Challenges for animal production in the changing world

Chris Knight

Professor Emeritus, University of Copenhagen

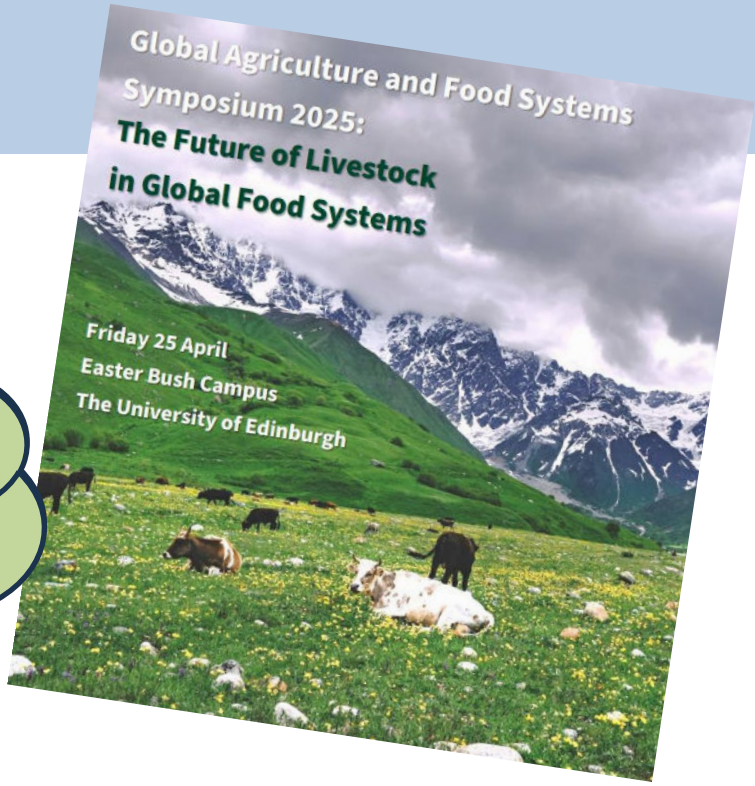
Scientific Communication and Inspiration

chrisknight@breathescience.org

Introduction

More food, less impact

More impact (on society)

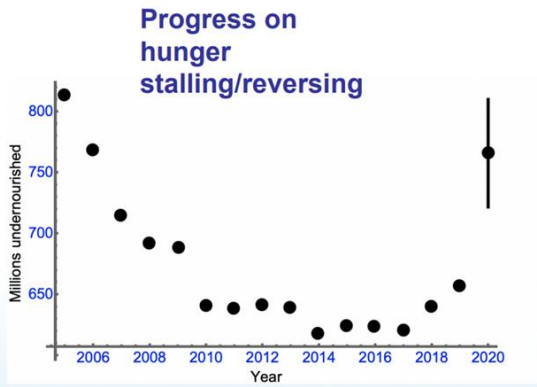


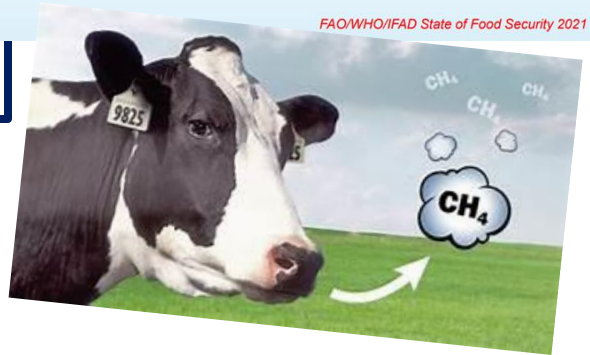
- "More food, less impact" is too simplistic
- We need to be more ambitious!

- I am a lactation scientist, so my examples will mainly be dairy

Lecture objectives and structure

- ***Objective: I hope that I can make you think, constructively***
- **What is "the changing world"?**
- **Can we produce more food, *responsibly?***
- **Can we reduce our environmental impact?**
- **Can we increase our societal impact?**





Responsible production

- ***Production with due regard for the health and welfare of…***
  - ***The animal***
  - ***The farmer***
  - ***The consumer***

Irene Camerlink

Gesa Busch

The changing world:
Where have we been?

- **Historically, man domesticated animals for food to provide sustainability and nutritional quality**
- **Cheap food policies have been in place since the great wars: *"meat and wheat"***
- **Driven by politics and global "fast food" business**
- **Today, we undervalue food**

The changing world:
Where is society?

