Impact of Sustainable Intensification on Landscapes and Livelihoods (SILL)

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Improving Integration among Agriculture, Forestry, and Land Tenure

15 June 2015

Lusaka

SILL Project Team

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- Dr. Laura Schmitt Olabisi, MSU
- Dr. Kurt Waldman, MSU

Project Objectives

1. Provide an **evidence base for linkages** between field and farm-scale sustainable intensification (SI) interventions and (i) forest conservation and (ii) biodiversity conservation in Zambia

2. Provide **recommendations** to inform the design of an **integrated framework** for programming in Zambia

- Pilot sites: Eastern and Lusaka Provinces, Zambia

Agricultural-Environmental Linkages
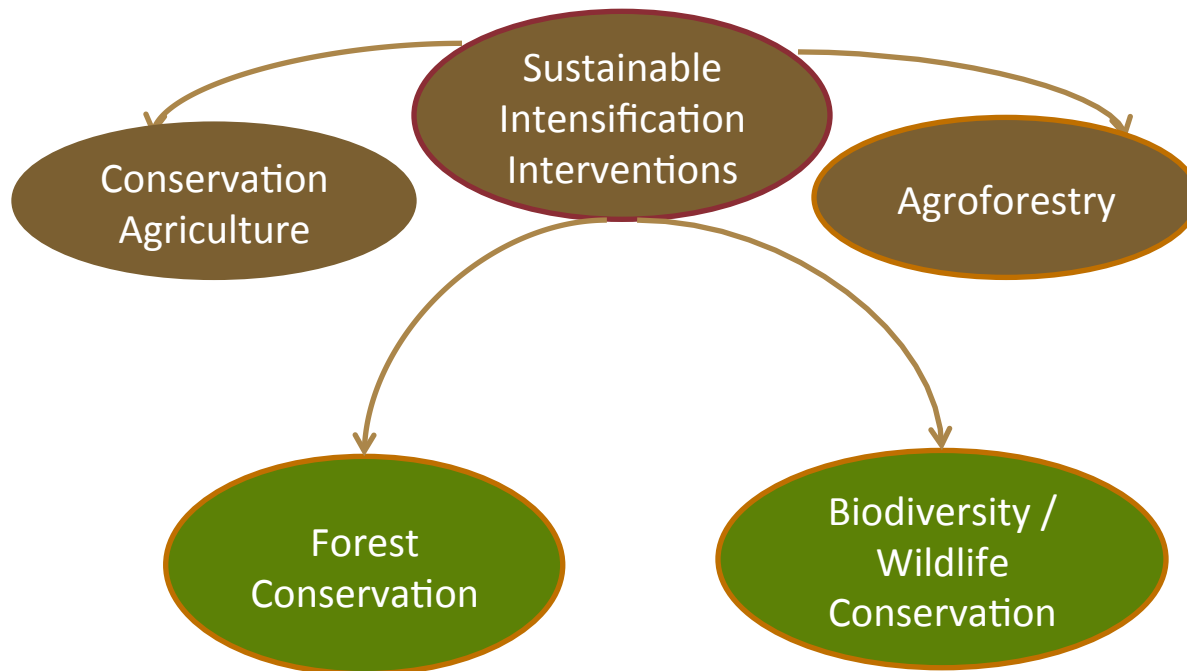
Participatory System Dynamics Modeling

- May 2014: Workshops in Mfuwe and Lusaka
  - Activities designed to identify causal relationships related to agriculture & environment in Zambia
  - Causal loop diagramming activities
- August 2014: Participatory modeling workshop in Chisamba

Major Trends in Zambia

- Relatively low population density
- Population growth
  - Projected to increase 10x by 2100
- High rates of urbanization

Implications

- Food security– demand for food
- Demand for cropland (migration to land abundant areas)
- Degraded soils
- Low non-farm rural employment

Forest Data Gaps

- Forest cover (estimates vary from 30 million Ha to 60 million Ha of forest)

- Deforestation rates (150,000—300,000/yr)

- Deforestation versus degradation

Wildlife Data Gaps

- Wildlife population data
- Poaching rates
- Response to habitat loss

Agricultural Income

- Do SI activities increase yields?
- Can we attribute increased income solely to SI practices?
- What do people do with increased agricultural income?

