Presentation to the National Academy of Sciences:
Considerations for the Future of Animal Science Research

Animal Agriculture and Climate Change

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Key Points

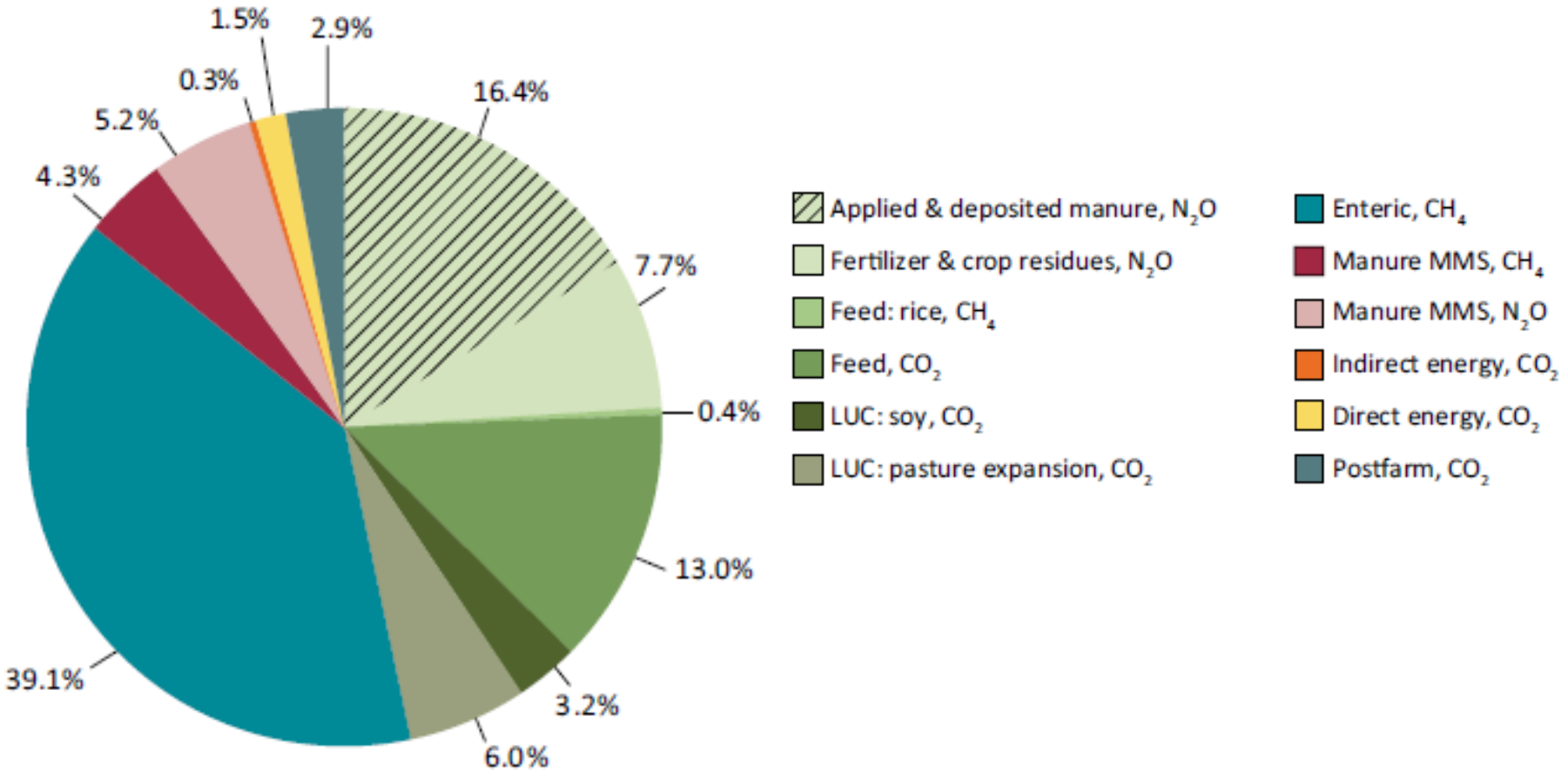
- Livestock are a significant emitter of climate gases; overriding role of ruminants (beef)
- People and - livestock are being hit hard by climate change (poverty, disease, unrest)
- Large potential for mitigation and socio-economic benefits
- Adaptation is a necessity and an opportunity
- Sustainable intensification and landscape management
- Livestock products in healthy diets

Emissions

Livestock are a significant emitter of climate gases; overriding role of ruminants (beef)

