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Sustainable Rendering

The Circular Bioeconomy and Its Effects on Carbon Allocation in Feed Ingredients.

International Rendering Symposium
Atlanta, January 30th, 2025

Lucas Cypriano
Technical Director

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1. Rendering and Sustainability
2. Global Policymaker Framework
3. Circular Bioeconomy
4. Carbon Allocation in Feed Ingredients
5. Challenges and Opportunities

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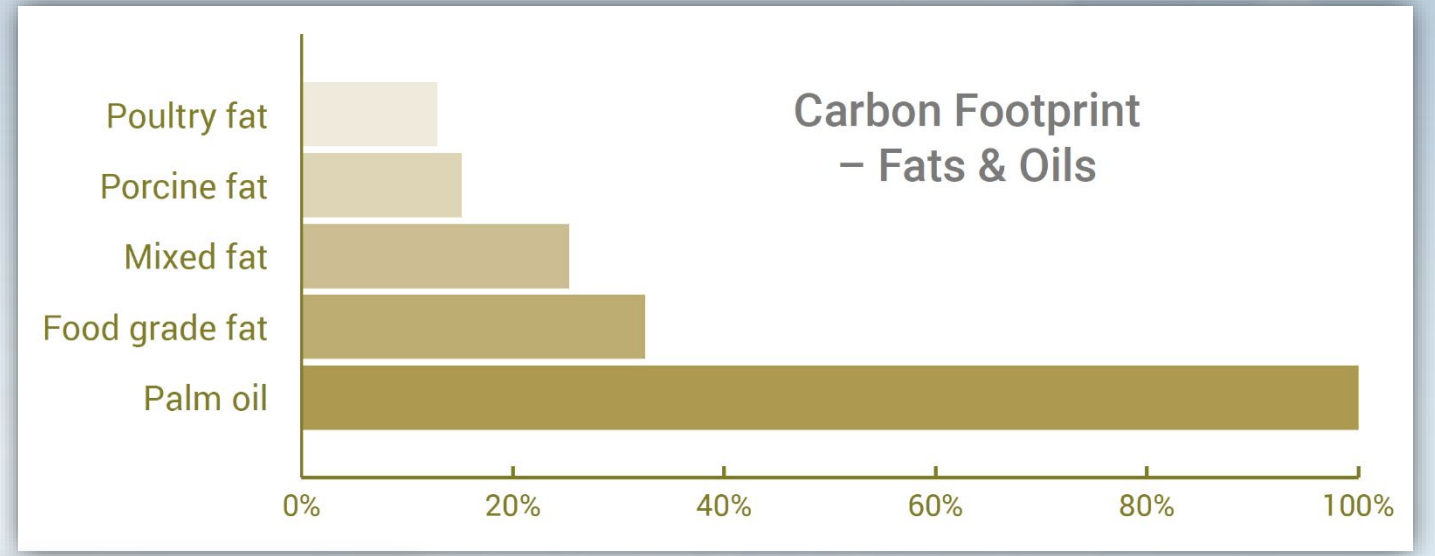
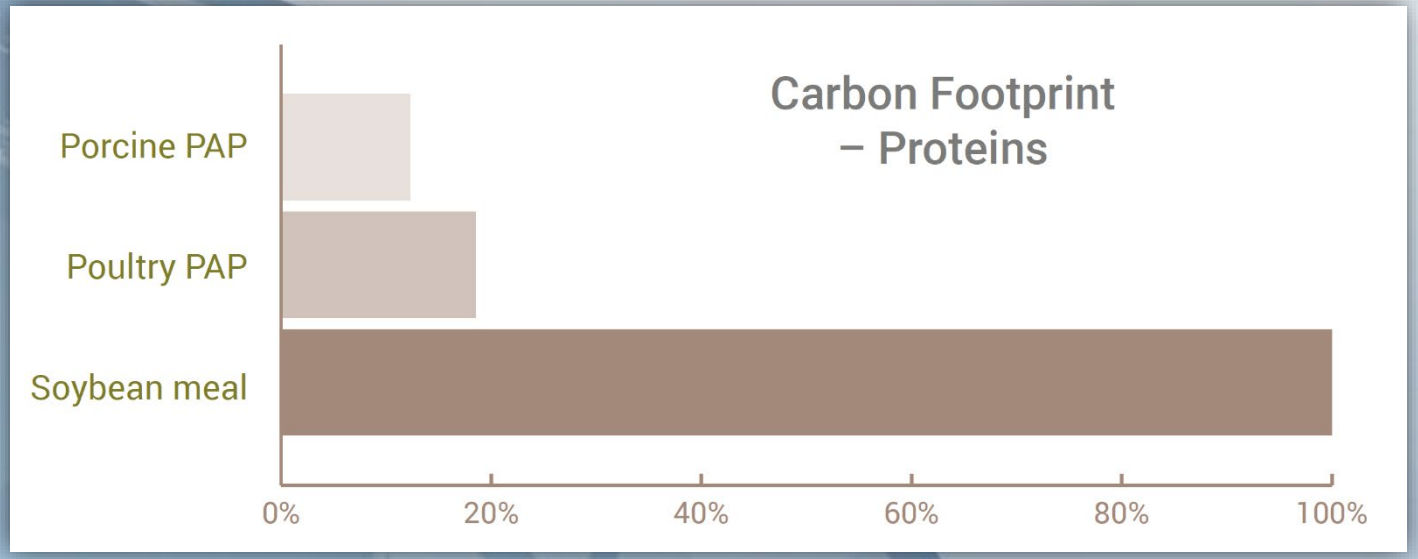
1. Rendering and Sustainability

A quick overview on our sustainability

Rendered products: LOW CARBON FOOTPRINT

Rendered products do not compete with food!





https://efpra.eu/wp-content/uploads/2022/05/EFPRA-SUSTAINABILITY-CHARTER-V1a.pdf

Rendered products: NUTRIENT AND LAND-SAVING

The fats and protein meal (5.3 million tons) produced in Brazil represents:*

- *650th tons of dicalcium phosphate (equivalent)***
- *1.9 million ton of pure protein and 32.4 billions kcal*

To replace protein & Kcal:

2.1 million hectares
910th tons of NPK

*: L. Cypriano, Revista Reciclagem Animal, Jan/Feb 2018, pp. 60 a 63 - http://www.mflip.com.br/pub/stilo/?numero=61&edicao=10598#page/61
**: L. Cypriano, Revista Reciclagem Animal, Dec/Nov 2017, pp. 50 a 55 - http://www.mflip.com.br/pub/stilo/?numero=60&edicao=10538#page/51

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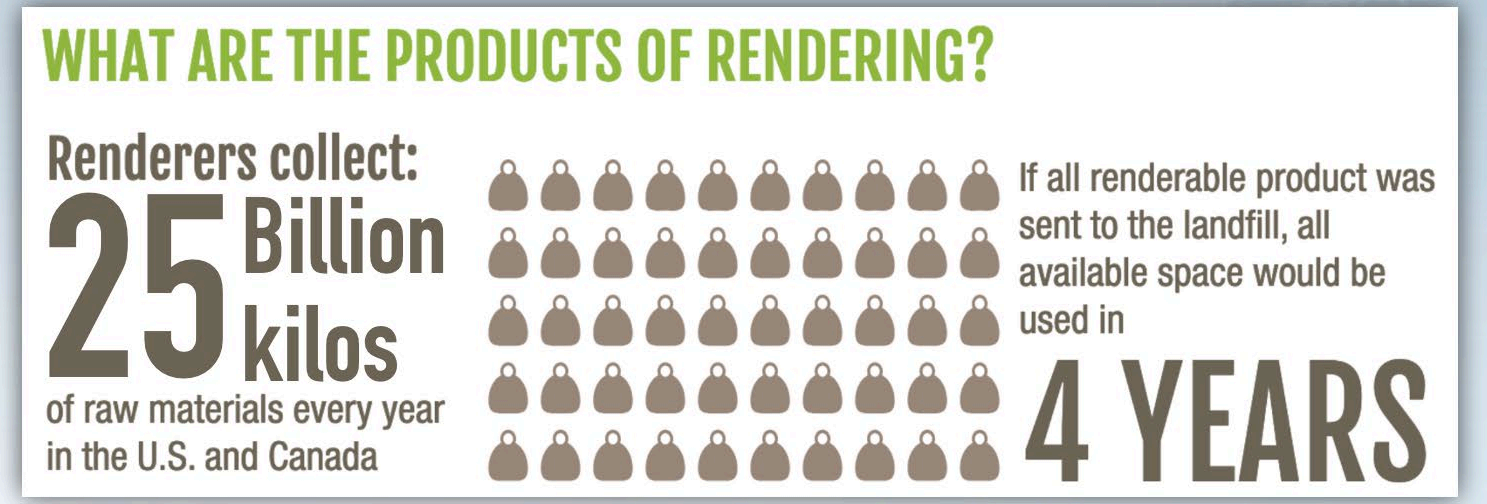
Rendered products: IS RECYCLING

Avoid waste

Reduced landfills outputs

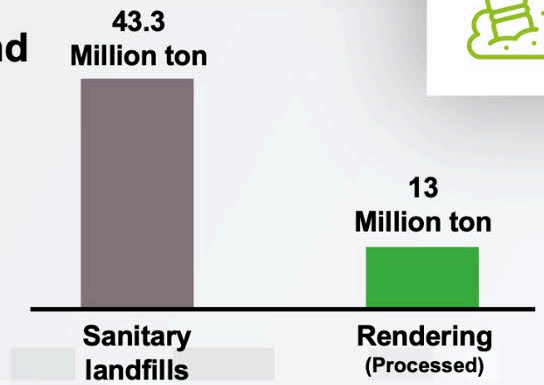


https://nara.org/wp-content/uploads/2019/12/Rendering-is-Recycling-Update.pdf

ENVIRONMENTAL SUSTAINABILITY

Brazil currently has more than 3 thousand sanitary landfills spread all over the country

Without the renderers job, this number would increase by 30.7%, about 921 new sanitary landfills.



