The Devil Is in the Details: Modeling Small-Scale Land-Use Change in Madagascar

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Background and research gap

Land use represents the fundamental interface between humanity and nature. It is a major driver of:

Habitat loss and species extinction

Nearly a quarter of global greenhouse-gas emissions

The emergence of 27% of vector-borne zoonotic diseases (VBZD) [1].

Land-use research overlooks tropical, least-developed regions and their unique agricultural systems. [2] These biodiversity hotspots face amplified problems due to the intense overlap of human activity and nature.

Research objective

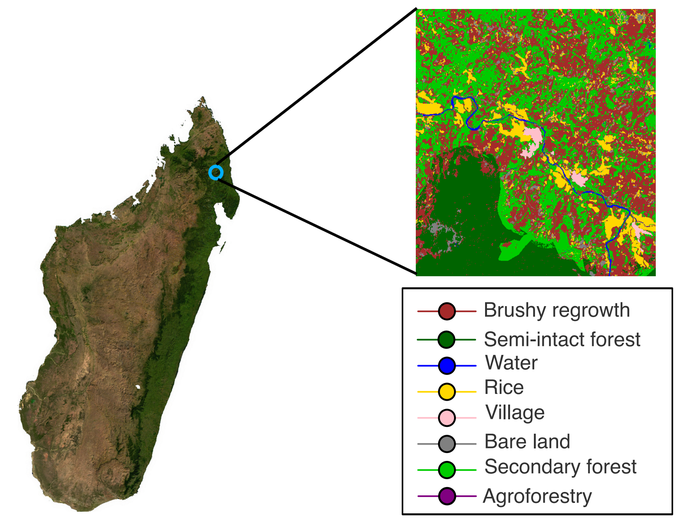
Project future land-use change in the Sava region, Madagascar

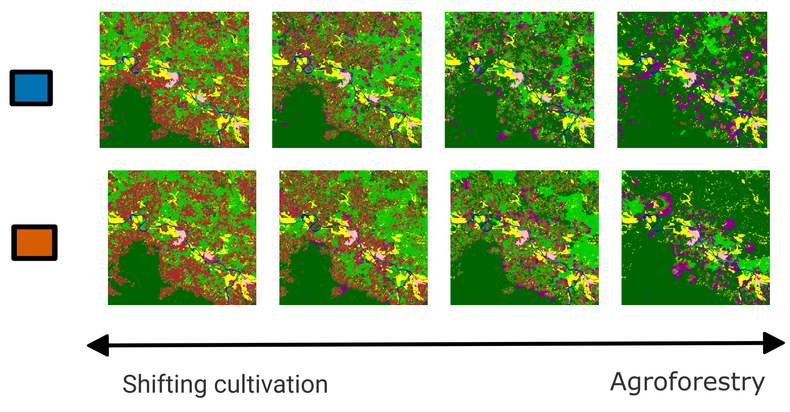
Assess the impacts of these scenarios on tick exposure.

Methods

Study Area: The Sava Region, Madagascar

The Sava region—an important biodiversity hotspot—faces rapid deforestation due to smallholder shifting cultivation. Increasing market integration is driving a shift toward cash-crop agroforestry [3].





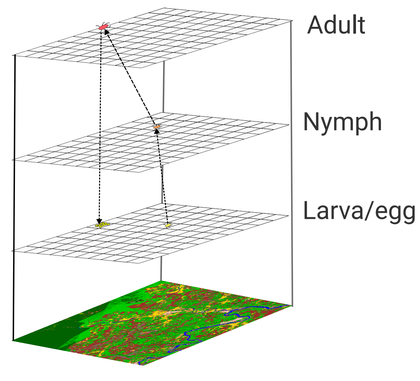
Modeling Future Scenarios

We model multiple future scenarios of market integration:

- Agroforestry spread
- Agroforestry near villages

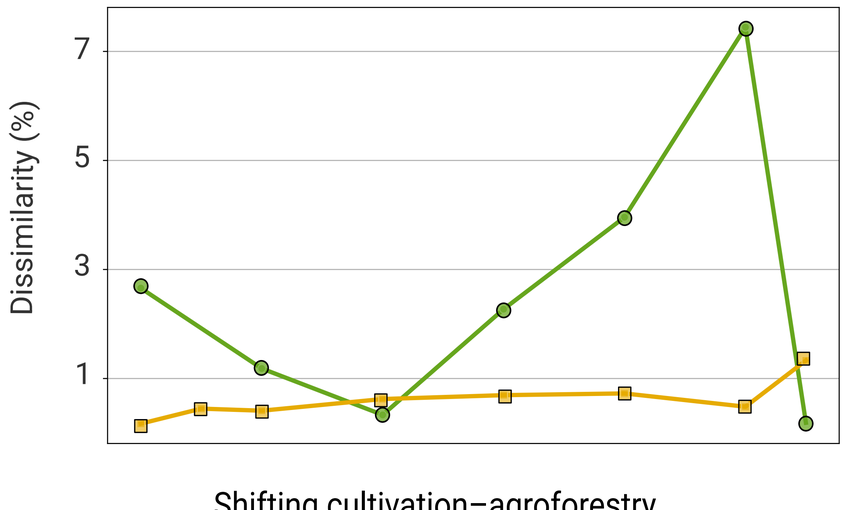
Agent-Based Model for Ticks

We use an Agent-Based Model to estimate tick exposure under each land-use scenario.

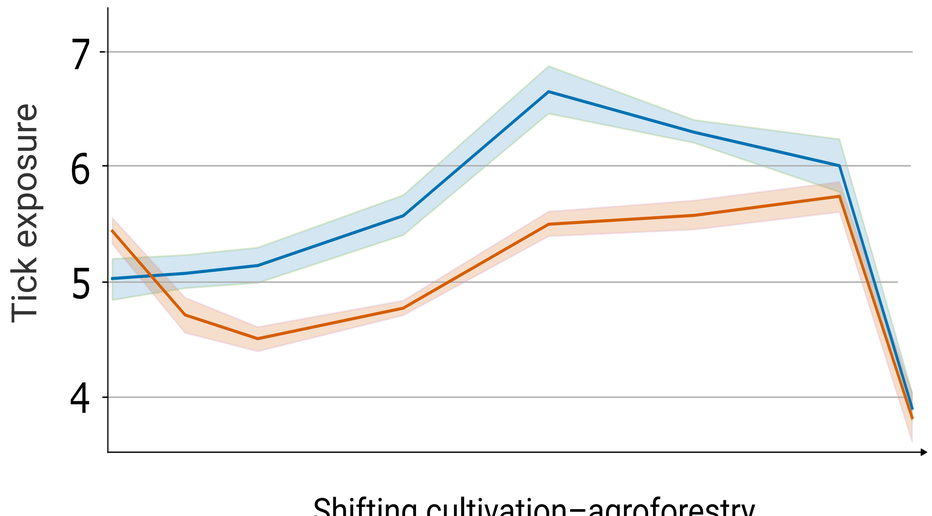


Results

The difference between the two land-use scenarios is driven mainly by land-use configuration rather than composition.



Aggregating vanilla cultivation near villages mitigates increases in tick exposure.



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