Model Structure
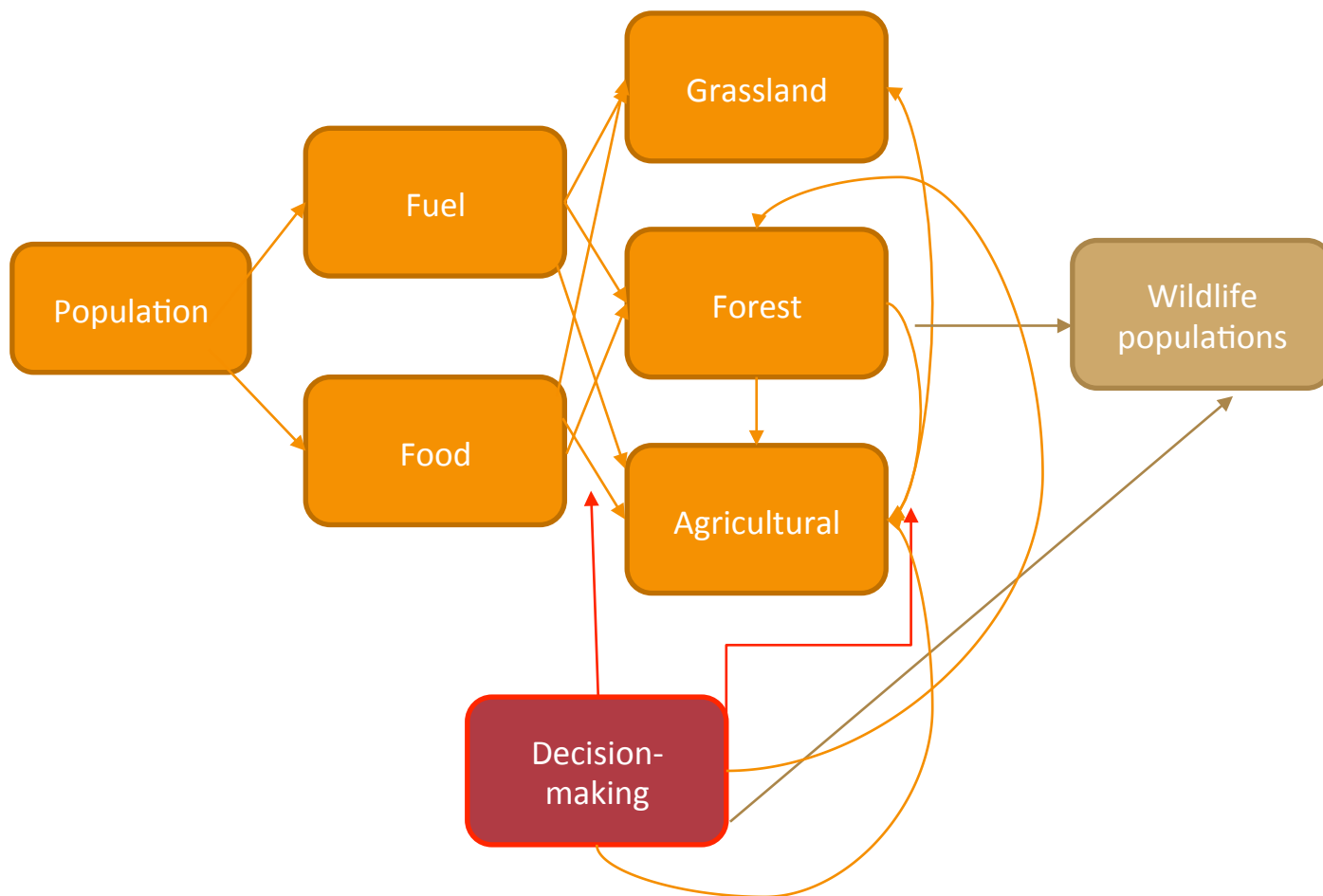
Sources of Deforestation Represented in Model

- Agriculture
- Charcoal production
- Fuelwood collection
- Home construction
- Commercial timber *

National Level Deforestation over time, baseline

18% loss   14% loss

National Model

Deforestation by Driver

National Model

Miombo Clearing by Driver
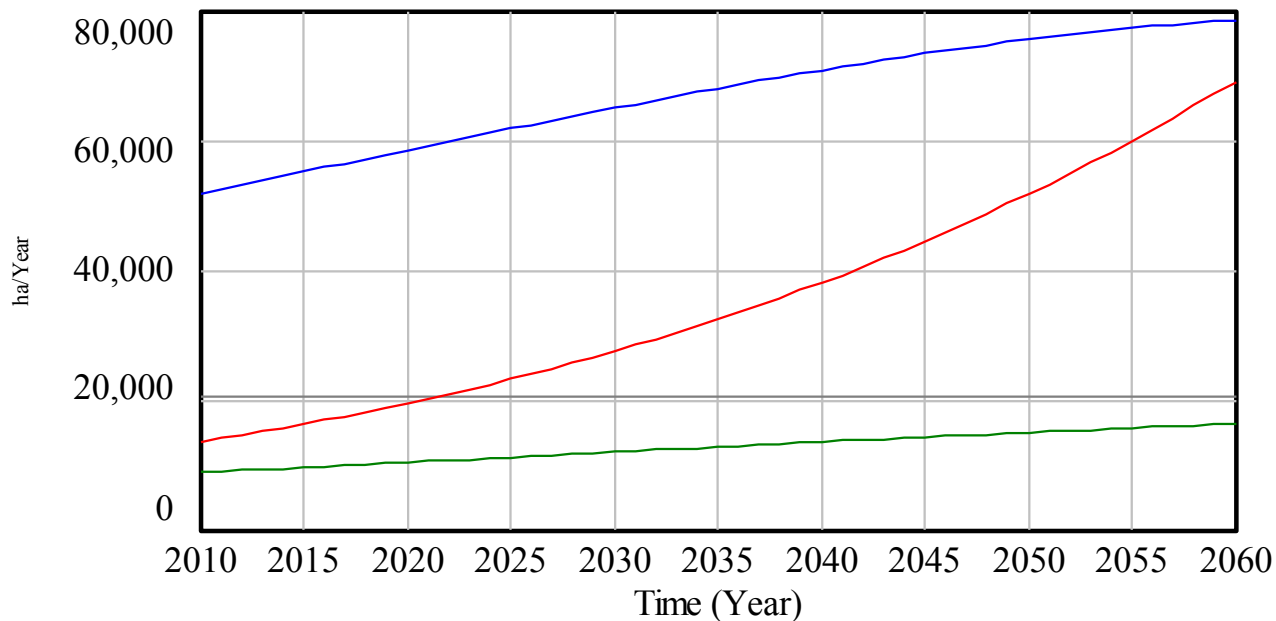
Model Validation