https://abra.ind.br/conheca-o-setor/?lang=en

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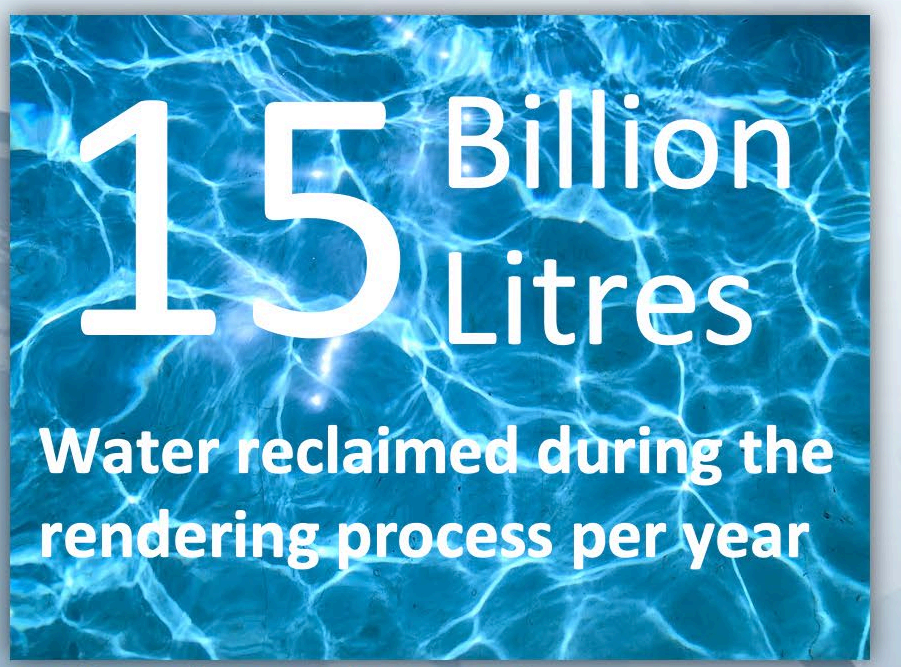
Rendered products: WATER RECOVERY

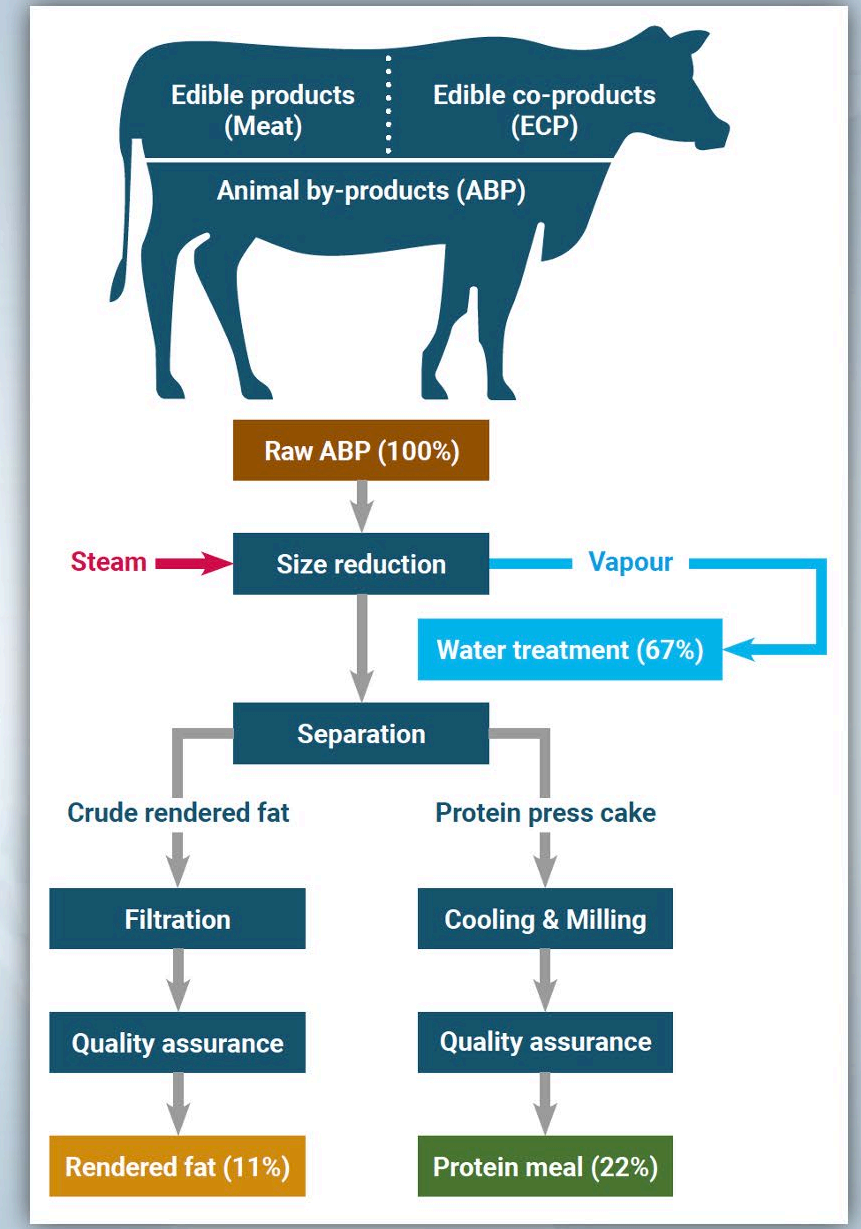
Water: from 50% to 90% is water reclaimed, and is treated before released

In USA & Canada:



https://nara.org/sustainability/water-recovery/

In European Union:



https://efpra.eu/wp-content/uploads/2022/05/EFPRA-SUSTAINABILITY-CHARTER-V1a.pdf

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2. Global Policymaking Framework

Understanding the Collaboration Between UN, FAO, IPCC, and Nations for Sustainability and Climate Action

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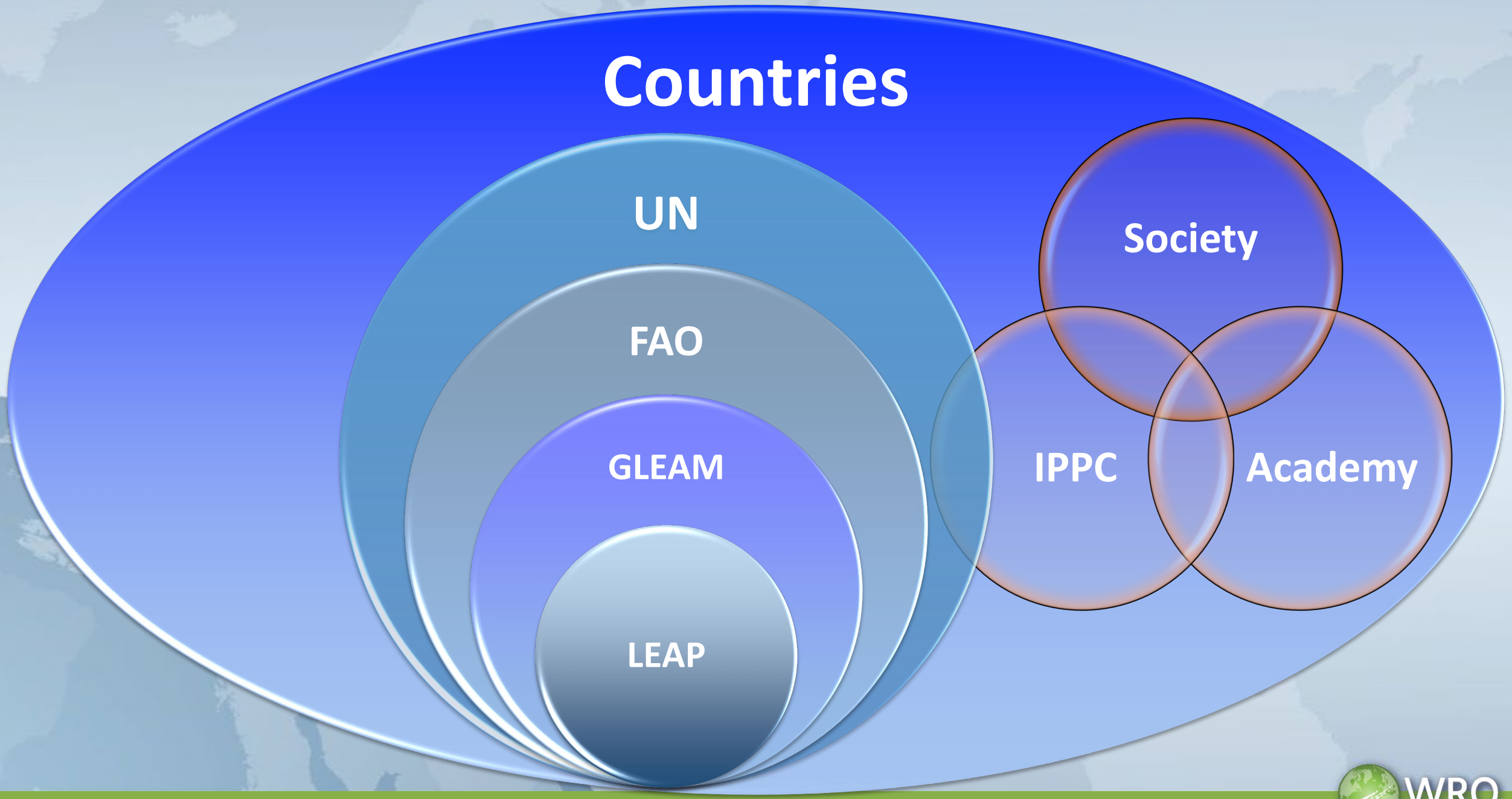

Countries
UN
FAO
GLEAM
LEAP
Society
IPPC
Academy

UN (United Nations) goals are:

- Maintain international peace and security
- Protect Human Rights
- Deliver Humanitarian Aid
- Uphold International Law
- **Support Sustainable Development and Climate Action**

Agenda 2030

All countries and all stakeholders (...) will implement this plan. We are resolved to free the human race from the tyranny of poverty and want and to heal and secure our planet (...) take the bold and transformative steps which are urgently needed to shift the world onto a sustainable and resilient path. (...) no one will be left behind. The 17 Sustainable Development Goals (...) demonstrate the scale and ambition of this new universal Agenda (...) They seek to realize the human rights of all and to achieve gender equality and the empowerment of all women and girls. They are integrated and indivisible (...) of sustainable development: the economic, social and environmental

FAO (Food and Agricultural Organization) goal is:

Achieve food security for all and make sure that people have regular access to enough high-quality food to lead active, healthy lives.

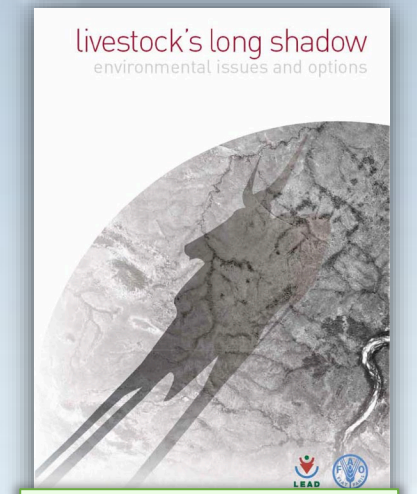
GLEAM (*Global Livestock Environmental Assessment Model*)

quantify production and use of natural resources (...) **and to identify environmental impacts of livestock** (...), **assessment** (...) **and mitigation** to (...) a more **sustainable livestock sector**.

