The role of livestock in our ecosystems and economy

bsas

Belfast'24

9-11 April 2024

Livestock's role in our economy and ecosystems

Frank O'Mara

Animal Task Force

Teagasc

bsas

british society of animal science

atf animal task force

A European Public-Private Partnership

ATF - A European Public-Private Partnership

Industry & farmers representative organisations

animalhealth europe

FABRE-TP Farm Animal Breeding & Reproduction Technology Platform

FEFAC Experts in Animal Nutrition

FEFANA

European Cattle Innovation Partnership

Knowledge providers

AARHUS UNIVERSITY

SLU

University of Novi Sad INSTITUTE OF FOOD TEHNOLOGY IN NOVI SAD (FINS)

crea

Luke NATURAL RESOURCES INSTITUTE FINLAND

INIA Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria

dafa Deutsche Agrarforschungsallianz

CIEL

teagasc Agriculture and Food Development Authority

INRAE

iniav

INSTYTUT GENETYKI I BIOTECHNOLOGII ZWIERZĄT Polskiej Akademii Nauk

VÚŽV Institute of Animal Science

WAGENINGEN UNIVERSITY & RESEARCH

Agroscope

BIOS science austria

NMBU Norwegian University of Life Sciences

Univerza v Ljubljani Biotehniška fakulteta petinsedemdesetletnica

Partners

copa cogeca

UECBV European Livestock and Meat Trades Union

eda european dairy association

EVERI

CEJA

European Dairy Farmers

AVEC The voice of Europe's poultry meat sector

CEMA

CLITRAVI

EFPRA

FVE

Livestock's role in our economy and ecosystems

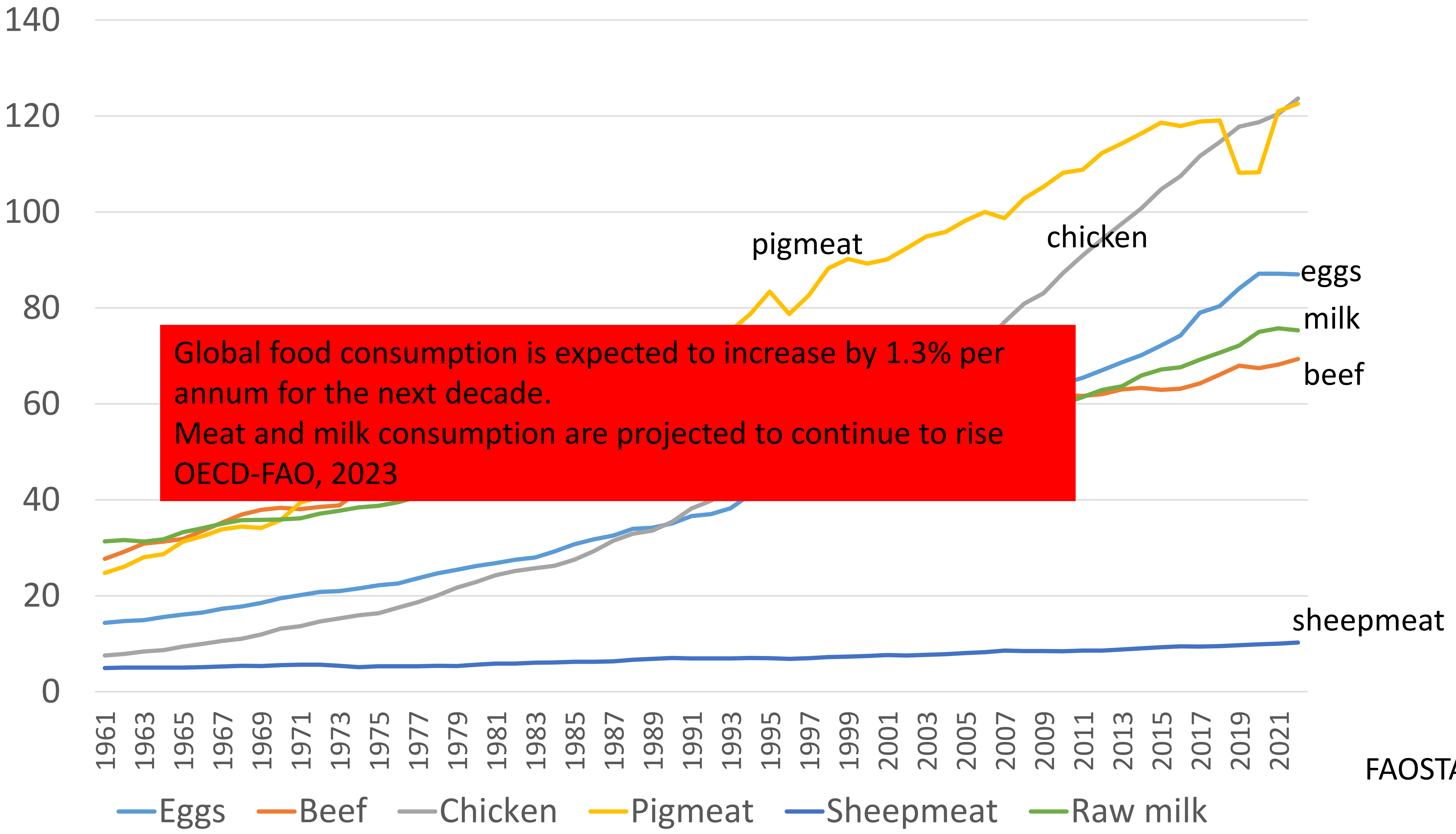
Outline of presentation

- The size and importance of the livestock sector
- The evolution and legitimacy of livestock production
- The three big environmental pressures – climate, biodiversity, water
- Components to improve sustainability
- Where can research and innovation help

- European perspective mainly
- Acknowledgements: ATF and Teagasc colleagues

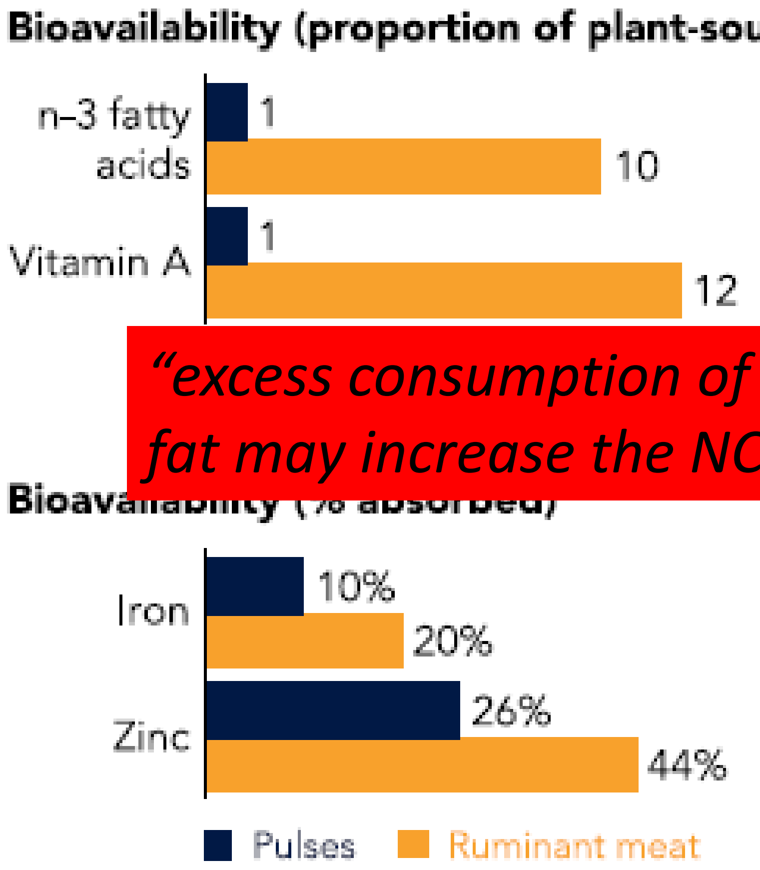
Global meat, egg and raw milk production

(m tonnes, except raw milk 10 x m tonnes)



FAOSTAT, 2024

Animal source foods are dense in bioavailable minerals and vitamins and have higher densities and more bioavailable forms of essential amino acids



"excess consumption of processed meat, red meat, and saturated fat may increase the NCD risk." Beal et al., 2023

FIGURE 1. Nutrient bioavailability differences between plant and animal sources. *Only terrestrial plant sources of n–3 fatty acids are shown here; sea vegetables contain long-chain n–3 fatty acids and have similar bioavailability as that of animal sources. Bioavailability estimates of n–3 fatty acids [26], vitamin A [16], and iron and zinc [18].

