# Biodiversity, Ecosystem Services, Social Sustainability and Tipping Points in East African Rangelands (BEST)

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espa
ecosystem services for poverty alleviation

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# BEST
# Approach

*Katherine Homewood*

# East African drylands

- Open, productive, species-rich → closed, impoverished
- What policies/incentives → socially/ environmentally sustainable land use?

Today's workshop is part of

- Preliminary stakeholder engagement
- Beginning to get research into policy and practice
  - Climate change adaptation plans
  - Planning / budgeting cycles
  - Best practice business models

**Overarching research question:**

How can policy and economic incentives improve the management of East African rangelands through their effects on pastoralists' livelihood choices?

# Phase 1 Research Questions

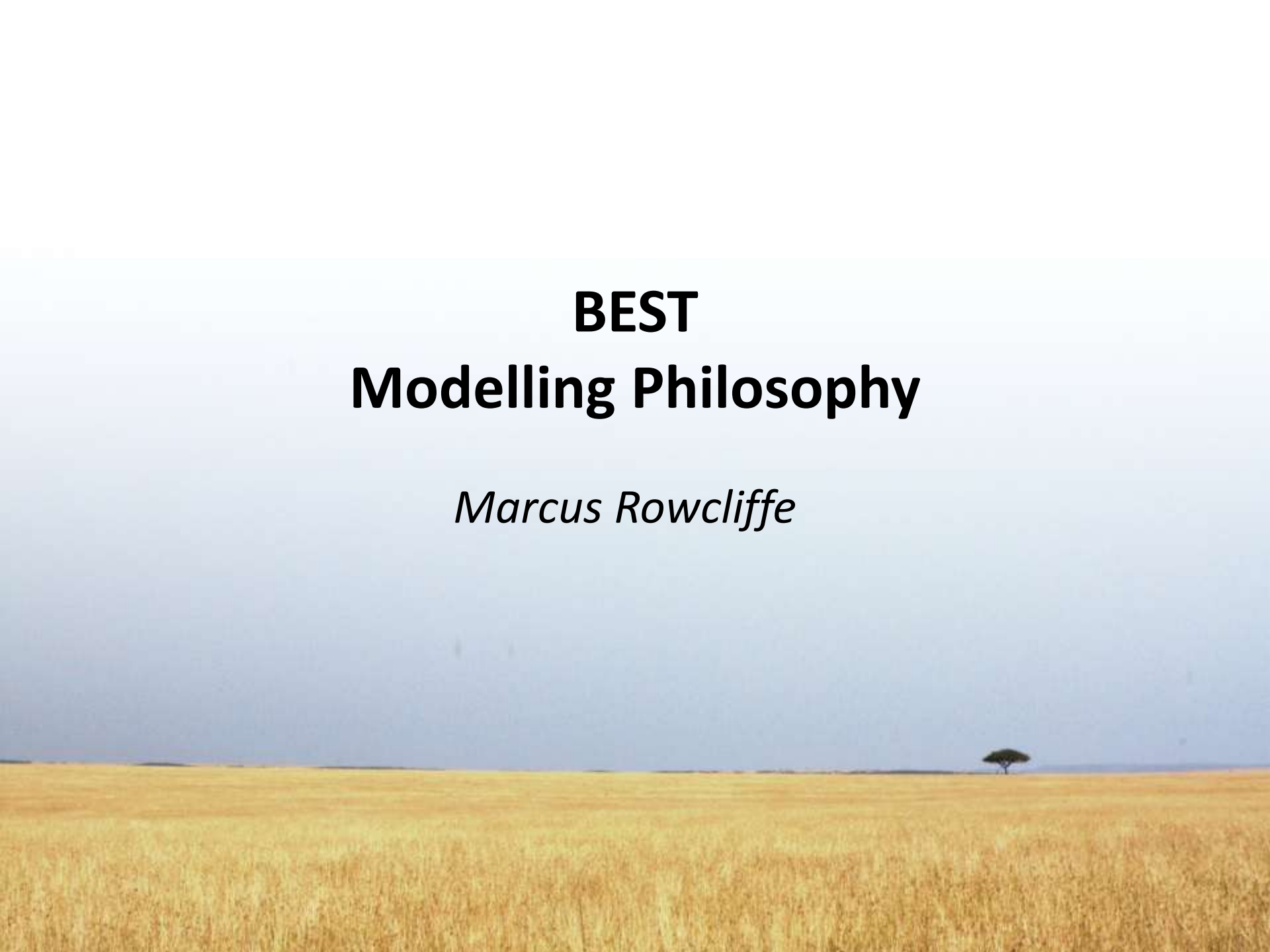
- How are pastoralist households' decisions on allocating land, labour and capital to different livelihood activities affected by conservancies?
- What are the economic and ecological consequences of these decisions? What are the trade-offs?
- How do the outcomes differ for households which participate in the conservancy and those who do not?
- How can policy and economic incentives encourage more economically and ecologically sustainable livelihood choices?

