Mitigation of climate change in livestock systems in Kenya

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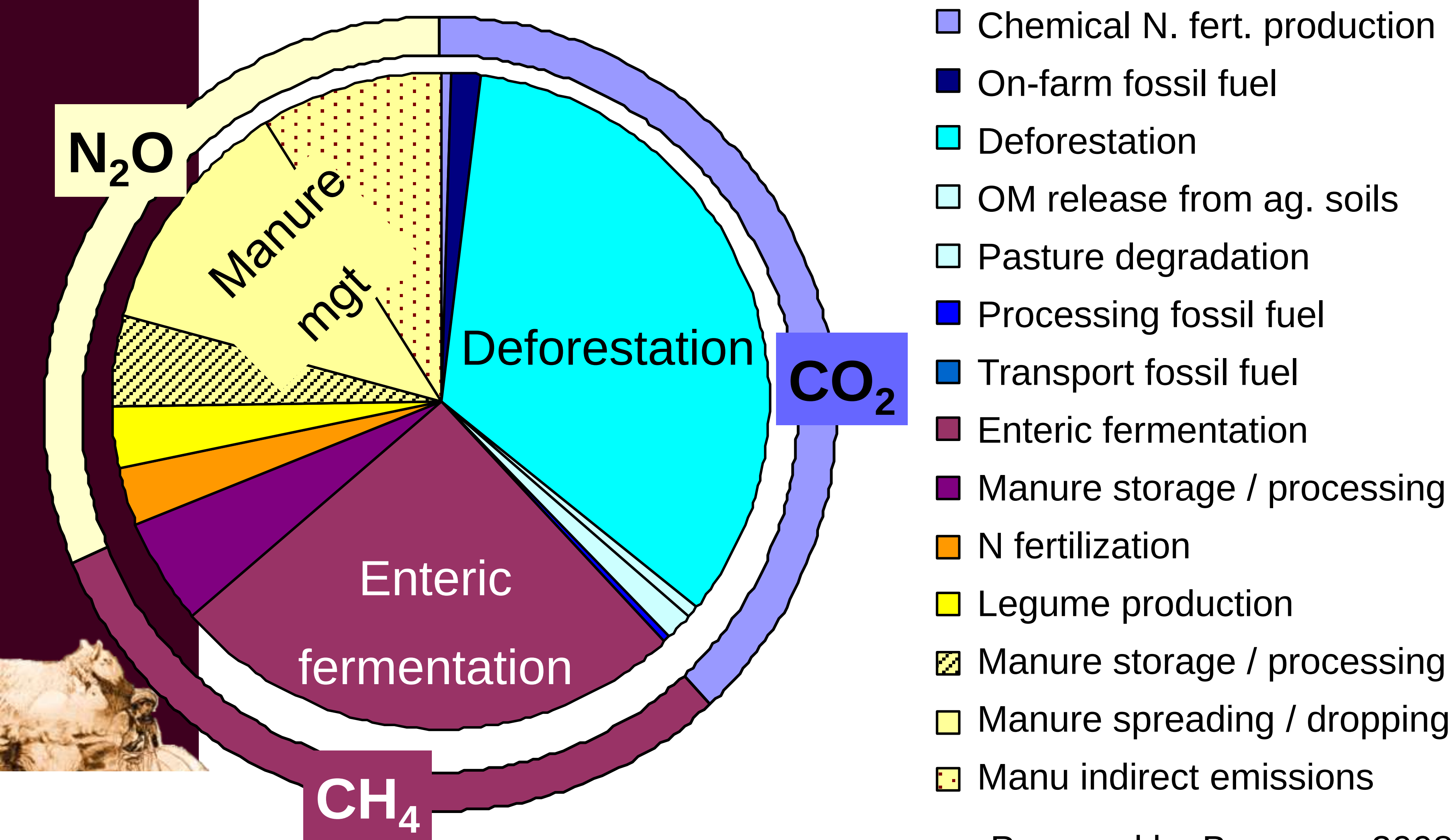
Structure of the presentation