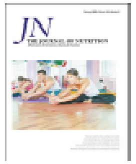
FIGURE 2. Digestible indispensable amino acids scores (DIAASs) of select foods: beef and pork [220], soy milk and tofu [221], and all other foods [222]. DIAASs reflects the percentage of total daily requirement of the most limiting dietary indispensable amino acids contained in an amount of protein equivalent to the estimated average

The Journal of Nutrition 153 (2023) 409–425

ASN American Society for Nutrition

JN THE JOURNAL OF NUTRITION

journal homepage: www.journals.elsevier.com/the-journal-of-nutrition

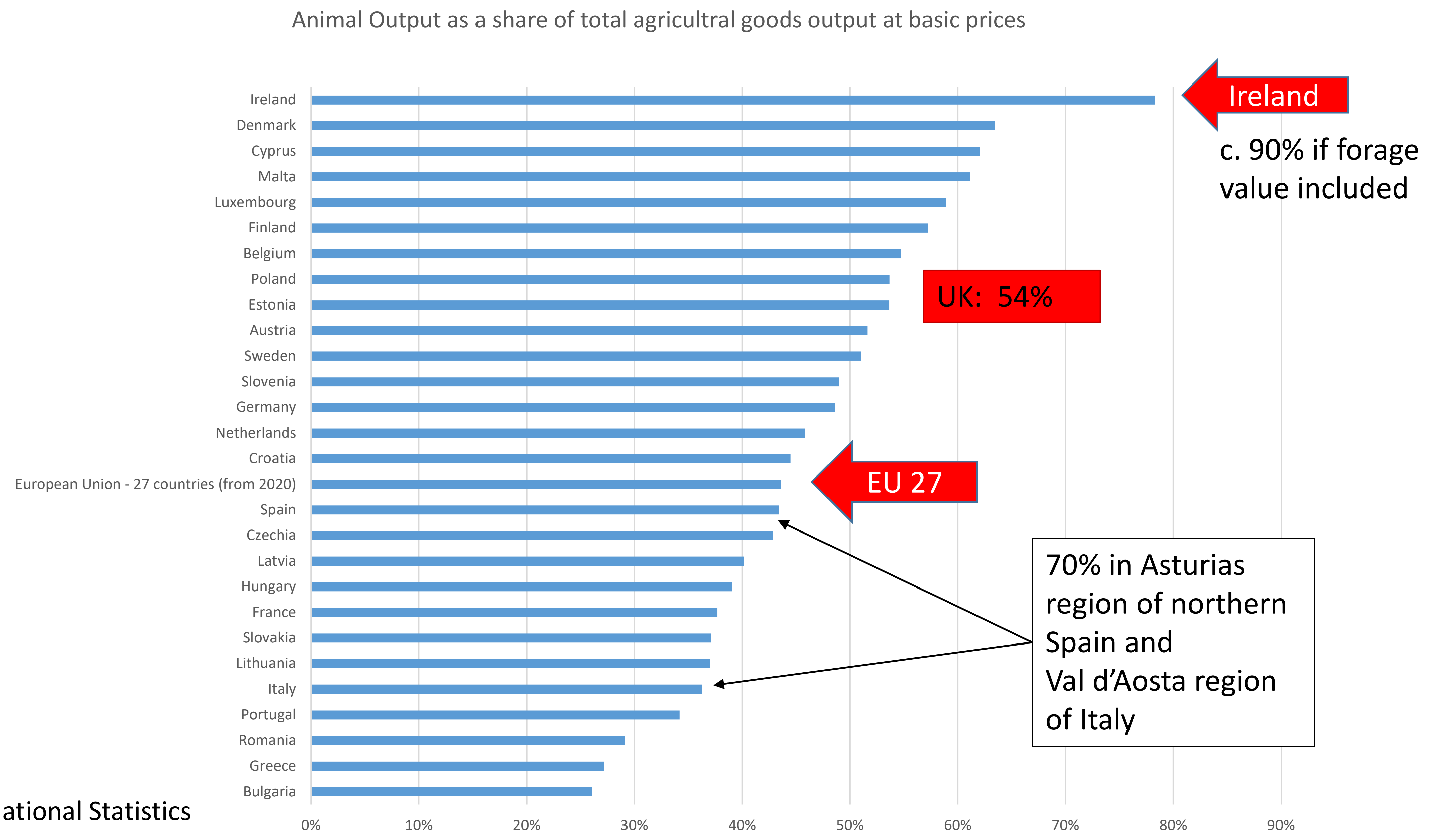


Critical Review

Friend or Foe? The Role of Animal-Source Foods in Healthy and Environmentally Sustainable Diets

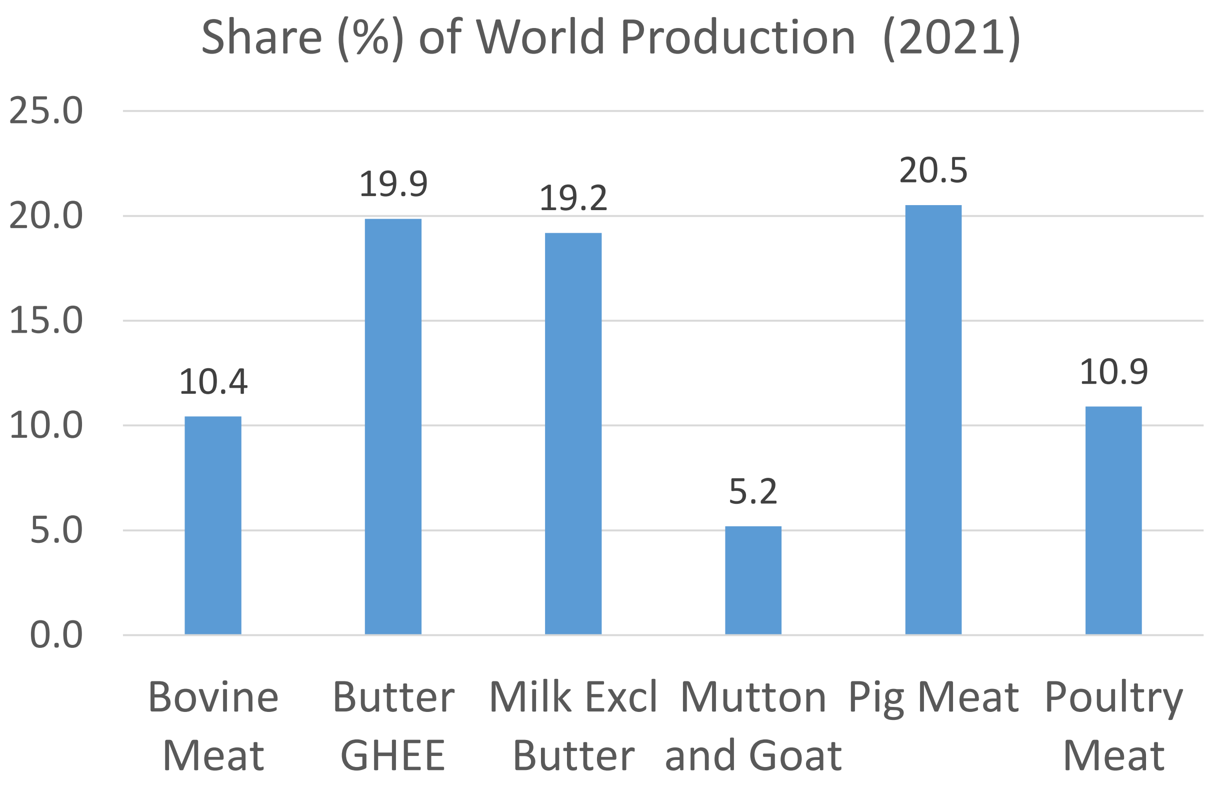
Ty Beal[1,2,*], Christopher D. Gardner[3], Mario Herrero[4], Lora L. Iannotti[5], Lutz Merbold[6], Stella Nordhagen[7], Anne Mottet[8]