- **We benefit from instantly accessible knowledge**
- ***Or fake news!***

- **We have lifestyles that far exceed those of our parents**
- ***Or obesity is threatening our very existence!***

- **We embrace virtual worlds and intelligent systems**
- ***Or we are becoming seriously de-skilled !***

- **We have shrunk time in a global sense**
- ***Or we short of the time to do things properly!***

Microsoft

The changing world:
Where are we as animal scientists?

- **We have a dairy industry that could feed 9B people**
- ***Or one that could destroy the planet!***

- **We have technologies that can dig deeper and deeper**
- ***But we often forget the big picture!***

- **We understand most things about lactation**
- ***But lactation consultants often don't!***

- **We spend billions on bovine mastitis**
- ***But ignore the human disease!***

The changing world:
Where next?

- **We have perhaps recovered from Covid, but now…**
- **We have global superpowers, but no global policy**
- **The world-trade balls are in the air, where will they land?**
- **Unilateralism has suddenly replaced multilateralism**

The changing world:
Where next for animal scientists?

- **Historically, you tested a hypothesis**
- **Today, you measure something**
- **Tomorrow, AI measures something for you**
- ***Cynical or realistic?***
- ***Worrying?***

The changing world:
Where next for food choices?

Shoppers of the future: what influences Gen Z food choices?

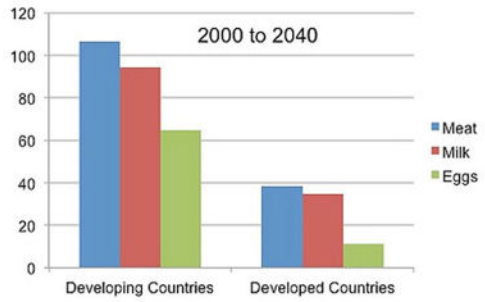
Monday, 25 November 2024

Our recent study explores Gen Z attitudes towards food, influences on their shopping behaviour and where they are sourcing this information from.

- **Survey by UK's AHDB (agricultural support body)**
- **Gen Z are in their teens/twenties**
- **Focused on healthiness and protein content, not worried so much by salt/sugar/fat**
- **Purchasers of meat (99%) and dairy (98%)**
- **Abandoning vegetarian/vegan**
- **We should not oversimplify, but we should also not make "plant-forward" assumptions lightly**

- ***Remember, for developing countries meat and dairy offer status as well as nutrition***

Percentage increase in demand for livestock products



Far higher growth in demand will occur in developing countries

IFPRI-ILRI IMPACT model results

The changing world:
Where next for livestock production?

- **Routes to sustainable livestock:**

- **Extensive, *"edible from inedible"***
- **Or intensive, "*more from less*"**

- **Improved smallholder farming**
- **Or big-business involvement**

- **Which is best? For animal, for farmer, for consumer**


Steps to sustainable livestock

VS

VS

Arla

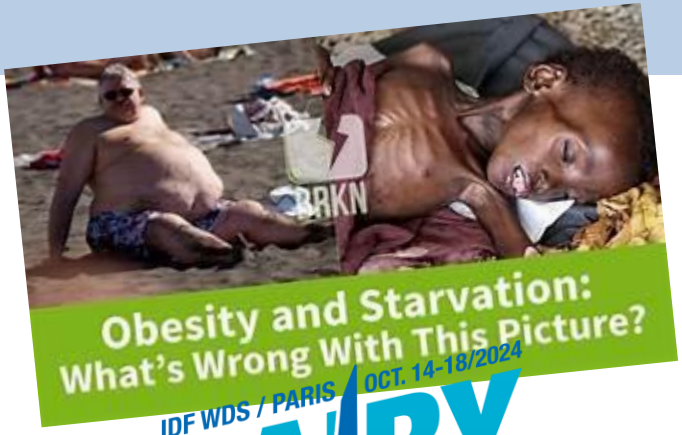
Nestlé

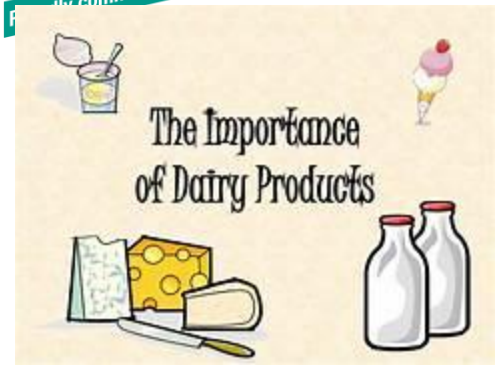
Can we produce more food:
Do we need to?