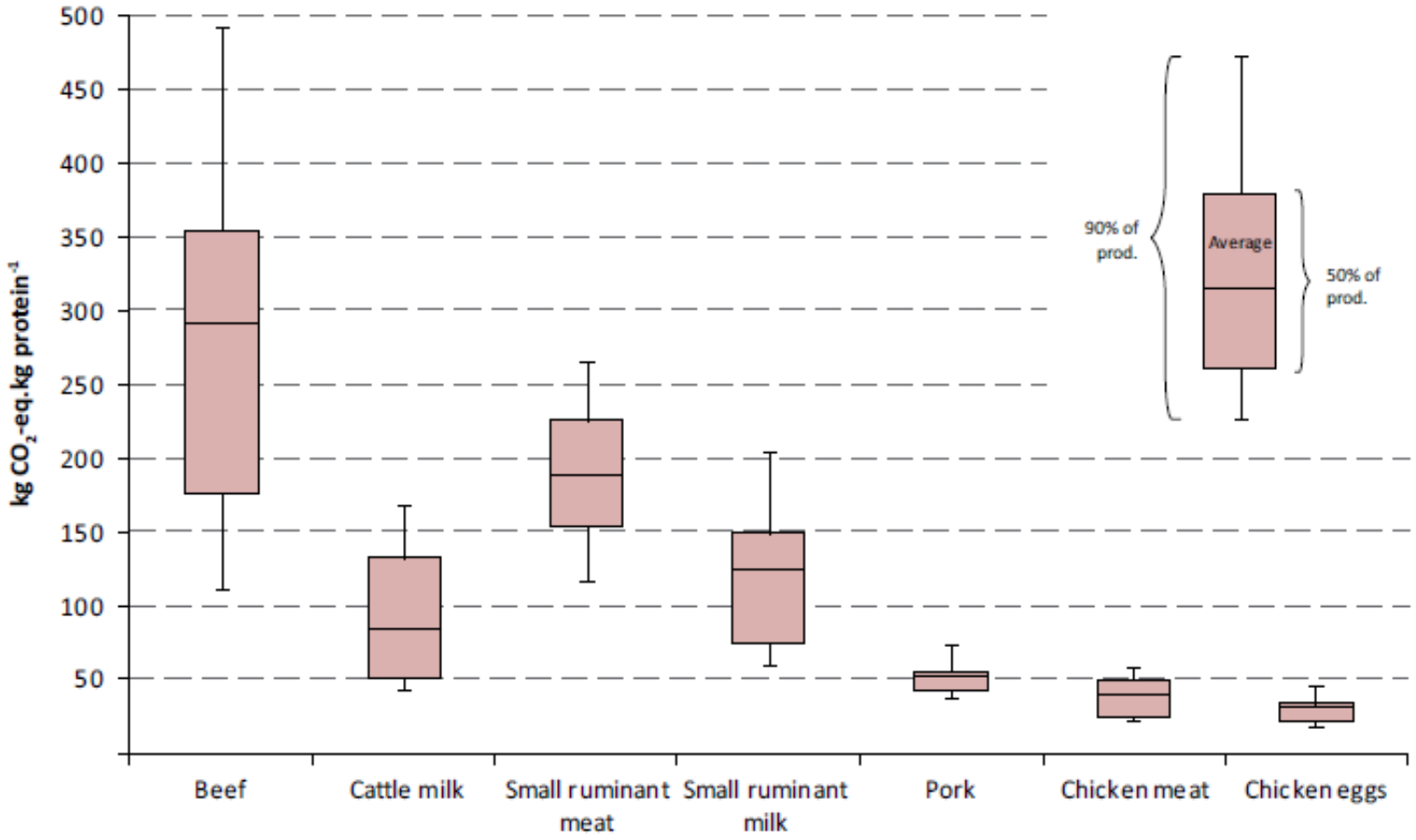
- Total emissions 7.1 GT $CO_{2\ eq}$ or 14 percent of total anthropogenic emissions (life cycle)
- Ruminants, enteric fermentation, methane
- Feed-related emissions for pigs and poultry
- Land use change: beef and soy
- Emission intensity: large variability
- Other purposes of keeping livestock (subsistence, traction, fertilizer, asset, cultural)

Sources of climate emissions from livestock



Is there an emission gap?

