# More vulnerability through drought insurance?

## Insights from a social-ecological simulation model

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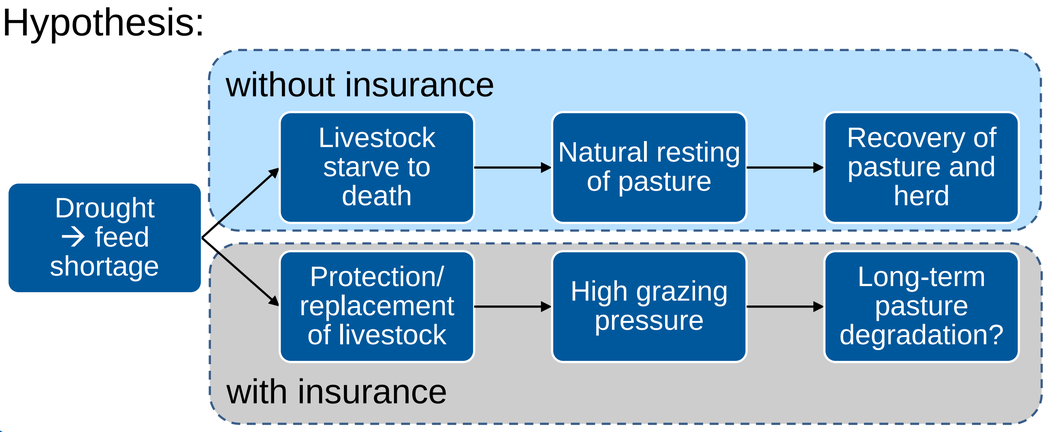
## Motivation

- **Livestock keeping** (pastoralism) provides the primary livelihood for over 1 bn. people. Especially in **East African drylands**, mobile pastoralism is argued to be the land-use strategy best adapted to variable rainfall conditions. Nevertheless, **increasing droughts** endanger its sustainability.
- Microinsurance is becoming increasingly popular as a means to **manage drought risks**.
- In Kenya and Ethiopia, a pilot programme called “Index-based **livestock insurance**” (IBLI) is being tested and scientifically monitored since 2010.
- Studies show **positive short-term effects** of drought insurance (Janzen/Carter 2013): Households are better able to keep livestock alive and maintain own level of food consumption. However, there is **no empirical data on long-term effects**.

## Research question

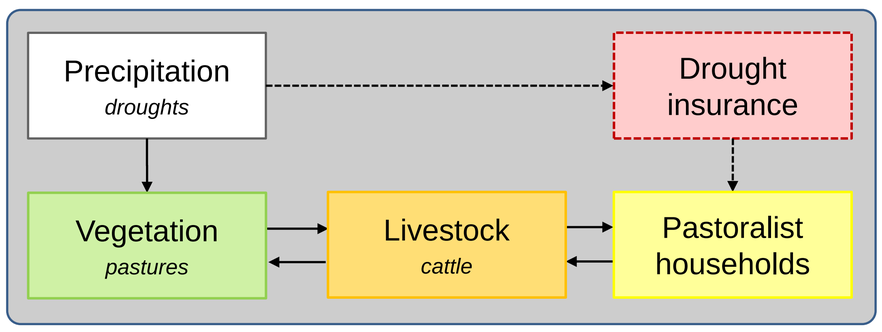
**Can drought insurance, in the long run, have unintended side effects** for dryland pastoralists (e.g. pasture degradation, collapse of herd sizes)**?** And if so, **under which conditions?**

Hypothesis:




## Methods

Spatially implicit **agent-based simulation model** based on case study of Borana pastoralists in Kenya/Ethiopia




- Aim: use model as a **“virtual lab”** to explore scenarios and observe **structural changes** in system dynamics
- Create rainfall scenarios (i.e. repeated sequences) to isolate the effects of insurance
- **Compare simulations** pairwise (with/without insurance)
- Apply Fourier transformations to detect structural changes

## Results

- Results show **boom-and-bust cycles** of livestock accumulation interrupted by droughts (Fig. 1).
- The system converges to one of the following long-term patterns:
  (1) A **stable** quasi-stationary state
  (2) A **long-term oscillation** caused by **gradual pasture degradation** (leading to a near-collapse of livestock numbers) with slow recovery
  (3) A **permanent collapse**
- The **effect of insurance** can be either positive or negative, depending on economic (insurance sum) and ecological (pasture regeneration capacity) conditions (Fig. 2).
- The effect is strongest when the **long-term pattern structurally changes**, i.e. when, for example, a stable stationary system starts to oscillate due to insurance.

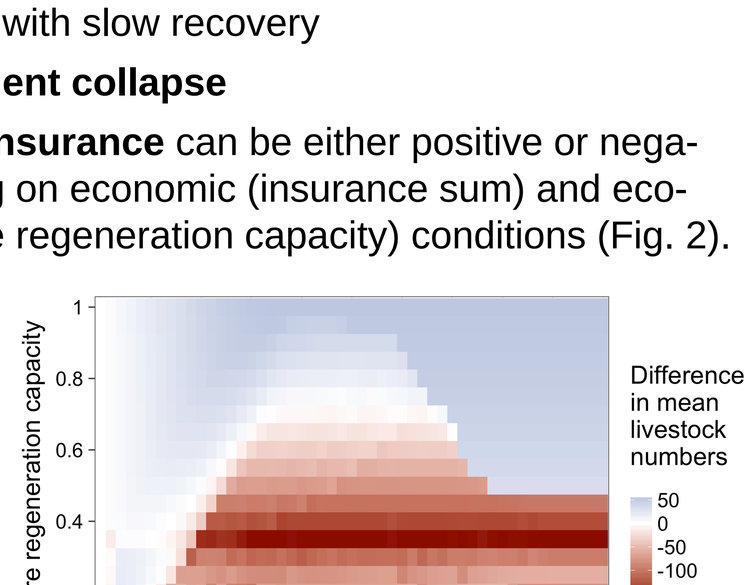



**Fig. 1:** Development of livestock, biomass and rainfall over time without insurance (light blue) and with an insurance of 40 animals (dark blue). The pasture regeneration capacity is 0.1.




**Fig. 2:** Effect of insurance on total livestock numbers. The results show the difference of the long term mean of the simulation with the given insurance sum and the one without insurance.

## Conclusions

- In the discussion of drought insurance, the focus usually lies on its immediate effect to cushion shocks at the individual level. Insurance, however, can also have **long-term effects on the system as a whole**.
- There is a **trade-off** between preventing livestock loss and letting pastures recover after droughts.
- Insurance ***can*** **increase vulnerability** and lead to long-term degradation. It is most likely to have adverse effects **when pastures are fragile**.
- Effects of insurance depend on **economic and ecological conditions.**
- **Pasture recovery periods** after droughts are important and should be accounted for in insurance design.

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