- Model reports 156,364 ha. loss of all forest types in 2010
- 167,000: FAO (2010)
- 298,000: UN-REDD (2010)
- World Bank: 0.33% annually (our model: 0.33% in 2010).
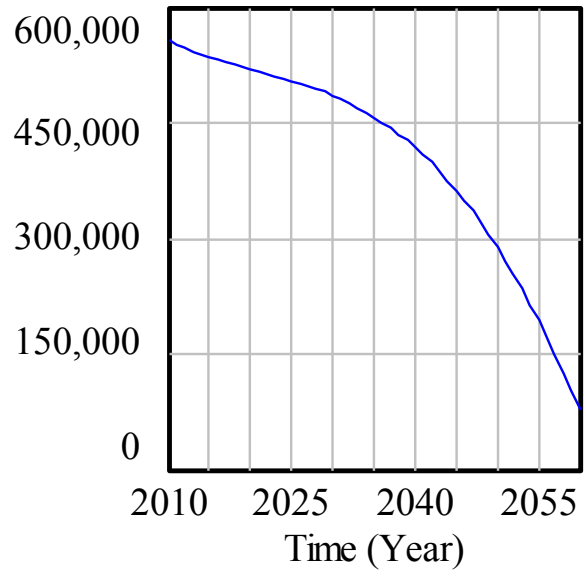- However, we do not include deforestation from mining

Lusaka Baseline

Deciduous and evergreen forest
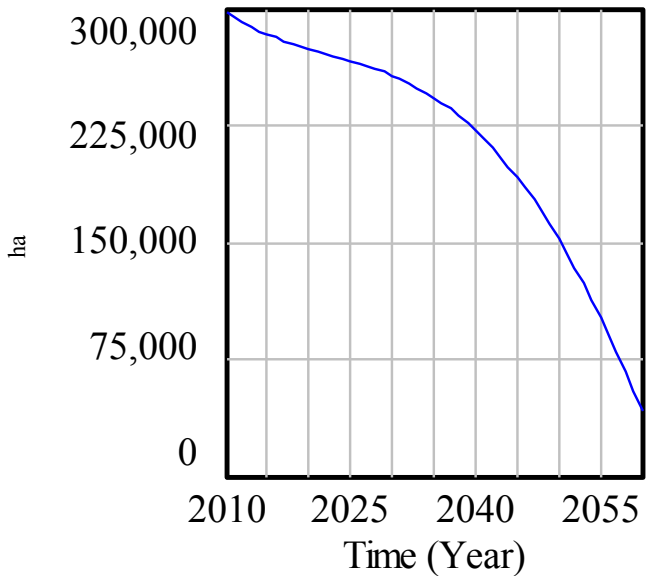
Deciduous and evergreen forest : lusaka_baseline

