Purpose led, performance driven

Creating brighter lives for all

How to communicate LCA results to feed and livestock customers

NUTRITION · HEALTH · SUSTAINABLE LIVING

DSM
BRIGHT SCIENCE. BRIGHTER LIVING.

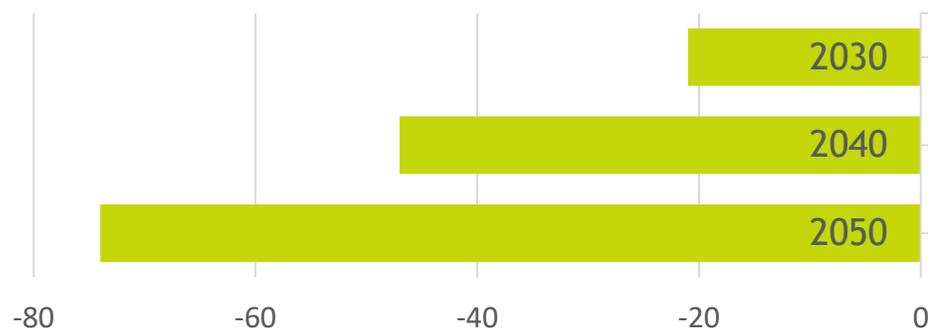# EU focus on GHG reductions from the livestock sector

The EU livestock sector will have to reduce its emissions to prevent it taking a greater share of the remaining emissions budget

Based on the Paris reduction targets current livestock production is operating outside of the 'safe space'

Average % emissions reductions needed by the EU28 livestock sector

10% of the total EU28 GHG emissions are derived from agricultural activities

40% of this comes from enteric methane

Enteric methane emissions estimated at 164 Mt CO_2-eq in 2017

DSM

GHG emissions reductions are possible if best practices are implemented across species

Cattle — **-37%**
Pigs — **-24%**
Poultry — **-17%**
Buffalo — **-30%**
Small ruminants — **-41%**

(axis: 0, 1000, 2000, 3000, 4000, 5000)
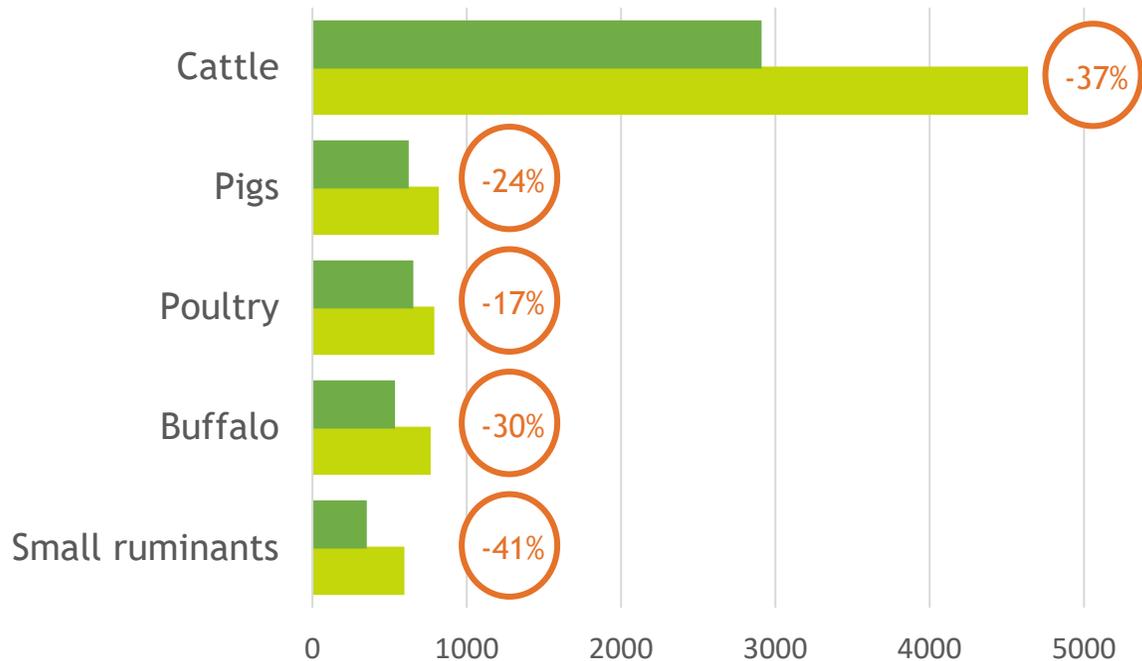
Reductions based on applying practices of the 10th percentile of producers with the lowest emissions while maintaining constant output. Million tonnes CO2-EQ

