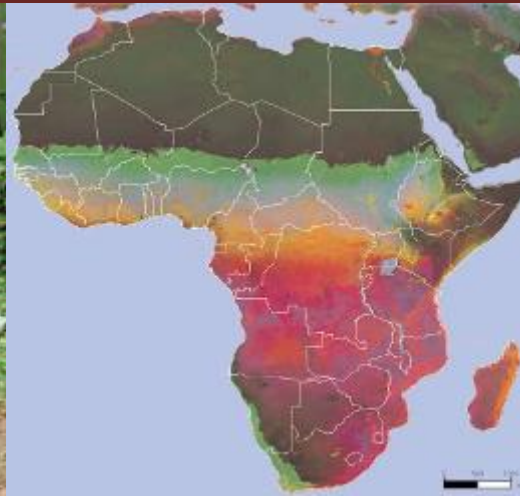


Sustainable animal production systems in Africa

Timothy Robinson

Catherine Pfeifer, Mario Herrero, Thomas van Boeckel & Marius Gilbert

61st International Congress of Meat Science & Technology
Clermont-Ferrand, France, 23–28 August 2015

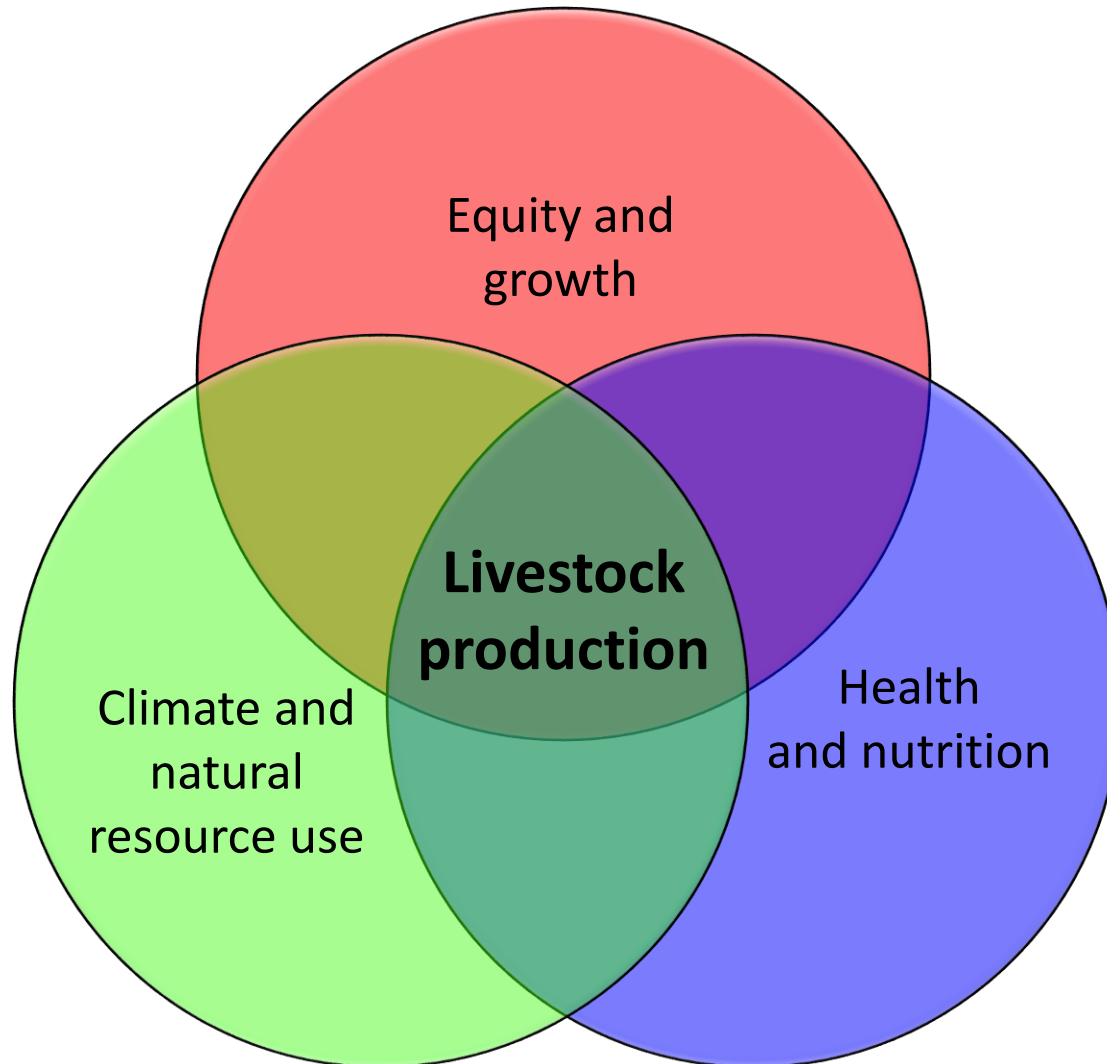


Overview

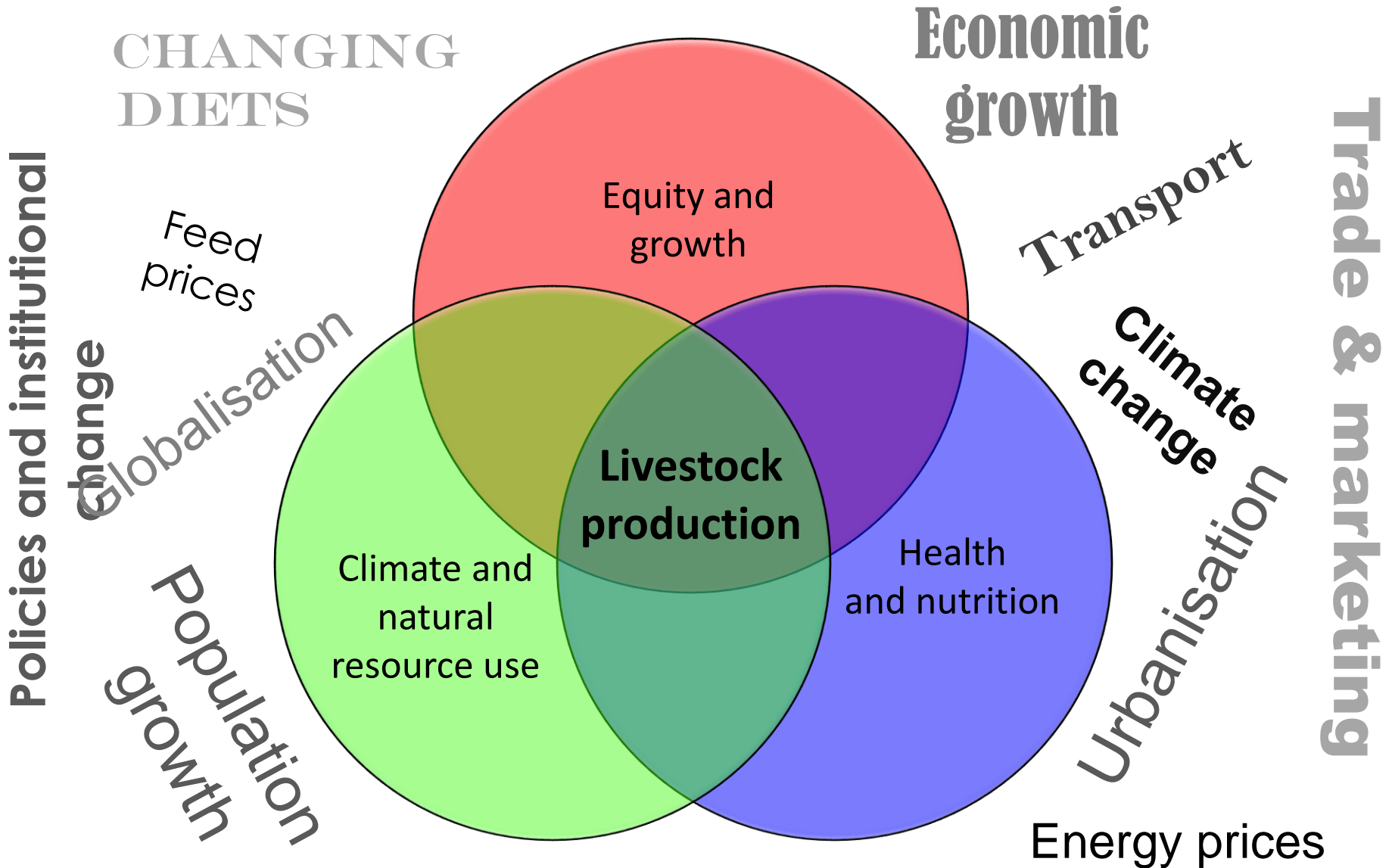


- What we mean by sustainability
- Livestock sector trends and drivers
- Mapping livestock distributions and production systems
- Livestock and livelihoods
- Livestock and the environment
- Livestock, health and nutrition
- Conclusions

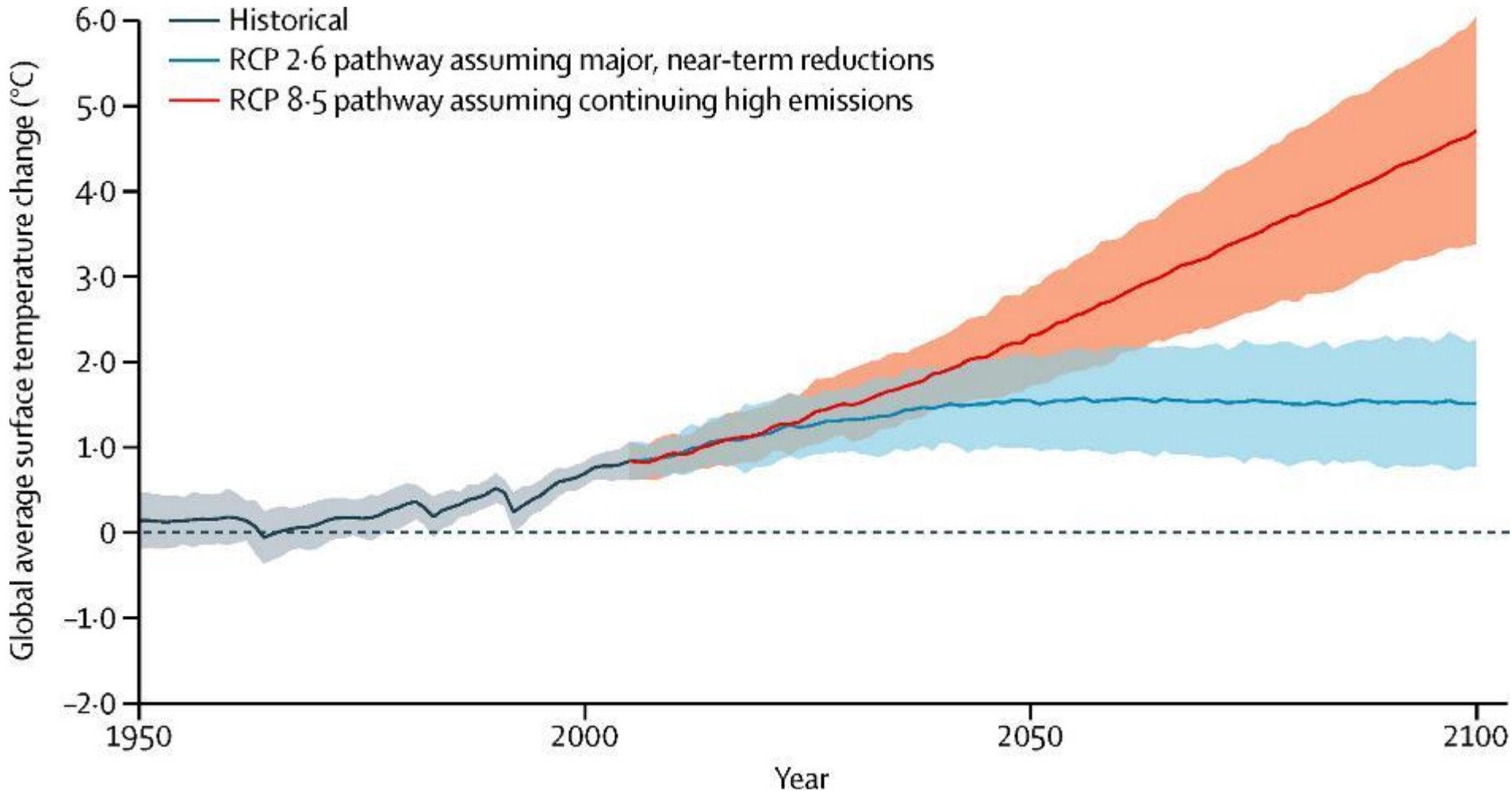
What does sustainable mean?



