

# Biodiversity, Ecosystem services, Social sustainability and Tipping points in East African rangelands (BEST)

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ESPA Researchers and Stakeholders Workshop  
Mombasa, June 11<sup>th</sup> 2013

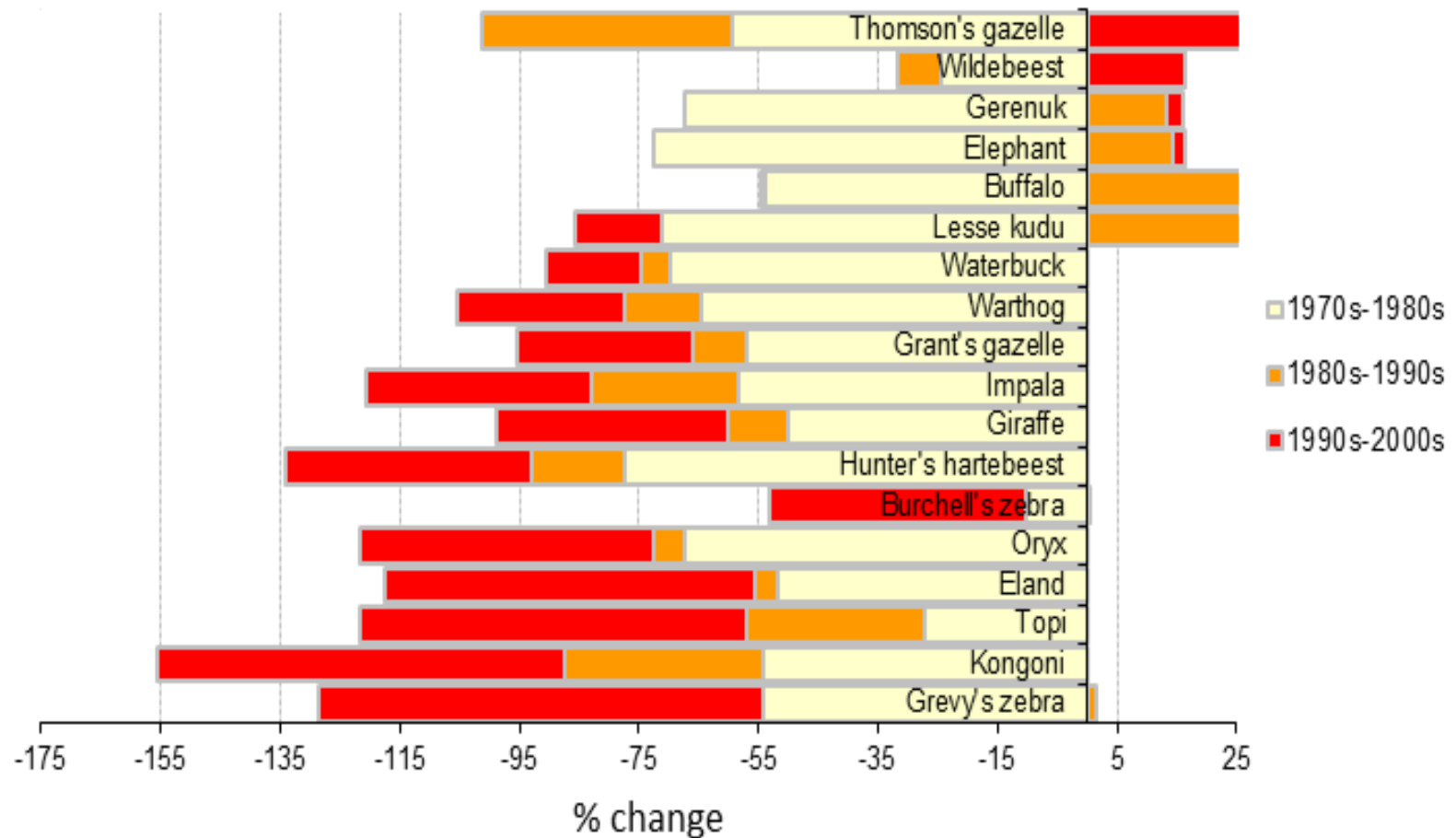


# What is happening in Kenya Rangelands



1. Biodiversity loss - wildlife declined by 50-70% in ASALs in the period 70s-2009 (Norton-Griffiths & Said 2010; Western et al 2009)
2. Livestock populations - vary year to year in response to rainfall, increase 0.6% per annum, high offtake
3. High poverty rates in pastoral communities
4. Emergence of conservancies - more than 40
5. Initiative for communities to benefit from wildlife revenue - Payments for Wildlife Conservation (PWC)

