Just transitions of agri-food systems: challenges and opportunities from an AE perspective

Marta G. Rivera Ferre

10/11/2022

ingenio CMC-UPV

ipcc INTERGOVERNMENTAL PANEL ON climate change

Food security: from simple messages

2050: A third more mouths to feed

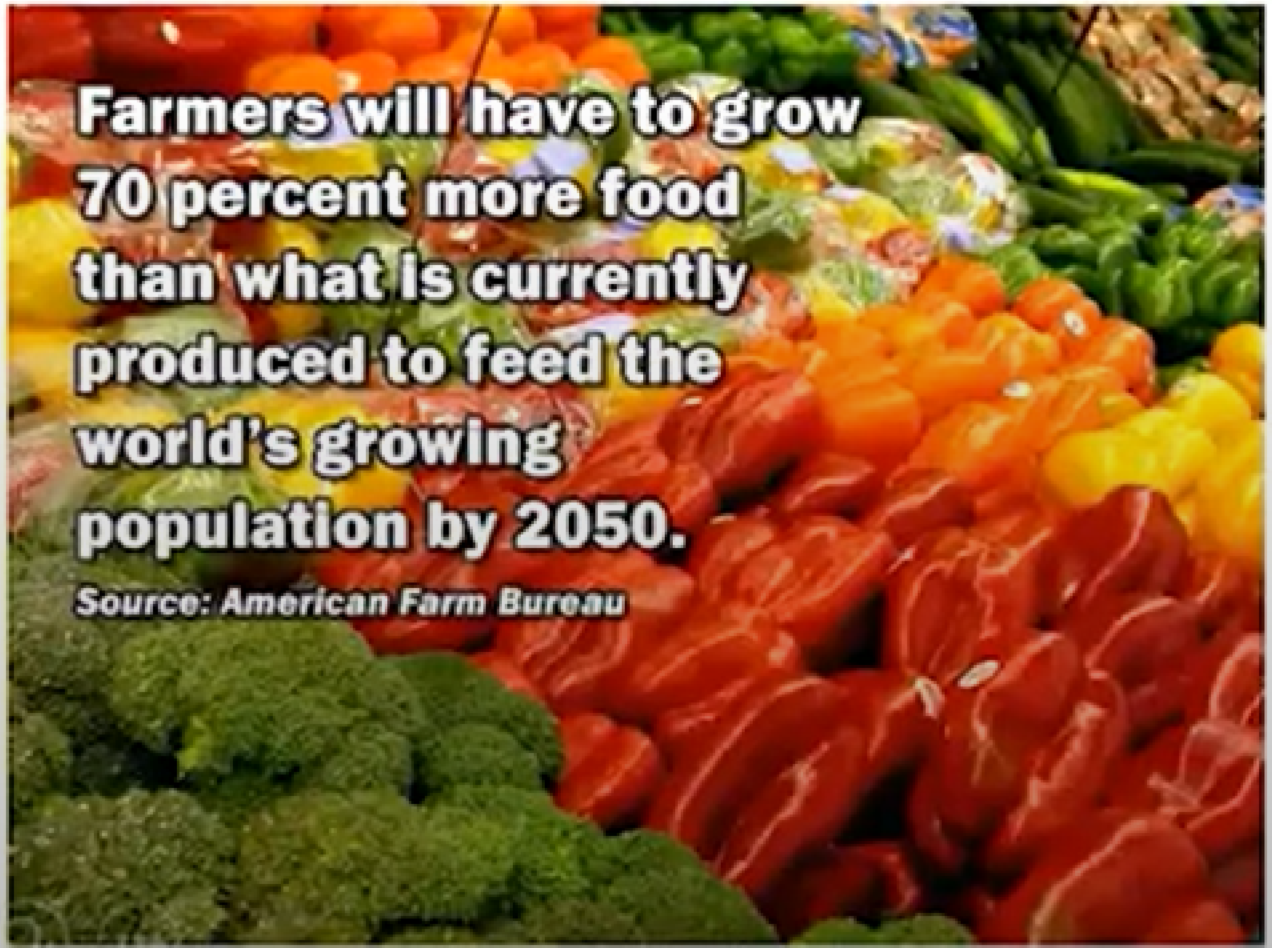
Food production will have to increase by 70 percent - FAO convenes high-level expert forum

HOW TO FEED THE WORLD 2050

12-13 October 2009

Related links

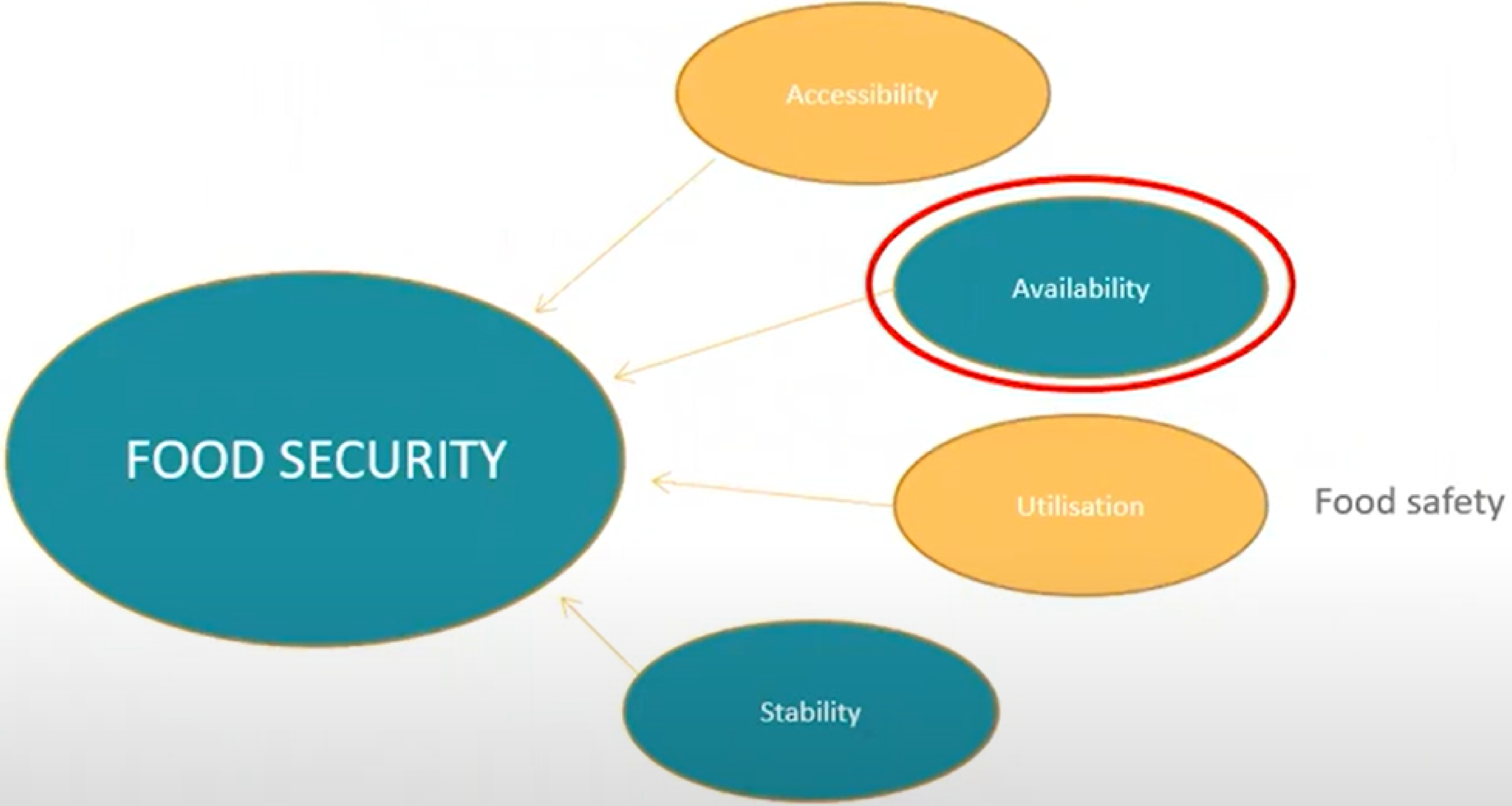
- Global agriculture towards 2050 (discussion paper)



UN: farmers must produce 70% more food by 2050 to feed population

A quarter of farmland is highly degraded, according to the first report into the state of the world's land resources

Dimensions of "*food security*"



Food availability is determined by the physical quantities of food *produced, stored, processed, distributed,* and *exchanged*

PRODUCTION

CONSUMPTION

↑ *240% against ~150 population increase*

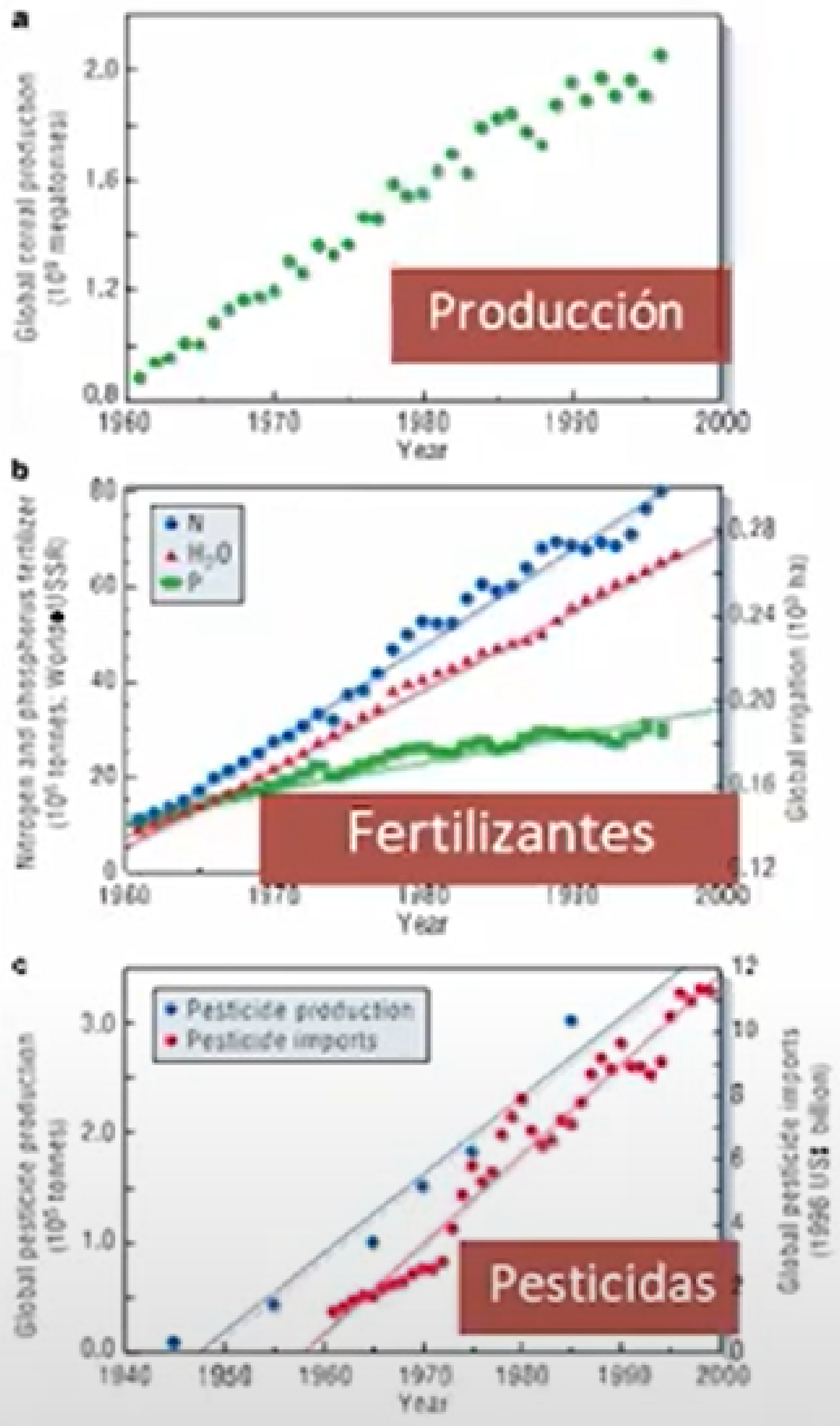
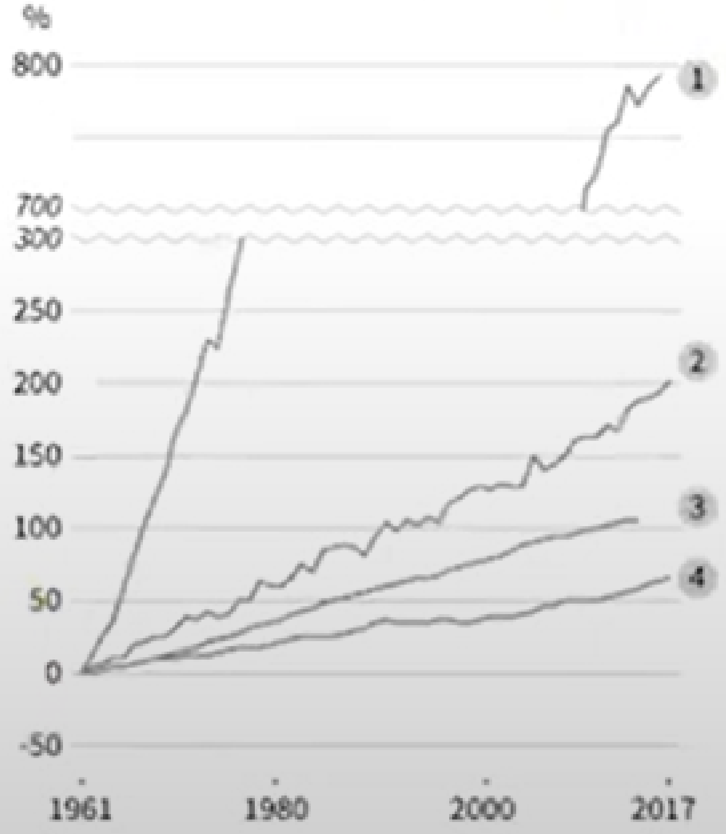


Figure 1 Agricultural trends over the past 40 years. **a**, Total global cereal production[2]; **b**, total global use of nitrogen and phosphorus fertilizer (except former USSR not included) and area of global irrigated land; and **c**, total global pesticide production[2] and global pesticide imports (summed across all countries)[2]. Parts **b** and **c** modified from ref. 4.

D. Agricultural production
Land use change and rapid land use intensification have supported the increasing production of food, feed and fibre. Since 1961, the total production of food (cereal crops) has increased by 240% (until 2017) because of land area expansion and increasing yields. Fibre production (cotton) increased by 162% (until 2013).

CHANGE in % rel. to 1961

1. Inorganic N fertiliser use
2. Cereal yields
3. Irrigation water volume
4. Total number of ruminant livestock

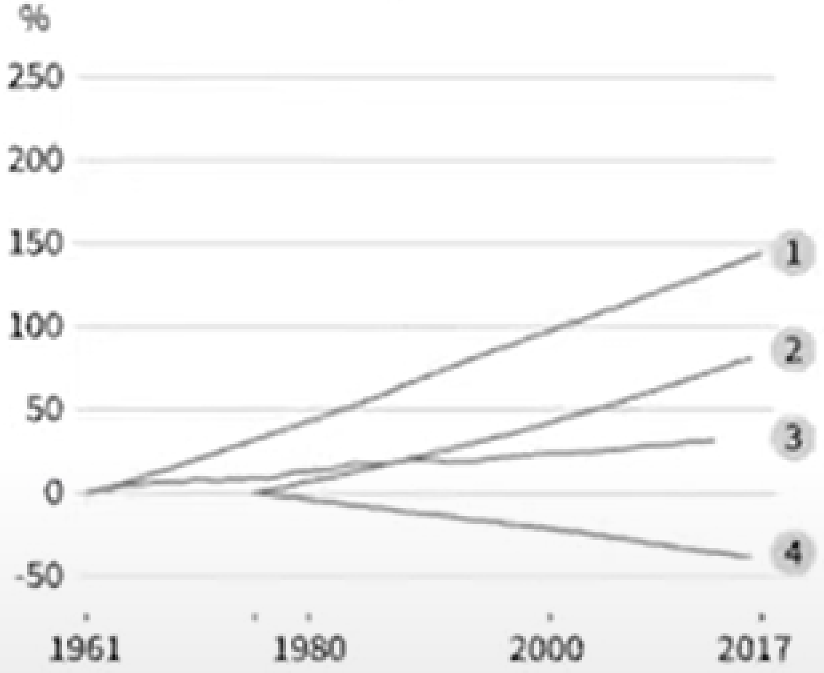


IPCC, 2019

E. Food demand
Increases in production are linked to consumption changes.

CHANGE in % rel. to 1961 and 1975

1. Population
2. Prevalence of overweight + obese
3. Total calories per capita
4. Prevalence of underweight



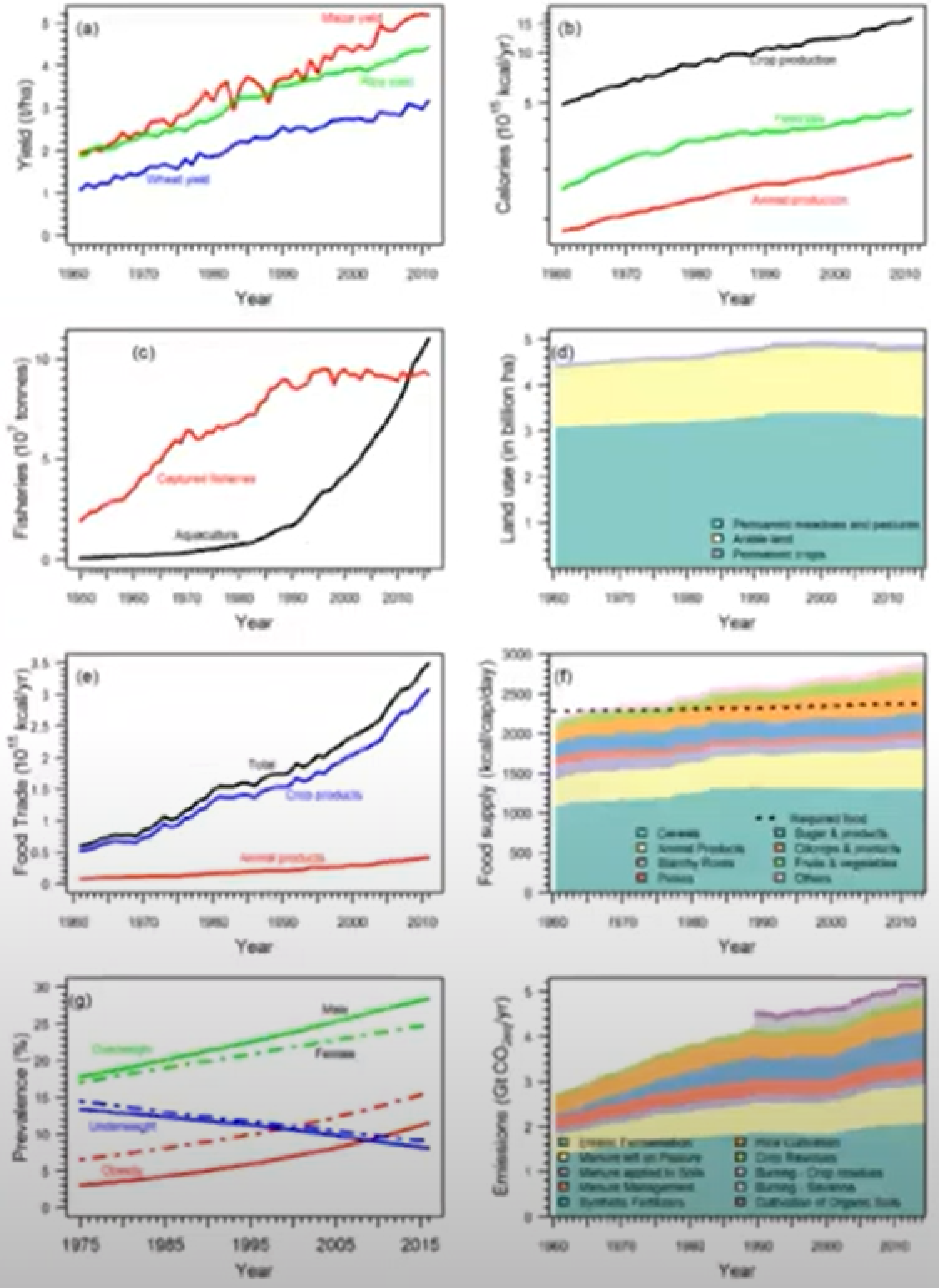
IPCC, 2019

FOOD SECURITY TRENDS

Period 1961 - 2013:

- Global availability of food, from 2200 to 2884 kcal/cap/day: "*from food deficit to food surplus*"

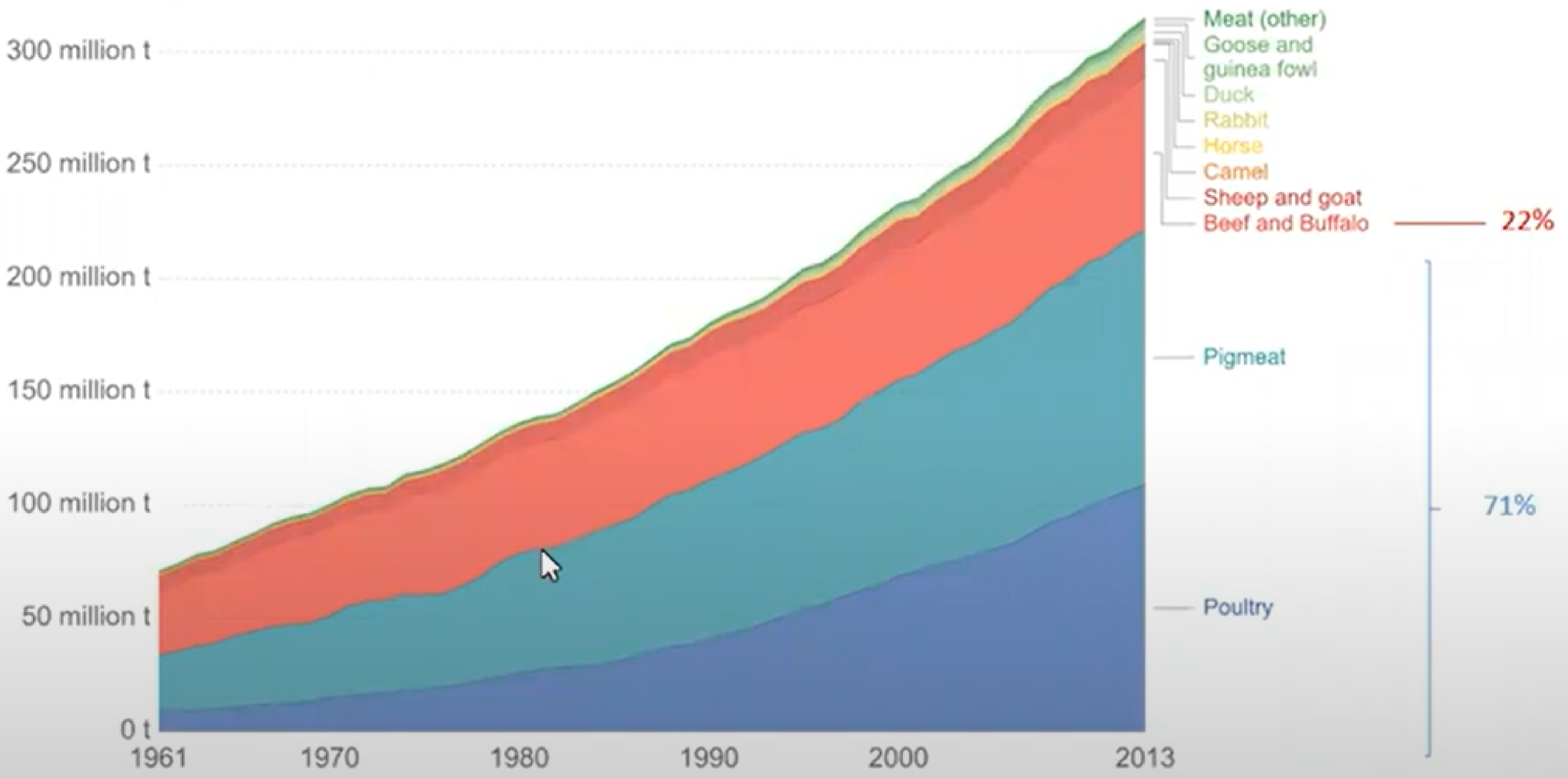
- > 50% world population suffers from overweight or undernutrition=> their diets do not offer conditions for an "*active and healthy life*" (IPCC, 2019)



IPCC, 2019

Meat production by livestock type, World

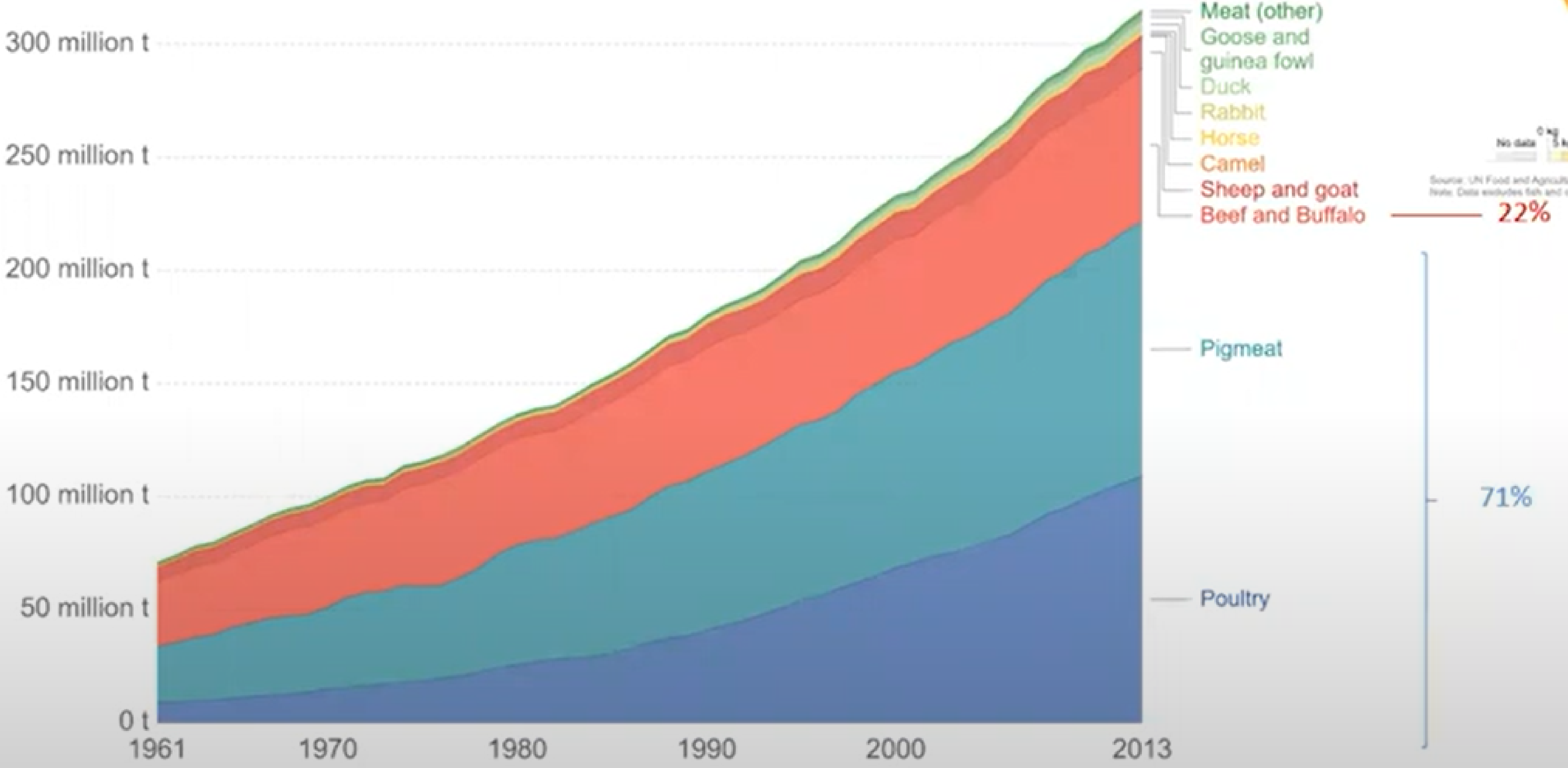
Meat production by commodity or product type, measured in tonnes per year. All data shown relate to total meat production, from both commercial and farm slaughter. Data are given in terms of dressed carcass weight, excluding offal and slaughter fats.



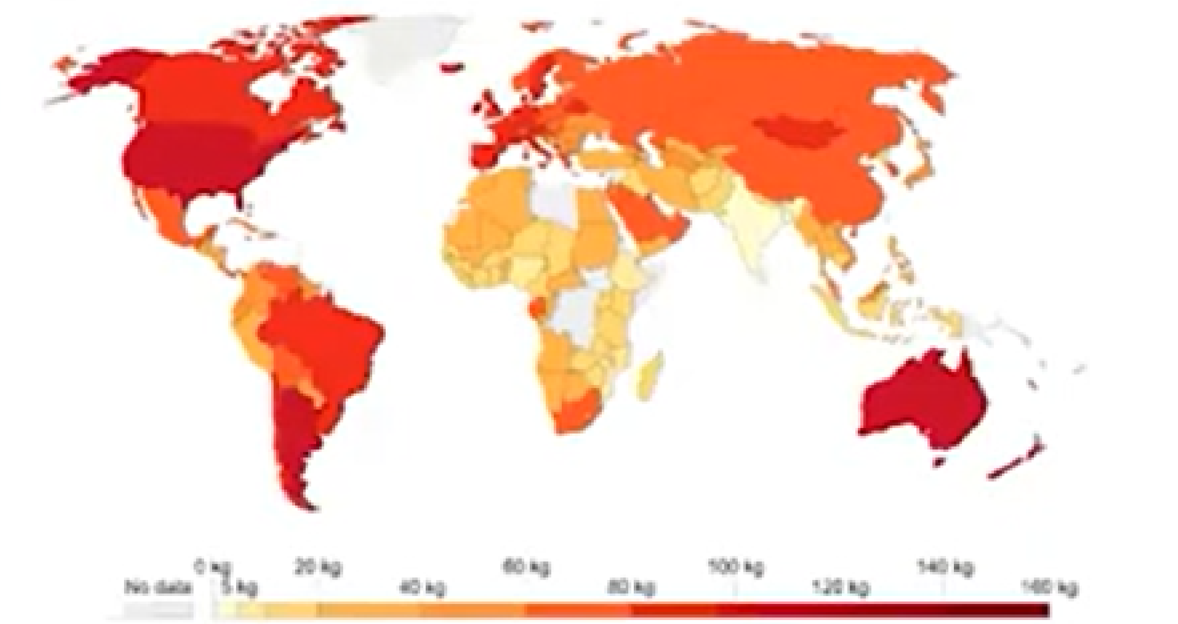
Source: UN Food and Agricultural Organization (FAO)

Meat production by livestock type, World

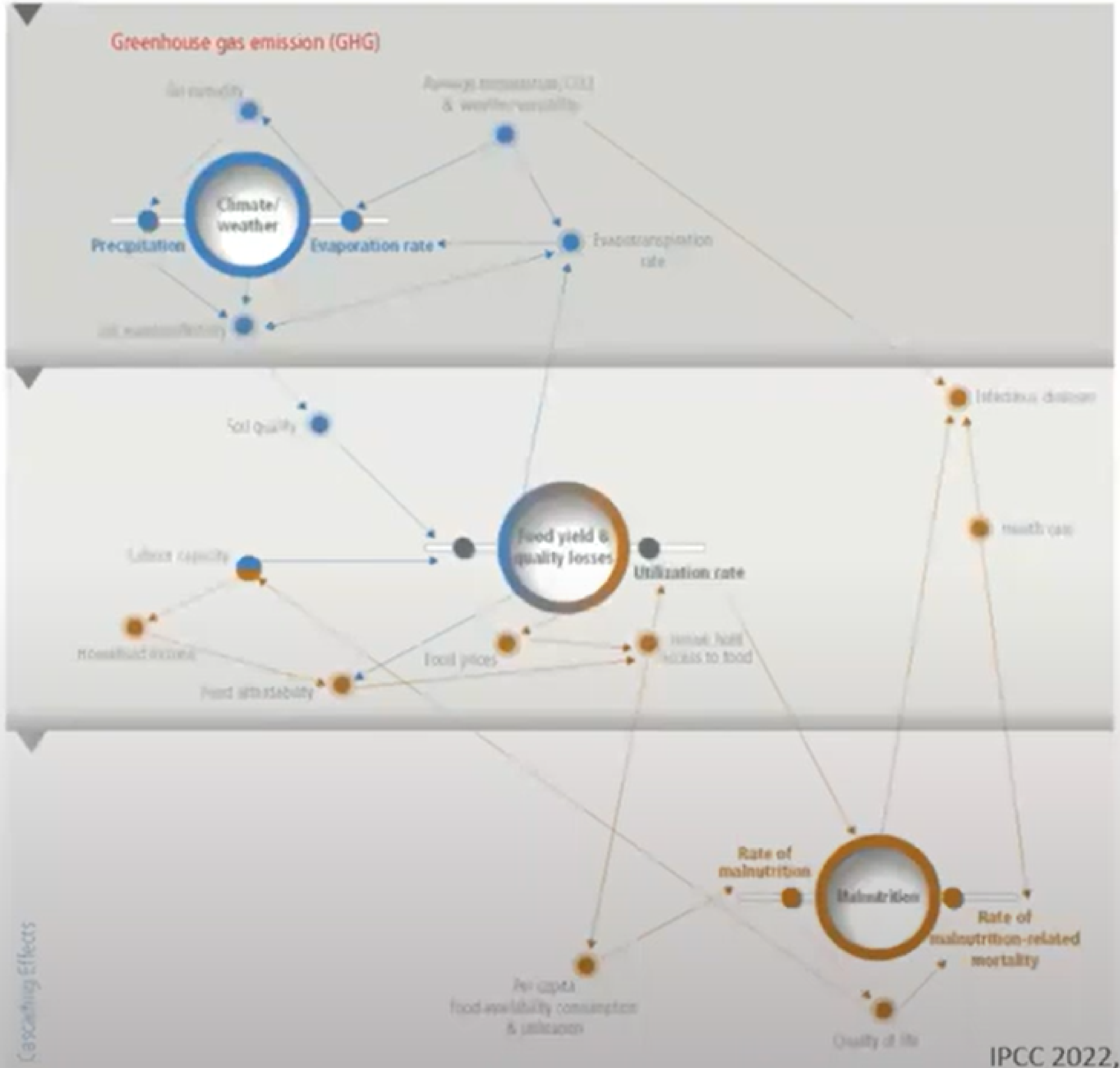
Meat production by commodity or product type, measured in tonnes per year. All data shown relate to total meat production, from both commercial and farm slaughter. Data are given in terms of dressed carcass weight, excluding offal and slaughter fats.



Source: UN Food and Agricultural Organization (FAO)   OurWorldInData.org/meat-and-seafood-production-consumption/ • CC BY

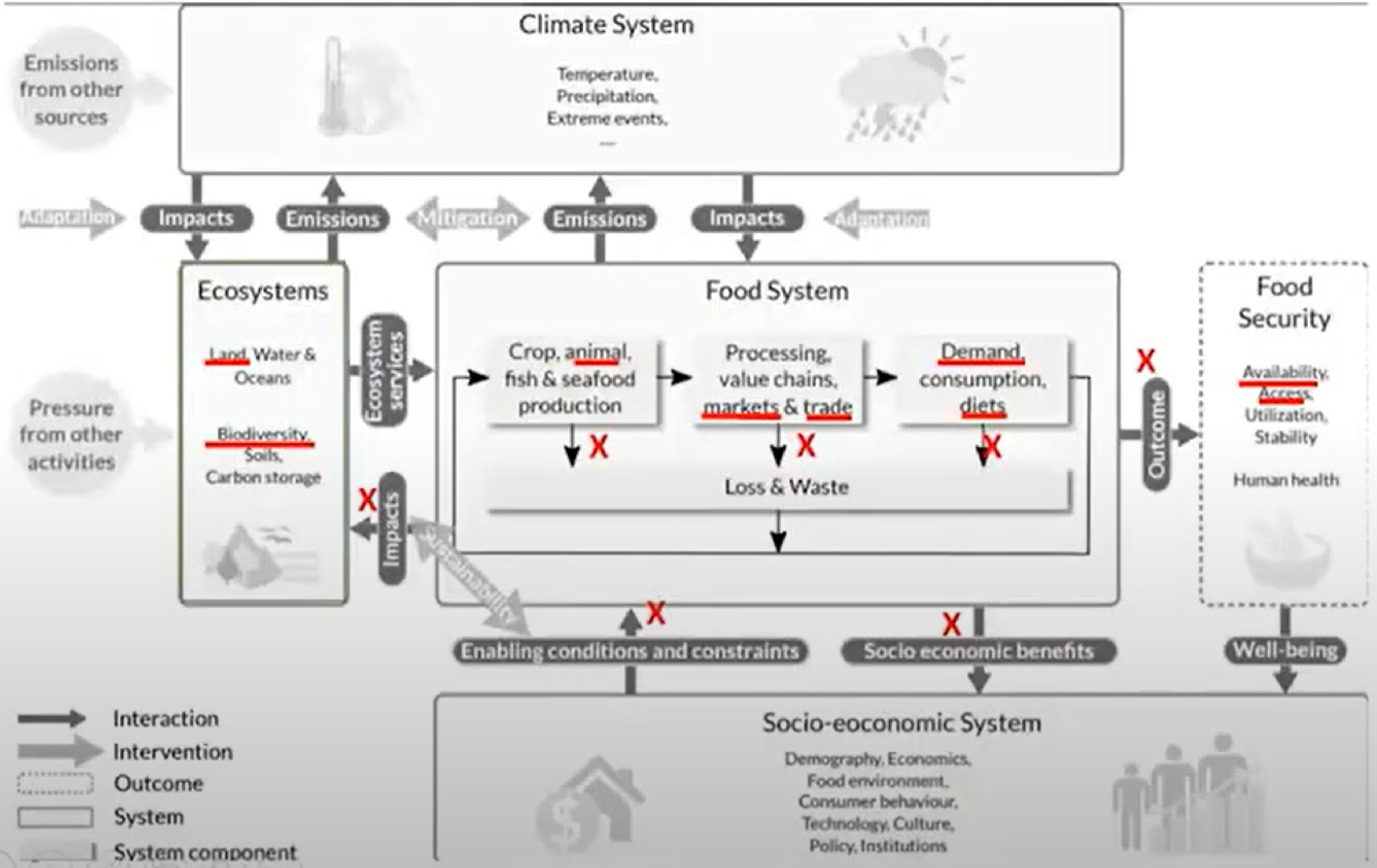


Complex pathways from climate/weather variability to undernutrition in subsistence farming households



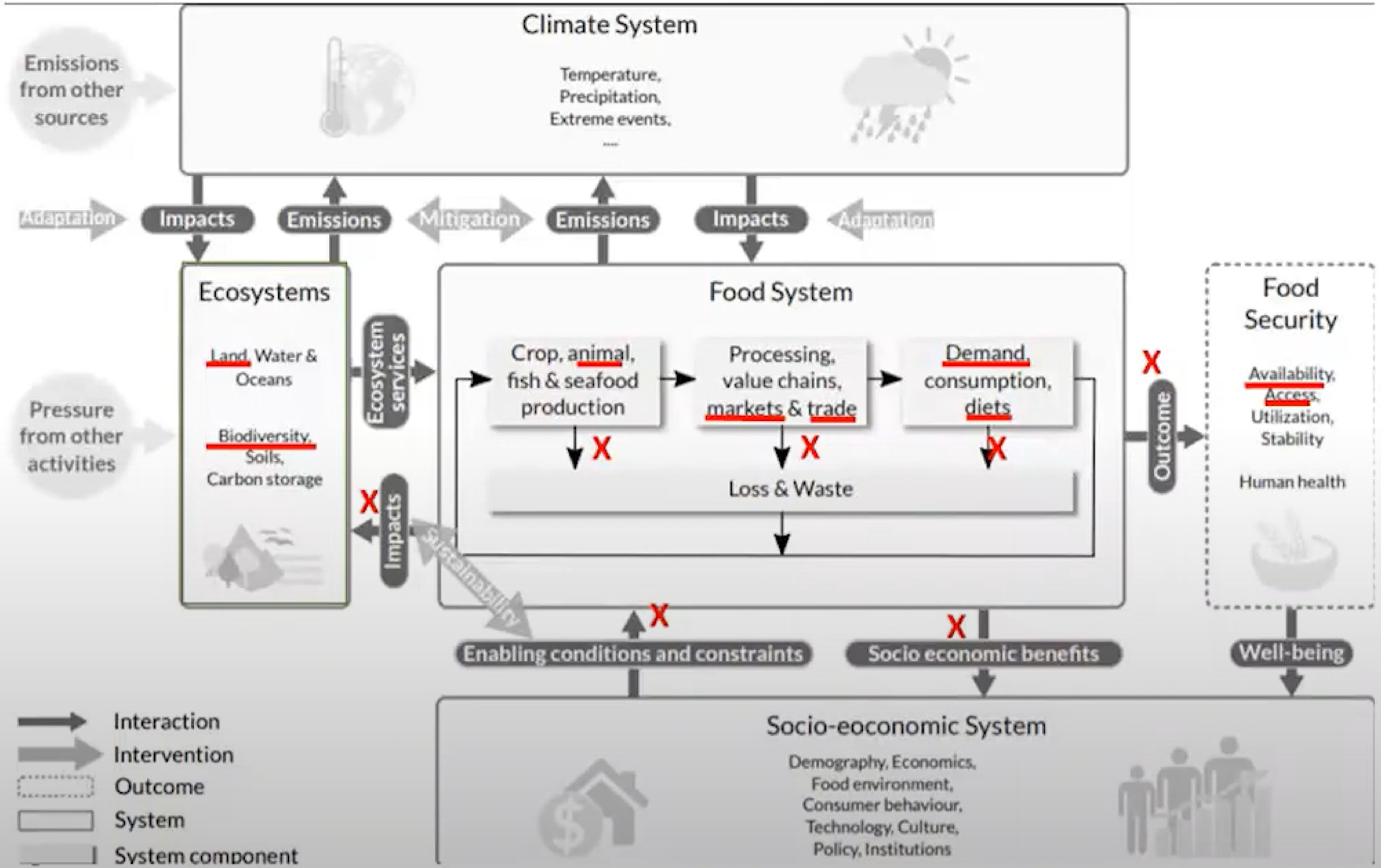
IPCC 2022, WG2

Food security: from simple messages



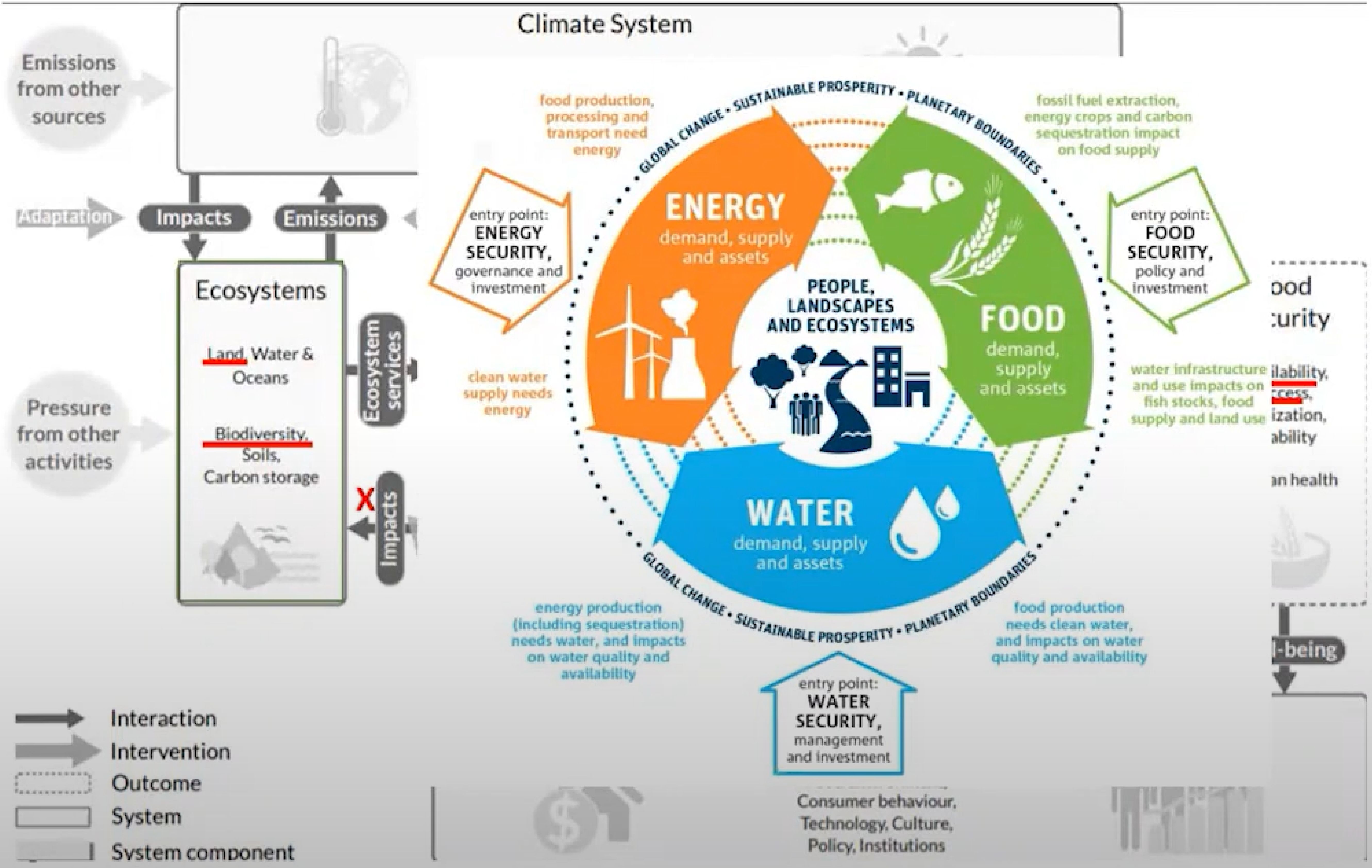
IPCC 2019

Food security: from simple messages



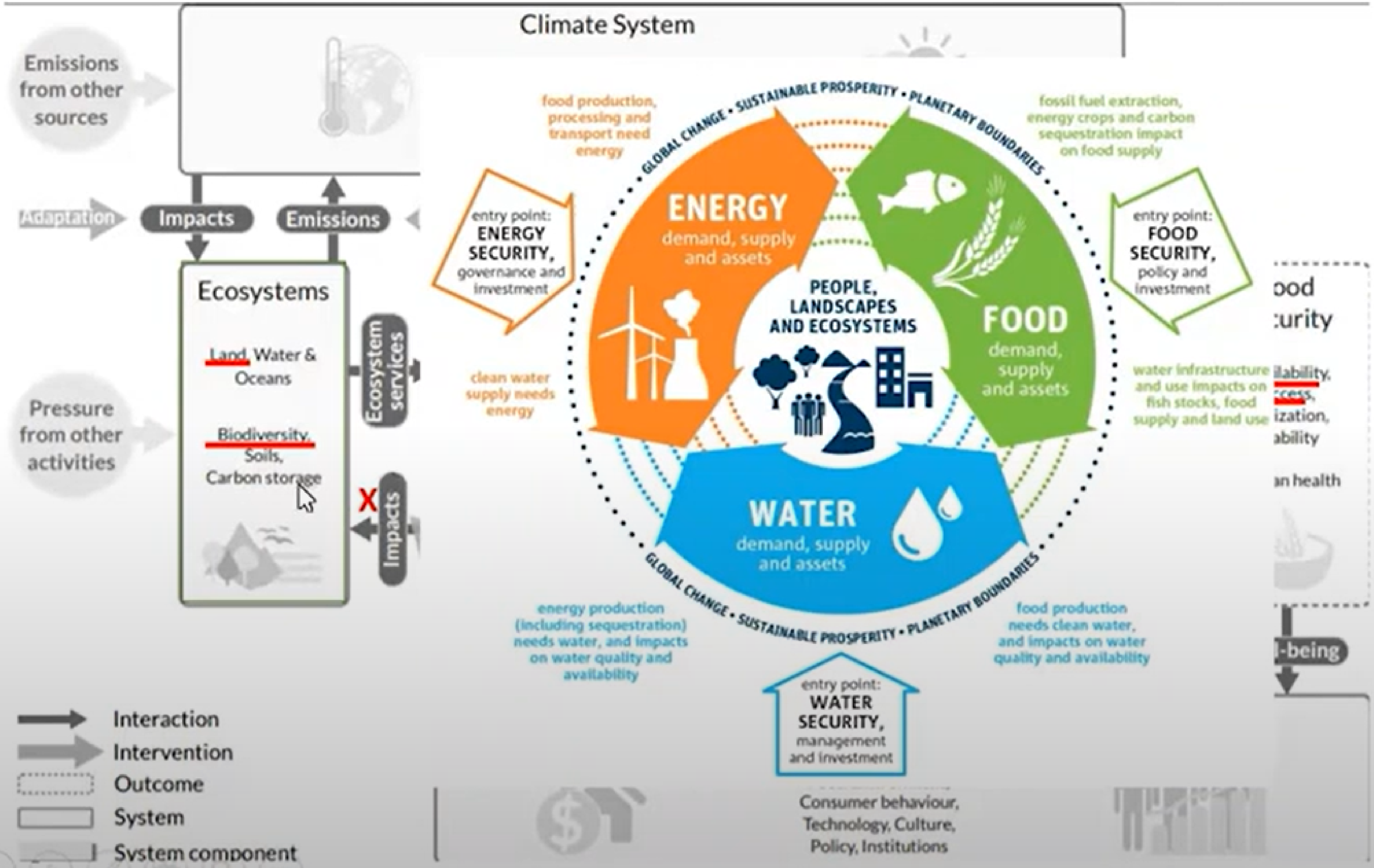
IPCC 2019

Food security: from simple messages



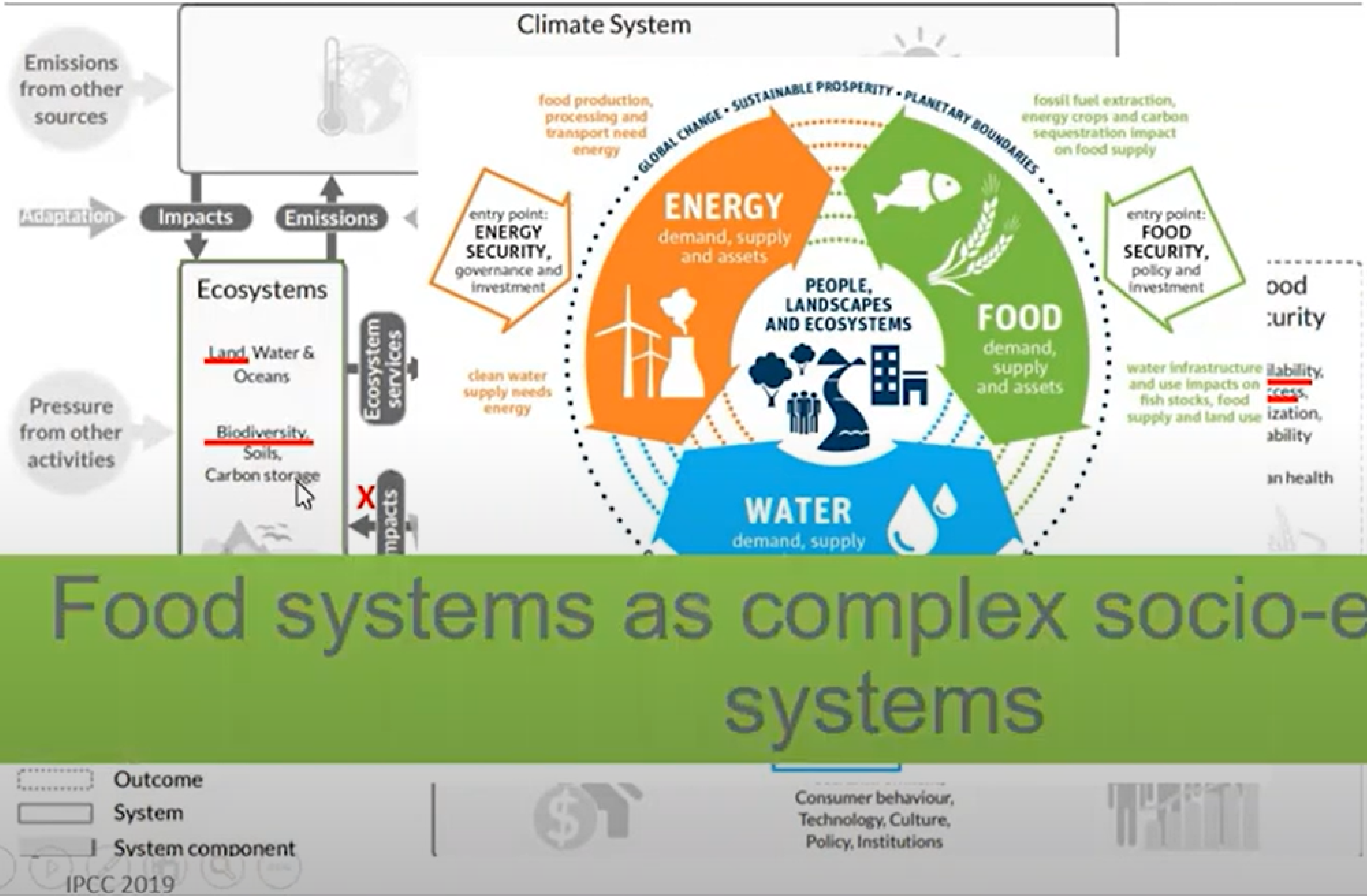
IPCC 2019

Food security: from simple messages



IPCC 2019

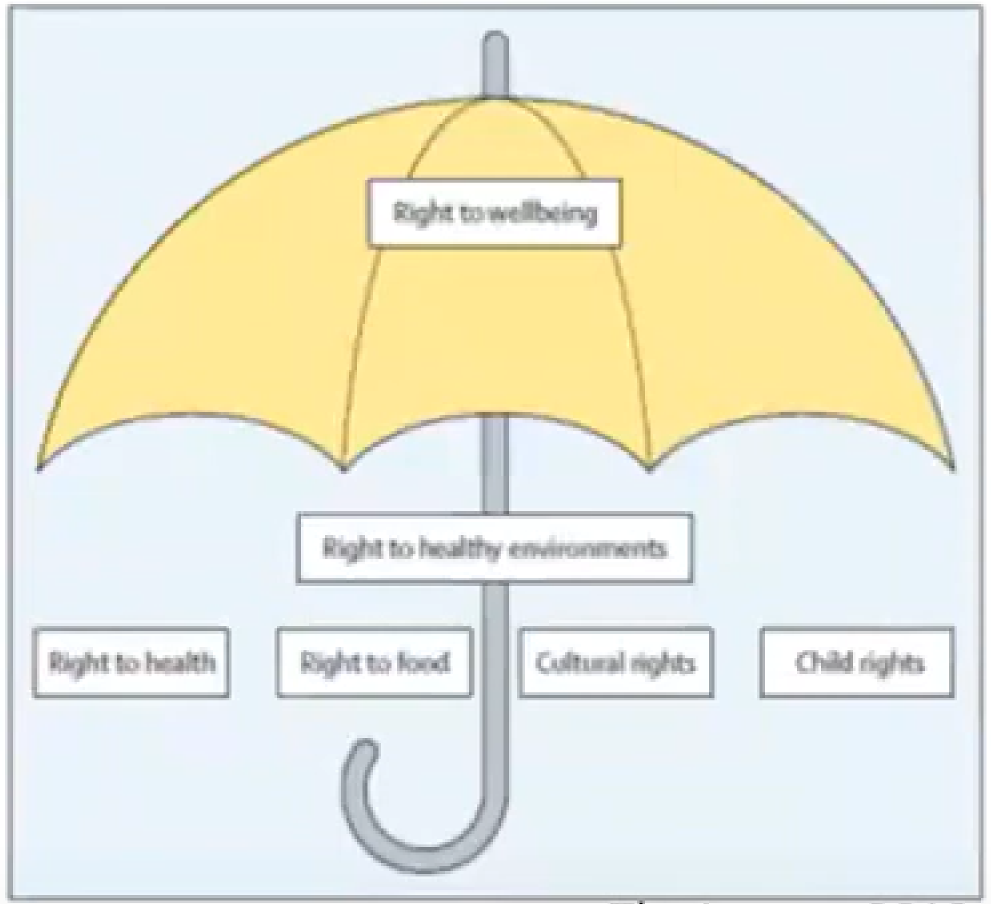
Food security: from simple messages



Food systems as complex socio-ecological systems

Challenges of food production **as part of food systems**

- Food security (all forms of *malnutrition*)
- Adapt to climate change
- Reduce GHG emissions
- Livelihoods of billions people



The Lancet, 2019

In a context of:

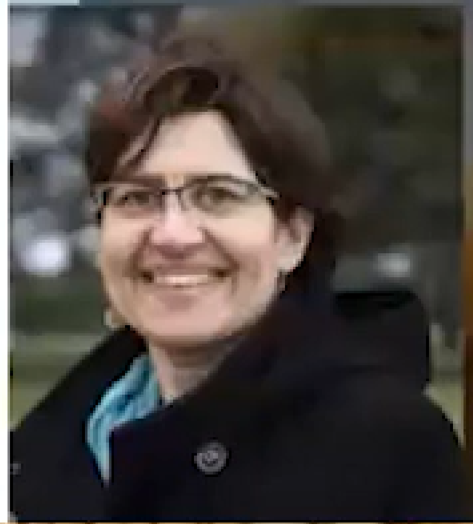
- Limited inputs (fossil fuels, N, P, water)
- Degradation of terrestrial and water ecosystems and resources
- Biodiversity degradation/loss
- Volatility increases
- Increasing population
- Conflicts
- Pandemics risk

This report addresses all three UN Rio conventions – climate, biodiversity and desertification – and thus our report recognizes the nexus of these global challenges and demonstrates the broad policy relevance of the IPCC's work.

Hoesung Lee, IPCC Chair
Geneva, 2019

ipcc

#SRCCL



New knowledge shows an increase in risks from dryland water scarcity, fire damage, permafrost degradation and food system instability, even for global warming of around 1.5°C

Valérie Masson-Delmotte
Co-Chair of IPCC Working Group I
Geneva, 2019

Balanced diets featuring plant-based foods, such as coarse grains, legumes, fruits and vegetables, and animal-sourced food produced sustainably in low GHG emission systems, present major opportunities for adaptation to and limiting climate change.

Debra Roberts
Co-Chair of IPCC Working Group II
Geneva, 2019

#SRCCL

ipcc

We need to adapt our land use to climate change so we can secure food production for present and future generations.

Inger Andersen
Executive Director, UNEP

ipcc

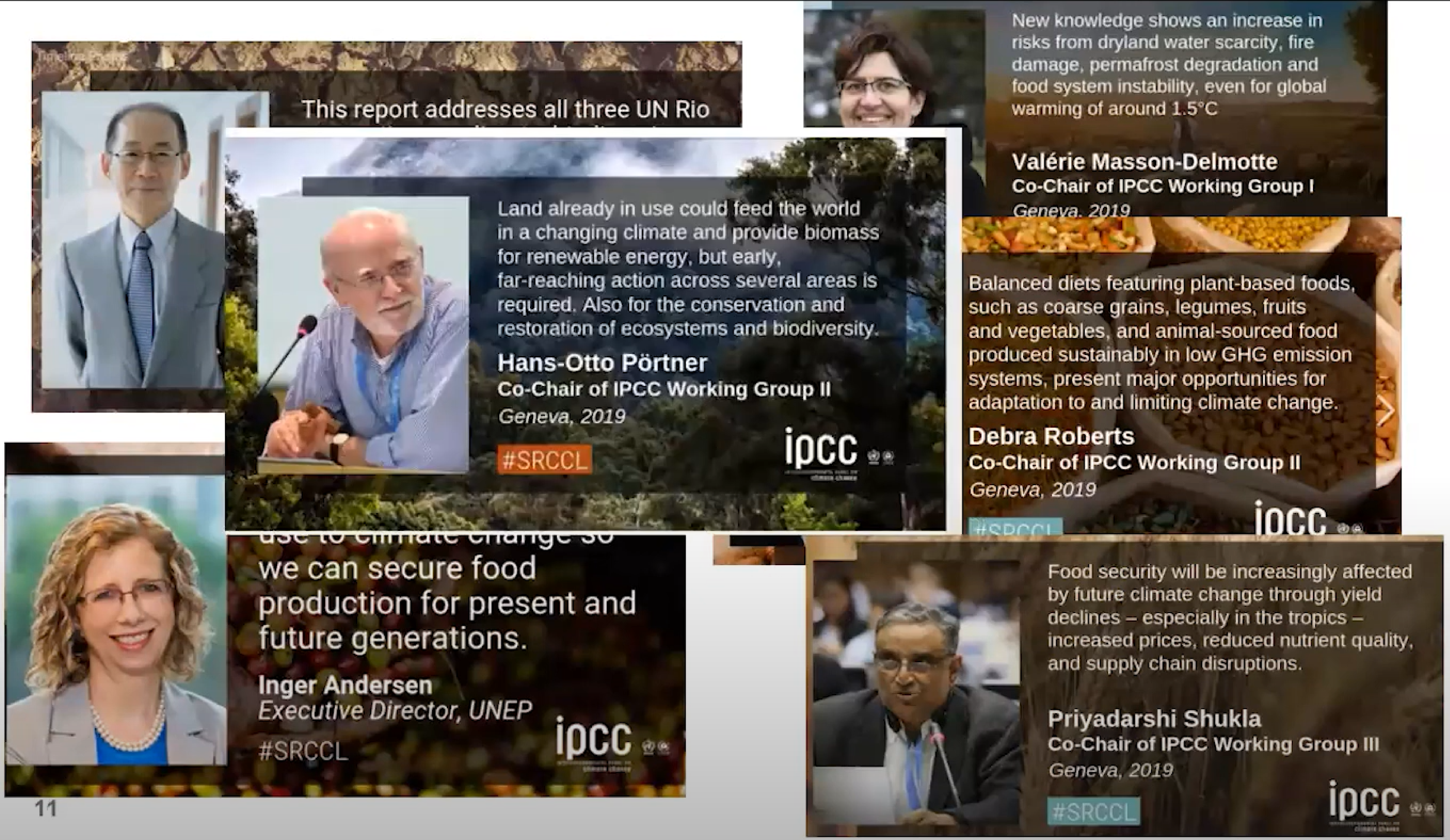
#SRCCL

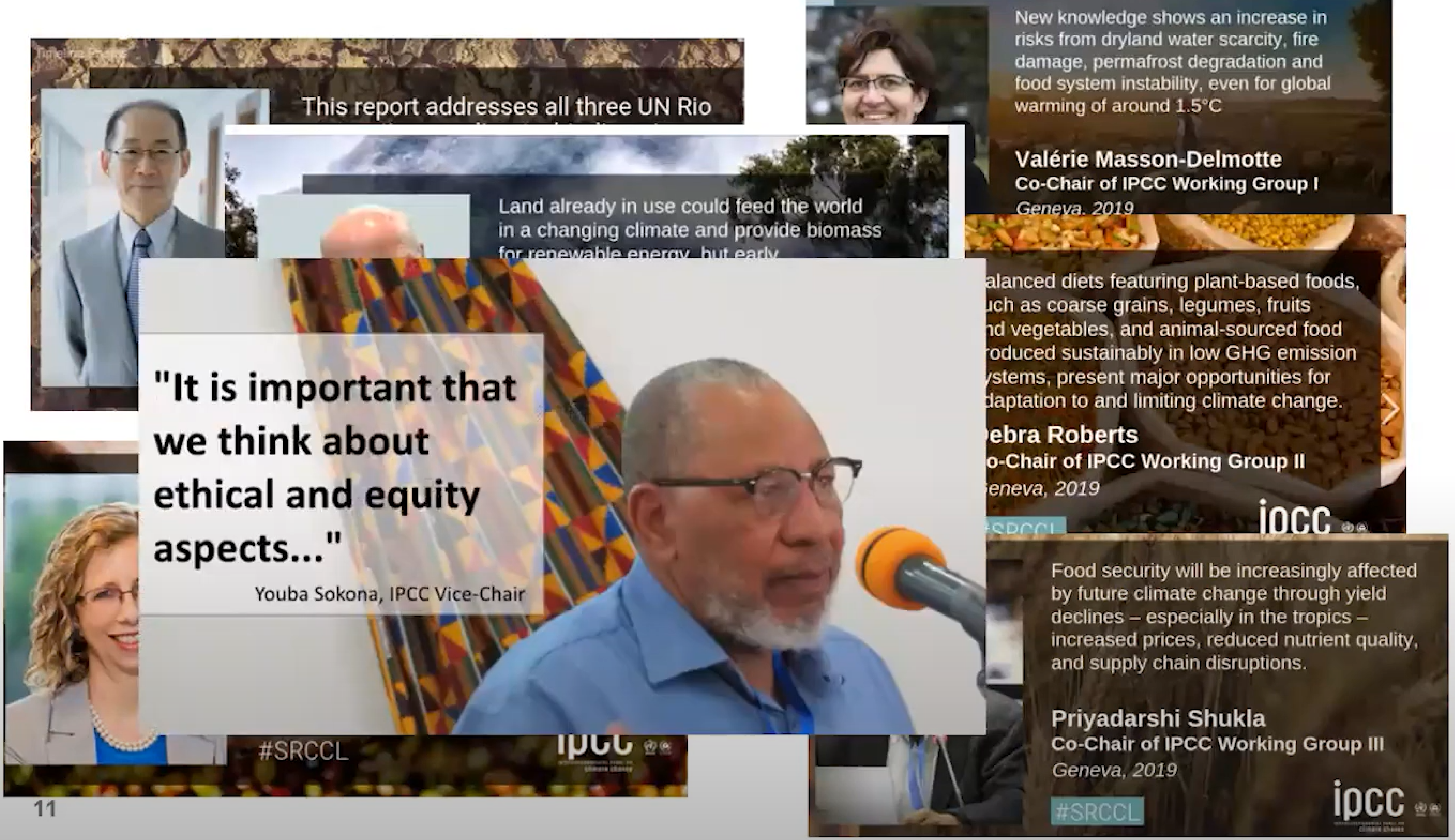
Food security will be increasingly affected by future climate change through yield declines – especially in the tropics – increased prices, reduced nutrient quality, and supply chain disruptions.

Priyadarshi Shukla
Co-Chair of IPCC Working Group III
Geneva, 2019

#SRCCL

ipcc


This report addresses all three UN Rio
New knowledge shows an increase in risks from dryland water scarcity, fire damage, permafrost degradation and food system instability, even for global warming of around 1.5°C
Valérie Masson-Delmotte
Co-Chair of IPCC Working Group I
Geneva, 2019
Land already in use could feed the world in a changing climate and provide biomass for renewable energy, but early, far-reaching action across several areas is required. Also for the conservation and restoration of ecosystems and biodiversity.
Hans-Otto Pörtner
Co-Chair of IPCC Working Group II
Geneva, 2019
#SRCCL
ipcc
Balanced diets featuring plant-based foods, such as coarse grains, legumes, fruits and vegetables, and animal-sourced food produced sustainably in low GHG emission systems, present major opportunities for adaptation to and limiting climate change.
Debra Roberts
Co-Chair of IPCC Working Group II
Geneva, 2019
ipcc
we can secure food production for present and future generations.
Inger Andersen
Executive Director, UNEP
ipcc
#SRCCL
Food security will be increasingly affected by future climate change through yield declines – especially in the tropics – increased prices, reduced nutrient quality, and supply chain disruptions.
Priyadarshi Shukla
Co-Chair of IPCC Working Group III
Geneva, 2019
#SRCCL
ipcc


This report addresses all three UN Rio
New knowledge shows an increase in risks from dryland water scarcity, fire damage, permafrost degradation and food system instability, even for global warming of around 1.5°C
Valérie Masson-Delmotte
Co-Chair of IPCC Working Group I
Geneva, 2019
Land already in use could feed the world in a changing climate and provide biomass for renewable energy, but early
"It is important that we think about ethical and equity aspects..."
Youba Sokona, IPCC Vice-Chair
alanced diets featuring plant-based foods, uch as coarse grains, legumes, fruits nd vegetables, and animal-sourced food roduced sustainably in low GHG emission ystems, present major opportunities for daptation to and limiting climate change.
ebra Roberts
o-Chair of IPCC Working Group II
eneva, 2019
ipcc
Food security will be increasingly affected by future climate change through yield declines – especially in the tropics – increased prices, reduced nutrient quality, and supply chain disruptions.
Priyadarshi Shukla
Co-Chair of IPCC Working Group III
Geneva, 2019
#SRCCL
ipcc
#SRCCL
ipcc

Comment | Published: 13 January 2020

Planet-proofing the global food system

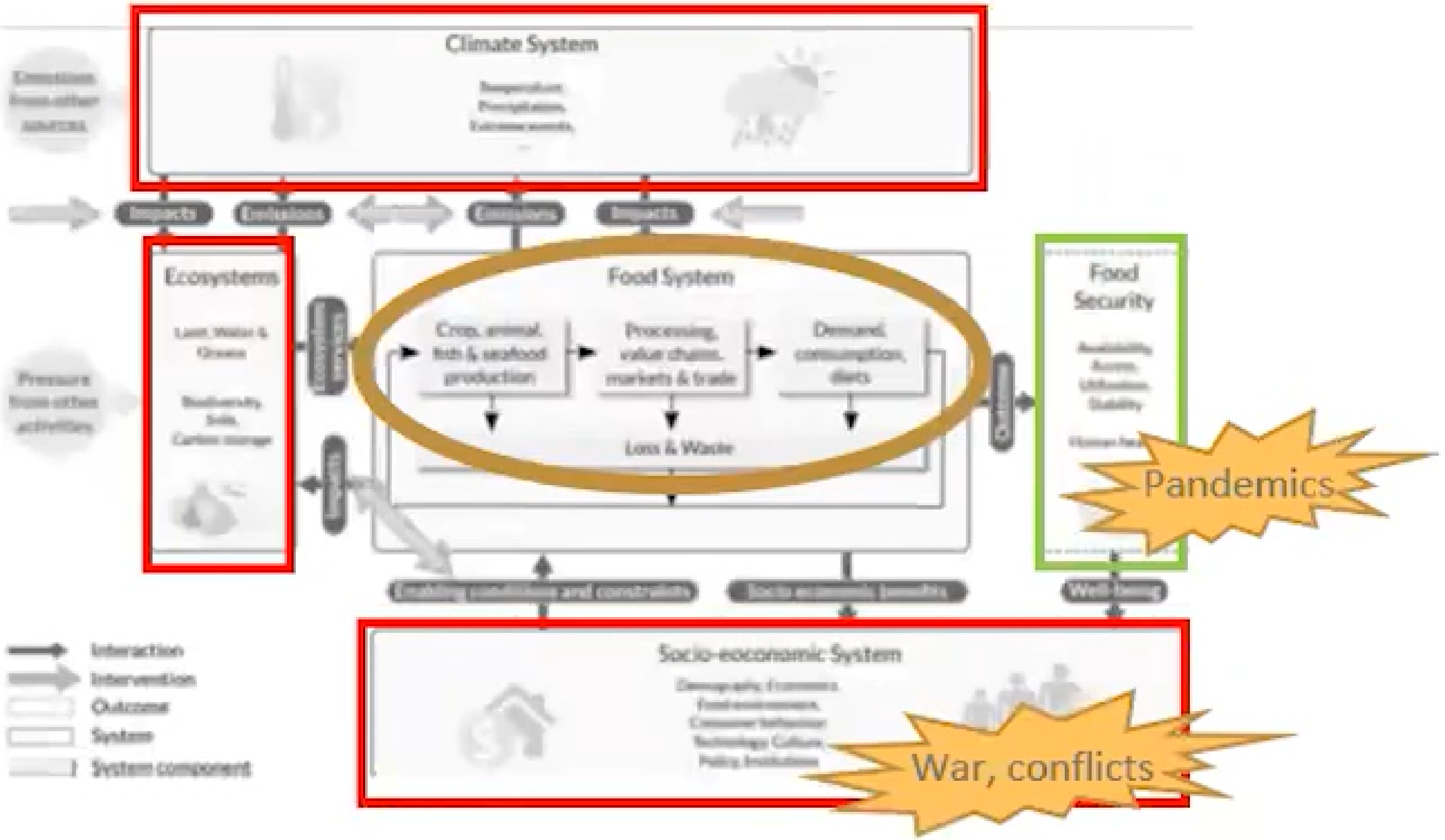
Johan Rockström, Ottmar Edenhofer, Juliana Gaertner & Fabrice DeClerck

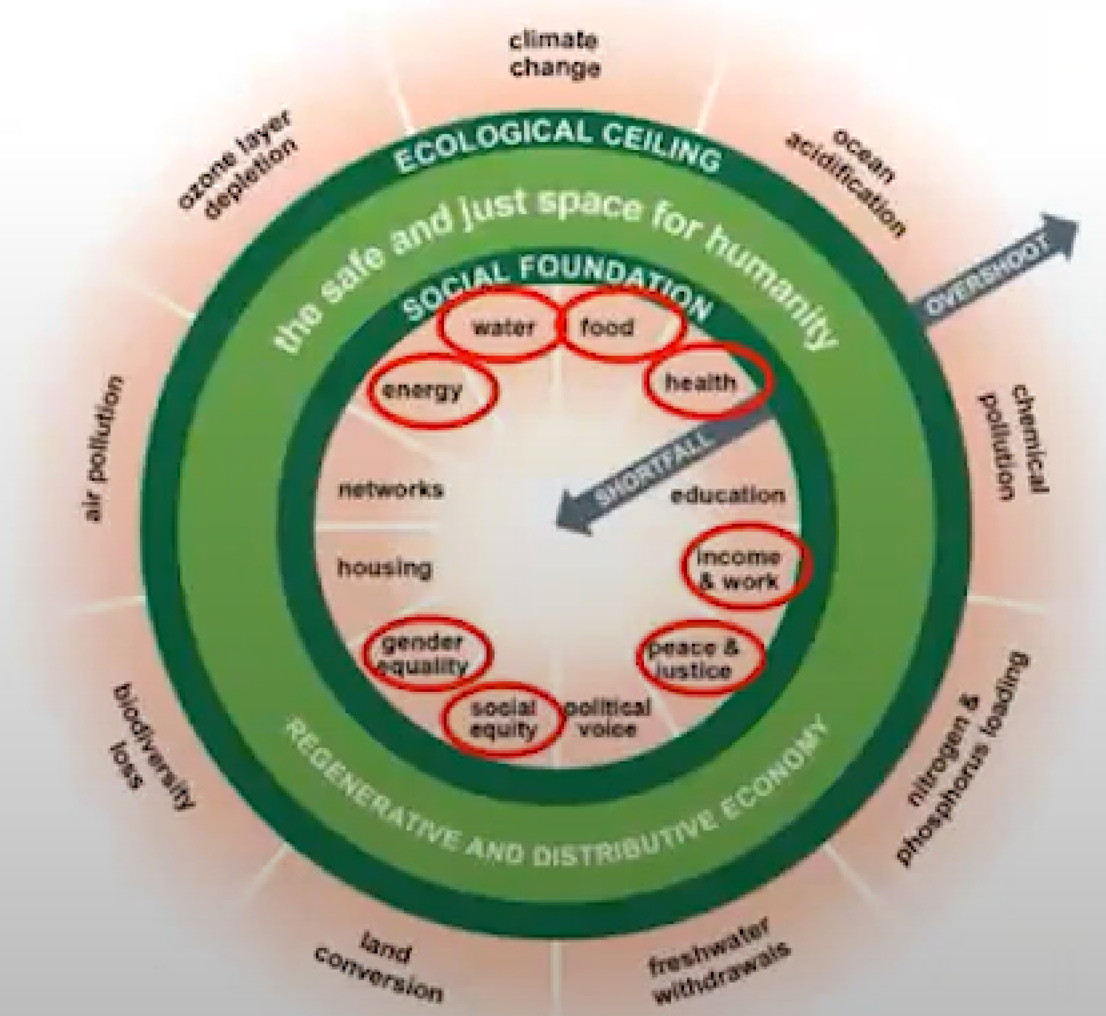
Nature Food **1**, 3–5(2020) | Cite this article

Without a great food system transformation, the world will fail to deliver both on the United Nations Sustainable Development Goals and the Paris Climate Agreement. There are five grand challenges to be faced, by science and society, to effect that transformation.

Food is failing us. The global food system is the single largest greenhouse-gas-emitting sector in the world[1], and by far the largest cause of biodiversity loss, terrestrial ecosystem destruction[2], freshwater consumption, and waterway pollution due to overuse of nitrogen and phosphorus[3]. It holds a firm grip over the stability of the Earth system and the future of humanity. Unhealthy food is the world's biggest killer, with diet-related chronic disease estimated to be responsible for 11 million premature deaths in 2017 alone[4]. Meanwhile, increasing numbers of people – more than 900 million – are undernourished. This increase is due in part to armed conflict, but climate change and the water–food–environment nexus are increasingly identified as amplifiers of social instability[5,6].

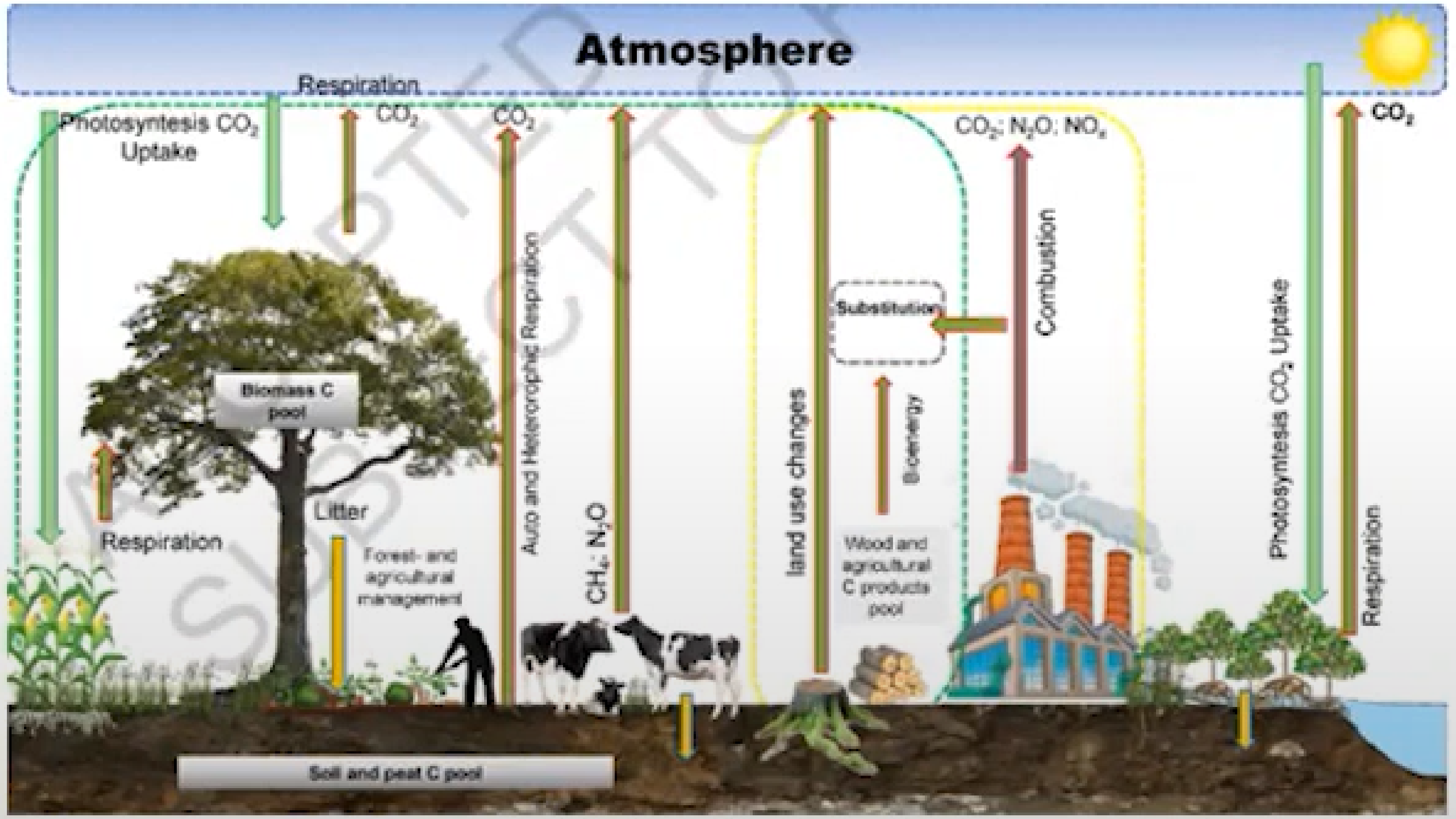
12





Kate Raworth, 2012

- ABOUT EMISSIONS



IPCC 2022, WG3

Science

Current Issue | First release papers | Archive | About | Submit manuscript

HOME > SCIENCE > VOL. 370, NO. 6517 > GLOBAL FOOD SYSTEM EMISSIONS COULD PRECLUDE ACHIEVING THE 1.5° AND 2°C CLIMATE CHANGE TARGETS

REPORT

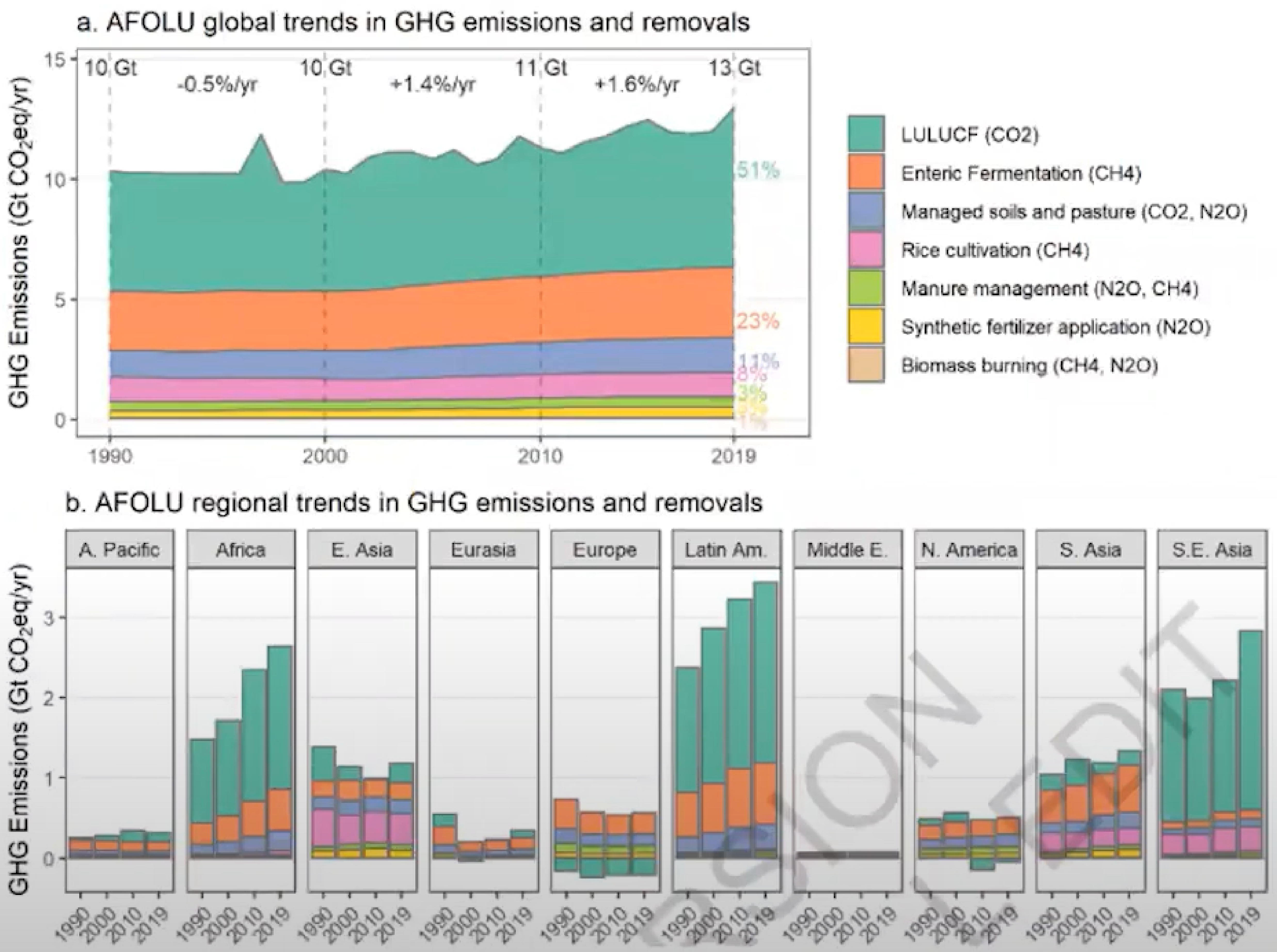
Global food system emissions could preclude achieving the 1.5° and 2°C climate change targets

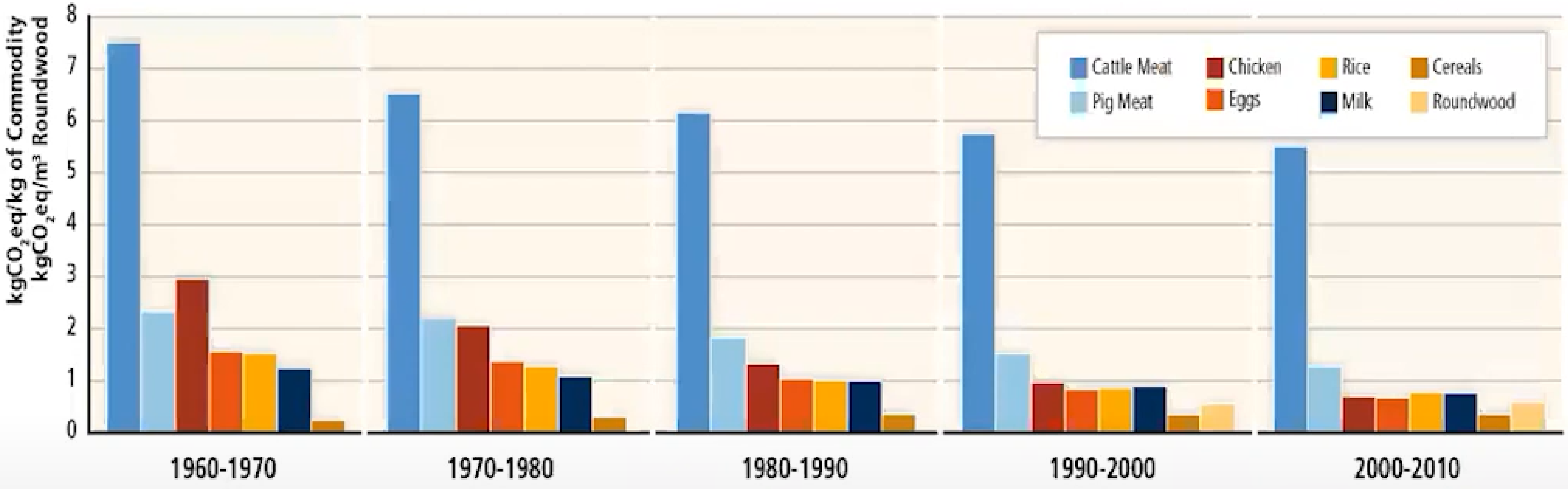
MICHAEL A. CLARK, NINA G. G. DOMINGO, KIMBERLY COLGAN, SUMIL K. THAKRAR, DAVID TILMAN, JOHN LYNCH, INÊS L. AZEVEDO, AND JASON D. HILL
Authors Info & Affiliations

SCIENCE · 6 Nov 2020 · Vol 370, Issue 6517 · pp. 705-708 · DOI: 10.1126/science.aba7357

Thought for food

To have any hope of meeting the central goal of the Paris Agreement, which is to limit global warming to 2°C or less, our carbon emissions must be reduced considerably, including those coming from agriculture. Clark *et al.* show that even if fossil fuel emissions were eliminated immediately, emissions from the global food system alone would make it impossible to limit warming to 1.5°C and difficult even to realize the 2°C target. Thus, major changes in how food is produced are needed if we want to meet the goals of the Paris Agreement.