This can be achieved through the following;

Productivity gains
- especially milk & meat production and reducing food loss & waste

Improved nutrient utilization
- including the consequential reduction in manure nitrogen & its reactive forms

Lifetime performance optimization
- key for the reduction of enteric methane

Enteric methane inhibition
- imperative for fast and effective GHG reduction

Animal nutrition plays an important role in the circular economy and low carbon economy

DSM

Customer are asking tough questions

?

> How can I **MEASURE MY ENVIRONMENTAL FOOTPRINT** in a credible way ⟩

> How can I **REDUCE MY FOOTPRINT** without a negative impact on production performance and cost? ⟩

> How can I **PREDICT THE IMPACT** of a sustainability intervention upfront? ⟩

> How can I **COMMUNICATE MY SUSTAINABILITY EFFORTS** in a credible way to strengthen brand value? ⟩

> What's the **ROI** of implementing a sustainability process and foot printing tool? ⟩

> How can I **UNLOCK SUSTAINABILITY** value for my business? ⟩

4

Customers are looking for practical solutions

- Low cost, easy to implement

- Limited CAPEX, or change to the farming system

- Measurable ROI

- Substantial, measurable reduction in environmental footprint

Feed is the key area of opportunity to deliver significant reductions in footprint …. fast

DSM

A case study on the role of nutrition

DSM

Case study on the footprint of 1 kg milk
Multiple interventions, multiple impacts

Results from a multiple intervention, multiple impact, multiple species, LCA study exploring the applicability of the sector LCA guidelines (**FAO LEAP** and **EC PEF**) to the modelling of nutritional interventions

The applicability of LCA guidelines to model the effects of feed additives on the environmental footprint of animal production

Case studies based on the use of feed additives in broiler, fattening pig and dairy cow farming systems.

Reviewed by external experts for ISO 14044 compliance

Braconi N., Van Cauwenberghe S., Kok B., Bosch H., Blonk H. (2021). The applicability of LCA guidelines to model the effects of feed additives on the environmental footprint of animal production – Case studies based on the use of feed additives in broiler, fattening pig and dairy cow farming systems. DSM Nutritional Products and Blonk Sustainability Tools

DSM

Case study on the footprint of 1 kg milk
Multiple interventions, multiple impacts

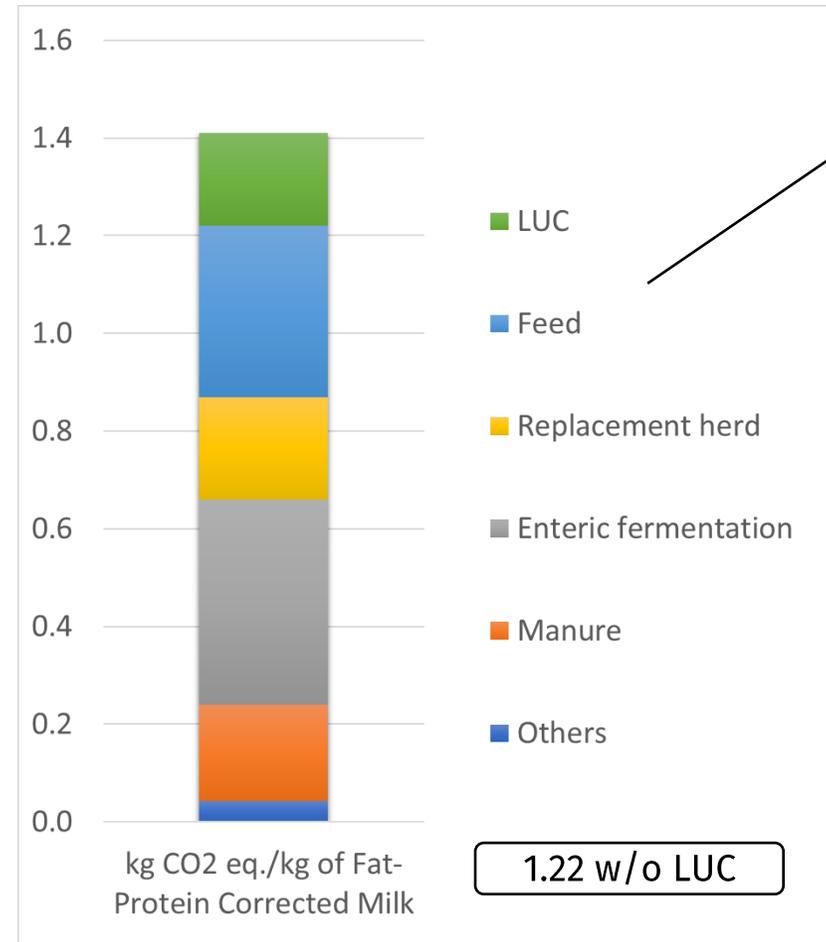*All impacts are considered. 5 lead impacts considered*

