BEST

*Biodiversity, Ecosystem Services, Social Sustainability and Tipping Points in East African Drylands*

# Project Findings and Future Potential

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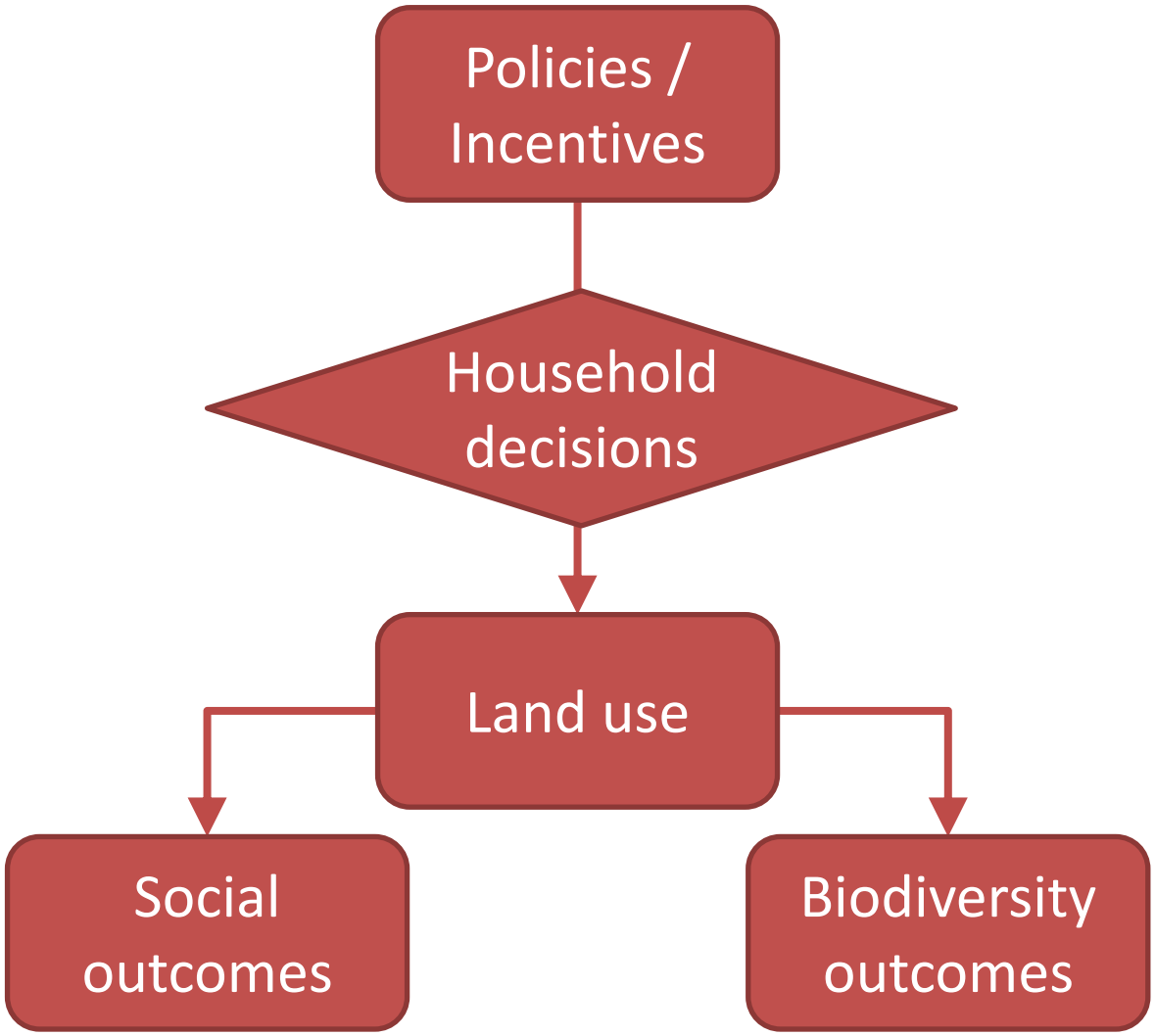
# Introduction

The BEST Project approach



# Introduction

What sort of questions are we asking?

***Modelling based on existing datasets***

**Which livelihood decisions work well?**

Household decisions

**What livelihood decisions do people make?**

**How do people value different livelihoods?**

***Experimental games***

***Discrete choice experiments***

# Economic games

*What livelihood decisions to people make?*

# Economic games

Introduction

## Games as experiments

- Behavioural economics
- Controlled settings
- e.g. co-operation, common-pool resources, public goods
- Mostly lab-based, undergraduate populations in USA/Europe
- Highly abstract

**This study:**

- Game tailored to real situation
- Played with local people, familiar with decision-making context
- Dynamic resource; droughts

# Economic games

Introduction

## Participants

- Groups of 8-10 individuals
- 191 participants in total
- ~50:50 conservancy members/non-members

## Key variables

- Outcomes:
  - cattle vs. cash
  - legal vs. illegal grazing
- Predictors:
  - situation in game
  - participant characteristics

# Economic games

Broad patterns

## Mean wealth outcomes

- Communal: 21.8 units/individual
- Private: 20.1 units/individual
- Conservancy: 23.2 units/individual

## Mean change in wealth per round (non-drought / drought)

- Communal: + 11.0% / - 34.1%
- Private: + 8.2% / - 38.2%
- Conservancy: + 11.3% / - 31.0%

# Economic games

Broad patterns

## Resource allocation

- Communal: 62.9% cattle
- Private: 71.0% cattle
- Conservancy: 64.9% cattle

## Illegal grazing

- Communal: 44.7% illegal
- Private: 35.0% illegal
- Conservancy: 51.5% illegal

# Economic games

Factors affecting decision-making

## "In-game" variables

- Treatment
- Wealth
- Turn
- (% Cattle)

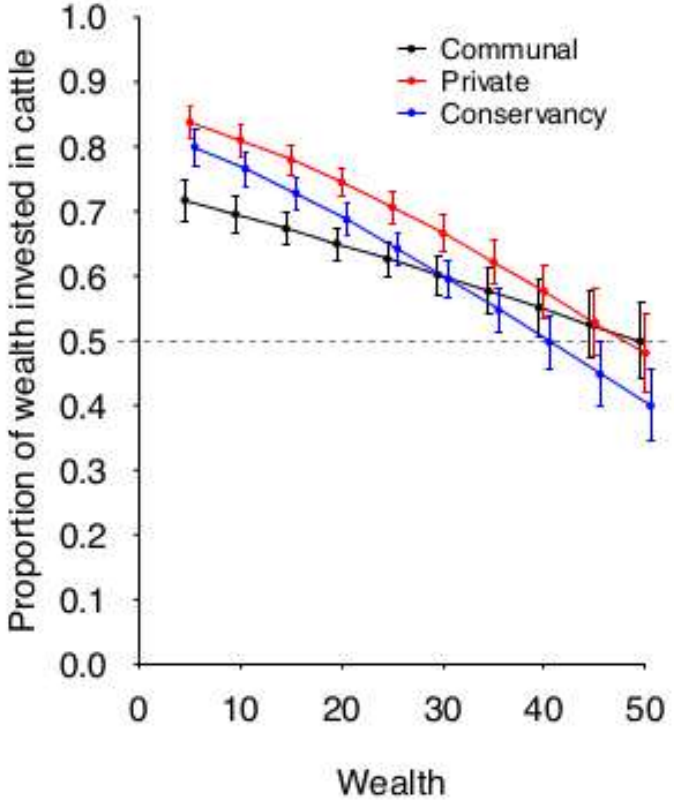
## Participant characteristics

- Conservancy membership
- Education
- Land Owned
- Cattle Owned
- Opinion 1: Resources
- Opinion 2: Subdivision
- Opinion 3: Conservancies