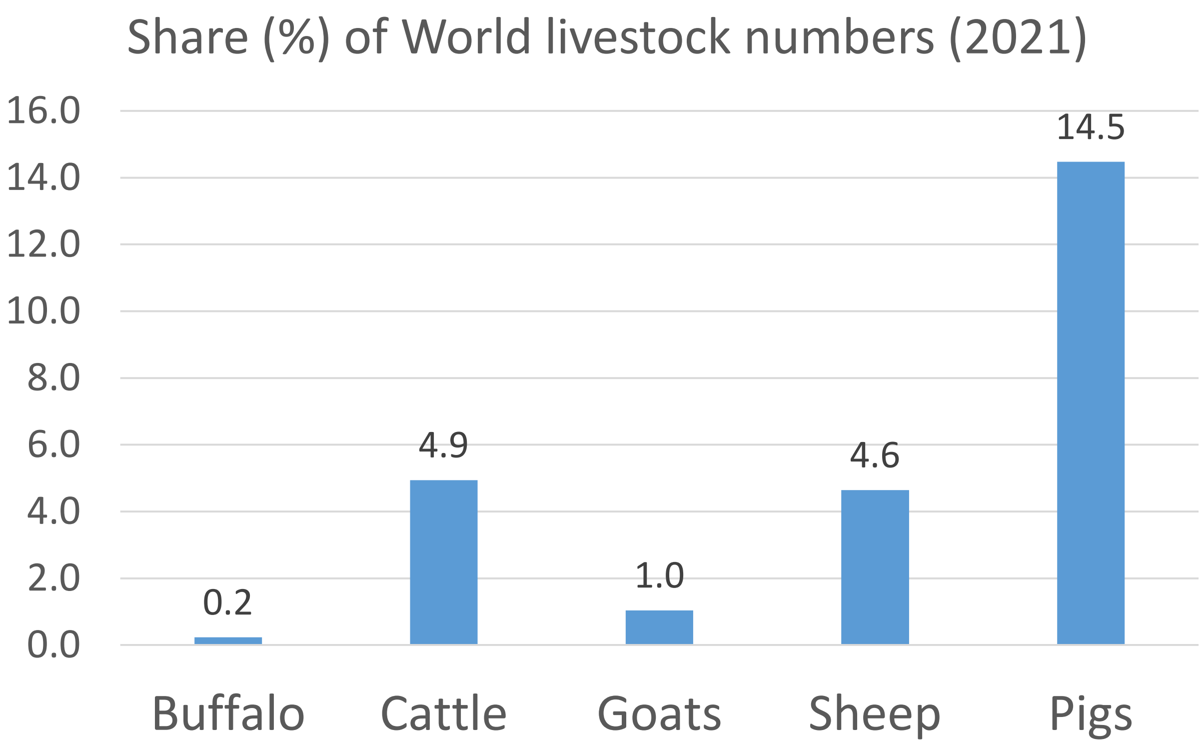
Livestock contribute 44% of EU Agriculture output (2023)



Eurostat
UK Office for National Statistics

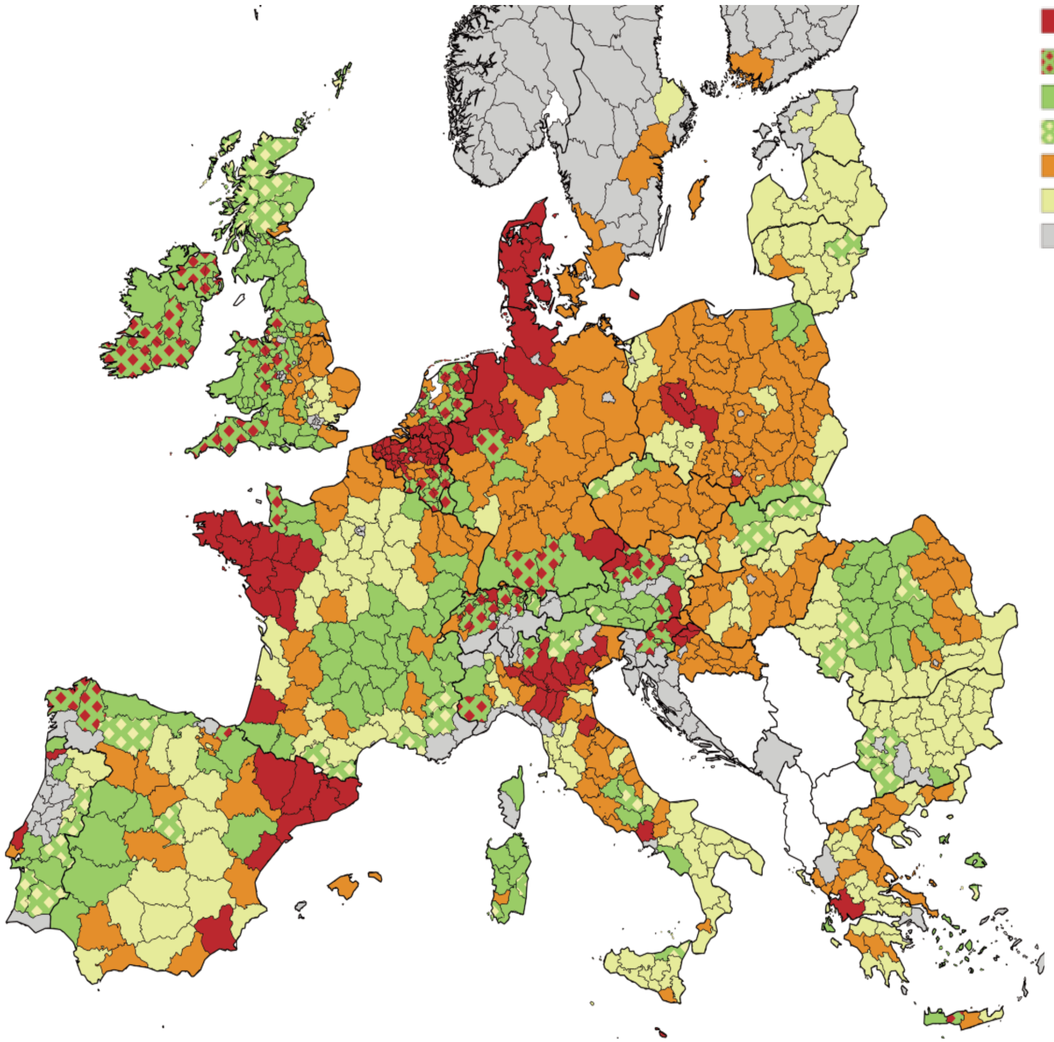
EU + UK as a global player in livestock production





Source: FAOSTAT

Europe has a diversity of livestock systems which is a strength



	AA (% total)	LU (% total)	LU/ha
	10.5	29.5	2.15
	6.7	14.6	1.70
	19.3	18.5	0.75
	6.8	2.1	0.25
	31.6	26.6	1.20
	25.0	8.6	0.30

- **Livestock are present in almost all regions of Europe, 58% of EU farms hold animals**

Diversity of livestock systems in Europe (Dumont et al, 2019) (LU= Land use)

Evolution and legitimacy of livestock production

Green revolution

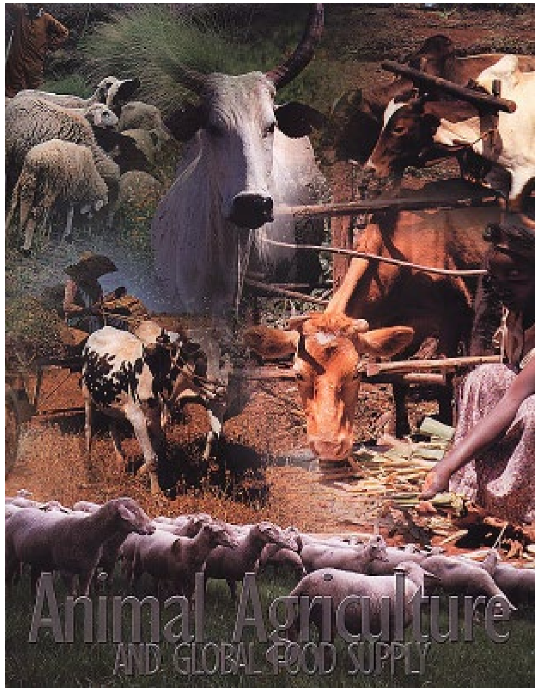
- Higher yields and greater production, enabling food supply to keep pace with a rapidly growing population
- Greater intensification – more imports to the farm (feed & fertiliser) and more manures to utilise or export
- Greater specialisation both at farm and regional level – less feed/manure circularity
- More pressure on resources: water, biodiversity, soils, air quality, climate

Many calls for a reduction in livestock

- EAT Lancet - need to reduce livestock to keep within planetary boundaries
- Role of livestock in GHG emissions (e.g. 30% of global methane emissions)
- Use of water by livestock (almost 30% of available freshwater)
- Impact of livestock on water quality
- Livestock contribute to main drivers of biodiversity loss: habitat change, pollution, climate change, over-exploitation and invasive species

