Healthy people, animals and ecosystems: The role of CGIAR research

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Regional Conference on Zoonotic Diseases in Eastern Africa
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INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

CGIAR
RESEARCH PROGRAM ON Agriculture for Nutrition and Health
Led by IFPRI

Key messages

1 FOOD SECURITY

A key role for developing countries

2 HEALTHY ANIMALS

Food security depends on better animal health

3 HEALTHY PEOPLE

Human health is influenced by diseases endemic in and emerging from animals

4 HEALTHY ECOSYSTEMS

Agriculture impacts ecosystem health

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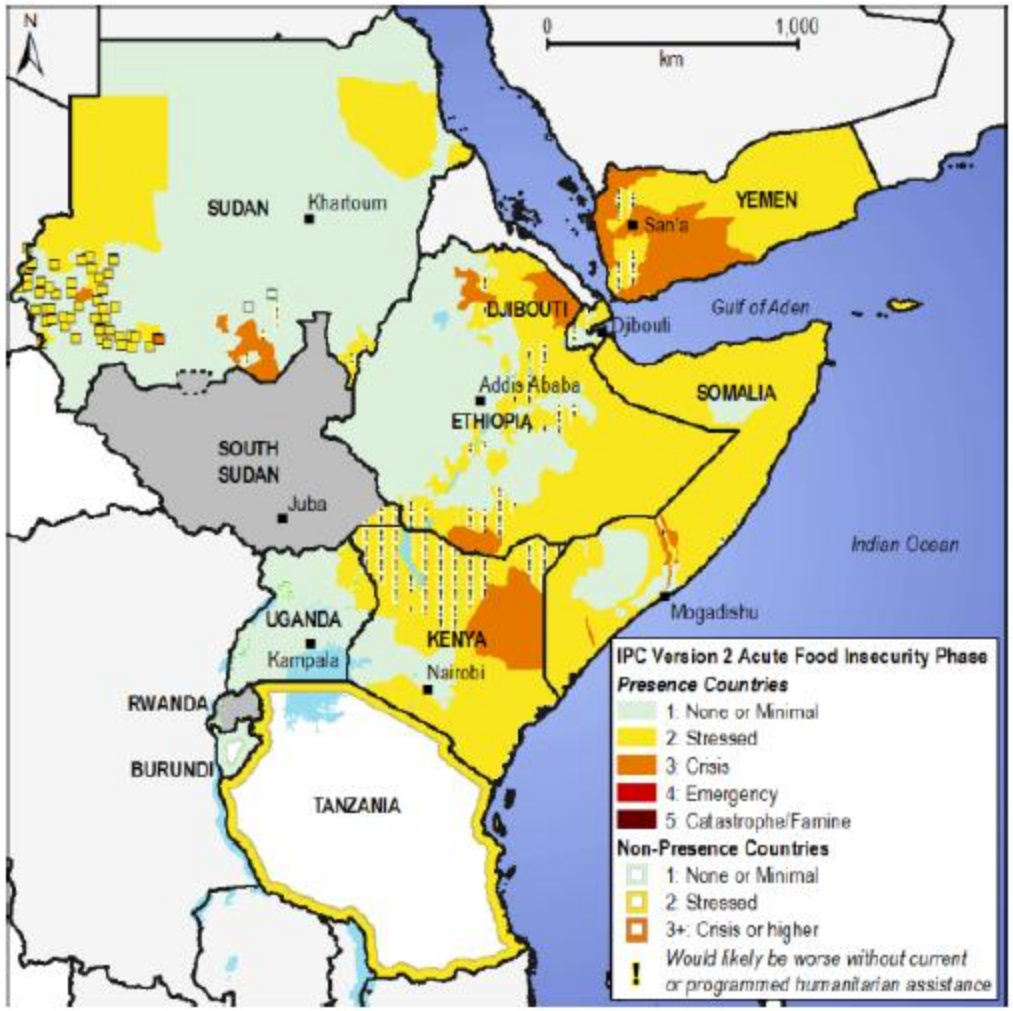
Food Security

Levels of food insecurity in eastern Africa



Source: FEWSNET

- 13.3 million people (about 10%) in need of humanitarian assistance

- Contributing factors:
  - Low productivity of the livestock sector
  - Heavy reliance on crop-fed agriculture
  - Conflicts
  - High levels of poverty

USD $1/day	18 – 59%
USD $2/day	49 – 99%

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Gaps between food supply and demand

Agriculture – source of food and income for up to 90% of the population in the region

- Human population has been increasing by 2.55% per year [2007 – 2017]
- Projections to the 2030, demand for meat will increase by 3.7% and milk – 2.7%
- Projected growth rates for livestock numbers, meat and milk production

	Project change
Total livestock numbers	1.41%
Total meet consumption	2.84%
Total milk production	2.95%

Source: FAO, 2007

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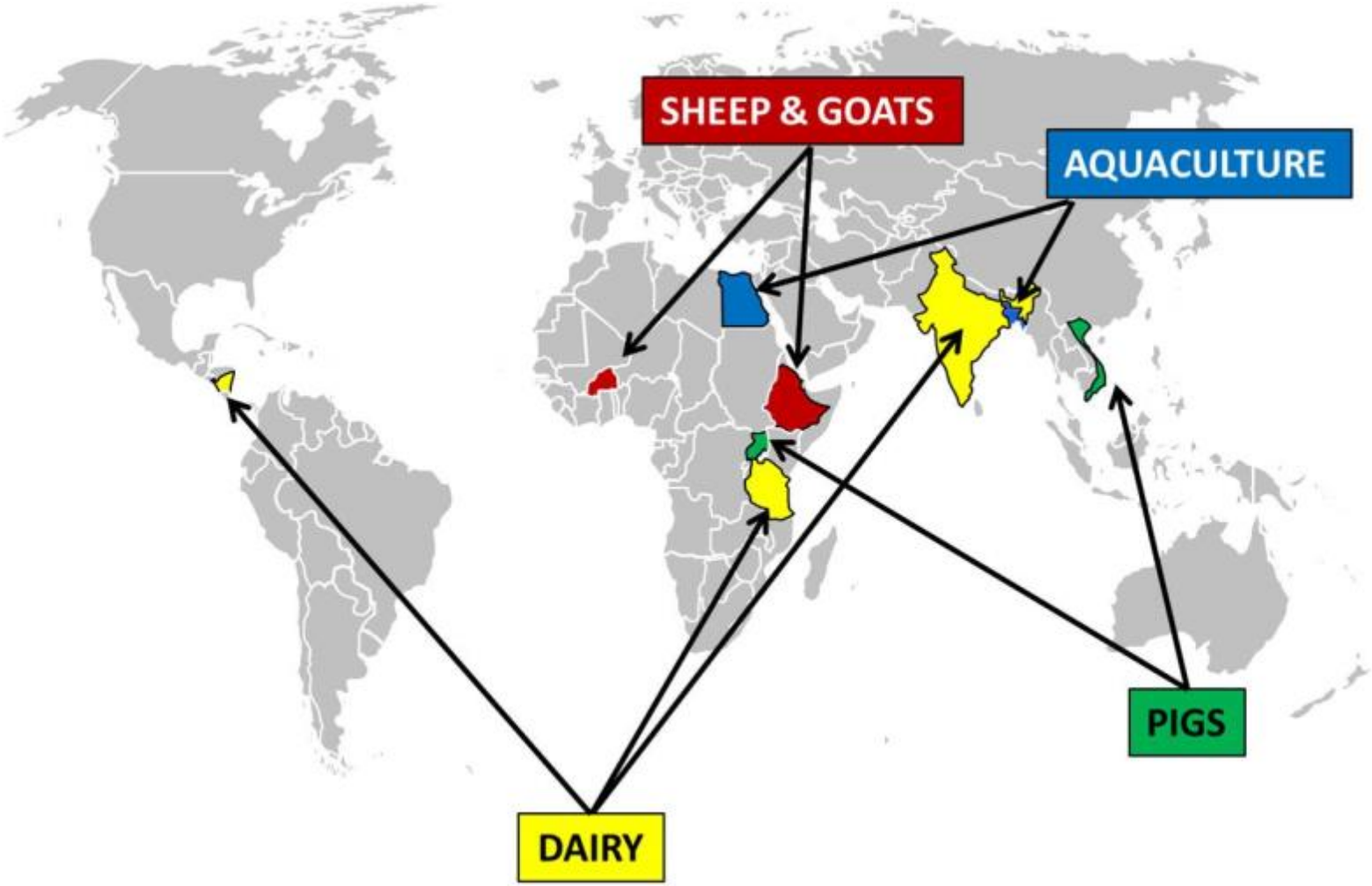
Food security and sustainability