Range of GHG emission intensities for livestock commodities

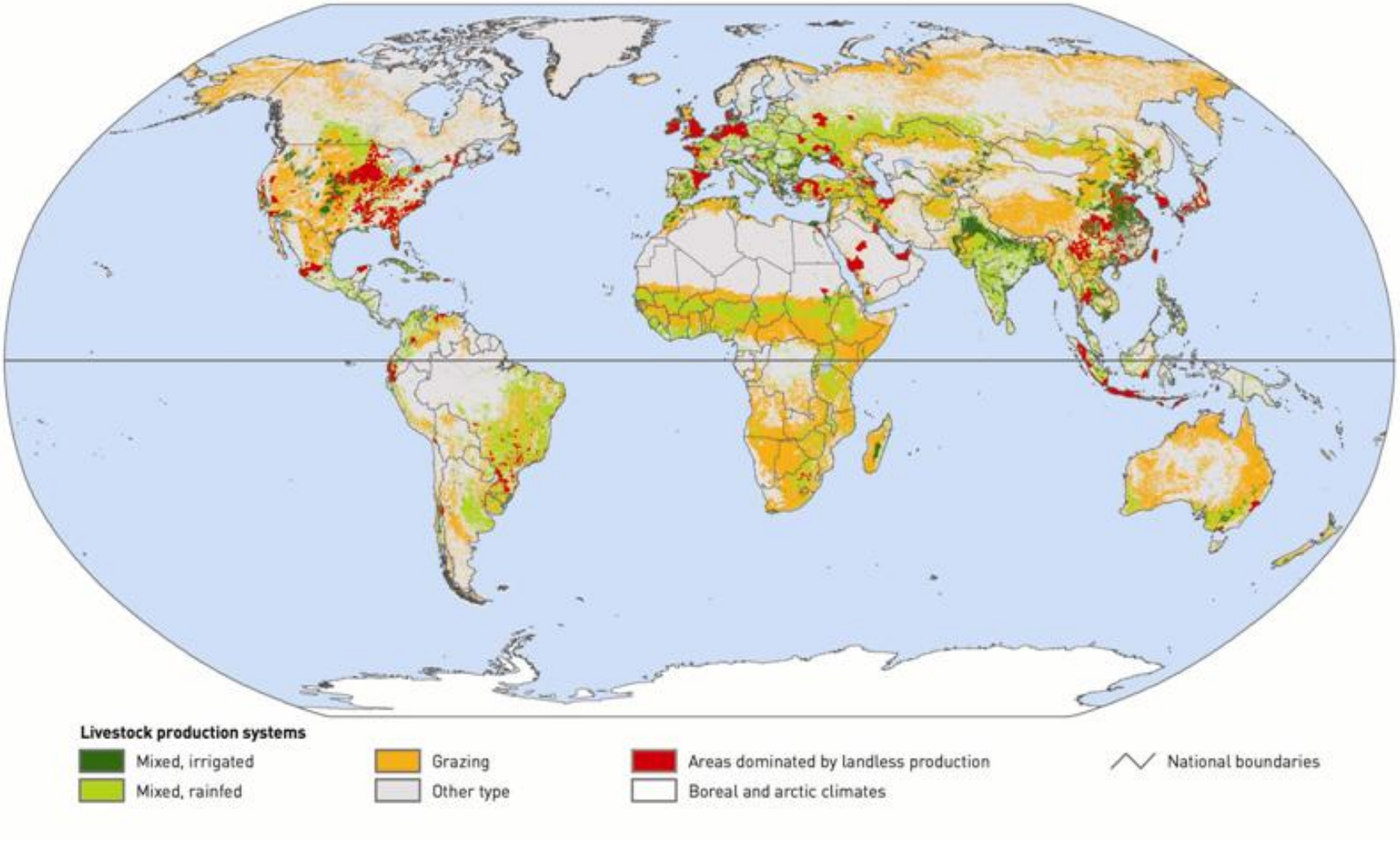


Climate Change Impacts

People and livestock are being hit hard by climate change - poverty, disease, unrest

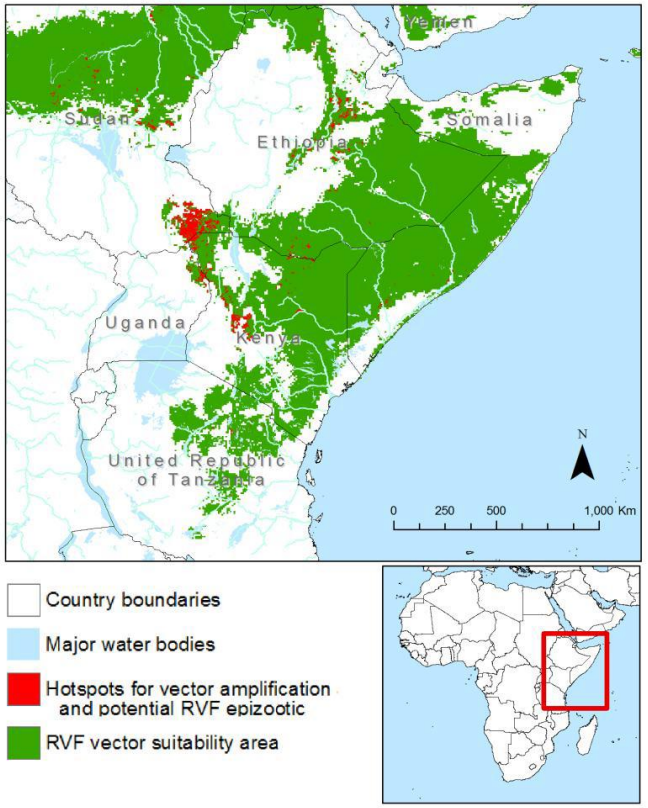
- Geography of livestock
  - Large crop-livestock interaction
  - Marginal and remote areas (widespread poverty)
  - Near Consumption Centers (depending on crops)
- Droughts, heat waves, floods: social Impact and humanitarian crises
- Changing disease ecologies – emerging and re-emerging health threats – human health
- Political instability and conflicts

