CLIMATE-SMART Agriculture 2015

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Climate-smart livestock systems: lessons and future research

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Livestock – the big numbers

- 17 billion domestic animals globally! (SOFA 2009)…almost 20 billion now!
- 30% of the Earth's ice-free surface occupied by livestock systems (Reid et al 2008)
- 1/3 of global cropland used for feed production
- 8-18% of GHG emissions (FAO 2013 and others)
- 72% of deforestation (Nepstad et al 2011)
- 32% of global freshwater consumption (FAO 2006, de Fraiture et al. 2007; Heinke et al, 2014)

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The demand for livestock products to 2050

		Annual per capita consumption		Total consumption	
	year	Meat (kg)	Milk (kg)	Meat (Mt)	Milk (Mt)
Developing	2002 2050	28 44	44 78	137 326	222 585
Developed	2002 2050	78 94	202 216	102 126	265 295

Rosegrant et al 2009

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Livestock's multiple socio-economic benefits

- Livestock are a significant global asset: value of at least $1.4 trillion (excluding infrastructure that supports livestock industries) (Thornton and Herrero 2008)
- Livestock industries organised in long market chains that provide incomes and/or employ at least 1.3 billion people (LID 1999)
- 1/3 protein supply, key nutrient provision for under 5s
- Livestock GDP: 20-40% of agricultural GDP but investment ratio 1:10 livestock to crops)
- Livestock support the lives of 800 million people and are key for mnaging risk in arid places

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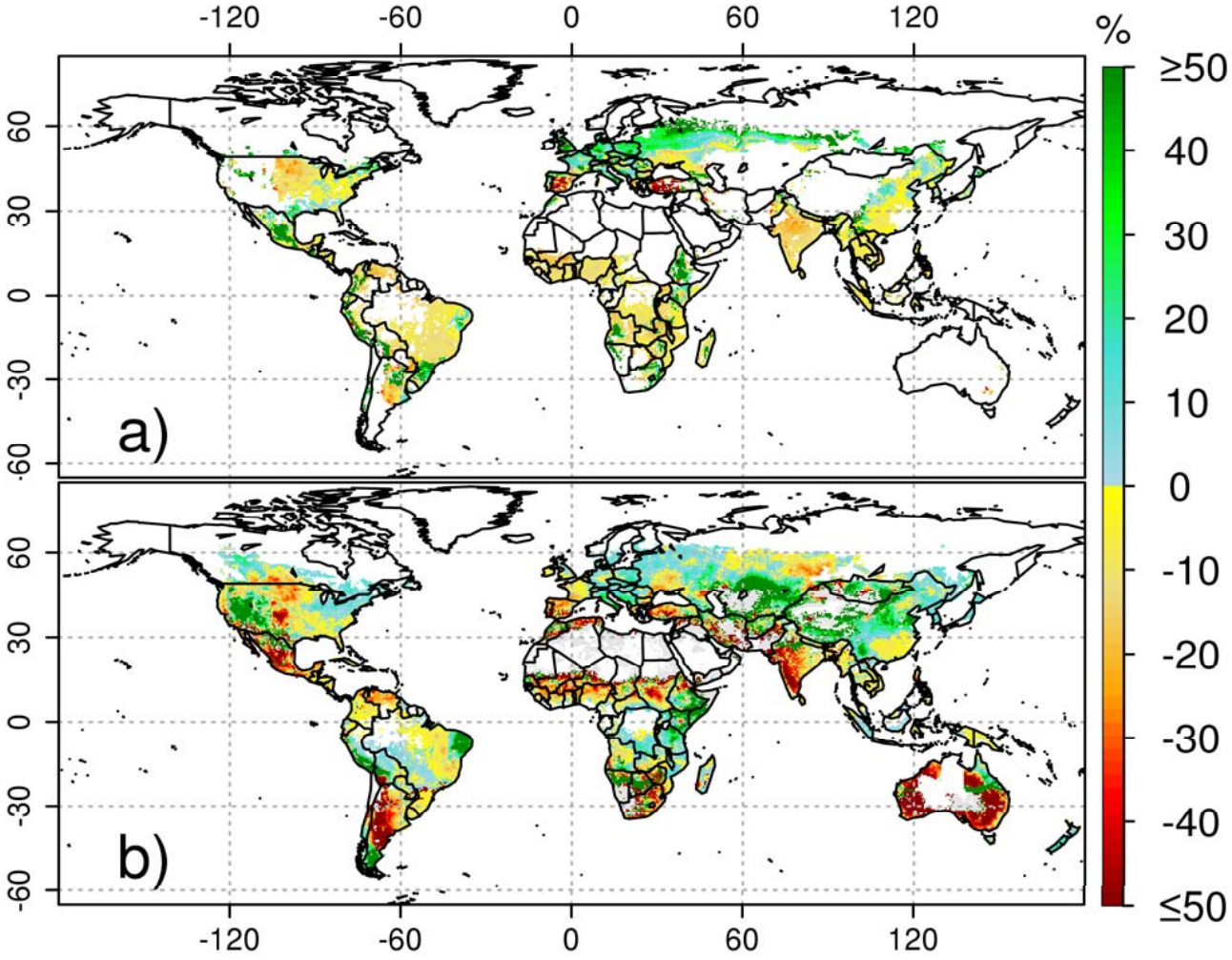
Climate change impacts severe in places