Bridging the gaps between demand and supply – global level

- 60% more food than is produced now will be needed
- 75% of this must come from producing more food from the same amount of land
- The higher production must be achieved while reducing poverty and addressing environmental, social and health concerns
- This greater production will have to be achieved with temperatures that may be 2–4 degrees warmer than today's

ILRI's contribution: More meat, milk and fish for and by the poor



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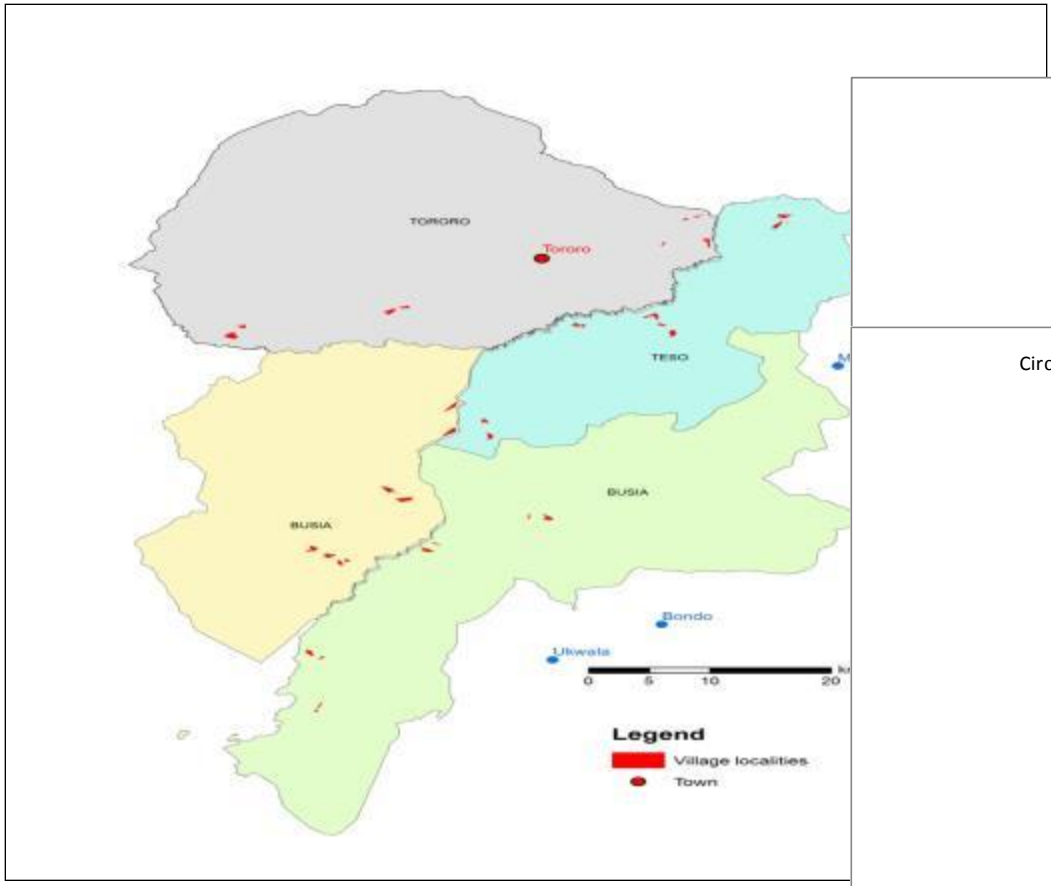
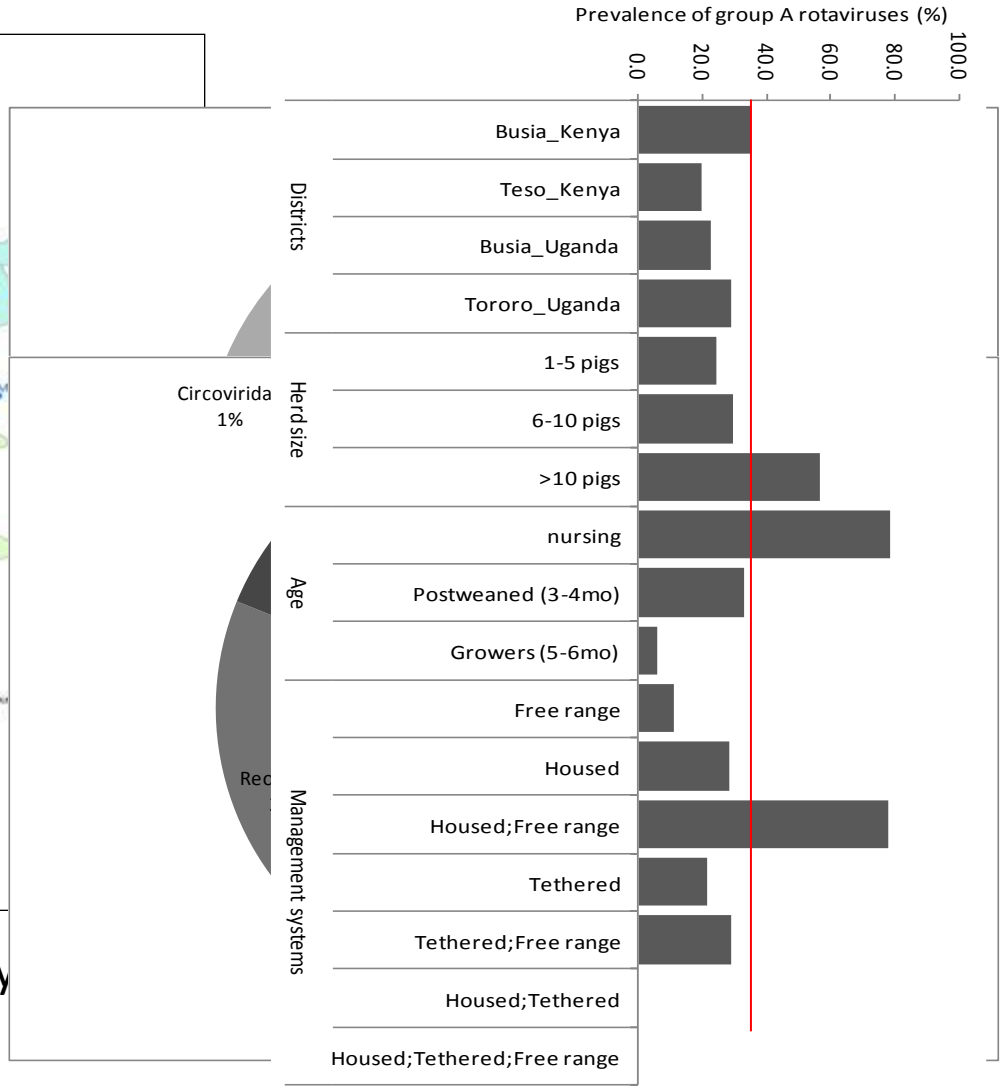
Healthy animals and people