Estimated distribution of livestock production systems



Risk areas for the end of 2013
(Rift Valley fever)

Hotsports for Rift Valley (RVF) vector amplification and potenial RVF epizootic for September 2013 in the Horn of Africa



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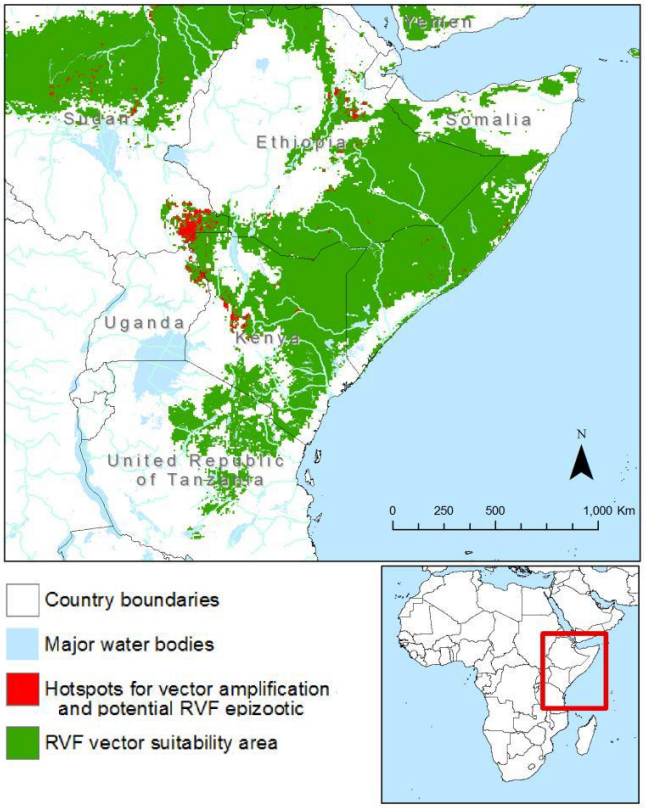
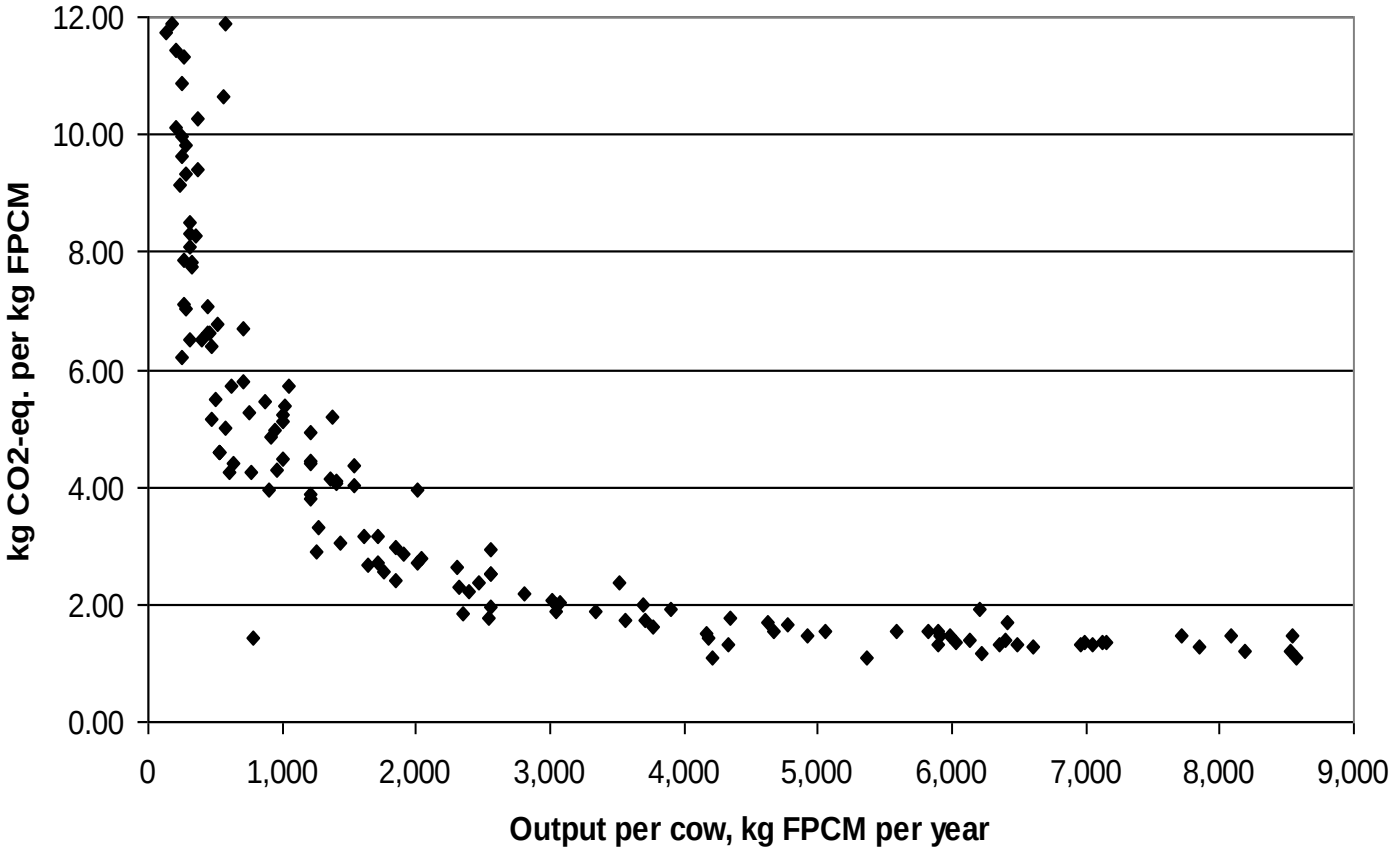