- ✓ Background and concepts
- ✓ Methods
- ✓ Diets
- ✓ Scenarios
- ✓ Mitigation strategies tested
- ✓ conclusions

Livestock and GHG: 18% of global emissions



Prepared by Bonneau, 2008

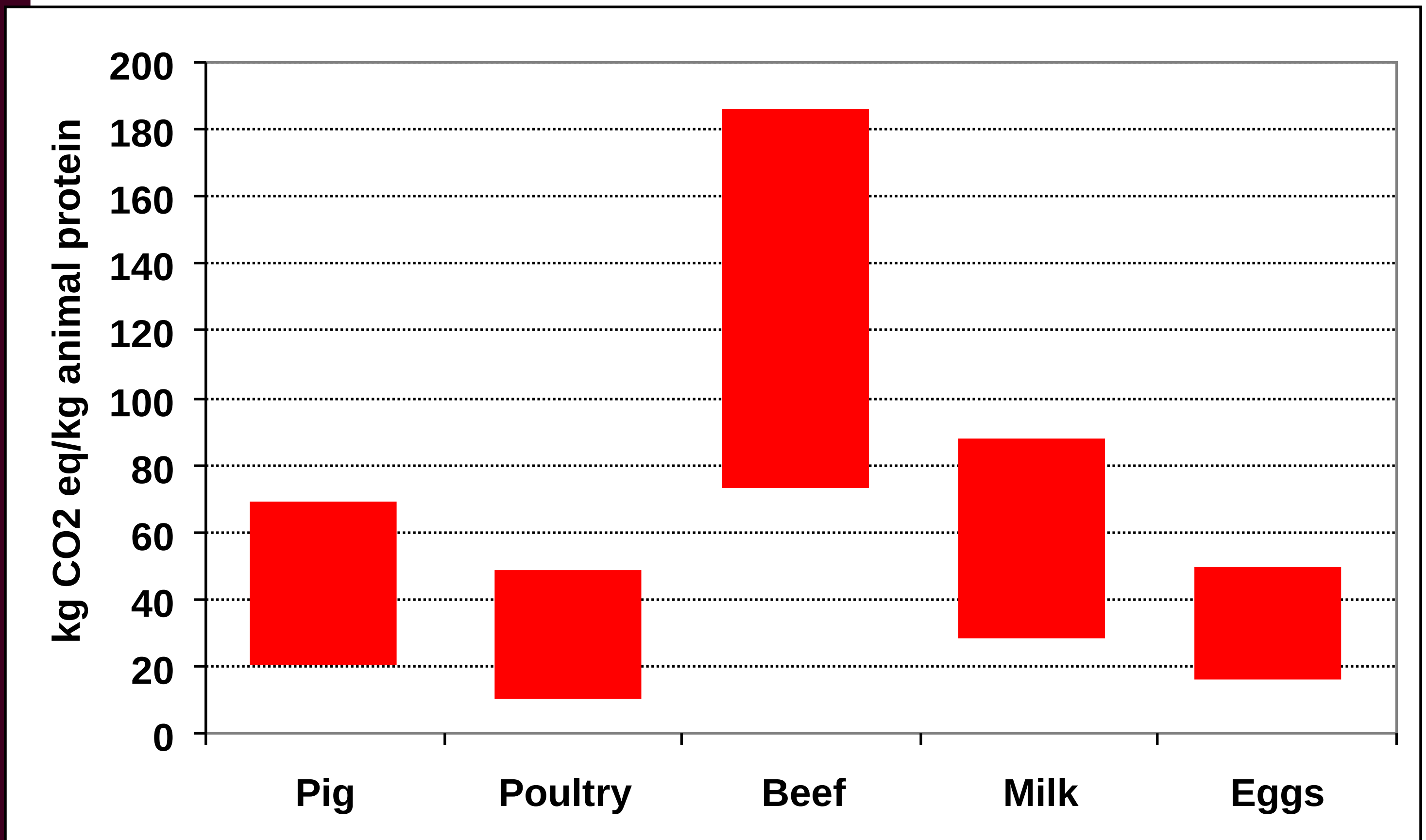
Mitigation options

- Reductions in emissions: significant potential!