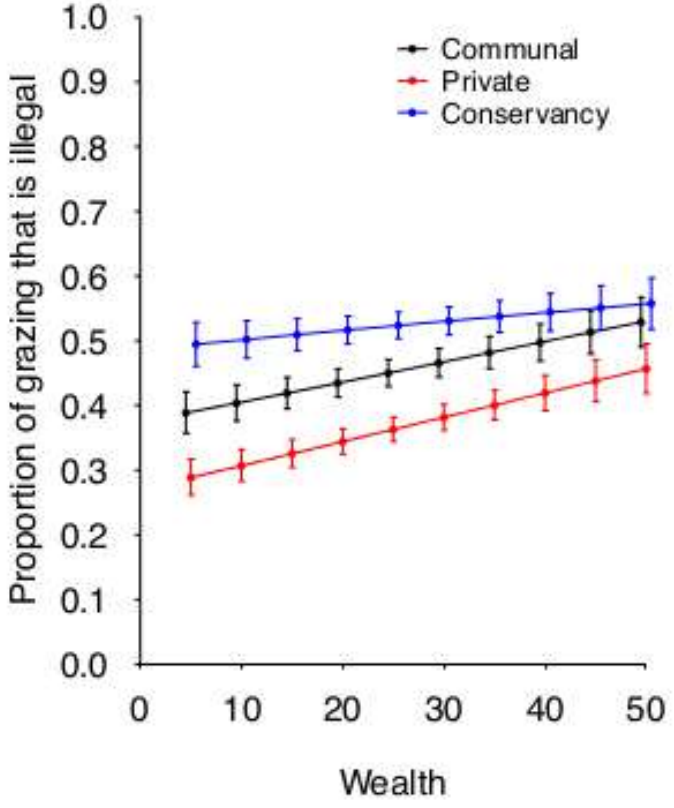
# Economic games

Effects of “in-game” variables on decision-making

## Allocation of resources to livestock

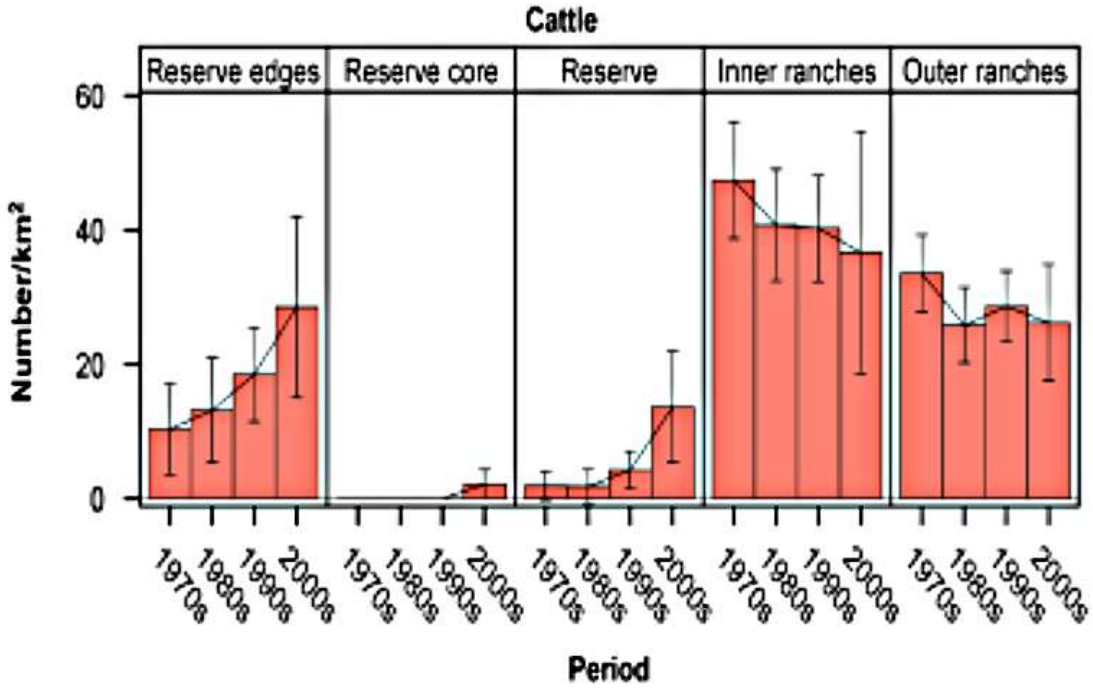


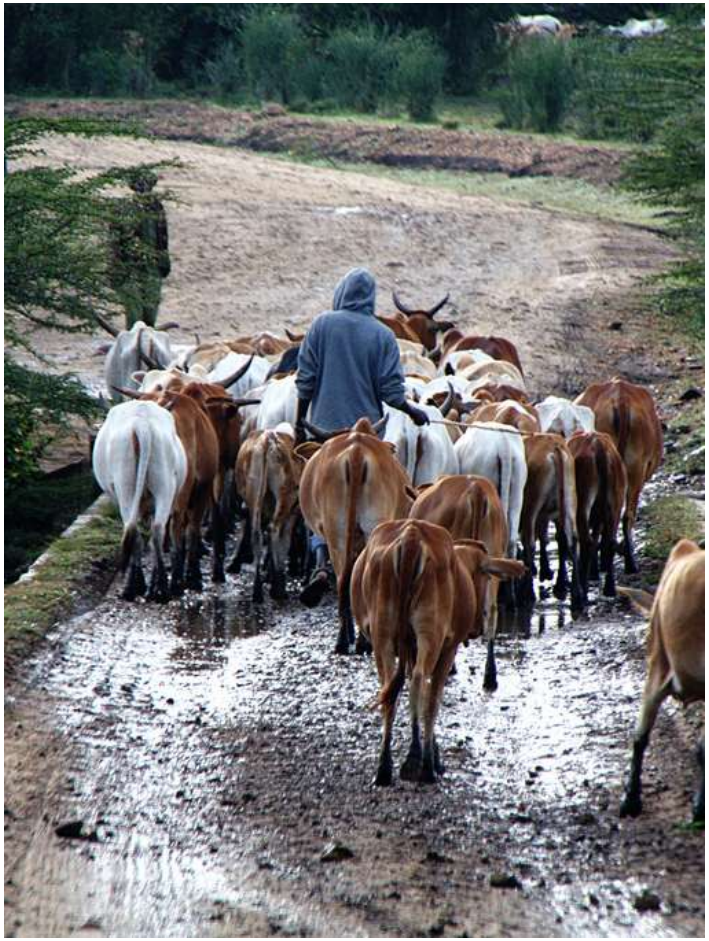

## Proportion of cattle grazed illegally



# Economic games

Comparison with empirical trends



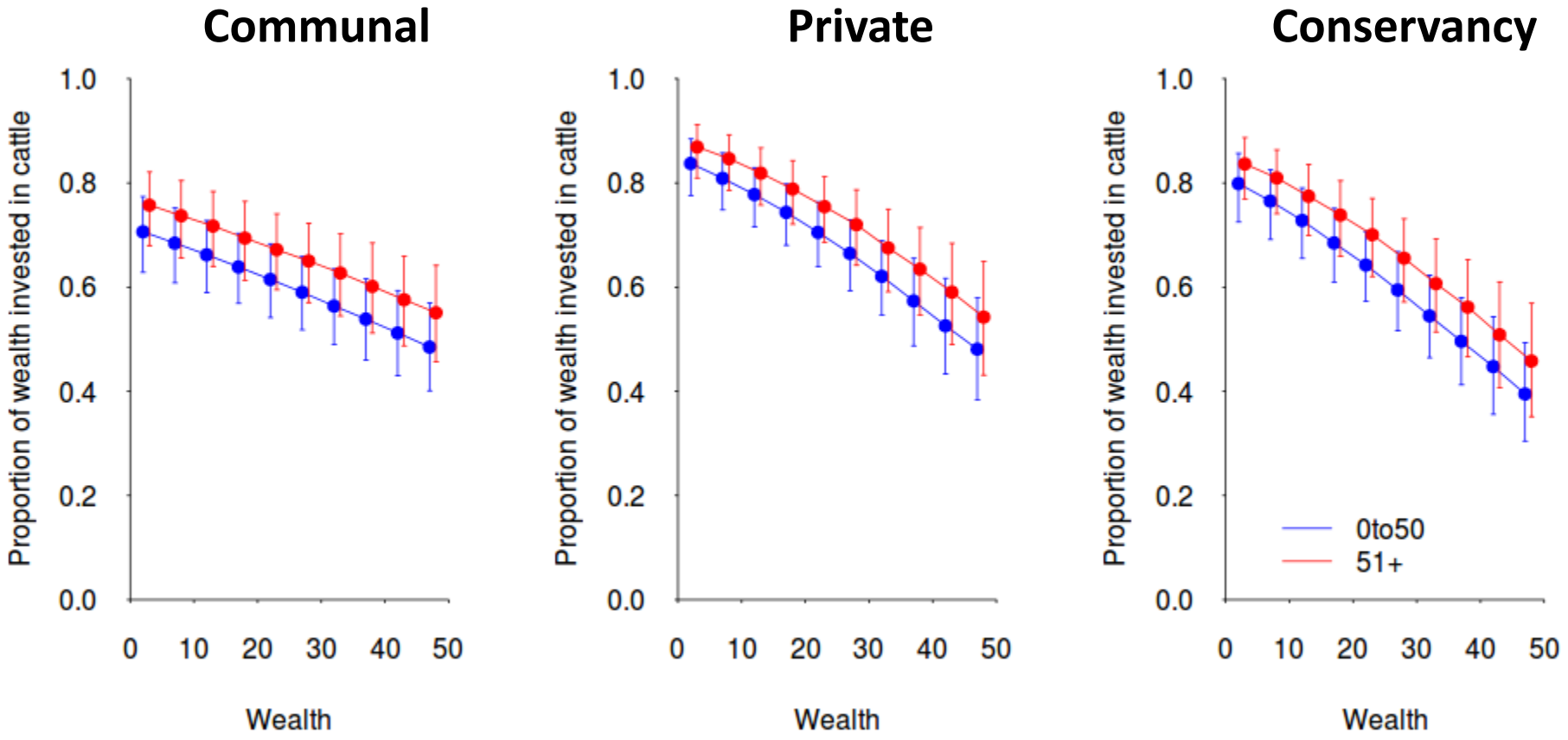
# Economic games

Effects of personal characteristics on decision-making

| | **Allocation of resources to livestock** (Comm. / Priv. / Cons.) | **Proportion of cattle grazed illegally** (Comm. / Priv. / Cons.) |
|---|---|---|
| **Education** | **+ / + / +** | **- / + / +** |
| **Land Owned** | **- / - / -** | **+ / - / +** |
| **Cattle Owned** | **+ / + / +** | |
| **Opinion 2: Subdivision** | **+ / + / +** | **+ / + / +** |