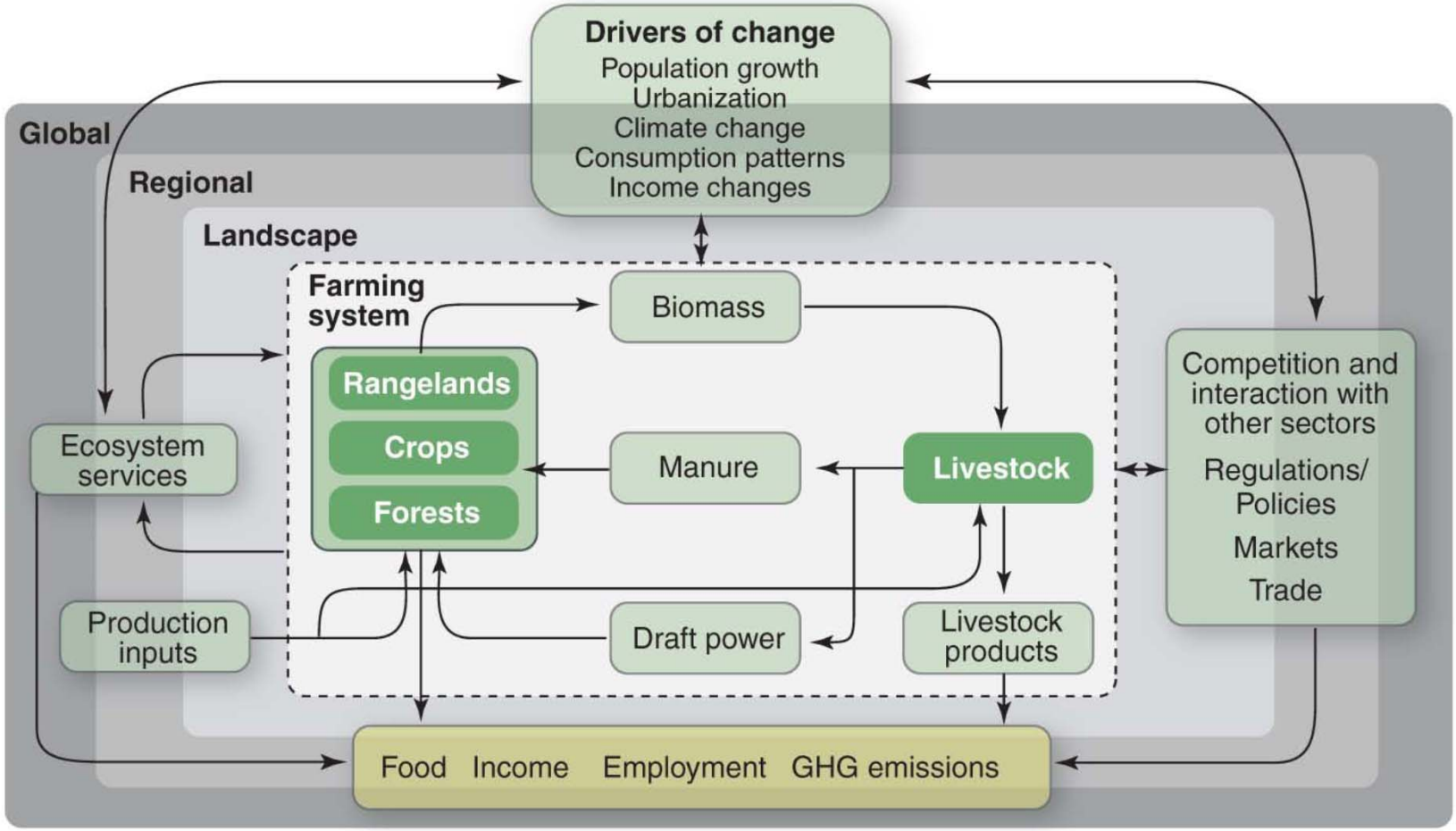
What will happen to feed resources? Diseases? Livestock Productivity?



a) Maize b) pastures

Weindl et al submitted

Key interactions in farming systems



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Herrero et al Science (2010)

What have we learnt?

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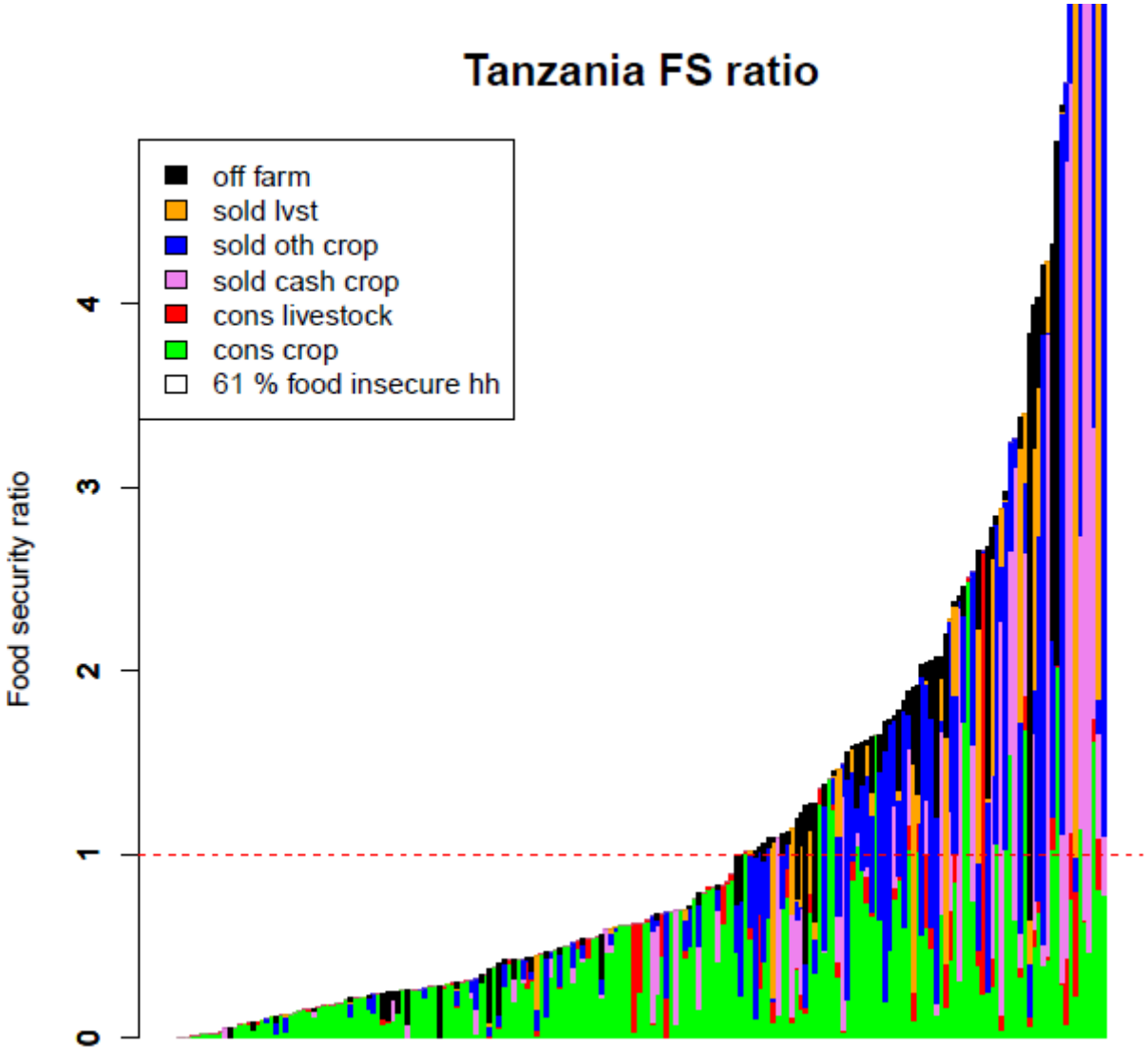
complex !