But livestock have a critical role in sustainable circular food systems

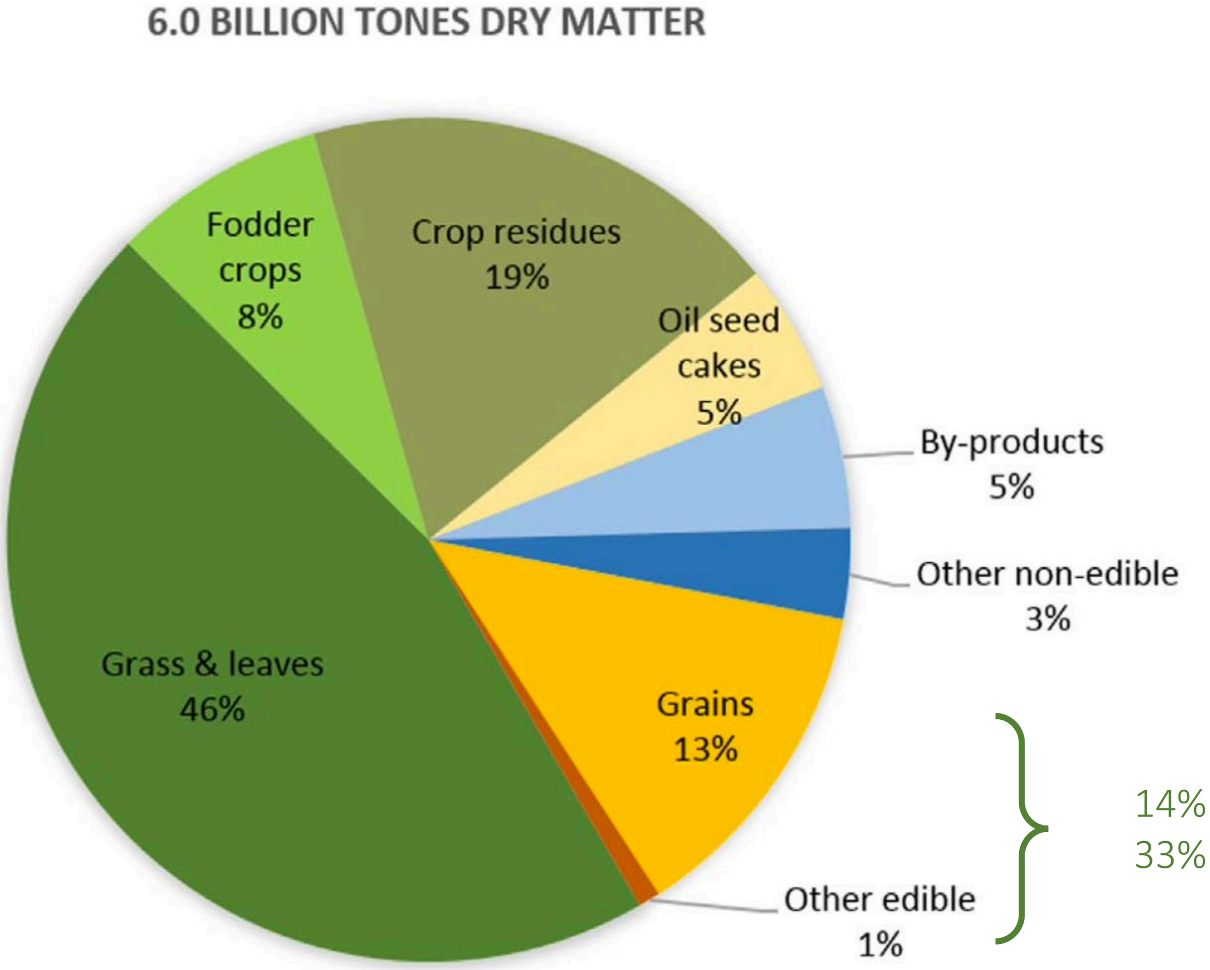
It cannot be a question of livestock or crops



Task Force Report
No. 135 July 1999

Council for Agricultural Science and Technology

The global livestock feed intake



Without livestock, no way to bring most of this dry matter into human food supply

But some of these crops and land-use could be replaced by human edible food

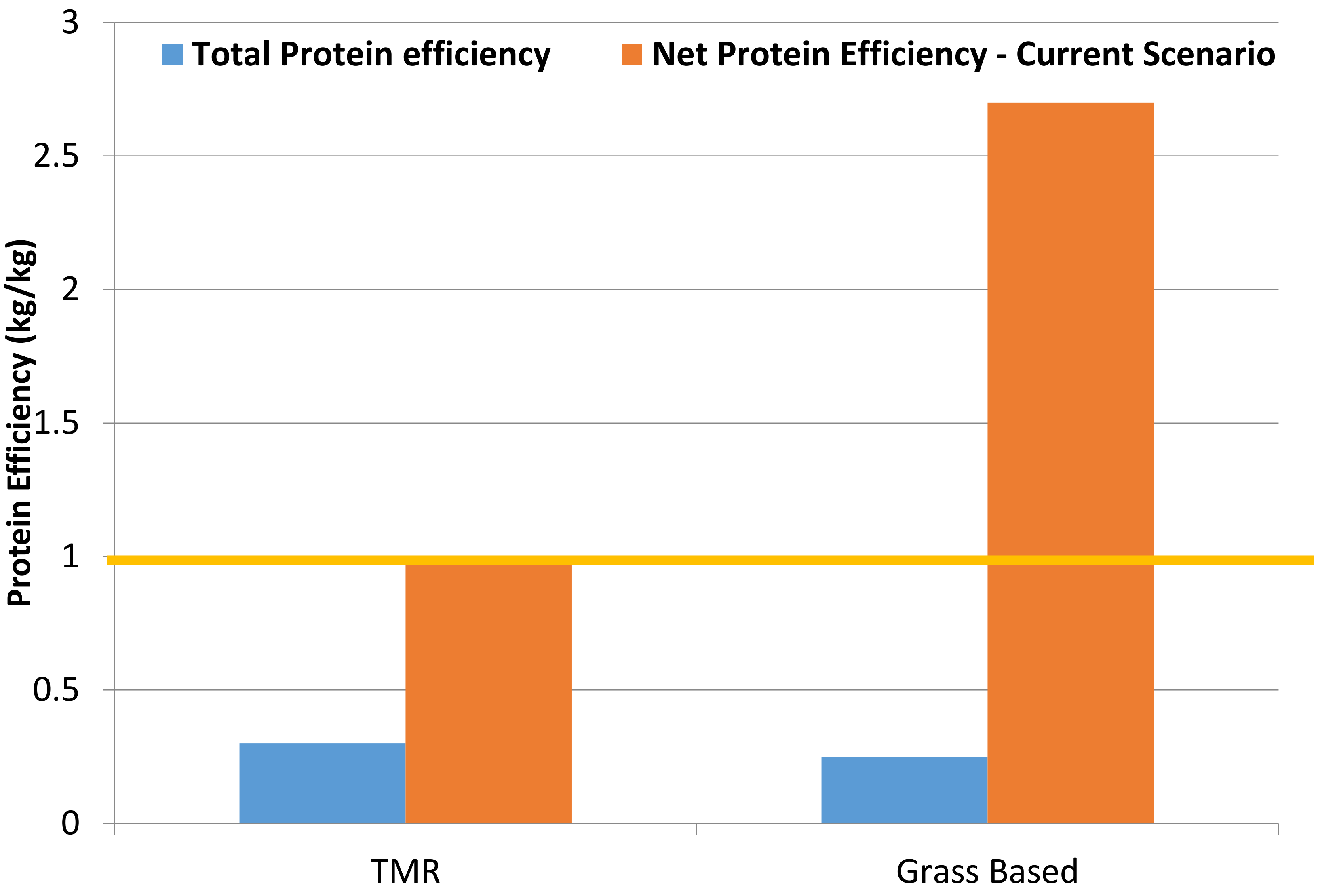
14% edible for humans
33% of global grain production

Fodder crops: grain and legume silage, fodder beets
Crop residues: straws and stover, sugar cane tops, banana stems
By-products: brans, corn gluten meal and feed, molasses, beetroot pulp and spent breweries, distilleries, biofuel grains
Other non-edible: second grade cereals, swill, fish meal, synthetic amino acids, lime
Other edible: cassava pellets, beans and soy beans, rapeseed and soy oil

Mottet et al., 2017.
Livestock: On our plates or eating at our table? Global Food Security