  - ✓ Managing demand for animal products
  - ✓ Improved / intensified diets for ruminants
  - ✓ Reduction of animal numbers
  - ✓ Reduced livestock-induced deforestation
  - ✓ Change of animal species
  - ✓ Feed additives to reduce enteric fermentation
  - ✓ Manure management (feed additives, methane production, regulations for manure disposal)
  - ✓ Carbon sequestration

Herrero et al. (Current Opinion in Environmental Sustainability 2009, 1: 111-120)

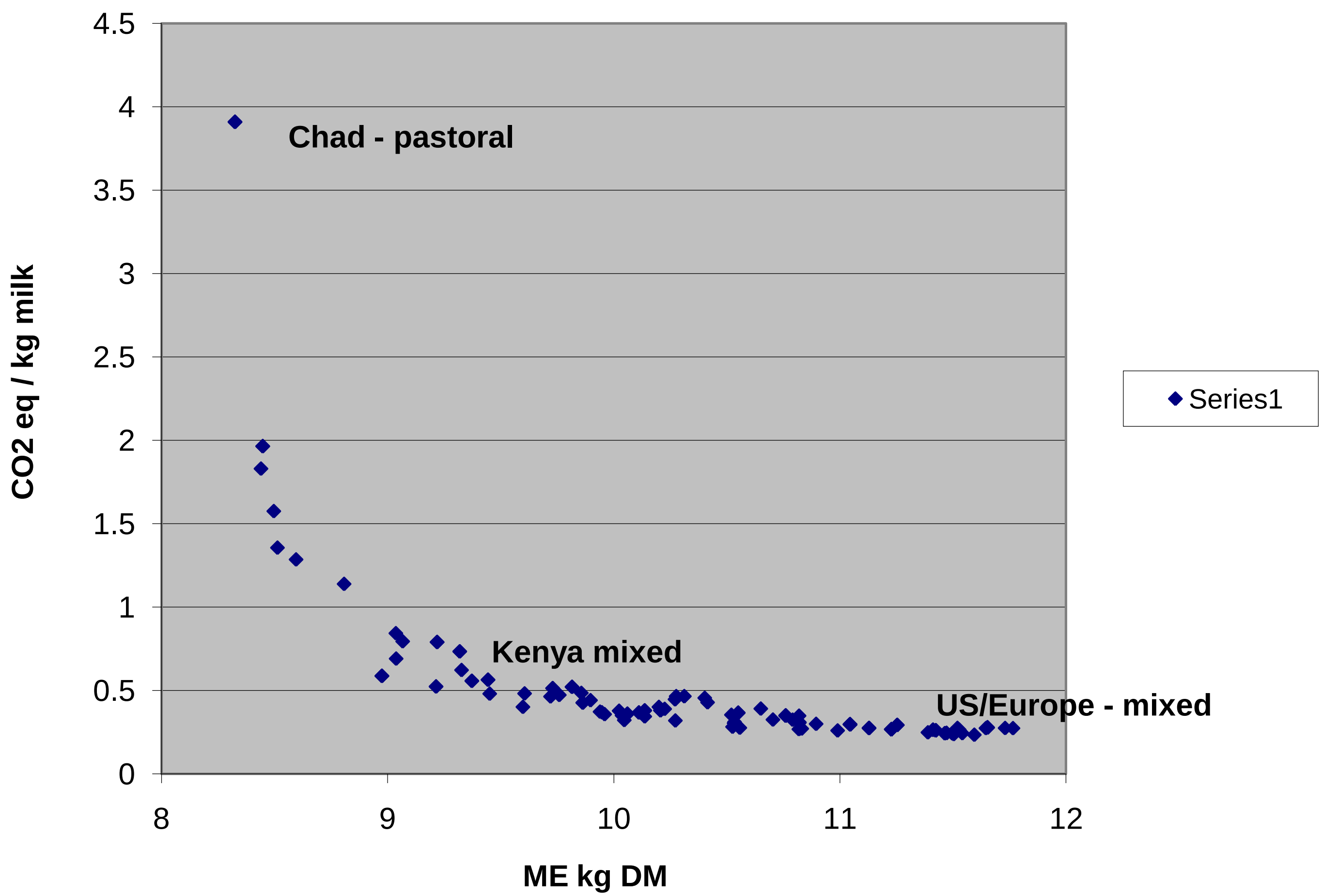
Range of GHG intensities for commodities in OECD-countries