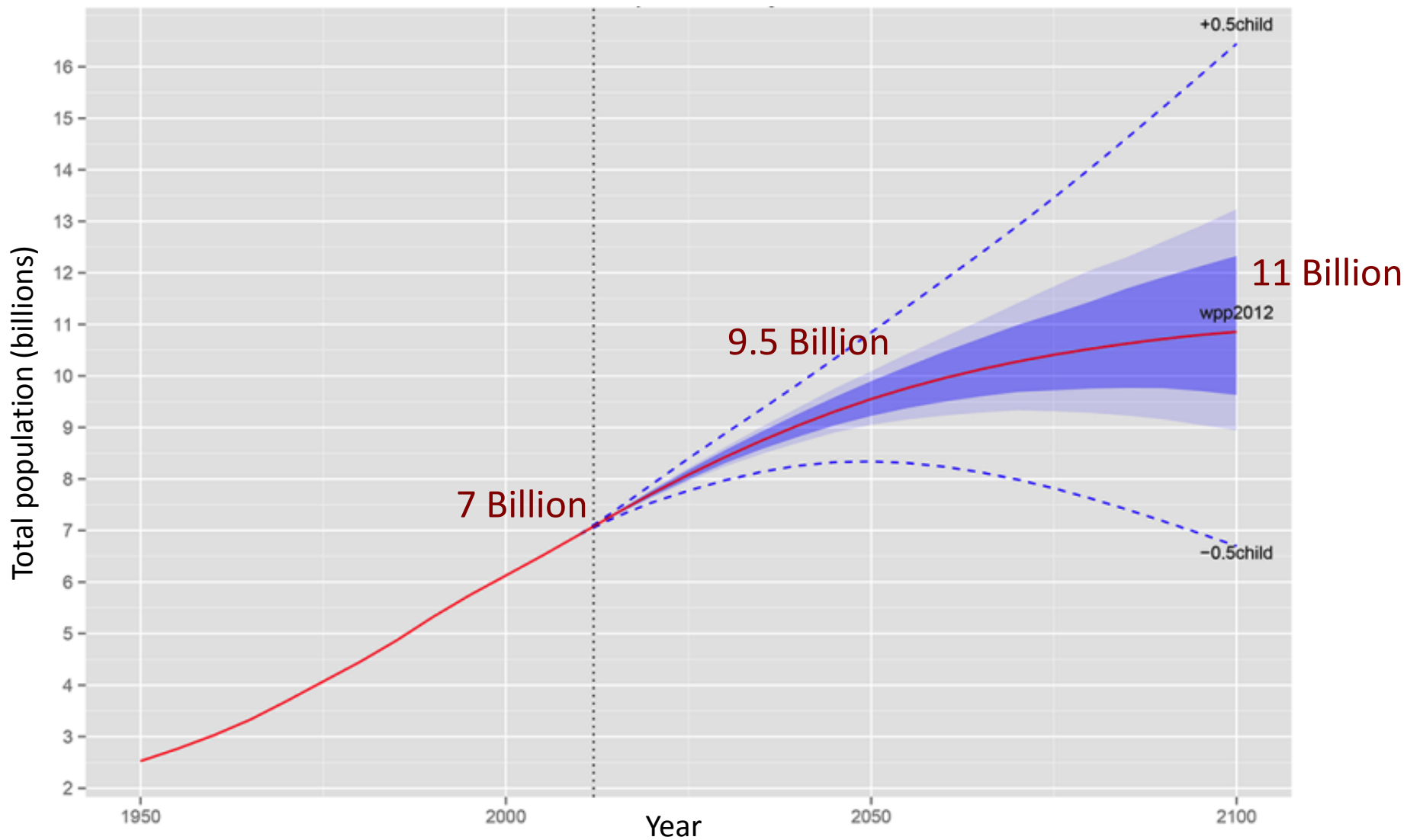
Drivers of change



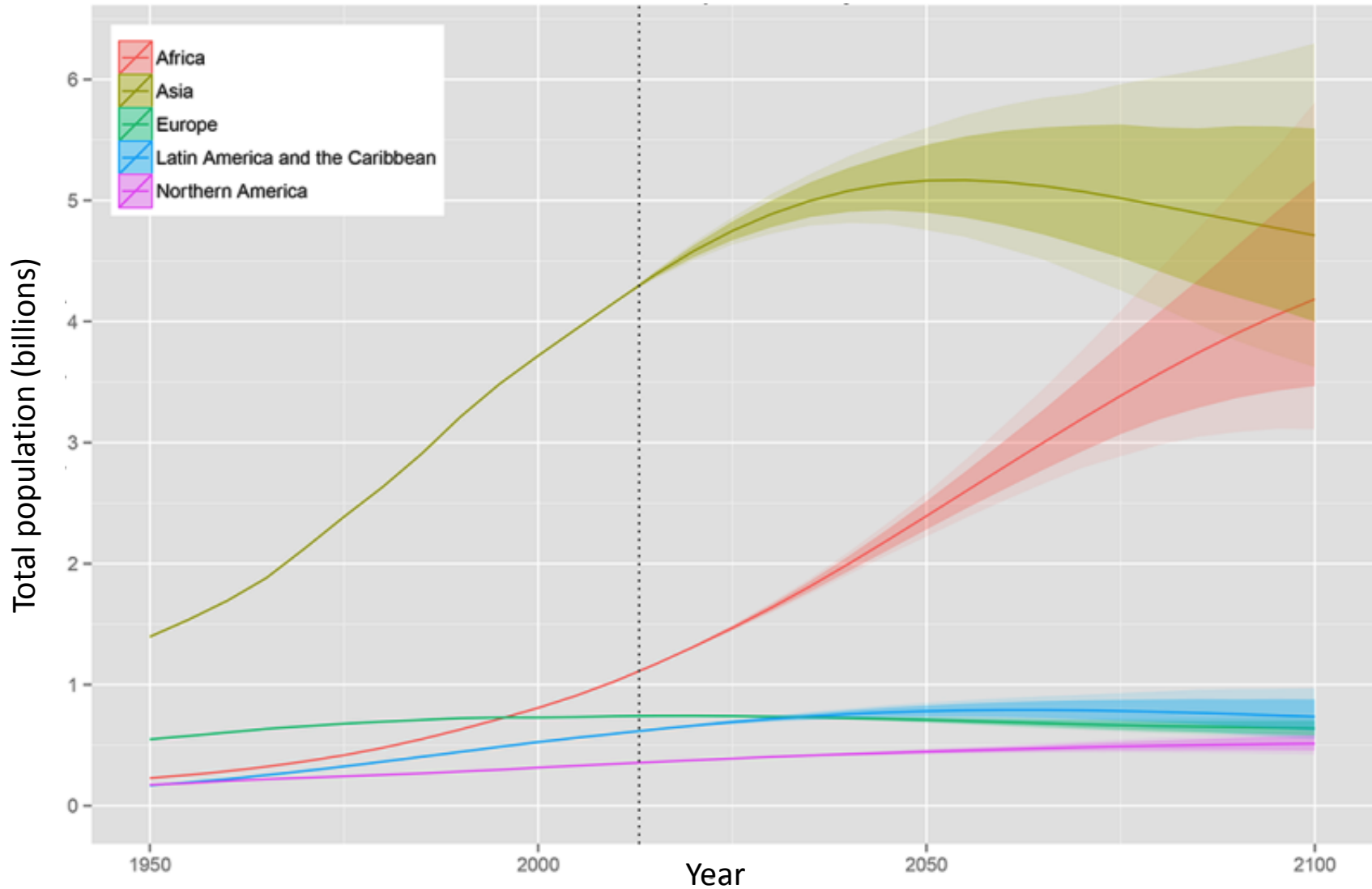
Surface temperature projections



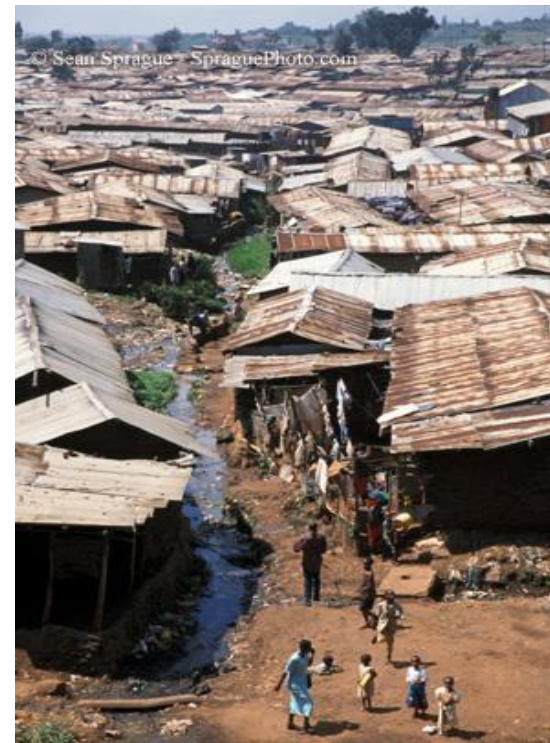
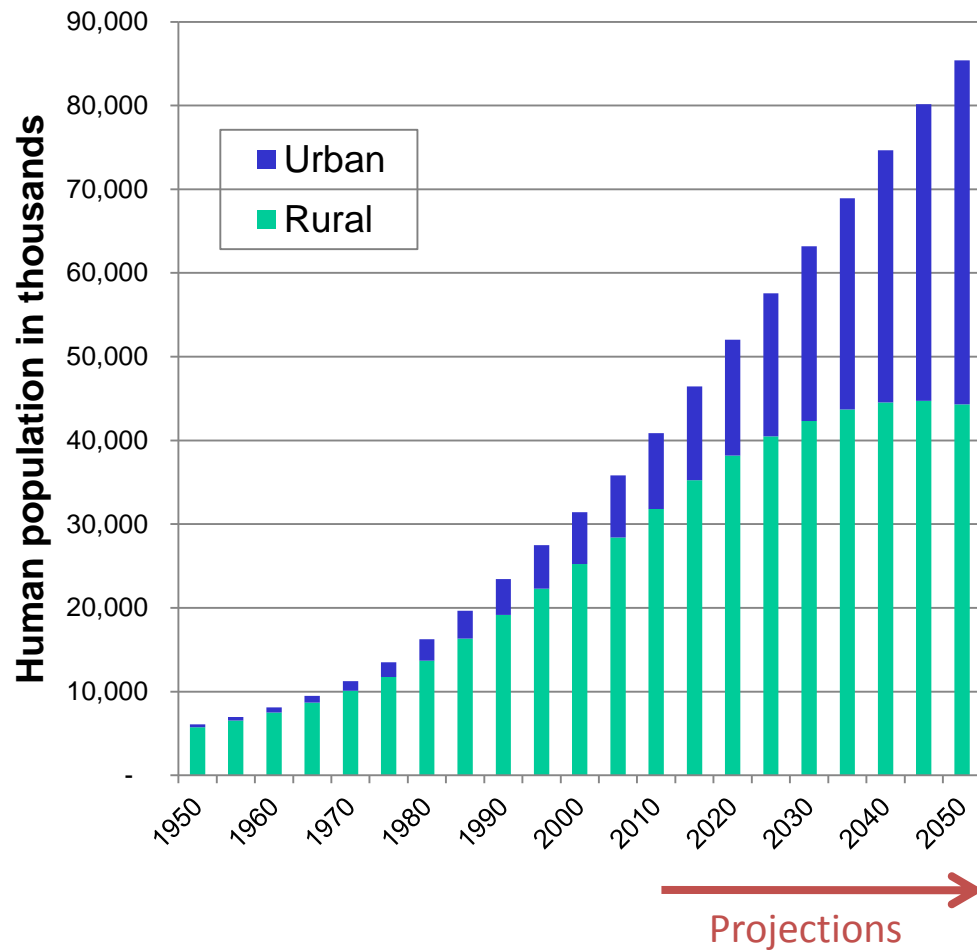
World population projection (UN 2012)