LEAP (*Livestock Environmental Assessment and Performance Partnership*)

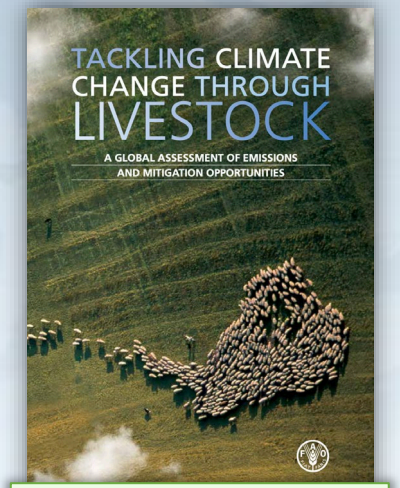
develops (...) **guidance and methodology for understanding the environmental performance of livestock** supply chains, in order **to shape evidence-based policy measures and business strategies**.

GLEAM History



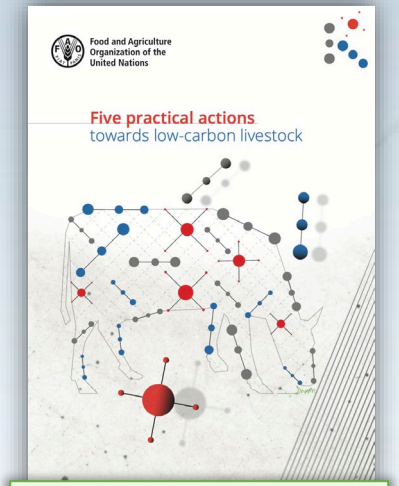
Pre-GLEAM
(base year 2001)
IPCC. 1997

2006



GLEAM 1
(base year 2005)
IPCC 2006

2013



GLEAM 2
(base year 2010)
IPCC 2006

2019

GLEAM 3
(base year 2015)
IPCC 2019, IPCC 2006

2023

2010

2016
- Large Ruminants
- Small Ruminants
- Poultry
- Feed

2018
- Pigs
- Nutrient Flow

2019
- Water
- Soil carbon

2020
- Biodiversity
- Feed additives

2024
- Methane emissions

ipcc

REPORTS SYNTHESIS REPORT WORKING GROUPS ACTIVITIES NEWS CALENDAR

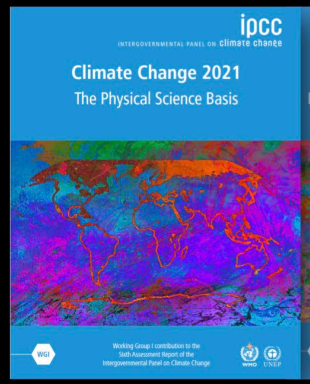
FOLLOW SHARE

About the IPCC

The Intergovernmental Panel on C
the United Nations body for assess
climate change.

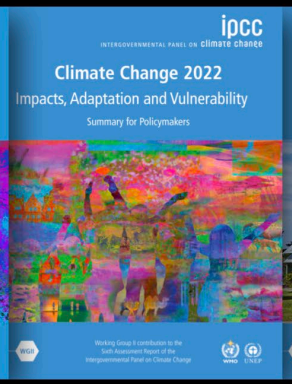
The State of Knowledge about Climate Change

WGI



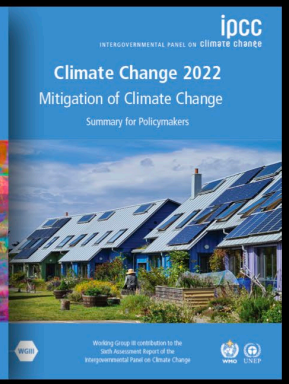
AR6 Climate Change 2021: The Physical Science Basis

WGII



Climate Change 2022: Impacts, Adaptation and Vulnerability

WGIII

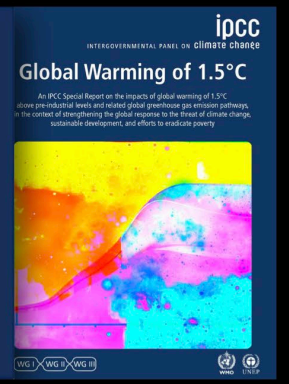


Climate Change 2022: Mitigation of Climate Change

Special Report

Ocean and Cryosphere in a Changing Climate

Climate Change and Land



Global Warming of 1.5 °C

Sixth Assessment Report | Synthesis Report

ipcc

More information: https://www.ipcc.ch

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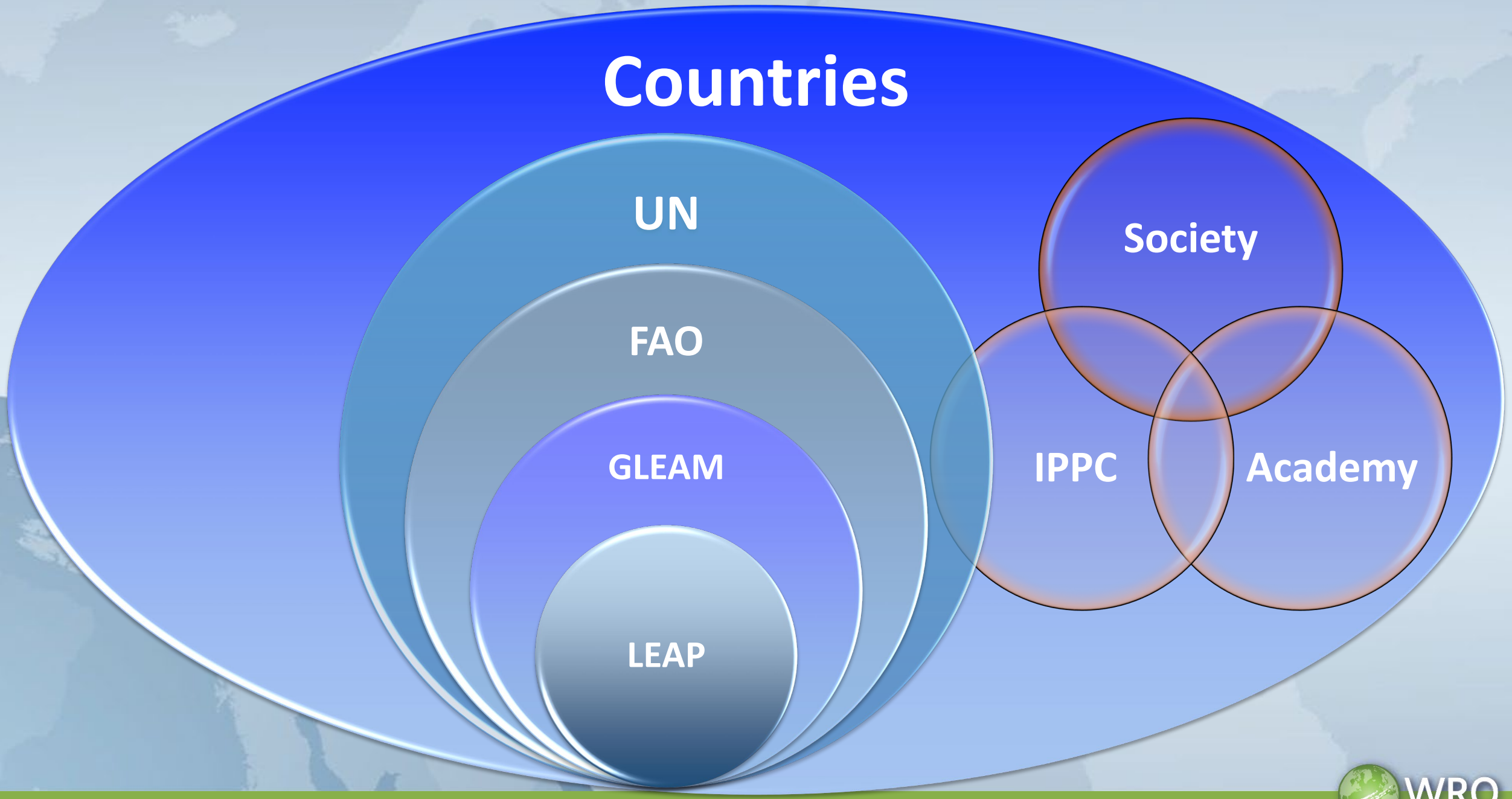
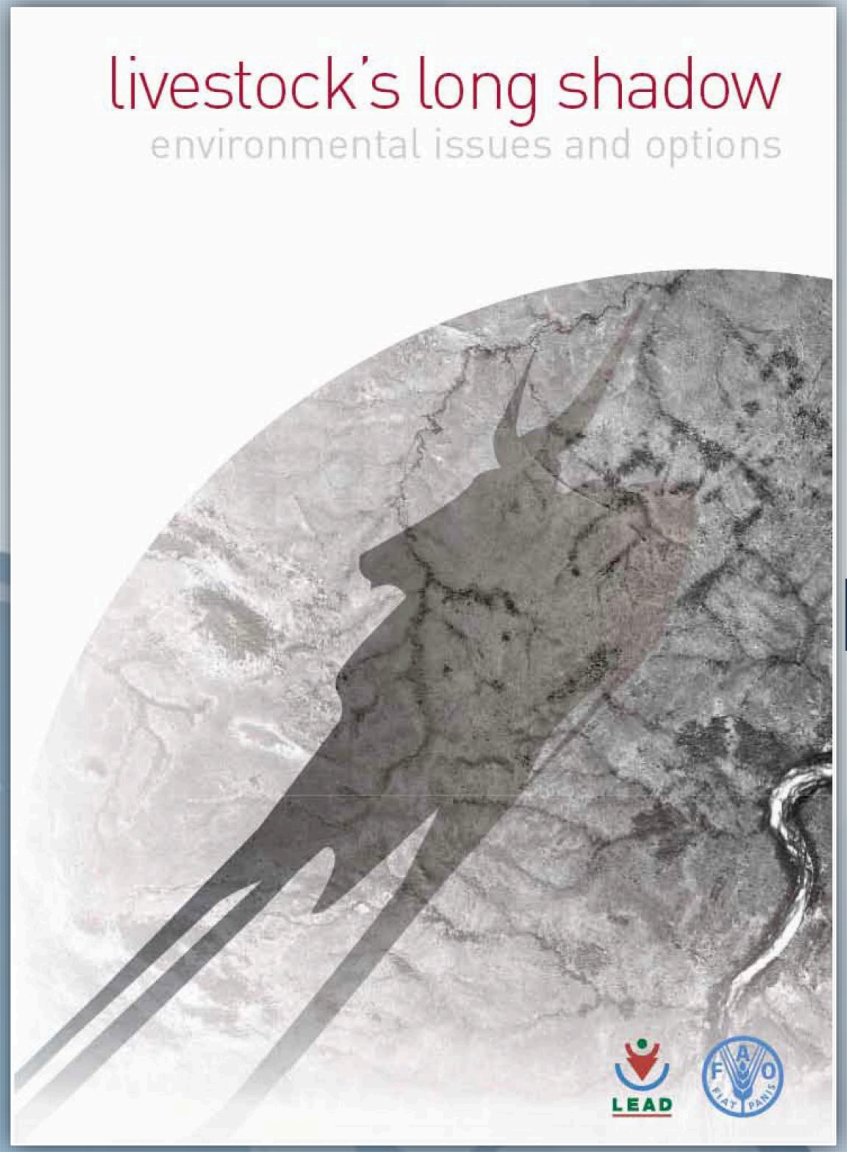
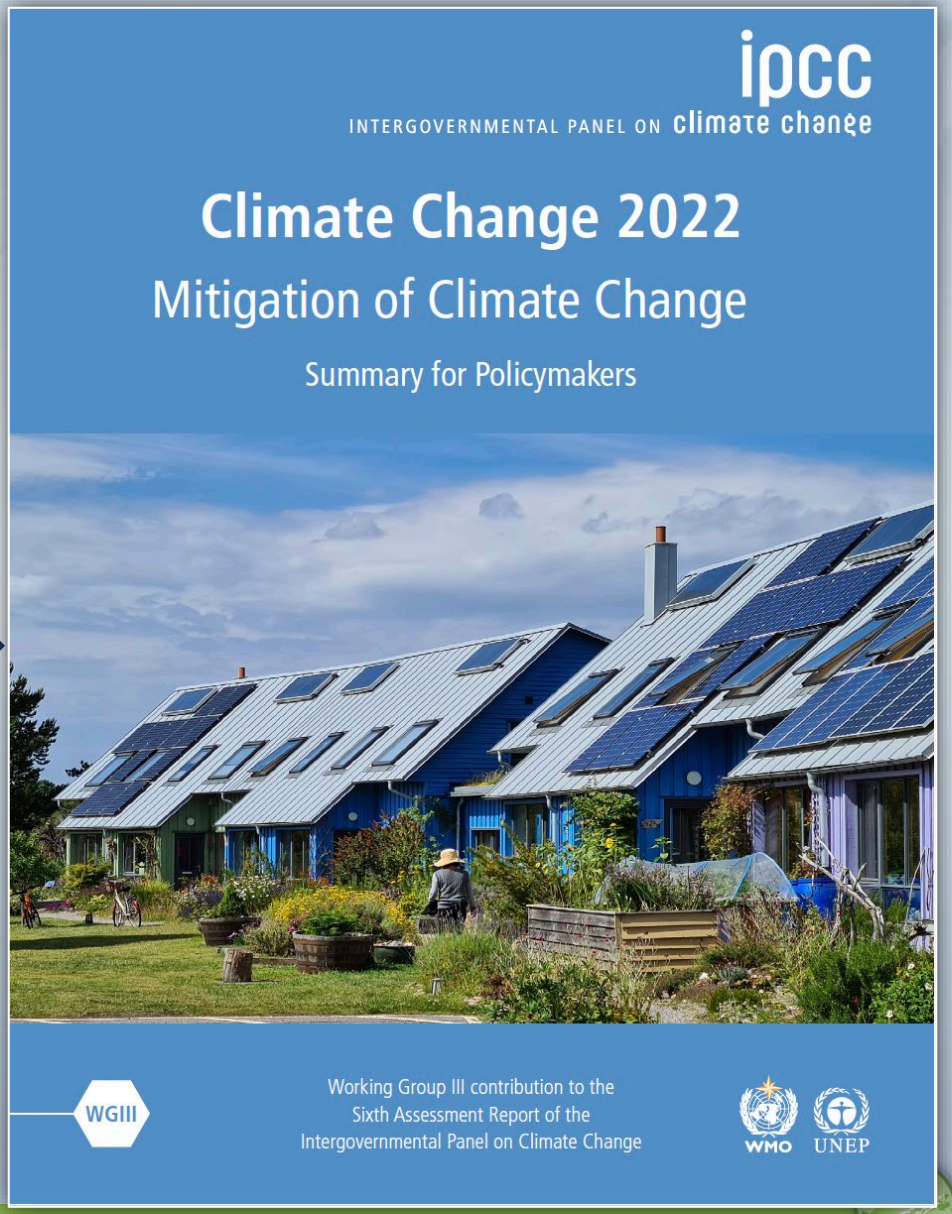