Mitigation

Large potential for mitigation and socio-economic benefits

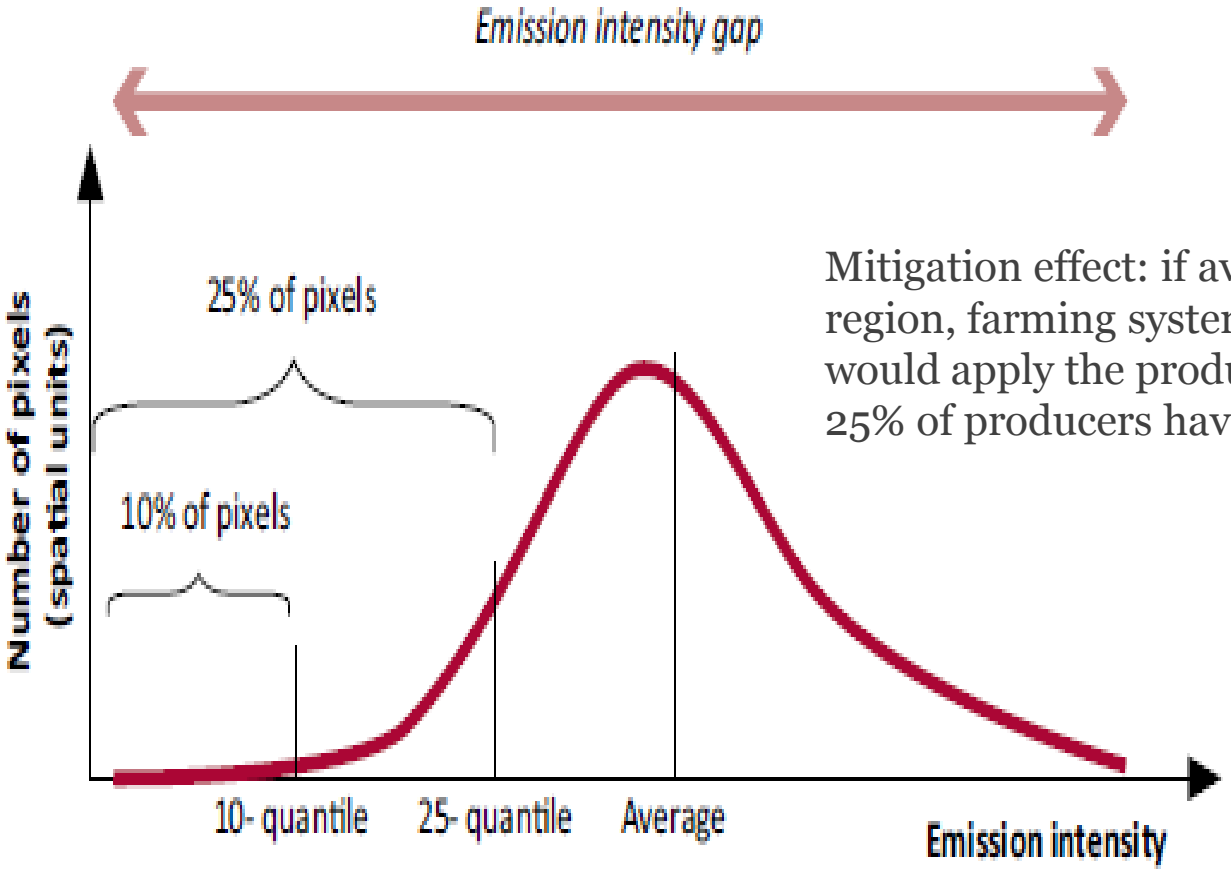
- Emission intensity and productivity move in parallel (socio-economic benefits)
- Close the productivity gap by tweaking existing practices - transfer and adoption of proven technologies (30% mitigation)
- Feeding, genetics, animal health, waste management
- On the horizon: rumen manipulation, feed additives, genetic selection