Pig farming and zoonotic diseases

- Pig farming – expanding in eastern Africa, particularly in Uganda
  - Total population rose from 0.19 million to 3.2 million between 1980 – 2008 in the country
- >70% of pigs produced in small holder production systems
- Close interactions between pigs and humans/wildlife

Pigs – reservoirs for many viruses, some zoonotic



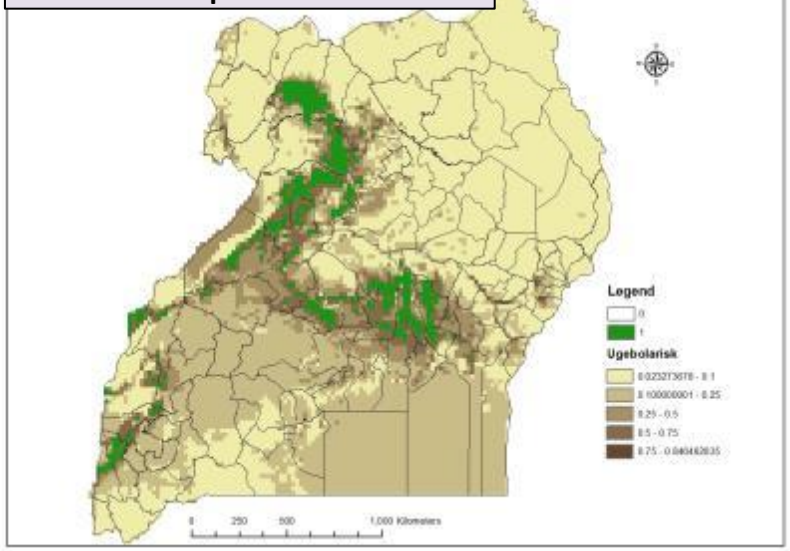


30% of pigs sampled had rotavirus, family

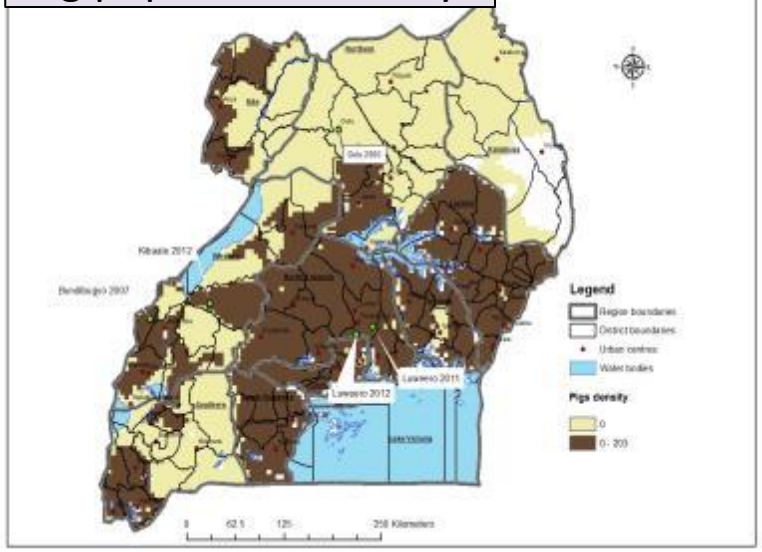
Amimo et al., 2015. Vet Microbiol.

Pigs as a potential reservoir for Ebola virus?

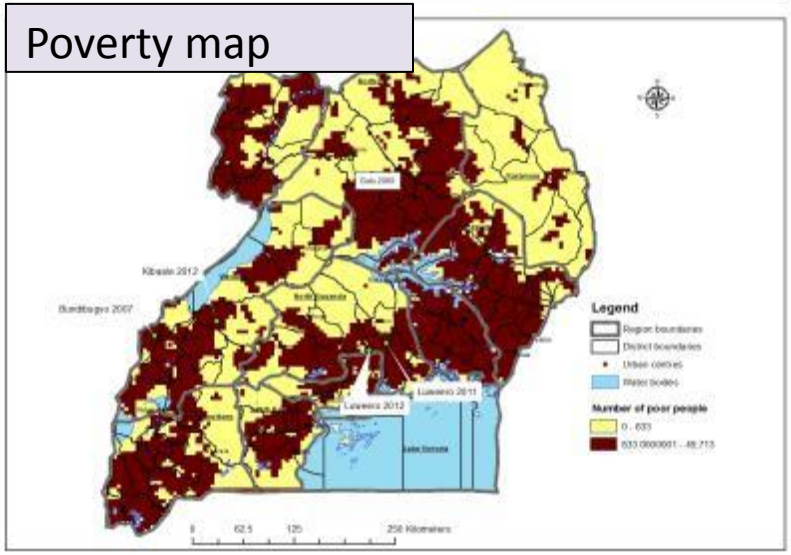
Niche map for Ebola



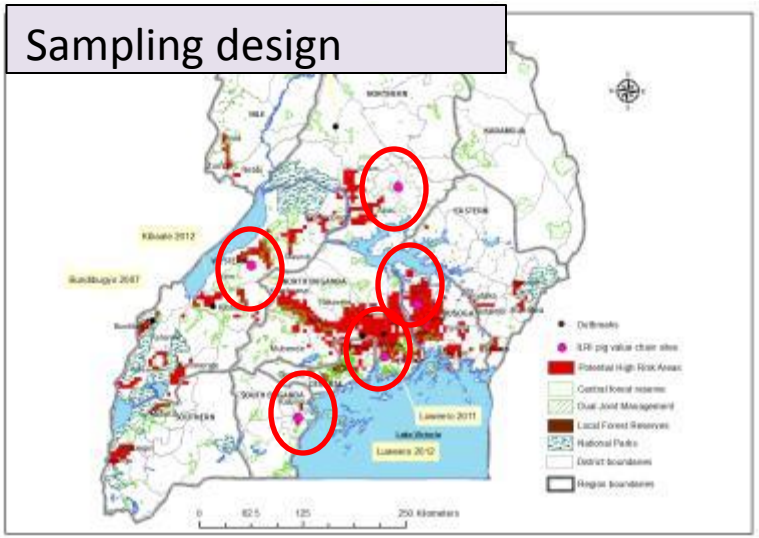
Pig population density



Poverty map



Sampling design



Eliza Smith, BVSc, ILRI/KYEEMA Graduate Fellow

Safe Food Fair Food project

- Risk analysis for food safety/zoonoses along the value chains
- Lots of capacity building – actors/partners
- Launched a book synthesizing the various activities conducted https://cgspace.cgiar.org/handle/10568/42438
- Policy briefs