Countries
UN
FAO
GLEAM
LEAP
Society
IPPC
Academy

Why it is so important?



2001 to 2022



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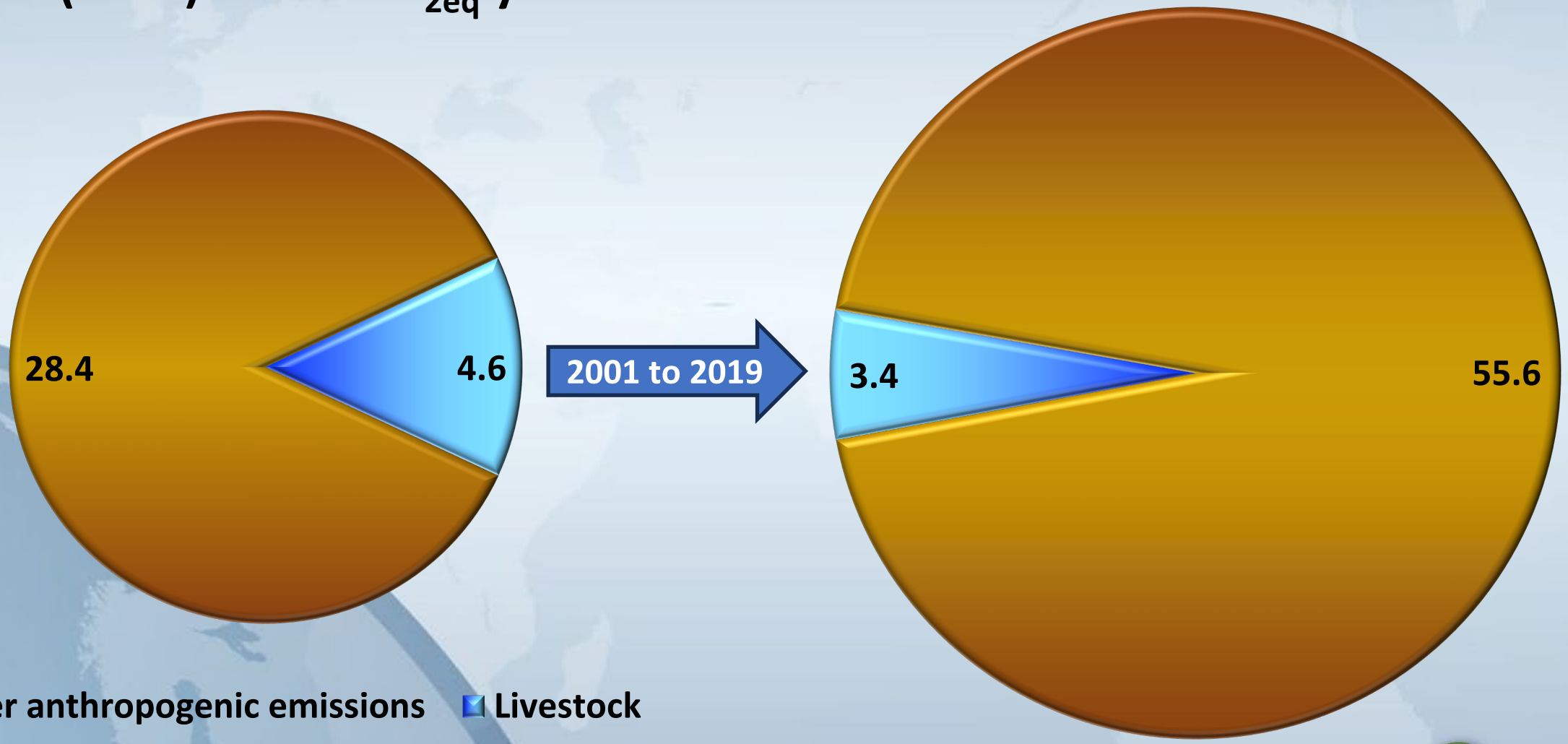
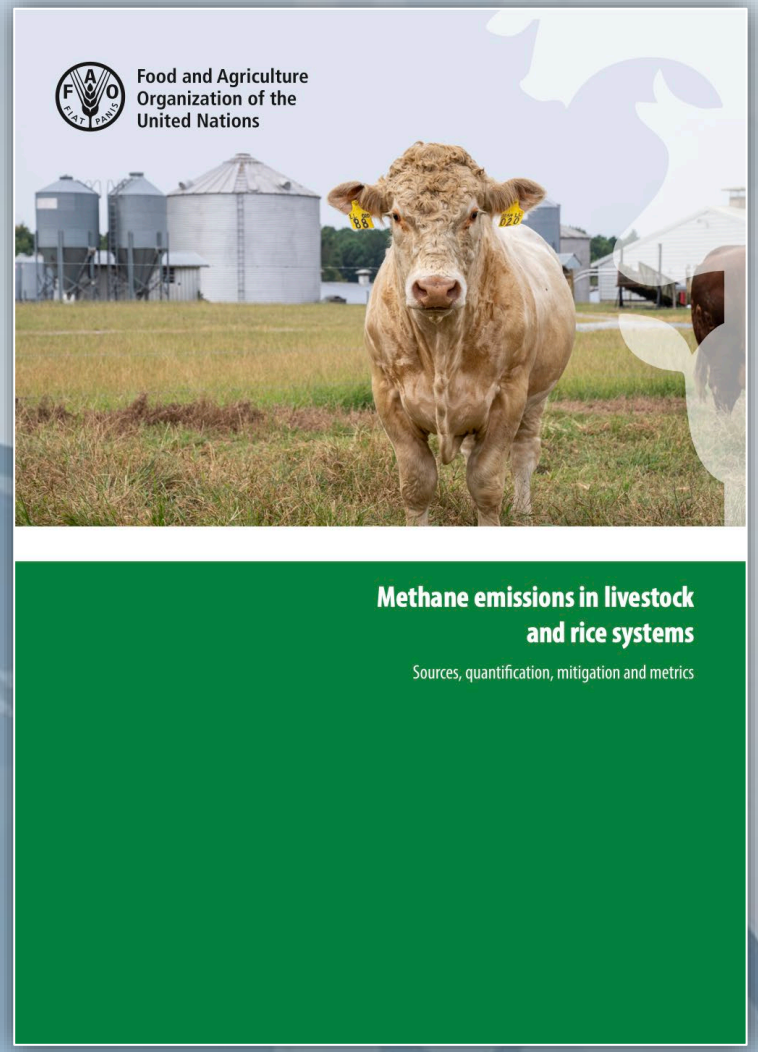
Why it is so important?