> ‘“We could synthesize every morsel of food, if we wanted to. But we don’t. We prefer to keep a third of our population on the land.” Aldous Huxley, *Brave New World, 1932.*’

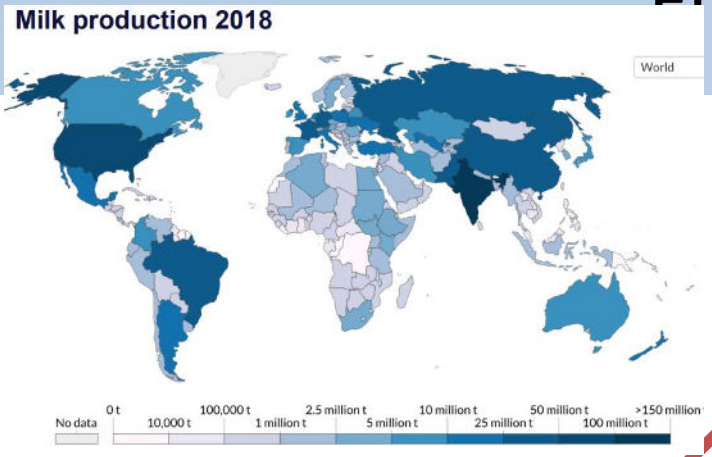
- **Yes, but….**
- **We produce far more food than we consume**
- **Many people are undernourished/starving, whilst others are grossly obese**

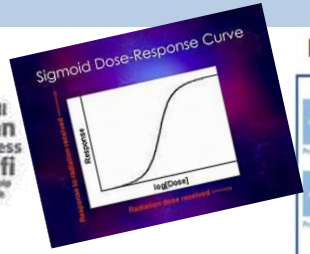
- **Dairy production is growing and predicted to grow faster than population (eg 2021-2028 by 38% vs 6.25%, nominally enough to feed 11 b at current per capita consumption)**

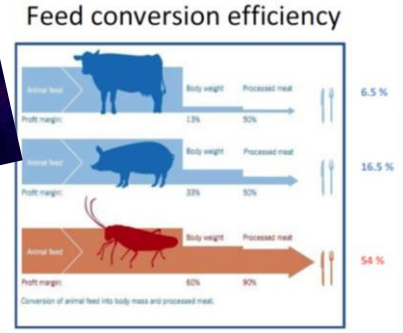


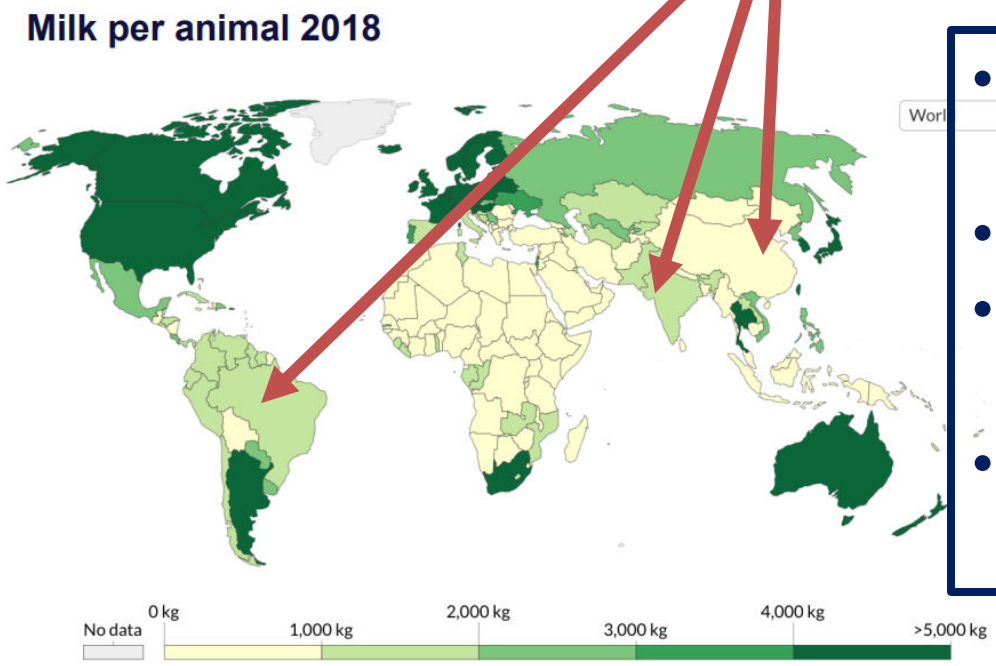


Can we produce more food:
From fewer animals?