# Economic games

e.g., Effect of cattle ownership



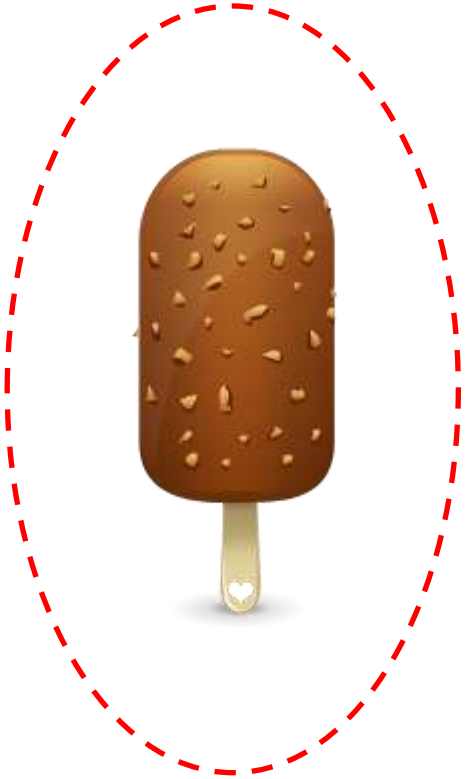

**Participants w. 50+ livestock allocate**
**8.7% more resources to cattle within the game**

# Choice experiments

*How do people value different livelihoods?*

# Choice experiments

## Preferences



# Choice experiments

Understanding preferences

**Attributes**

**Flavour:**
Chocolate and strawberry

**Delivery mechanism:**
Waffle cone

**Price**
200 KSh

**Flavour:**
Chocolate and chopped nuts

**Delivery mechanism:**
Stick

**Price**
250 KSh

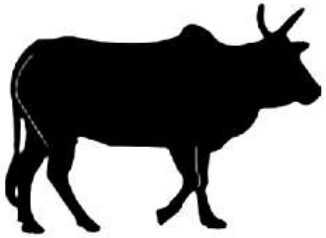
**Attribute levels**

# Choice experiments

Our experimental design

**Monthly wage**
- 0 KSh/month
- 6,000 KSh/month
- 10,000 KSh/month


**Conservancy**
- No involvement
- 75 acres for 9,000 KSh
- 150 acres for 18,000 Ksh



**Number of cattle**
- No cattle
- 40 animals
- 100 animals

**Access for grazing**
- Grazing allowed
- Grazing forbidden

**Number of small stock**
- No smallstock
- 80 animals
- 200 animals

**Cultivation**
- No cultivation
- 5 acres cultivated

# Choice experiments

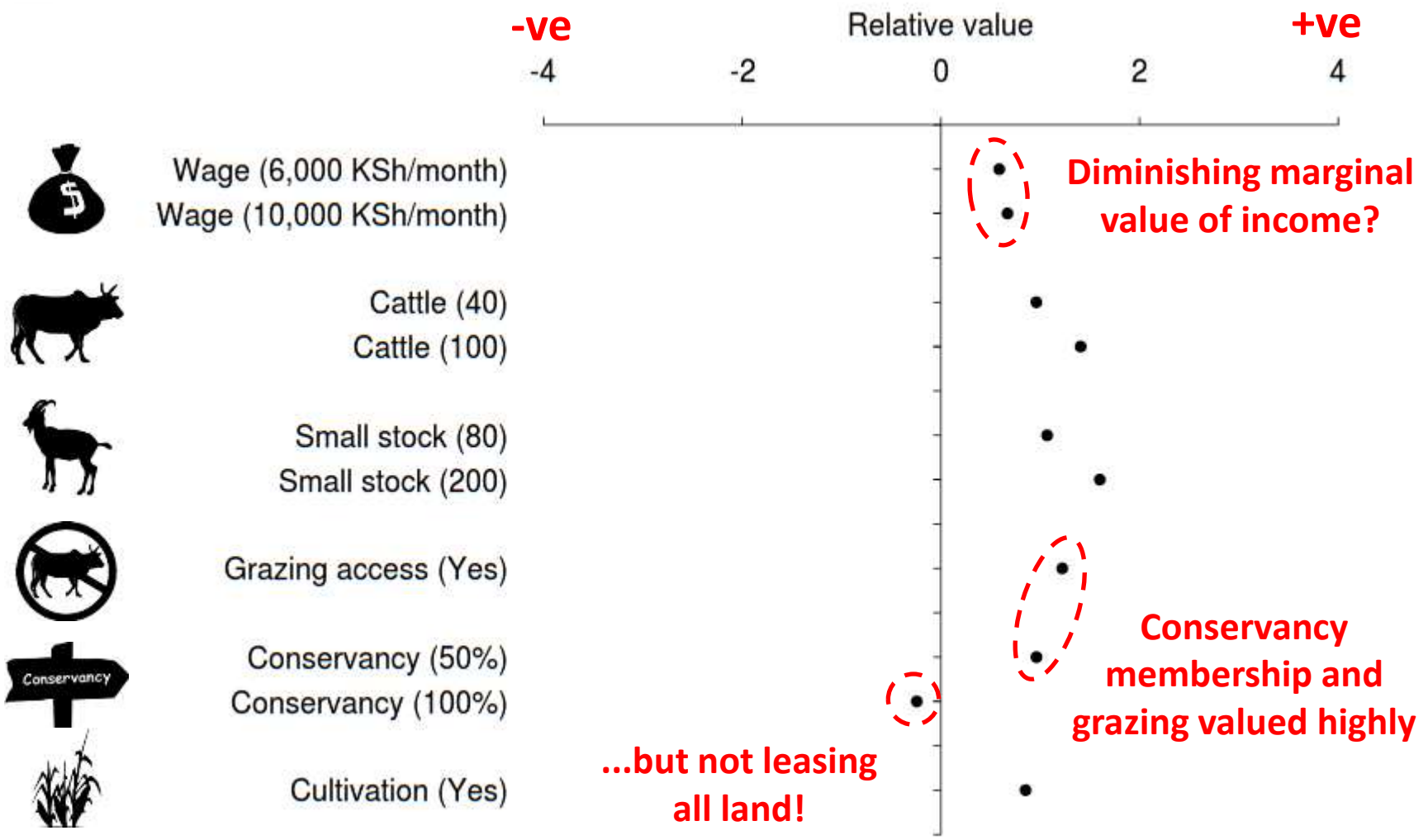
Our experimental design

## 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, 18,000KSh conservancy payments | 75 acres private grazing land, 9,000KSh conservancy payments |
| 4. Grazing permitted in conservancy during drought | No | No |
| 5. Monthly wage | 6,000KSh | 6,000KSh |
| 6. Area of land cultivated | 0 | 5 acres |