LLS (2006) – 33GtCO$_{2eq}$ y^{-1}

IPCC (2023) – 59GtCO$_{2eq}$ y^{-1}

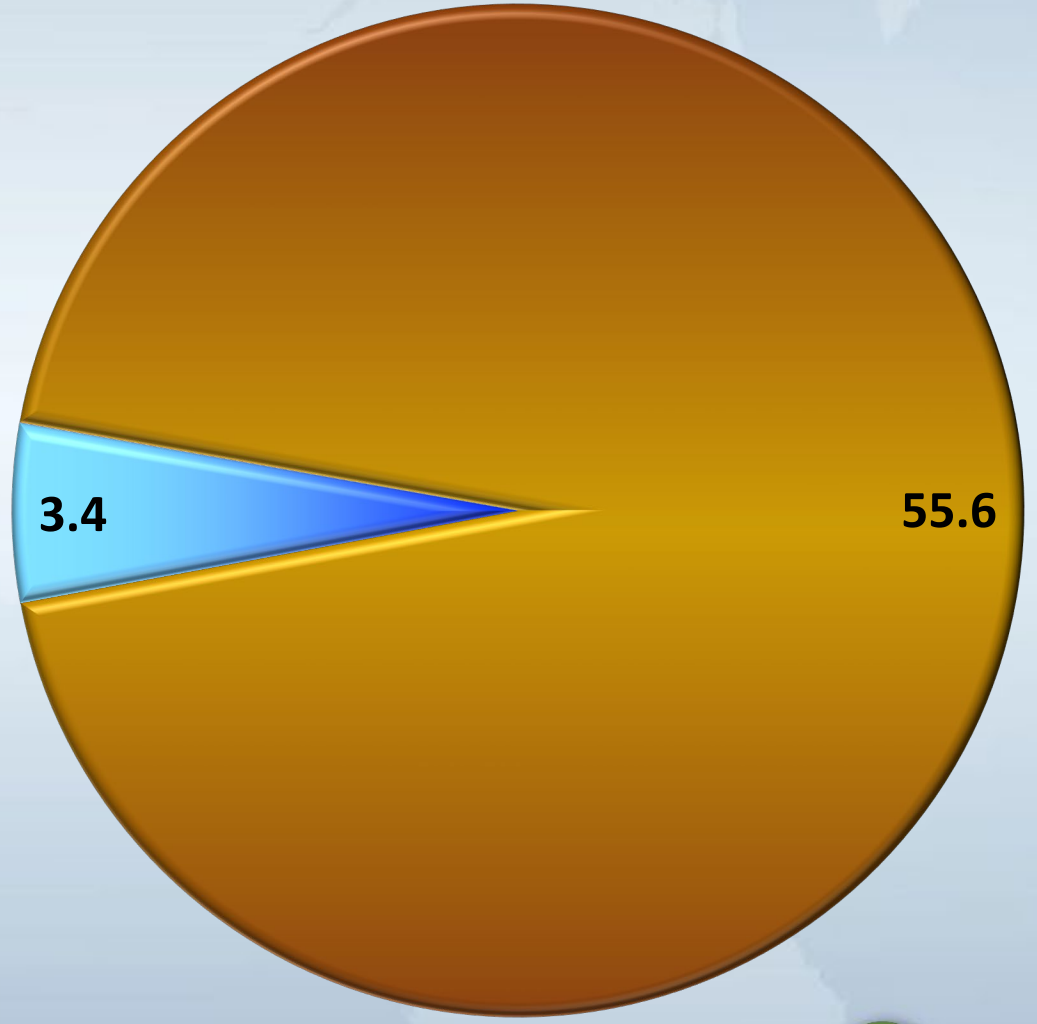


Why it is so important?



New metrics yet to be assumed

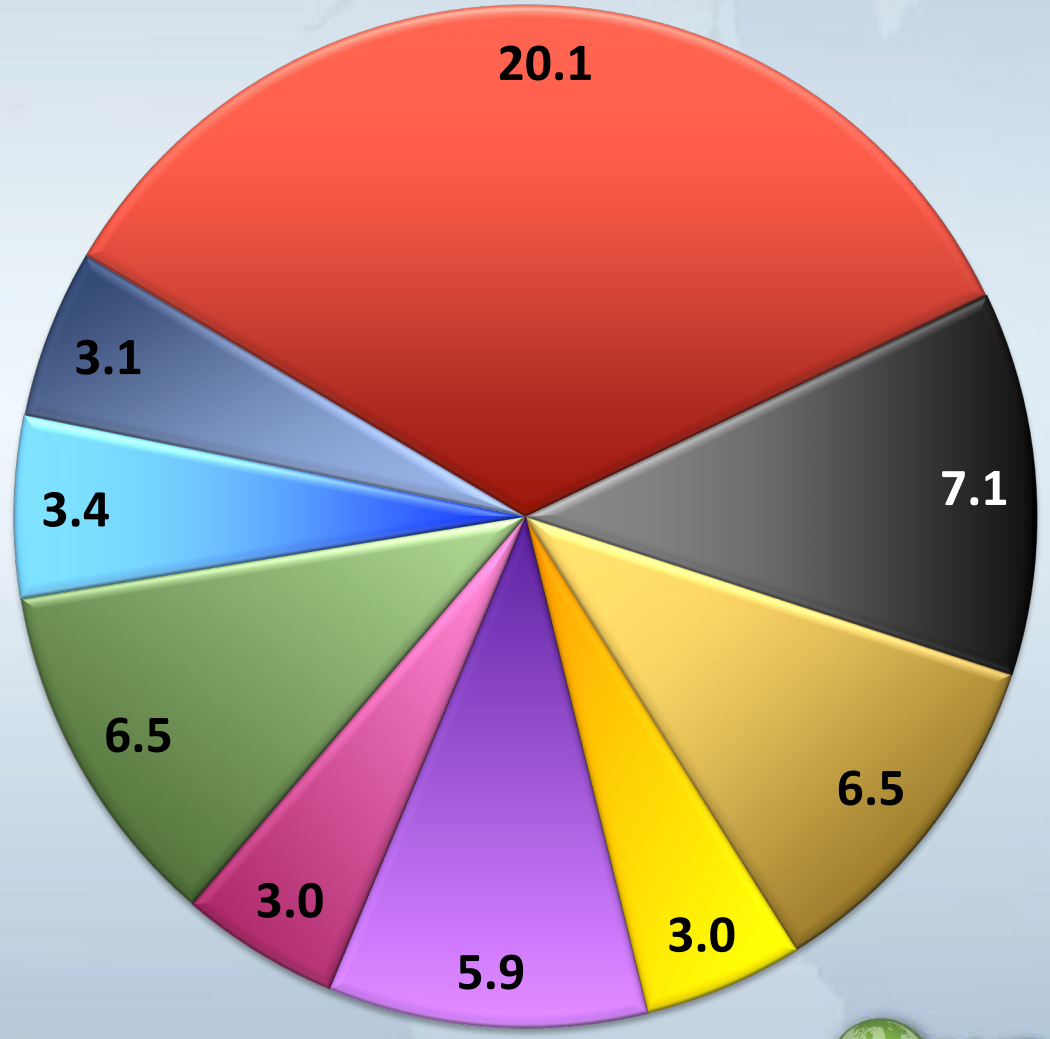
IPCC (2023) – 59GtCO_{2eq} y^{-1}



Why it is so important?

IPCC (2023) – 59GtCO$_{2eq}$ y-1

- Buildings (houses)
- Buildings (others)
- Tranport (roads)
- Tranport (others)
- LULUCF
- Agriculture (livestock)
- Agriculture (others)
- Industry
- Other energy (refining and fugitive emissions)



3. Circular Bioeconomy

How LEAP is leading the way in shaping the concept

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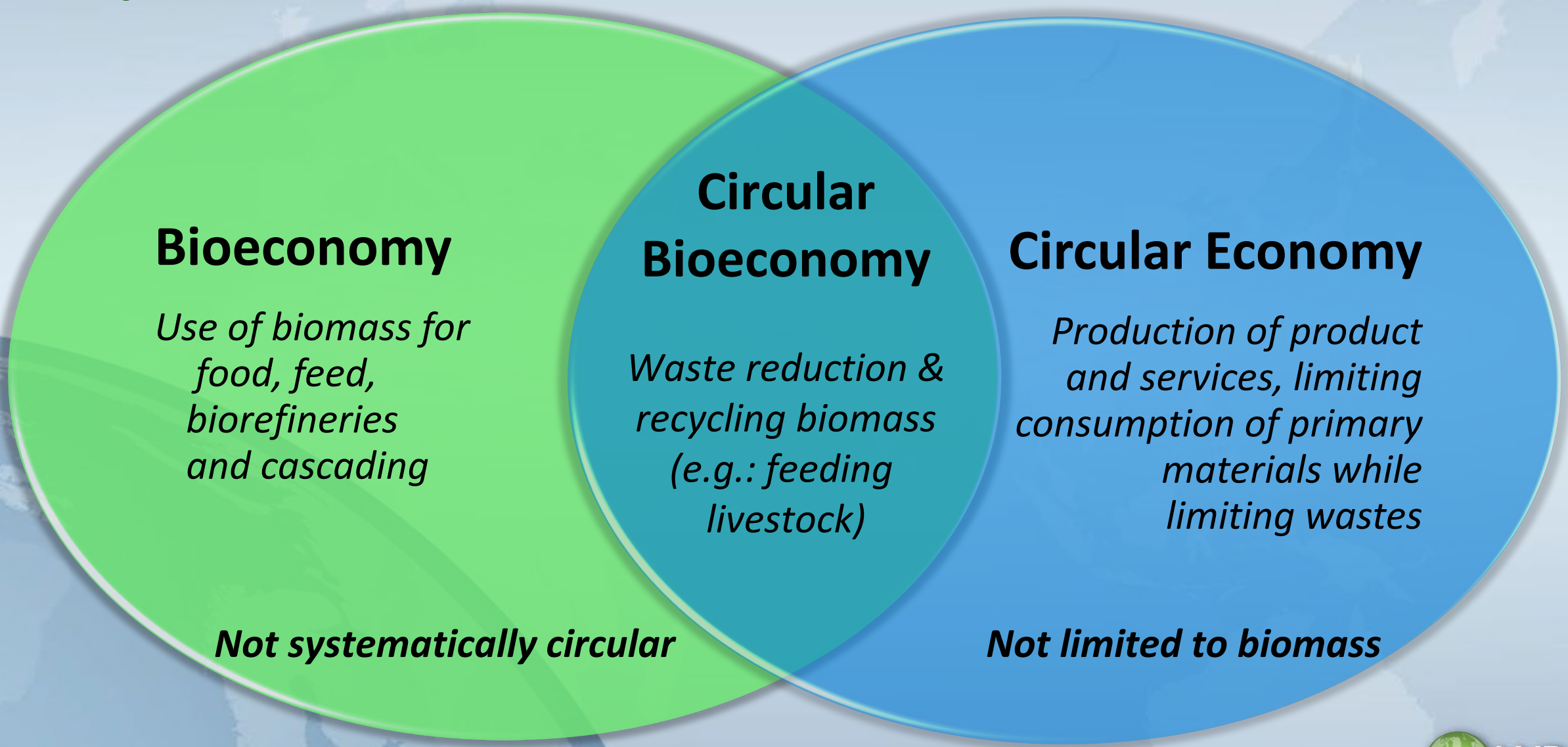
FAO/LEAP