- **Some of the biggest dairy producers are also the least efficient**
- **There is a desire to improve**
- **We still try to find the “top 5%”**

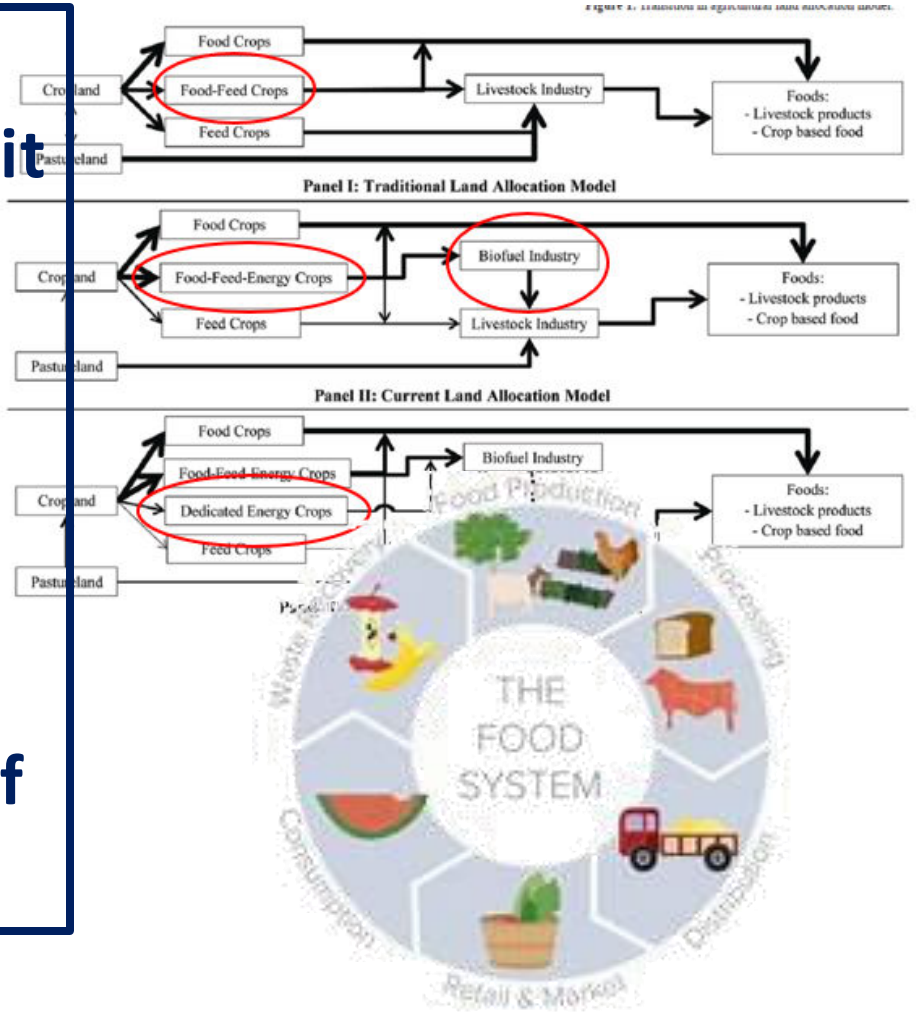
- **Often, we have the knowledge but don’t apply it**

Our World in Data, Oxford University, ex FAO

Can we produce more food:
From less land?

- **Land use is evolving**
- **There are more demands on it**
- **There is more smart technology available**

- **Decision point: expand livestock into marginal environments…**
- **…or focus on improved use of existing "prime" land**



Can we produce more food:
By reducing waste?