Lesson 1: different opportunities for different systems

Food security analyses: example of Lushoto, Tanzania



Enormous within site variation in FS

Accompanied by a complete shift in farm orientation

Different types of best-bet interventions for different groups of farmers

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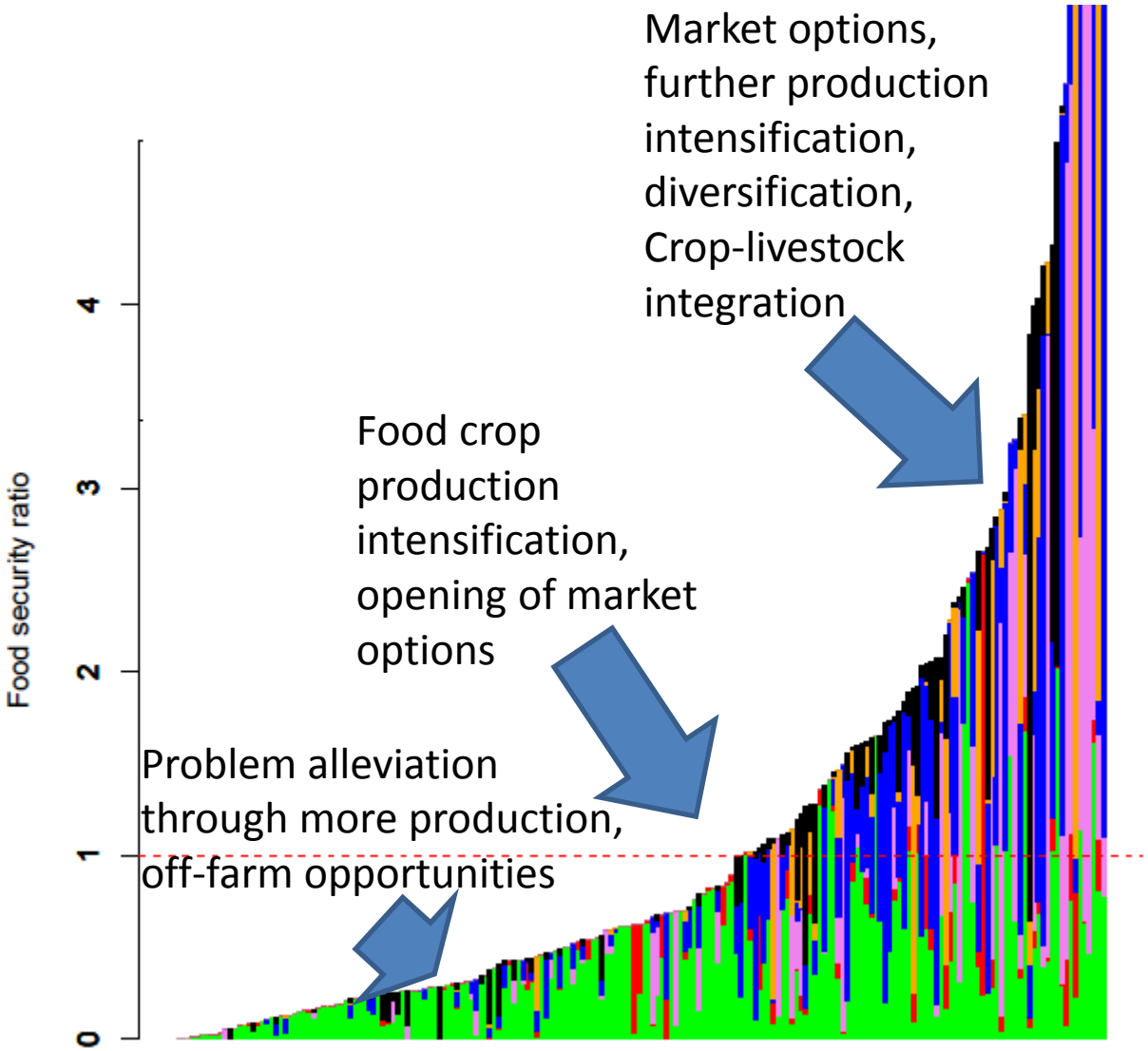
Van Wijk et al 2015