1.23% loss rate
in 2010

Miombo woodland

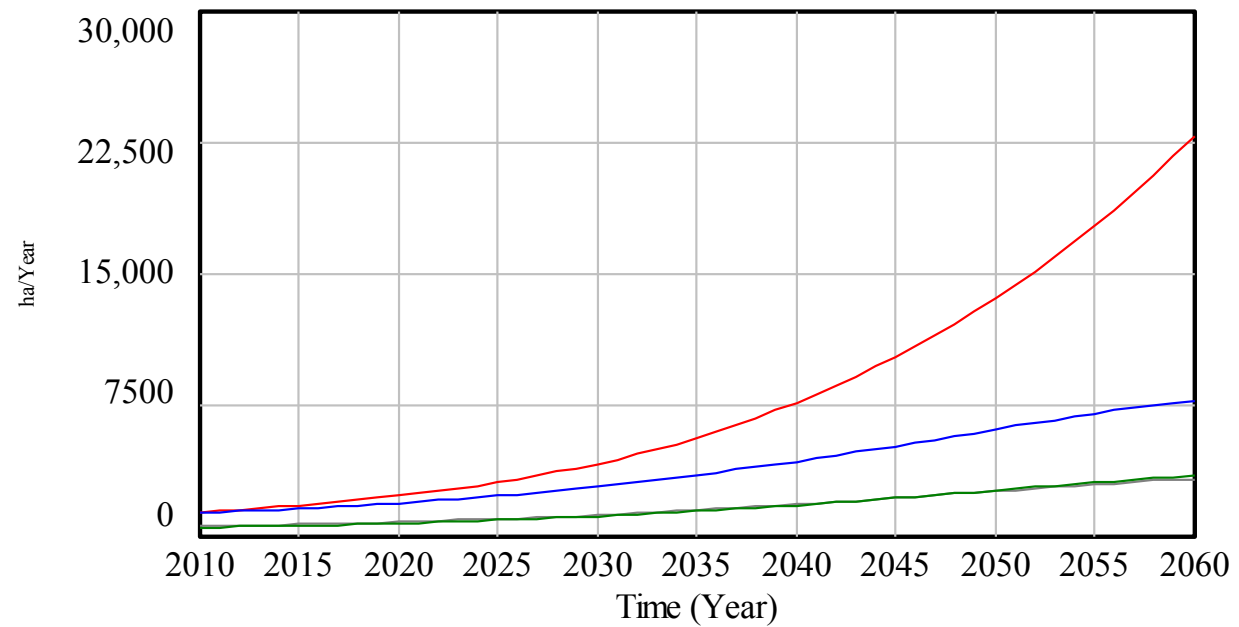Miombo woodland : lusaka_baseline

0.93% loss rate
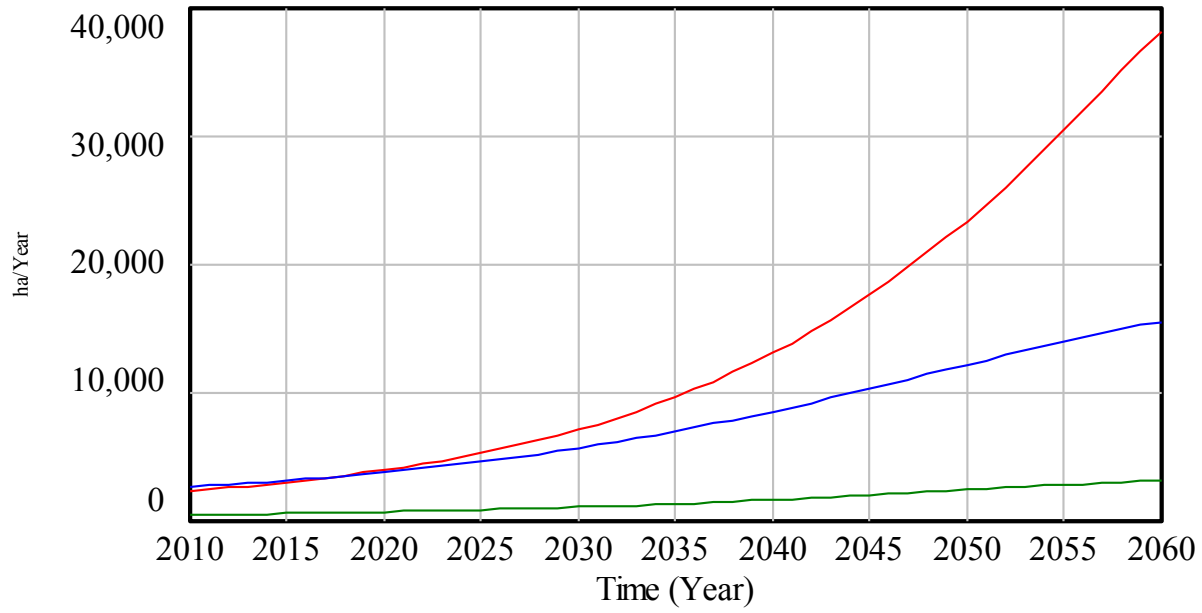in 2010

Lusaka Province

Deforestation by Driver

ha/Year

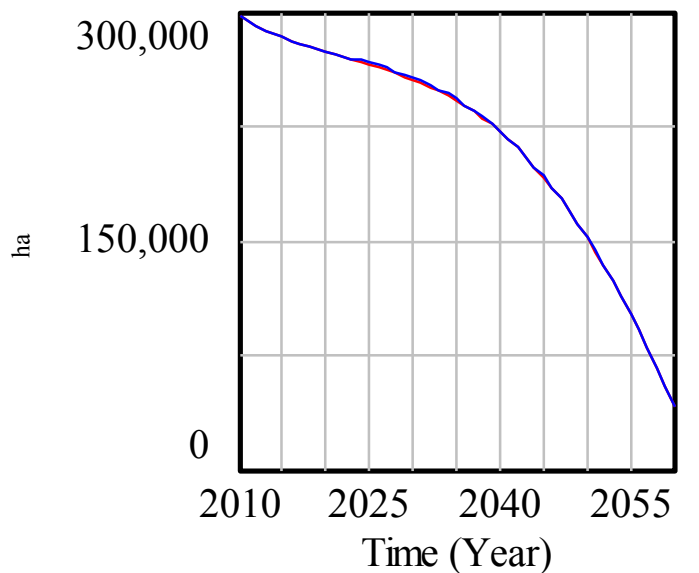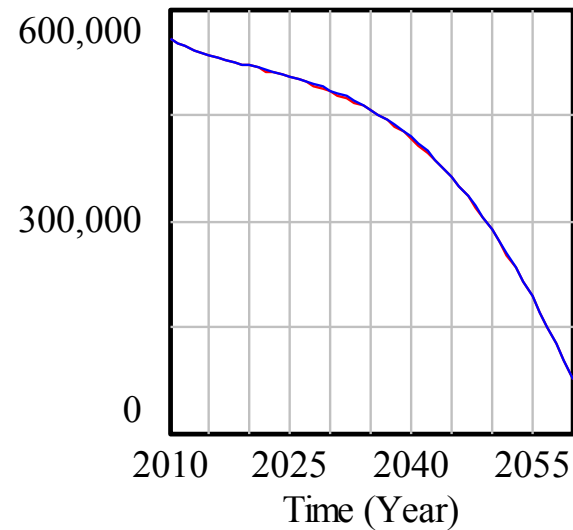|	
deforestation for agriculture : lusaka_baseline	
area of forest needed for charcoal : lusaka_baseline	
area of forest needed for fuelwood : lusaka_baseline	
forest clearing for rural home construction : lusaka_baseline	

Lusaka Province

Miombo Clearing by Driver

Effect of Drought on Forest Cover

Deciduous and evergreen forest

Miombo woodland

A drought affecting 70% of agricultural area occurs every 40 years, and 40% of agricultural area every 8 years. Farmers turn to charcoal production for income in years in which their crops are affected. If farmers engage in CA, they are not affected.
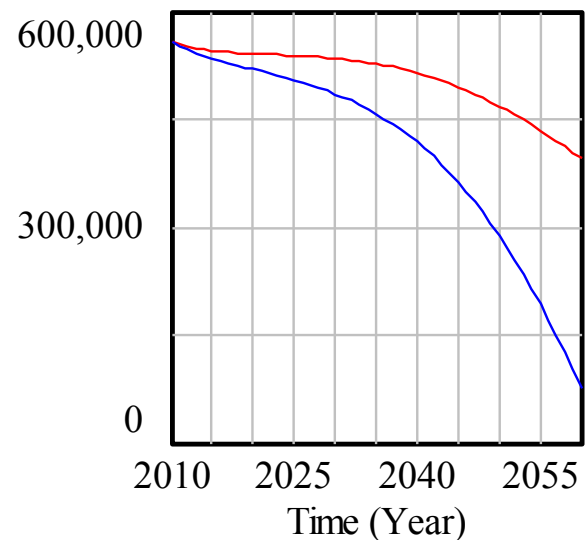
Effect of Full Electrification on Forest Cover

Deciduous and evergreen forest

Miombo woodland

Effects of Maize Yield increase on Forest Cover

Deciduous and evergreen forest

ha 300,000 — 150,000 — 0

2010   2025   2040   2055
Time (Year)

Deciduous and evergreen forest : lusaka_baseline ————
Deciduous and evergreen forest : lusaka_yield ————

Miombo woodland

600,000 — 300,000 — 0

2010   2025   2040   2055
Time (Year)

Miombo woodland : lusaka_baseline ————
Miombo woodland : lusaka_yield ————

Maize yields increase at 3x their current rate.