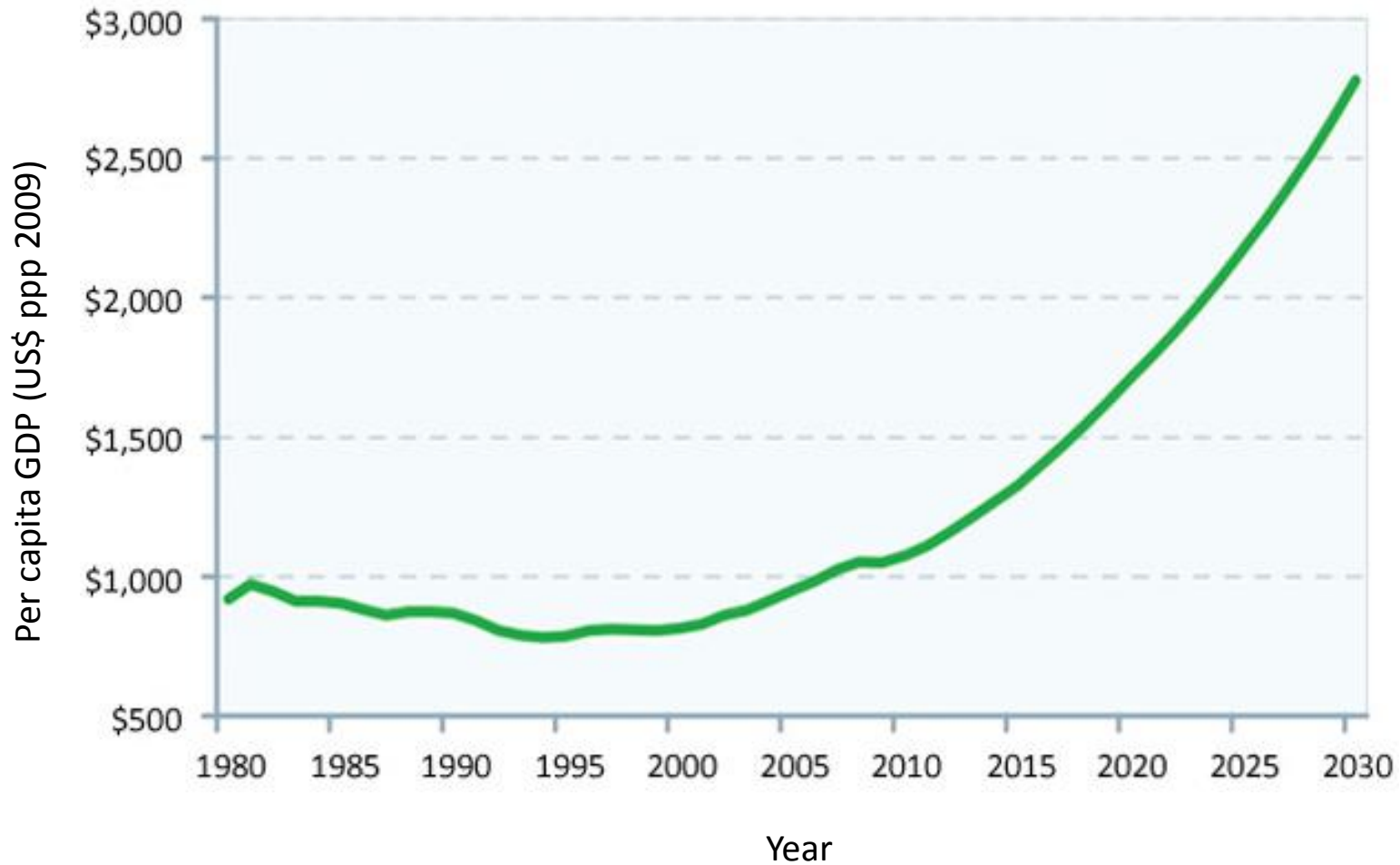
Continental population projection



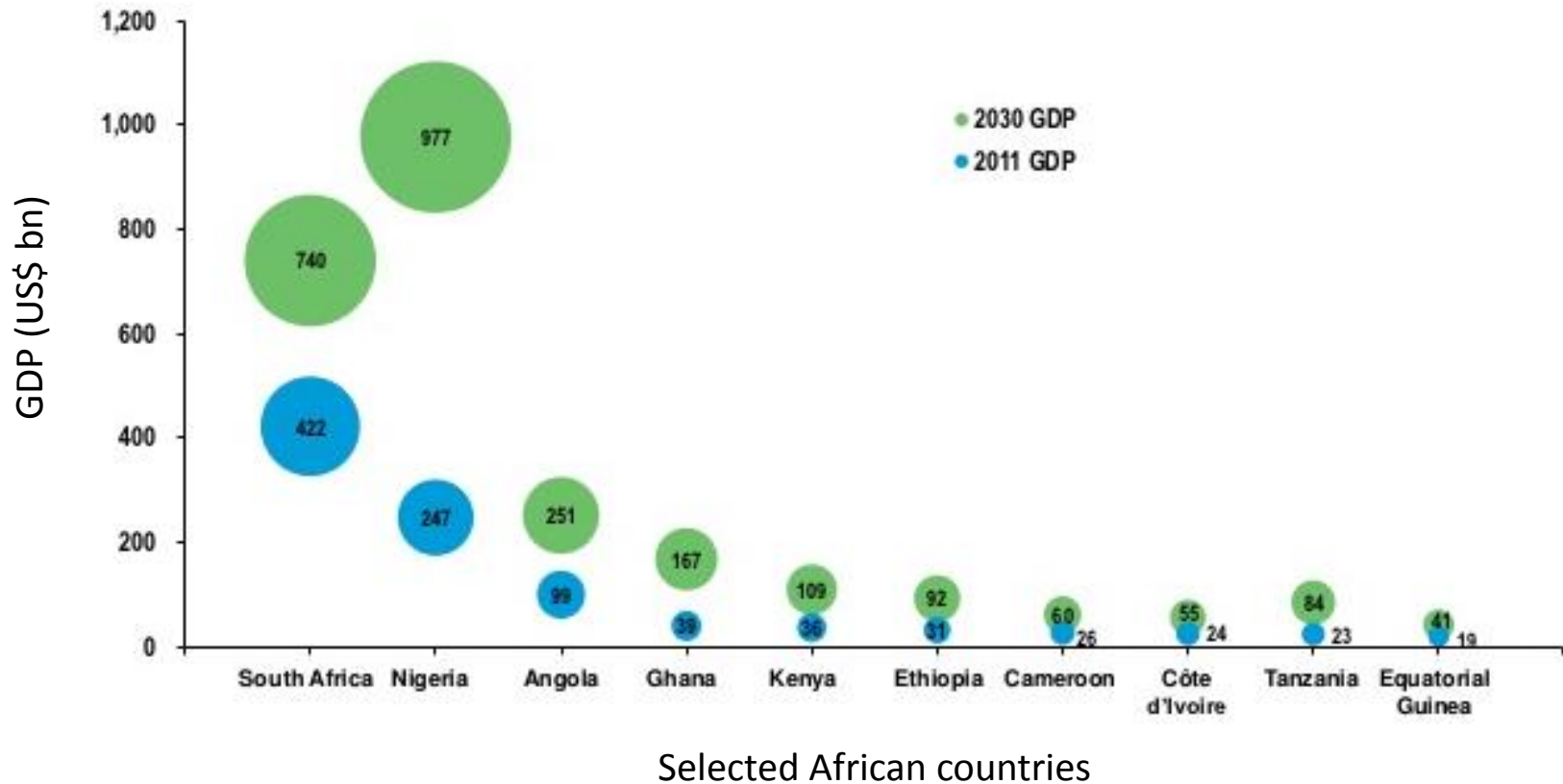
Urbanisation in Kenya



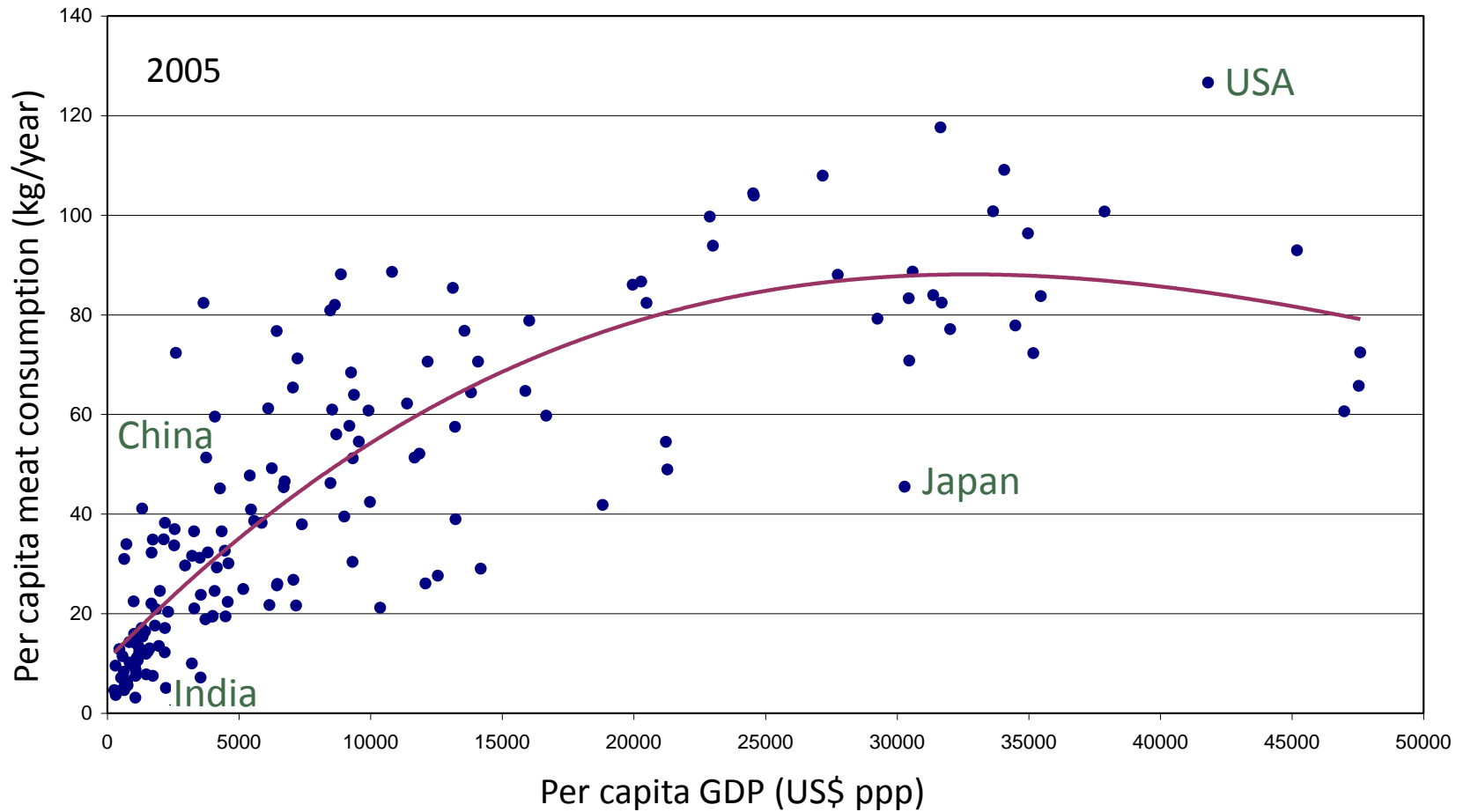
GDP growth in sub-Saharan Africa



GDP growth in sub-Saharan Africa



Drivers of change



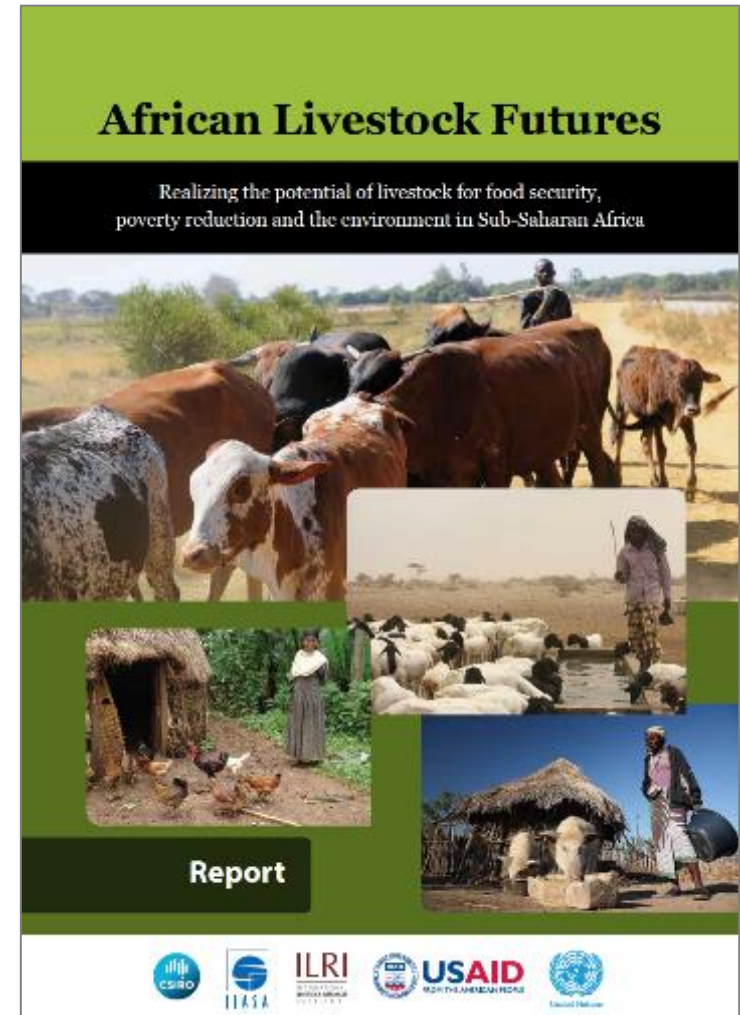
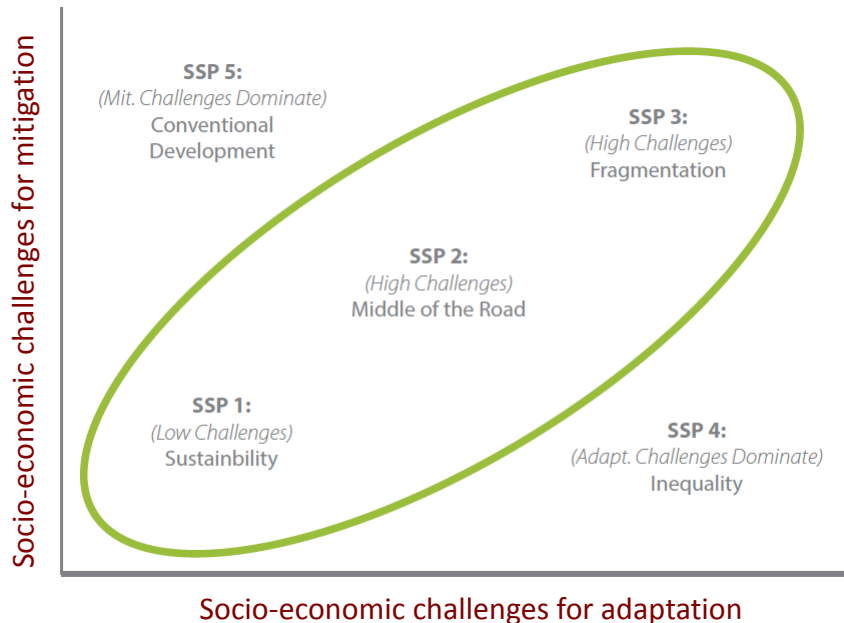
The changing livestock sector

- Demographic and social drivers
 - Population: + 32% or 9.6 billion people by 2050
 - Income growth: + 2% per year by 2050
 - Urbanization: 70% will live in cities by 2050
- Growth in demand for animal source foods
 - + 70% by 2050
 - + 200 million tonnes of meat
- Structural changes in the livestock sector
 - Shift from ruminant to monogastric
 - Intensification of production
- Impinges on global public goods
 - Equity and growth
 - Health and nutrition
 - Climate and natural resource use



African livestock futures

- GLOBIUM: partial equilibrium model to determine consumption, production, prices and trade for different livestock commodities
- Projections to 2050 were based on a spectrum of Shared Socioeconomic Pathways (SSPs)