Roesel Kristina, ILRI Uganda

Multipathogen surveys in dairy value chain - Tanzania

DISEASE	% POSITIVE	N	% FARMERS REPORTING DISEASE AS COMMON
Q fever	11.2	392	-
East Coast Fever	31.8	402	37
Theileriosis	10.2	402	--
Anaplasmosis	31.6	402	18
Babesiosis	21.4	402	--
Brucellosis	11.4	403	0.7
CBPP	18.1	381	22
Bovine Respiratory Syncytial Virus	₮		
Infectious Bovine Rhinotracheitis	₮		25
Bovine Parainfluenza Virus Type 3	₮		
Bovine Viral Diarrhoea Virus	₮		--
Neospora	₮		--

₮- *Lab work in progress*

Silvia Alonso – Scientist, ILRI

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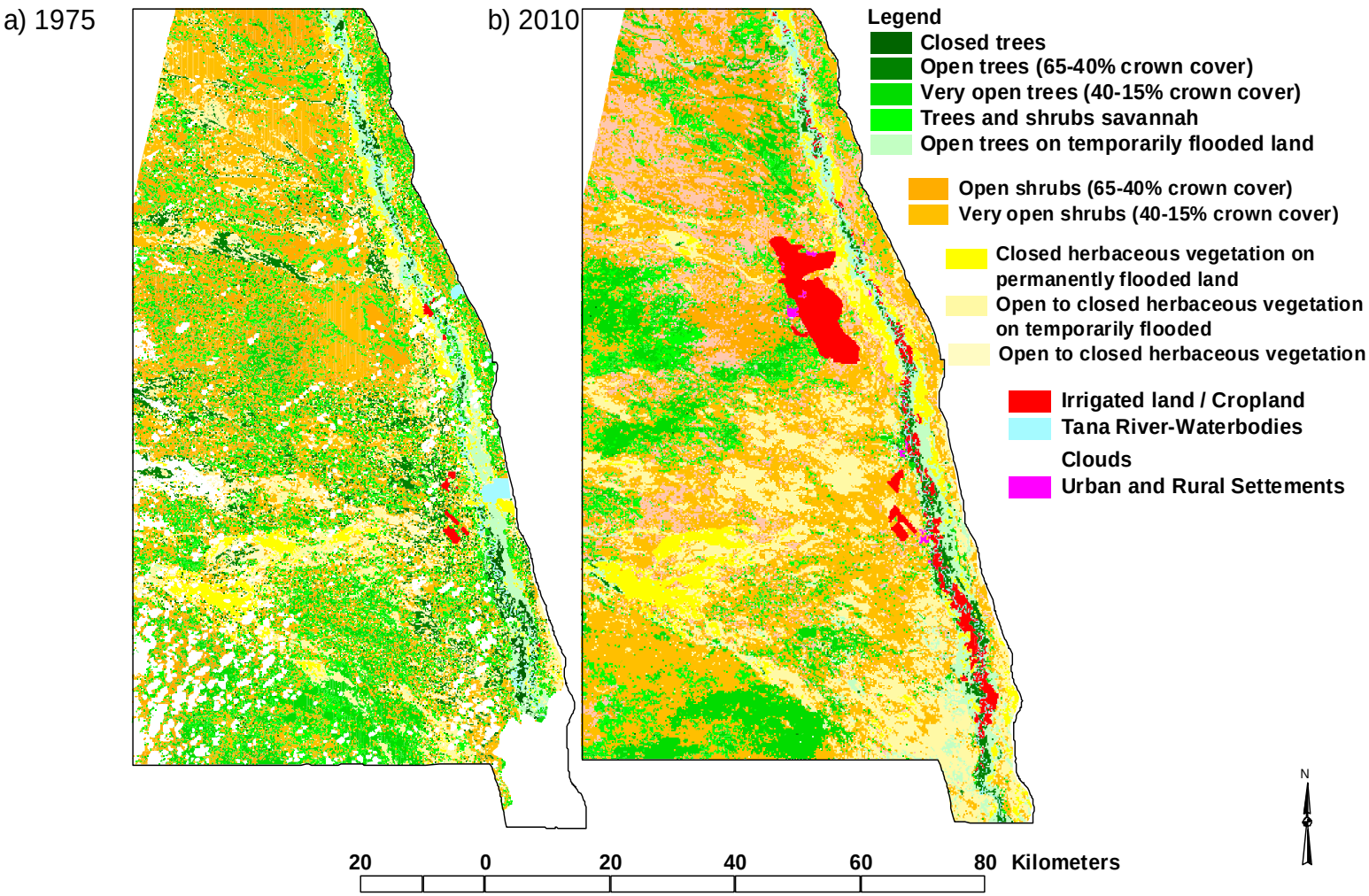
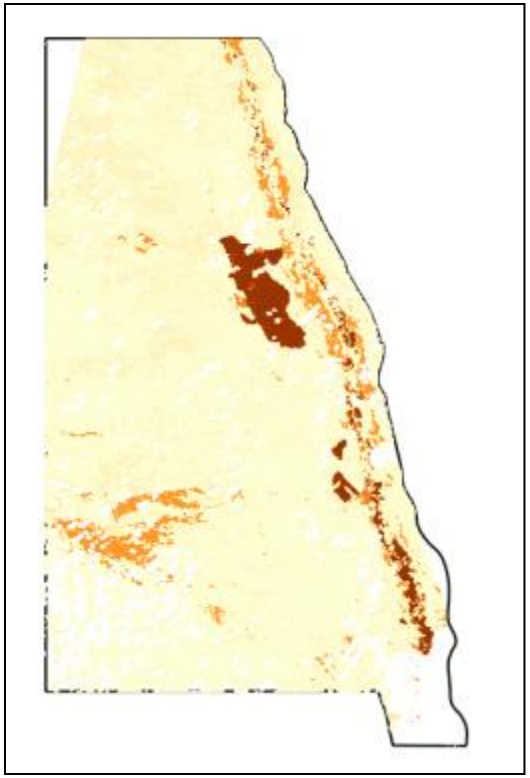
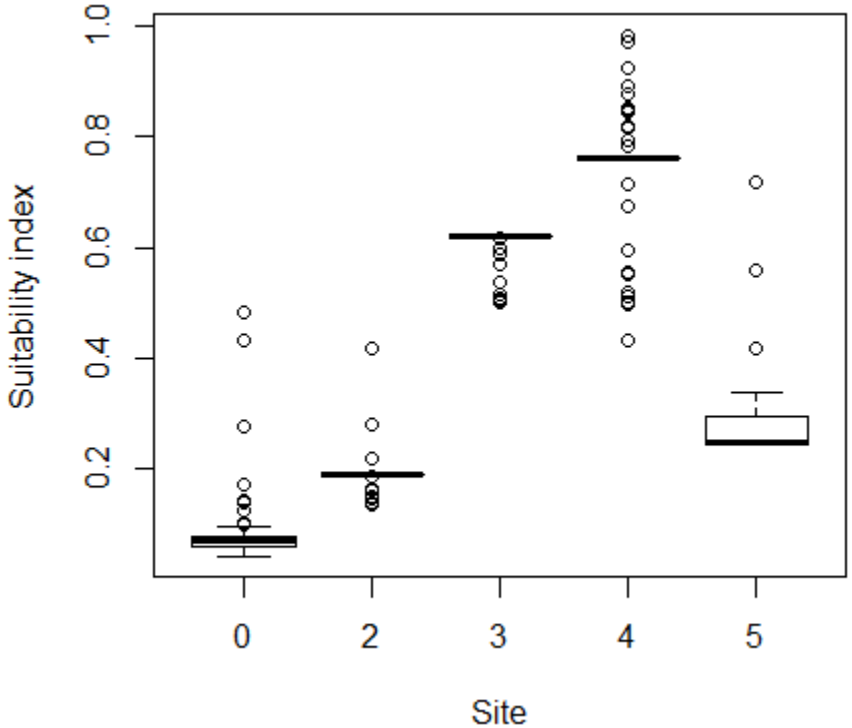
Land use change and zoonotic diseases - Kenya



