Low Emissions Development Strategies (LEDS) Modelling Support - Mozambique

Mozambique Modelling Team
Layout of the presentation

1. Background and Context

2. Model selection

3. Replacing fuel-based irrigation pumps by PV-based pumps

4. Replacing SAB agriculture by AFS

5. Scenarios development

6. Results

7. Conclusions and Lessons learned
1. Background

Forest cover: 40 million ha (51% of the country surface)

Mainly Miombo forests (dry forests)

Annual deforestation rate: 0.58% (1990-2005)

- 65% Slash and burn Agriculture
- 4% Wood fuel
Low Emissions Development Strategies (LEDS) Modelling Support - Mozambique

• Establish Mozambique’s project level baseline as reference for extrapolating future policy & implementation options in the identified priority sectors

• Long term LEDS policy planning analytical framework established targeting emissions abatement & climate resilience trends, socio-economic development tradeoffs and cost-benefit analysis of prioritized options
Action 2: Replace slash-and-burn (SAB) agriculture with Agroforestry Systems
Action 1: Replace fuel operated irrigation pumps with Photovoltaic pumps
Modelling team constitution

• Eduardo Mondlane University (Team Leader)
  • Ecological Modelling
  • Agroforestry
  • Agricultural Economics
  • Energy solutions

• INIR – National Institute for Irrigation – irrigation policies and statistics;

• IIAM – Agricultural Research Institute of Mozambique – Agriculture policies and statistics;

• MITADER – Ministry of Land, Environment and Rural Development – Environment, Climate Change, and Sustainable Development Policies
2. Model selection

The Long-range Energy Alternatives Planning system

LEAP

REDD Abacus SP

Land Use Planning Tool

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Version 1.2.2
3. Replacing Fuel Pumps by Photovoltaic Pumps

![Graph showing emissions from 2010 to 2030 comparing BAU and All2Solar scenarios.](image-url)
3. Replacing Fuel Pumps by Photovoltaic Pumps

Energy Demand
3. Replacing Fuel Pumps by Photovoltaic Pumps

Energy Balance
4. Replacing SAB Agriculture with AFS
# Data requirements and parameterization

<table>
<thead>
<tr>
<th>Land use type</th>
<th>Description</th>
<th>C stock (Mg C/ha)</th>
<th>Profitability (NPV, $/ha)</th>
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<td>Plantation forests</td>
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<td>Natural forests</td>
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<td>CS</td>
<td>Cassava</td>
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<td>Maize</td>
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<td>Agroforestry systems</td>
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<td>FuelIrr</td>
<td>Fuel Pumps</td>
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5. Scenario development

• BAU (Business-as-Usual)
  • Land use matrix based on the current land conversion processes

• Replace all fuel-based irrigation pumps by photovoltaic-based irrigation pumps
  • In irrigated agriculture, replace 100% of fuel pumps by photovoltaic pumps

• Replace 50% of the SAB based maize systems by AFS
  • In SAB maize systems, replace 50% by AFS
Land use transition matrix (Area x10^6 ha)

<table>
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<th></th>
<th>PL</th>
<th>FL</th>
<th>AFS</th>
<th>CS</th>
<th>Fuellrr</th>
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6. Results

Cost & Benefits relative to Business as Usual
Opportunity cost curve from 2010 to 2014 (emission avoidance from land use systems conversion)
Opportunity cost curve from 2010 to 2014 (sequestration from land use systems conversion)
Scenario analysis

**Emission scenario**

- