

# *Livestock Production Pathways for Sustainable Agro-Ecosystems Transformation in Africa – Insights from livestock research in the CGIAR*

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**Kristina Rösel, PhD**

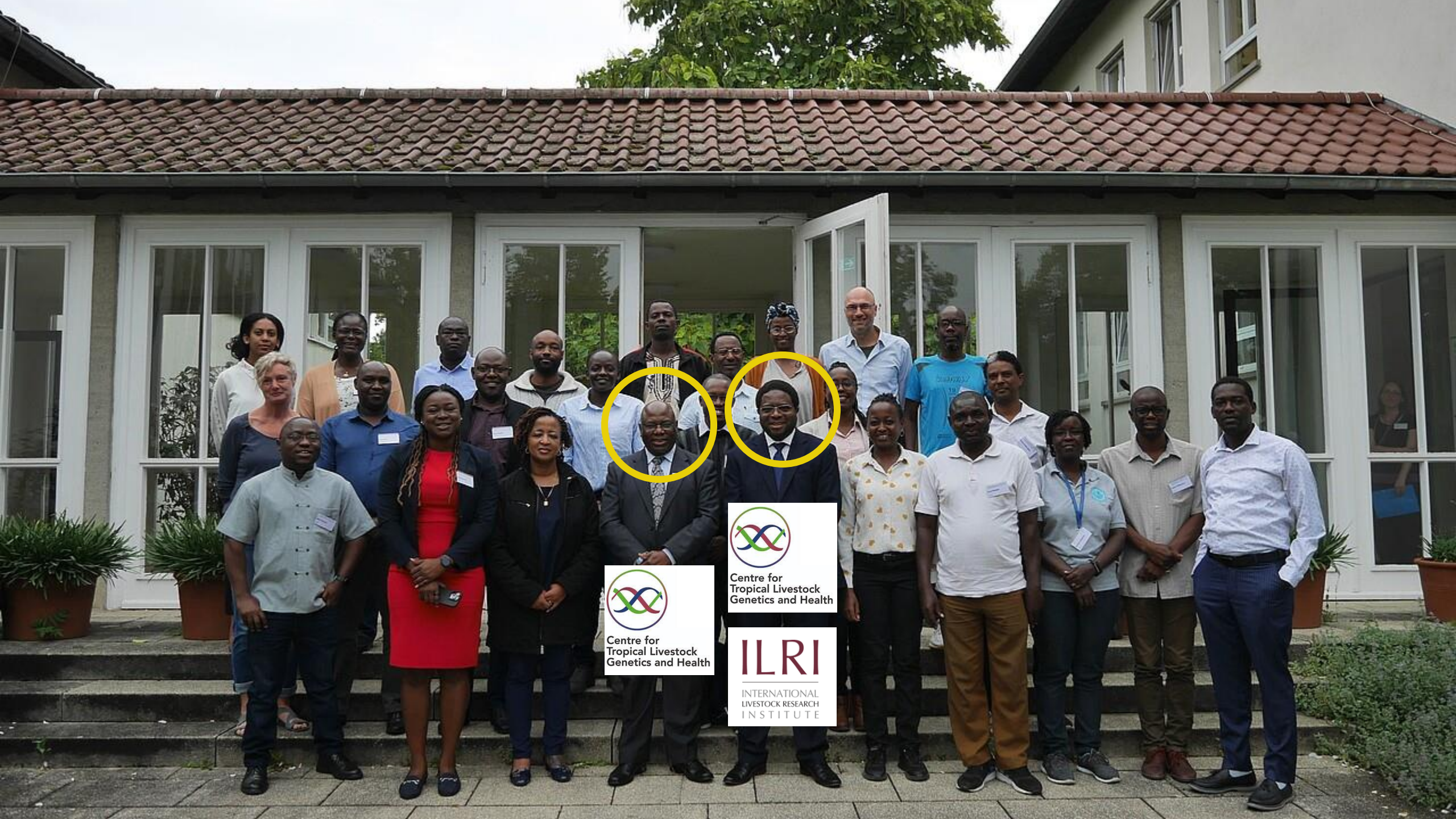
Chair (interim) Department of Animal Breeding and Husbandry in the Tropics and Subtropics (490h)  
Institute of Agricultural Sciences in the Tropics and Subtropics

ILRI senior scientist until April 2024



**Agri-Alumni-Net**  
Webinar 4 December 2024





Centre for  
Tropical Livestock  
Genetics and Health



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**ILRI**

INTERNATIONAL  
LIVESTOCK RESEARCH  
INSTITUTE



# CGIAR

Since 1970s

Formerly the **Consultative Group for International Agricultural Research**

Vision: food-secure future in a climate crisis

Approach: Agricultural Research for Development



**Nutrition, health and food security**



**Poverty reduction, livelihoods and jobs**



**Gender equality, youth & social inclusion**



**Climate adaptation and mitigation**



**Environmental health and biodiversity**



# One CGIAR: 14 research centres, >9,000 staff, 89 countries



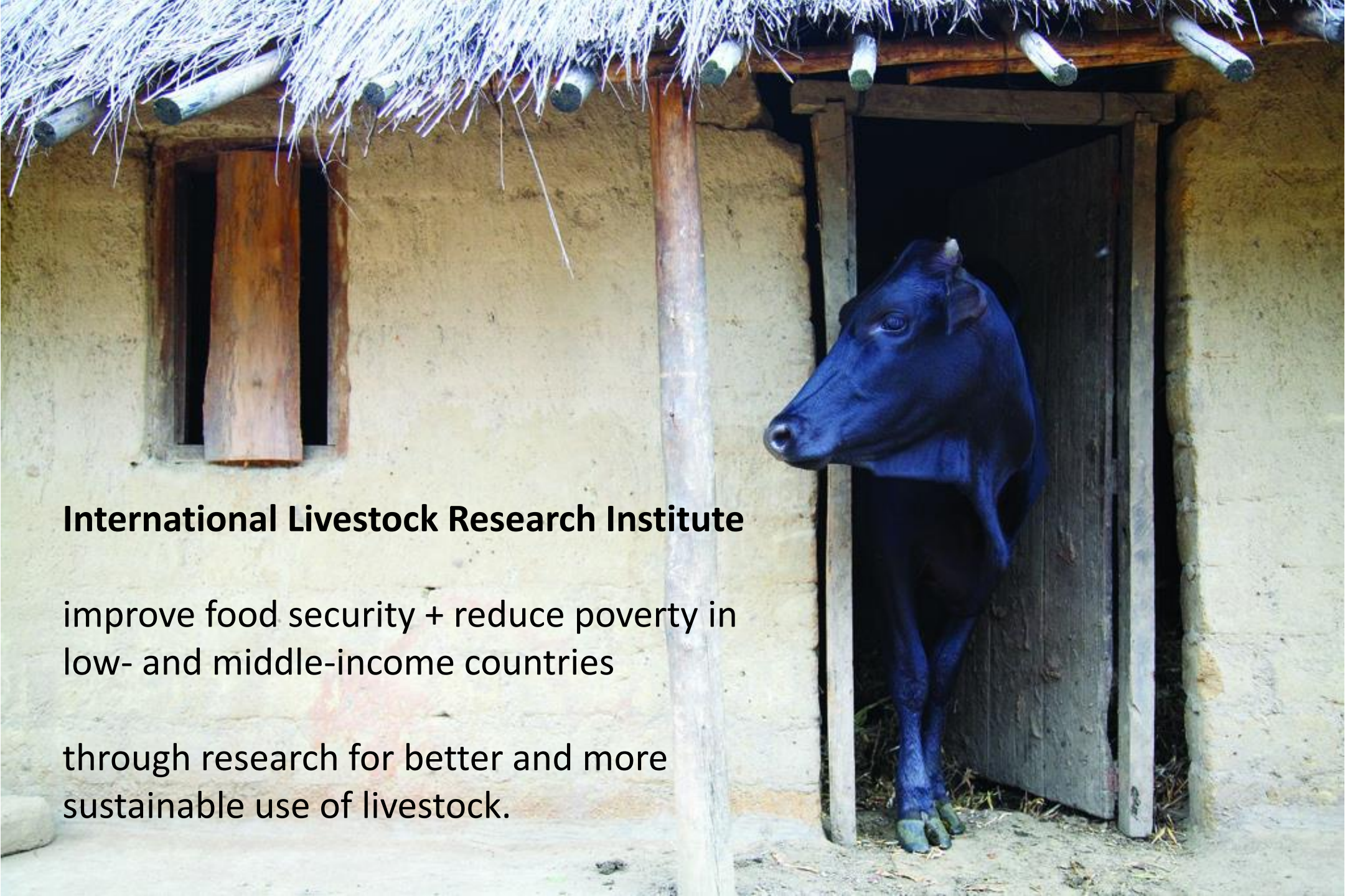
The 2030 Research and Innovation Strategy situates CGIAR in the evolving global context, which demands a **systems transformation approach for food, land, and water systems.**

From commodities to systems

<https://www.cgiar.org/how-we-work/strategy/>





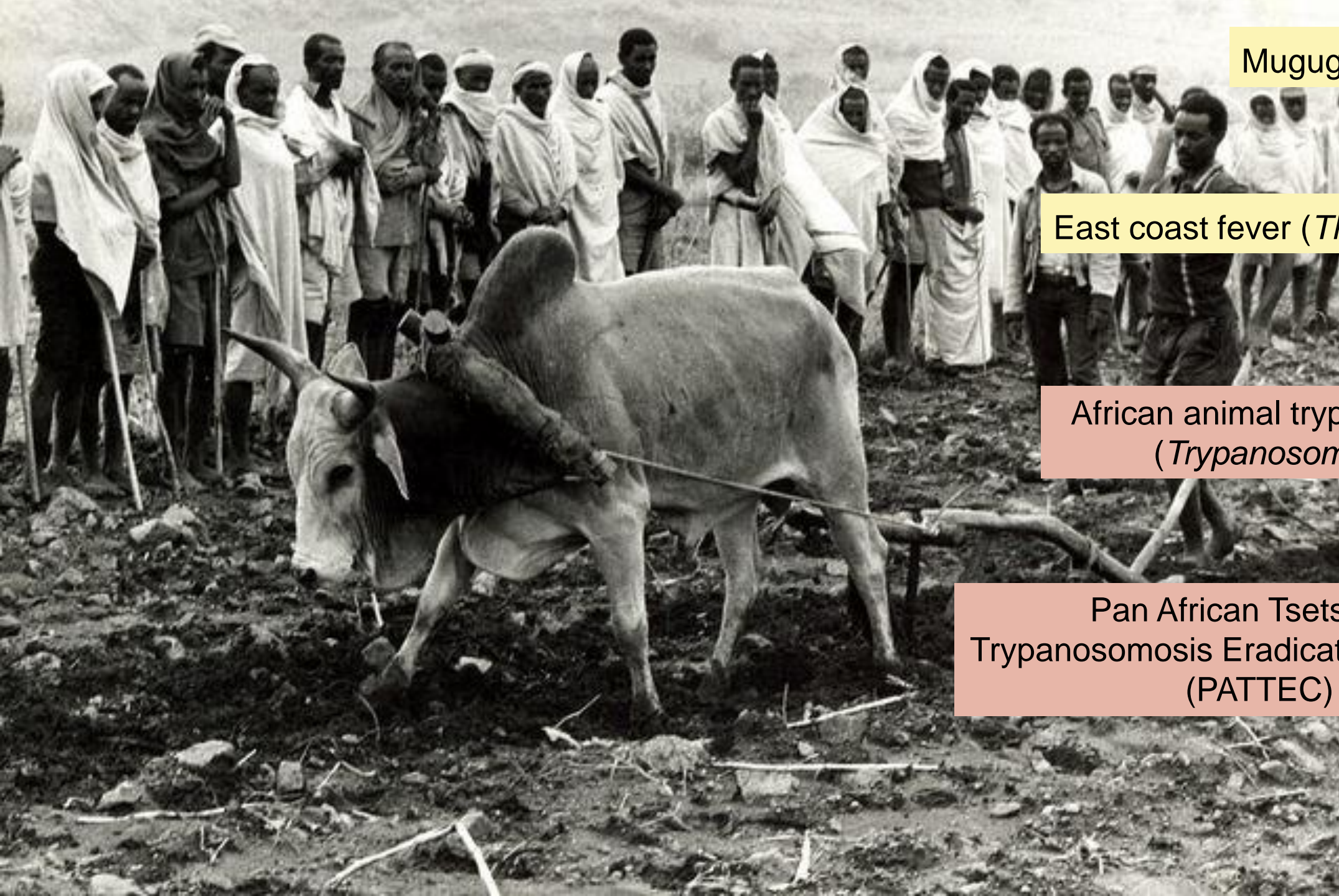


## **International Livestock Research Institute**

improve food security + reduce poverty in  
low- and middle-income countries

through research for better and more  
sustainable use of livestock.





Muguga cocktail



East coast fever (*Theileria parva*)

African animal trypanosomiasis  
(*Trypanosoma* spp.)



Pan African Tsetse and  
Trypanosomosis Eradication Campaign  
(PATTEC)

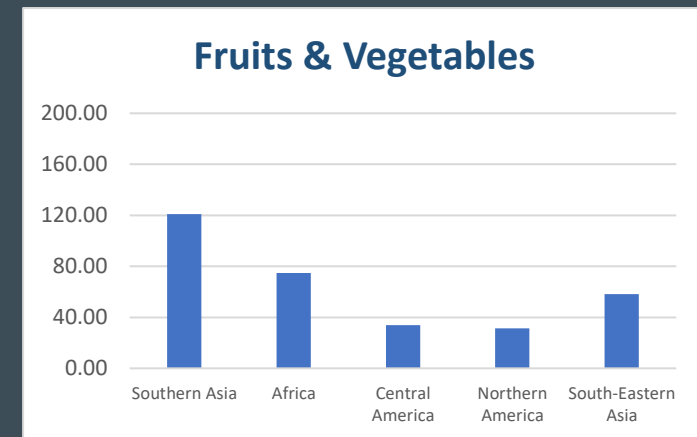
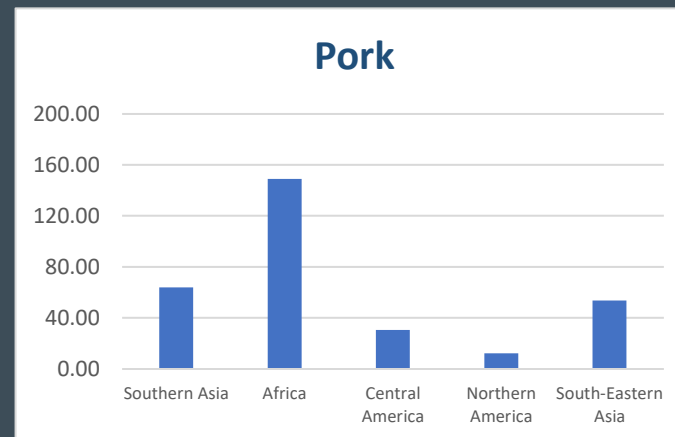
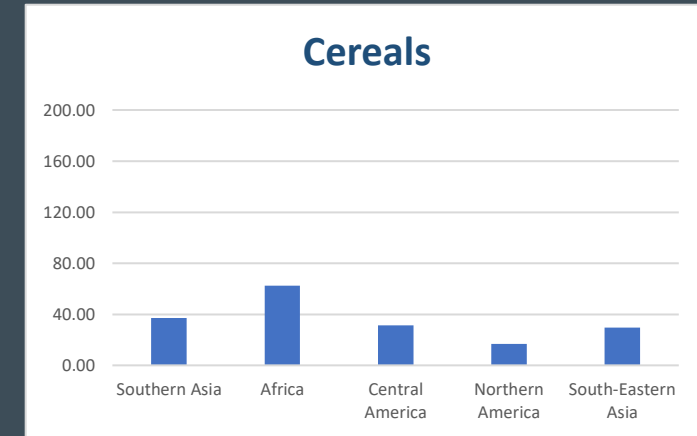
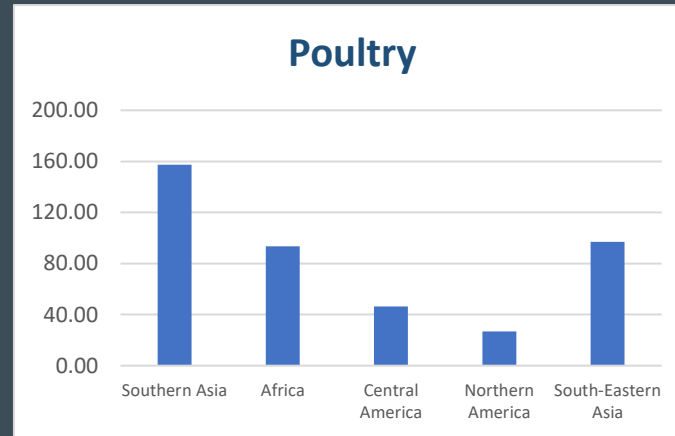
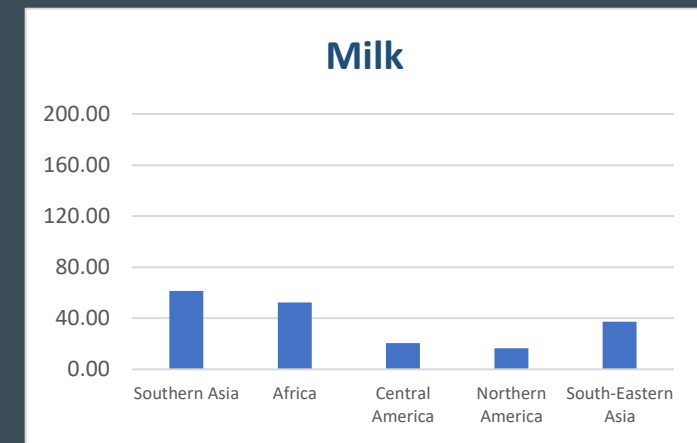
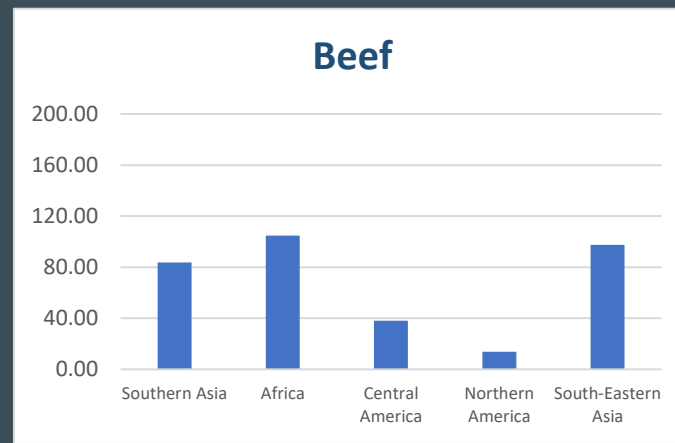
# Demand for food has been and will keep growing

*Especially in LMICs*

- Drivers: Population growth, urbanization, rising incomes
- Not based on significant over-consumption in LMICs (attention: 'double burden')
- 70% of livestock-derived foods consumed in LMICs are **sourced in informal markets**

## Percentage changes in demand 2010 to 2030

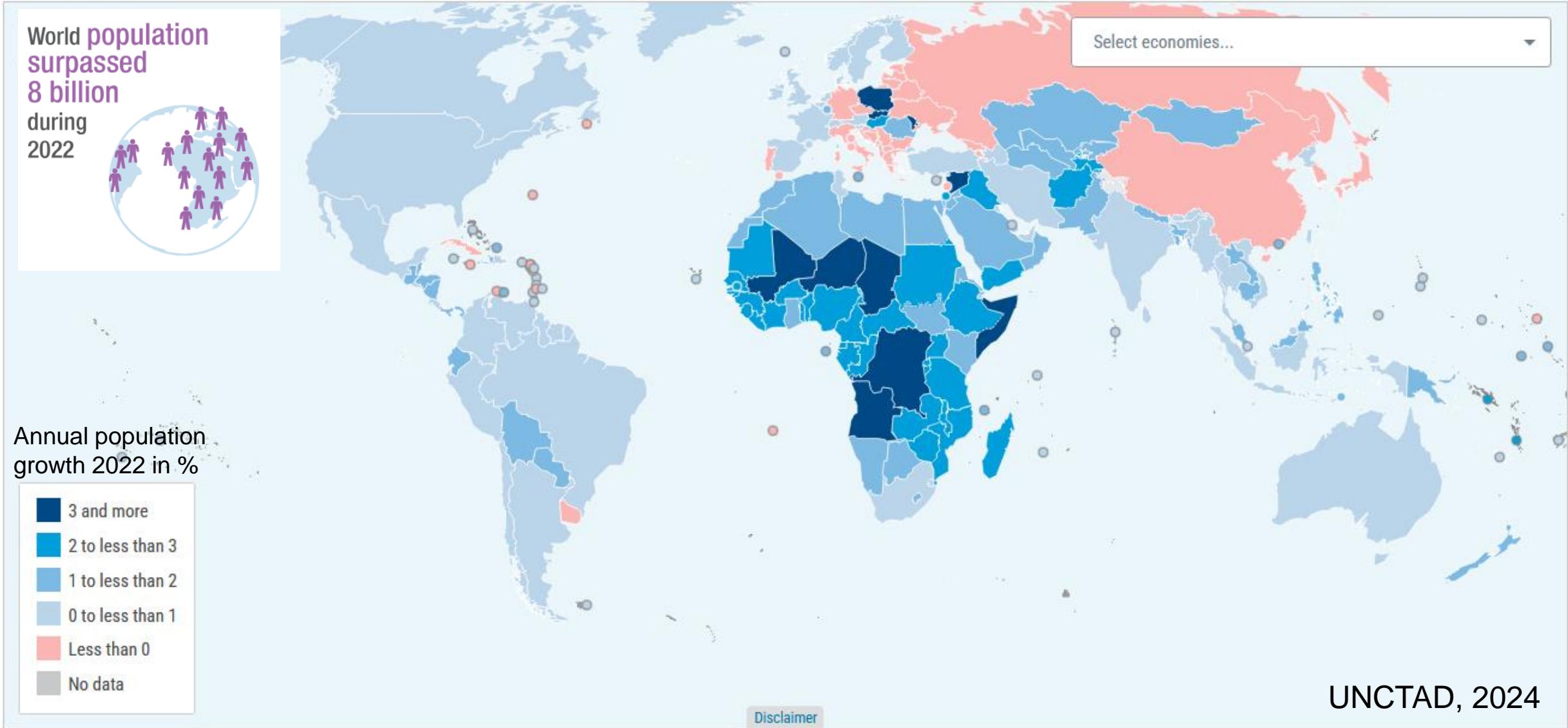
Projections based on IMPACT model, Dolapo Enahoro (ILRI)





# Global drivers for livestock production

## 1) human population ↑



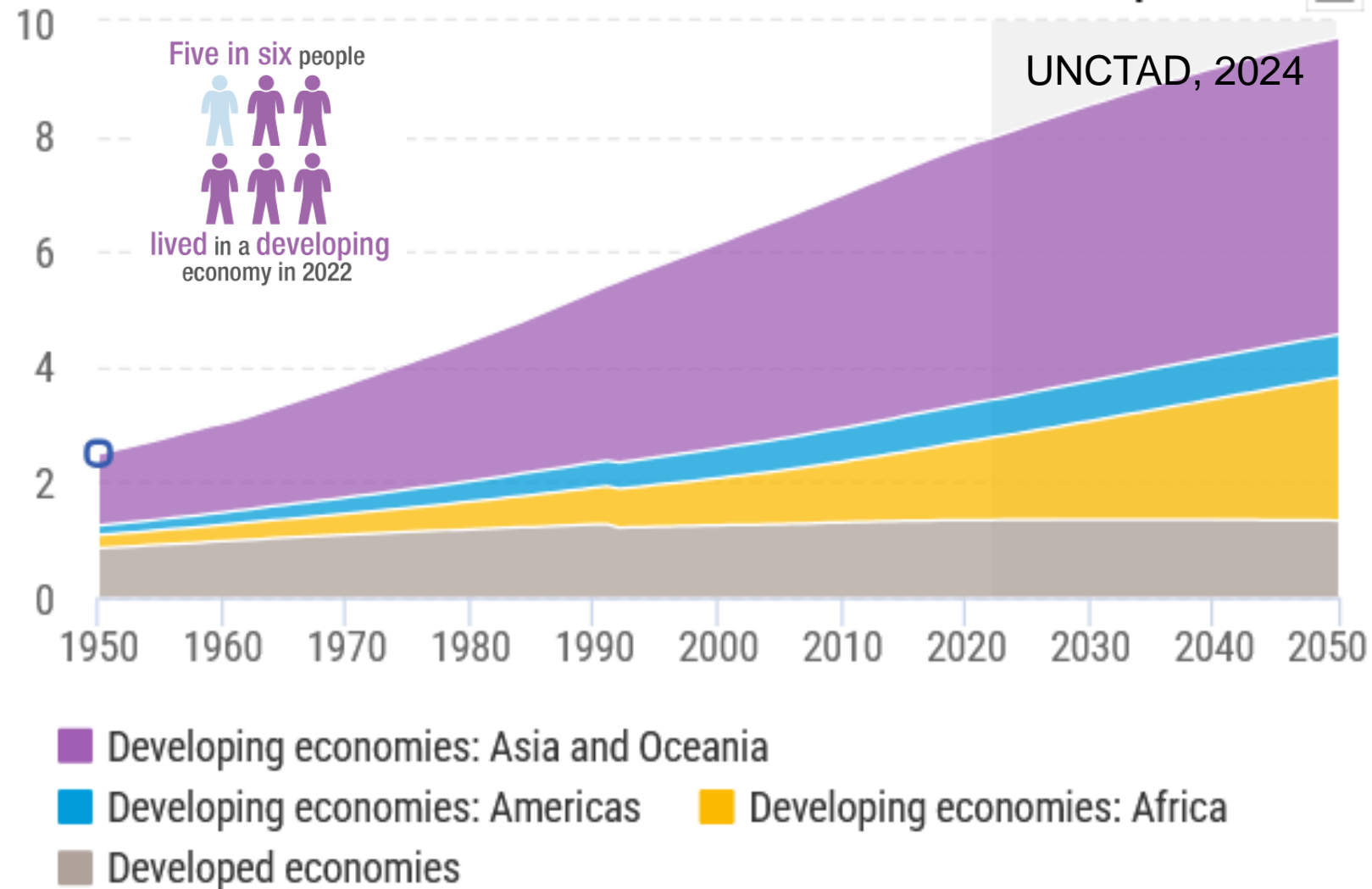
# 1) human population ↑ driven in LMIC

## Last 25 years:

world population 2.1 billion people ↑  
 Asia & Oceania (1.1 billion ↑)  
 Africa (0.7 billion ↑)

## Next 25 years:

world population 1.6 billion people ↑  
 Africa (0.9 billion ↑)  
 Asia & Oceania (0.6 billion ↑)





# Global drivers for livestock production

## 2) urbanization ↑

57% of the world's population lived in urban areas in 2022



### Urban and rural population projected to 2050, World, 1770 to 2050

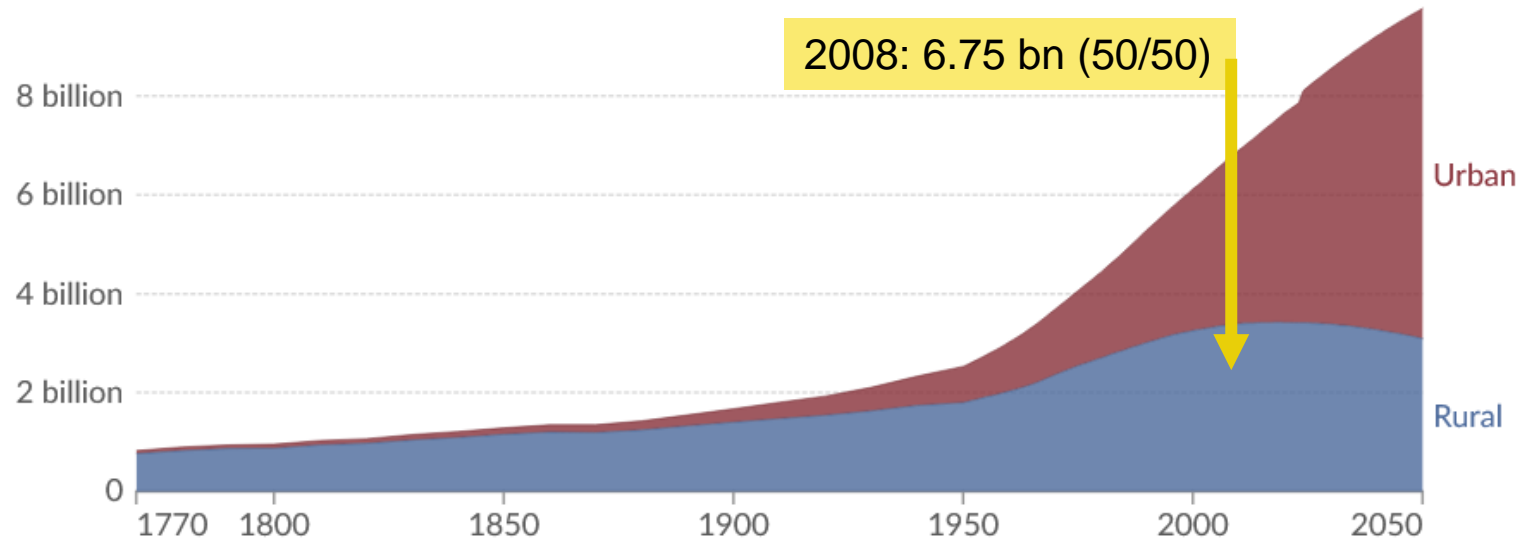
Our World in Data

Total urban and rural population, given as estimates to 2023, and UN projections to 2050. Projections are based on the UN World Urbanization Prospects and its median fertility scenario.

Table Chart

Change country or region

Settings



10,000 BCE

2050

Data source: United Nations, Department of Economic and Social Affairs, Population Division (2018); HYDE (2023) - [Learn more about this data](#)

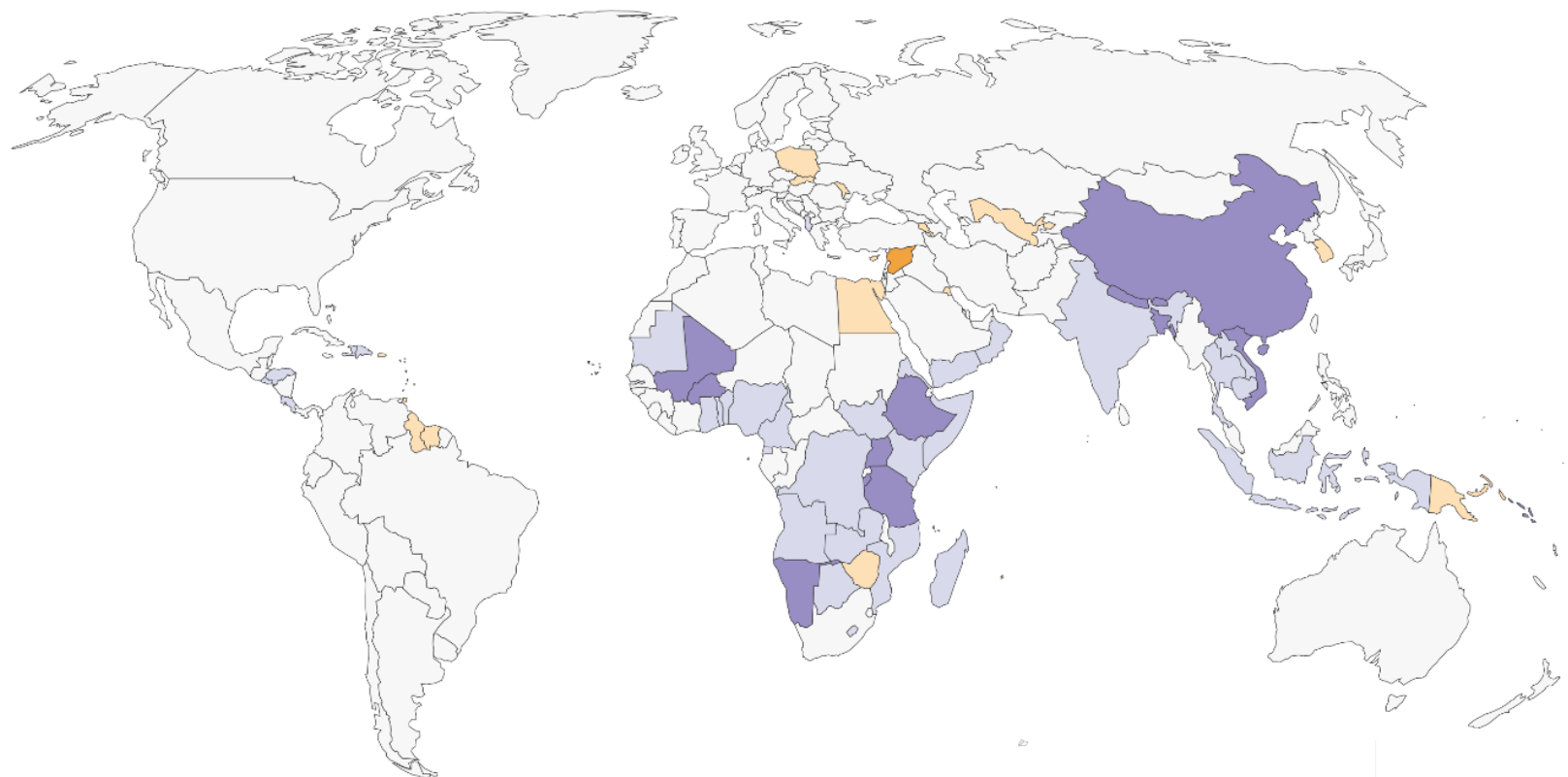
OurWorldinData.org/urbanization | CC BY



# Annual growth rate of urban population share, 2015

Our World  
in Data

The average yearly growth rate of the share of the population living in urban settings. For example, the rate for 2015 represents the average annual growth from 2010 to 2015



No data

-2%

-1%

0%

1%

2%

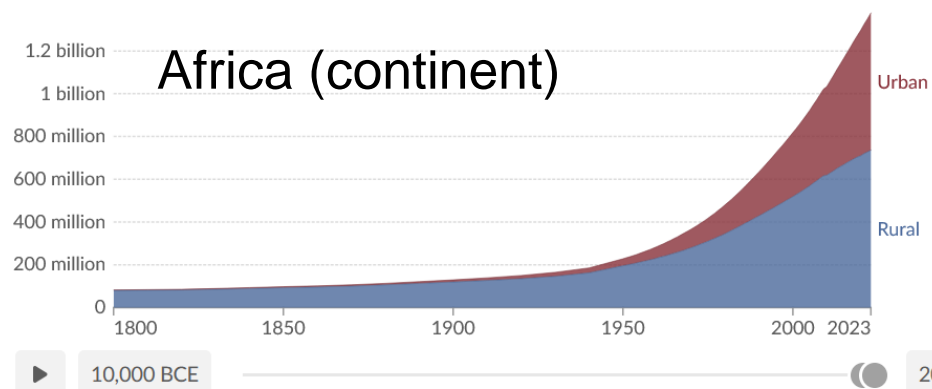
3%

**Data source:** United Nations, Department of Economic and Social Affairs, Population Division (2018)

**Note:** Because the estimates of city and metropolitan areas are based on national definitions of what constitute metropolitan area, cross-country comparisons should be made with caution.

[OurWorldinData.org/urbanization](https://ourworldindata.org/urbanization) | CC BY

ourworldindata.org

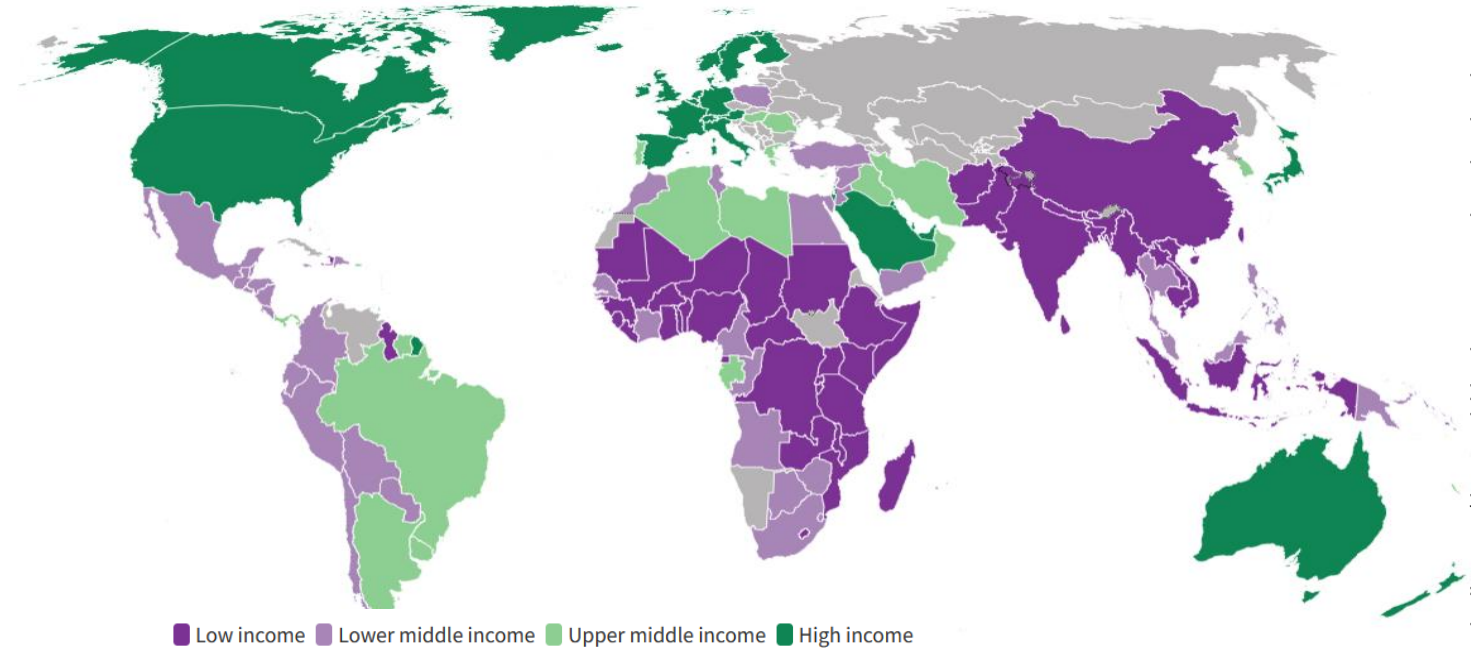




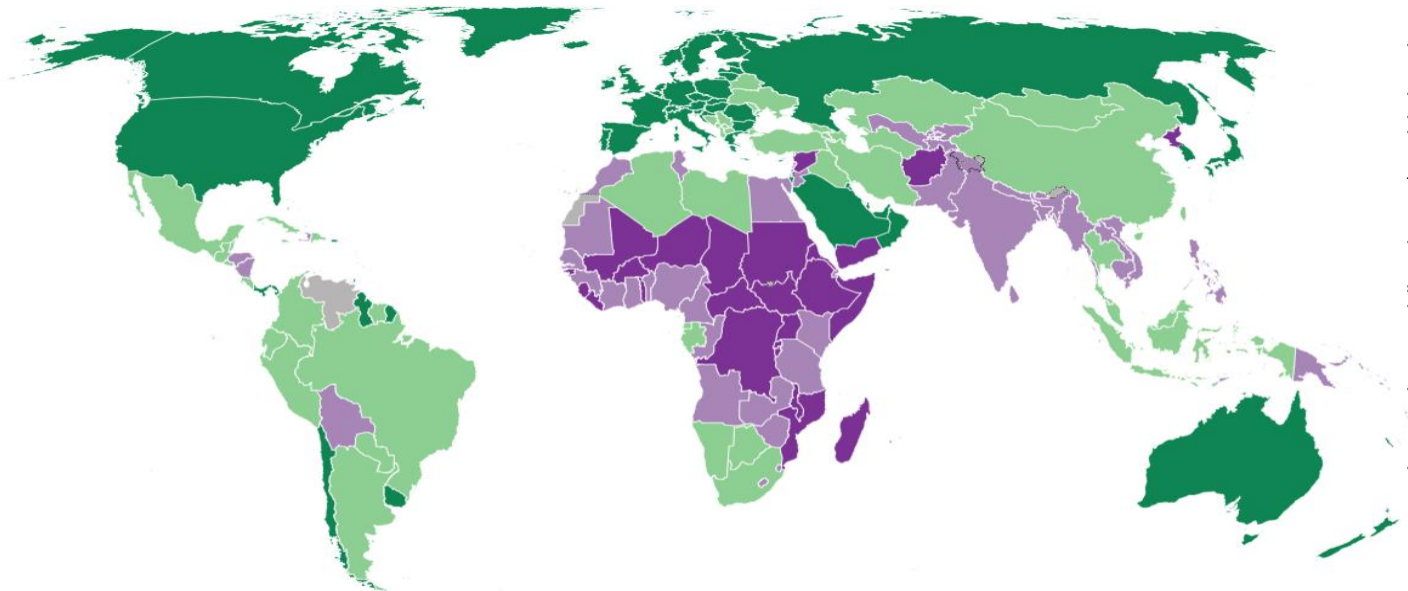
# Global drivers for livestock production

## 2) income ↑

1987



2023



# Not all of Africa's land surface is suitable for crop production

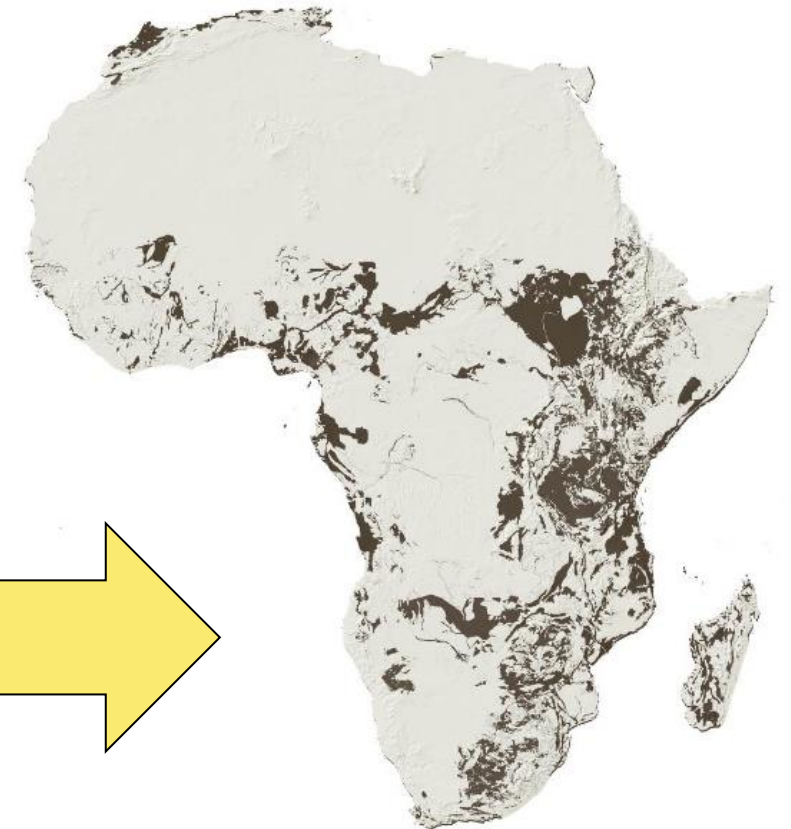
30.4m km<sup>2</sup> land surface

**Minus** areas that are too high

**Minus** areas that are too hot/dry

**Minus** regions with soils that are too shallow/sandy/salty/acidic/nutrient-low

= naturally fertile soils



Source: National Geographic magazine

"Africa's food challenge" <http://www.nationalgeographic.com/foodfeatures/land-grab/>

*"The world's population will likely reach nine billion by 2050, and Africa could help feed it. In some areas arable land may be developed; in other areas it never will be."*



# Growing demand vs. limited supply



## Eating wild animals: Rewards, risks and recommendations

Better Management of Wild Meat Value Chains  
through One Health

Delia Grace<sup>1</sup>, Bernard Bett<sup>2</sup>, Elizabeth Cook<sup>3</sup>, Steven Lam<sup>4</sup>, Susan MacMillan<sup>5</sup>, Phyllis Masud<sup>6</sup>,  
Manon Mispiratcegyu<sup>7</sup>, Ha Thi Thanh Nguyen<sup>8</sup>, Hung Nguyen-Viet<sup>9</sup>, Ekta Patel<sup>10</sup>, Annabel Slater<sup>11</sup>,  
Steven Staaf<sup>12</sup> and Ian Thomas<sup>13</sup>

*Importing livestock products*

*Increased bushmeat  
consumption*

*Importing livestock industrial  
production know-how*

*Transforming smallholder  
livestock systems*



(c) Ramona Waldner





Bibi at Babati, Tanzania. (c) ILRI/David Ngunga



Binita in India © GalvMed



ILRI/Stevie Mann

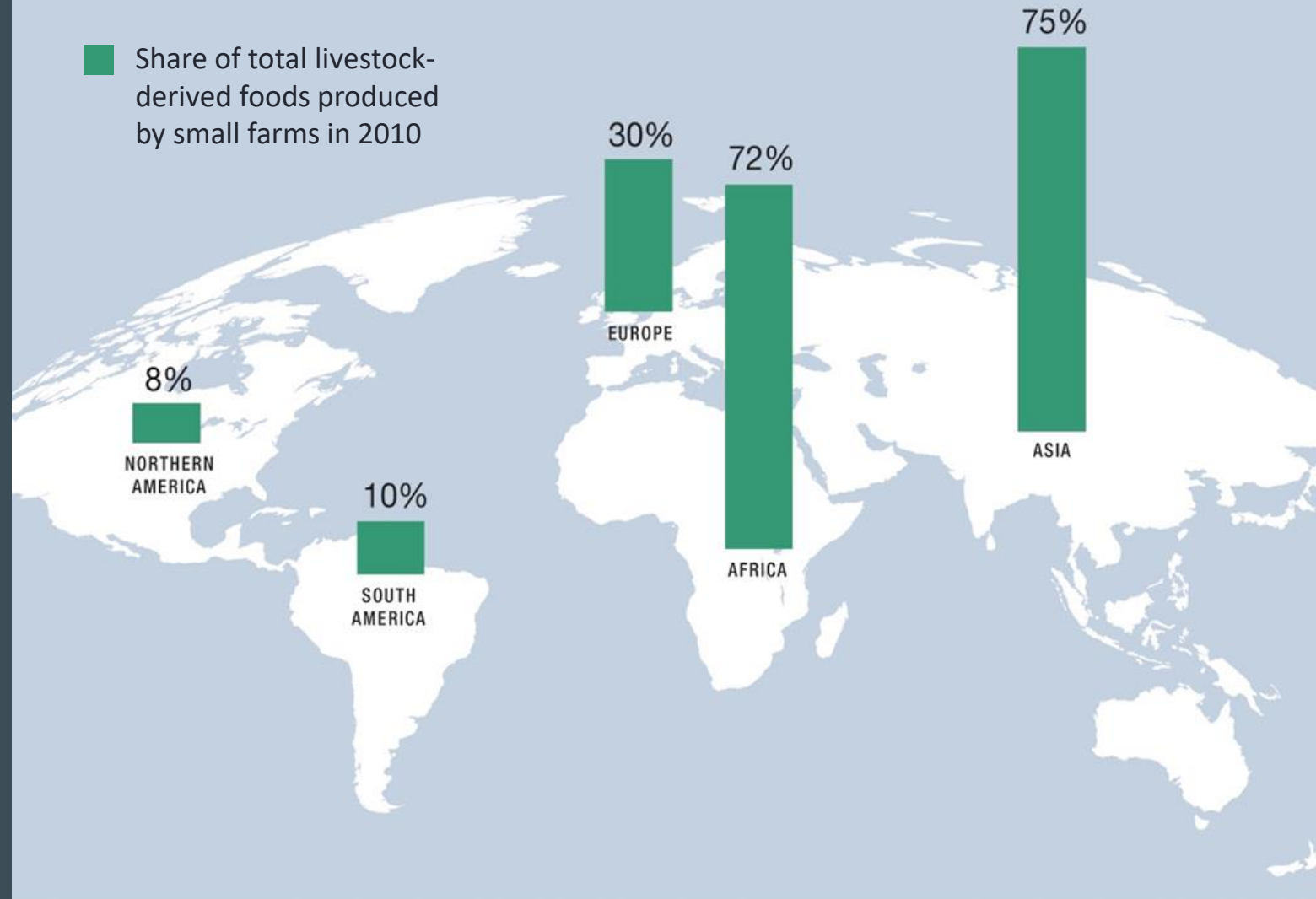


Dairy in Nepal © Heifer International



## Smallholder farmers currently provide most of the meat, milk and eggs AND staple cereals in LMICs

- **1.7 billion people** derive some livelihood from livestock; over half a billion depend on livestock
- **Livestock are fundamental** to many economies; provide income, jobs, and supporting risk mitigation
- Livestock are the basis for **farm sustainability**, integrated livestock-food farms make food crop farming even possible for many in the Global South – circular bioeconomy in action!

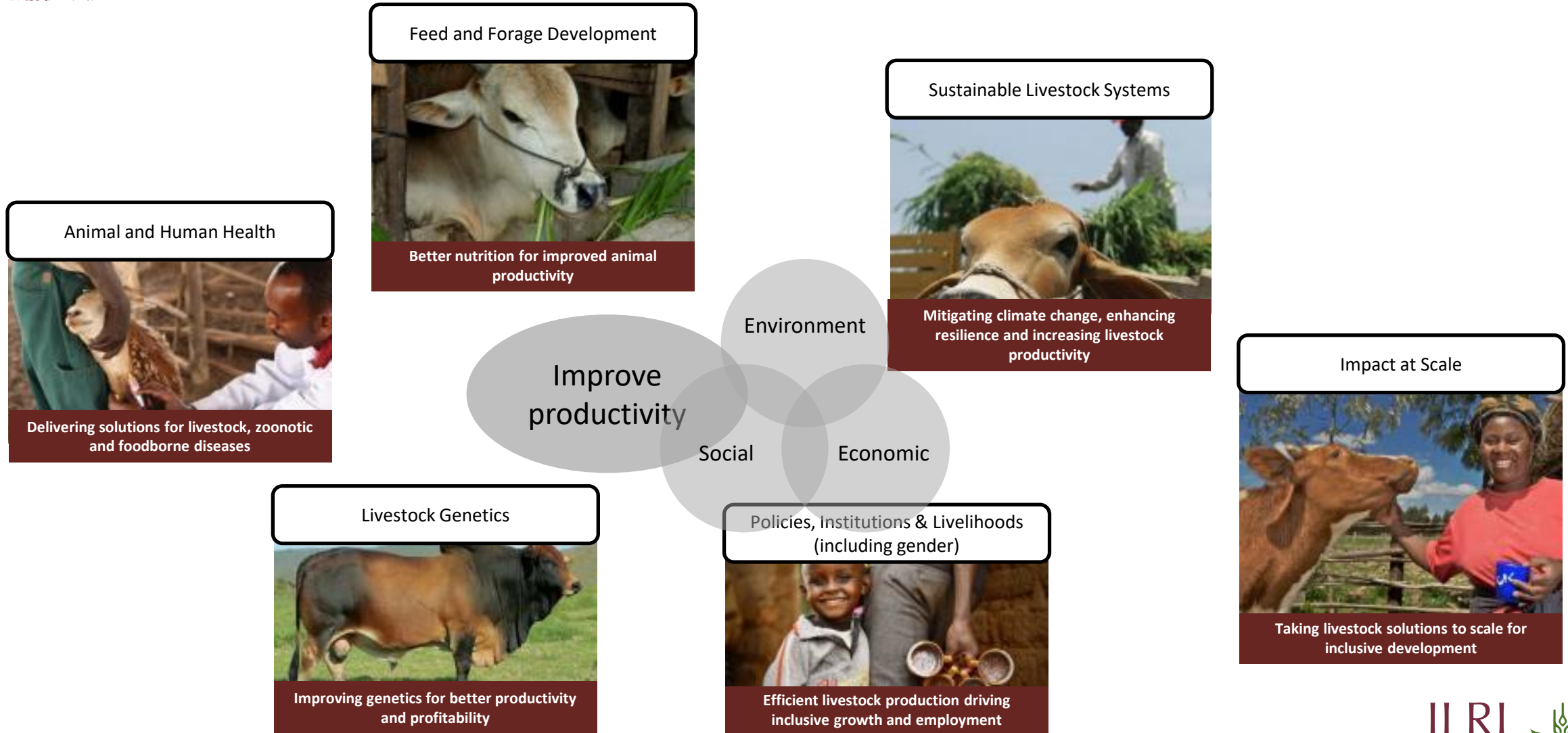


### Farms of less than 20 hectares provide:

Nearly 50% of the world's livestock and cereals, and close to 70% of the livestock and cereals in LMICs



# ILRI's livestock research: solutions for food and nutritional security, poverty, environmental and human health



Capacity development; communications; knowledge management

# Feed and Forages

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Genomic selection in forage grasses  
(including drought and pest tolerant species)

Mobile Near-Infrared Spectroscopy (NIRS) to  
instantly analyze feed quality for optimal  
nutrition

Feed Assessment Tool (FEAST) to understand  
local feed constraints and guide solutions

Feeds and forages genebank

(ca. 19,000 accessions > 1000 species; Forage and tree seed production)

[ilri.org/research/programs/feed-and-forage-development](http://ilri.org/research/programs/feed-and-forage-development)



*Cenchrus (Pennisetum) purpureum*  
Elephant or Napier grass

*Brachiaria spp.*





# Sustainable Livestock Systems

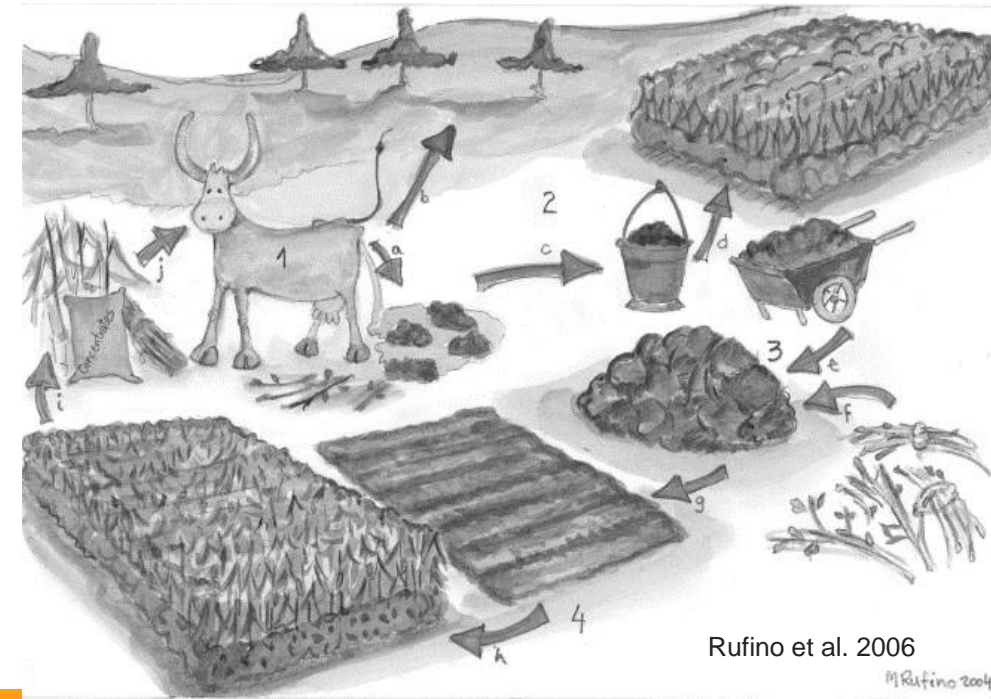
Emission data from African livestock production systems

Climate change mitigation, e.g. Low methane forage

Climate change adaptation, e.g. vegetation-index based livestock insurance (IBLI)

Rangeland management

[ilri.org/research/programs/sustainable-livestock-systems](http://ilri.org/research/programs/sustainable-livestock-systems)





# Livestock Genetics

genomic selection in the African dairy and poultry sector

heritable resistance to East Coast fever and a possible route to a 'technology-skipping' precision breeding approach

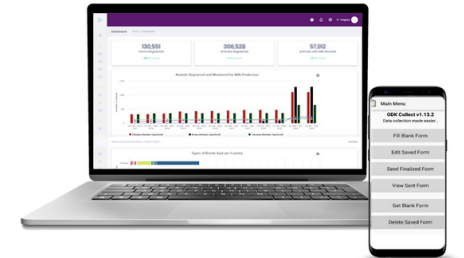
Improved delivery of AI



Africa Dairy Genetic Gains (ADGG) is an international Livestock Research Institute (ILRI) - led investment by the Bill and Melinda Gates Foundation (BMGF) that is developing and testing a multi-country genetic gains platform. ADGG data platform contains data on farms and dairy animal reared in specified countries of Eastern Africa. The database has access control logic features for different users based on their role and permissions. The data is owned by the respective country and can be used by the registered farmers either directly or through service providers to manage their herds, leading to sustained animal and herd productivity gains.

LEARN MORE

SIGN IN



Nene, V., Lacasta, A., Steinaa, L., Toye, P., Teufel, N. and Pye-Smith, C. 2021. Tackling the key cattle disease East Coast fever: An overview of CGIAR research in one of Africa's most important livestock diseases. Innovation Brief. Nairobi, Kenya: ILRI. <https://hdl.handle.net/10568/119497>