- **We waste one-third of our food**
- **Some waste is avoidable, some is not**
- **Everyone has a role to play**

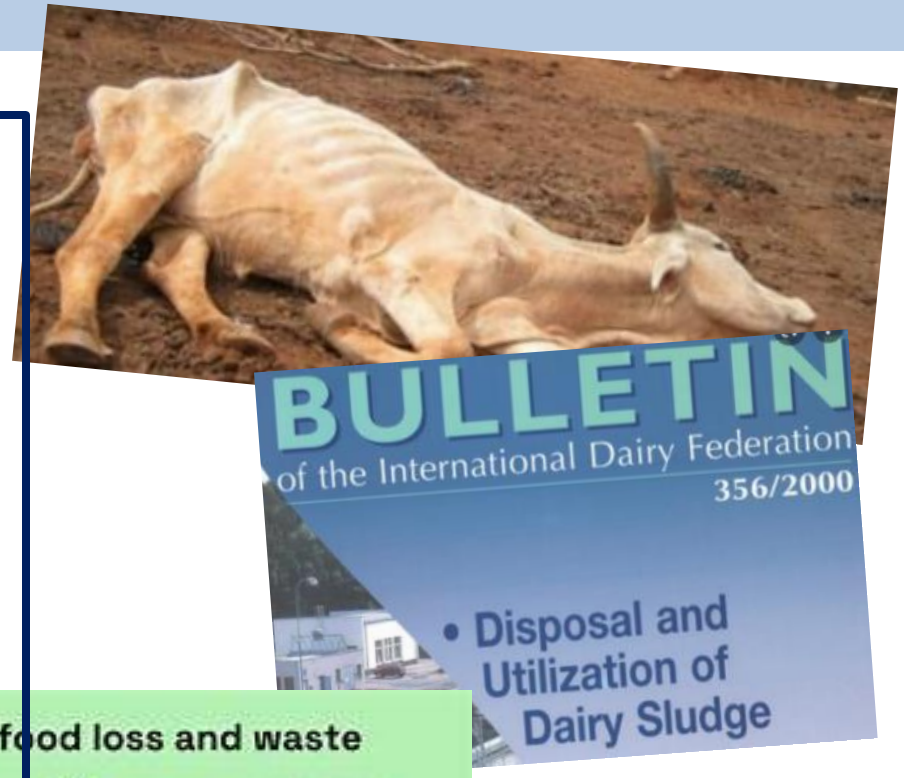
- **The circular bioeconomy envisages a drastic reduction through recycling/reuse**
- **Livestock no longer seem to figure in this scenario!**

Can we produce more food:
By reducing waste?

- **Globally, total waste differs little between nations**

- **Where it is lost does differ!**
- **Developed nations: in the home**
- **Developing: post harvest**

- **Any circular bioeconomy also needs to be safe (remember BSE!)**



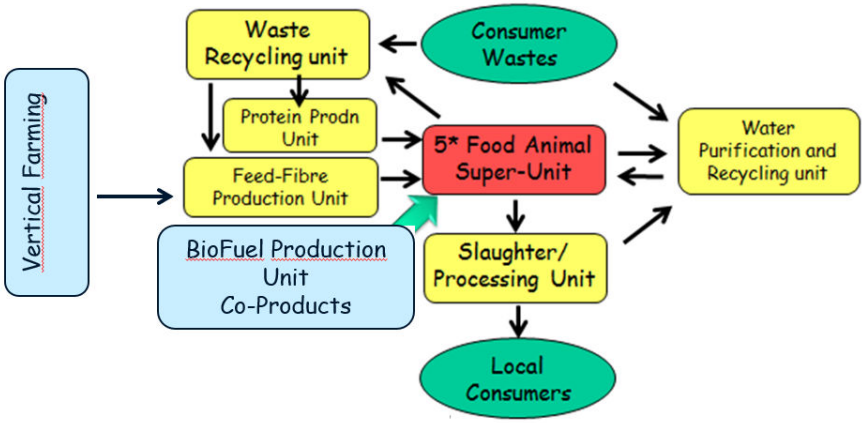
Can we produce more food:
Through sustainable intensification?