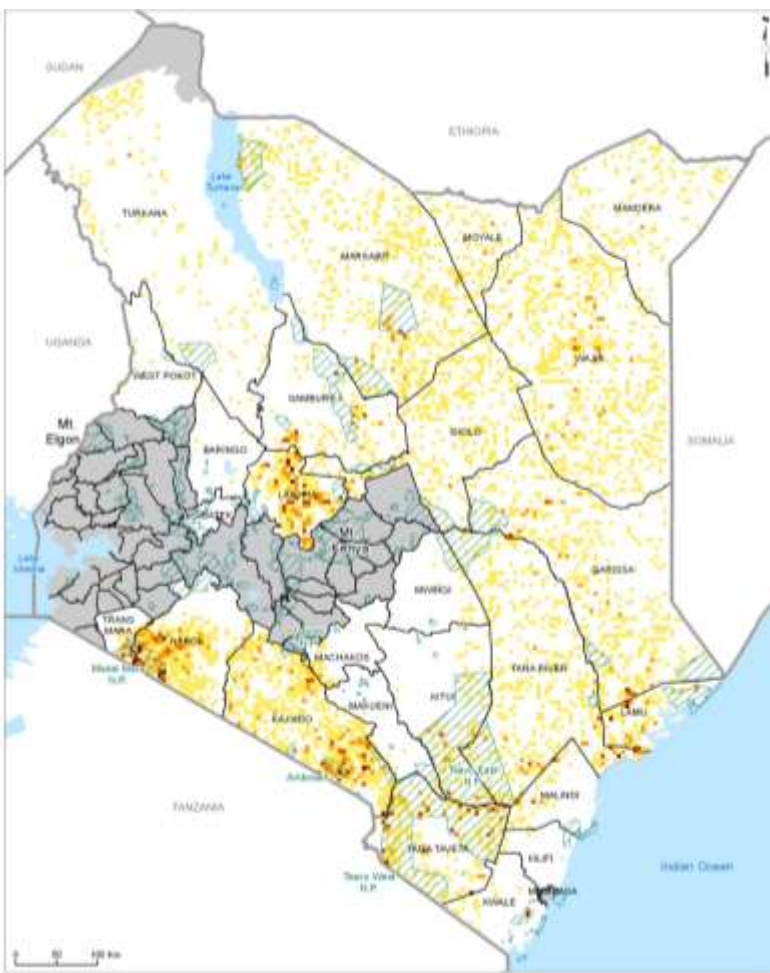
# Wildlife trends in ASALs



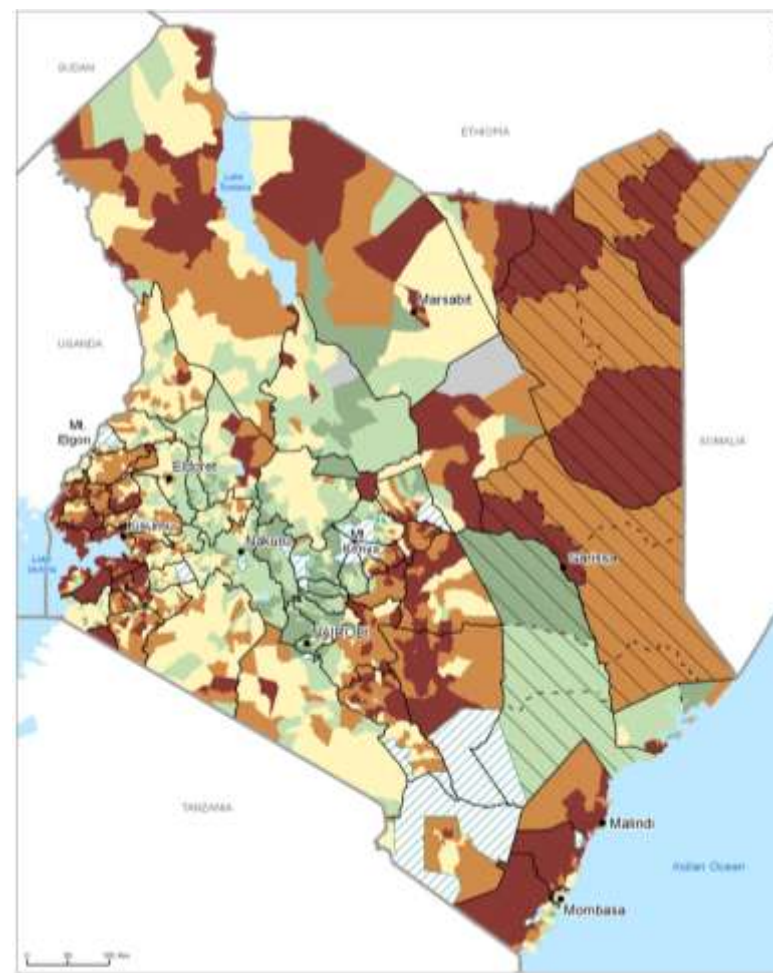
# Wildlife and livestock trends (1990s - 2000s) in relation to biomes

	Cattle	Camel	Donkey	Shoats	Buffalo	Eland	Elephant	Grant's gazelle	Thompson's gazelle	Grant's gazelle	Giraffe	Hunter's hartebeest	Impala	Kongoni	Lesser Kudu	oryx	Ostrich	Topi	Warthog	Waterbuck	Wildebeest	Burchell's zebra	Total	
Forest	↓	↑	↑	↓	↑	↑	↑		↑	↓	↑		↓	↑	↑	↓	↓	↓	↓	↑	↑	↑	↑	
Woodland	↑	↑	↑	↑	↑	↓	↓	↓	↑	↓	↑	↑	↓	↓	↓	↓	↓	↓	↓	↓	↓	↑	↑	↓
Shrubland	↓	↑	↓	↑	↓	↓	↑	↓	↑	↓	↓	↓	↓	↓	↓	↓	↓	↑	↓	↓	↑	↓	↓	↓
Savana grassland	↓	↑	↓	↑	↓	↓	↑	↓	↑	↑	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Desert, dunes and bare areas	↑	↑	↓	↑		↑		↓	↑	↓	↑					↓	↑		↓		↑	↑	↑	↑
Wetlands	↑	↑	↑	↑	↓	↓	↓	↓	↓	↑	↑	↑	↓	↓	↑	↓	↓	↓	↓	↑	↓	↓	↓	↓
Cropland	↓	↑	↑	↑	↑	↓	↑	↓	↑	↓	↑		↓	↓	↓	↑	↓	↓	↓	↓	↑	↓	↑	↑
								<25' Low				↓	Decreasing											
								25-50% Mode				↑	Increasing											
								51-75% High																
								75-100% Very High																

## Wildlife Density in 1990s



## Poverty Rate in 1999



**Can conservancies slow/reverse biodiversity loss and reduce poverty concurrently?**

# Shifts in Land Management in ASALs



Communal

Open

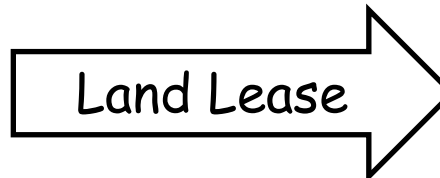
Latent



Privatized

Closed

Gone



# How can policy/ economic incentives improve management of East African rangelands through pastoralists' livelihood choices?