# Overall approach

- Build on existing knowledge
- Build on existing data
- Use modelling to get full value from these

# BEST
# Modelling Philosophy

*Marcus Rowcliffe*



# BEST modelling philosophy

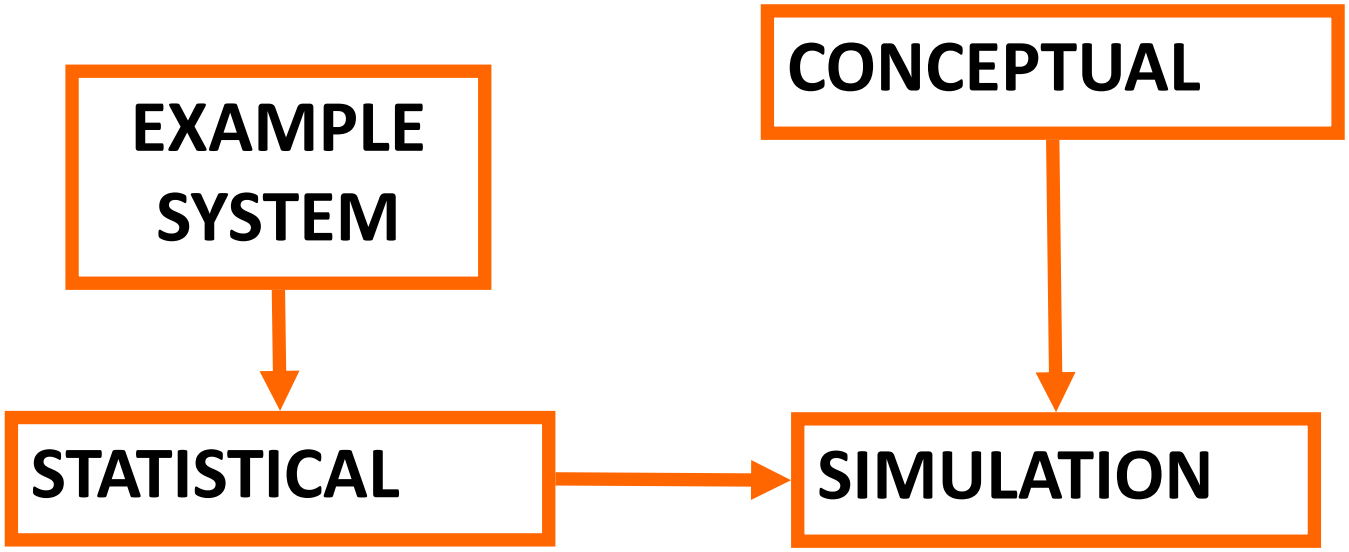
Abstraction of reality for scenario exploration

Types of model:

- **Example:** representative real-world system
- **Statistical:** quantitative description of patterns
- **Conceptual:** qualitative description of process
- **Simulation:** predictive computation

# Building a simulation

- Formalise conceptual model
- Quantify through statistical models…
- …informed by model systems