Source: DeVries & DeBoer (2009)

Mitigation 101 – intensification is essential

The better we feed cows the less methane per kg of milk they produce



Herrero et al (forthcoming)

Can we tap the potential for carbon sequestration in rangeland systems?

Largest land use system

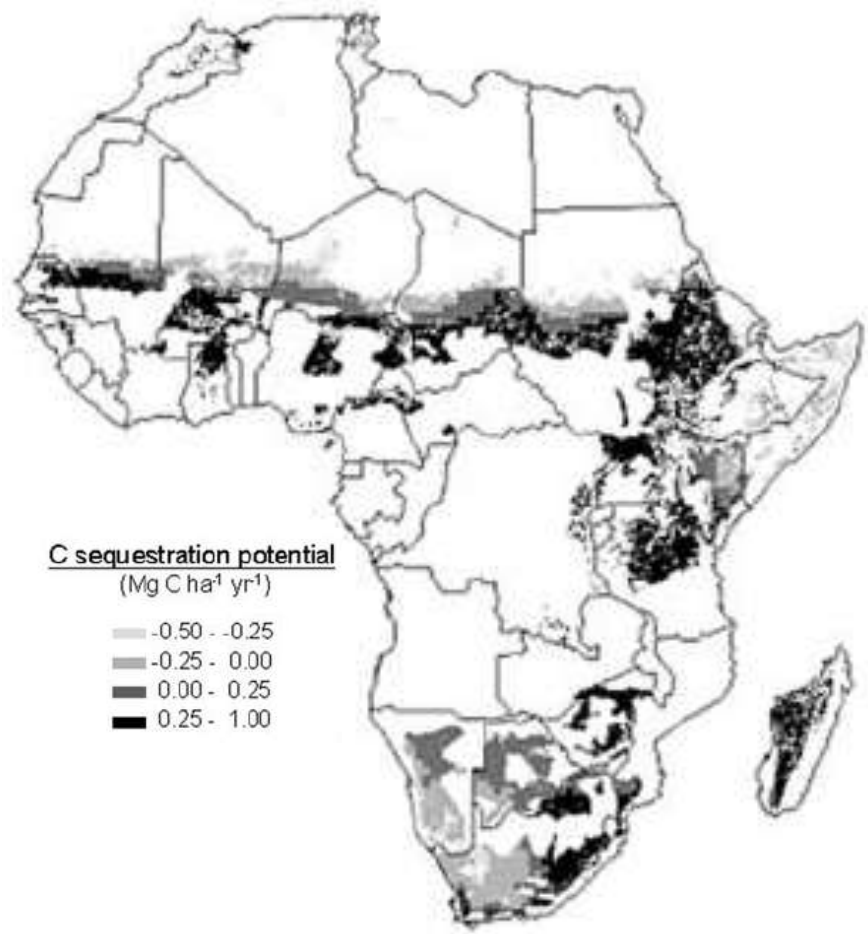
Potentially a large C sink