Food security analyses: intervention analysis



Enormous within site variation in FS

Accompanied by a complete shift in farm orientation

Different types of best-bet interventions for different groups of farmers

Van Wijk et al., in prep
Ritzema et al., in prep
Frelat et al., in prep

Lesson 2: We have focused mostly on technological solutions

Impact of alternative feeding strategies on milk, manure and methane production in Kenya (% change over the baseline) (Bryan et al 2012 Climatic Change)

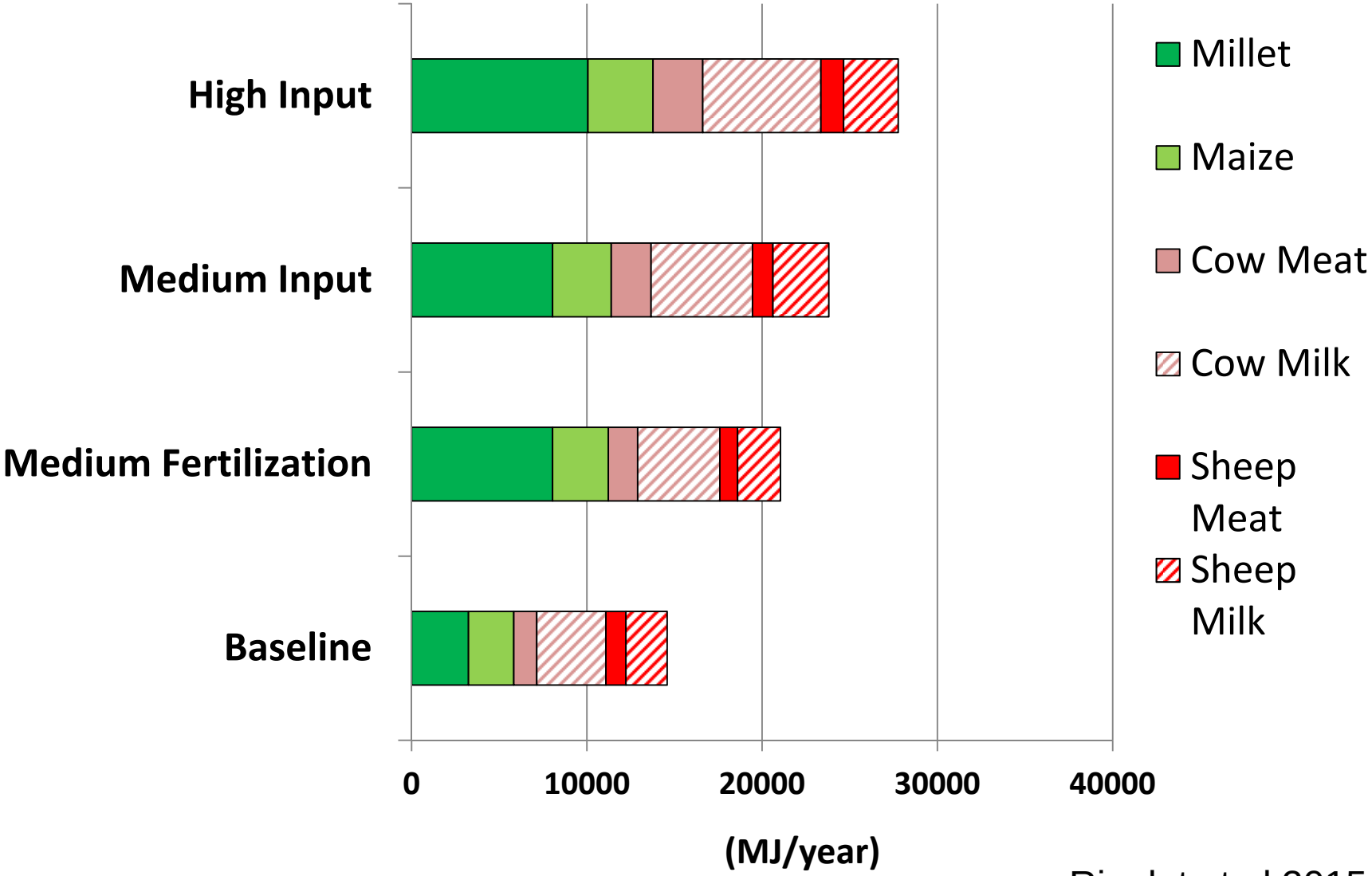
District	Scenario	Milk production	Manure production	Methane production	Methane per kg milk
Garissa	Prosopis				
	1.5 kg	64	0	-2	-40
	3 kg	136	0	-5	-60
Gem	Desmodium				
	1 kg	21	5	-3	-20
	2 kg	36	10	0	-26
Mbeere	Napier grass				
	2 kg	12	11	3	-8
	3 kg	17	16	2	-12
Njoro	Hay				
	1 kg	18	-5	6	-10
	2 kg	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

Testing packages of Interventions

	Residue Collection	Fertilization Level	Animal Supplementation	Target Feeding
High supplementation and fertilization	**yes**	**+60kgN/ha cereal**	**+3kg/day**	**yes**
Medium supplementation and fertilization	**yes**	**+30kgN/ha cereal**	**+1kg/day**	**yes**
Medium Fertilization no supplementation	**yes**	**+30kgN/ha cereal**	**no**	**no**
Baseline	**yes**	**no**	**no**	**no**