DDDAC Research team

Mosquito niche values: pastoral, irrigated and riverine ecosystems





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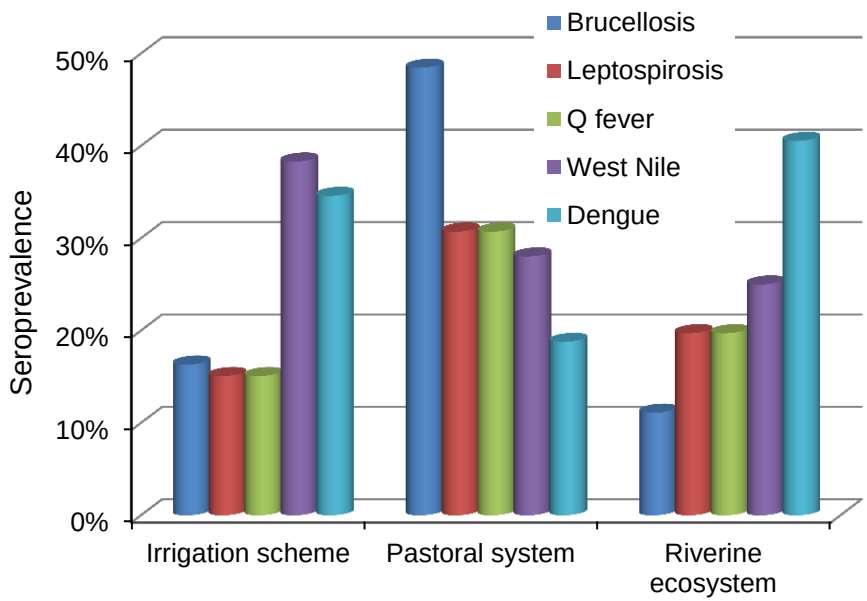
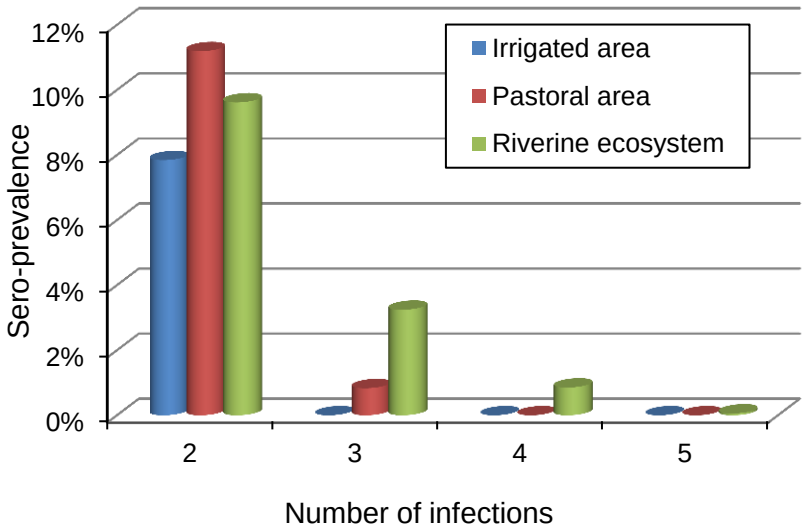
Multipathogen surveys – Tana River, Kenya

Sero-prevalences of selected zoonoses by area



Multiple infections per subject

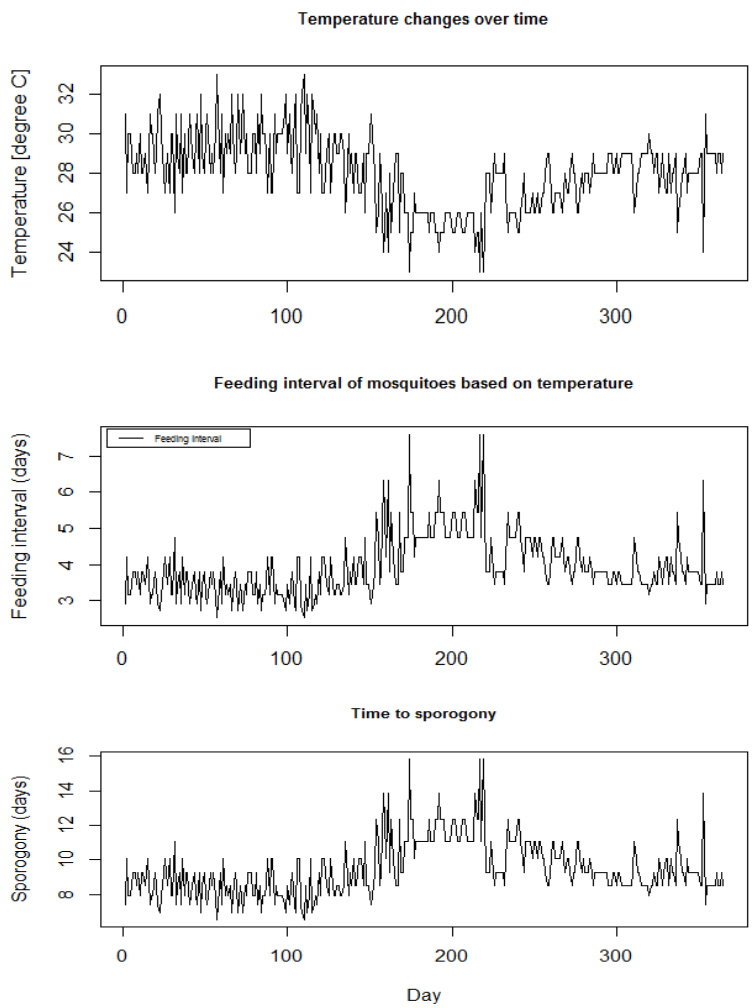


DDDAC Research team

Irrigation in the ASALs and vector-borne diseases

- Irrigation covers only 6% of the sub-Saharan Africa, compared to 37% of Asia and 17% of Latin America
- Kenya, Tanzania and Zambia – greatest potential to expand irrigation; each offering 100 – 200 thousand ha [WB Report, 2008]
- Implications on VBDs:
  - Standing water - breeding sites
  - Target sites have very high temperatures
  - Pests – rats, birds,
  - Wildlife