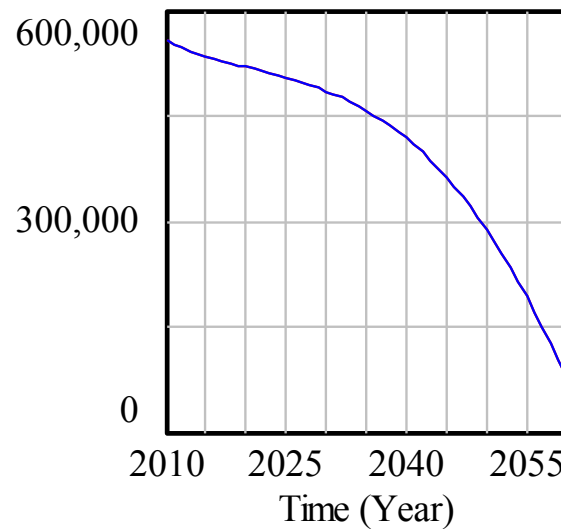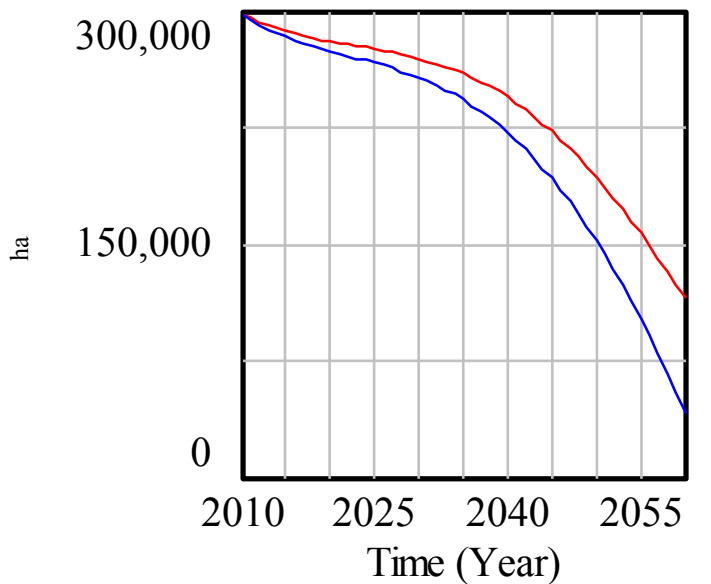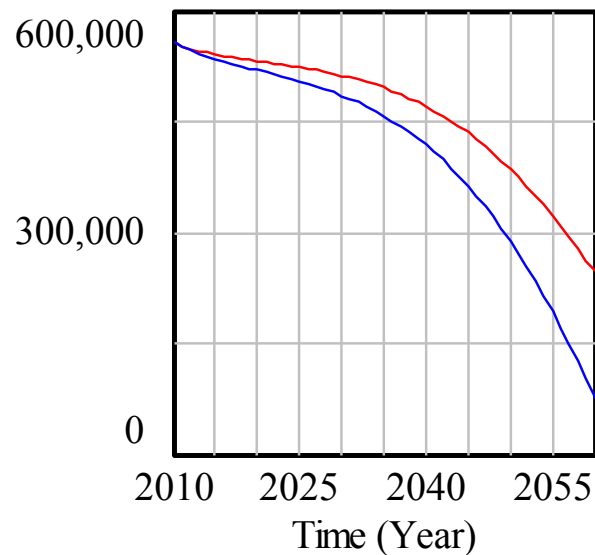# Effect of Fuel Efficient Stoves on Forest Cover

Deciduous and evergreen forest

Deciduous and evergreen forest : lusaka_baseline
Deciduous and evergreen forest : lusaka_efficient_stoves

Miombo woodland

Miombo woodland : lusaka_baseline
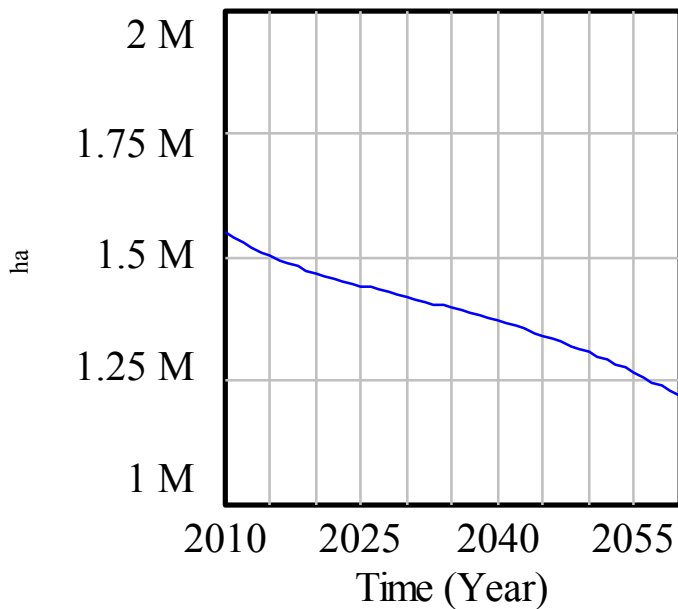Miombo woodland : lusaka_efficient_stoves
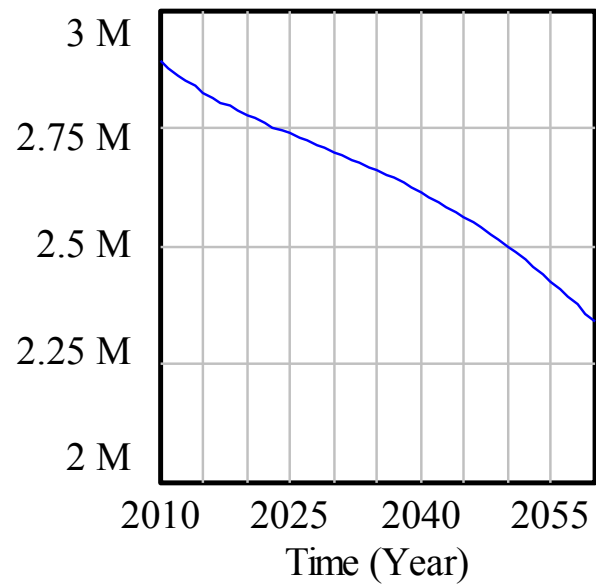
Eastern Baseline