Could be an important income diversification source

Difficulties in: Measuring and monitoring C stocks

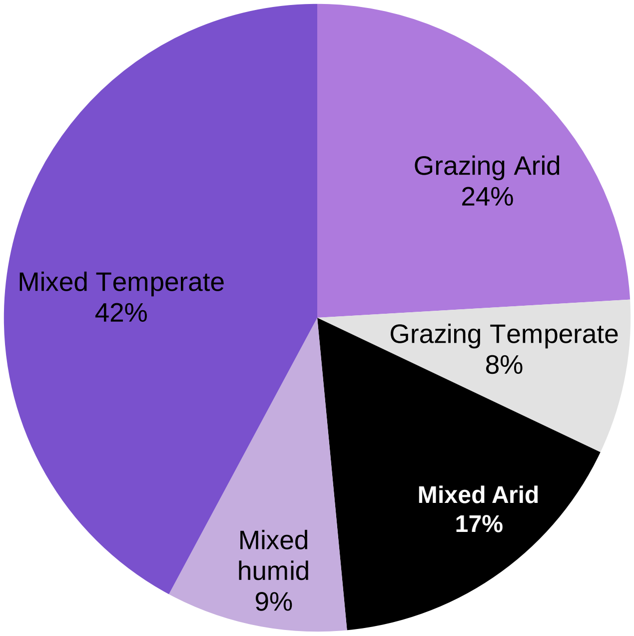
Establishment of payment schemes

Dealing with mobile pastoralists



Potential for carbon sequestration in rangelands (Conant and Paustian 2002)

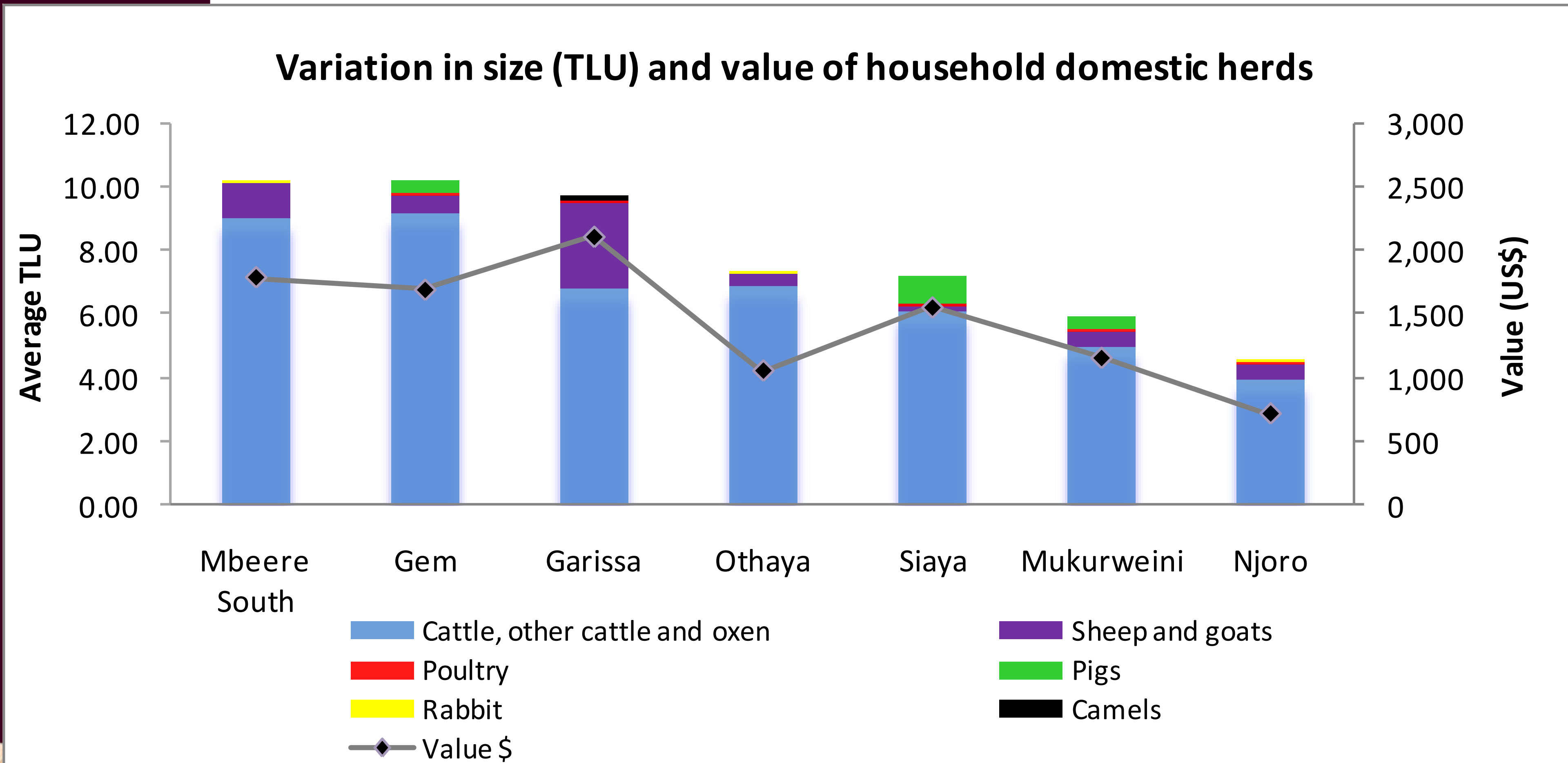
Kenya
Methane production from ruminants (Herrero et al 2008)