Rigolot et al 2015

Average household kcal production



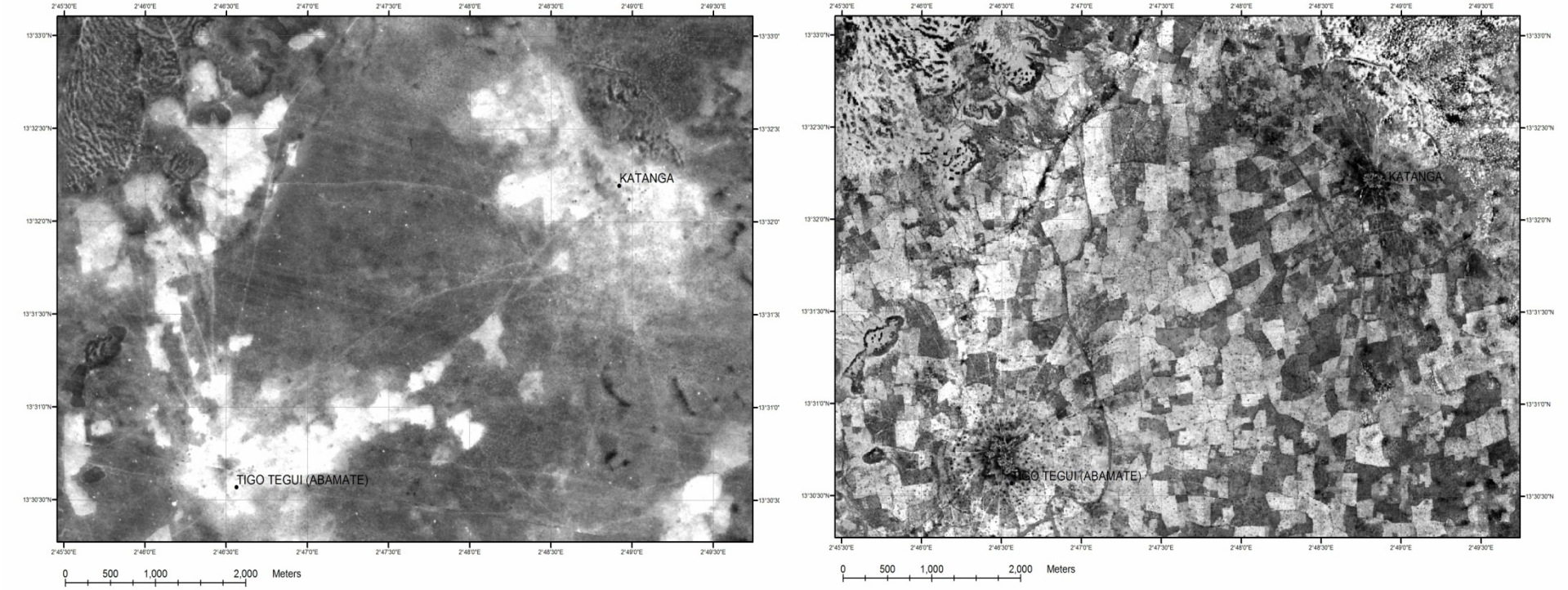
Rigolot et al 2015

Lesson 3: transformational adaptation will be essential for the livestock sector

Systems and livelihoods in transition: the target is moving!

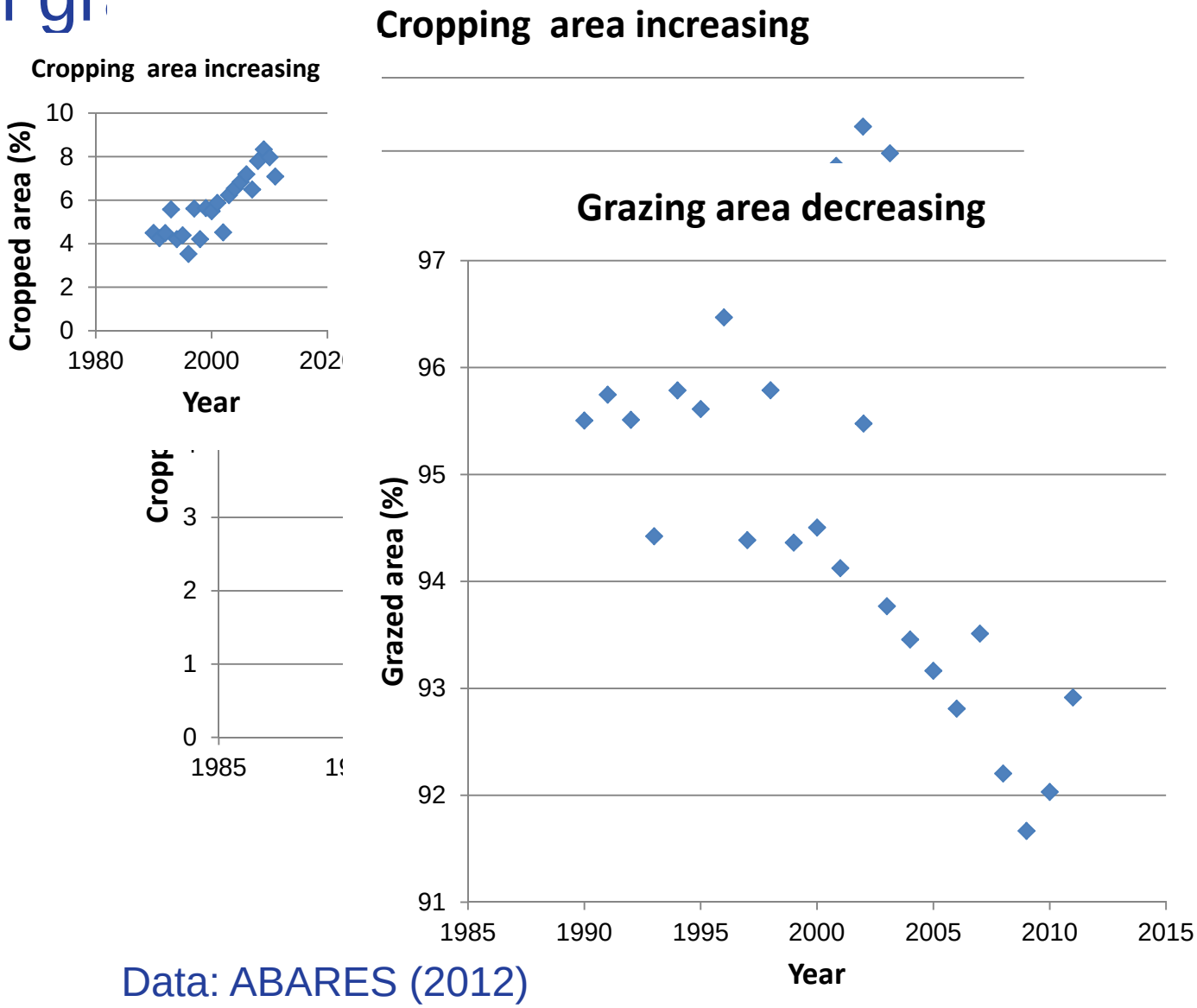
Can we ensure that the next transition is sustainable, equitable and helps feed the world?