Relationship between total greenhouse gas emissions and milk output per cow



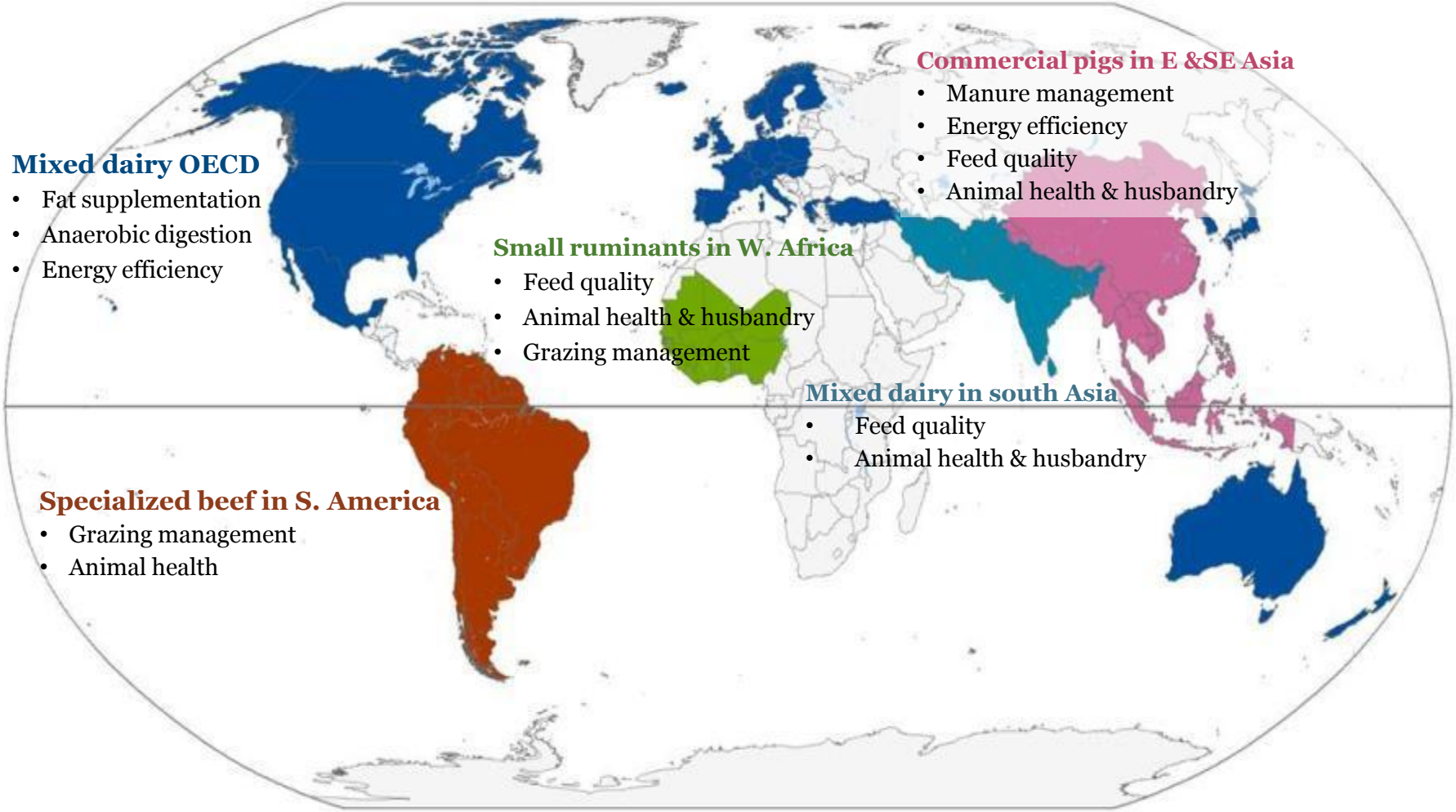
How to bridge the emissions gap

Estimating mitigation potential through analysis of emissions gap



Mitigation effect: if average producers in a given region, farming system and agro-ecological zone would apply the production practices of the 10 to 25% of producers having lowest emission intensity.