1.1 billion tonnes CO2 eq
68% mixed systems / 32% grazing systems
50% from the highlands
85% from cattle

Methodology

- Survey in 6 districts
- Livestock species, productivity, feeding practices, etc
- Baseline diets for animals
- Simulations of productivity, methane and manure
- Scenarios with alternative diets
- Recalculation of productivity, methane and manure



Cattle dominates herds

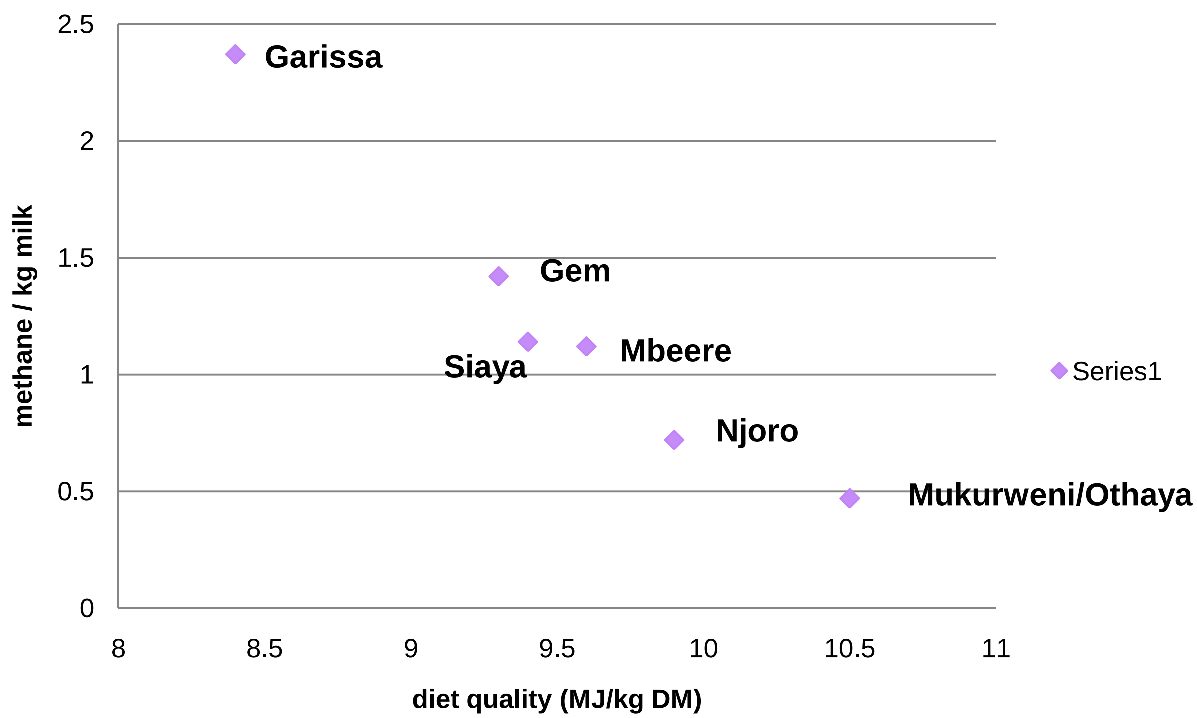
Milk production and diets for cattle in the 6 districts