Deciduous and evergreen forest

Deciduous and evergreen forest : eastern_baseline

0.74% loss rate
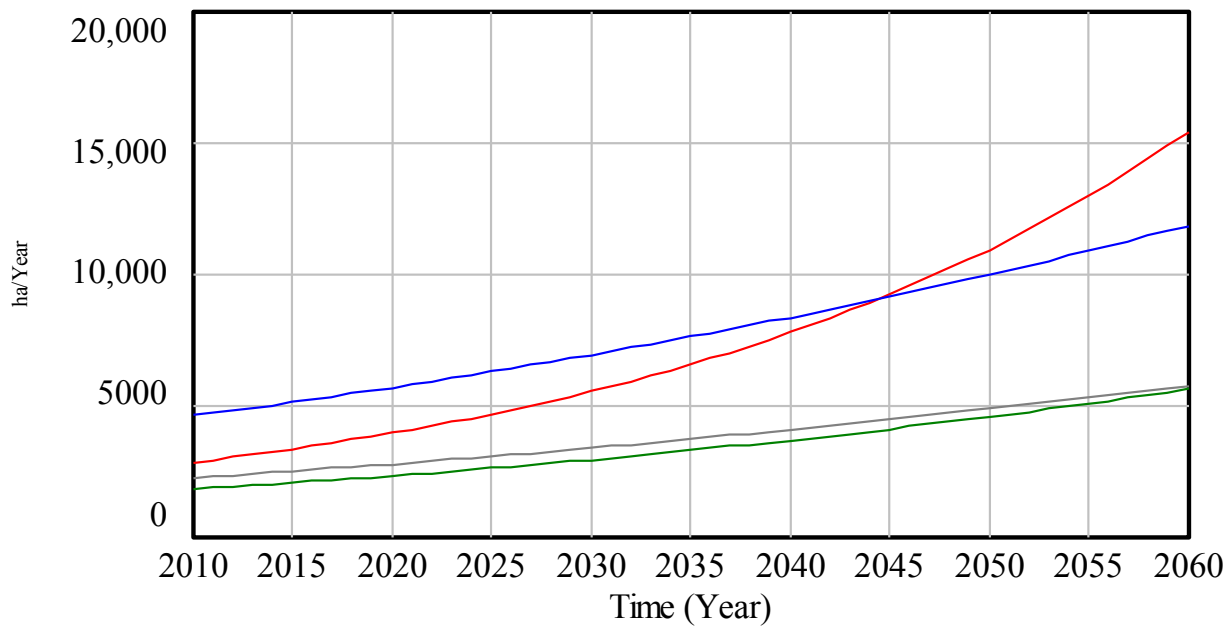in 2010

Miombo woodland

Miombo woodland : eastern_baseline

0.54% loss rate
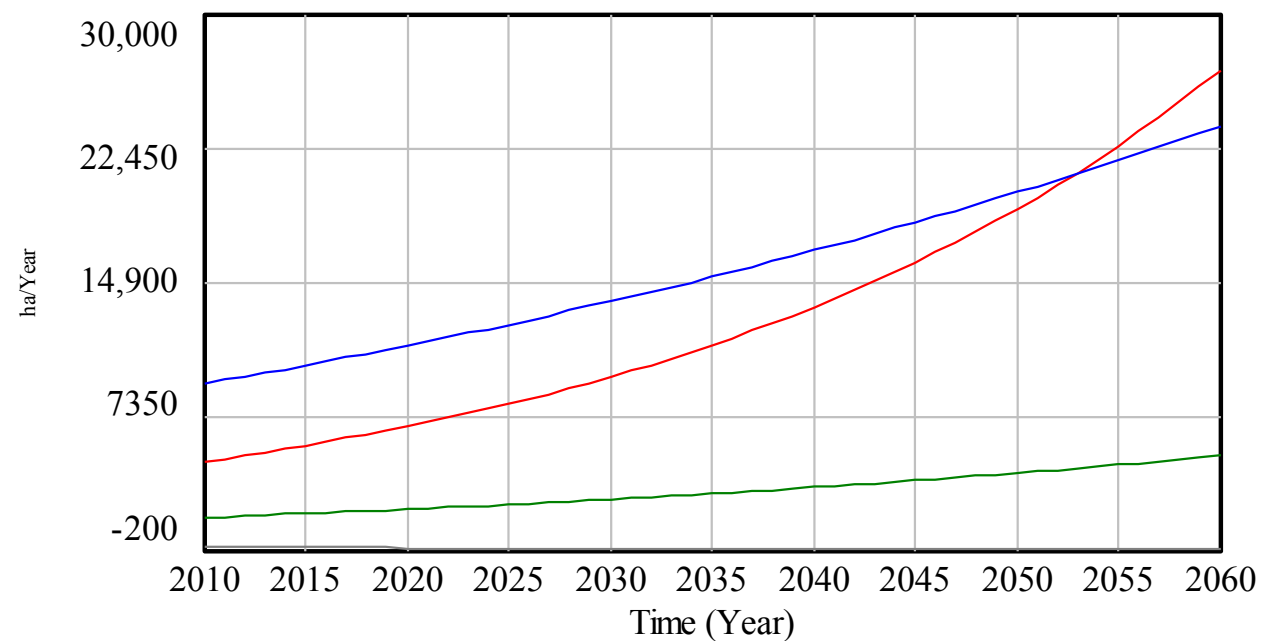in 2010

Eastern Province

Deforestation by Driver

Legend:
- deforestation for agriculture : eastern_baseline
- area of forest needed for charcoal : eastern_baseline
- area of forest needed for fuelwood : eastern_baseline
- forest clearing for rural home construction : eastern_baseline

Eastern Province