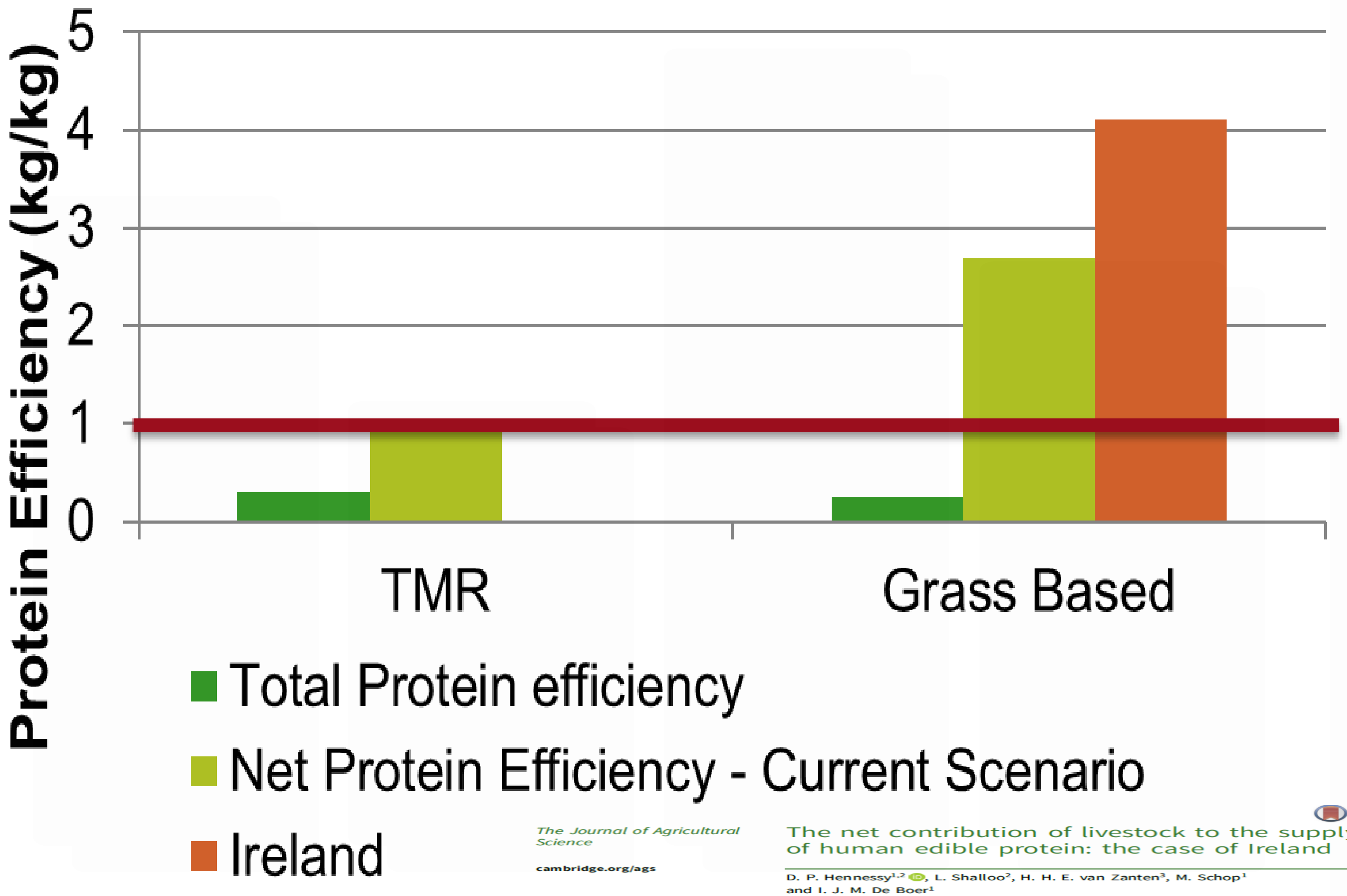
Grass fed - Human-edible Protein efficiency

Kg of human edible protein produced per kg of human edible protein consumed by animals



Laisse et al., 2018

Grass fed - Human-edible Protein efficiency



The Journal of Agricultural Science

cambridge.org/ags

Animal Research Paper

Cite this article: Hennessy DP, Shalloo L, van Zanten HHE, Schop M, De Boer IJM (2021). The net contribution of livestock to the supply of human edible protein: the case of Ireland. *The*

CrossMark

The net contribution of livestock to the supply of human edible protein: the case of Ireland

D. P. Hennessy[1,2], L. Shalloo[2], H. H. E. van Zanten[3], M. Schop[1] and I. J. M. De Boer[1]

[1]Animal Production Systems Group, Wageningen University & Research, P.O. Box 338, 6700 AH Wageningen, the Netherlands; [2]Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co., Cork, Ireland and [3]Farm Systems Ecology Group, Wageningen University & Research, P.O. Box 430, 6700 AK, Wageningen, the Netherlands

The three big environmental pressures – climate, biodiversity, water

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Livestock and methane, the main agricultural GHG

2nd One-day symposium of the ATF & EAAP Commission on Livestock Farming Systems

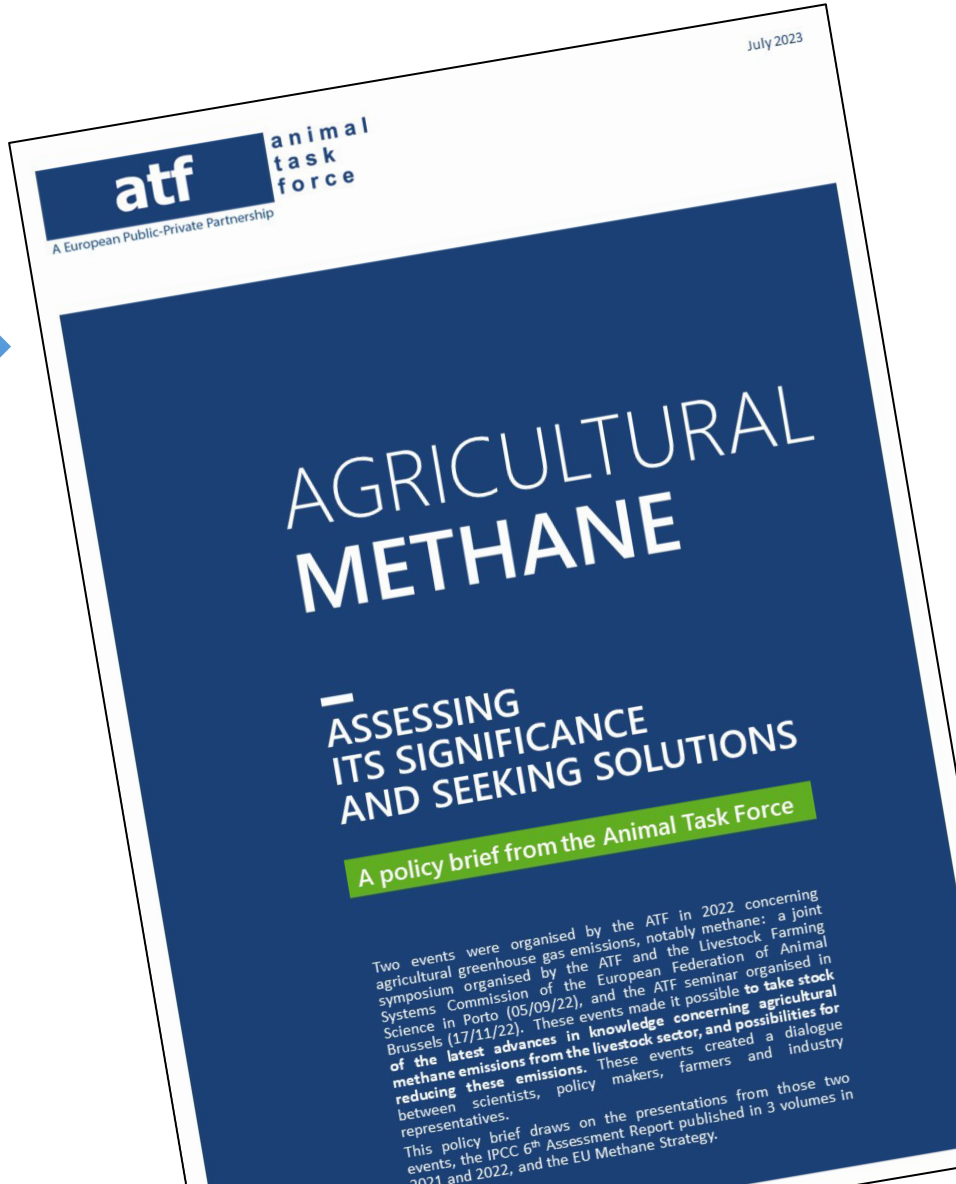
EAAP Annual Meeting

Porto, Portugal - Sept. 2022

12th ATF Seminar

Brussels - Nov. 2022

Now available !



July 2023

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AGRICULTURAL METHANE

ASSESSING ITS SIGNIFICANCE AND SEEKING SOLUTIONS

A policy brief from the Animal Task Force

Two events were organised by the ATF in 2022 concerning agricultural greenhouse gas emissions, notably methane: a joint symposium organised by the ATF and the Livestock Farming Systems Commission of the European Federation of Animal Science in Porto (05/09/22), and the ATF seminar organised in Brussels (17/11/22). These events made it possible **to take stock of the latest advances in knowledge concerning agricultural methane emissions from the livestock sector, and possibilities for reducing these emissions.** These events created a dialogue between scientists, policy makers, farmers and industry representatives.

This policy brief draws on the presentations from those two events, the IPCC 6th Assessment Report published in 3 volumes in 2021 and 2022, and the EU Methane Strategy.

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Methane – a greenhouse gas

Second largest contributor to warming after CO_2 (about 30% of increase in global temperature)

GWP100 is not a good metric to assess its contribution to warming because of its short half life (≈ 10 years)

Global Methane Pledge

TABLE 1. SOURCES OF GLOBAL AND EU ANTHROPOGENIC METHANE EMISSIONS (%)

	Global*	EU**
Energy	**37**	**19**
Waste	**19**	**26**
Agriculture	**44**	**53**
Enteric fermentation	*29.5*	*43.3*
Manure management	*3.4*	*9.5*
Rice cultivation	*10.7*	*0.11*
Agric. waste burning	*0.5*	*0.02*

*Janssens-Maenhout et al. (2017) ; **EU Methane Strategy

… reduce global methane emissions at least 30 percent from 2020 levels by 2030. This is a global, not a national reduction target.