1. How do conservancies affect pastoralist household decisions allocating land, labour and capital to competing livelihood options?
2. What are the economic and ecological outcomes of these decisions, and what are the trade-offs?
3. How do conservancy impacts differ between households which participate in the conservancy and those which are excluded?
4. How can policy and economic incentives encourage more economically and ecologically sustainable livelihood choices?

# Methods

- **Economic games**

- Explore how conservancies prompt changes in livelihood decisions
- Approach:
  - Controlled experiments studying behaviour
  - CPR games based on Maasai Mara grazing resources
  - Explore situations where individual interests conflict with those of group

- **Choice experiments**

- Explore conservancy effects on wellbeing
- Approach:
  - offer choices between pairs of alternative livelihoods futures
  - Each with contrasting levels of herd size, crop area, wage, land set aside, etc
  - Estimates threshold values at which decisions change

- **Stochastic dynamic programming models**

- Explore single-household decisions over 15-yr timeline
- Calculate optimal decision sets for differing wealth/policy scenarios
- Major shift as land availability becomes limiting



# Economic games



Elders allocating wealth counters among cattle (green), cash (blue), conservancy (red) and crops (yellow) options for single-year rounds with different land use



# Choice experiments: showing two of 16 pairs of choices

## Choice 1

	Option 1	Option 2
1. Number of cattle	100	40
2. Number of shoats	0	0
3. Private grazing land and monthly conservancy payments	No private grazing land, 30,000KSh conservancy payments	50ha private grazing land, 15,000KSh conservancy payments
4. Grazing permitted in conservancy during drought	No	No
5. Monthly wage	4,300Ksh	4,300Ksh
6. Area of land cultivated	0	2ha

?

?

?

## Choice 2

	Option 1	Option 2
1. Number of cattle	0	100
2. Number of shoats	0	0
3. Private grazing land and monthly conservancy payments	No private grazing land, 30,000KSh conservancy payments	No private grazing land, 30,000KSh conservancy payments
4. Grazing permitted in conservancy during drought	Yes	No
5. Monthly wage	7,700Ksh	4,300Ksh
6. Area of land cultivated	0	0

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# Key findings:

- Change in
  - land availability
  - Payments (PES)
- Leads to changes in
  - People's evaluation of alternative options
  - People's land use/livelihood decisions
- Outcomes **very** context-dependent

In more detail....

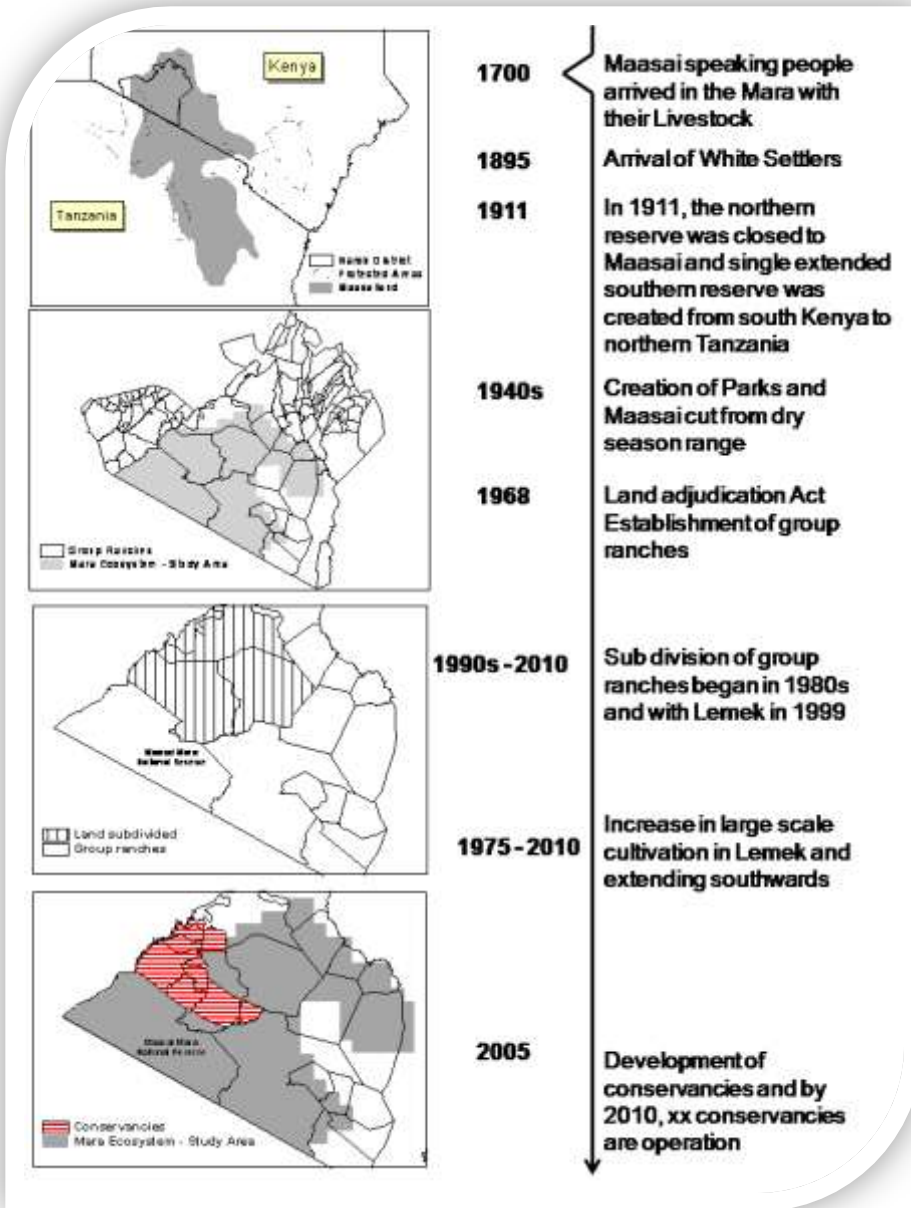
# How do conservancies affect pastoralist household decisions allocating land, labour and capital to competing livelihood options?