Effect of climate variables on mosquito parameters – malaria model



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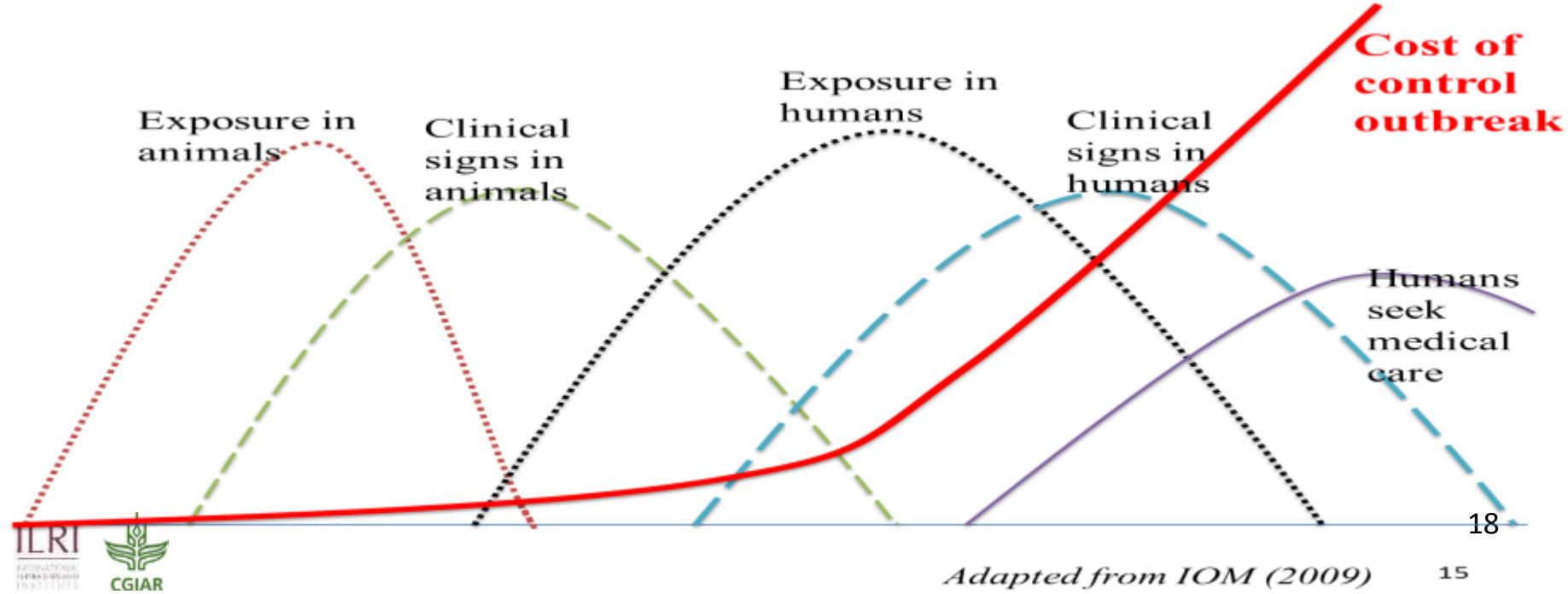
Solutions – One Health approach

- Control zoonoses in animal hosts "One Health"
  - Median benefit to cost ratio is 4:1
- Timely response to outbreaks can reduce 90% costs
- Capacities to detect zoonoses



Solutions: Food safety in developing countries

- Branding & certification of milk vendors in Kenya: led to improved milk safety & saved economy $33 million
- Training Nigerian butchers led to 20% more meat samples meeting standards. It cost $9 per butcher but resulted in savings $780/per butcher per year from reduced cost of illness among consumers

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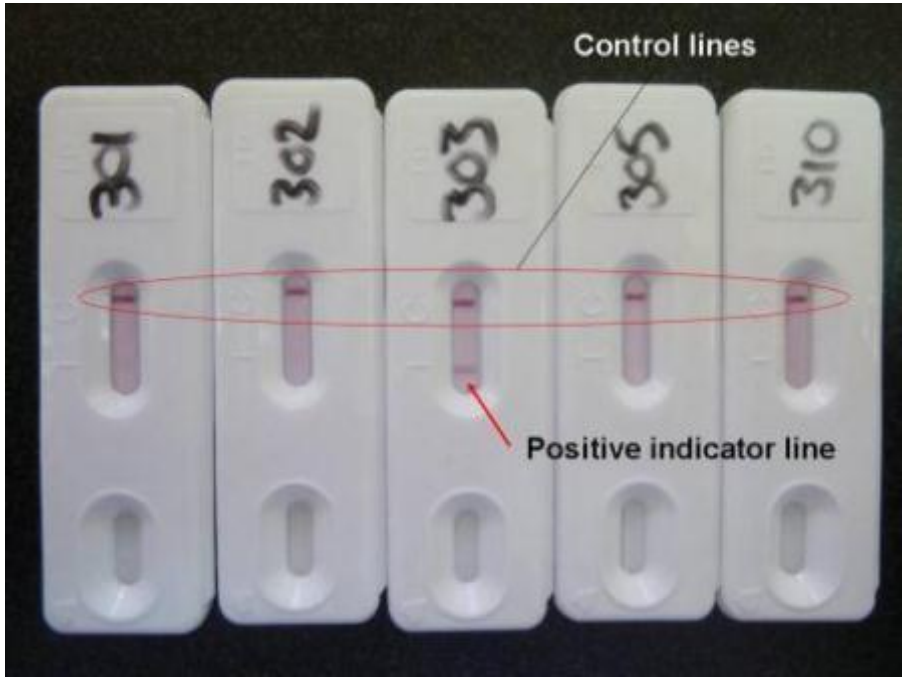
Solutions: Innovations, incentives, capacities and institutions for managing zoonotic diseases