# Appropriate uses of simulation

## Key limitations

- Cannot replicate reality
- Require simplifying assumptions

## Key strengths

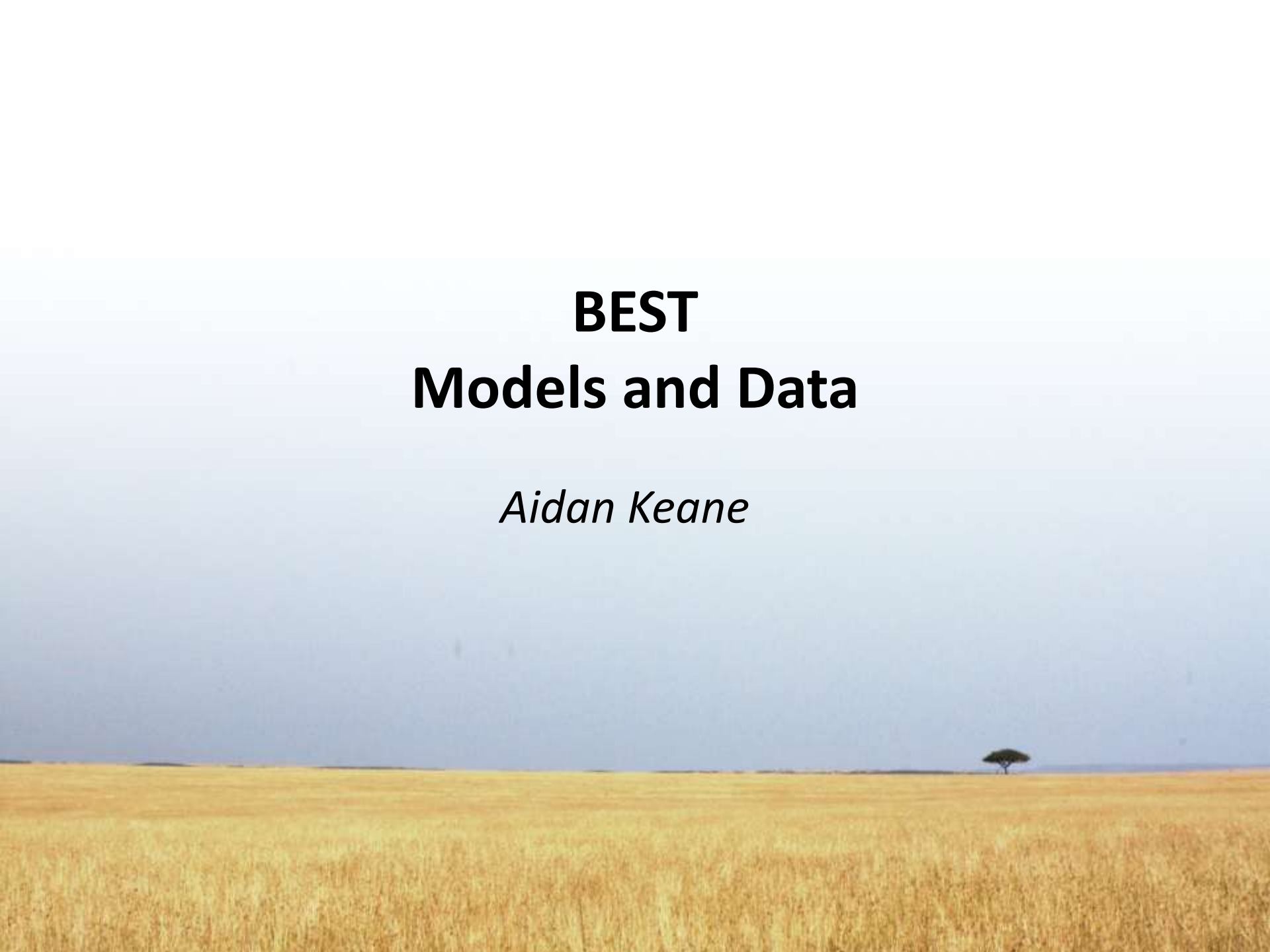
- Forces recognition of assumptions
- Key process capture - generality
- Allow “experiments” on complex systems