Miombo Clearing by Driver

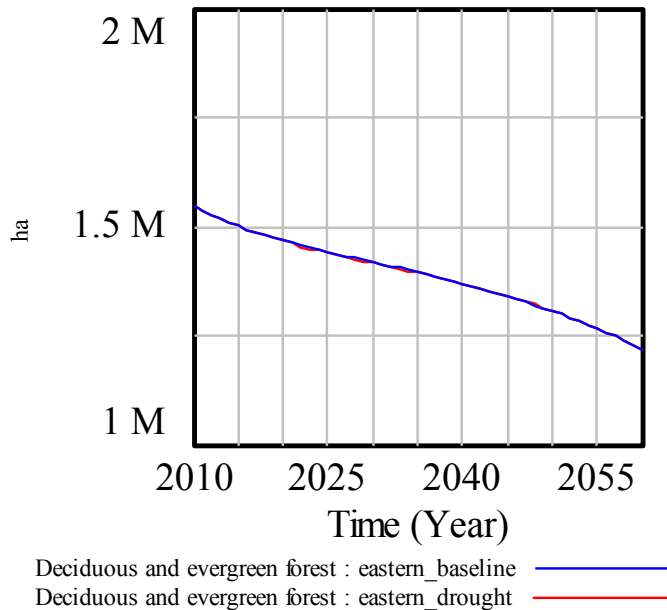miombo clearing for ag : eastern_baseline
area of miombo needed for charcoal : eastern_baseline
area of miombo needed for fuelwood : eastern_baseline
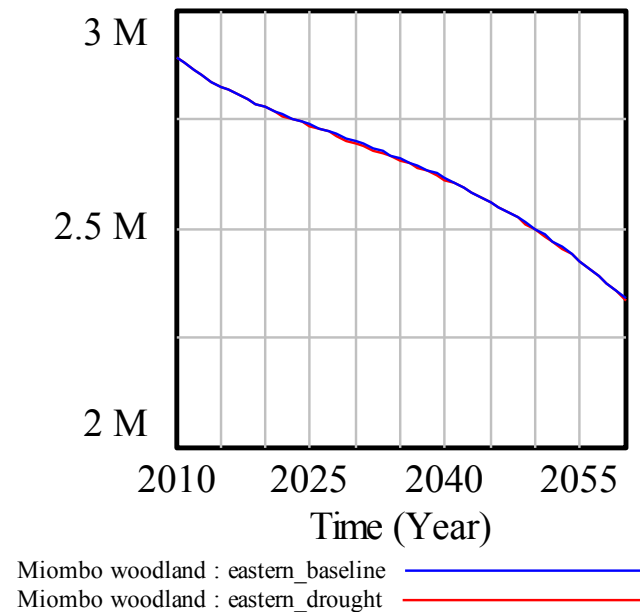miombo clearing for rural home construction : eastern_baseline

Effect of Drought on Forest Cover

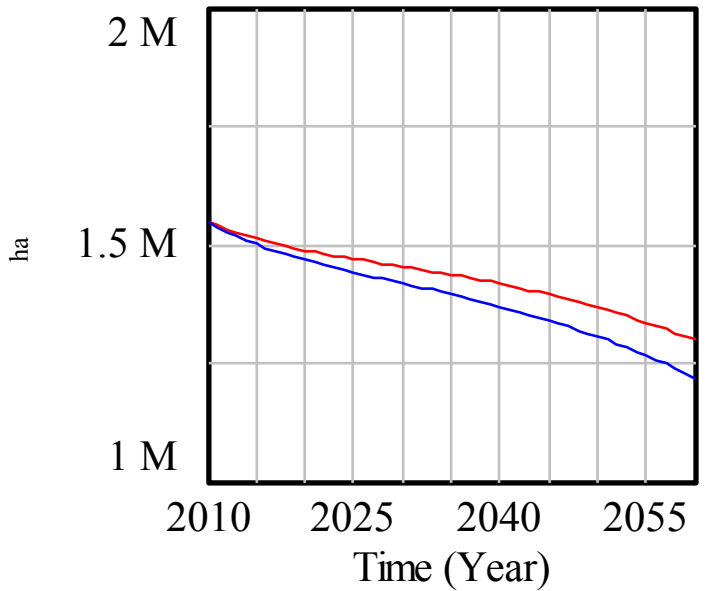Deciduous and evergreen forest

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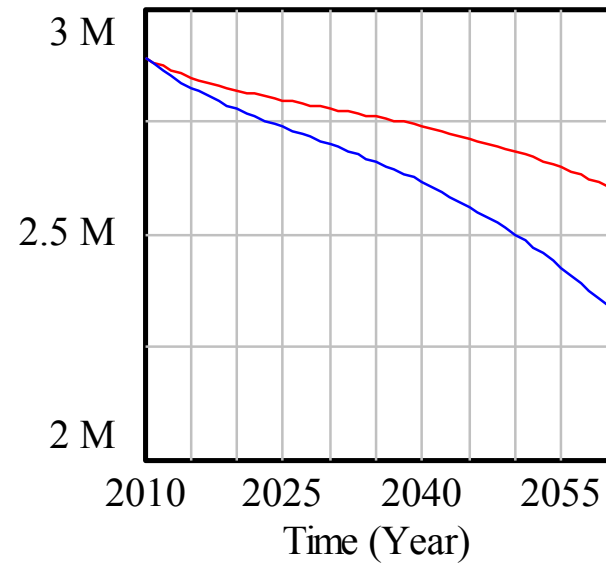
Effect of Full Electrification on Forest Cover