*"Thus, **livestock** play an important role in the circular bioeconomy as they **enable the upcycling** of agricultural products that cannot be consumed by humans into valuable and nutritional food, produce manure as a fertilizer and deliver other ecosystem services and cultural value."*

https://www.fao.org/partnerships/leap/resources/public-review/en/

FAO/LEAP



https://www.fao.org/partnerships/leap/resources/public-review/en/

FAO/LEAP

***Circular bioeconomy**: The production, utilization and conservation of **biological resources to provide products** and services **across all economic sectors** in the most efficient way respecting planetary boundaries, **based on the avoidance/prevention of raw materials use, reduction of waste, reuse and recycling of biomass materials**. It also concerns social (fairness and accessibility) and animal centered (animal health and wellbeing) criteria*

https://www.fao.org/partnerships/leap/resources/public-review/en/

FAO/LEAP

Glossary

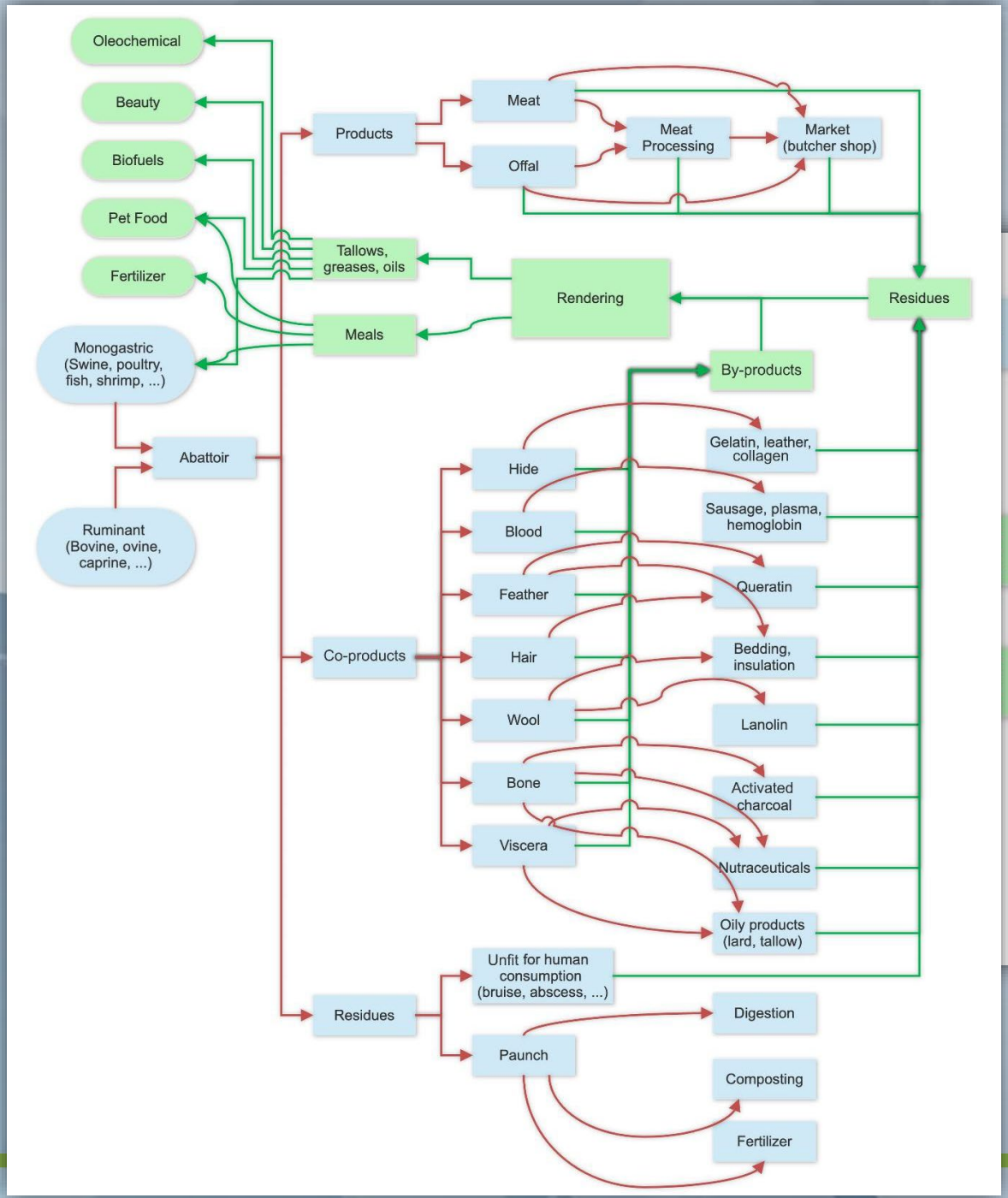
***Residual**: Any material without economic value leaving the product system in the condition as it is created in the process (Note 1: Materials with economic value are considered by-products).*

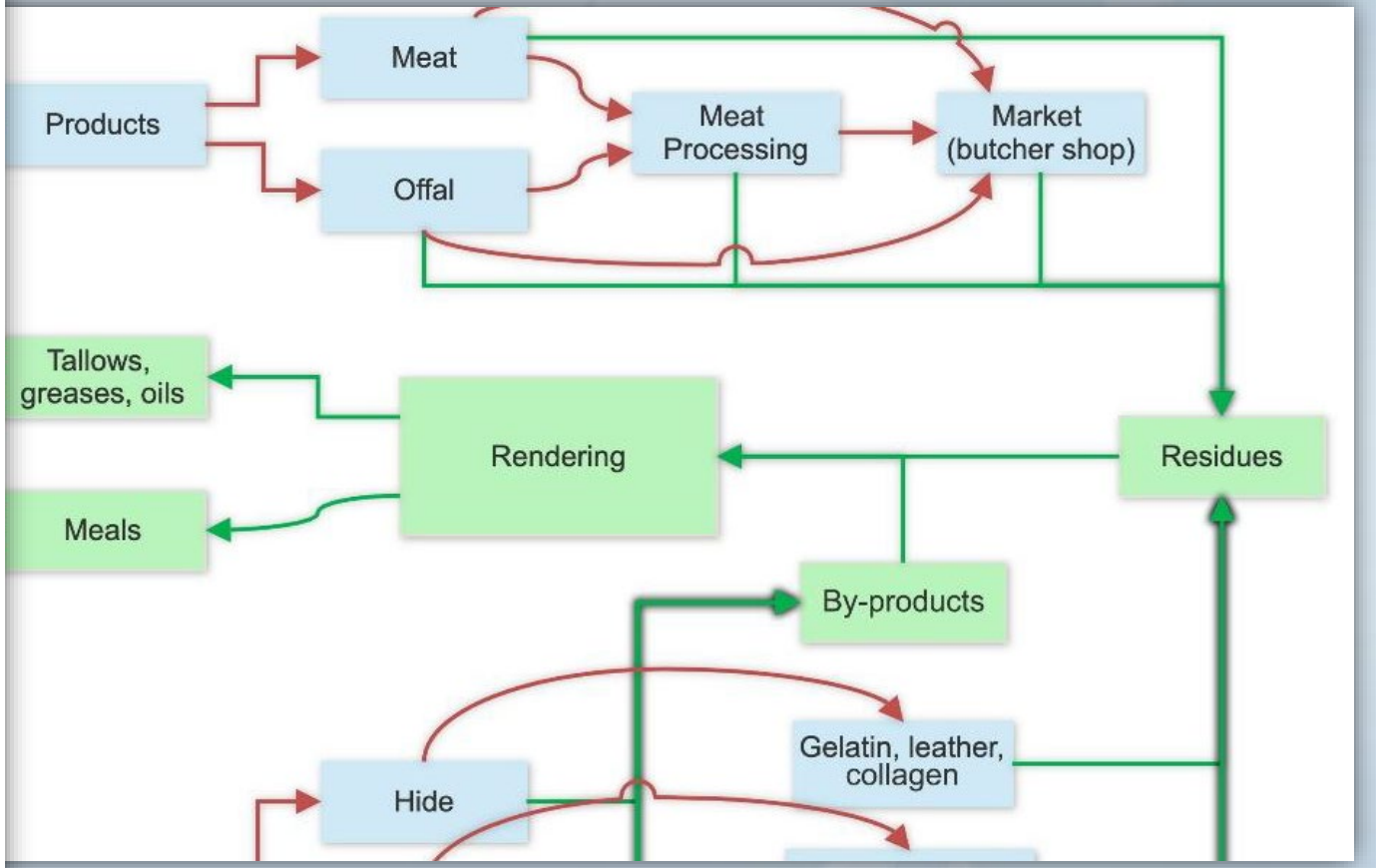
***By-product:** Material produced during the processing (including slaughtering) of a livestock or crop product that is not the primary product of the activity (e.g. oil cakes, meals, offal, or skins). Most of the by-products are considered low economic value or at least lower than the main product (**the product that drives the production**).*