African livestock futures

Some key results

- 3 fold increase in milk consumption to 2050 – especially high growth in East Africa
- 6-7 fold increase in consumption of pork and poultry meat – especially high growth in West Africa
- Overall, poultry consumption exhibits the highest rates of growth throughout SSA
- The consumption of meat from pigs and chickens will exceed red meat consumption by 2030 in most sub-regions of SSA
- Smallholder mixed crop-livestock systems are, and will remain, the main producers of ruminant products to 2050, under all scenarios
- Under SSP1 a low trade deficit (10%) can be maintained to 2050
- Under SSP2 imports of milk and meat from monogastrics will double in relation to production
- Any negative deviation (SSP3) would make African livestock production largely uncompetitive – negative outcomes for producers, consumers and continental food security

Africa's food
importation bill

Total:

US\$ 44 billion

Meat:

US\$ 5 billion

Milk:

US\$ 4 billion

Source: Herrero et al. 2014

Sustainable intensification

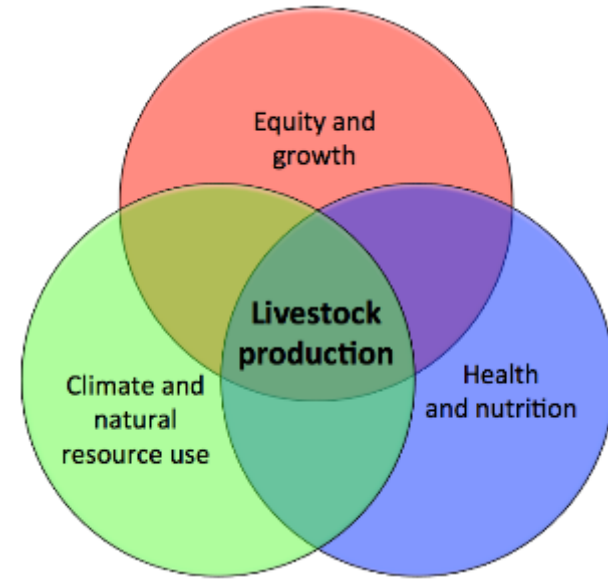
- Sustainable intensification will be key to elicit a production response in most regions of Africa
- Need to achieve rates of annual growth in productivity of around 6% per year

Annual growth rates of livestock production:

SSP1: Sustainability scenario > 5-6%

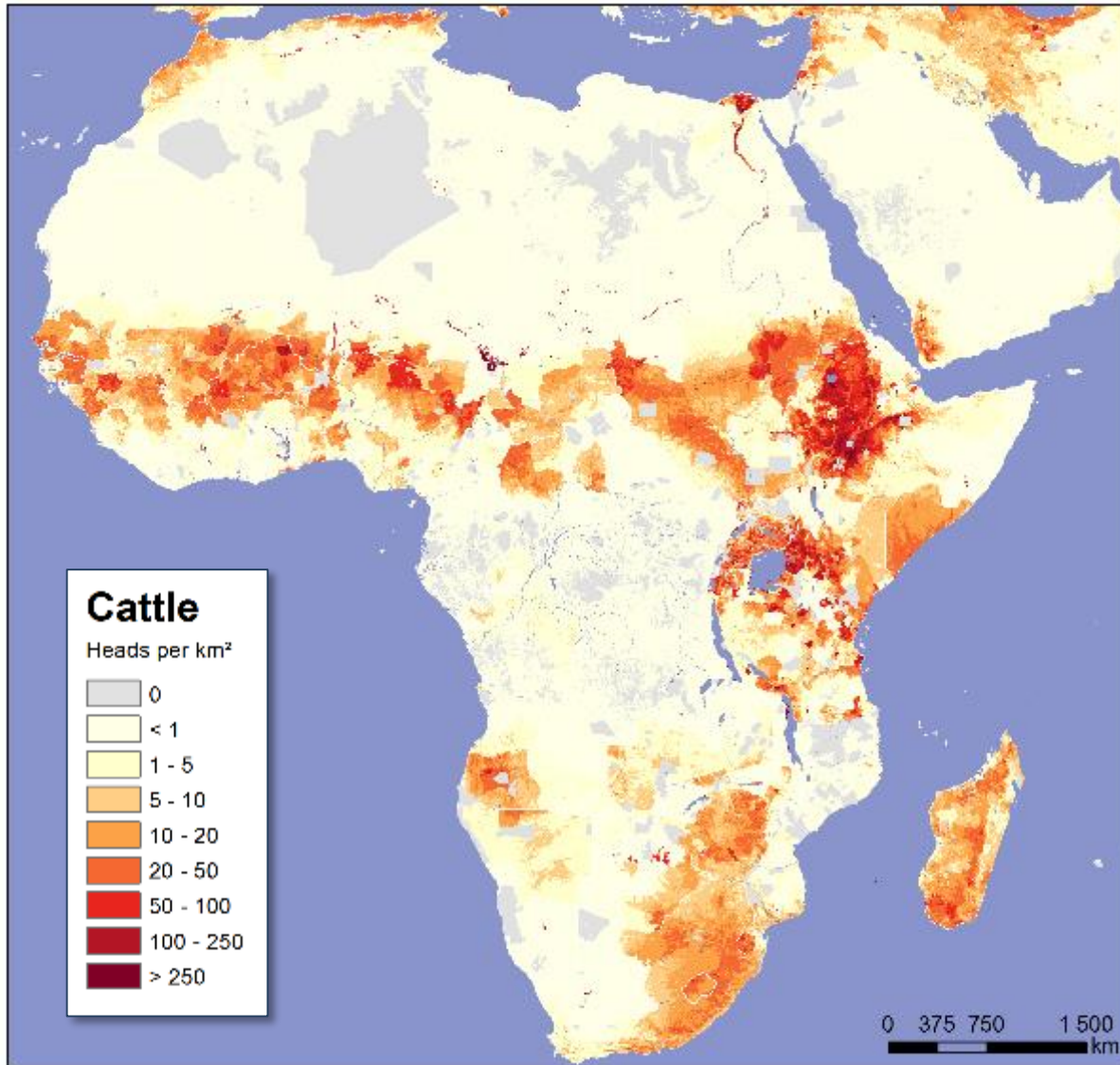
SSP2: Business as usual 2-3%

SSP3: Fragmentation scenario 1.5-2.5%



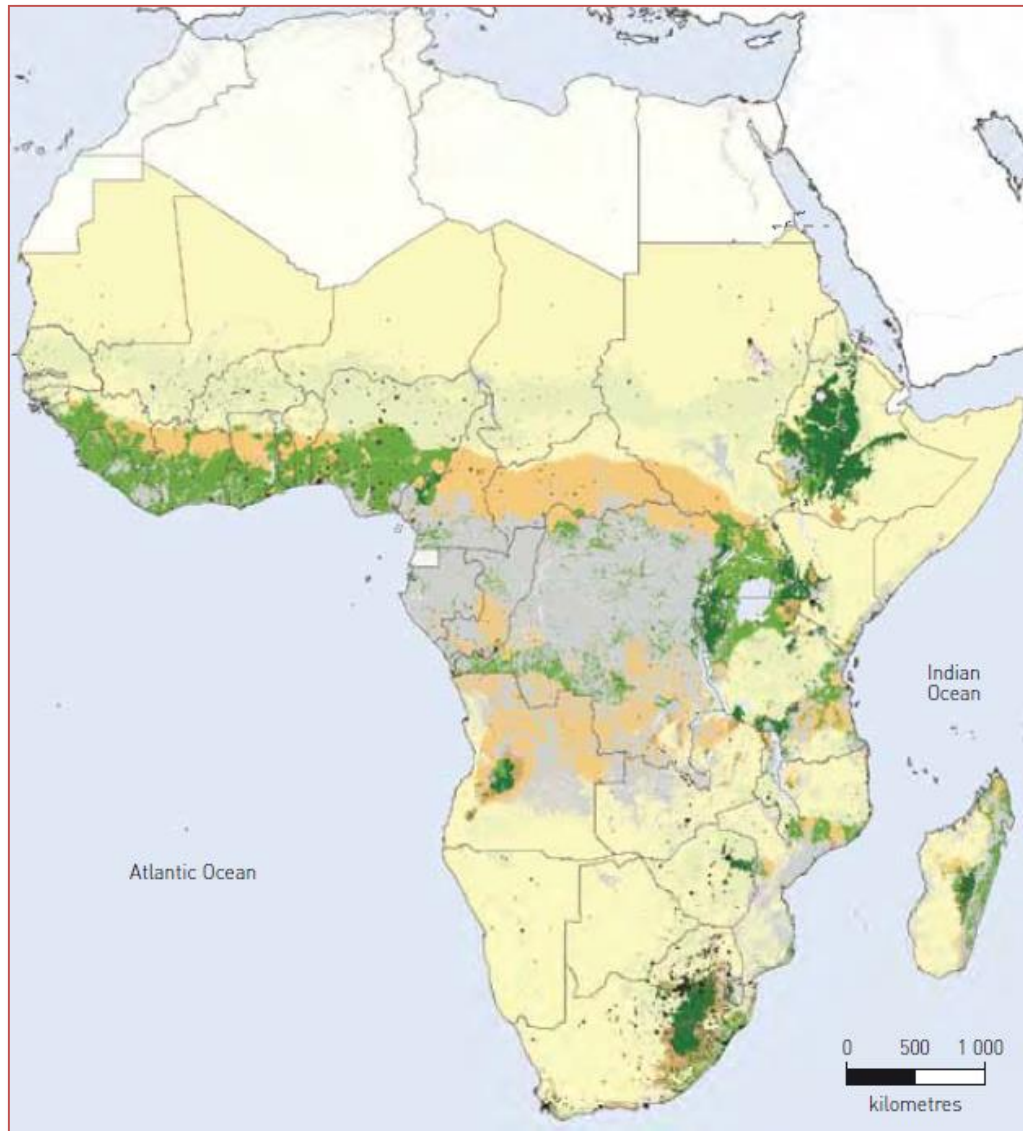
- Calls for an integrated, systems approach to sustainable livestock sector development
- Need reliable data and information to guide policy












Distribution of cattle in Africa (2006)



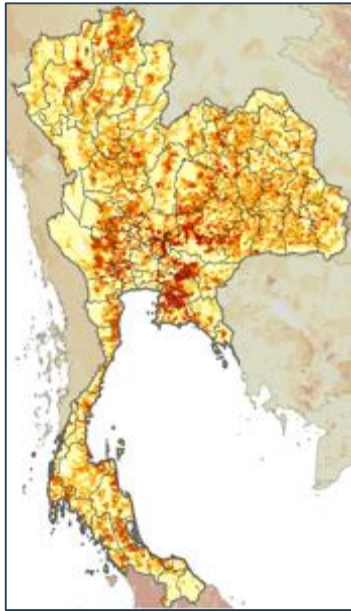
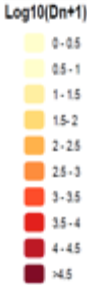
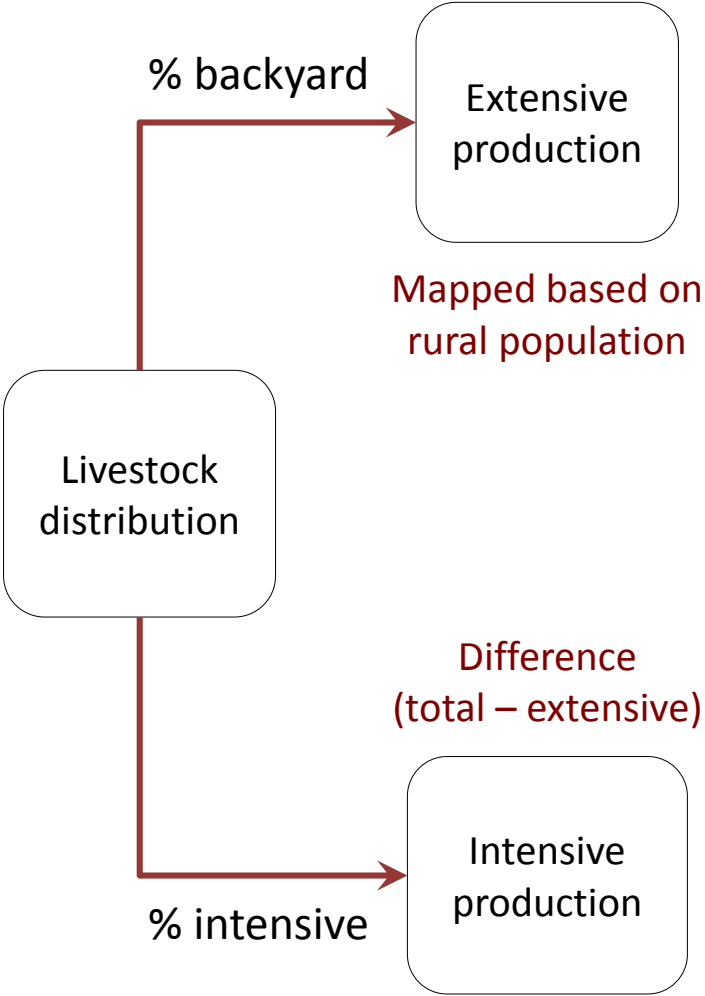
Gridded Livestock of the World
Source: Robinson et al. 2014

Ruminant production systems (v5)

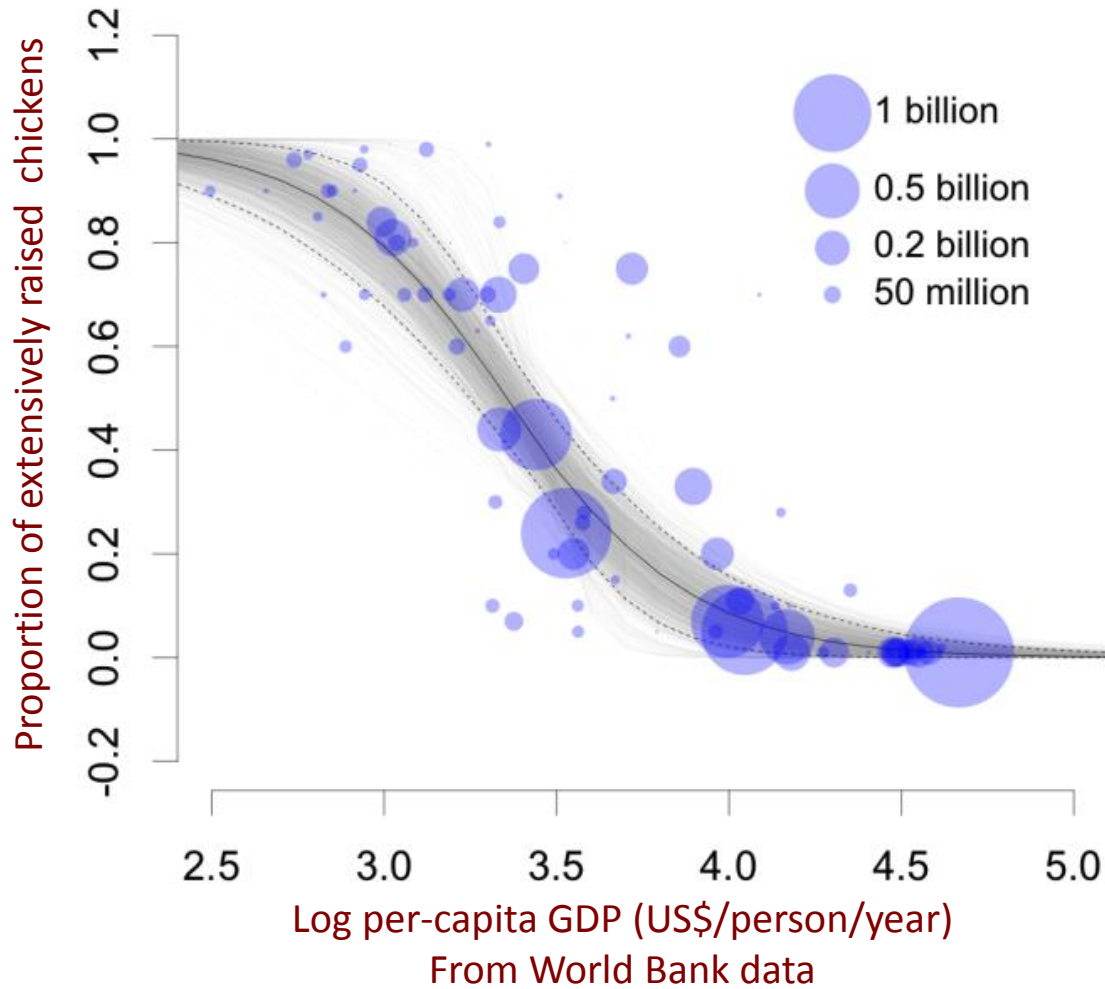


-  Livestock only – arid & semi-arid
-  Livestock only – humid & sub-humid
-  Livestock only – tropical highlands
-  Mixed rain-fed – arid & semi-arid
-  Mixed rain-fed – humid & sub-humid
-  Mixed rain-fed – tropical highlands
-  Mixed irrigated – arid & semi-arid
-  Mixed irrigated – humid & sub-humid
-  Mixed irrigated – tropical highlands
-  Urban areas
-  Other (forest)

Monogastric production systems

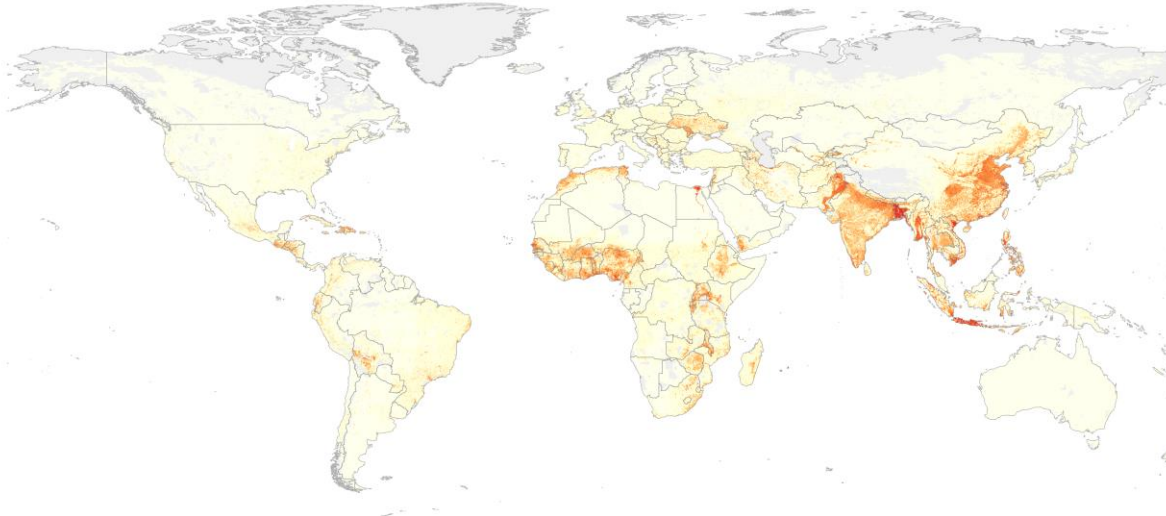


Chicken systems

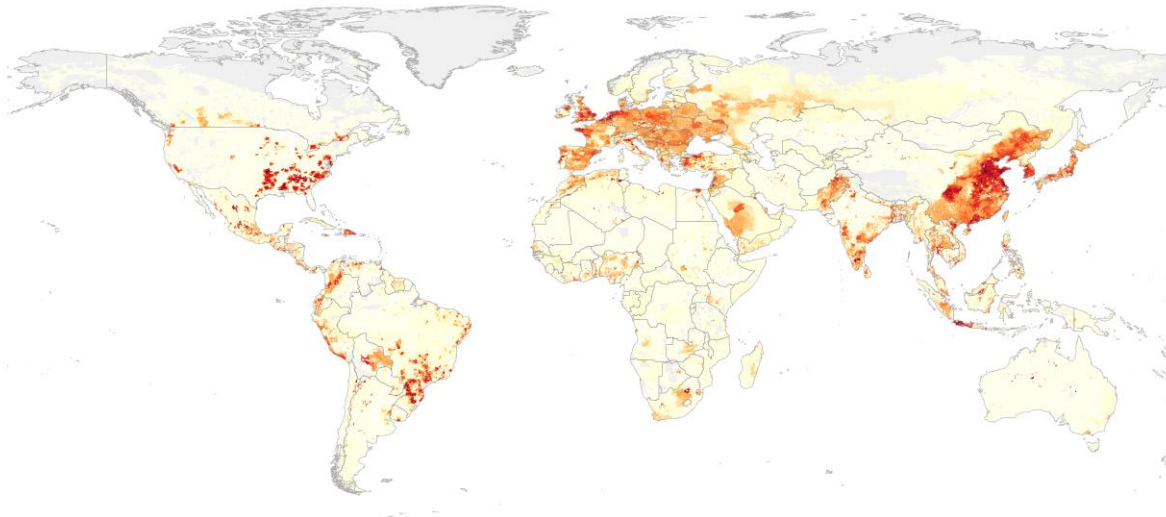


Source: Gilbert et al. 2015

Chicken systems



Extensive chicken production



Intensive chicken production



<http://www.livestock.geo-wiki.org>



International Livestock
Research Institute



Food and Agriculture
Organisation of the UN



International Institute for
Applied Systems Analysis



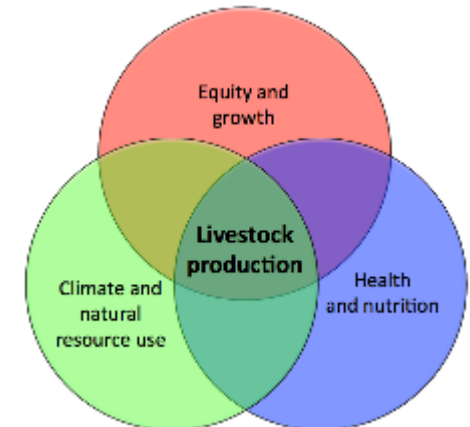
Université Libre
de Bruxelles



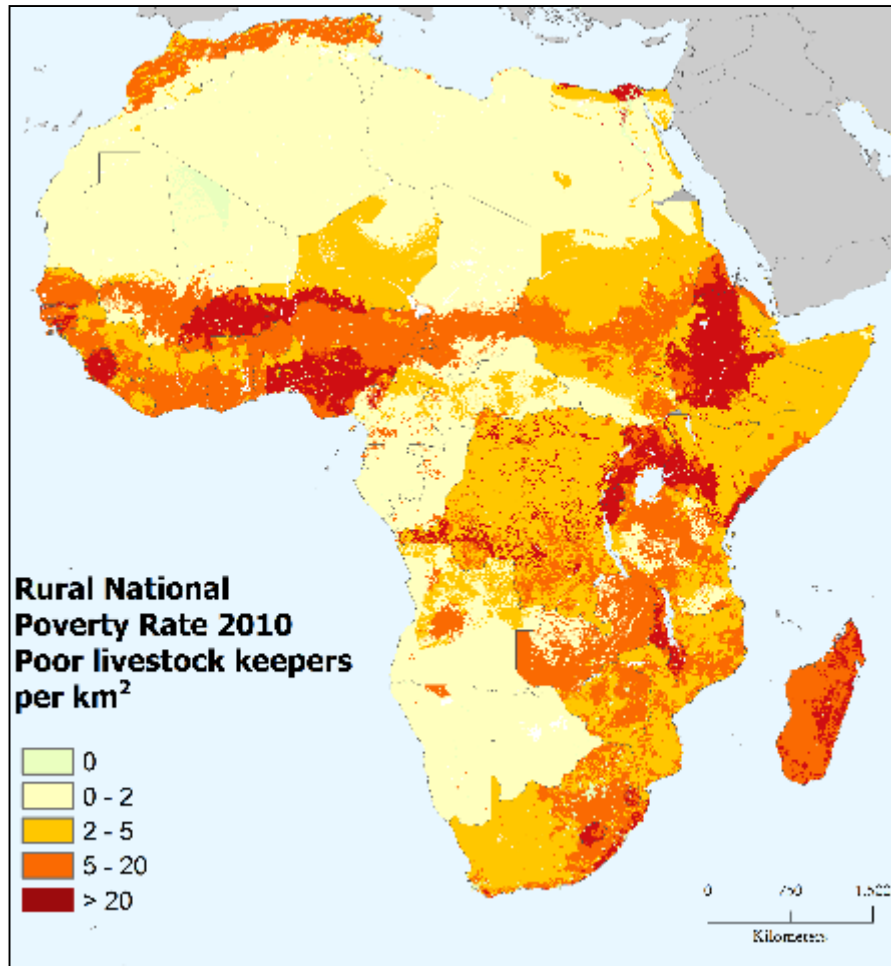
Wageningen University



University of Oxford



Mapping poor livestock keepers



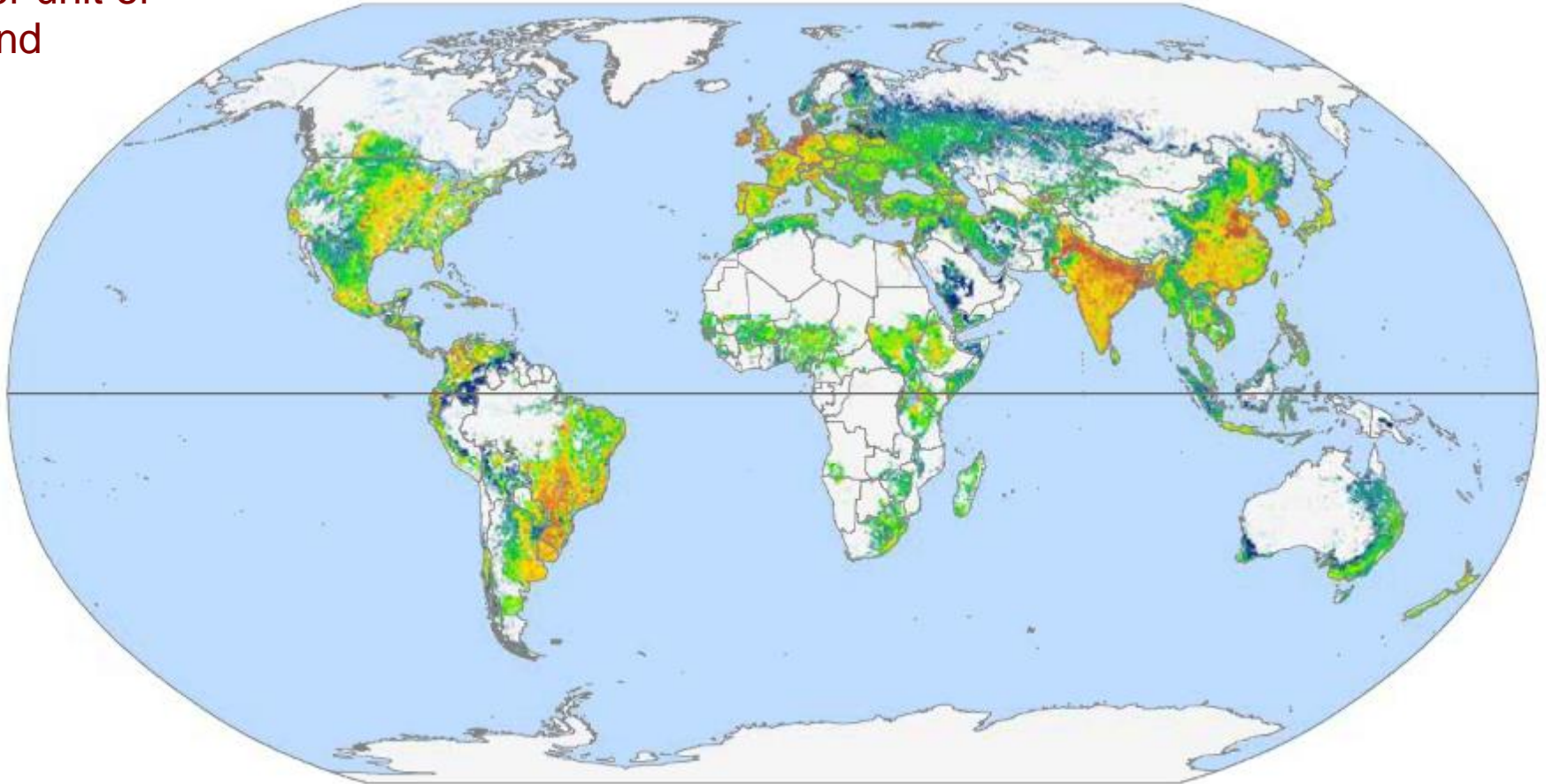
165 million poor people in Africa depend on livestock for their livelihoods