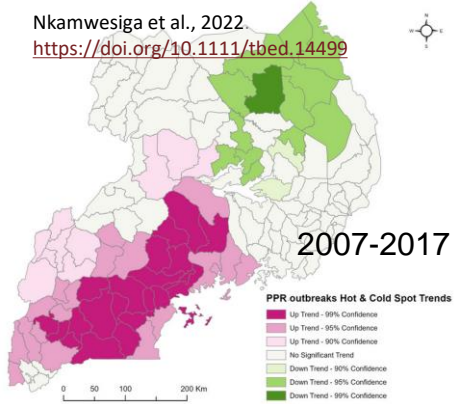


# Animal and human health

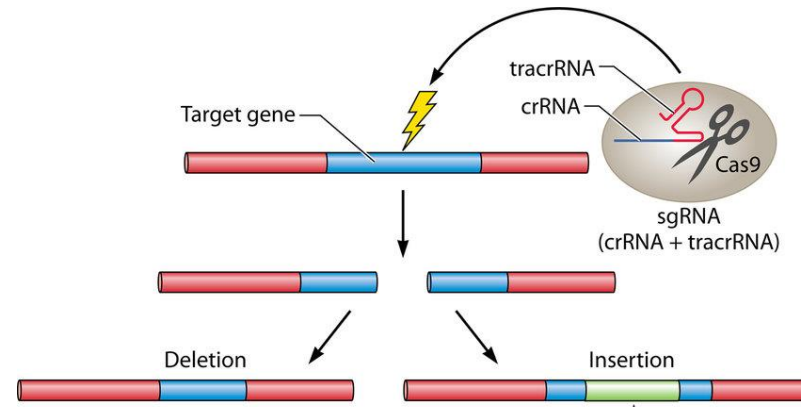
Transboundary animal diseases

Emerging and neglected zoonotic diseases

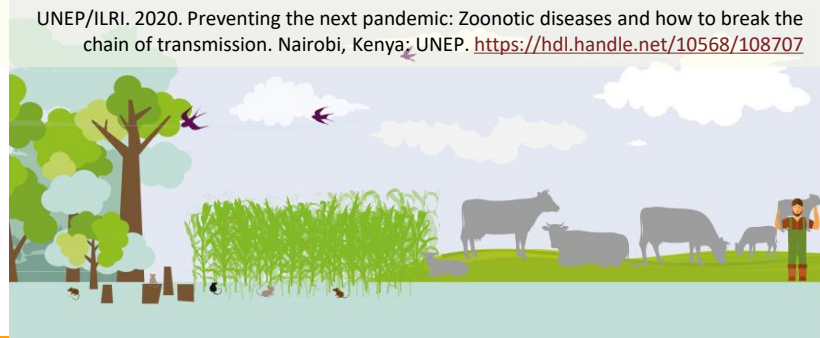
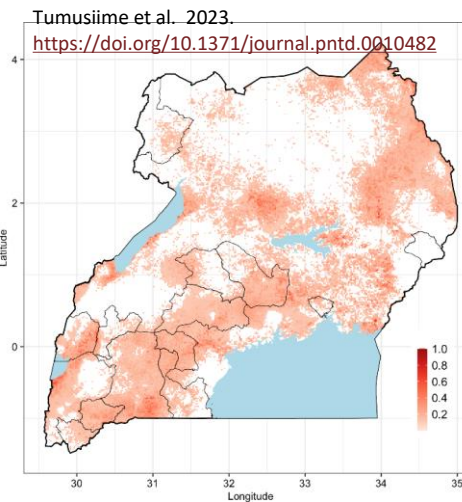
- Peste des petits ruminants
- African swine fever
- Rift Valley fever
- Foot and mouth disease
- CCPP/CBPP
- East coast fever
- Trypanosomiasis ....



Antimicrobial resistance



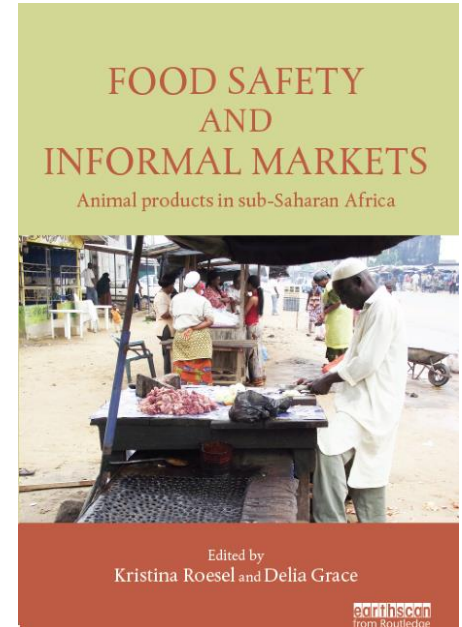
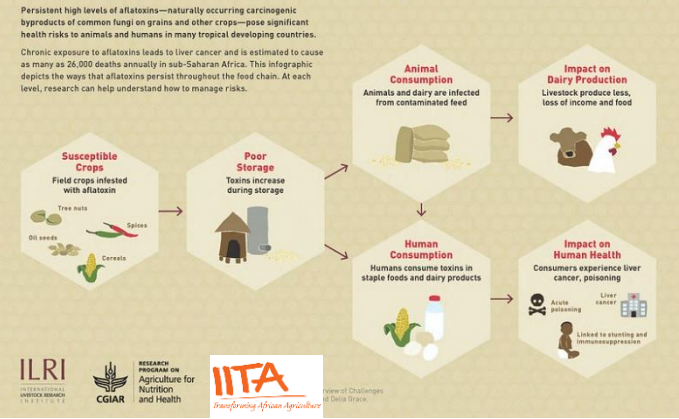
Abkallo HM et al., 2021. Rapid CRISPR/Cas9 Editing of Genotype IX African Swine Fever Virus Circulating in Eastern and Central Africa. *Front. Genet.* 12:733674.  
<https://doi.org/10.3389/fgene.2021.733674>



Food safety and informal markets



# AFLATOXIN A Fungal Toxin Infecting the Food Chain



Roesel, K. and Grace, D. (eds). 2014. Food safety and informal markets: Animal products in sub-Saharan Africa. London, UK: Routledge. <https://hdl.handle.net/10568/42438>



# Policies, Institutions and Livelihoods

- Livestock master plans
- Facilitating the development of the Tanzania Dairy Development Forum (170 organizations)
- Integration of gender research
- Challenges to adoption of candidate solutions

## Existing LIVESTOCK MASTER PLANS



ETHIOPIA



TANZANIA



RWANDA



UZBEKISTAN



BIHAR (INDIA)



ODISHA STATE (INDIA)



THE GAMBIA

## LIVESTOCK MASTER PLANS being developed



KENYA



NIGERIA



MADAGASCAR

## Under discussion

- Somalia
- Zimbabwe
- Senegal

## ILRI offices and staff worldwide

ILRI is co-hosted by both the governments of Ethiopia and Kenya, with offices in 8 other countries in Africa (Burkina Faso, Burundi, Mali, Nigeria, Senegal, Tanzania, Uganda and Zimbabwe); 4 countries in Asia (China, India, Nepal and Vietnam).

ILRI has over **600 permanent staff** (40% female and 60% male).

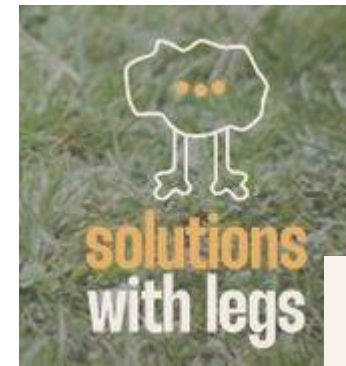
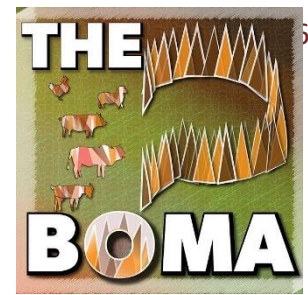
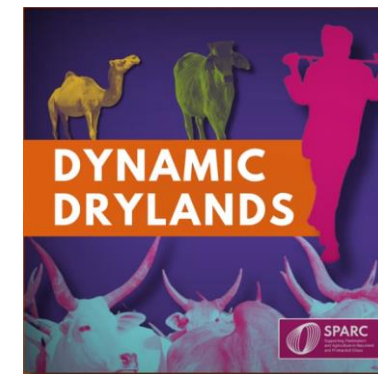


<https://www.ilri.org/>



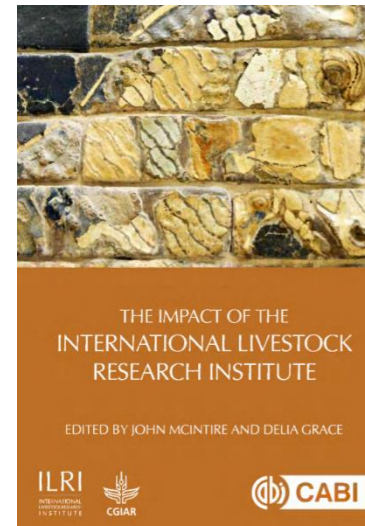
# Resources

- <https://whylivestockmatter.org/>
- <https://www.sparc-knowledge.org/publications-resources/dynamic-drylands-podcast>
- <https://theboma.buzzsprout.com/>
- <https://livestockdata.org/>
  
- <https://cgspace.cgiar.org/home>
- <https://www.flickr.com/photos/ilri/>
  
- <https://shambashapeup.com>
  
- McIntire, J. and Grace, D. (eds). 2020. The impact of the International Livestock Research Institute.  
<https://hdl.handle.net/10568/108972>



**LD4D**  
LIVESTOCK  
DATA FOR  
DECISIONS

**WHY LIVESTOCK  
MATTER**



# Asanteni sana



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