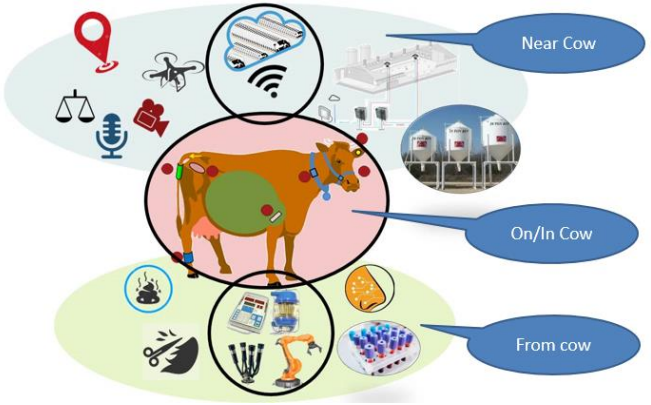
- **Sustainable intensification is an (achievable) concept**
- **Breeding for resilience..**
- **..or optimized management?**

Improve AND Protect

Klaus Wimmers

Sensor technologies for health and welfare

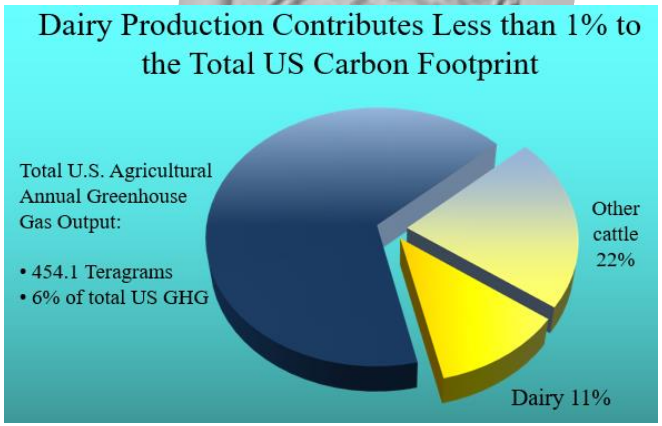


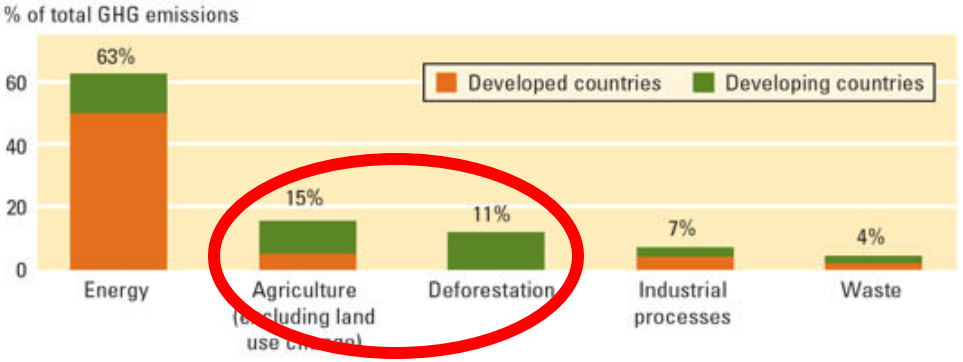


Ilan Halachmi

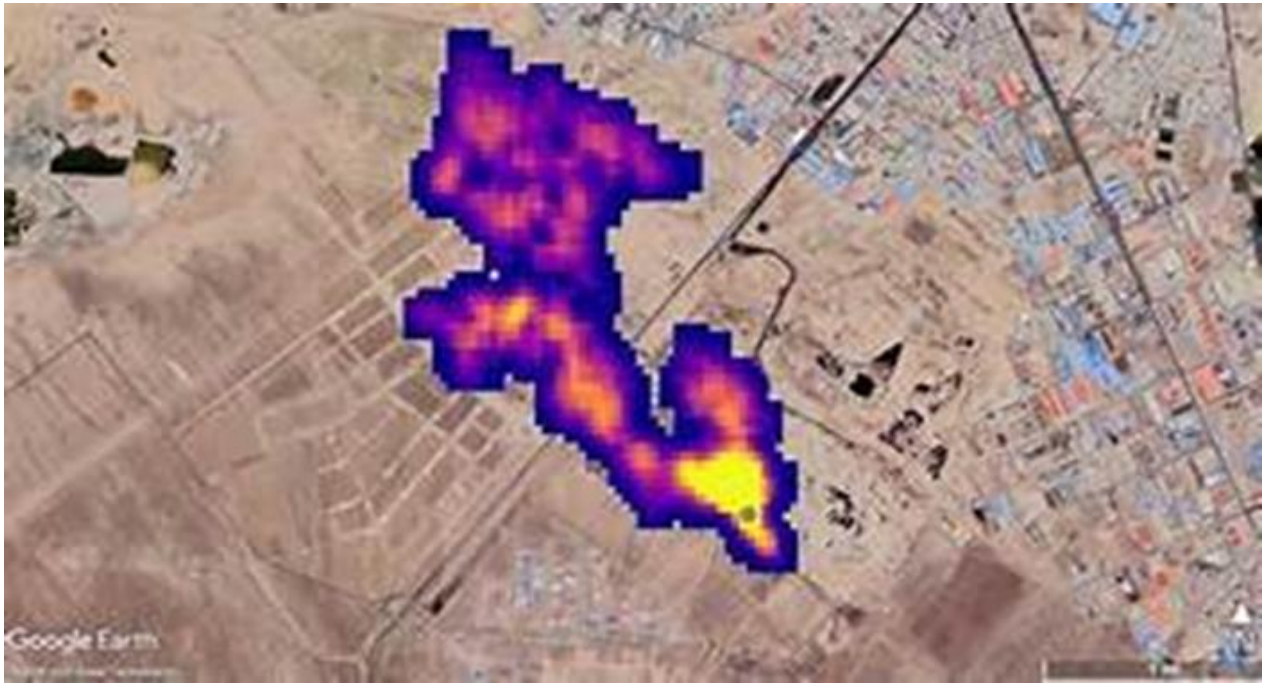
Can we reduce our environmental impact:
Do we need to?