## Key requirements

- Clear question definition
- Identification of key processes

# BEST
# Models and Data

*Aidan Keane*



# Modelling overview

Focus on modelling **decision making**

Types of modelling approach:

- searching for optimal outcomes
- exploring consequences

…strengths and weaknesses

Data requirements and gaps

Scenarios

# Stochastic Dynamic Programming

- Optimal actions over several time-steps in an uncertain environment
- Previously used, but not for policy analysis (e.g. Mace 1993)
- Key assumptions
  - Rationality
- Data requirements
  - Variability in returns to activities
- Limitations
  - Low complexity, no feedbacks

# Stochastic Dynamic Programming

For the Maasai Mara

- State variable: Wealth
- Goal: Maximise wealth
- Livelihood activities:
  - Livestock
  - Cultivation
  - Trading/wage-earning
- Fixed characteristics: Land-holdings; Household size; Conservancy membership

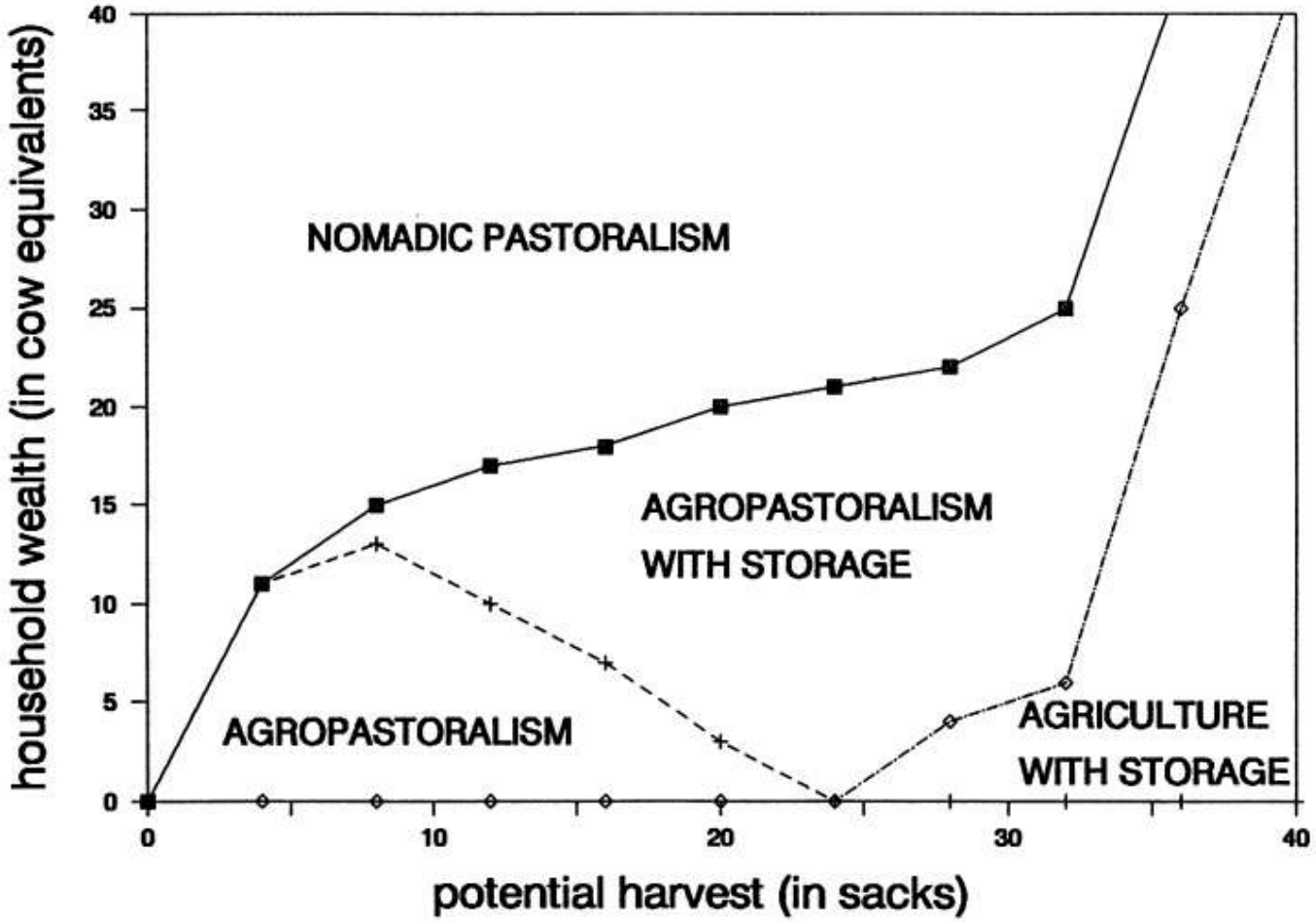
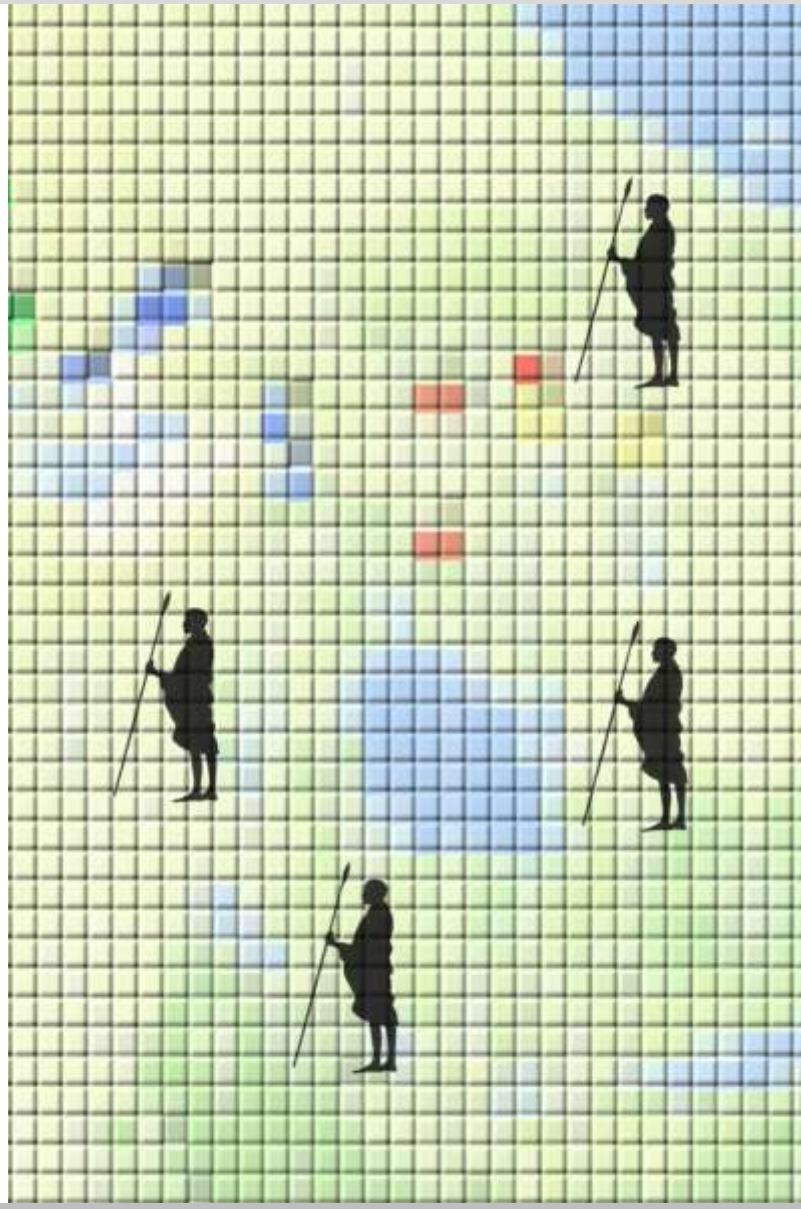