Optimal strategies depend on household wealth and land tenure context

Policy scenarios tested:

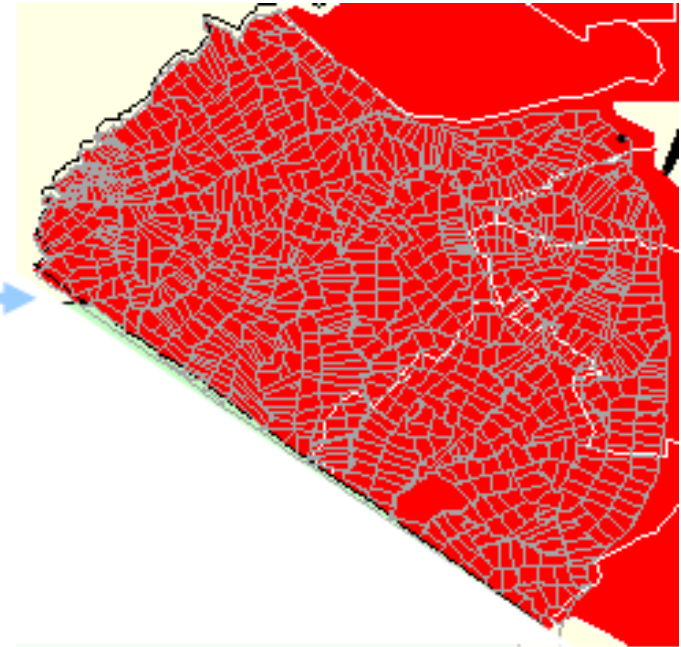
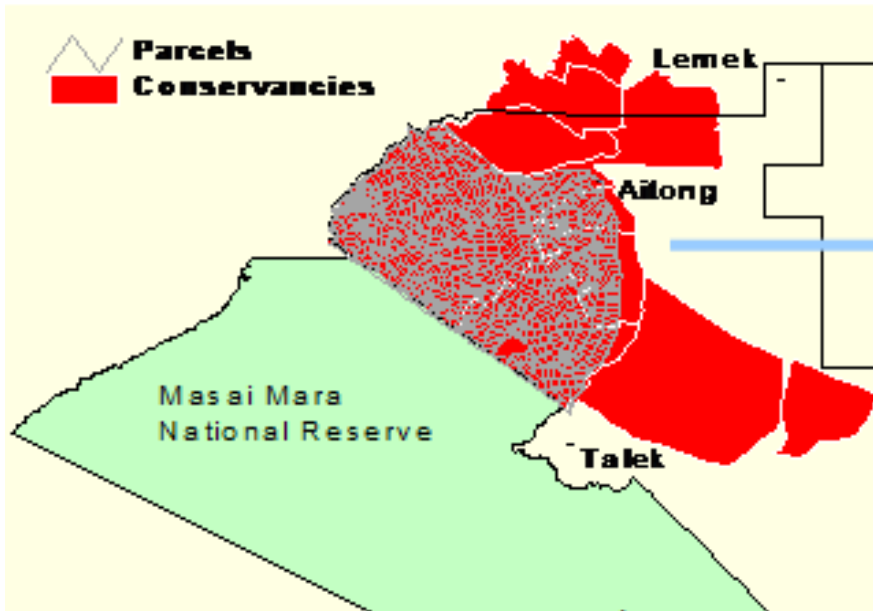
- 1. Communal tenure:** As wealth increases, households shift
  - from small stock + crops + wage labour
  - Through increasing additional investment in cattle
  - To 1<sup>o</sup> cattle + multiple income-generating investments
- 2. Private land, no conservancy:** as above, but
  - Cultivation used by **all**
  - Balance shifts from cattle to cash investment
- 3. Private land, conservancy members: limited land availability → major change**
  - Shift to cattle at lower wealth threshold
  - Stable optimal strategy:
    - smallstock + few cattle + cash investment in other activities.
    - Multiple possible choices re cultivation

# Land tenure and policy changes in the Mara



- In 1911, the Maasai lost about 60% of their best land and pastures
- They were moved from northern reserves to southern reserves
- Land tenure is changing from Group ranches to private ownership
- Subdivision as been followed by land intensification
- Since 2006 land around the Mara have consolidated to form

# Land consolidation



## 1. What are the economic outcomes?

- Depends on externally driven payment (PES) thresholds
- People diversify PROVIDED can access DS grazing

## 2. What are the economic trade-offs?:

- choice experiments allow estimation of threshold/tradeoff values
- PES benefits *vs* decline in primary (livestock-based) income
- Distributional effects - within and between households
  - PES benefits to Landowner household, and (usually) male household head
  - Costs borne by non landowner households and by non-head (often female) household members

# Revenues from Conservancies



Photo Credit: David Huberman (IUCN)



