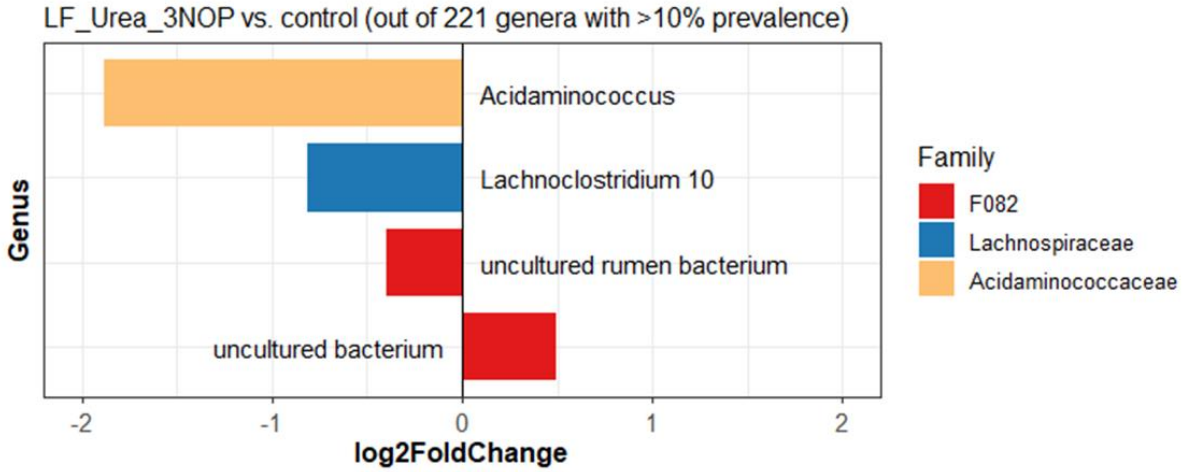
+ FAT



+ NITRATE



+ 3-NOP



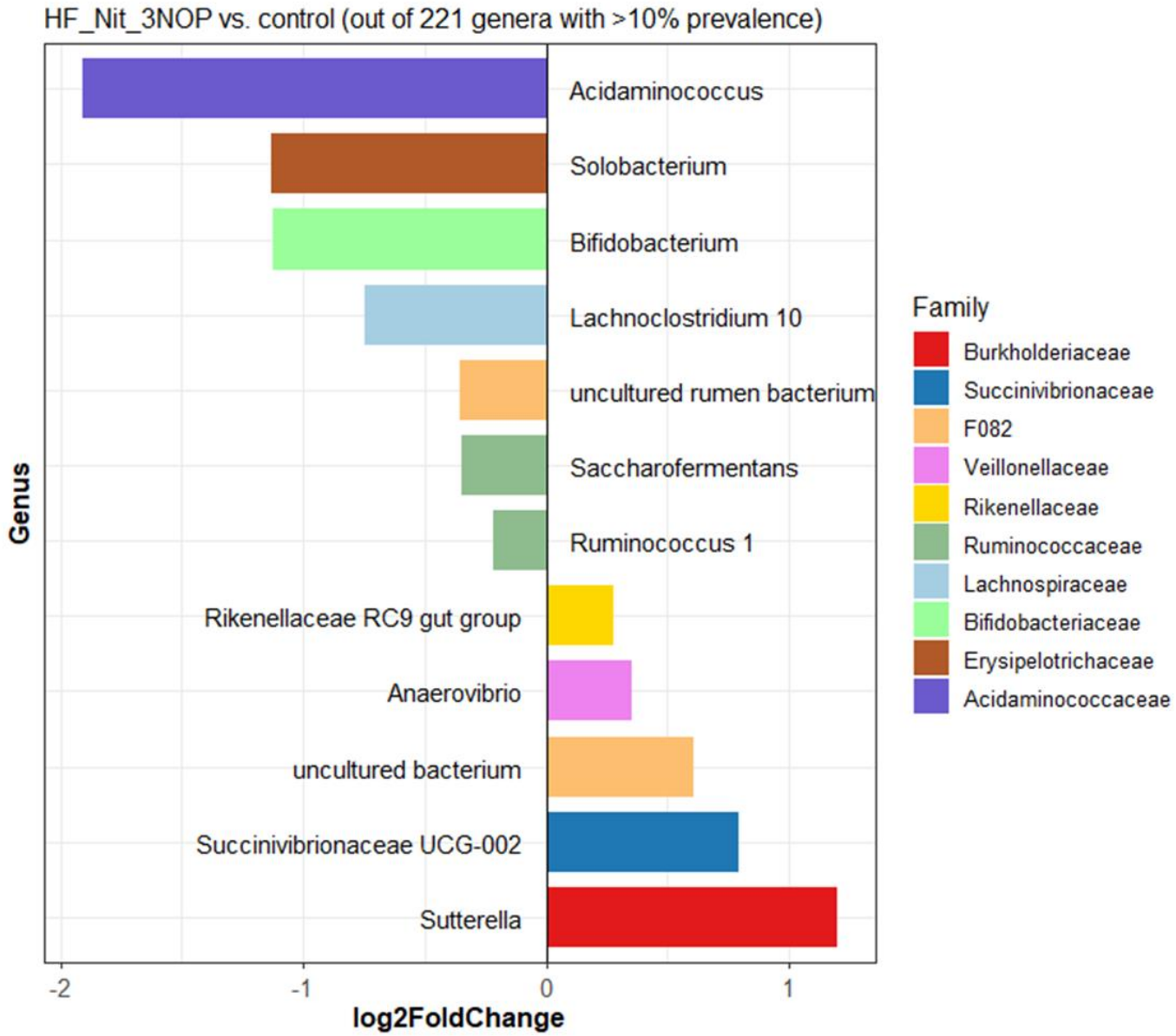
Noel et al. (2022)

RUMEN MICROBIOME

+ NITRATE

+ 3-NOP

+ FAT



DOCUMENTATION

On a national level:

Access to representative data on: Milk yield, feed intake, amount sold of a given additive.

Leads to reasonable estimation of proportion of the national herd fed a given additive.

On a farm level:

Prerequisite that a feed additive comes as part of a concentrate or mineral mix.

Audit and analysis of feed samples are too costly at present.

Online measurement of methane is an immature technology (cow level; barn level).

Proxies in milk are challenges by absence of residues in milk or only very small amounts.

Is a feed plan sufficient documentation for use and correct dose?

The instrument should be cheap, meaning that the premium ideally should be directly reflected in the price and cover the marginal costs.

These tools should be developed in collaboration with the industry e.g. FEFANA

STANDARDISATION - GREENWASHING

Case: A given additive has a methane mitigation potential of **25 % in the national inventory model** and **35 % in the incentive model** of an industrial stakeholder

Problems both within country and between countries

- Greenwashing – overestimation of effect
- Underestimation of effect

A common European model for efficacy of new methane mitigation feed additives will therefore be a huge step forward

- Inventory system on national level
- Farm accounting

PERSPECTIVES

In the last decade we have had a chicken-and egg problem: Business case vs. instruments vs. accounting systems/premiums

Any unwanted side effect is not an option (Denmark: animal health and welfare)

Beef and dairy are global commodities, European perspectives will be under pressure

Very strong stakeholders with different opinions calls for alignment of effects within country and between countries (avoid to be blamed for greenwashing/underestimation of effect)

Interactions and general lack of additivity poses a major problem for national and on farm accounting

Even in a Danish perspective with a long tradition of registration on farm, sufficient documentation of use will pose a challenge

Ways to avoid fraud needs to be developed, especially if premiums/taxes are significant.