W. Africa 1966 – pastoral system → 2004 – crop-livestock system



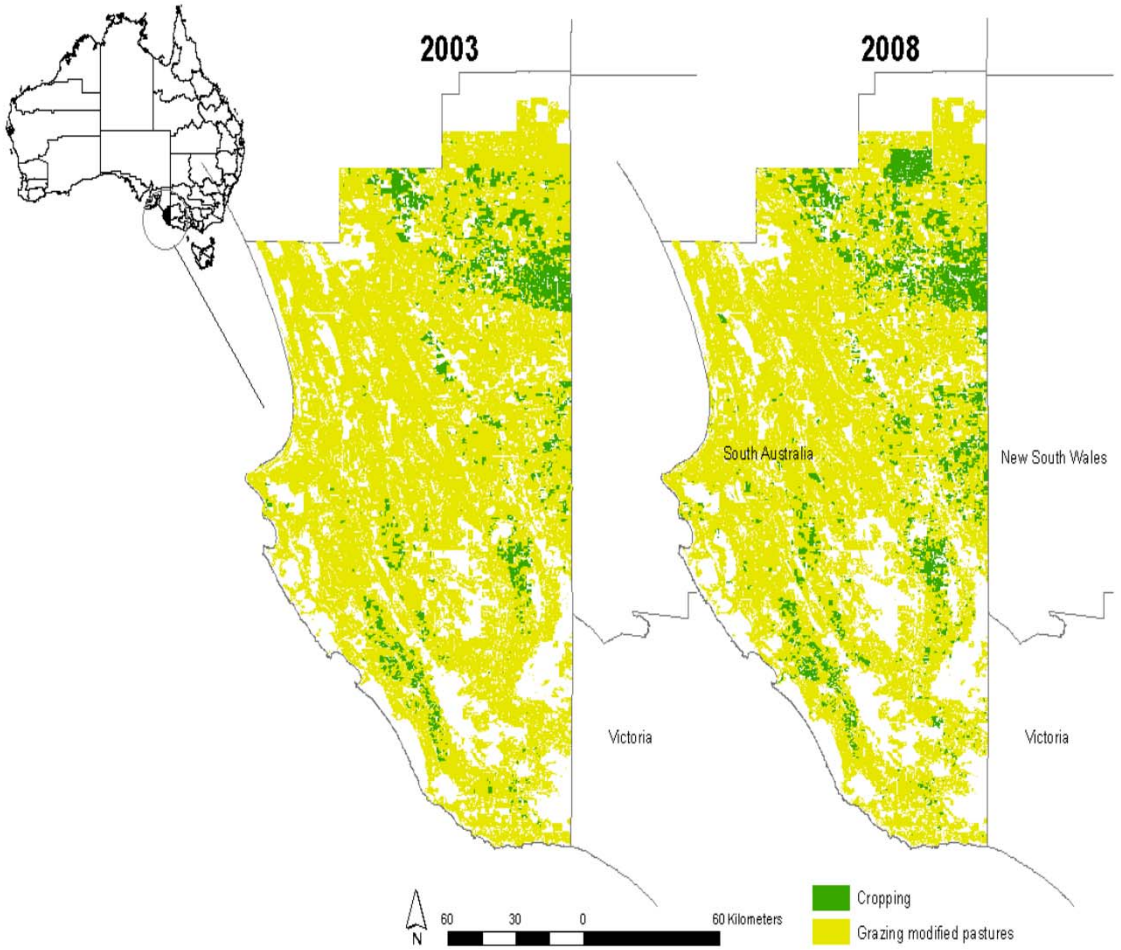
Australia - high rainfall zone land use:

from gr



Data: ABARES (2012)