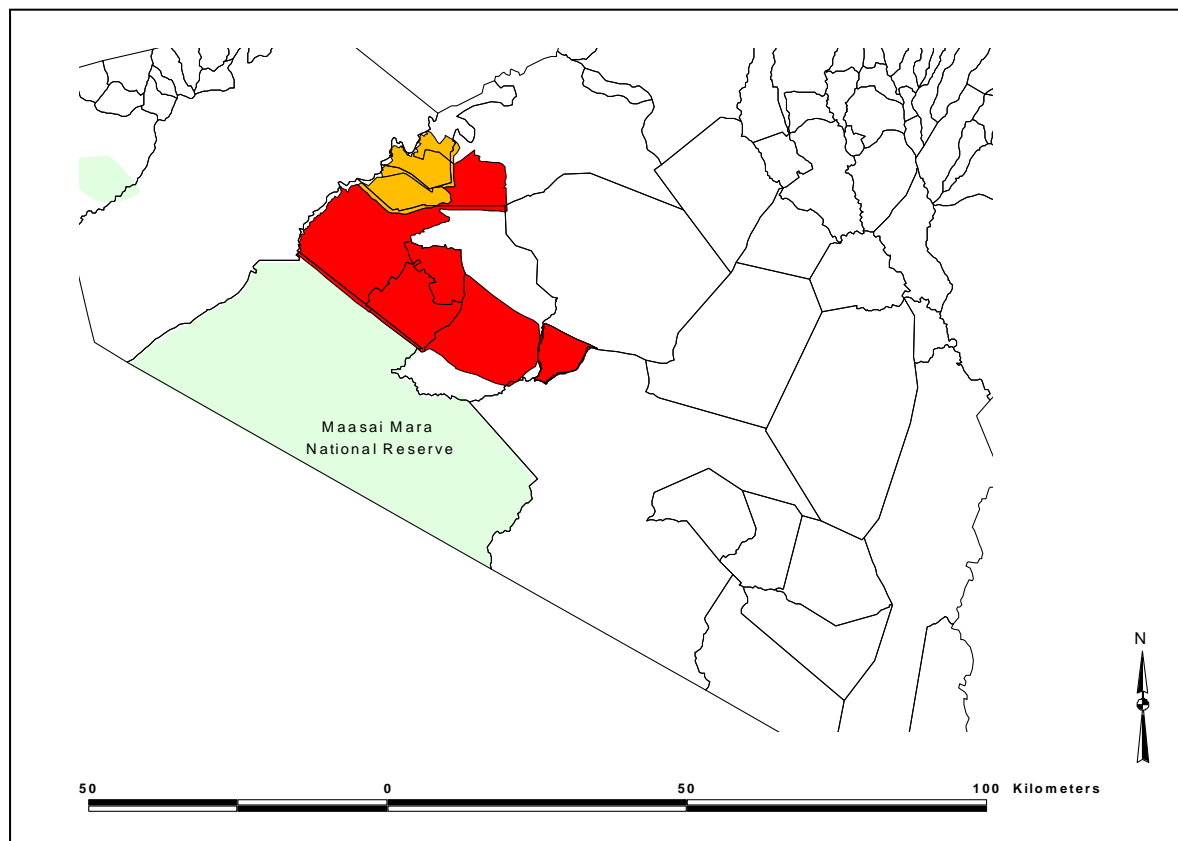


*Mean revenue (US\$ per household per year) for a sub-sample of pastoral households participating in a Payment for Ecosystem Service scheme (enrolled in Olare Orok Conservancy: N=73), and not participating in the PES (N=45) in Maasai Mara Ecosystem (MME)*

Income Source		Year	Income	
			Mean (US\$) HH/yr	Percentage (%) HH
Livestock	OOC	2008	3,180	(55)
		2009	2,280	(46)
	Non-OOC	2008	2,840	(74)
		2009	1,830	(73)
PES		2008	1,730	(30)
		2009	1,860	(37)
Other Income	OOC	2008	920	(16)
		2009	870	(17)
	Non-OOC	2008	990	(26)
		2009	670	(27)
Total	OOC	2008	5,830	
		2009	5,010	
	Non-OOC	2008	3,840	
		2009	2,510	

# PWC and Tipping Points on Private Land

## 2010 Conservancies



### Names & Area (Ha)

1. Olare Orok (9,720)
2. Olkinyei (4,856)
3. Motorogi (5,466)
4. Mara North (30,955)
5. Naboisho (20,946)

### Potential for PWC

1. Enoonkishu (6,566)
2. Lamek (6,860)
3. Ol-Chorro (6,879)

1. Post-privatisation land reconsolidation to create open spaces for wildlife and livestock mobility
2. Total area of the eight (8) Conservancies (~ 92,000 ha) is more than half (61%) of the area of Maasai Mara National Reserve itself (150,000 ha)
3. Local pastoralists earn more than US\$ 3.6 M annually, now paid directly to households on a flat rate based on land holdings

## 1. What are the ecological outcomes?

### Conservancies

- maintain open rangeland for wildlife (...± livestock?) BUT
- increase illegal grazing in national park/reserve