FIG. 1. *The mode of subsistence which maximizes long-term survival as a function of potential grain harvest (in a non-drought year) in grain units* (x *axis*) *and household wealth in cow units* (y *axis*). Solid line, *the minimum household wealth at which it is optimal to follow nomadic pastoralism;* dashed line, *the minimum wealth at which agropastoralists should keep a grain store;* dotted and dashed line, *the minimum wealth at which cows should be kept. Household viability (not shown) increases towards the upper right and decreases towards the lower left. Parameter values are shown in table 1.*

# Agent-based models

- Bottom-up, pattern-oriented approach
- e.g. DECUMA
- Key assumptions
  - Processes, structure
- Data requirements
  - Generally data intensive
- Limitations
  - Complexity
  - Validation



# Requirements

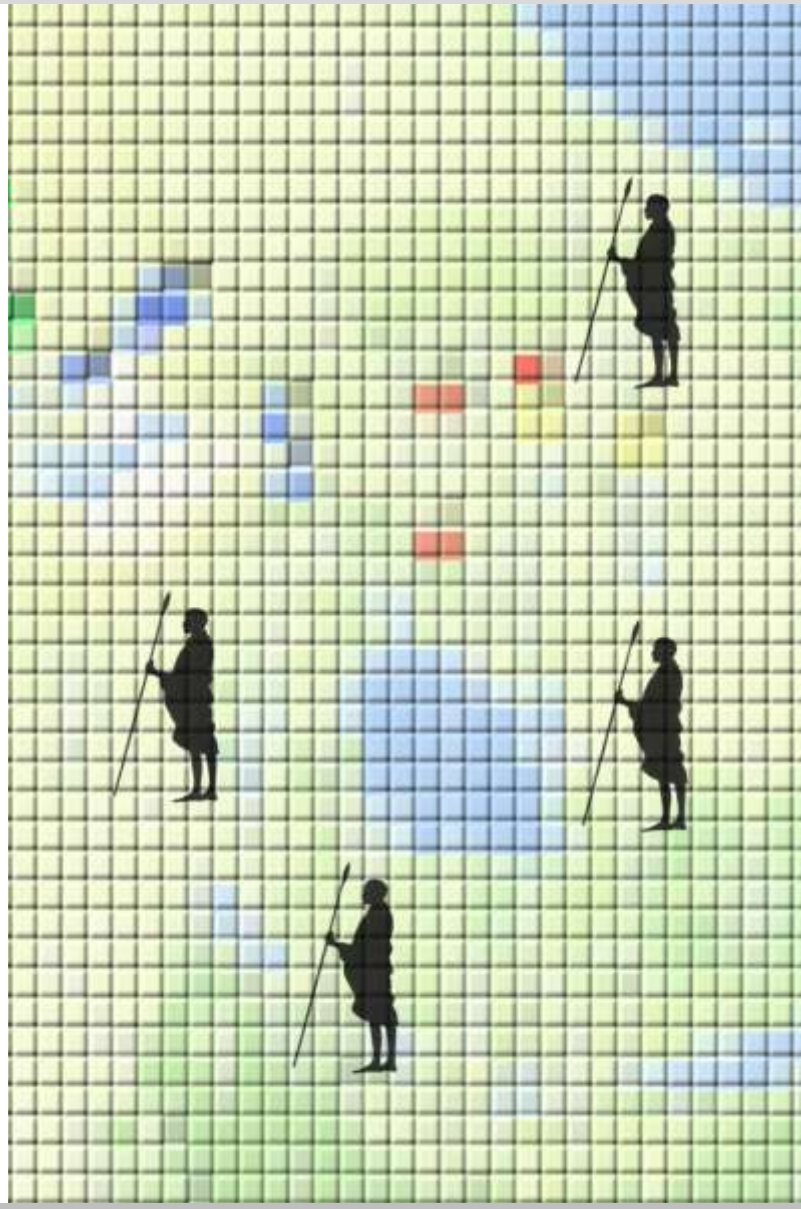
Good understanding of **processes**

Data types:

- Range of activities pursued
- Returns on investment of labour, land
- Livestock dynamics
- Climatic effects

Datasets:

- Reto-o-reto, PARIMA, ALRMP DEWS, biophysical, wildlife, livestock



# Reto-o-reto

Sites:

- Southern Kenya (Mara, Kitengela, Amboseli)
- Northern Tanzania (Longido, Tarangire)

Data:

- collected between 1998-2005
- 170-290 households/area
- snapshots in time

# Reto-o-reto

Demographic data

Livelihood activities:

- Livestock
- Cultivation of land
- Income from wildlife
- Salaries, trading

Annual rates of income, births, deaths, yields, gifts, loans etc

# PARIMA

Sites:

- Northern Kenya
- Southern Ethiopia

Data:

- collected between 2000-2005
- ~ 150 households/country
- repeat visits every 3 months 2000-2002 then annually 2003-2005

# PARIMA

Demographic data

Wealth indicators

Herd size and composition

Livelihood activities

- Livestock
- Cultivation
- Salaries, trading

Quarterly rates income, births, deaths, yields, gifts, loans etc

**Movement and water points**

# ALRMP DEWS

Sites:

- 28 arid and semi-arid districts of Kenya

Data:

- Initiated in 2003, data 2005-2010
- ~ 250 households per district per month
- Approximately monthly surveys

# ALRMP DEWS

Household size

Wealth indicator

Livestock: births, deaths, sales, milk production

Income from labour

Crop harvest

Food purchase & sale

# Data Gaps

Long-term data capturing variability over time

Decision-making processes

Future possibilities

- Experimental games
- Discrete choice experiments
- Interviews

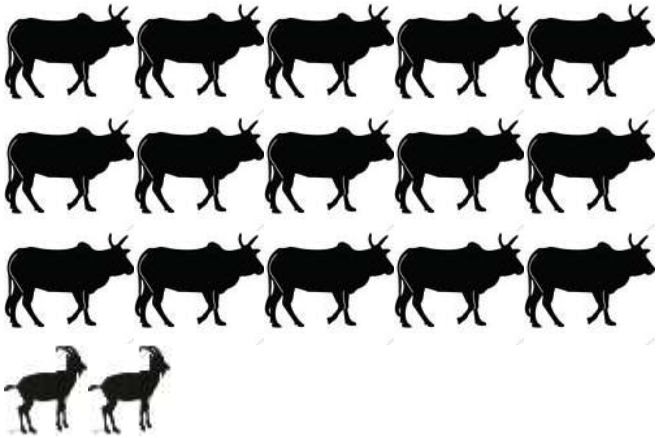
# Scenarios

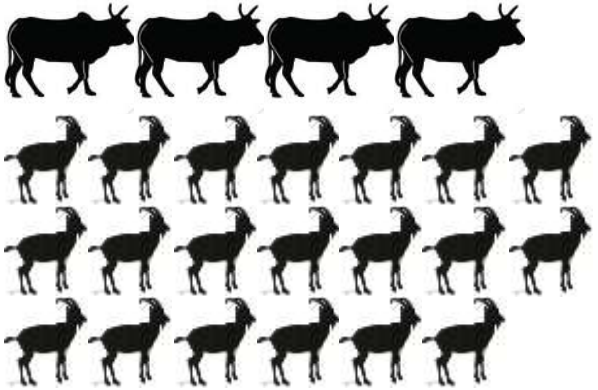
Exploring:

- Long-term effects
- Human responses to incentives

Examples:

- Changes in average income and distribution
- Changes in size and composition of stock
- Effects of harsher drought
- **Effects of alternative design**



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