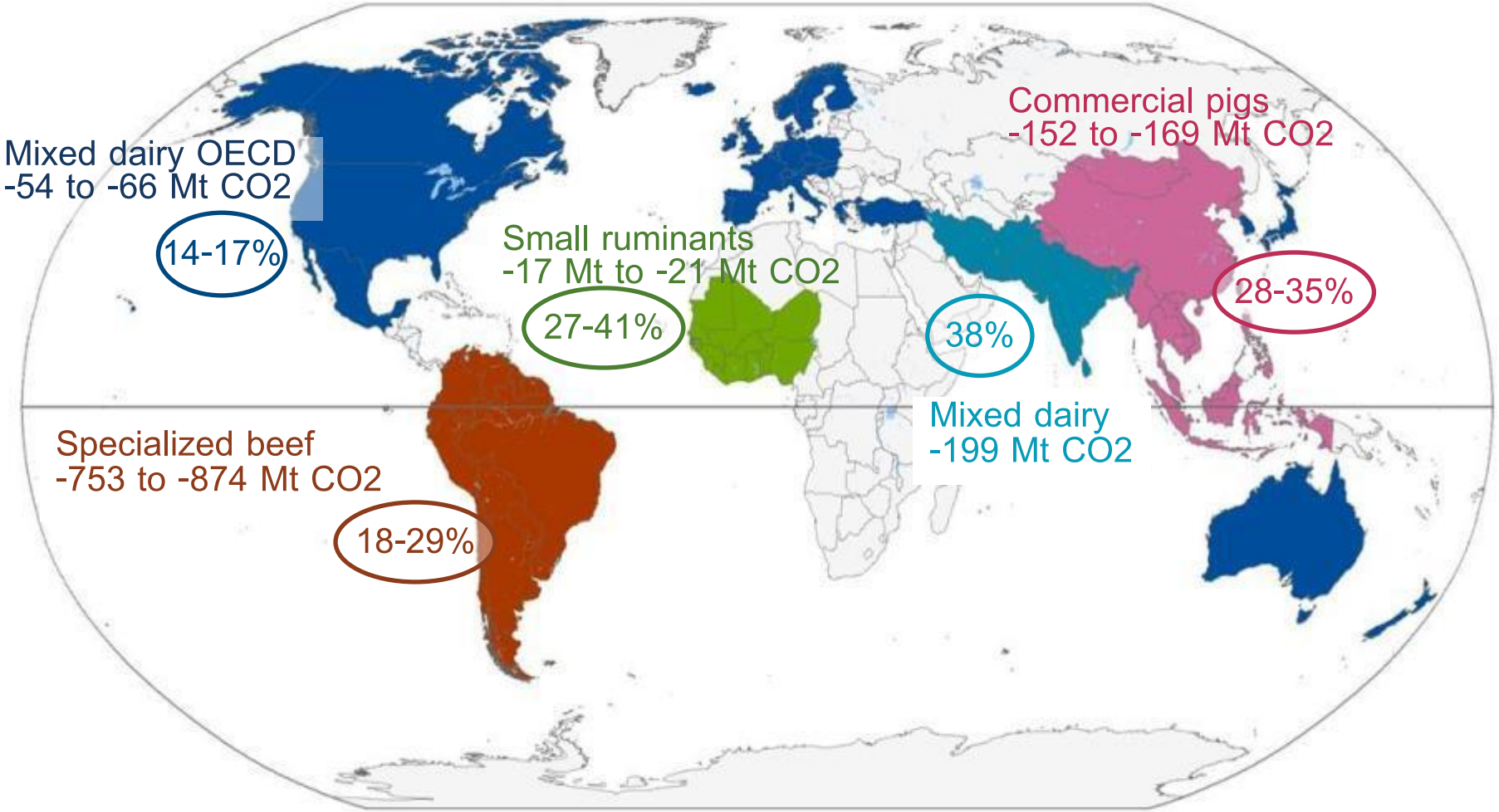
Case studies in selected regions: mitigation packages



Assumptions based on:

- understanding of sector contribution to emissions and key drivers of emissions
- selection of technical feasible options in different production systems and regions
- economic feasibility and implications on food security

Case studies: mitigation potential



Adaptation

Adaptation is a necessity and an opportunity

- Large exposure of livestock to climate change – extensive systems will be most affected - outmigration
- Some livestock are “natural” adapters; take advantage of changing bio-mass production
- Intensive systems adapt through switching among feeds, and growth/contraction