1. **Climate change (excl LUC), kg CO2 eq**
2. **Climate change, kg CO2 eq**
3. **Eutrophication freshwater, kg P eq**
4. **Eutrophication marine, kg N eq**
5. **Respiratory inorganics, disease inc.**

7. Eutrophication terrestrial, mol N eq
8. Ozone depletion, kg CFC11 eq
9. Ionising radiation, kBq U-235 eq
10. Photochemical ozone formation,, kg NMVOC eq
11. Non-cancer human health effects, CTUh
12. Cancer human health effects, CTUh
13. Acidification terres. and freshwater, mol H+ eq
14. Ecotoxicity freshwater, CTUe
15. Land use, Pt
16. Water scarcity, m3 depriv.
17. Resource use, energy carriers, MJ
18. Resource use, mineral and metals, kg Sb eq

Case study on the footprint of 1 kg milk
Multiple interventions, multiple impacts

Dairy baseline for the reference system defined, in kg CO2 eq./kg Milk

- A modern Benelux farm with a typical number of dairy cows (103), each producing 8328 kg of milk every year.

- Four animal types are considered: dairy cows (103), heifers (5), calves from 1 to 2 years of age (31) and calves below 1 year of age (35).

- Methane emission is calculated with Tier 3

- Manure is managed in pits where the manure is stored for more than one month, as defined by IPCC manure management category "Pit storage (> 1 month)".

- Farm feed consumption (dry matter basis) is 28% concentrate feed, 39% grass silage, 21% maize silage, 12% fresh grazed grass.

Chart legend:
- LUC
- Feed
- Replacement herd
- Enteric fermentation
- Manure
- Others

x-axis: kg CO2 eq./kg of Fat-Protein Corrected Milk

1.22 w/o LUC

Maize gluten feed 17.5%, Rapeseed meal 15%, Corn 15%, Soybean meal 13.66%, Sunflower meal 7.85%, Soybean hulls 5%, Wheat 5%, Beet molasses 5%, Barley 5%, Beet pulp 4.61%, Wheat gluten feed 3.06%, Limestone 1.64%, Soybean oil 0.92%, Salt 0.53%, Magnesium oxide 0.13%, Trace elements 0.05%, Vitamins 0.05%,

Origins based on NL Trade mix

GFLI data

DSM

Case study on the footprint of 1 kg milk
Multiple interventions, multiple impacts

Qualitative set of nutritional interventions

- **Vitamin E**, via its anti-oxidative properties, supports tissue function and particularly supports udder health exposed to milking stress factors.

- **25(OH)D3** (25-hydroxycholecalciferol, HyD) is an advanced source of Vitamin D with a higher potency than Vitamin D. 25(OH)D3 in dairy cows supports tissue function and thereof supports udder health exposed to milking stress factors. It also supports fertility. Via its role on calcium metabolism, it supports calcium homeostasis upon lactation onset

- **Biotin** supports horn tissue synthesis and thereof supports healthy hooves, less lameness

- **Beta-carotene** is documented for its effect on cows' fertility, via its antioxidant effects in the ovary

- **Amylase** fed to dairy cows enhances the digestion of corn starch and thereof facilitates the overall rumen digestion processes