- Develop and test technologies



Novel lateral flow assays for cysticercosis

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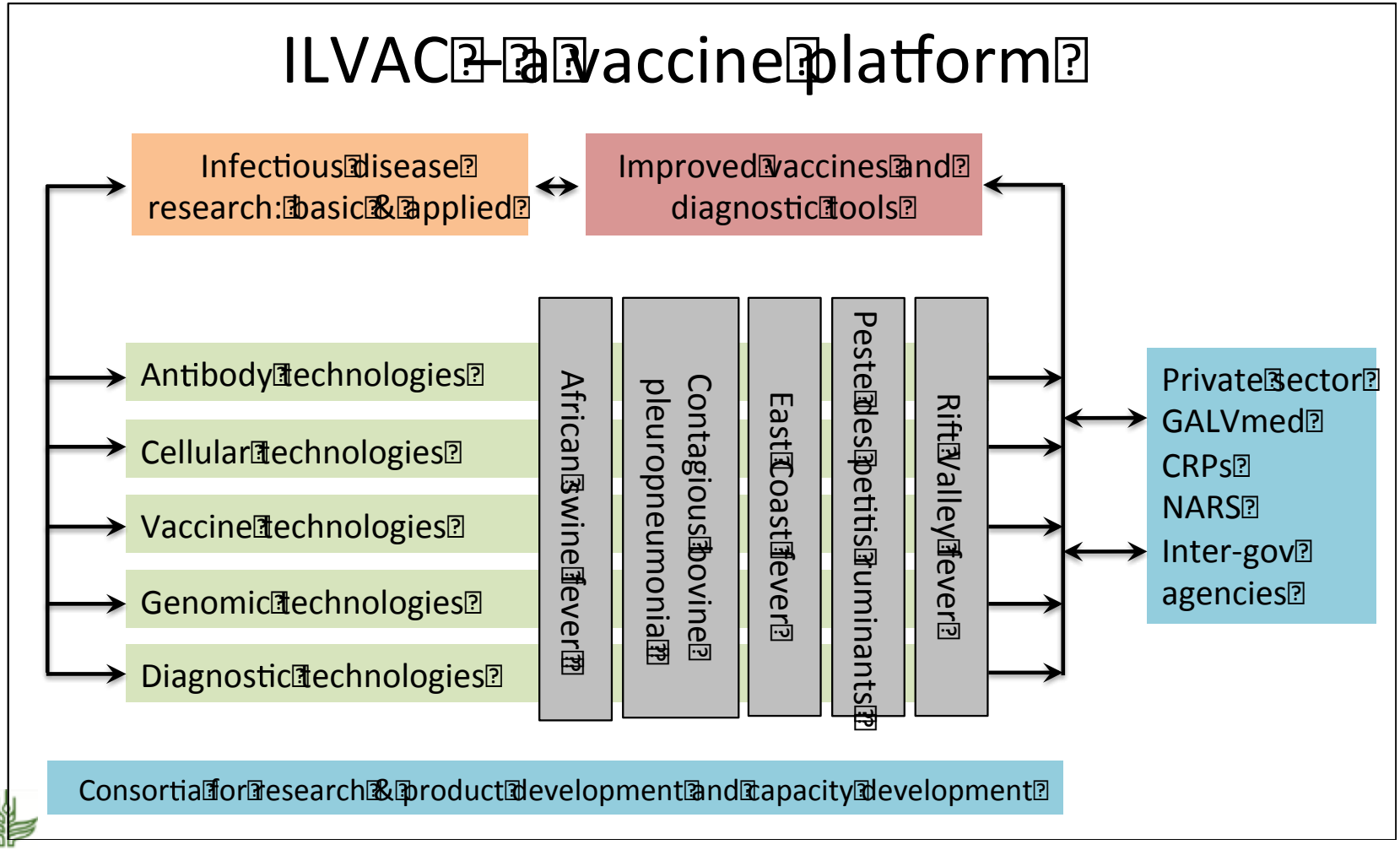
Solutions:
ILVAC – a global vaccine initiative

Vaccines save lives of animals that both increase food security and reduce poverty



Healthy ecosystems

Livestock and ecosystem health

- Livestock are a source of greenhouse gases but improving production efficiencies is key to reducing their C footprints
- Livestock feed can compete with staple crops and biofuels for water and other natural resources but
  - Pastures can help store carbon
  - Animals in smallholder systems consume crop wastes and natural pasture, not grain
- Manure can pollute land and water but is an important source of organic matter for soil fertility

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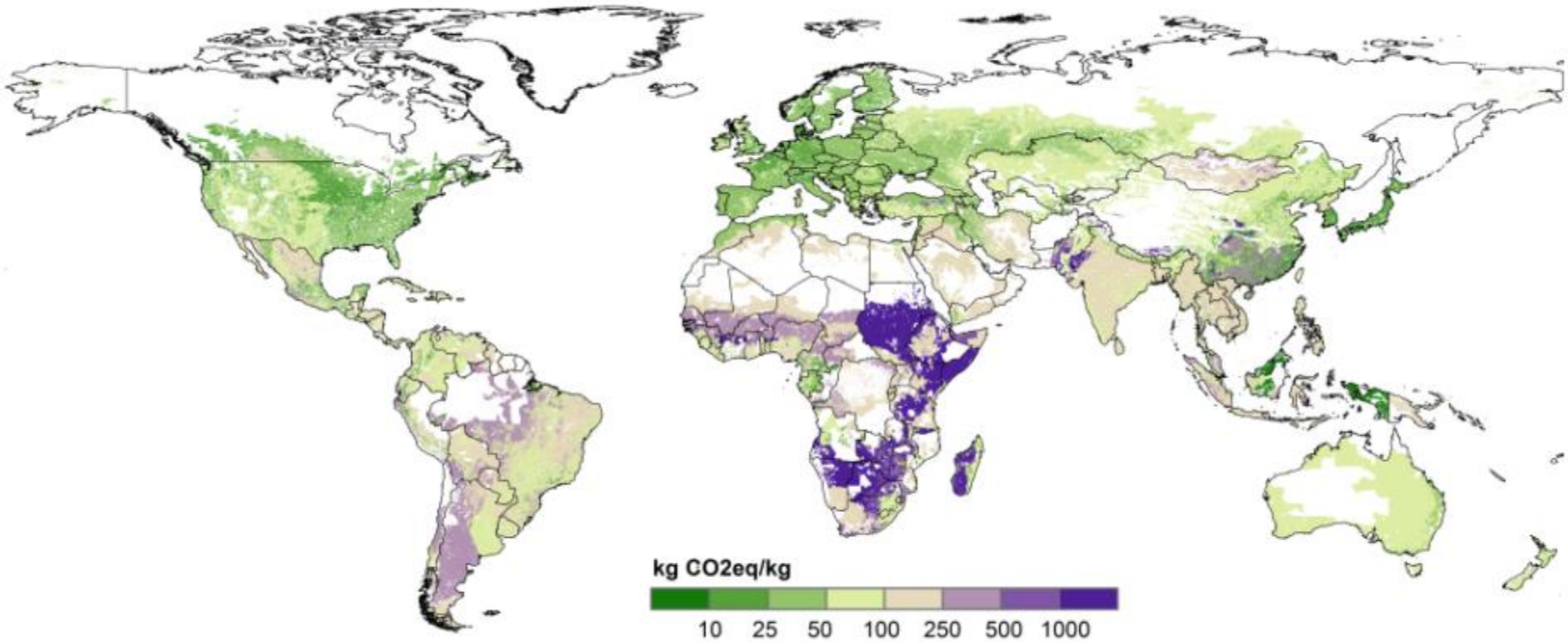
Addressing GHG inefficiencies in the developing world is an opportunity