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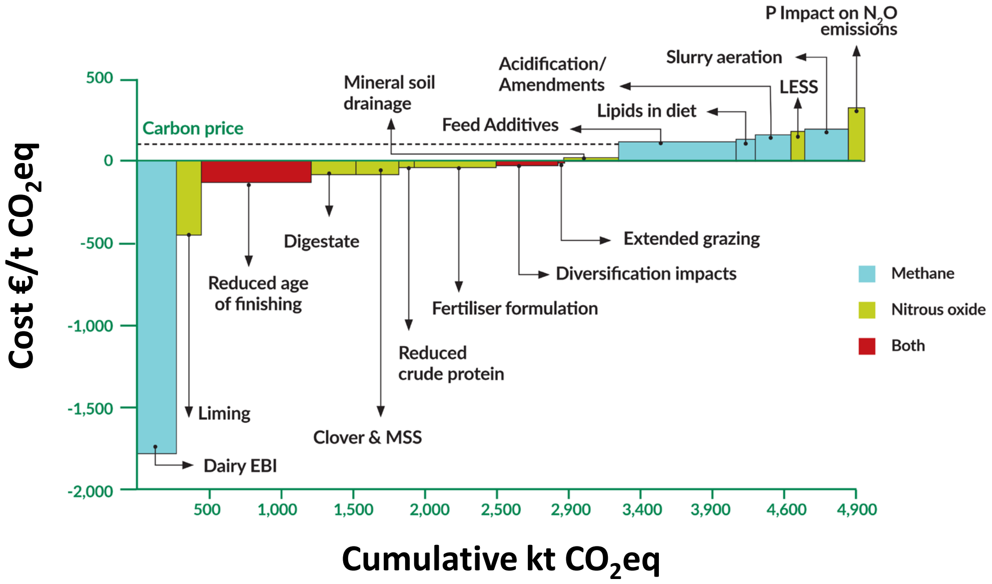
Reducing methane emissions – where to start?

- Methane from energy should be tackled first – can be cut the quickest and with least cost (EU Methane Strategy)
- Minimising biodegradable waste going into landfill should be a priority
- Agricultural emissions should be reduced as much as possible, but some methane emission from livestock are unavoidable (unique ability to convert fibre to food)
  - Breeding, lifetime efficiency, diet, additives, manure management, animal health

*"The Commission welcomes the provisional agreement reached today (**15 Nov 2023**) between the European Parliament and Council on a new EU Regulation to **reduce energy sector methane emissions in Europe and in our global supply chains**."*

There are solutions to reduce emissions from livestock agriculture

Ireland's MACC 3 (2023)



UK's net zero

And grassland can contribute carbon sequestration

Livestock and Biodiversity

- Livestock can contribute positively or negatively to biodiversity

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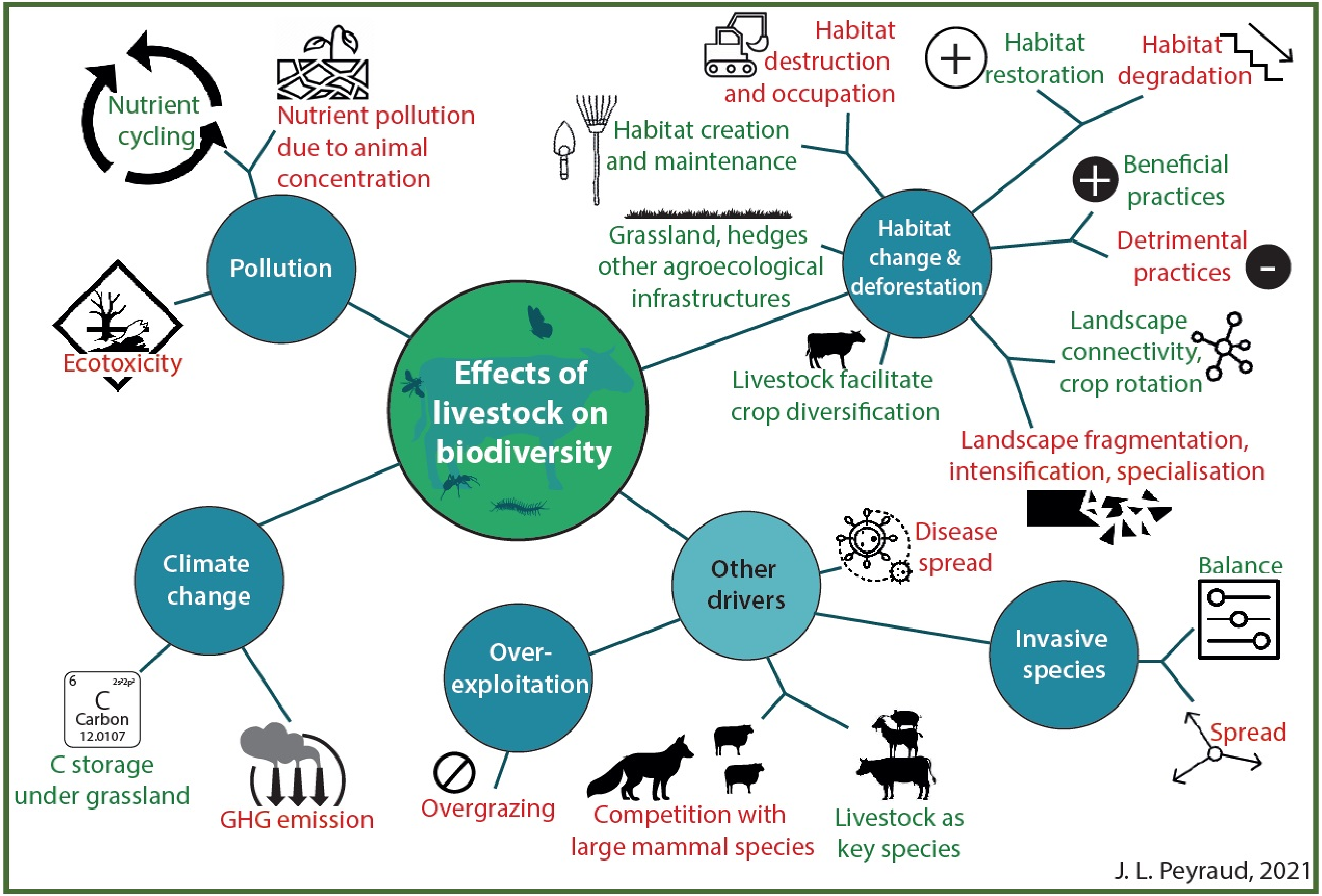
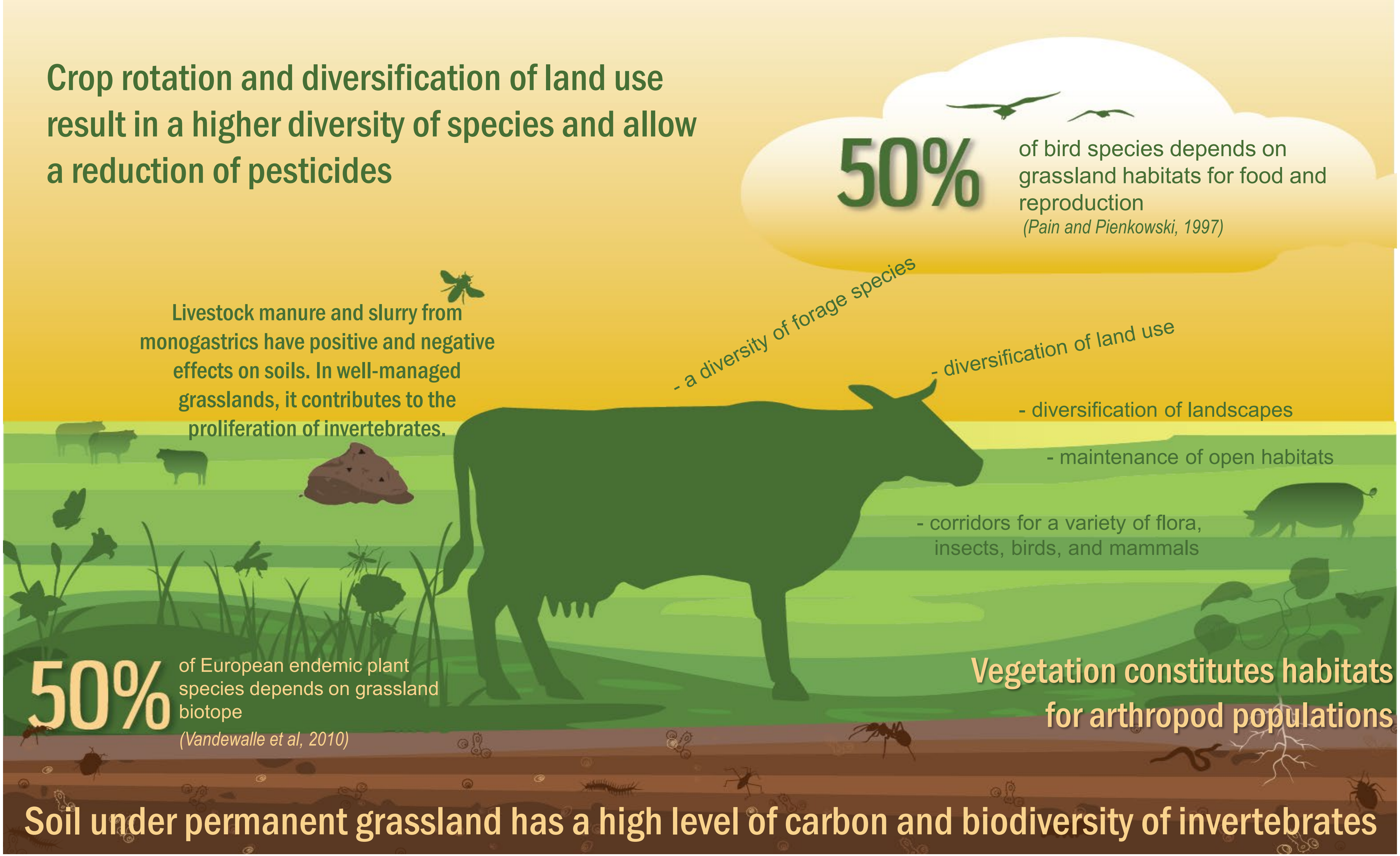