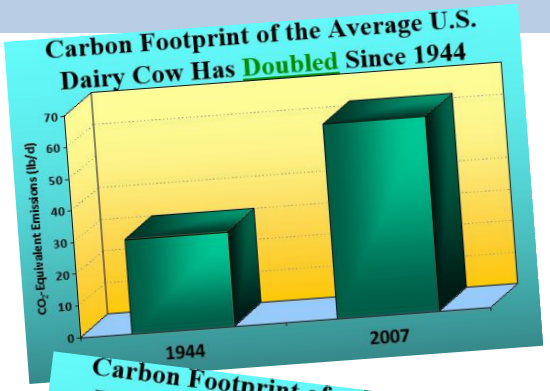
- **Environmental impact is a *very* complex issue**
- **Do we believe "Long Shadow" or "Less than Bison" arguments**
- **Calculation *must* be output based**
- **COP26 proposed 30% CH4 reduction, some experimental data suggests we may already have done that**

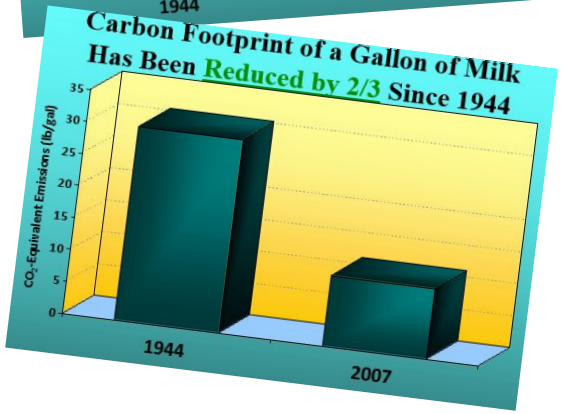




Can we reduce our environmental impact:
By more than we have done?







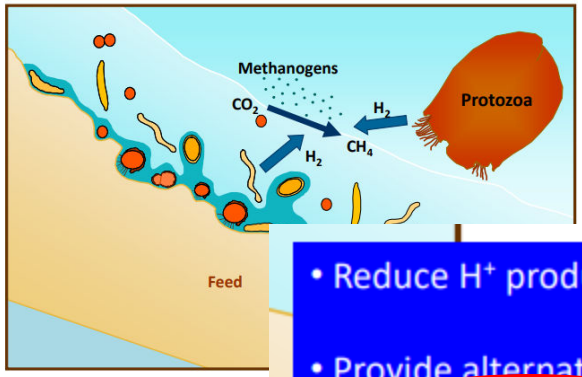
- **Remember: Point-emission CH4 has long been measurable**
- **Diffuse environmental emission will be in the future**

Can we reduce our environmental impact:
By switching off methane production?