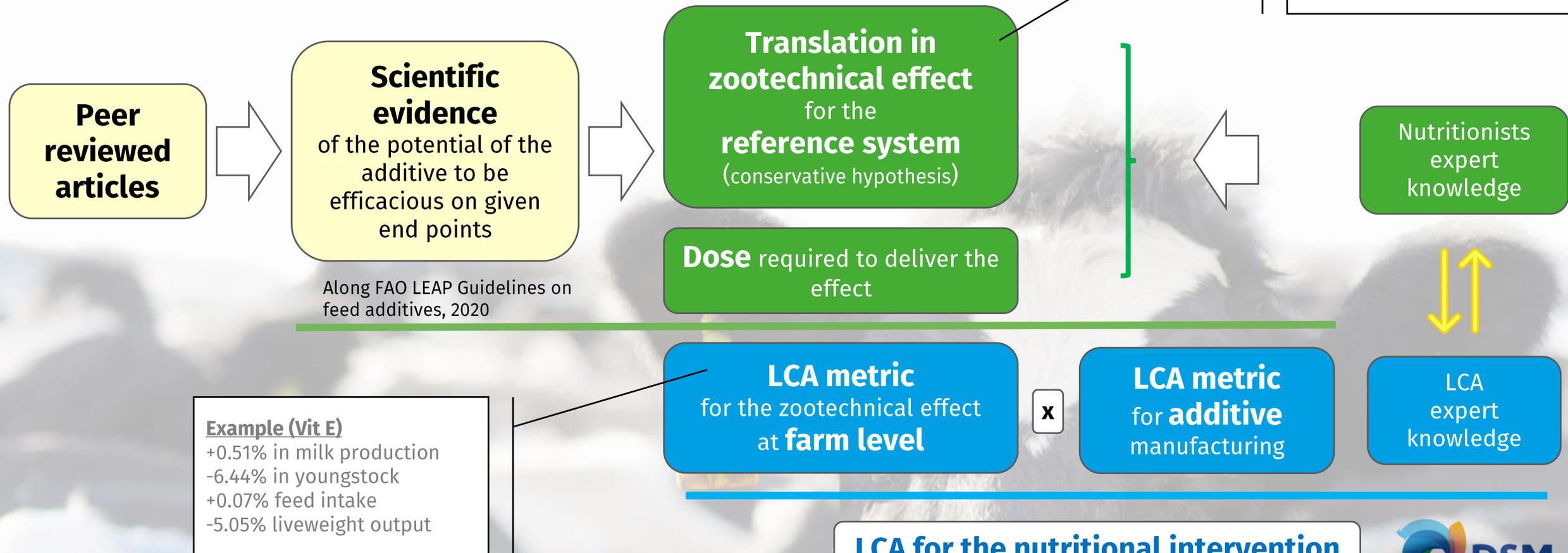*Effects substantiated in peer reviewed journals*

DSM

Case study on the footprint of 1 kg milk
Multiple interventions, multiple impacts

Translating nutritional interventions to LCA modeling

Feed LCI data and the animal system LCA methodologies are at a level of maturity that allows an accurate representation of the footprint and the impact of nutritional interventions (and non-nutritional)

Example (Vit E)
Dry period -2d
Clinical mastitis -22.5%
Subclinical mastitis -37.5%
Culled cow parity +5%

Peer reviewed articles

Scientific evidence of the potential of the additive to be efficacious on given end points

Translation in zootechnical effect for the **reference system** (conservative hypothesis)

Dose required to deliver the effect

Nutritionists expert knowledge

Along FAO LEAP Guidelines on feed additives, 2020

LCA metric for the zootechnical effect at **farm level**

x

LCA metric for **additive** manufacturing

LCA expert knowledge

Example (Vit E)
+0.51% in milk production
-6.44% in youngstock
+0.07% feed intake
-5.05% liveweight output

LCA for the nutritional intervention

10

DSM

Case study on the footprint of 1 kg milk
Multiple interventions, multiple impacts