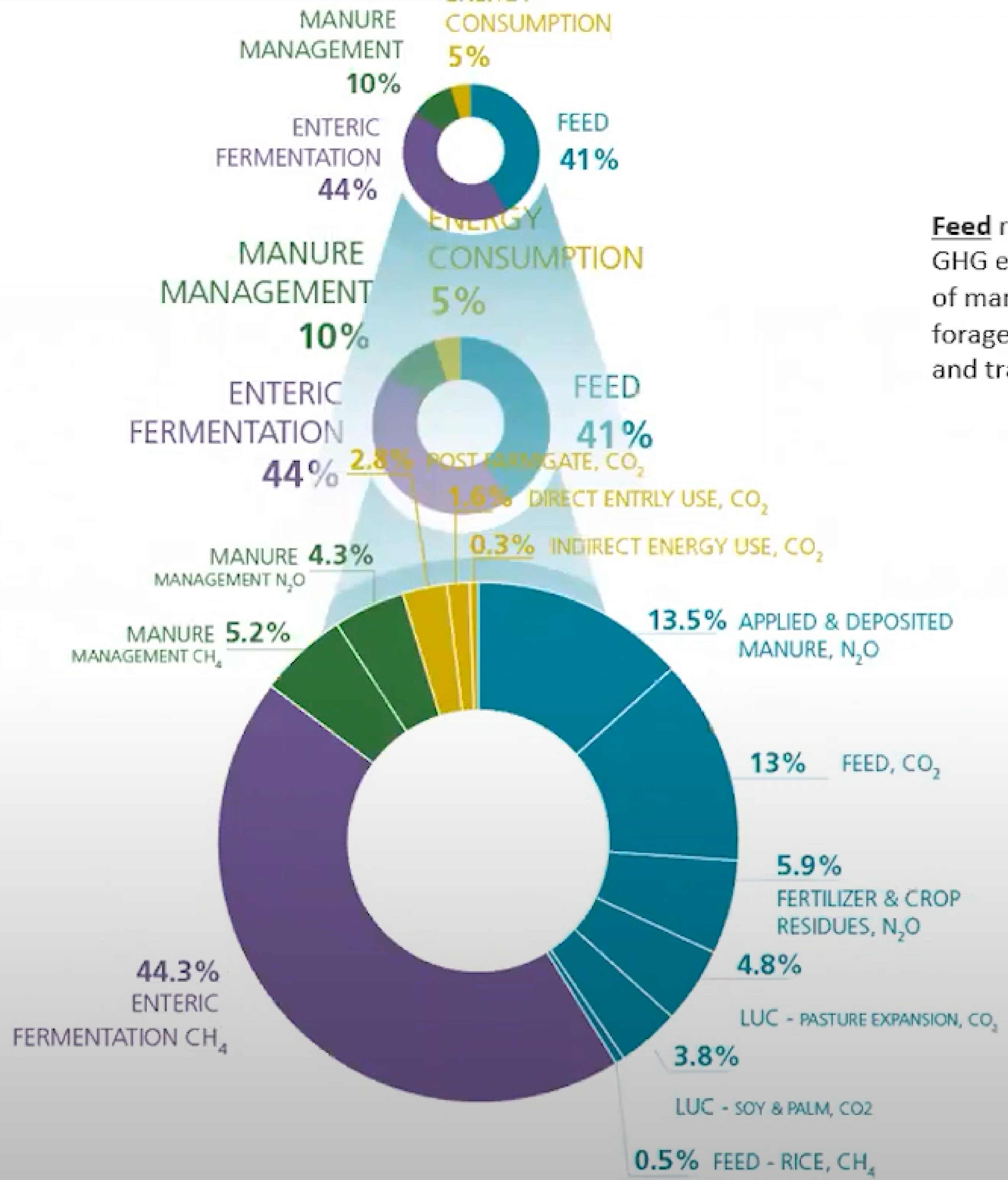

a. AFOLU global trends in GHG emissions and removals
10 Gt
-0.5%/yr
10 Gt
+1.4%/yr
11 Gt
+1.6%/yr
13 Gt
51%
23%
11%
8%
3%
GHG Emissions (Gt CO_2eq/yr)
1990
2000
2010
2019
LULUCF (CO2)
Enteric Fermentation (CH4)
Managed soils and pasture (CO2, N2O)
Rice cultivation (CH4)
Manure management (N2O, CH4)
Synthetic fertilizer application (N2O)
Biomass burning (CH4, N2O)
b. AFOLU regional trends in GHG emissions and removals
A. Pacific
Africa
E. Asia
Eurasia
Europe
Latin Am.
Middle E.
N. America
S. Asia
S.E. Asia
GHG Emissions (Gt CO_2eq/yr)



- Ruminant meat has a GHG intensity much higher than other agricultural products
- But these are <u>direct emissions only</u>. If we include the emissions from the human-edible feed for mono-gastric animal products, they move closer to ruminant meat

Smith *et al.* (2014) – IPCC WGIII AR5

Emissions by activity and GHG types: delivering complex messages



Feed related activities makes 41% of total GHG emissions: associated LU change, use of manure and synthetic fertilizers for forage and feed production, processing and transport of feed

GLEAM 2.0

Water	Measure of water use	Grazing	Intensive
		Liters day^{-1} per animal at 15°C	
Cattle	Drinking water: all	22	103
	Service water: beef	5	11
	Service water: dairy	5	22
Pigs (lactating adult)	Drinking water	17	17
	Service water	25	125
Sheep (lactating adult)	Drinking water	9	9
	Service water	5	5
Chicken (broiler and layer)	Drinking water	1.3–1.8	1.3–1.8
	Service water	0.09–0.15	0.09–0.15
Feed required to produce 1 kg of meat		**kg of cereal per animal**	
Cattle		–	8
Pigs		–	4
Chicken (broiler)		–	1
Methane emissions from cattle		**kg of CH_4 per animal year^{-1}**	
Cattle: dairy (U.S., Europe)		–	117–128
Cattle: beef, dairy (U.S., Europe)		53–60	–
Cattle: dairy (Africa, India)		–	45–58
Cattle: grazing (Africa, India)		27–31	–

Godfray et al., 2010

	Grazing System	Mixed Crop-Livestock System	Industrial System
GHG emissions (examples)	27–31 kg of CH_4 per animal per year in grazing cattle in Africa and India[46] 12% total non-CO_2 emissions[40]	53–60 kg of CH_4 per animal per year in beef & dairy cattle in USA and Europe; 45–58 kg of CH_4 per animal per year in dairy cattle in Africa and India.[46] 77% emissions from cattle (not all mixed crop-livestock)[40]	117–128 kg of CH_4 per animal per year in dairy cattle in USA and Europe[46] 10% total non-CO_2 emissions from monogastric (not all industrial)[40]
GHG emission metrics giving the most favorable outcome	Area (kg CO_2eq/area of land); resource based (kg CO_2eq/kg of fossil fuel based inputs; kg edible output/quantity of ecosystem services provided; kg CO_2eq. avoided by use of marginal land).[52]	Quantity based (e.g., kg CO_2eq./kg food and non-food goods—leather, wool, manure, traction, etc.)[52]	Quantity based (e.g., kg CO_2eq/kg produce)[52]
Mitigation assets	Grazing responsive to environmental variation and low dependence on fossil-fuel-based practices and external inputs. Enhanced animal husbandry, GHG sequestration.	Maintenance of soil fertility, low dependence on fossil-fuel based practices and external inputs. Enhanced animal husbandry and herd/flock management, supplements, feed budgets.	Increased productivity and efficiency through better nutrition and genetics, adjusting the growing environment, animal health.

Rivera-Ferre et al., 2016

	Comments
Quantity based	
kg CO_2 eq/kg product	Mainstream metric – favours intensive monogastric production
kg CO_2 eq/kg protein, iron, calcium, fatty acid profile and so forth	Depends on nutrient: iron and calcium metric may favour ruminants; grass-fed ruminants may have better Omega 3–6 ratios than cereal fed animals (Aurousseau et al., 2004; Demirel et al., 2006); protein as metric will favour intensive monogastrics
kg CO_2 eq/kg food and non-food goods provided (leather, wool, feathers, dung, traction)	Variable; on balance likely to favour ruminants
Area based	
kg CO_2 eq per area of land	Emissions lower for extensive systems and for monogastrics
kg CO_2 eq per area of prime arable land required	Emissions lower for extensive systems, both ruminant and monogastric
Resources based	
kg CO_2 eq/kg of fossil fuel based inputs	Emissions lower for extensive systems, both ruminant and monogastric
kg CO_2 eq avoided through use of byproducts or poor quality land to rear livestock; this approach quantifies the GHG and land opportunity cost of needing to obtain an equivalent quantity of nutrition from elsewhere	Favours extensive systems and particularly landless household pig and poultry reliant on scraps
kg edible output per given quantity of ecosystem services provided on farmed land	Favours extensive ruminant systems
kg edible output per given area of land 'spared' for conservation or biomass production	Favours intensive systems, especially monogastrics

Tara Garnett, 2010

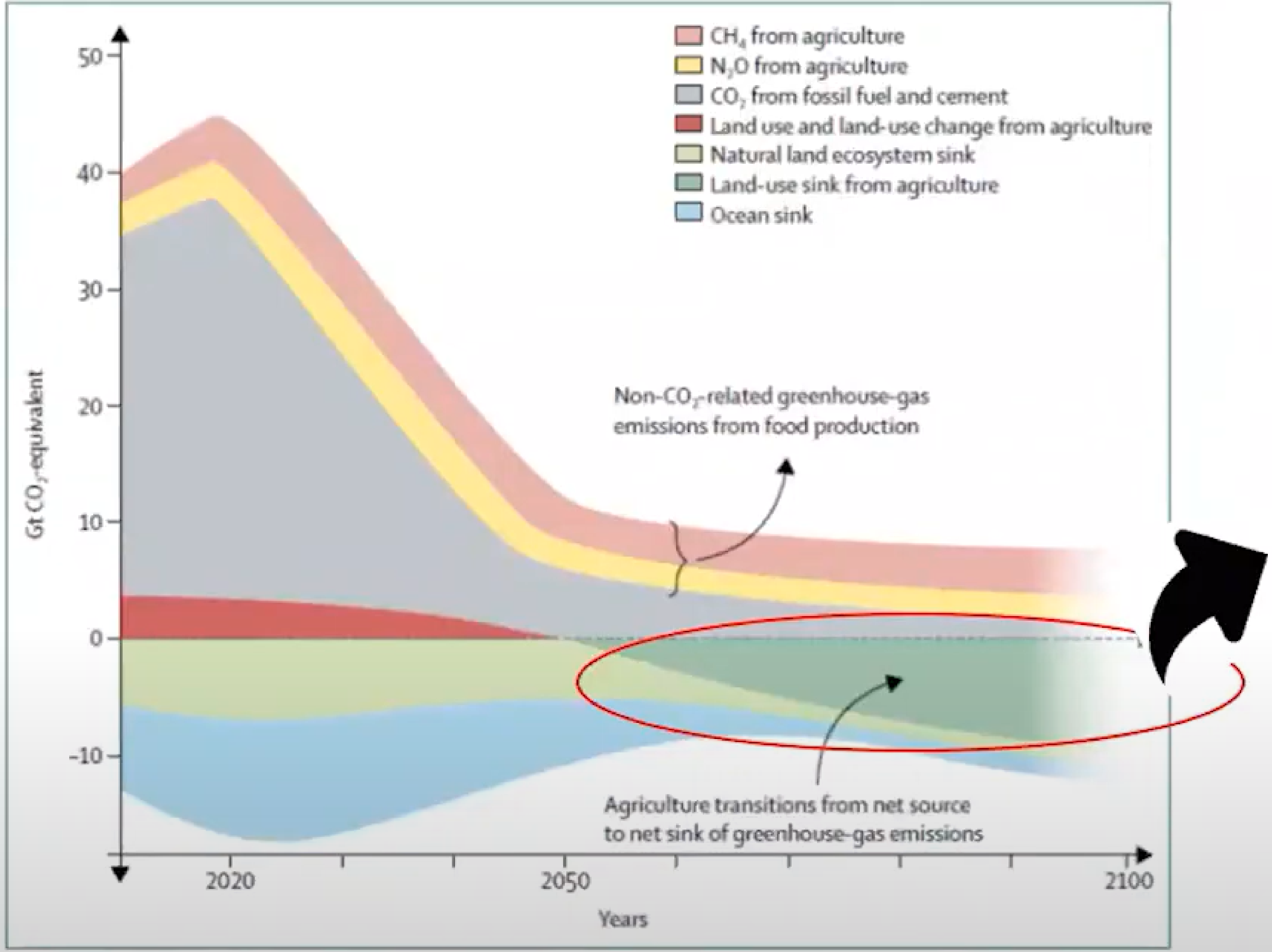


Figure 2: **Projections of global emissions to keep global warming to well below 2°C, aiming for 1·5°C**
Data are from Intergovernmental Panel on Climate Change fifth assessment report (RCP2.6 data for nitrous oxide and methane) and Rockström and colleagues[28] (for fossil-fuel emissions, land use, land-use change, and forestry, and biosphere carbon sinks).

- Reduce emissions
- Feeding people
- Sequester carbon

Modified from The Lancet, 2019

SPM Figure 3 – a

Synergies and trade-offs

IPCC 2019, SRCCL

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WMO UNEP

Effectiveness & feasibility of adaptation options for food system to climate impacts & risk in Europe

Impact Type	Adaptation Option	Effectiveness	Feasibility						Confidence	
			Economic	*Technological*	*Institutional*	*Socio-cultural*	*Ecological*	*Geophysical*	*Evidence*	*Agreement*
Heat stress	Irrigation	M	M	H	M	L	L	L	M	M
	Change of sowing/harvest date	M	H	H	NL	M	M	H	H	M
	Change of cultivars	L	M	M	NL	M	M	H	M	M
Drought	Irrigation	H	H	M	M	H	L	L	H	H
	Change of sowing/harvest date	M	H	H	NL	M	M	H	M	M
	Change of cultivars	L	M	M	NL	M	M	H	H	M
	Soil management	M	M	M	H	M	H	M	L	M
Flooding Compound & extreme weather	Change of sowing/harvest date	L	L	M	NL	H	M	L	L	M
	Plant & livestock breeding, including GMO	M	M	L	L	M	M	M	M	M
	Mixed use - agroecology & agroforestry	H	M	M	L	L	H	M	M	M
	Agricultural policy changes	M	M	M	M	M	M	H	L	H
	Training & information	L	M	NL	M	M	M	H	L	M
	Crop selection changes	M	H	H	NL	L	L	L	L	L
	Land cover change, incl. agricultural land abandonment	L	M	M	L	L	L	L	L	L
Disease pathogen & vectors	Plant & livestock breeding, including GMO	NL	NL	L	L	L	NL	NL	L	NL
	Management, including high frequency rotations	NL	NL	NL	NL	NL	NL	NL	L	NL
Combined impacts on productivity	International trade changes	M	M	NL	L	M	L	M	L	M
	Consumer shifts in consumption	NL	M	NL	NL	L	NL	NL	L	M

Legend
- High = H
- Medium = M
- Low = L
- No/Limited Evidence = NL

IPCC 2022, WG2

UN special rapporteur on the right to food calls for a new Green Revolution based on agroecology

by Olivier De Schutter and Gaëtan Vanloqueren | 21 Sep 2011

Share this article

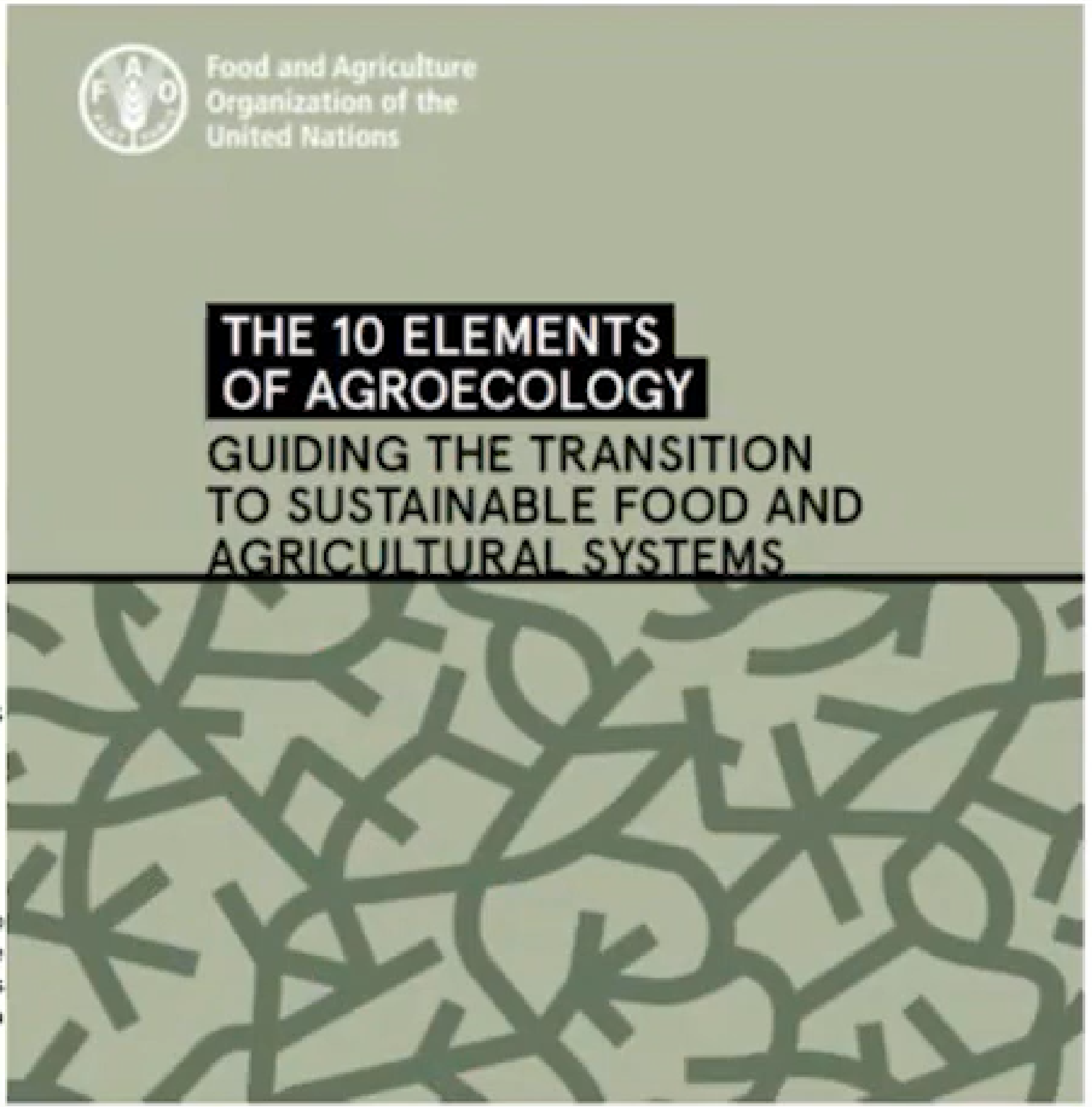
DeSIRA PARTNERSHIPS FOR INNOVATION

INTPA / F3

Supporting the transformation of agricultural and food systems through agroecological approaches

Summary

This technical note aims to provide support for reflection and decision-making to develop interventions aimed at supporting the transformation of agricultural and food systems, based on the principles of agroecology and in line with the priorities of the European Green Deal. In this perspective, it supports a vision of agroecology open to innovation and the market and including a set of interventions (production, processing, distribution, consumption).