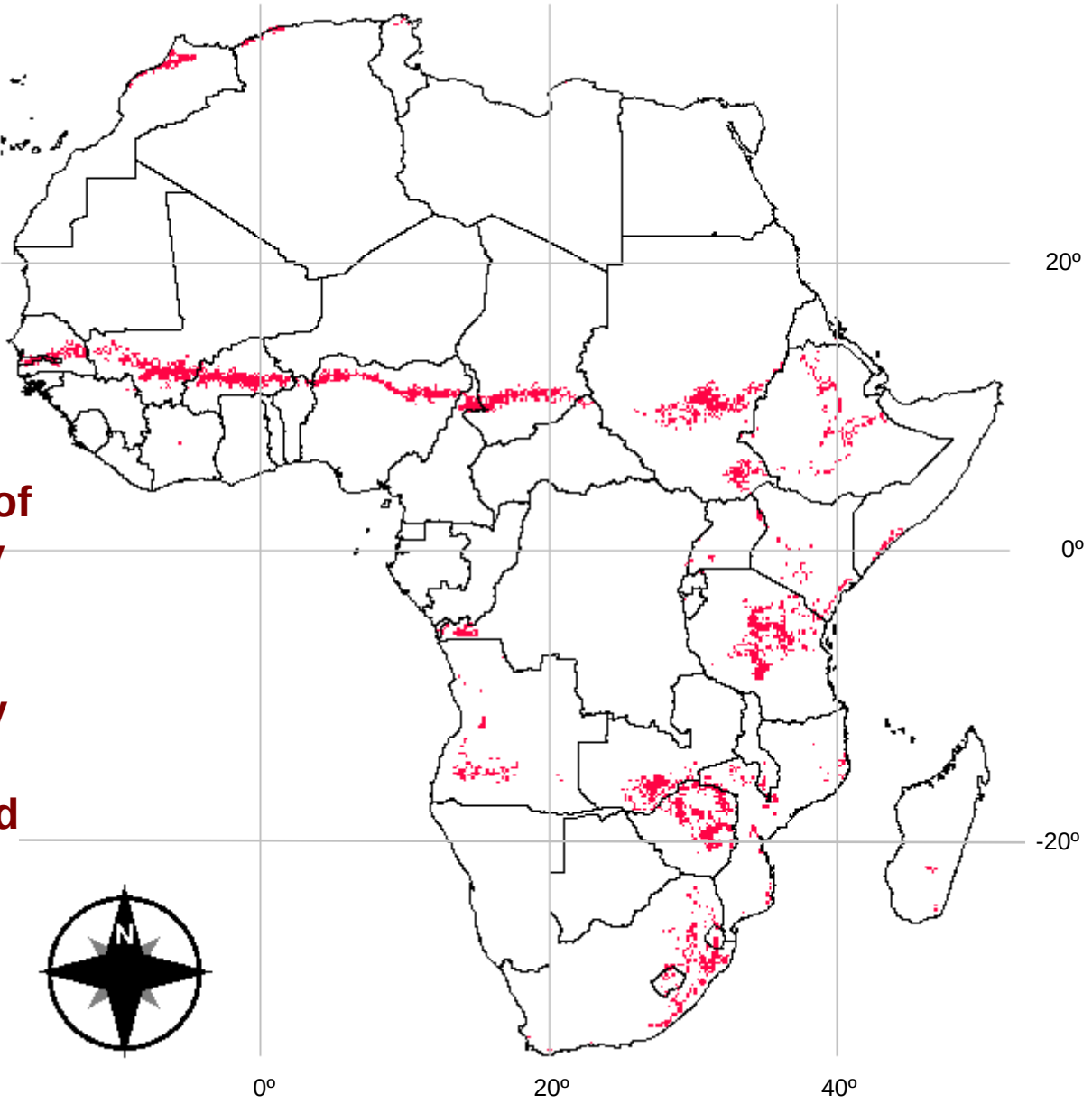
Opportunities: land use change



An extra 52000ha cropped: Nidumolu (2010)

From croppers to livestock keepers

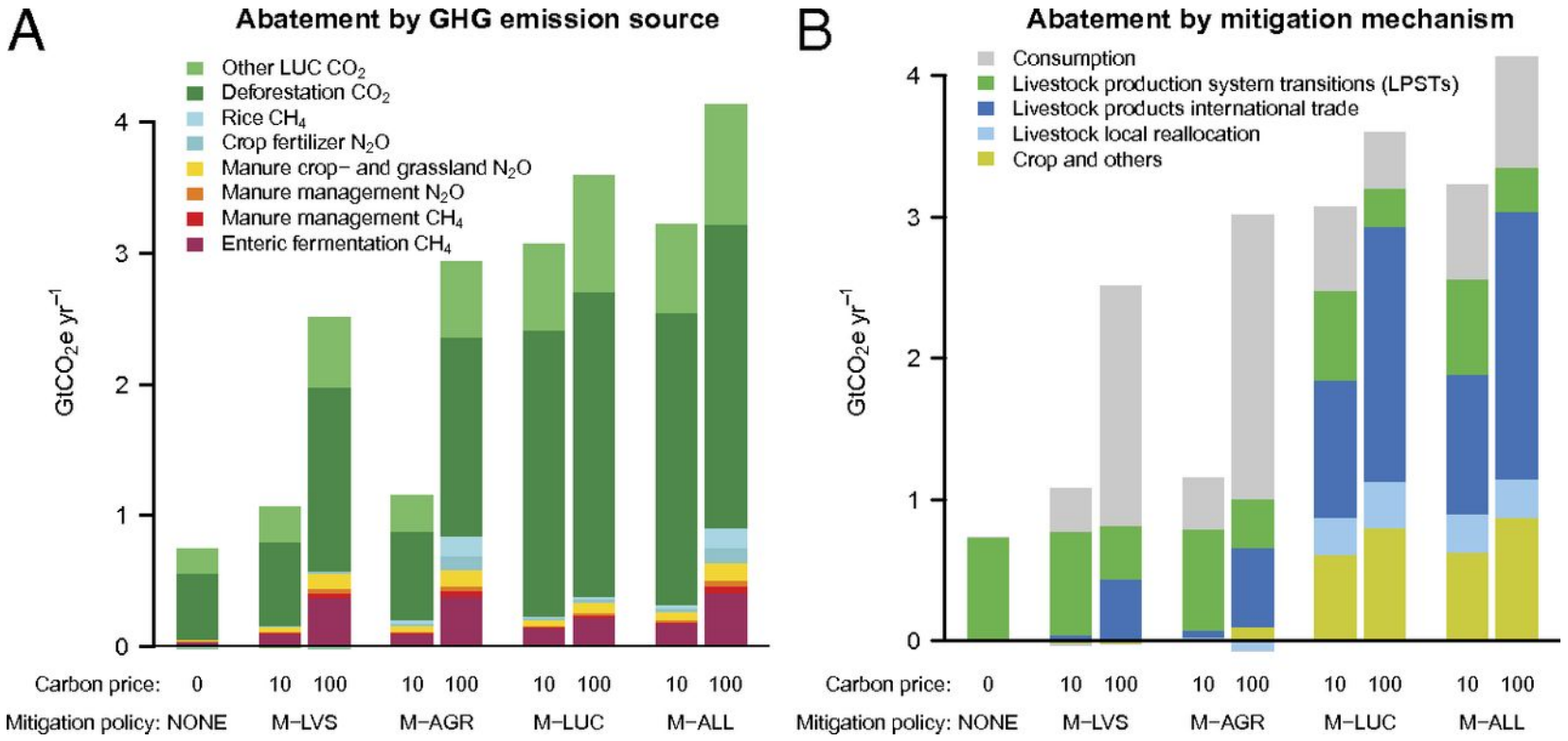
Areas where cropping of an indicator cereal may become unviable between now and 2050 and where farmers may have to rely more on livestock as a livelihood strategy