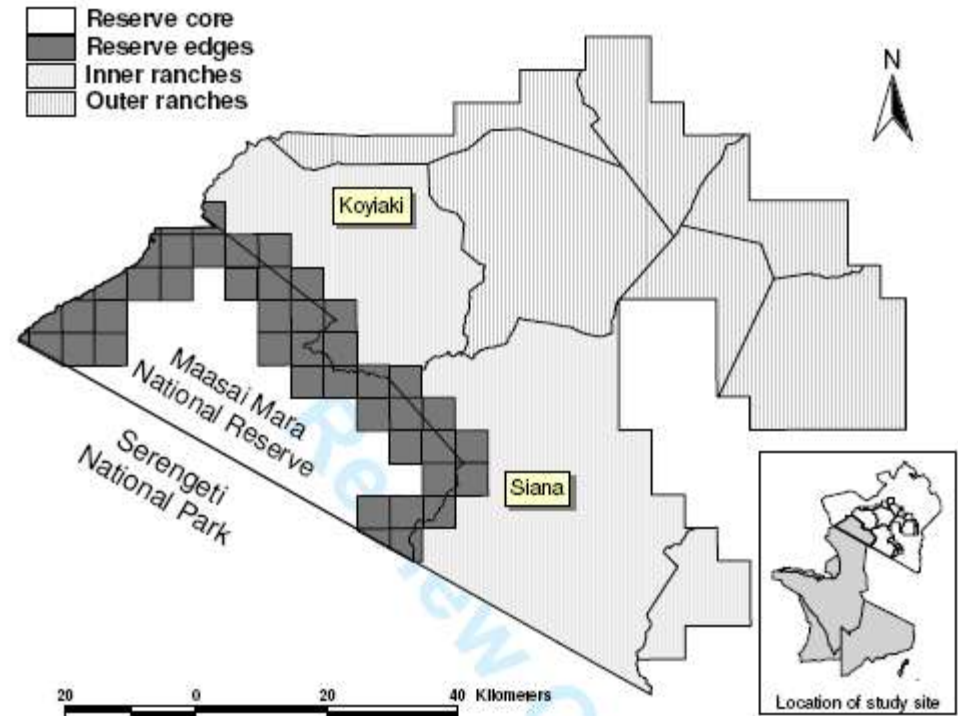
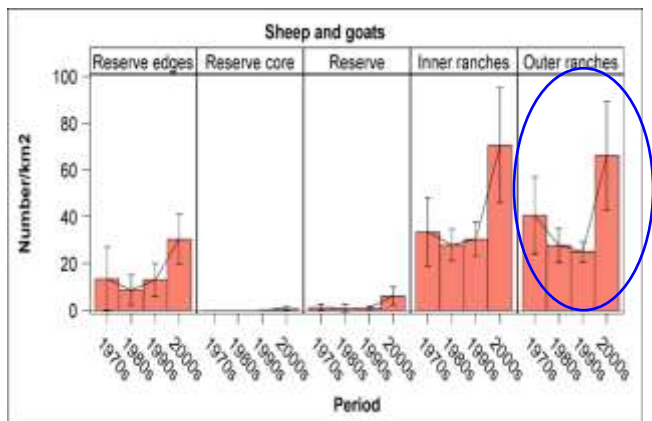
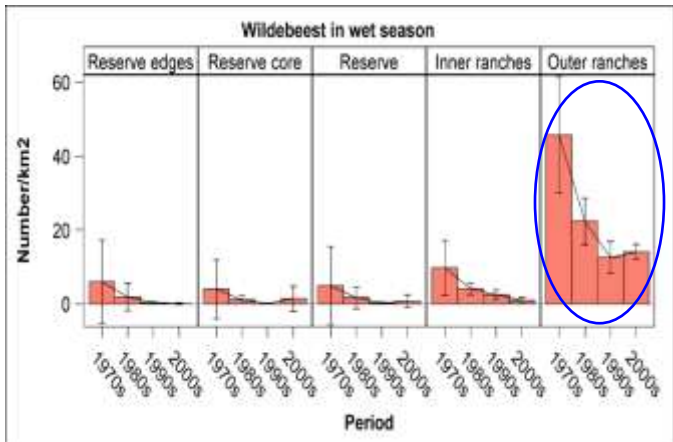
## 2. What are the ecological trade-offs:

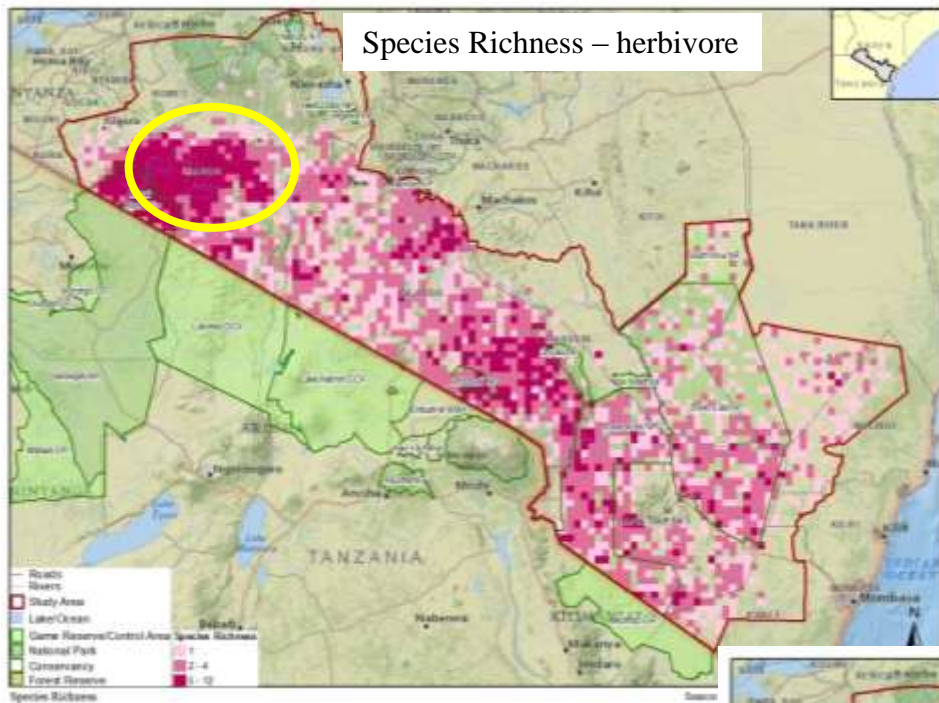
- Most choose to diversify land use (conservancy + livestock grazing ± crops)
- Some covenant all land (especially if have land elsewhere)
- BUT
- 98% choose guaranteed access to DS grazing within conservancy, over alternative benefits