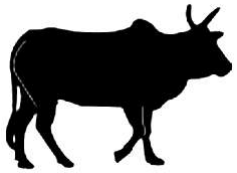
# Choice experiments: Men

Relative values of livelihood components



# Choice experiments: Men

Substitution rates between attributes



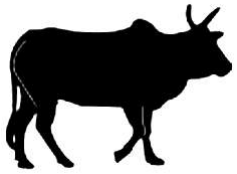
**40 cattle** ≈

**16,475 KSh/ month**

**40 small stock** ≈

**13,671 KSh/ month**

**5 acres cultivation** ≈

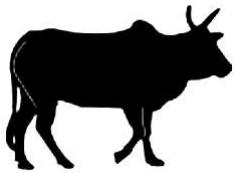


**44 cattle**

# Choice experiments: Men

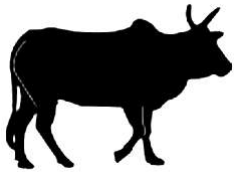
Substitution rates between attributes

**Access to grazing** ≈



**59 cattle**


**Leasing 50% for 9,000 KSh** ≈



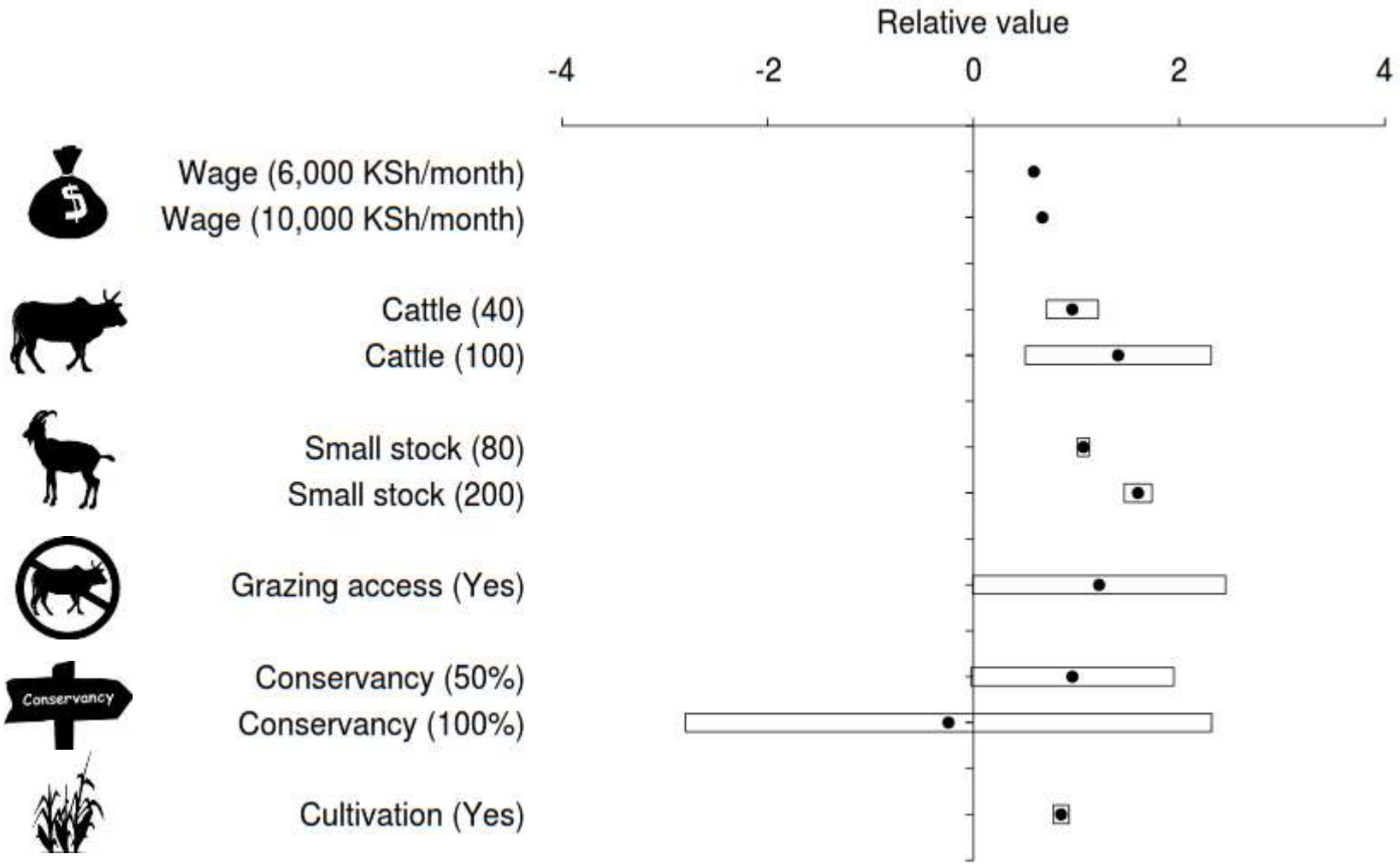
**45 cattle**


**Leasing 100% for 18,000 KSh** ≈

**- 5,499 KSh/ month**

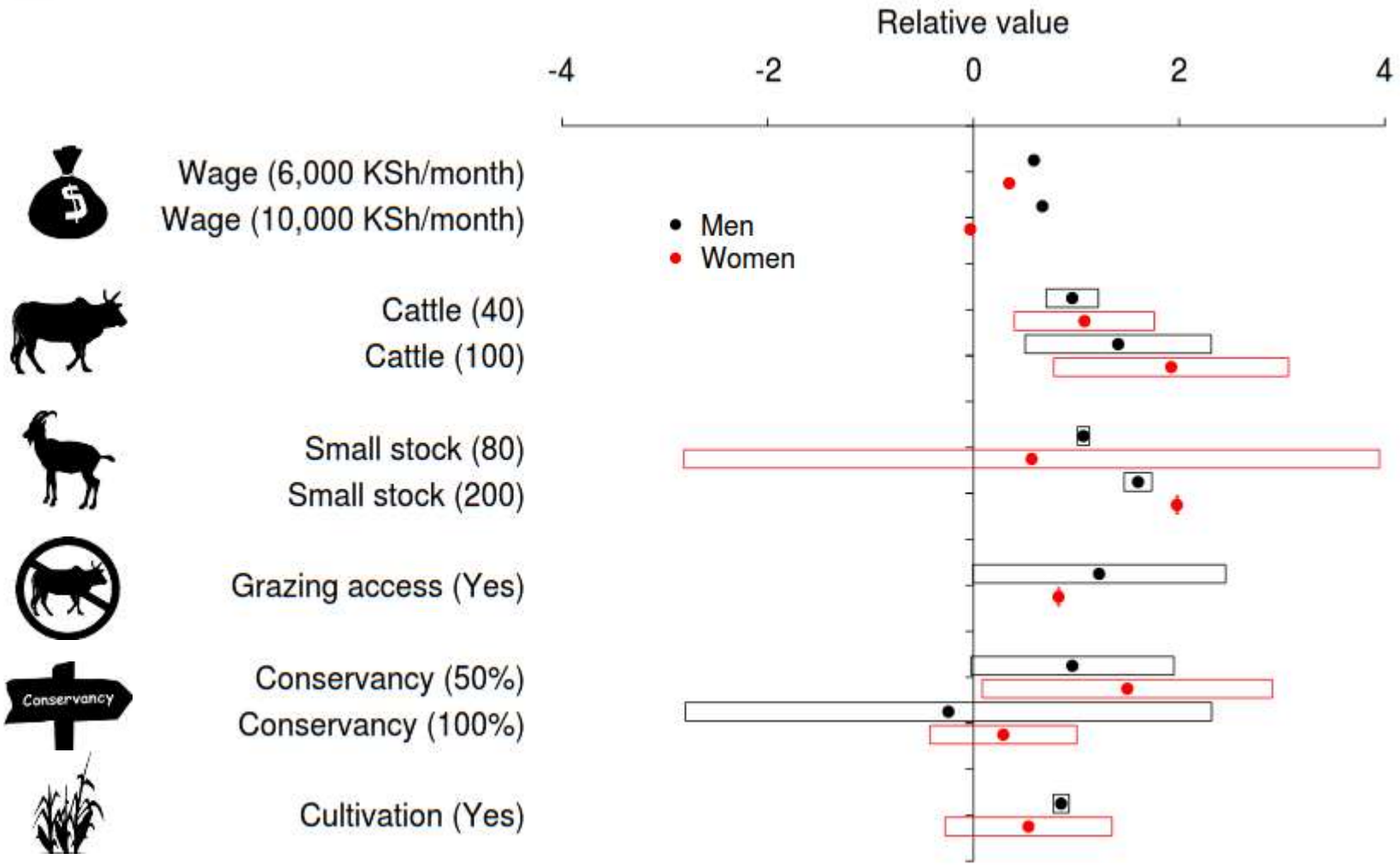