Jones & Thornton (2008)

Transitions from livestock systems to mixed systems could meet livestock product demands at lower GHG emissions

Relocation of production and trade could also be important



Petr Havlík et al. PNAS 2014;111:3709-3714

Lesson 4 - Transformation can be costly if not well planned

Searchinger et al NCC 2015

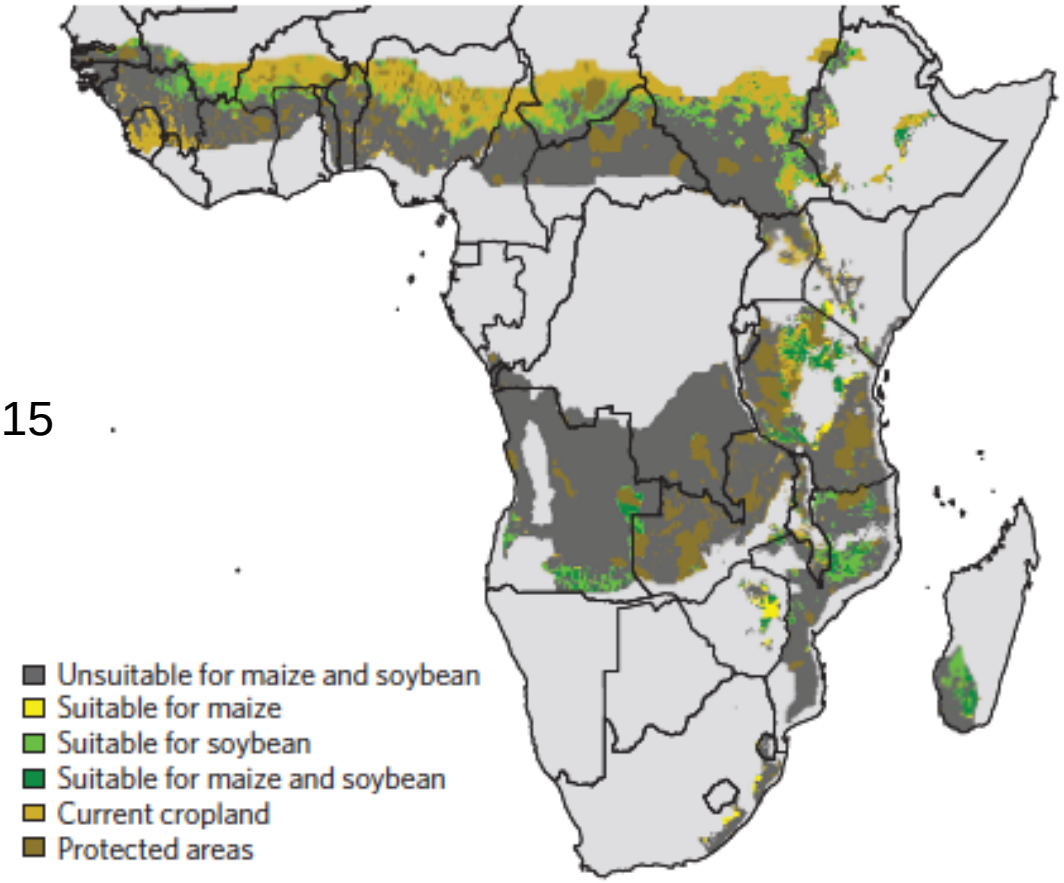


Figure 2 | Low-carbon potential cropland sites. Suitable: yields $\geq$4 t ha^{-1} (maize) or 1.5 t ha^{-1} (soybeans), yield CV $\leq$30%, crop season failure rates $\leq$10%, and carbon loss/yield ratios 33% lower than global averages for each crop.

Concluding remarks

Lesson 5 – agenda still too biophysical
Next big step - From knowledge to action

Lots of progress on the science

need to understand what drives adoption, incentives systems

new partnerships, new institutions, new value chains in places

more robust and realistic policy formulation and smarter scenarios

better monitoring and learning mechanisms

Multiple indicators: beyond GHG emissions intensities

Towards climate and nutrition-smart livestock systems

Designing alternative livestock product demand trajectories part of the solution for health and the environment

What is a sustainable diet and what is the role of livestock?

The land sparing story is no longer enough! Towards better understood social and economic impacts is essential.

- Impacts on employment
- alternative options for producers
- economic impacts
- how to deal with profitable livestock systems in export economies
- effecting behavioural change – consumption
- role of policy

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Thank you!