Livestock system	PLK
Livestock only – arid & semi-arid	22,582,000
Livestock only – humid & sub-humid	7,456,000
Livestock only – tropical highlands	653,000
Mixed rain-fed – arid & semi-arid	51,394,000
Mixed rain-fed – humid & sub-humid	41,647,000
Mixed rain-fed – tropical highlands	28,343,000
Mixed irrigated – arid & semi-arid	432,000
Mixed irrigated – humid & sub-humid	139,000
Mixed irrigated – tropical highlands	179,000
Other (forest)	11,701,000

Increases to 230 million PLK using the international \$2.00 per day poverty rate

Livestock emissions

per unit of
land



Tonnes of CO₂ equivalent per square km

< 10

10 - 25

25 - 50

50 - 100

100 - 250

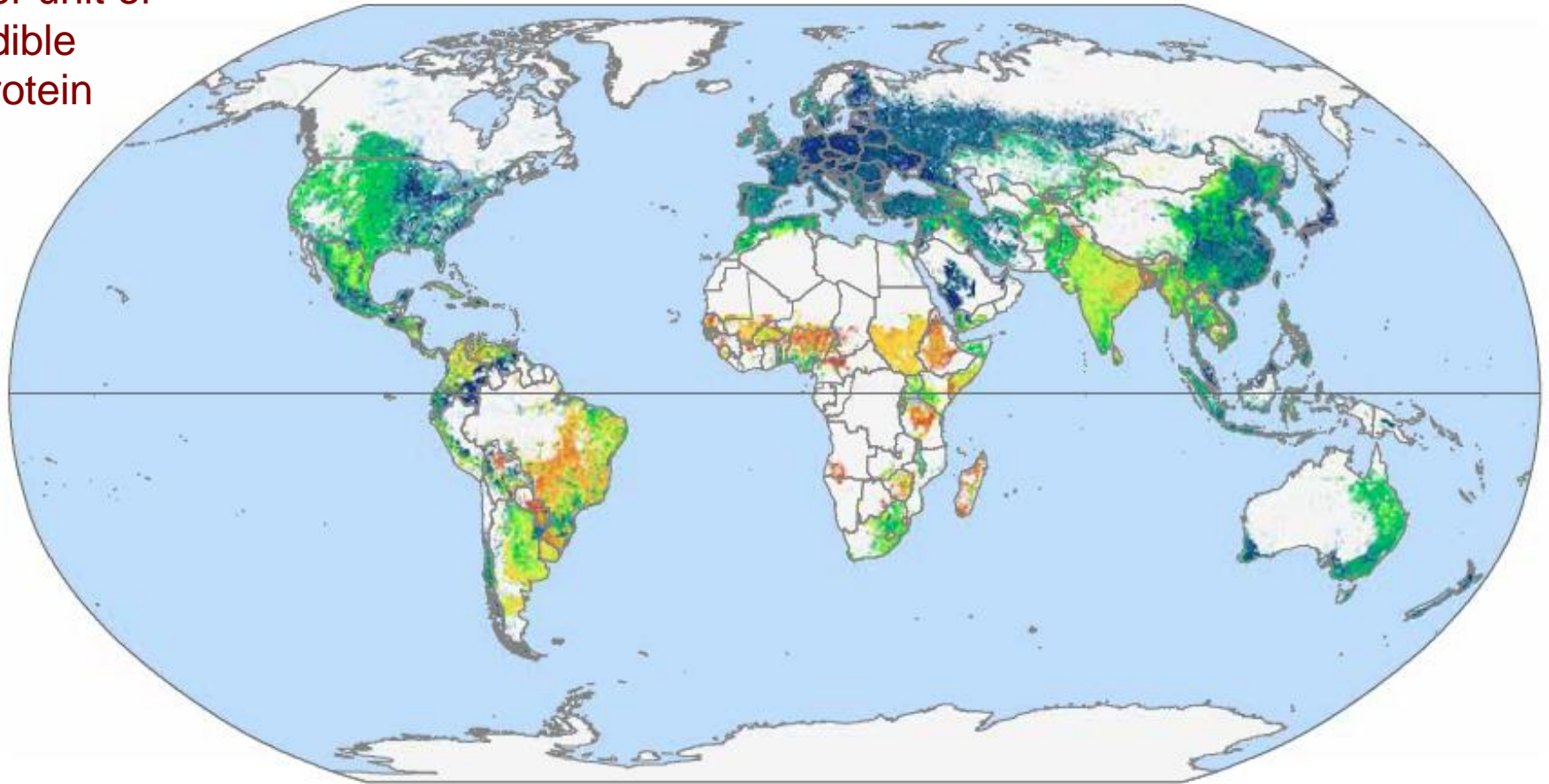
250 - 500

> 500

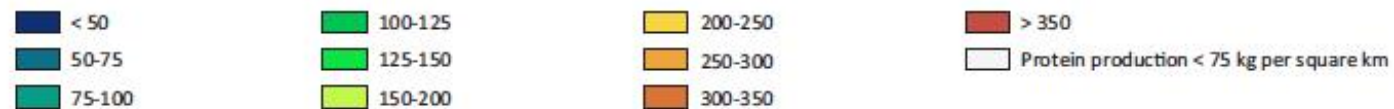
Protein production < 75 kg per square km

Livestock emissions

per unit of
edible
protein



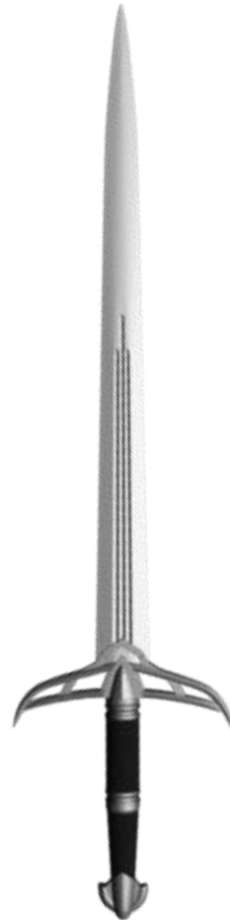
Kg of CO₂ equivalent per kg of edible protein



Source: Gerber et al. 2013

Nutrition: the double-edged sword

- We live in a world more than with 800 million hungry and 165 million stunted children
- Animal-Source Foods provide 17% of calories and 26% of protein
- Animal-Source Foods provide valuable micronutrients to the poor



- Over one third of all adults across the world – 1.46 billion people – are obese or overweight
- Between 1980 and 2008, the numbers of people affected in the developing world more than tripled, from 250 million to 904 million

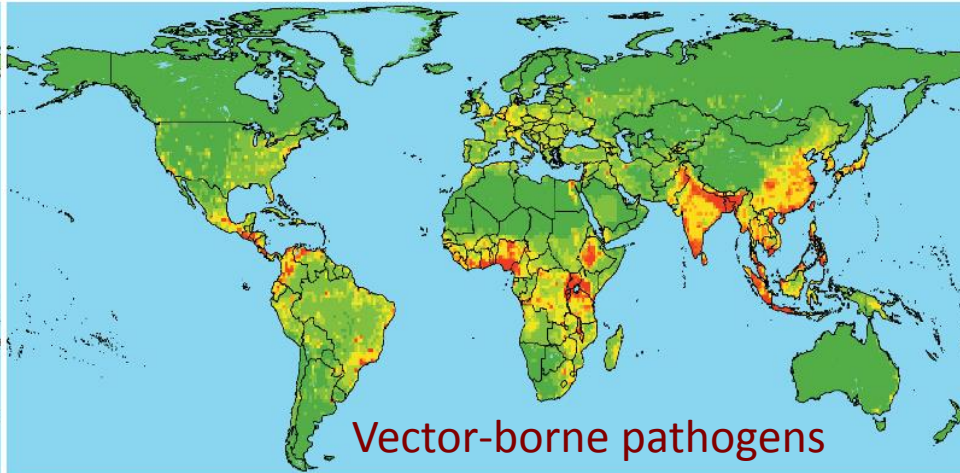
Livestock are key to both sides

Diseases related to livestock farming

- More than 2 billion are sickened each year from the food they eat
 - Millions more die from zoonotic diseases that emerge from, or persist in, agricultural ecosystems
 - Diseases recently emerged from animals make up 25% of the infectious disease burden in least developed countries and kill one in ten people who live there
- We have proven agricultural interventions which can tackle the diseases associated with agriculture
- \$25 billion invested in zoonotic disease control would bring benefits worth \$125 billion



Emerging infectious diseases



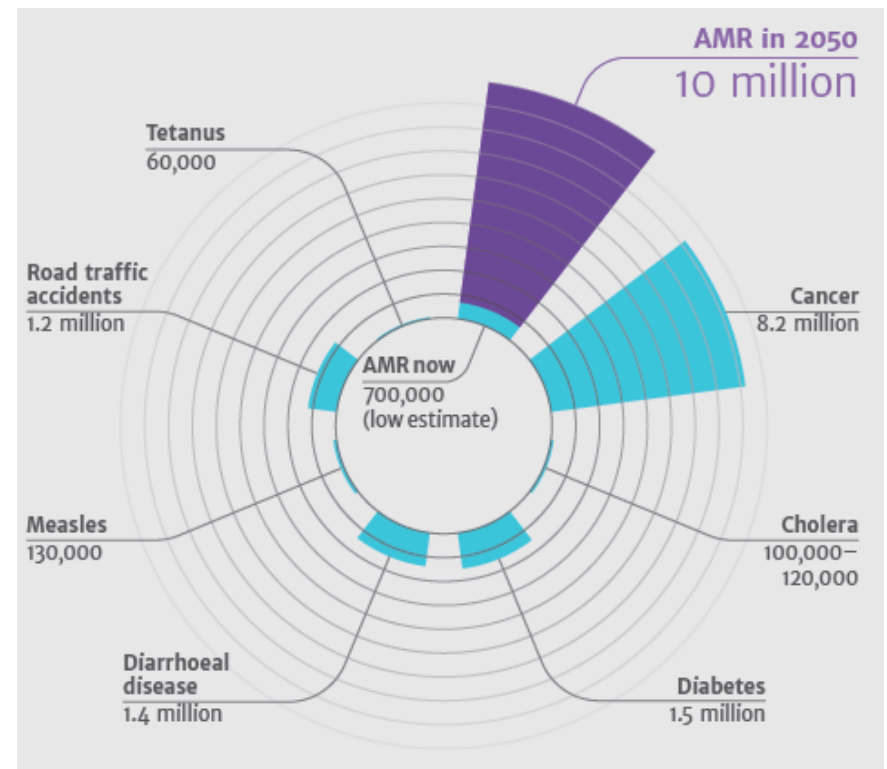
Global distribution of
relative risk of an EID event

Source: Jones et al. 2008

Antimicrobial resistance

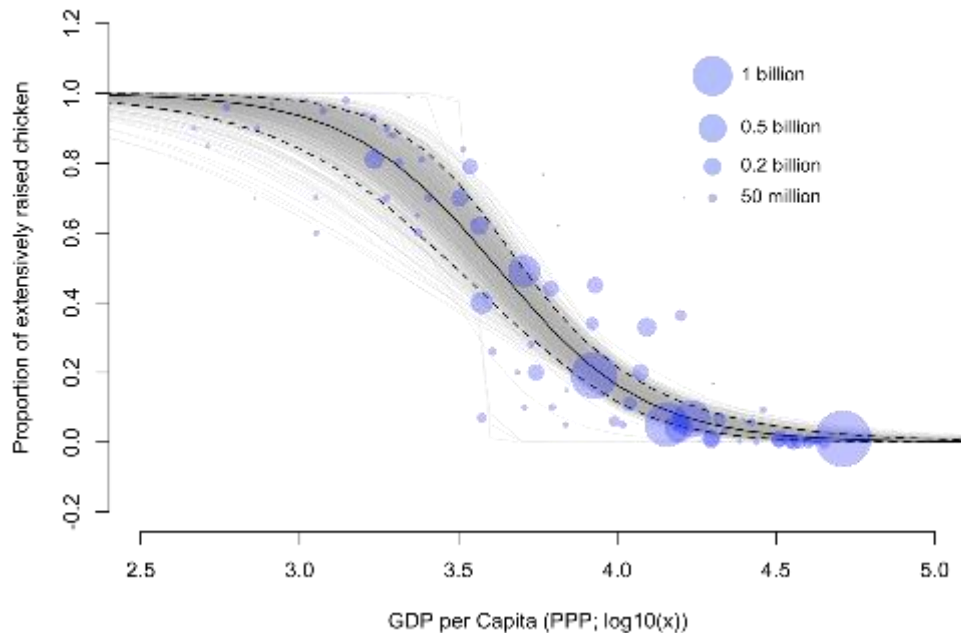
The O'Neill Report (2014)