European Commission | EN English | Search

Research and innovation

European Commission > ... > Agriculture, forestry and rural areas > Ecological approaches and organic farming > Partnership on agroecology

European R&I partnership on agroecology living labs and research infrastructures

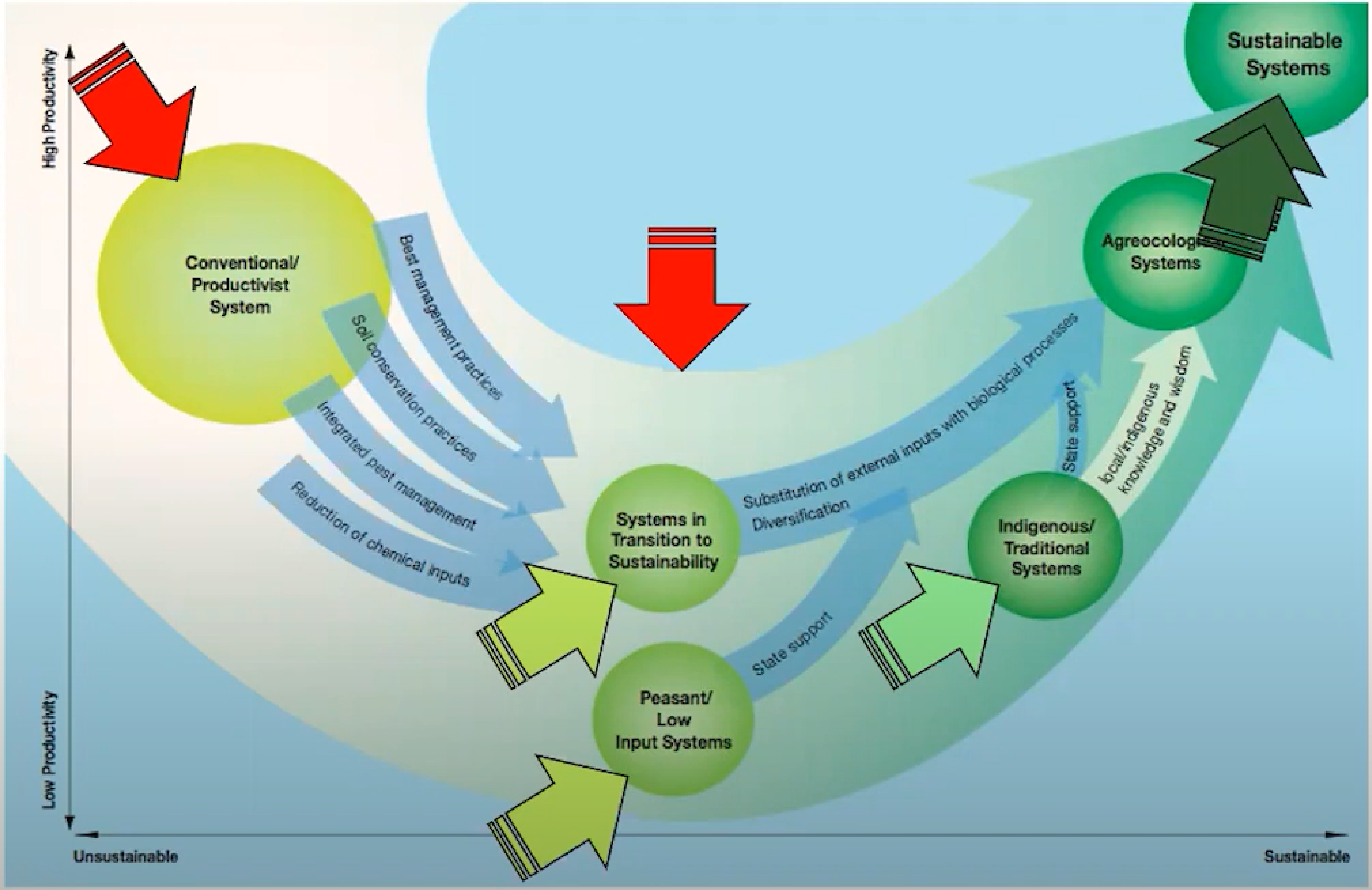
Outline of what the partnership entails, why it has been proposed and how it will be developed.

PAGE CONTENTS

A partnership on agroecology living labs and research

A partnership on agroecology living labs and research infrastructures

Transition towards sustainable and resilient agri-food systems based on agroecology



Agroecology… some definitions

FAO: agroecology is an integrated approach which simultaneously applies ecological and social concepts and principles to the design and management of food and agricultural systems. . Agroecology aims to optimize the interactions between plants, animals, humans and the environment while taking into account the social aspects that must be addressed for a sustainable and equitable food system …

It is based on bottom-up and territorial processes, helping to deliver contextualised solutions to local problems. Agroecological innovations are based on the co-creation of knowledge, combining science with the traditional, practical and local knowledge of producers. By enhancing their autonomy and adaptive capacity, agroecology empowers producers and communities as key agents of change. Rather than tweaking the practices of unsustainable agricultural systems, agroecology seeks to transform food and agricultural systems, addressing the root causes of problems in an integrated way and providing holistic and long-term solutions. This includes an explicit focus on social and economic dimensions of food systems. Agroecology places a strong focus on the rights of women, youth and indigenous peoples.

Agroecology... some definitions

<u>HLPE (2019)</u>: Agroecological approaches favour the use of natural processes, limit the use of purchased inputs, promote closed cycles with minimal negative externalities and stress the importance of local knowledge and participatory processes that develop knowledge and practice through experience, as well as more conventional scientific methods, and address social inequalities.

11 Principles Of Agroecology according to ECVC (2022)

1. Fluid in application across territories
2. Ecological and low-input
3. Political, social, and determined by communities
4. Collective rights and access to the commons
5. Horizontality and diversity of learning
6. Spiritual and non commodified connection to the land
7. Solidarity and collective action
8. Autonomous and fair, based upon a solidarity economy
9. Challenging and transforming global power structures
10. Equal power and remuneration across genders
11. Opportunities for rural youth

Framings of food: evidence review in the SAPEA Evidence Review Report

SAPEA
Science Advice for Policy by European Academies

SAPEA 2020

SAPEA 2019

Framings of Food Security (Benè et al. 2019, Maxwell, 1996, Rivera-Ferre, 2012,...)

The state of play	What is the failure about?	What is threatened and needs to be fixed?	Where do the priorities for action stand?
"our food system is failing us"	Inability of the system to feed the future world population	Food security	Closing the yield gap
	Inability of the system to deliver a healthy diet	Nutrition security and health	Closing the nutrient gap and ensuring the quality of diet
	Inability of the system to produce equal and equitable benefits	Social justice, democratic process, small-scale actors	Decentralization, grass-roots autonomy
	Unsustainability of the system and its impact on the environment	Natural resources, agrobiodiversity, energy-water-carbon efficiency	Reducing the food-print of the system on the environment

Table 1. Agri-food assessments characteristics under different research framings.

		Alternative	Official
Object of study	*Agricultural systems*	Peasant agriculture	Industrial agriculture
	Seeds/breeds/cultures	Multiple species/varieties + polyculture	Few species/varieties + monoculture
	Distribution	Short food supply chains	Long distribution–processing–storage (exports)
Methodology and research process	*Agri-food systems*	Complex socio-ecological systems/holistic	Simple systems or simplification processes
	Interdisciplinarity/Transdisciplinarity	High	Null or very little. Fragmentation social–natural sciences
	Major scientific disciplines	Social and political sciences	Natural sciences
	Economic Science	Political economy/ecological economy	Classical economy/bio-economy
	Type of knowledge	Traditional/ indigenous + formal knowledge (*Diálogo de saberes*)	Formal knowledge
	Participation	High	Small, null participation
	Production and knowledge transfer	Co-production of knowledge (science with people)	Top-down transfer of knowledge
Results	*Solutions*	Diverse	Panaceas
	Technologies	Appropriate technologies	Non-replicable technologies
Vision of science		Complex vision of science Constructionist approach	Instrumental vision of science Positivist approach
Policy responses		Address power structures, alternative development pathways, integrated response	Economic growth, sectorial responses

- **Food as a commodity**: food as a tradable good, based on tradable features that can be valued and priced in the market; clear productivist focus.
- **Food as a human right**: main focus is on the social dimensions of food. Includes i) democratic participation in food system choices; ii) fair, transparent access to all necessary resources for food production; iii) multiple independent buyers; iv) absence of human and resource exploitation...
- **Food as a commons**: food is framed as having multiple dimensions, including both social and environmental, each of which is equally and properly valued, requiring different governance structures and institutions at different levels.

nature food

Explore content ⌄ About the journal ⌄ Publish with us ⌄ Subscribe

nature › nature food › comment › article

Comment | Published: 11 March 2021

Food as a commodity, human right or common good

Peter Jackson, Marta Guadalupe Rivera Ferre, Jeroen Candel, Anna Davies, Cristiane Derani, Hugo de Vries, Verica Dragović-Uzelac, Alf Håkon Hoel, Lotte Holm, Erik Mathijs, Piergiuseppe Morone, Marianne Penker, Ruta Śpiewak, Katrien Termeer & John Thøgersen

Nature Food **2**, 132–134 (2021) | Cite this article

Different framings of food may shape food policies and their impact. Despite acknowledging food systems' complexities, the European Commission's Farm to Fork Strategy still addresses food as a commodity instead of a human right or common good.

A report from the Group of Chief Scientific Advisors (GCSA) to the European Commission recently concluded that the path to a more sustainable food system requires "moving from

ENVIRONMENTAL RESEARCH
LETTERS

LETTER • OPEN ACCESS

Redefining agricultural yields: from tonnes to people nourished per hectare

Emily S Cassidy[1], Paul C West[1], James S Gerber[1] and Jonathan A Foley[1]

Published 1 August 2013 • © 2013 IOP Publishing Ltd
Environmental Research Letters, Volume 8, Number 3
Citation Emily S Cassidy *et al* 2013 *Environ. Res. Lett.* 8 034015

ELSEVIER
Global Food Security
Volume 17, June 2018, Pages 64-72

How much of the world's food do smallholders produce?

Vincent Ricciardi [a, b], Navin Ramankutty [a, b], Zia Mehrabi [a, b], Larissa Jarvis [a, b], Brenton Chookolingo [a, b]

Show more

Farms < 2 ha produce 30–34% food supply on 24% gross agricultural area.
As farms get larger, crop diversity declines and post-harvest loss increases.

ENVIRONMENTAL RESEARCH
LETTERS

LETTER • OPEN ACCESS

Subnational distribution of average farm size and smallholder contributions to global food production

Leah H Samberg[1], James S Gerber[1], Navin Ramankutty[2], Mario Herrero[3] and Paul C West[1]

Published 30 November 2016 • © 2016 IOP Publishing Ltd
Environmental Research Letters, Volume 11, Number 12
Citation Leah H Samberg *et al* 2016 *Environ. Res. Lett.* 11 124010

ELSEVIER
World Development
Volume 142, June 2021, 105455

Which farms feed the world and has farmland become more concentrated?

Sarah K. Lowder [a], Marco V. Sánchez [b], Raffaele Bertini [a]

Show more

+ Add to Mendeley Share Cite

https://doi.org/10.1016/j.worlddev.2021.105455
Get rights and content

Highlights

- There are more than 608 million farms in the world.
- Family farms produce roughly 80% of the world's food in value terms.
- Farms smaller than 2 hectares produce roughly 35% of the world's food.
- The largest one percent of farms operating 70 percent of the its farmland.

smallholder-dominated systems home to more than 380 million households make up **roughly 30% of the agricultural land, produce > 70% of the food calories produced in these regions, responsible for more than half of the food calories produced globally, than half of global production of several major food crops.**

Trends in Ecology & Evolution

Volume 36, Issue 10, October 2021, Pages 919-930

Opinion

Beyond organic farming – harnessing biodiversity-friendly landscapes

Teja Tscharntke [1], Ingo Grass [2], Thomas C. Wanger [3,4,5], Catrin Westphal [6], Péter Batáry [7]

nature sustainability

Explore content | About the journal | Publish with us | Subscribe

nature > nature sustainability > analyses > article

Analysis | Published: 25 March 2021

Higher yields and more biodiversity on smaller farms

Vincent Ricciardi, Zia Mehrabi, Hannah Wittman, Dana James & Navin Ramankutty

Nature Sustainability 4, 651–657 (2021) | Cite this article

Trends in Ecology & Evolution

Volume 36, Issue 10, October 2021, Pages 919-930

Opinion

Beyond organic farming – harnessing biodiversity-friendly landscapes

Teja Tscharntke [1], Ingo Grass [2], Thomas C. Wanger [3,4,5], Catrin Westphal [6], Péter Batáry [7]