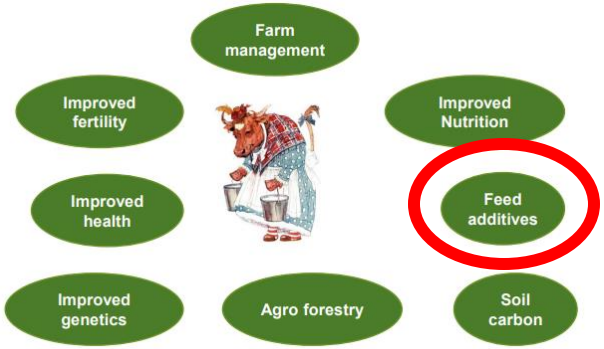
- **Methane reduction is possible under experimental conditions**
- **And is becoming possible on farm**

- **But not without its problems!**

Methane production a microbially driven process to remove hydrogen



- Reduce H^+ production
- Provide alternative H^+ sinks
- Inhibition of methanogens

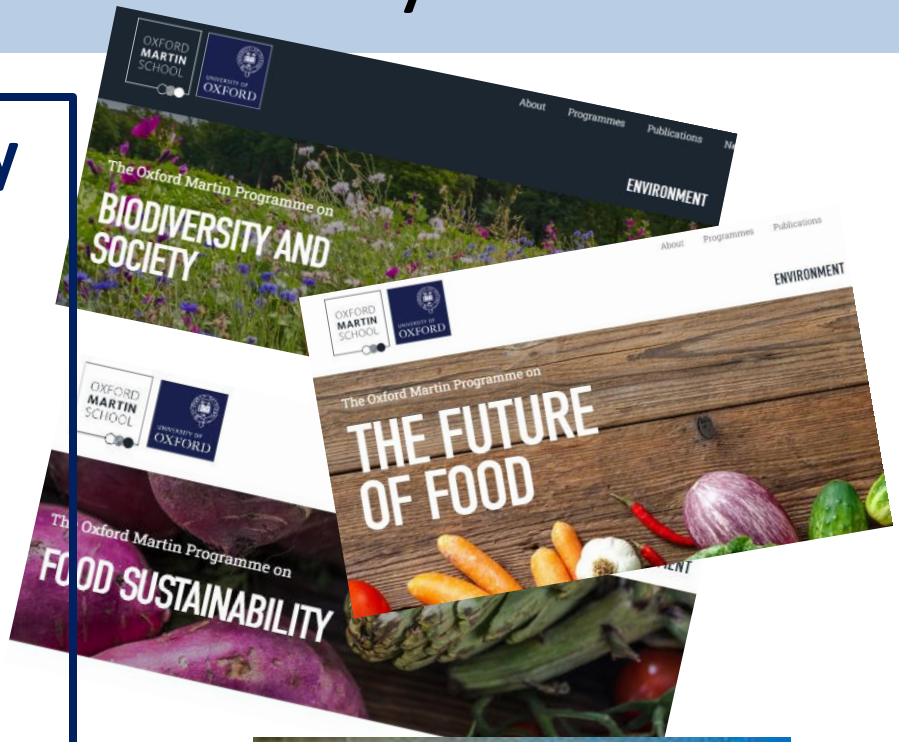


Can we reduce our environmental impact:
By encouraging biodiversity?

- **Livestock are part of biodiversity**
- **But not in the eyes of many environmental scientists!**

- **There is a lack of joined-up thinking and action**

- **“More from less” releases land for specific biodiversity effort**
- **“Inedible to edible” (eg mixed swards) can be directly effective**



Can we increase our societal impact?

- **Historically, animal science made major contributions, eg**
  - **Reproduction, IVF etc**
  - **Nutrition science**
  - **Activity monitors**

Susanne Kreuzer-Redmer

- **What can we do now?**
  - **Energetics: partitioning, obesity**
  - **Appetite control: stress, protein,**
  - **Human lactation: lactogenesis, lactose debate, mastitis, lactation failure**

Scientific challenges
(for mammary biologists)

- Cell shape/size/stretch
- ”Physiological” vs ”pathological” inflammation
- Mother/young contact, passive immunity
- Regulation of water flux
- Glucose trafficking to Golgi
- Secretory vesicle locating apical membrane
- Membrane balance between apocrine secretion and exocytosis
- Cell function: effects of ”tight” vs ”leaky” TJ
- How selective/non-selective is paracellular flux?
- *Please, de-focus from data gathering!*

Take home messages

- **There are options to meet the challenges!**
- **But…production animal science is about more than producing animals**
- **And..for maximum impact, knowledge must be transferred AND implemented**
- **So…where research is needed, the objectives must be clear and clearly hypothesized and tested**

chrisknight@breathescience.org

Questions?

- What can we do now?
  - Energetics: partitioning, obesity
  - Appetite control: stress, protein,
  - Human lactation: lactogenesis, lactose debate, mastitis, lactation failure

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