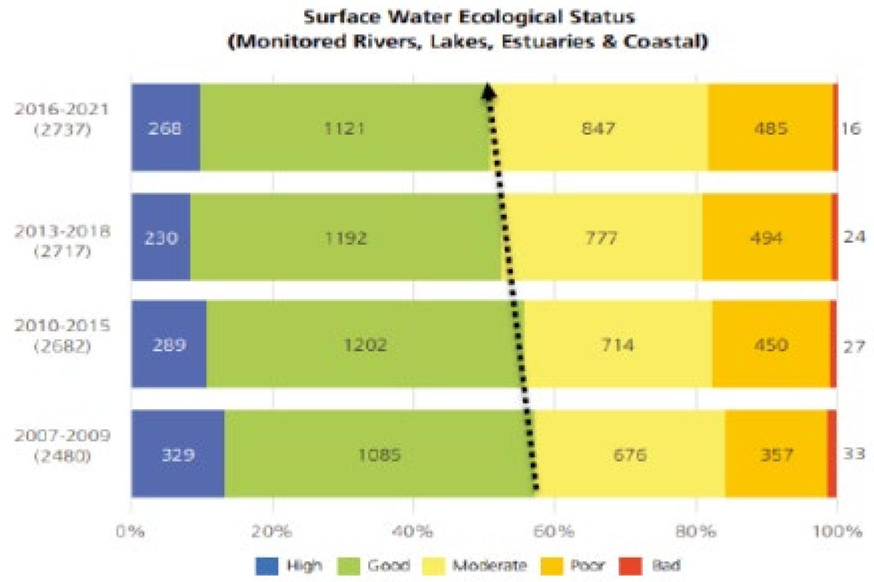

Crop rotation and diversification of land use result in a higher diversity of species and allow a reduction of pesticides
50%
of bird species depends on grassland habitats for food and reproduction
(Pain and Pienkowski, 1997)
Livestock manure and slurry from monogastrics have positive and negative effects on soils. In well-managed grasslands, it contributes to the proliferation of invertebrates.
- a diversity of forage species
- diversification of land use
- diversification of landscapes
- maintenance of open habitats
- corridors for a variety of flora, insects, birds, and mammals
50%
of European endemic plant species depends on grassland biotope
(Vandewalle et al, 2010)
Vegetation constitutes habitats for arthropod populations
Soil under permanent grassland has a high level of carbon and biodiversity of invertebrates

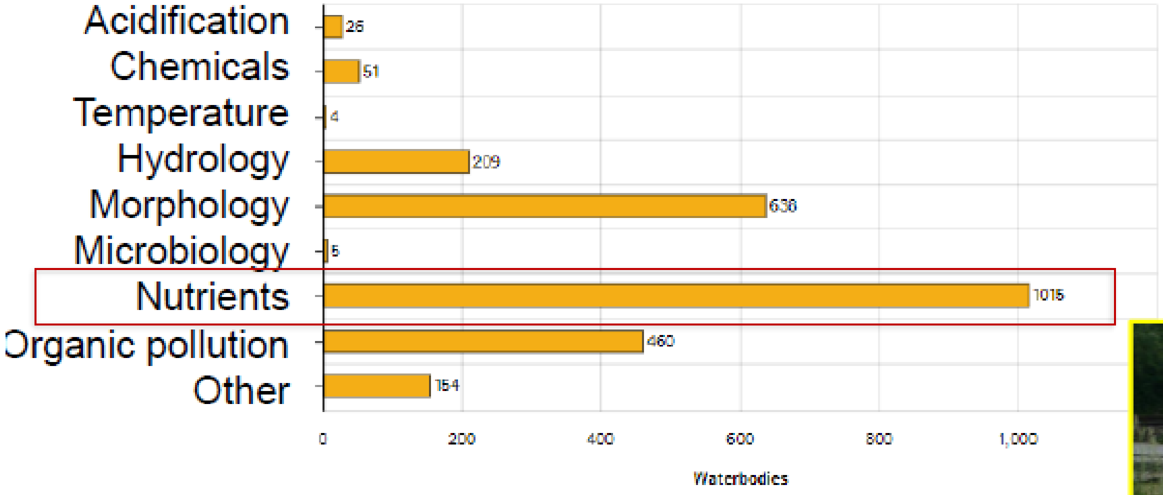
Livestock and water quality

- Many ways that water quality can be impacted
    - Multiple stressors – P, N and sediment
    - Livestock with access to water courses
    - Run-off from farmyards, drainage ditches, farm roadways
    - Nitrate~~s~~ leaching due to miss-match between nitrate load and off-take by crop
    - Excess nutrient loads and nutrient application at times of low crop uptake (early spring/autumn)
    - Nutrient loss from non-grass feed production & fallow soils

- Water quality is very complex:
    - Big impact of soil type
    - Climate and weather are major factors

How good are our waters and what's impacting on them?





Excess nutrients (nitrogen and phosphorus) leading to eutrophication is the most widespread problem

Source: EPA

Water quality – key steps to stabilisation and improvement

- Water quality is challenging in most of Europe
- Very few countries now farm above 170kg organic N/ha (derogation): much of Ireland reduced from 250kg to 220 in 2024
- Many measures being implemented to improve water quality in Ireland
  - Measures already introduced will have an effect in coming years
  - Banding, 220 kg N SR, lower chemical N limit, more restricted spreading dates, etc
  - Reduced levels of chemical N usage (-30%) will help water quality if sustained (role of legumes and multi species swards)
  - Slurry storage appears to be inadequate on some farms – leads to sub-optimal nutrient management spreading at times of low uptake/crop requirement
  - Need to get slurry / FYM around all blocks, not just the platform
  - Need to focus on good nutrient management planning (pH, P, K, S)
  - Address point sources of pollution (roadways, farmyards, ditches)
  - Non grass feed – need for cover crops between crops (e.g. maize)
  - Need to do a better job of getting information to farmers on local water quality and risk factors

Where have we got to and where to from here?

- Europe has a very important and efficient livestock sector
- Livestock’s legitimacy questioned but role in our food system make them too valuable to dispense with
- Interaction between livestock and environment is complex (+ and -)
- Livestock can put pressure on our ecosystems – climate, biodiversity, water
- We must preserve what’s good and reduce the pressures