***Animal-based products (ABP)**: All co-products from livestock production, such as meat, dairy, fiber (e.g. wool), eggs, and fish from aquaculture and fisheries, as well as any other materials derived from their processing.*

***Co-products**: Any of two or more products coming from the same unit process or product system (ISO 14044:2006, 3.10)*

https://www.fao.org/partnerships/leap/resources/public-review/en/


Oleochemical
Beauty
Biofuels
Pet Food
Fertilizer
Monogastric (Swine, poultry, fish, shrimp, ...)
Abattoir
Ruminant (Bovine, ovine, caprine, ...)
Products
Meat
Offal
Meat Processing
Market (butcher shop)
Tallows, greases, oils
Rendering
Residues
Meals
By-products
Co-products
Hide
Blood
Feather
Hair
Wool
Bone
Viscera
Gelatin, leather, collagen
Sausage, plasma, hemoglobin
Queratin
Bedding, insulation
Lanolin
Activated charcoal
Nutraceuticals
Oily products (lard, tallow)
Residues
Unfit for human consumption (bruise, abscess, ...)
Paunch
Digestion
Composting
Fertilizer


Products
Meat
Offal
Meat Processing
Market (butcher shop)
Tallows, greases, oils
Rendering
Residues
Meals
By-products
Hide
Gelatin, leather, collagen

CIRCULAR BIOECONOMY

WRO: partner of FAO/LEAP

*: As the country´s BSE regulation

4. Carbon Allocation in Feed Ingredient

For all feed ingredients

FAO/LEAP

“Of the feed consumed by livestock, 86% is estimated to be unsuitable as food for humans”.

“Under a circular paradigm, food-feed competition dynamics are reduced, while livestock systems based on recycling residual streams from food, feed production and biobased industries are promoted.”

“If the allocation would be based on the share of human edible food (…), the share between the products changes. If only oil would be human edible, it would receive 100% of the environmental impact”

https://www.fao.org/partnerships/leap/resources/public-review/en/

FAO/LEAP

From a LCA to a CLCA (Consequential Life Cycle Analysis)

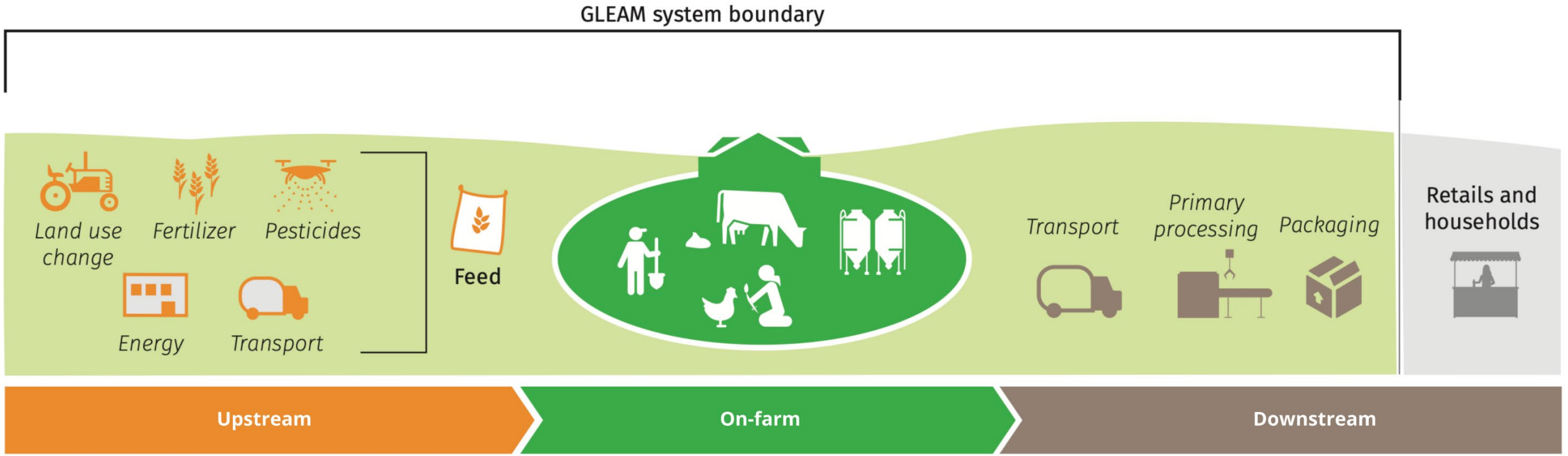
Table 1: Environmental impact allocation of the co-products resulting from the multifunctional process of sunflower seed crushing under economic and circular allocation. Table inspired from Van Hal et al., (2019).

Oil extraction process		Prices	Allocation	
Input	Output	(€/kg)	Economic	Circular
Sunflower seed	Oil	€ 1.15	88%	100%
	Meal	€ 0.18	12%	0%
	Hulls	€ 0.00	0%	0%

When the by-product/residue (inedible) is used for circular feeding, the driver (edible product/co-product) takes it all!

https://www.fao.org/partnerships/leap/resources/public-review/en/

FAO/LEAP



The LCA is linear – it does not and will not consider circularities

FAO/LEAP

*"The concept of livestock fed with biomass unsuitable for human consumption requires a complete redesign of the food system. In this situation the current **LCA** results are not valid anymore."*

*"**CLCA** may better evaluate the impact of sector changes on the overall food system"*

*"**CLCA**s provide information about the potential impact of changing the status quo"*

https://www.fao.org/partnerships/leap/resources/public-review/en/

FAO/LEAP

If adopted, the CLCA has the potential to profoundly change the carbon allocation of all feed ingredients classified as unsuitable for human consumption

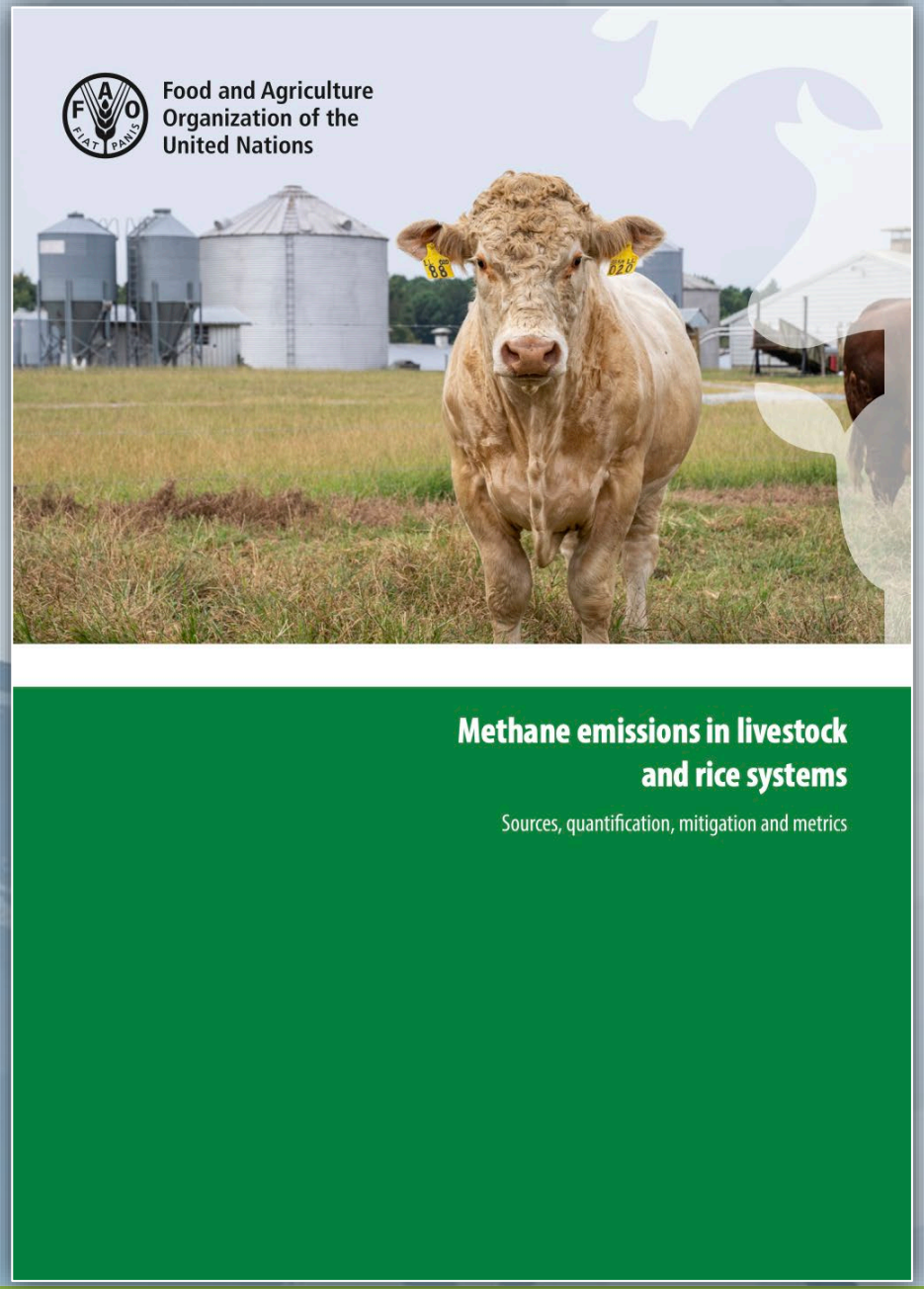
“Circular Bioeconomy”