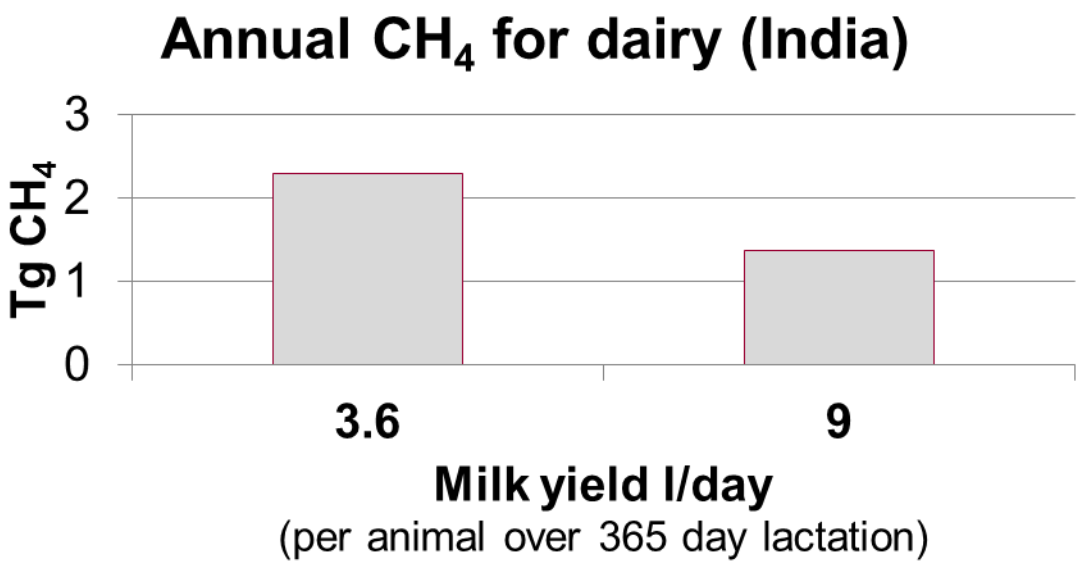
GHG per kg of animal protein produced

Herrero et al 2013

Feed opportunities

Developing countries can mitigate GHG emissions without moving to industrial grain-fed systems:

e.g., through improved efficiencies
(e.g., better feeds and feeding systems)



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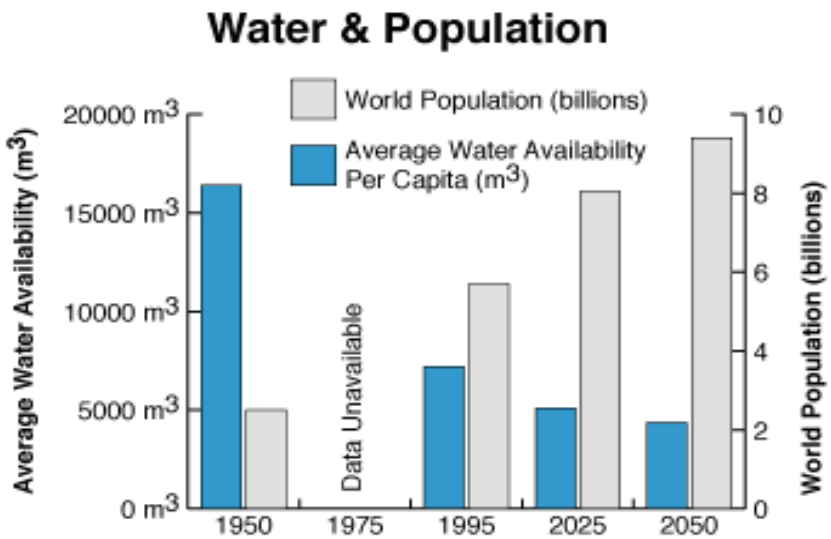
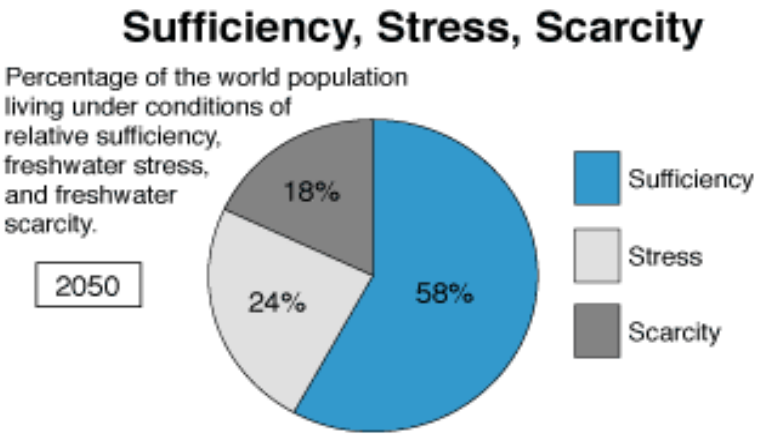
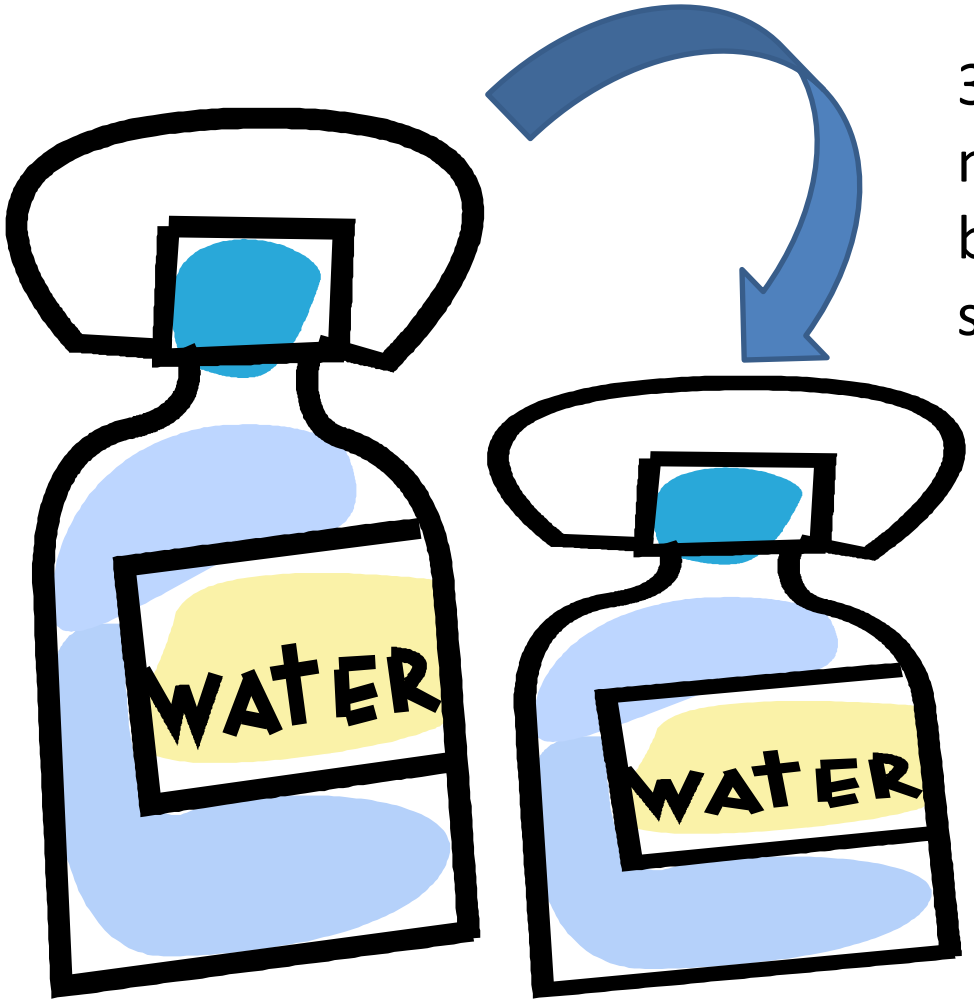
A global water crisis

- 2 billion people lack access
- Demand is growing; freshwater is getting scarcer
- 70% of total freshwater use is for agriculture, of which 31% is for livestock





Water for feed



30% reduction in water needed for 1 litre of milk by improving sorghum stalk digestibility by 5%

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Acknowledgements

- Partners
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Thank you!

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