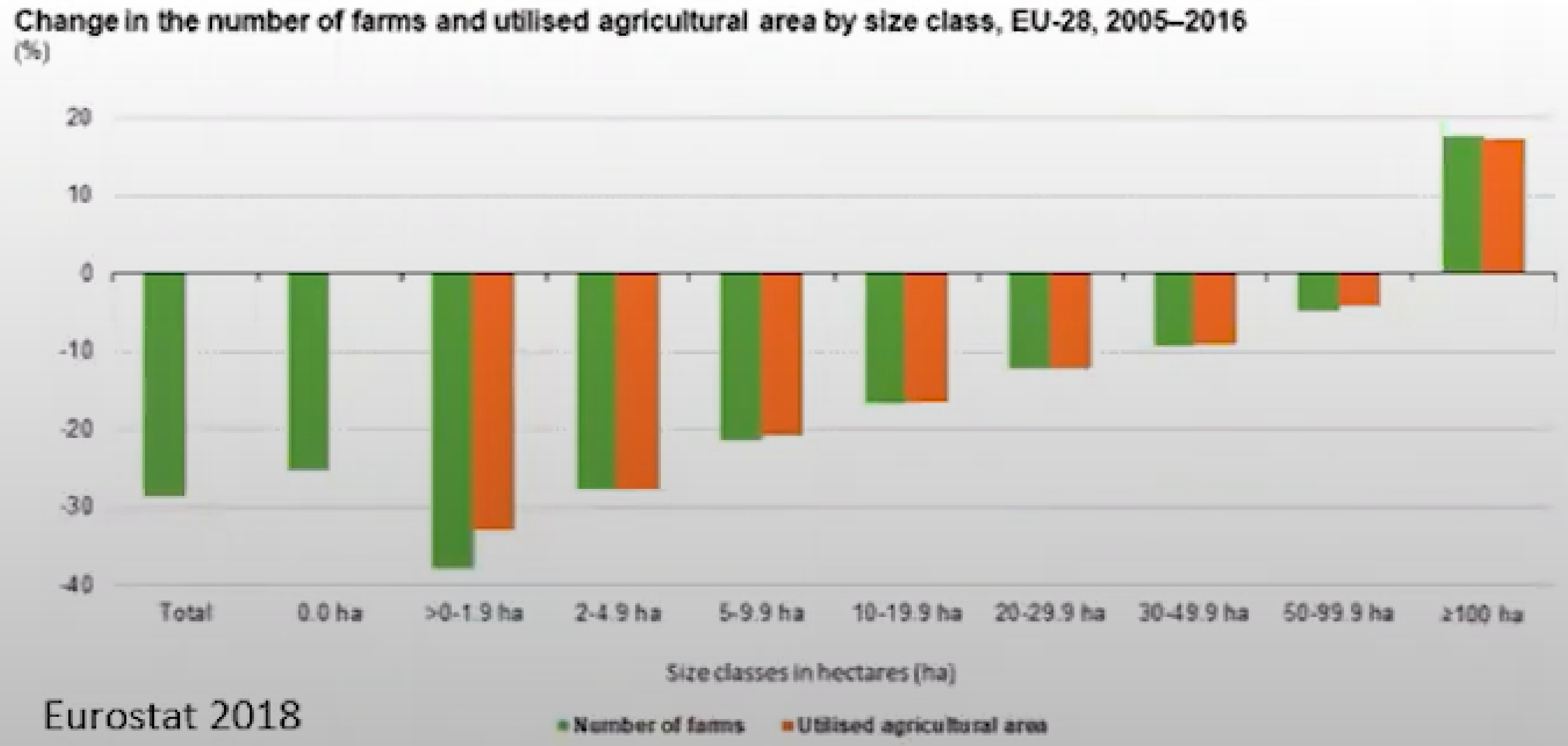
nature sustainability

Analysis | Published: 25 March 2021

Higher yields and more biodiversity on smaller farms

Vincent Ricciardi, Zia Mehrabi, Hannah Wittman, Dana James & Navin Ramankutty

Nature Sustainability 4, 651–657 (2021) | Cite this article



Eurostat 2018

ELSEVIER

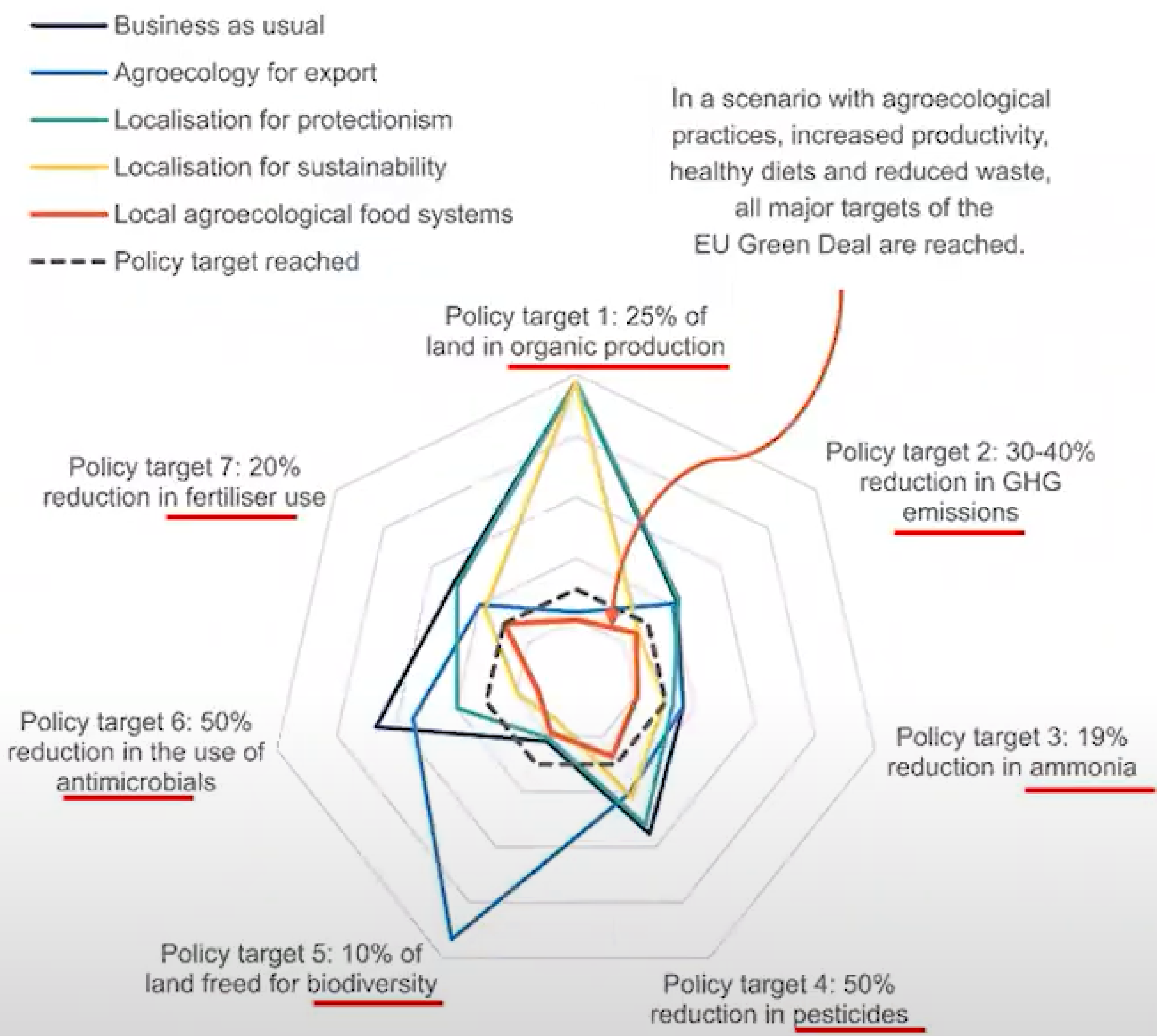
Science of The Total Environment

Volume 847, 15 November 2022, 157612

Agroecological practices in combination with healthy diets can help meet EU food system policy targets

Elin Röös [a], Andreas Mayer [b], Adrian Muller [c], Gerald Kalt [b], Shon Ferguson [d, e], Karl-Heinz Erb [b], Rob Hart [d], Sarah Matej [b], Lisa Kaufmann [b], Catherine Pfeifer [c], Anita Frehner [c], Pete Smith [f], Gerald Schwarz [g]

Show more



Aguilera & Rivera-Ferre, 2022

Gráfico 7. Energía No Renovable (PJ/año) utilizada para el consumo alimentario de la población española en los escenarios estudiados, según procedencia y tipo de alimento

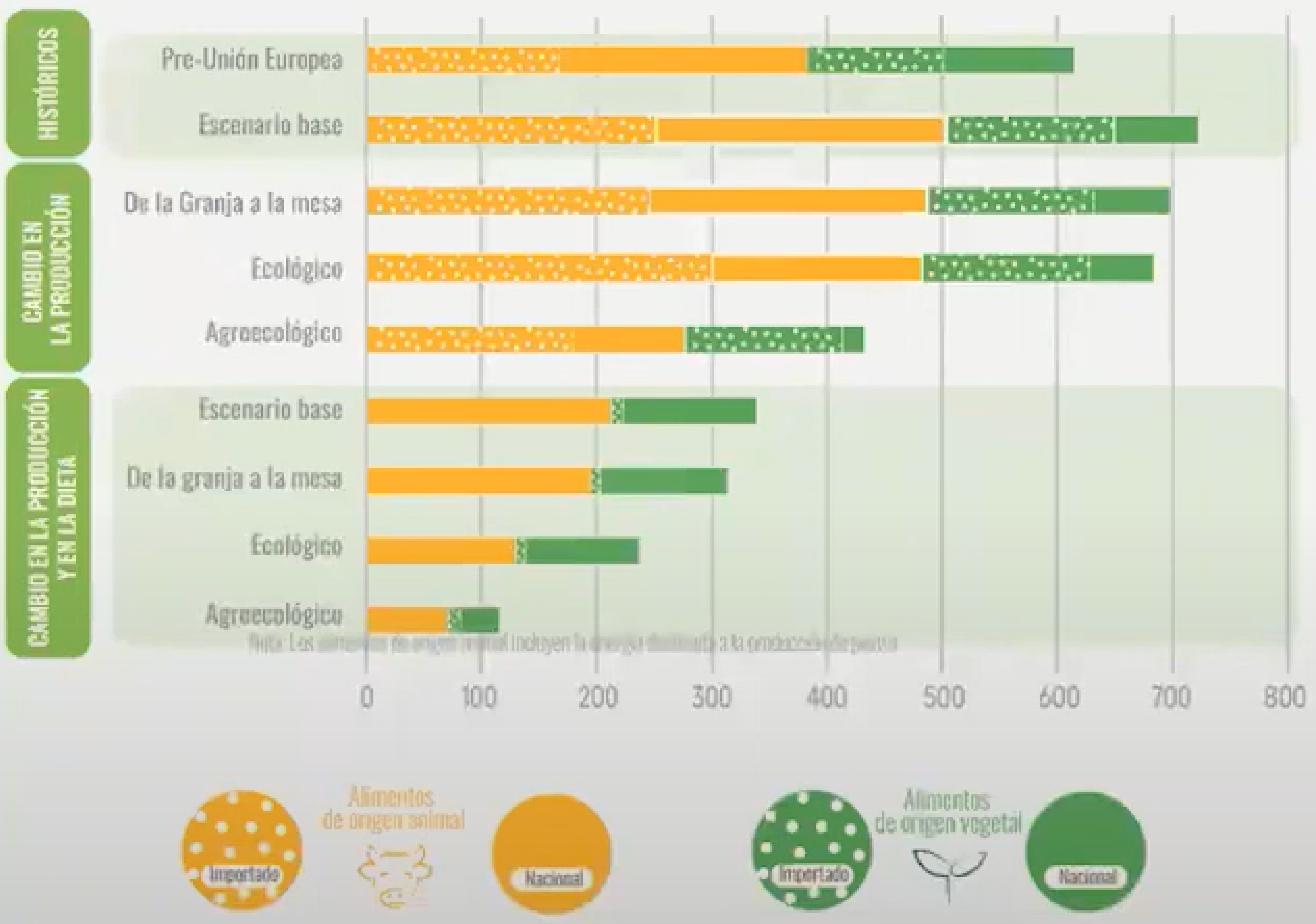
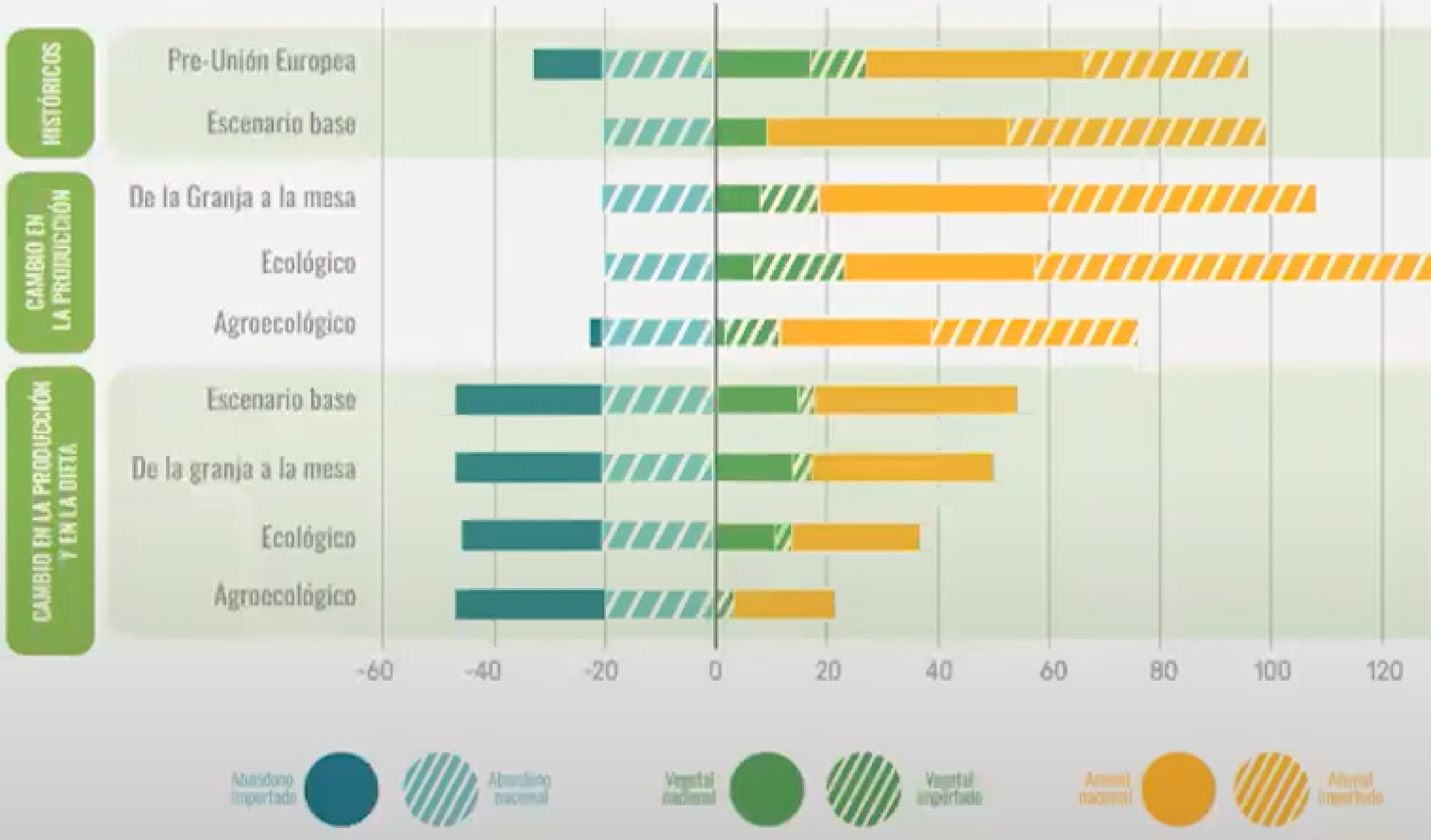
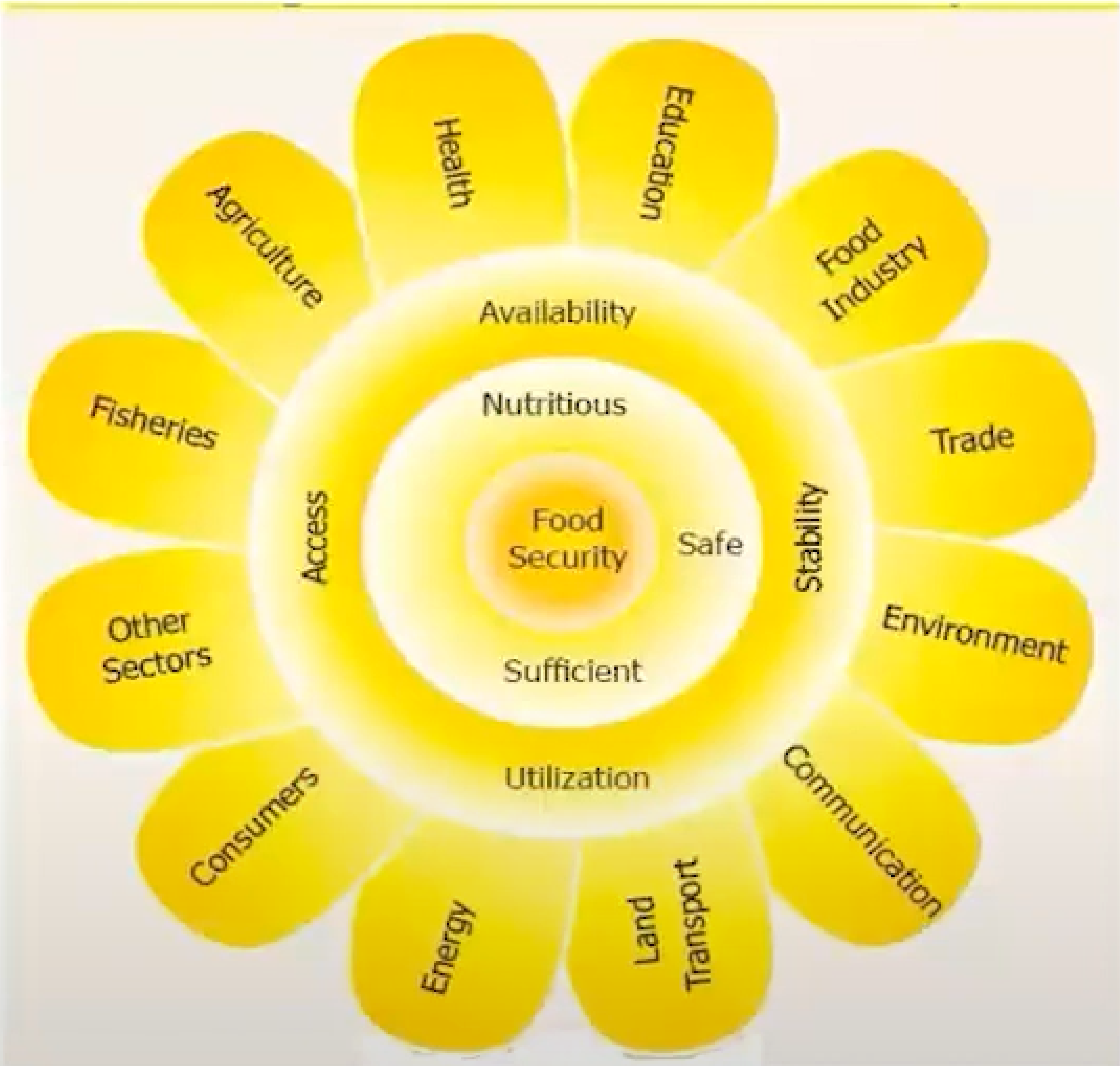


Gráfico 8. Emisiones de GEI asociadas al consumo alimentario de la población española en los escenarios estudiados (en $MtCO_2e$)



Just transition in agri-food systems

- **Scietific challenge-** Complex systems
- **Sustainable agricultural practices** (soil, biodiversity): adaptation, mitigation, carbon sequestration.
- Small-scale farms => “Size matters”
- **Dietary changes** (revert nutrition transition, obesity, etc)
- Policies to reduce meat/animal protein consumption
- Reducing **food loss and waste**
- **Territorialization**



Social sciences essential to look at the policies, institutions and governance models required to transform food systems.

MUCHAS GRACIAS

transición justa de los sistemas alimentarios

Marta G. Rivera Ferre

10/11/2022