Cumulative results on the reduction of key environmental impacts

Adding interventions increases the uncertainties
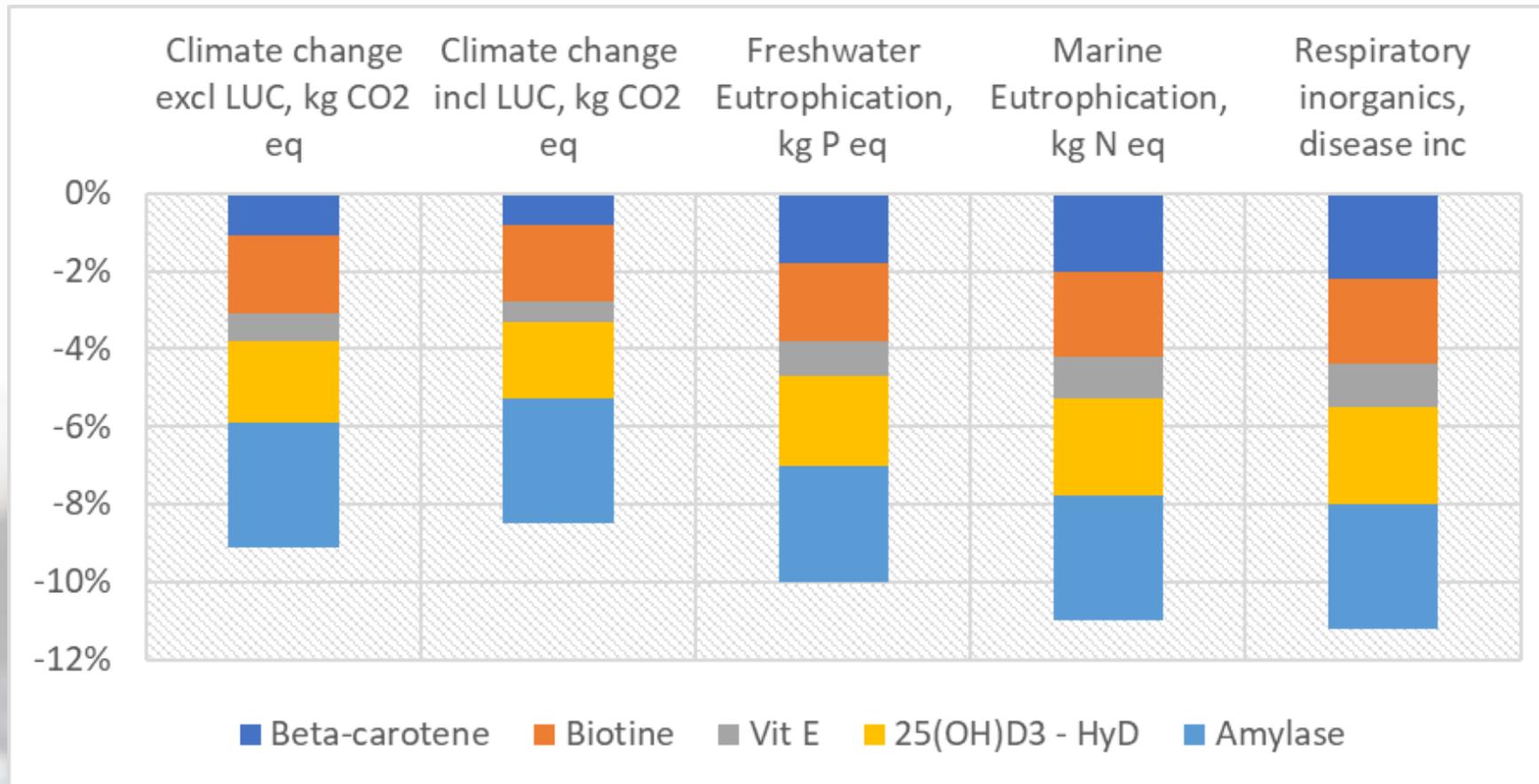
Customers are looking for practical solutions

- Solutions are available

- Economically viable

- Readily applicable

- Scalable

- Measurable

Animal protein industry can make substantial footprint reductions ... now

| 2 ZERO HUNGER | 3 GOOD HEALTH AND WELL-BEING | 12 RESPONSIBLE CONSUMPTION AND PRODUCTION | 13 CLIMATE ACTION | 14 LIFE BELOW WATER |

DSM

If not us, who?
If not now, when?

WE MAKE IT POSSIBLE