# Choice experiments: Men

Variability between individuals



# Choice experiments: Women

Differences between values of men and women



# Modelling optimal decisions

*Which livelihood decisions work well?*

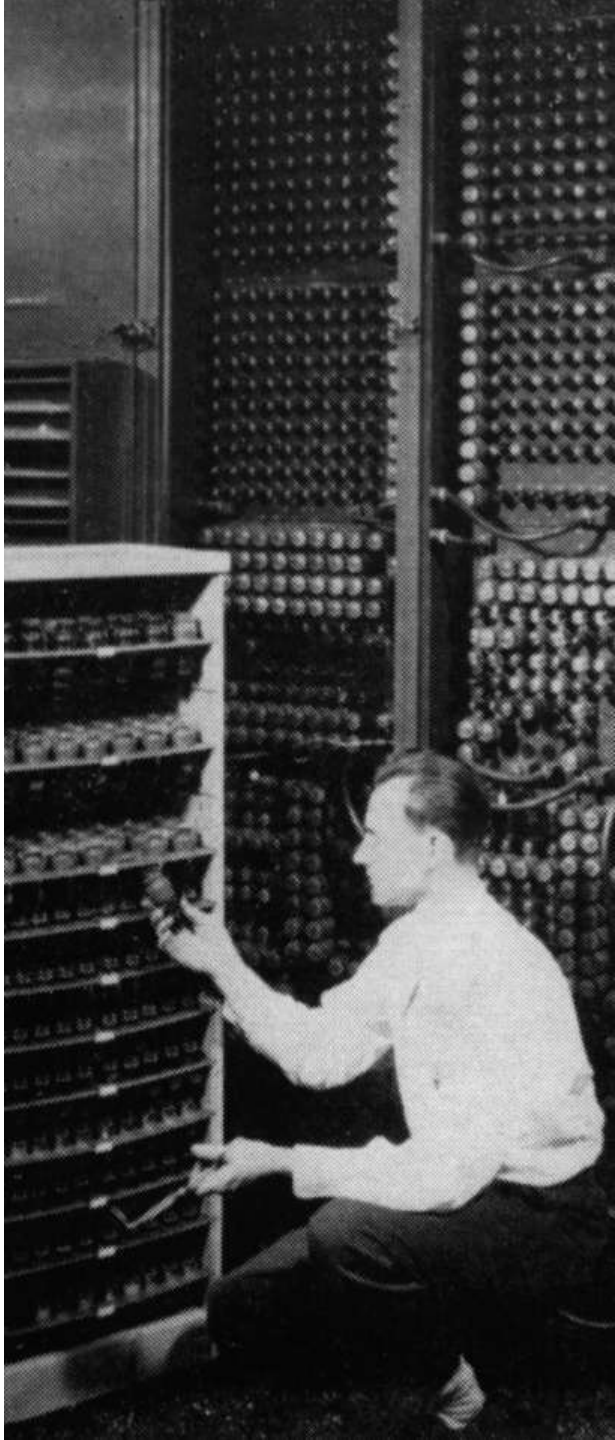
# Modelling decision-making

Introduction

Computer modelling allows:

- Exploration of theoretical understanding
- Assumptions --> Consequences
- Experiment with fewer constraints (e.g. scenarios)

Potential for *unexpected outcomes*



# Modelling decision-making

Stochastic dynamic programming

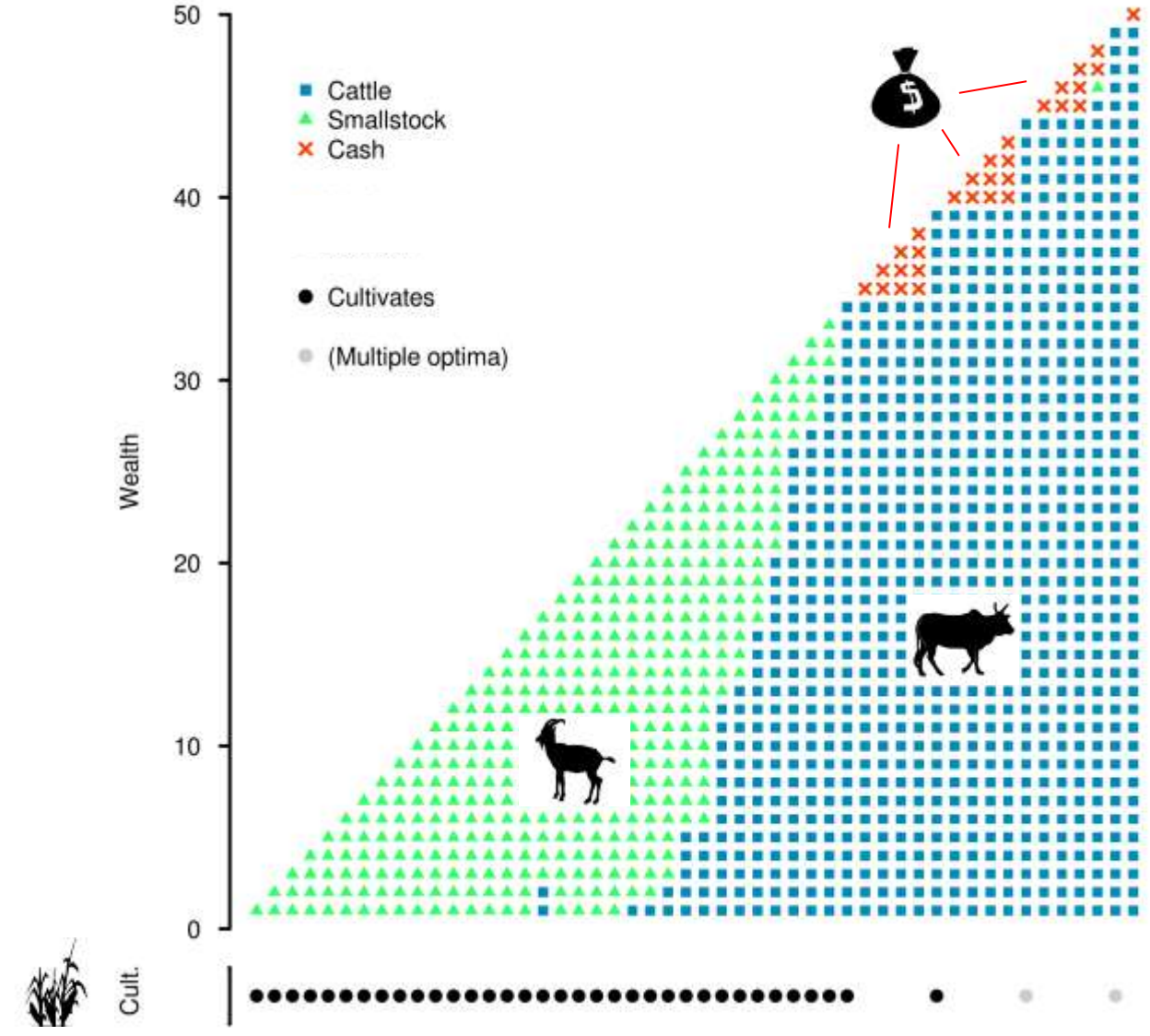
Optimal actions over time in an uncertain environment