Effects of Maize Yield increase on Forest Cover

Deciduous and evergreen forest

Deciduous and evergreen forest : eastern_baseline
Deciduous and evergreen forest : eastern_yield

Miombo woodland

Miombo woodland : eastern_baseline
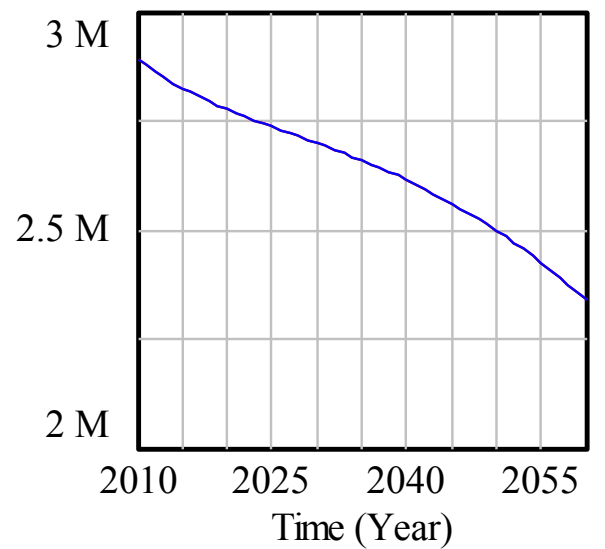Miombo woodland : eastern_yield

Maize yields increase at 3x their current rate.

Effect of Fuel Efficient Stoves on Forest Cover

Deciduous and evergreen forest

Deciduous and evergreen forest : eastern_baseline
Deciduous and evergreen forest : eastern_efficient_stoves

Miombo woodland

Miombo woodland : eastern_baseline
Miombo woodland : eastern_efficient_stoves

Conclusions
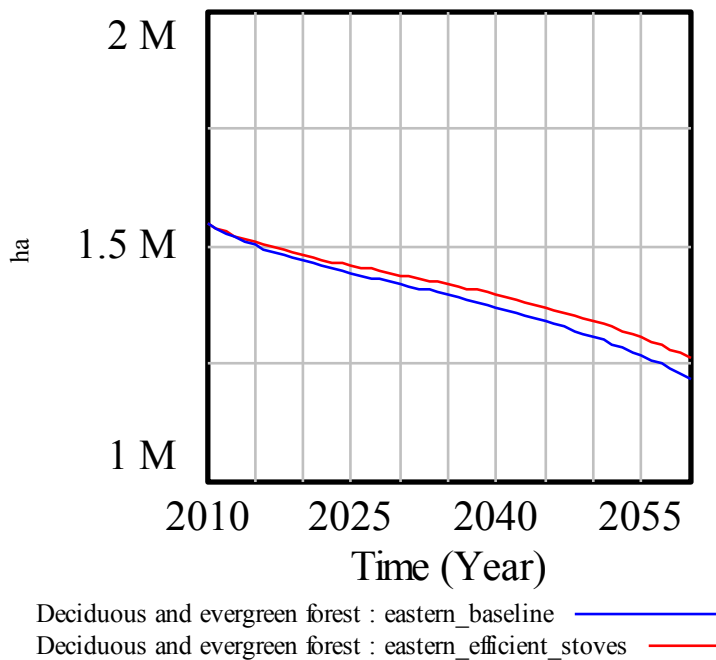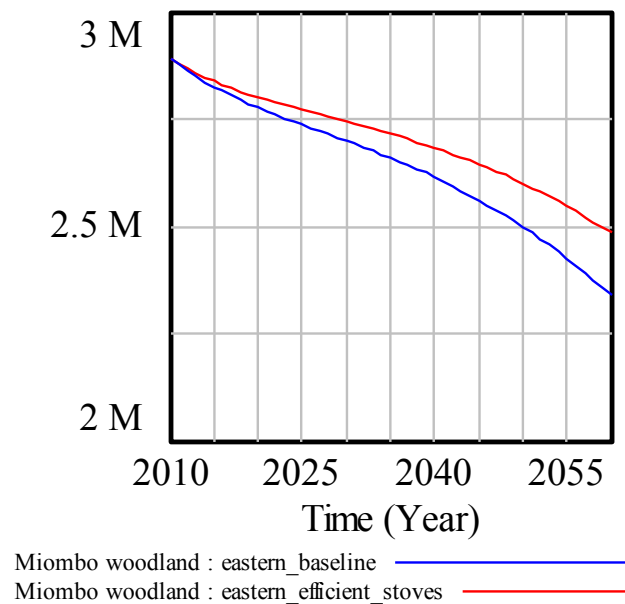
- Charcoal and clearing for agriculture are both important stories

- Charcoal dominates in Lusaka; agriculture dominates currently in EP

- Charcoal dominates both in the future

- Agricultural land clearing is driven by rural population growth, not low yields/land abandonment

- Charcoal production is driven by urban population growth and energy demand