District	Milk per cow (kg/yr)	Rangeland grazing	Maize stover	Cut and carry fodder	Roadside weeds	Grain supplements
Garissa	275	X				
Gem	548	X	X	X	X	X
Mbeere S	860	X	X	X	X	X
Njoro	1256	X	X	X	X	X
Mukurweni	2089		X	X	X	
Othaya	2035		X			
Siaya	706		X			

Manure and methane production for the baseline diets in the six districts

District	Energy density of the diet (MJ ME/kg DM)	Manure per animal (kg/yr)	Methane production (CO_2 eq/lactation)	Methane produced per lt of milk (CO_2 eq/lt)
Garissa	8.4	693	796	2.37
Gem	9.3	730	780	1.42
Mbeere S	9.6	693	824	1.12
Njoro	9.9	693	863	0.72
Mukurweni	10.5	657	936	0.47
Othaya	10.5	657	936	0.47
Siaya	9.4	730	838	1.14

Efficiency of GHG emissions from milk production in 6 districts of Kenya



Most common new feeds appearing in the last 10 years and the scenarios simulated

District	Main new feed	Scenarios of use
Garissa	Prosopis spp.	1.5 kg offered in the diet
		3 kg offered in the diet
Gem	Desmodium	1 kg offered in the diet instead of stover
		2 kg offered in the diet instead of stover
Mbeere S	Napier grass	2 kg offered in the diet instead of stover
		3 kg offered in the diet instead of stover
Njoro	Hay	1 kg offered in the diet instead of stover
		2 kg offered in the diet instead of stover
Mukurweni	Desmodium	1 kg offered in the diet instead of stover
		2 kg offered in the diet instead of stover
Othaya	Hay	2 kg offered in the diet instead of stover
		4 kg offered in the diet instead of stover
Siaya	Napier grass	2 kg offered in the diet instead of stover
		3 kg offered in the diet instead of stover

Impact of alternative feeding strategies on milk, manure and methane production

District	Scenario	Milk production	Manure production	Methane production	Methane per kg milk
Garissa	Prosopis				
	1.5 kg	64	0	-2	-40
	3 kg	136	0	-5	-60
Gem	Desmodium				
	1 kg	21	5	-3	-20
	2 kg	36	10	0	-26
Mbeere	Napier grass				
	2 kg	12	11	3	-8
	3 kg	17	16	2	-12
Njoro	Hay				
	1 kg	18	-5	6	-10
	2 kg	49	-5	18	-21
Mukurweni	Desmodium				
	1 kg	9	11	2	-7
	2 kg	8	11	0	-7
Othaya	Hay				
	2 kg	9	11	2	-7
	4 kg	8	11	0	-7
Siaya	Napier grass				
	2 kg	42	0	12	-21
	3 kg	79	10	16	-35
6 districts	Average	36	6	4	-20

Conclusions

- Significant potential for mitigation (and adaptation) in livestock systems through improving diets for ruminants

- Real mitigation potential only exploited by producing the same amounts of milk with less but better fed animals

- Large differences exist between the regions under study, with the largest potential improvements in the districts with the poorer feed resources available.

- Achieving higher efficiency in GHG management will require incentives for farmers to follow a market-oriented dairy focus for their farms

- Essential to test more options