*Per capita expenditure on PES income by OOC households on seven bundles of goods and services in 2009 (listed in descending order based on mean values)*

	Household PES Expenditure in 2009
Bundle of goods and services	Mean (US\$/AE/yr)
Basic needs expenses (food, cloths etc)	75
Educational expenses (books, fees etc)	40
Livestock veterinary expenses	35
Purchase of livestock (cattle, sheeps, goats)	30
Human health expenses (drugs, hospital fee)	24
Purchase of hay/lease of land for grazing rights	2
Purchase of water for domestic consumption	1

# Trends of wildebeest and sheep & goats in the Mara Ecosystem

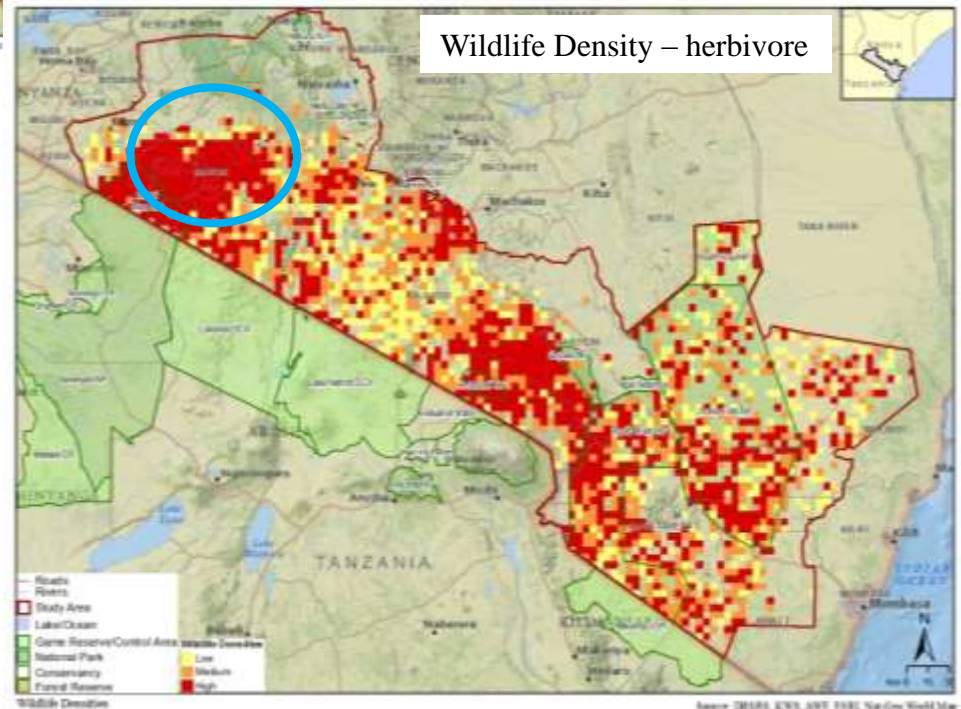




Photos: Rob O'Meara, Sarah O'Meara  
Source of Information: Olare Orok Conservancy Trust publication