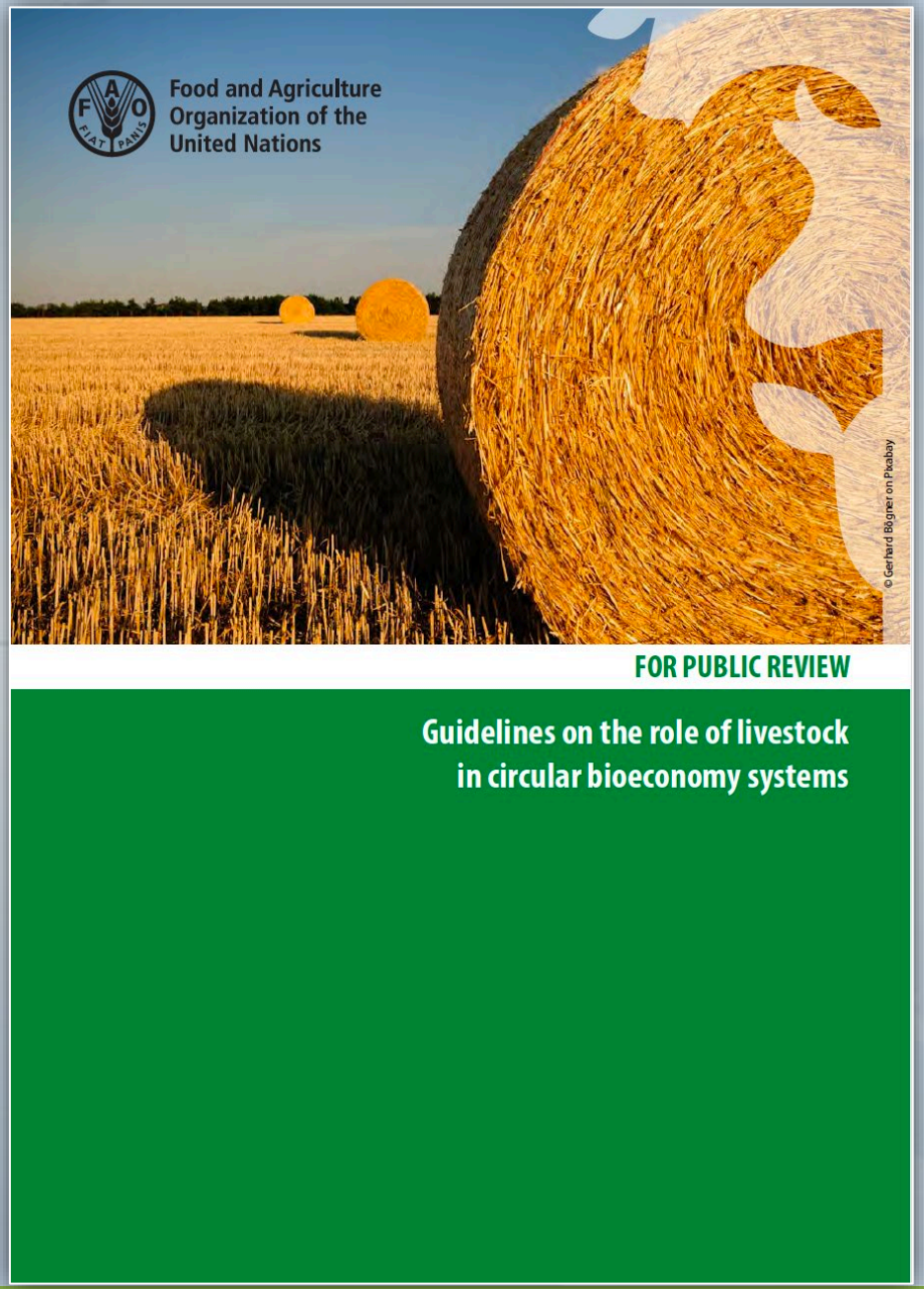
Rendered protein meals and fats: a vital link in the circular bioeconomy of the meat, egg, milk, and fishery supply chains

Sustainable and natural resource for petfood, biodiesel, RD, SAF, oleochemicals, cosmetics…

5. Opportunities and Challenges

OPPORTUNITIES





Circular Bioeconomy is not just climate change

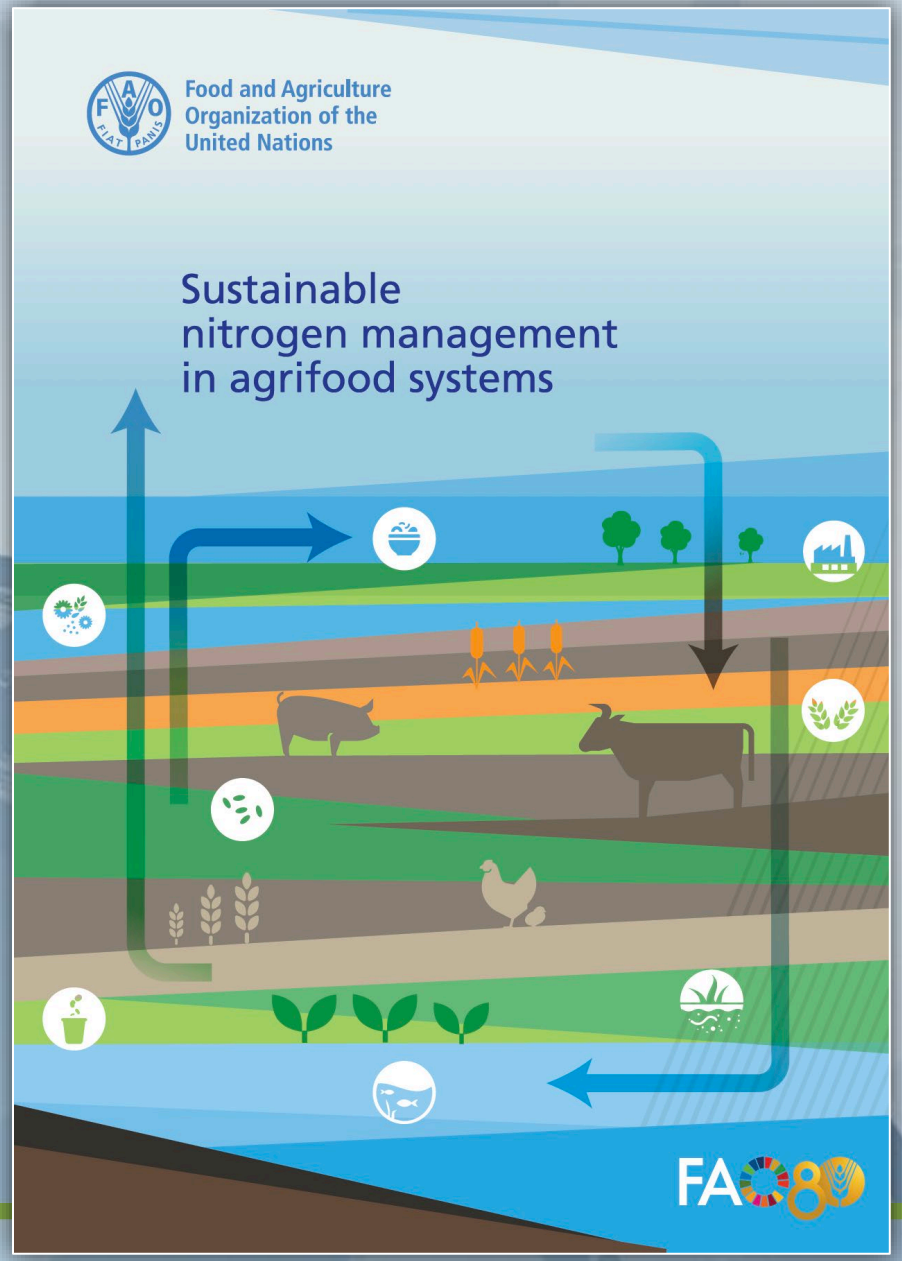
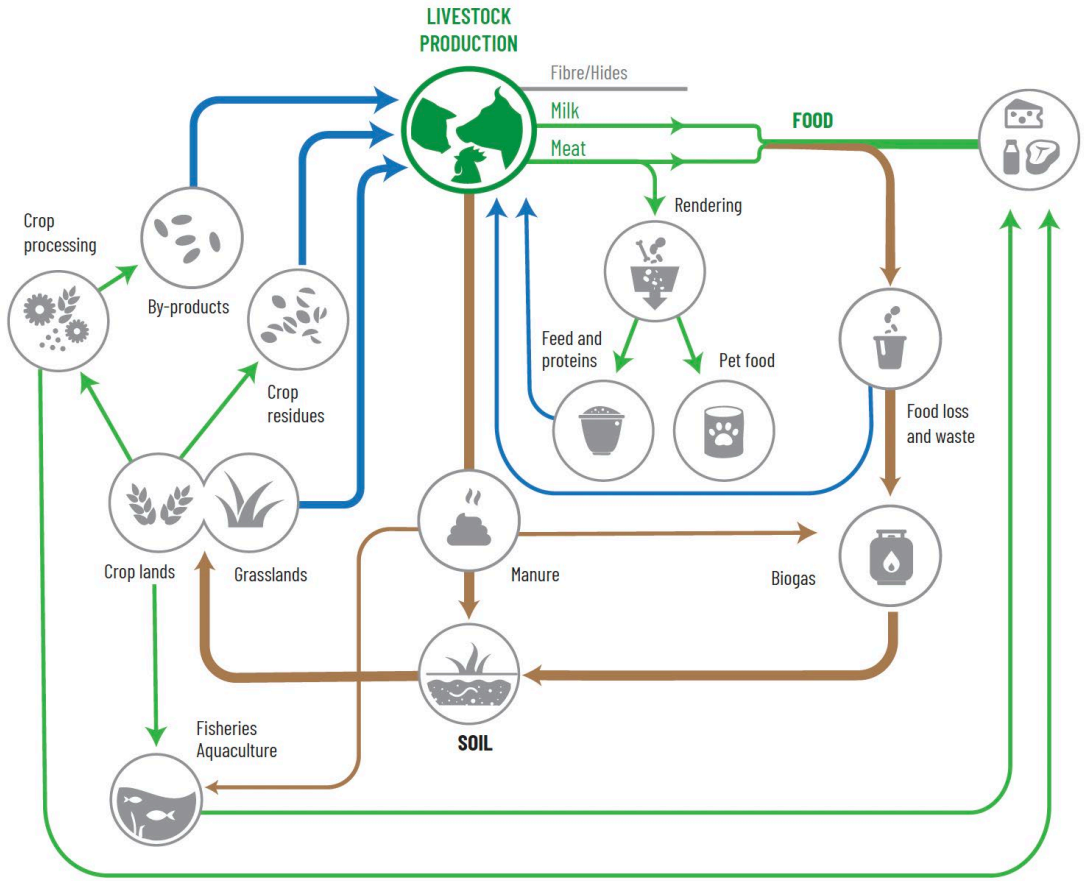


FIGURE 29
Diagram that represents circular bioeconomy approaches in the livestock sector



Note: The green arrows represent the production of food, blue arrows represent the supply of animal and fish feed, and the brown arrows represent the recycling flows across agrifood systems.

Source: Authors' elaboration.

OPPORTUNITIES

CHALLENGES

1. Transforming LEAP's Circular Bioeconomy concept & metrics into IPCC recommendations for policymakers.

2. Policymakers translating the new IPCC recommendations into regulations.

Natural, Sustainable, Circular

The essence of all rendered products!

Thanks!

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