Sustainable intensification

Intensive systems: Focus on efficiency/feed conversion

- of land and biomass – modern practices based on “opportunistic” feed use
- Nitrogen – optimal use of fertilizer, precision feeding, waste management
- emission intensity
- but consider human health, animal welfare

Through

- Life cycle analysis
- Economics of mitigation

Integrated grassland management

Extensive Systems

- Focus on multitude of services from grasslands: social and environmental benefits
- Land – grazing management, pasture improvement, silvo-pastoral systems

Through:

- Payments for environmental services (incl. soil carbon)
- Institutional change and land use arrangements/regulations

Mitigation/adaptation through consumption

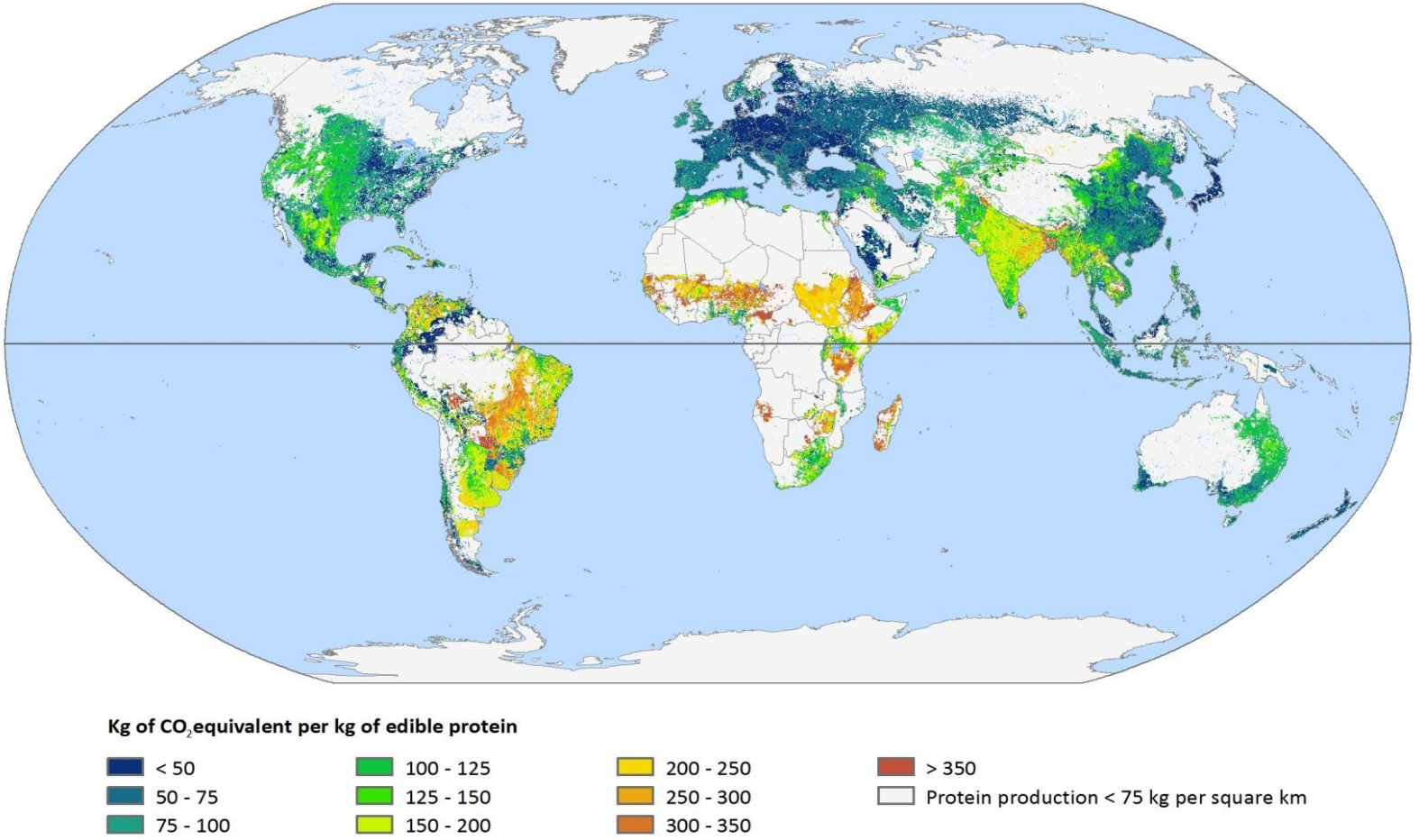
- Reduction of consumption where unhealthy
- Shift to low-emission products (eggs, poultry meat, dairy, farmed fish)

Through

- Awareness building
- Marketing and supply chain management

Geographic Distribution of Emission Intensity

(per unit of edible protein from livestock)



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Thank you

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www.livestockdialogue.org