Photo: Ron Beaton

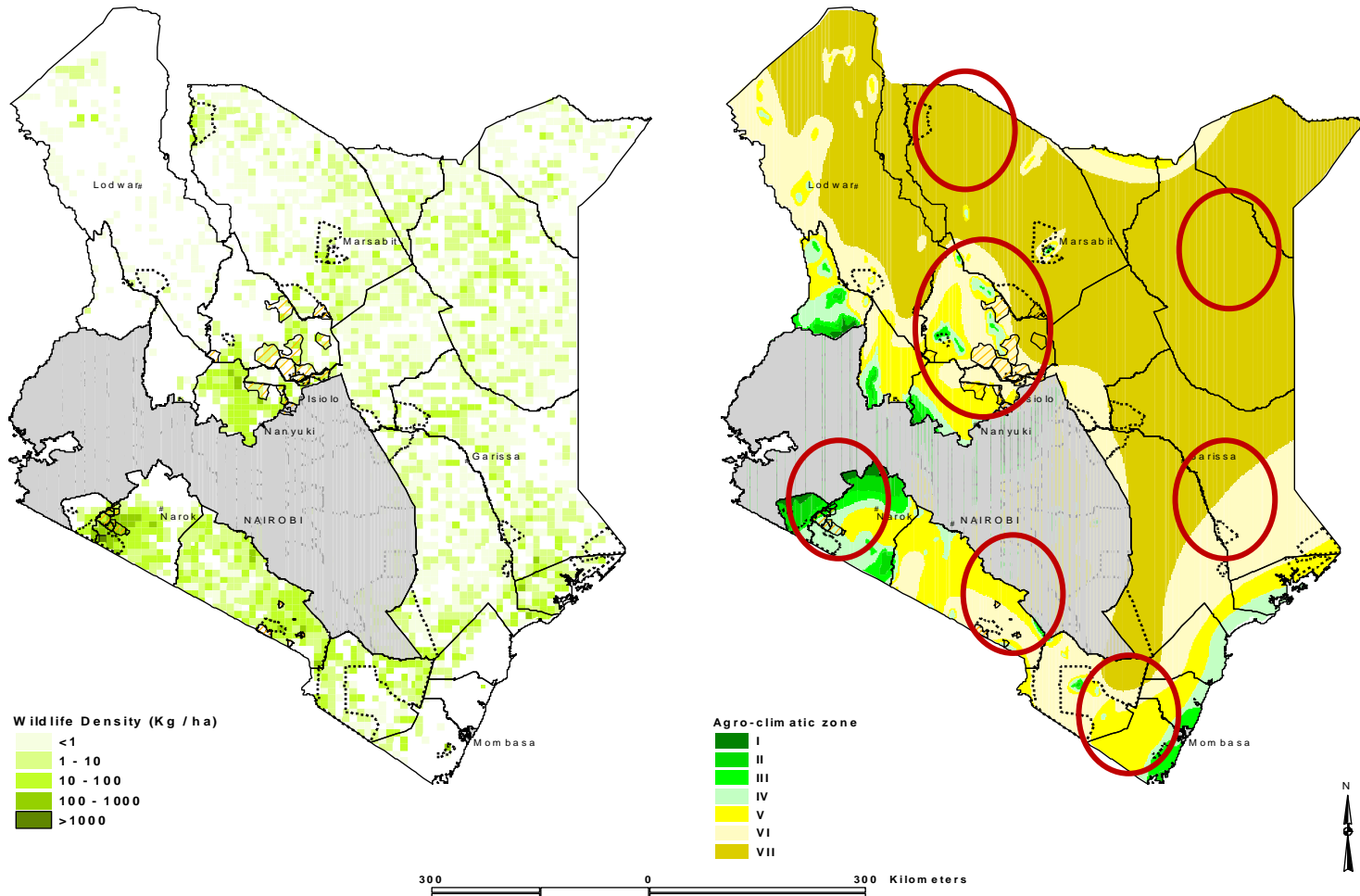


Source: DRSRS et al. in prep

# How can policy and economic incentives encourage more economically and ecologically sustainable livelihood choices?

1. Rapid pace of change/ shifting baseline
2. Major effect of (externally set) PES thresholds on decisions
3. BEST
  - Economic games/choice experiments reveal underlying decision rules
  - Policy scenarios reveal unanticipated outcomes
  - Findings help make policymakers aware of user perspectives/responses
  - Findings help inform more effective policy and practice

# Can we upscale conservancies across the country?





# Future research

## Further questions important to policy:

- Who is able/ not able to engage with conservancies?
- How do impacts differ for members vs non-members?
- How would measuring broader dimensions of wellbeing change conclusions?
- What are the leakage effects on surrounding areas?

## Generalizing beyond Mara

- Applicability in Kenya beyond high-PES Mara?
- Applicability across East Africa, the Horn and beyond?
- Can policy (promoting/governing PES) enhance financial sustainability in less favourable areas?

# Putting BEST research into use

## 1. Stakeholder engagement - February 2012

- policymaker/practitioner workshop
- Field stakeholder engagement

## 2. Stakeholder engagement - August 2013

- policymaker/practitioner workshop
- Field stakeholder engagement
- Scientific and public media outputs

## 3. Mainstreaming actions - ongoing

- research team member roles in policy and practice
  - Donor panels,
  - Government committees,
  - International agencies
  - NGOs

# Engagement in policy

- Reviewed and participated in the ASAL and Environmental policies in Kenya
- Member of ASAL Stakeholder forum (ASF) bringing together communities, researchers, NGOs, Private sector working in ASAL and linking to government
- Represented ASF in the launch of the National Policy for the Sustainable Development of Northern Kenya and other Arid Lands 5<sup>th</sup> February, 2013.
- Provides technical support developing key policies
  - i) mapping wildlife corridors (Vision 2030 project)
  - ii) valuing Kenya's natural capital (Ministry of Environment and Mines).

# Mapping Wildlife Dispersal Areas and Migratory Routes/Corridors



## Southern Kenya Rangeland Ecosystems



**CORRIDORS AND CONNECTIVITY FOR CONSERVATION**

### PART I

Kenya Vision 2030 Flagship Project: "Securing Wildlife Migratory Routes and Corridors"



Ministry of Environment and Mineral Resources - Department of Resource Surveys and Remote Sensing in collaboration with Kenya Wildlife Service, Kenya Meteorological Department, African Wildlife Foundation, African Conservation Centre, and International Livestock Research Institute, Nairobi, Kenya, August, 2013.

# Future research opportunities: Other ESPA/ ESPA-related research informed by/ linked with BEST

- NERC 2013-2015 *Assessing Risks of Investment in Groundwater Resources in Sub-Saharan Africa*. de Leeuw (PI, ICRAF) UCL Co-I, African and Dutch partners
- ESRC-DFID 2013-2016 "*Measuring complex outcomes of environment and development interventions*" (ES/J018155/1, with Wildlife Conservation Society (PI), UCL, Imperial Co-PIs).
- AHRC 2013-2015 *Sustainability and subsistence systems in a changing Sudan* (AH/K006193/1, British Museum PI, UCL co-PI with National Museums of Sudan, Khartoum and Dongola Universities).
- NERC-VNN 2011-2 *Capturing differentiated experience of change to ensure pro-poor ecosystem service interventions are fit for purpose* (Imperial PI; co-Is UCL, IoZ, LSE, FarmAfrica, WCS)
- (shortlisted) ERC *Transforming ESPA interventions through collaborative action-based learning* (Imperial (PI), UCL and IoZ, with UK, African, Cambodian and international partners)
- (shortlisted) ESPA 2013: *Poverty and ecosystem Impacts of payment for wildlife conservation initiatives in Africa: Tanzania's wildlife Management Areas* (UCL (PI) with Tanzania Wildlife Research institute, Copenhagen University, Tanzania Natural Resources Forum, Imperial and UNEP-WCMC)



A research programme co-funded by DFID, ESRC & NERC and accredited by LWEC



LIVING CONSERVATION