For the Maasai Mara

- Goal: Maximise survival
- Livelihood activities:
  - Cattle / small stock
  - Cultivation
  - Trading & wage-earning
- Heterogeneity:
  Land-holdings; Household size;
  Conservancy membership

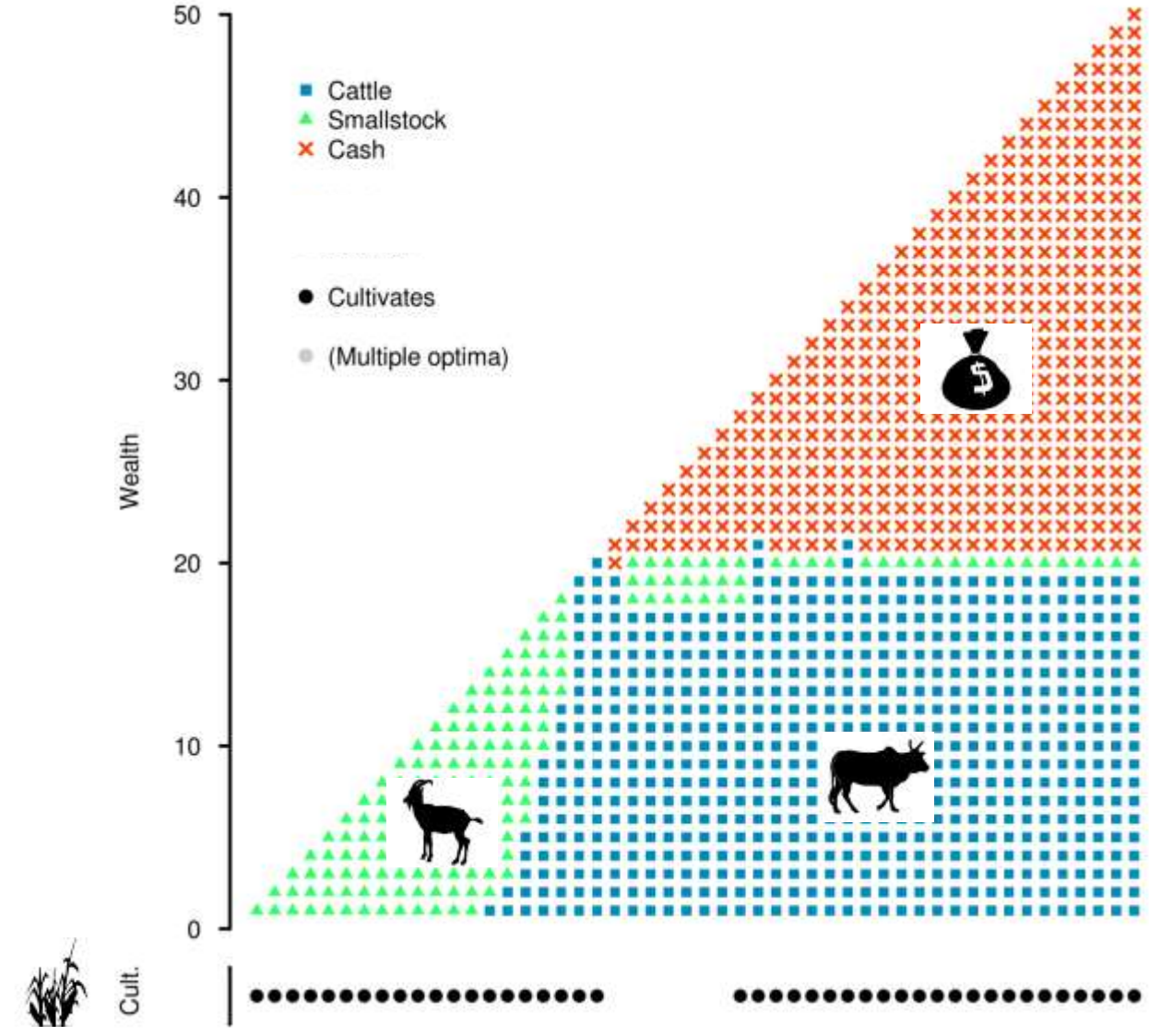
# Modelling decision-making

## Communal scenario



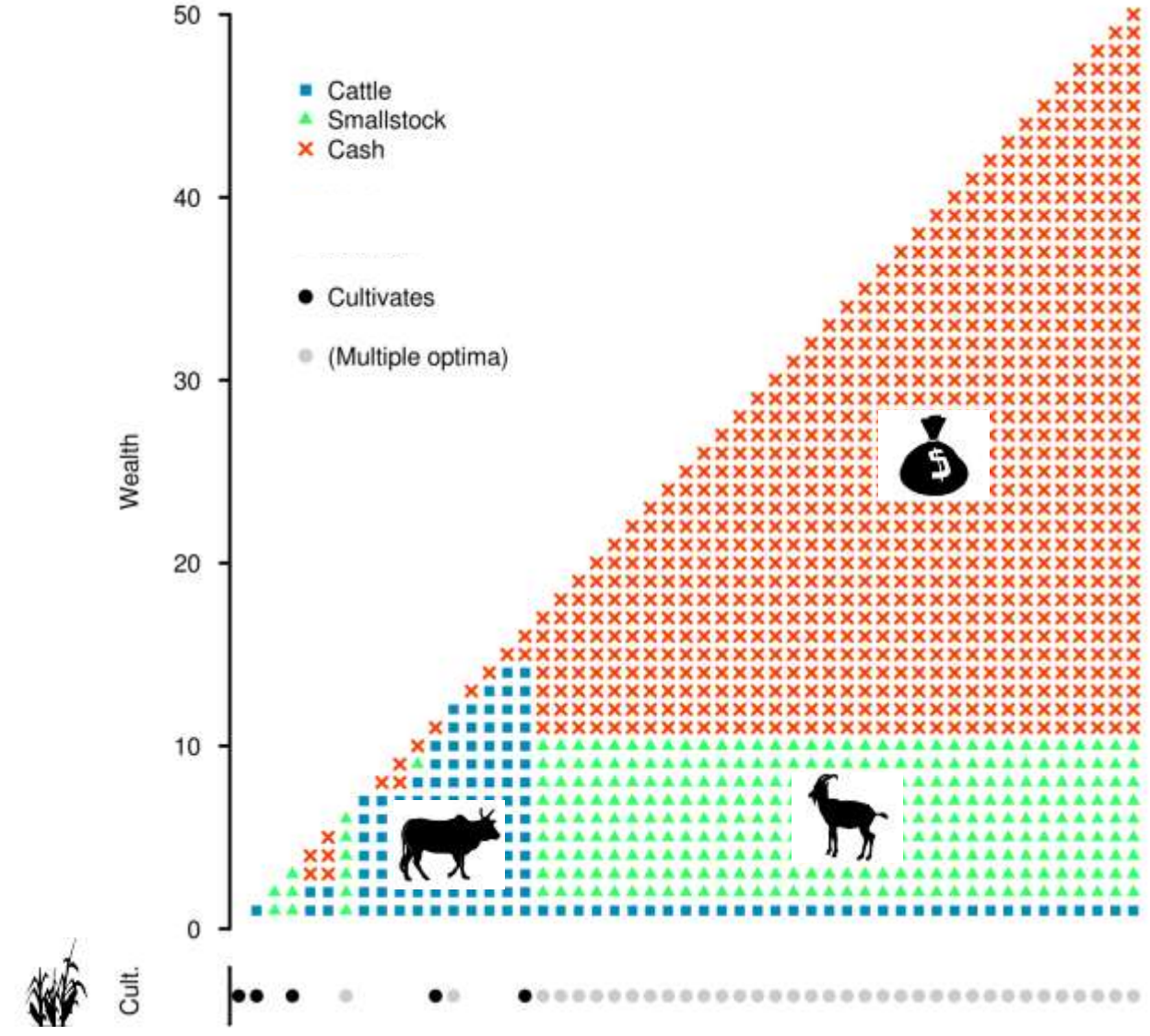

# Modelling decision-making

## Subdivided scenario



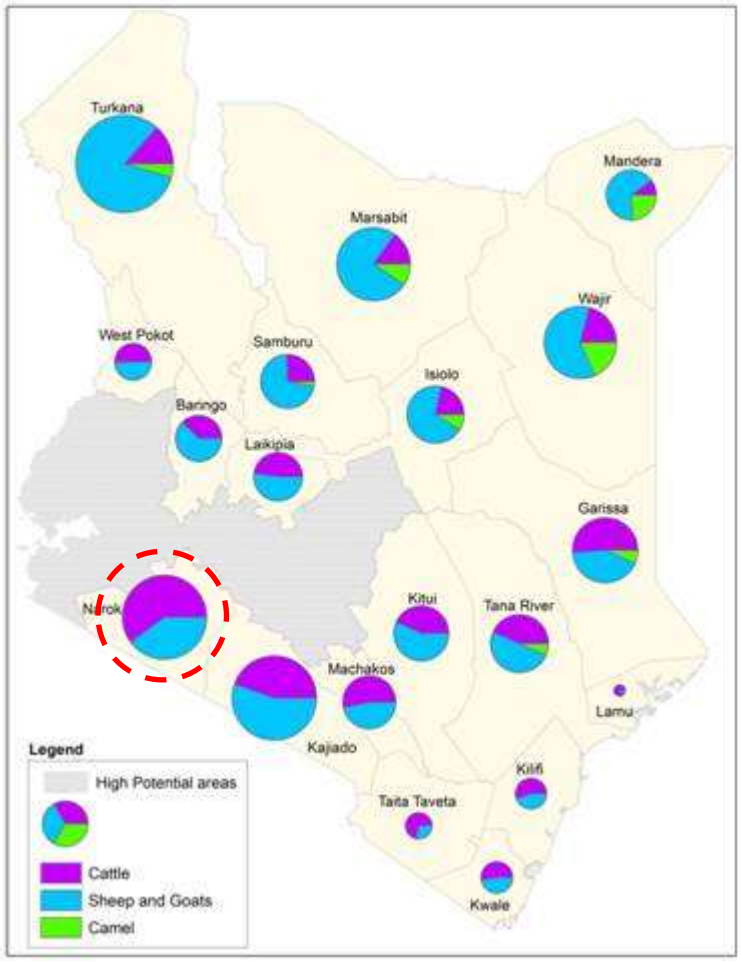

# Modelling decision-making

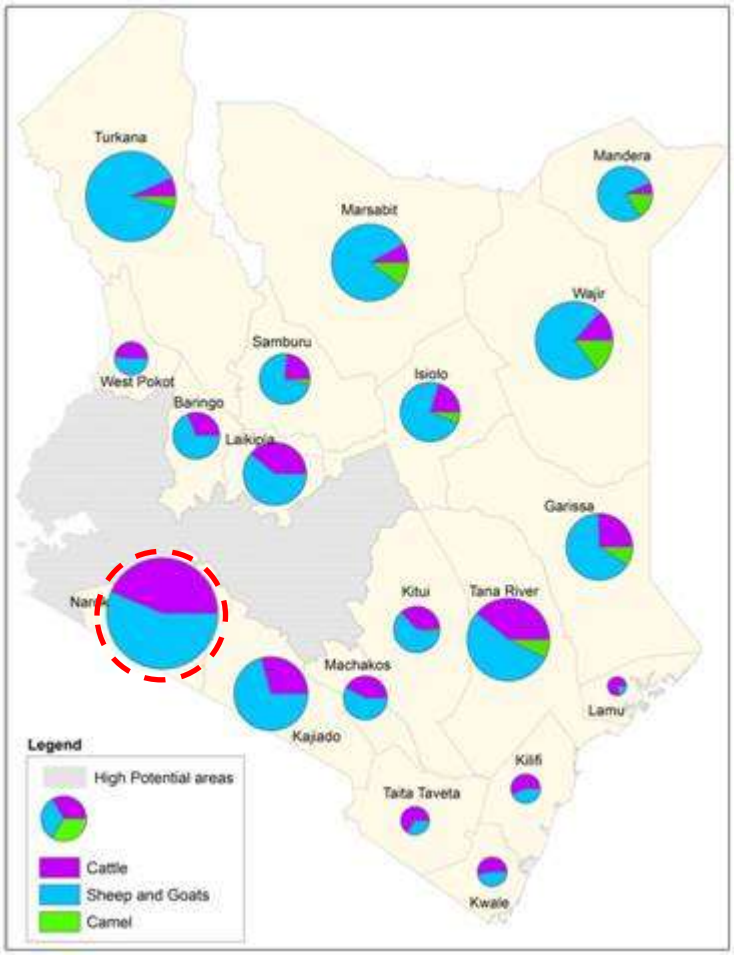
## Conservancy scenario




# Modelling decision-making

## Comparison with empirical trends



# Modelling decision-making

Next steps

Incorporate multiple, heterogeneous households

Examine overall effects at community level

Look for winners and losers at household level

Extend to consider changing climatic conditions

...and others, based on feedback!

# Conclusions

Better understanding of household level processes driving landscape level changes.

Potential for unexpected consequences of rangeland policy

For discussion

- Interpretation of results
- Real-world relevance
- How to disseminate
- Influencing policy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