- AMR infections currently claim at least 50,000 lives each year across Europe and the USA alone
..... with many hundreds of thousands more dying in other areas of the world
- In 15 European countries more than 10% of bloodstream *Staphylococcus aureus* infections are caused by methicillin-resistant strains (MRSA)
..... closer to 50% in several of these



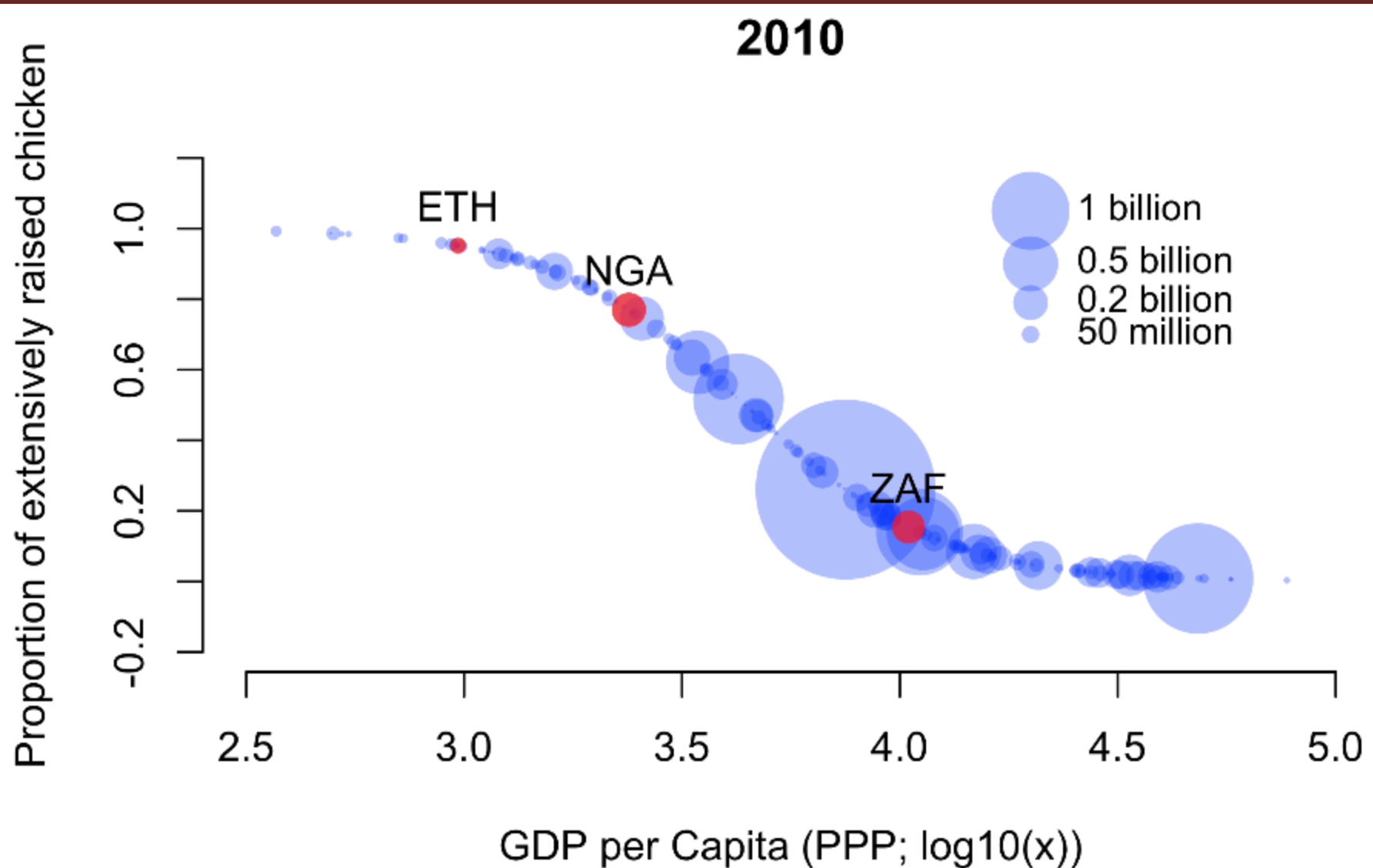
Intensification trajectories

- Model described in Gilbert et al. (2015) to estimate current proportions extensively raised chickens (globally)

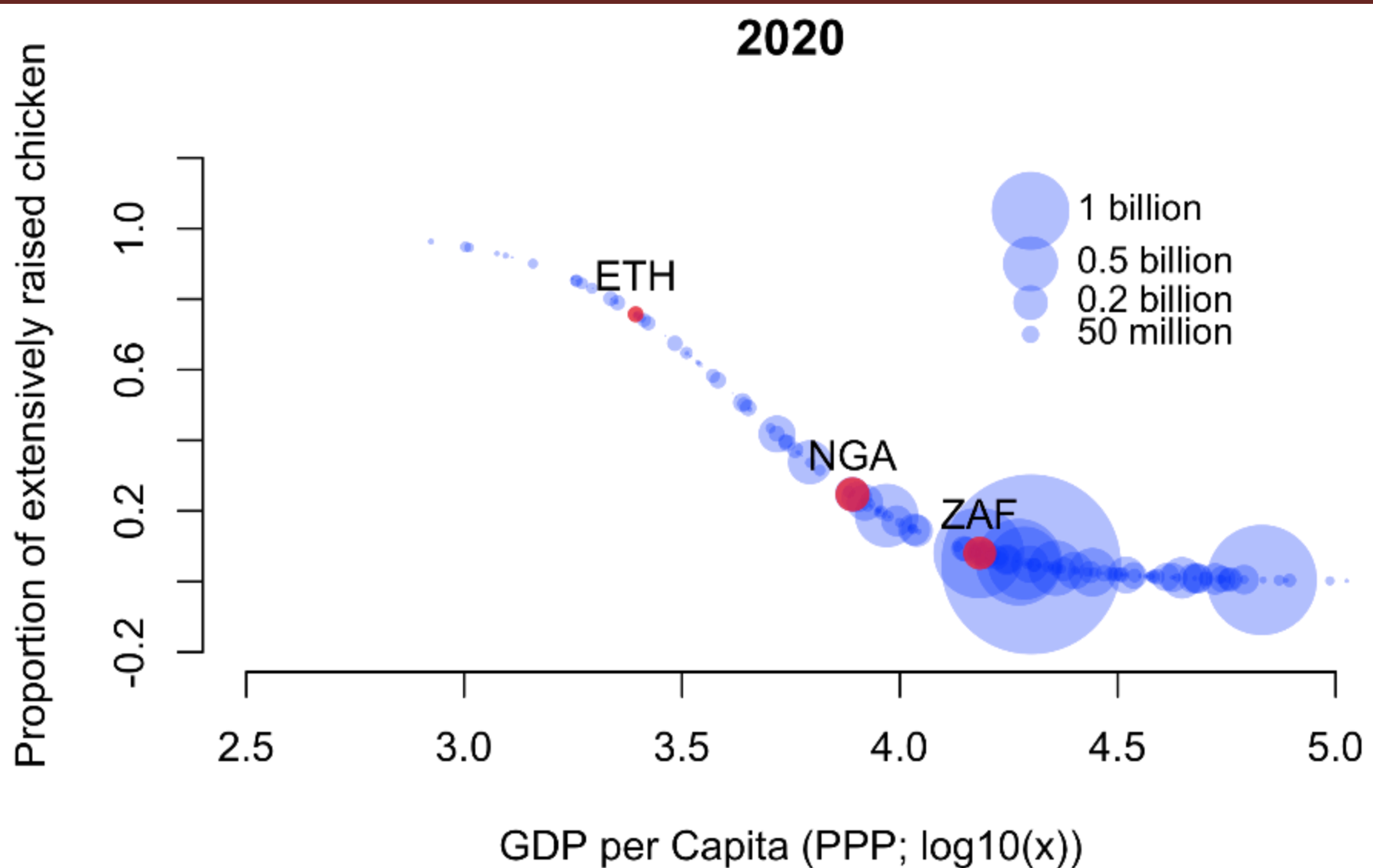


- GDP PPP values and projections until 2020 from the IMF
- Projections beyond 2020 are based on regional growth rates and convergence scenarios (Leimbach et al. 2015)
- Poultry intensification trajectories, highlighting the changes in Nigeria, South Africa and Ethiopia as examples