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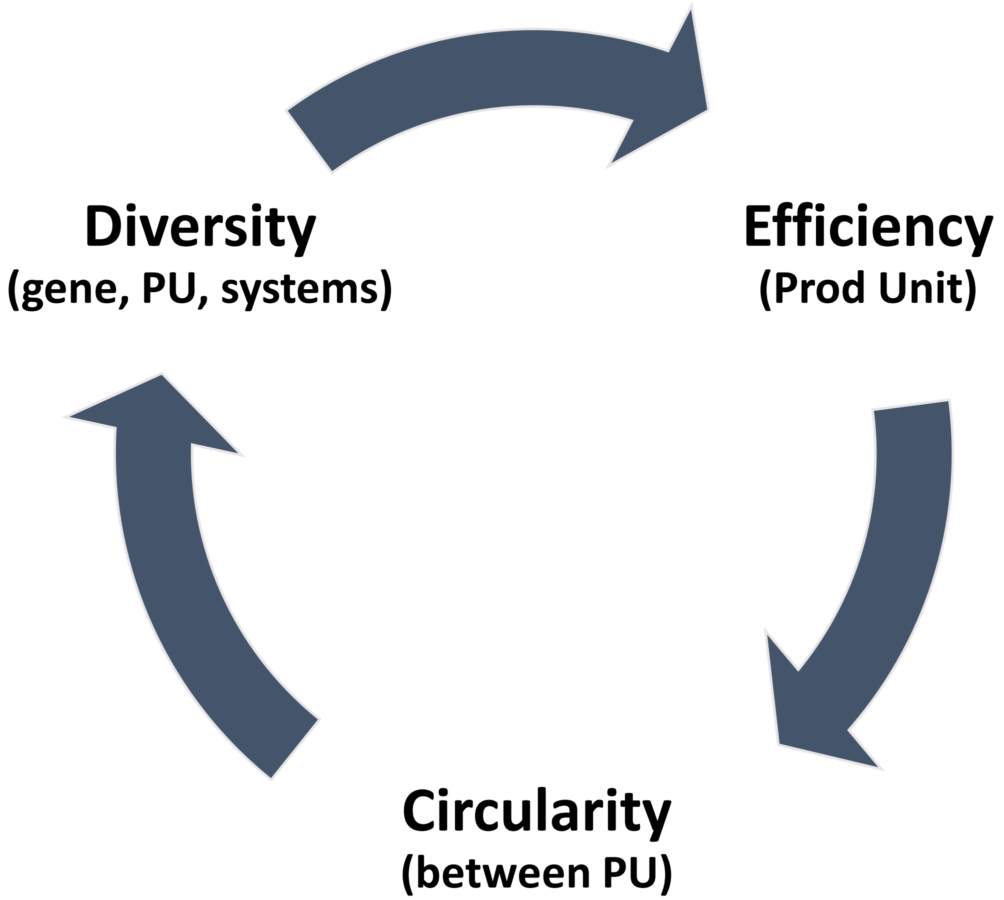
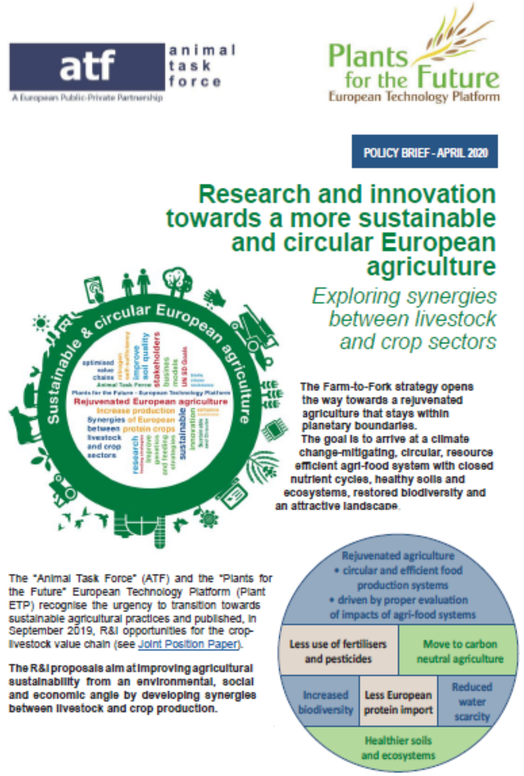
Three interconnected components for improving sustainability

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Plants for the Future
European Technology Platform
POLICY BRIEF - APRIL 2020
Research and innovation towards a more sustainable and circular European agriculture
Exploring synergies between livestock and crop sectors

The Farm-to-Fork strategy opens the way towards a rejuvenated agriculture that stays within planetary boundaries.
The goal is to arrive at a climate change-mitigating, circular, resource efficient agri-food system with closed nutrient cycles, healthy soils and ecosystems, restored biodiversity and an attractive landscape.

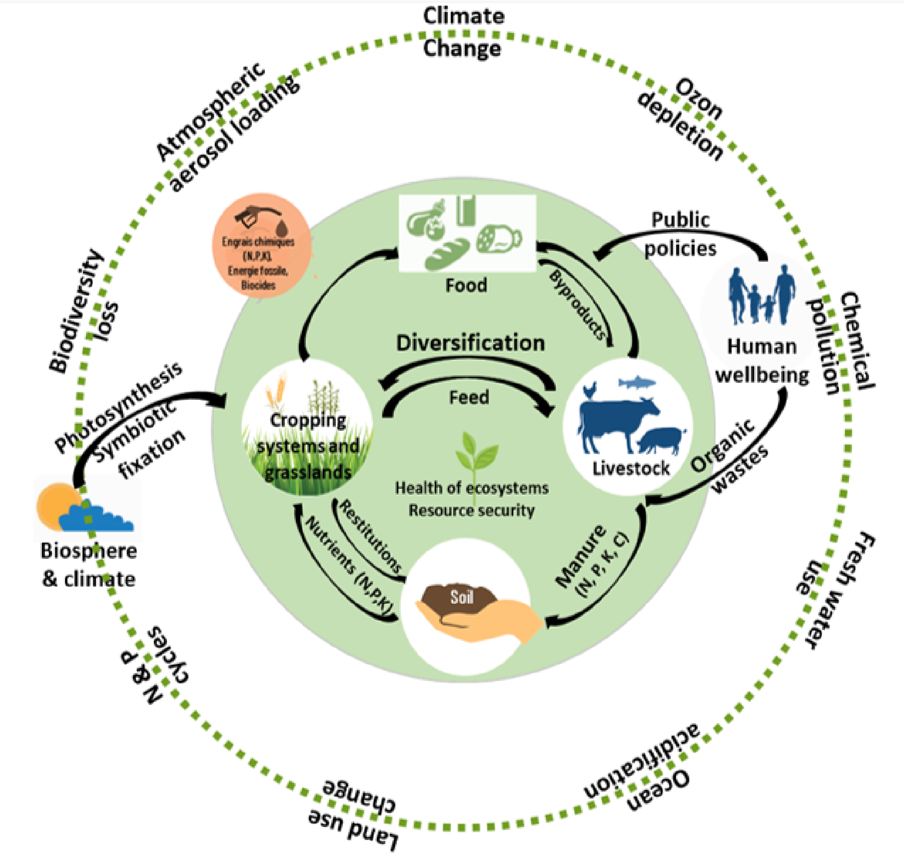
The "Animal Task Force" (ATF) and the "Plants for the Future" European Technology Platform (Plant ETP) recognise the urgency to transition towards sustainable agricultural practices and published, in September 2019, R&I opportunities for the crop-livestock value chain (see Joint Position Paper).

The R&I proposals aim at improving agricultural sustainability from an environmental, social and economic angle by developing synergies between livestock and crop production.

Key principle for progress - 1

Livestock have a critical role to increase circularity in sustainable food systems

- Can't have a sustainable circular food system without livestock
- Livestock facilitate crop diversification
- They are recyclers by nature and they convert biomass to food
- They provide organic fertilisers which contribute to soil health



Roles of livestock and crops in realising a European Sustainable Circular Bioeconomy

Key principle for progress - 2
Diversity of livestock systems is needed

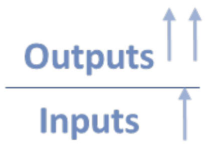
- A diverse set of livestock systems are needed because of varying agro-climatic conditions – no one size fits all
- A diversity of systems gives more resilience to the overall system from shocks such as climate/weather, input prices and availability, disease
- Different systems have different intrinsic qualities

	Ruminant meat	Monogastric meat
Price/kg meat		√
Feed conversion efficiency		√
Use of non-edible feed	√	
Feed and manure circularity	√	

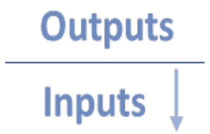
Key principle for progress – 3

Efficiency is good, but which efficiency?

- Efficiency has a role to play in better use of resources
- Animal, herd, production unit (farm) or landscape level
  - Important to consider at least at the level of production unit
- Intensification: Fewer animals for a given production, lower emissions / kg products



- Sustainable intensification: Less emissions (NH_3, NO_3, N_20, CH_4) for the same production/animal



- There are limitation to LCA assessments – does not capture circularity, biodiversity, soil quality, social aspects…..

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Research and Innovation have a major role to play in developing the future livestock systems

New ATF Strategic Research and Innovation Agenda

Four sustainability domains and one cross-cutting issue to improve European livestock farming systems

Are the non-food co-products / by-products / benefits of livestock sufficiently considered in the cost:benefit ratio of livestock?

Joint ATF – EAAP/LFS symposium in Florence, 1 September 2024

Summary

- Europe has a very important and efficient livestock sector
- Livestock's legitimacy questioned but role in our food system make them too valuable to dispense with
- Interaction between livestock and environment is complex (+ and -)
- Livestock can put pressure on our ecosystems – climate, biodiversity, water
- We must preserve what's good and reduce the pressures
- Circularity, diversity and efficiency are critical to improving sustainability
- Research and innovation have a huge role to play