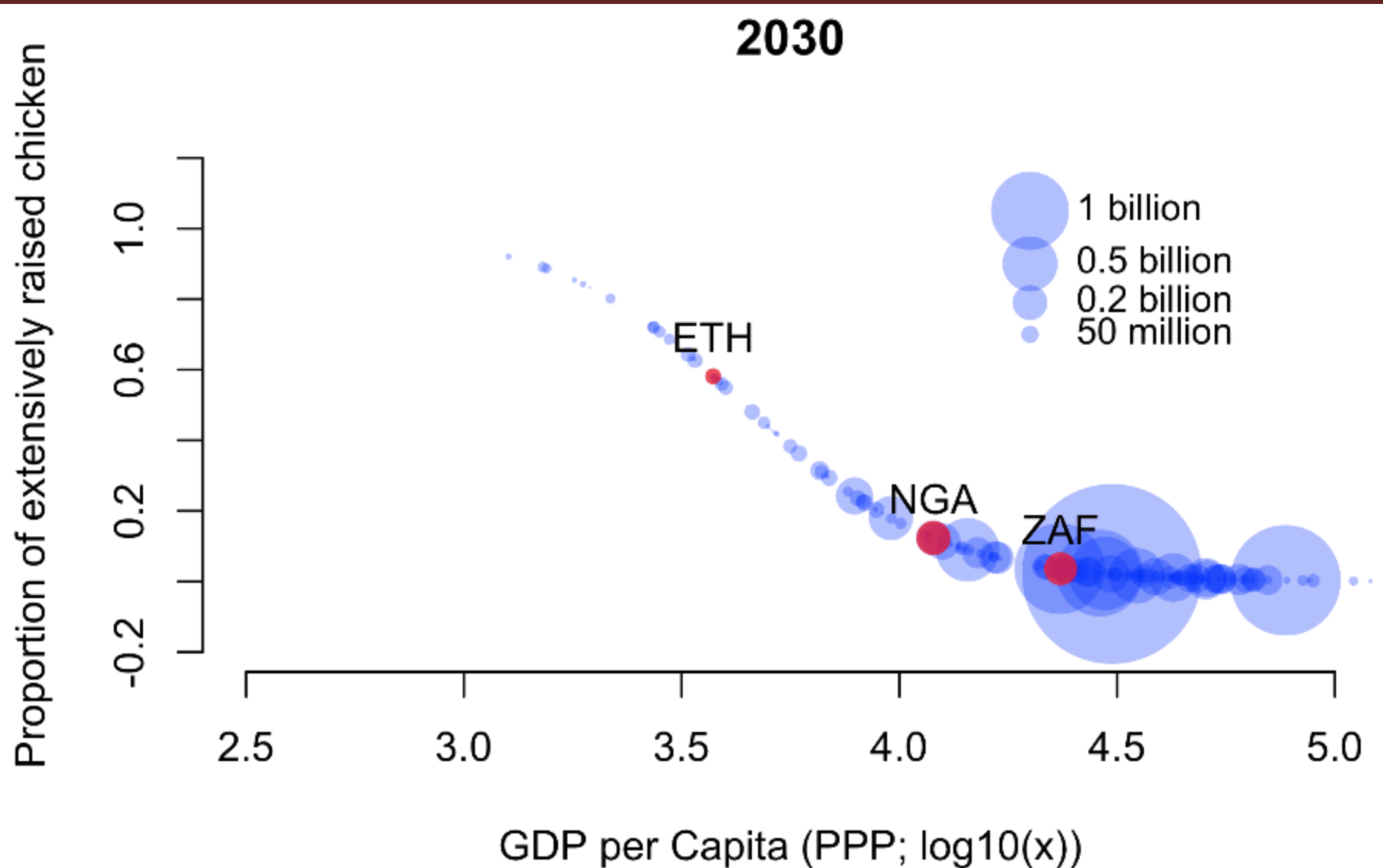
Intensification trajectories



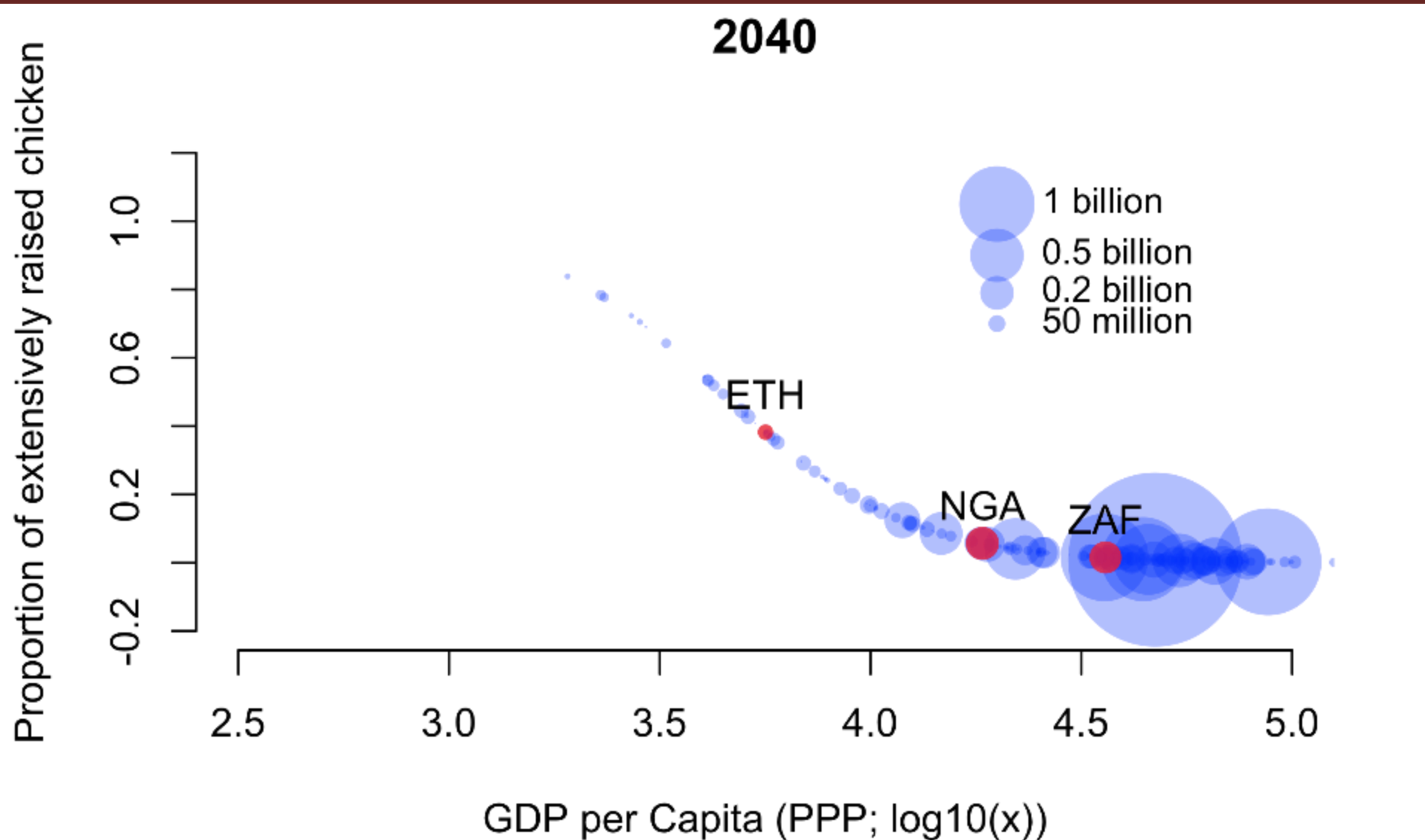
Intensification trajectories



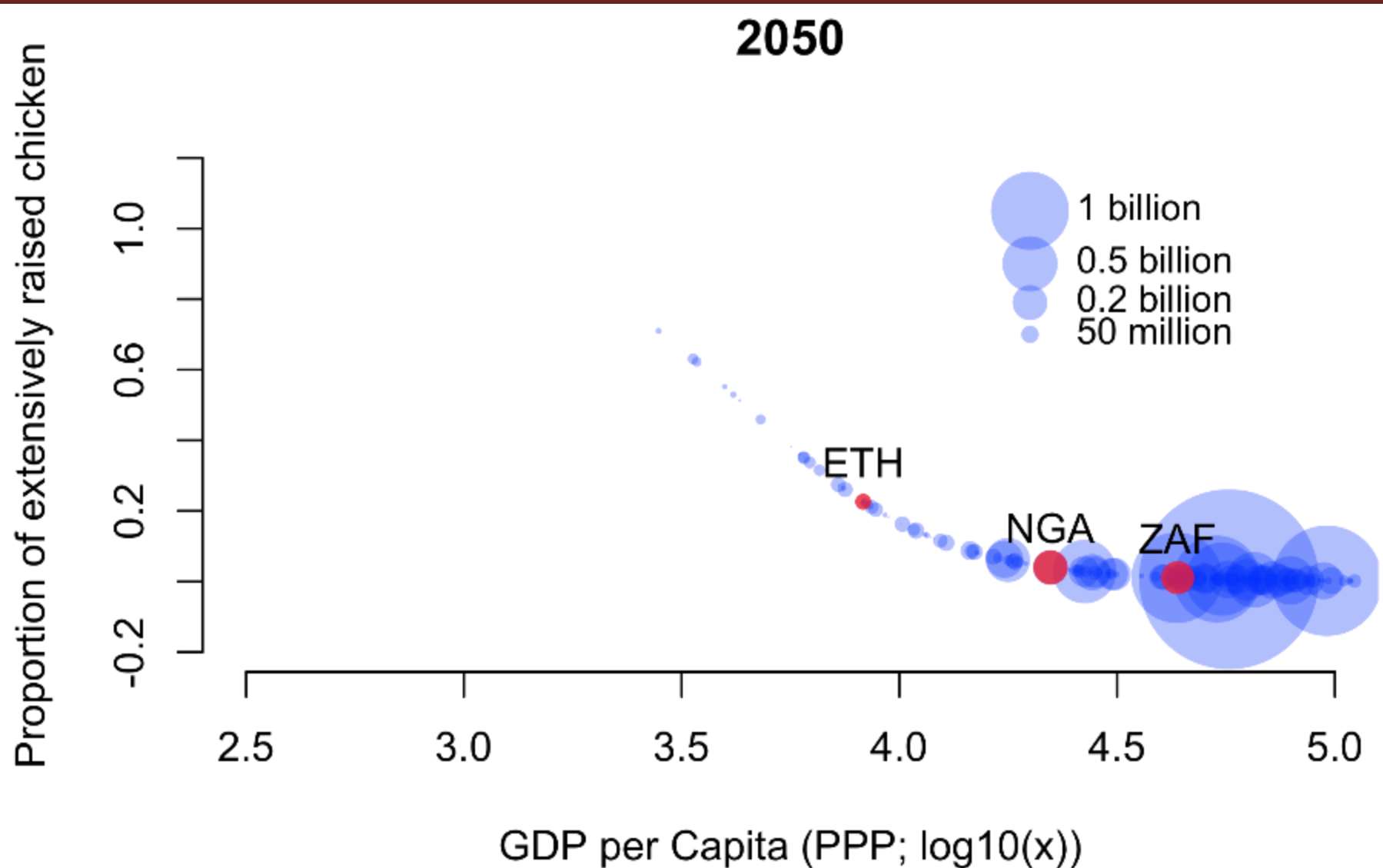
Intensification trajectories



Intensification trajectories



Intensification trajectories



Antimicrobial use in livestock



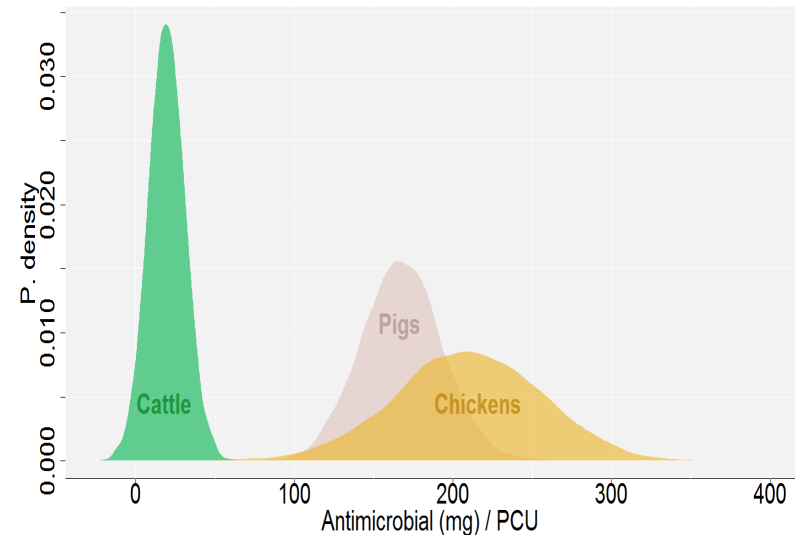
Global trends in antimicrobial use in food animals

Thomas P. Van Boeckel^{a,1}, Charles Brower^b, Marius Gilbert^{c,d}, Bryan T. Grenfell^{a,e,f}, Simon A. Levin^{a,g,h,1}, Timothy P. Robinsonⁱ, Aude Teillant^{a,e}, and Ramanan Laxminarayan^{b,e,j,1}

^aDepartment of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ 08544; ^bCenter for Disease Dynamics, Economics & Policy, Washington, DC 20036; ^cUniversite Libre de Bruxelles, B1050 Brussels, Belgium; ^dFonds National de la Recherche Scientifique, B1000 Brussels, Belgium; ^ePrinceton Environmental Institute, Princeton, NJ 08544; ^fFogarty International Center, National Institutes of Health, Bethesda, MD 20892; ^gBeijer Institute of Ecological Economics, 10405 Stockholm, Sweden; ^hResources for the Future, Washington, DC 20036; ⁱInternational Livestock Research Institute, 00100 Nairobi, Kenya; and ^jPublic Health Foundation of India, New Delhi 110070, India

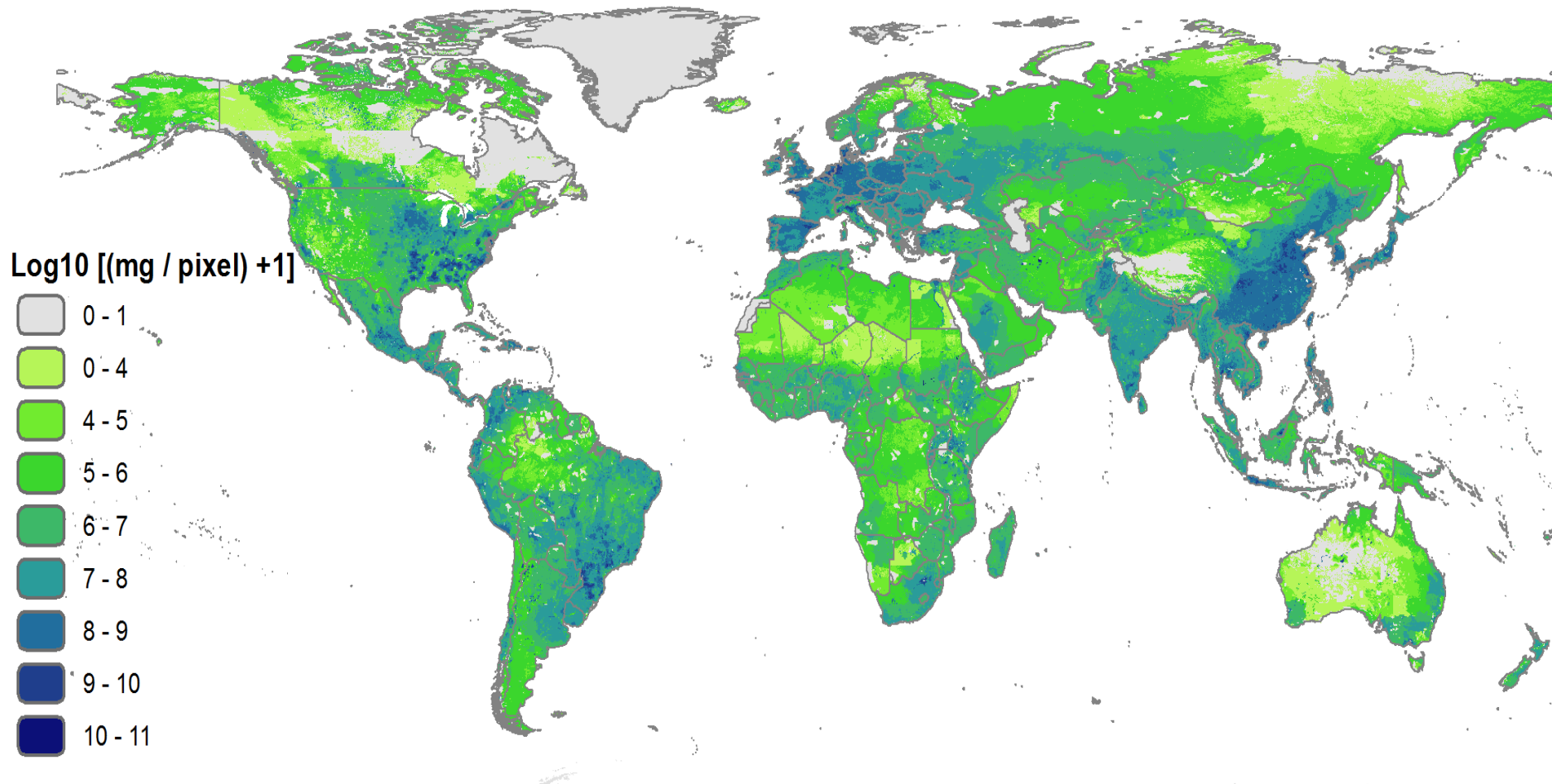
Contributed by Simon A. Levin, February 18, 2015 (sent for review November 21, 2014; reviewed by Delia Grace and Lance B. Price)

- Total consumption in the livestock sector in 2010 estimated at 63,151 tons
- Global antimicrobial consumption will rise by 67% by 2030
- It will nearly double in BRICS (Brazil, Russia, India, China, and South Africa) countries



Antimicrobial resistance

Global antimicrobial consumption in livestock (mg per 10km pixel)



Source: Van Boeckel et al. 2015

Antimicrobial resistance

- The European Union banned the use of antibiotics to boost animals' growth in 2006
- There is a 'voluntary' ban in the USA
..... Chick-fil-A, McDonalds and Costco
- Very difficult to regulate in the developing and emerging economies
 - Concerted action – multi-stakeholder platforms
 - Strengthen the evidence base linking agricultural use to AMR in the medical sector
 - Appropriate approaches in different settings – poor countries may not have the 'resilience' or 'capacity' of Europe in withstanding a blanket ban, for example
 - This is a global issue and calls for a coordinated, global response



In conclusion



- Rapid demand growth for Animal Source Foods in Africa – especially milk, pork and poultry
- African production can only meet this demand, avoiding a growing trade deficit, under a sustainable growth scenario (SSP1)
- The required annual growth in productivity is around 6% per year
- Sustainable intensification will be needed to achieve this: equity – environment – health
- This calls for integrated, systems-based solutions to guide sector development along a sustainable pathway
- The need for action is urgent if African livestock production is to meet its growing demand

Thank you!

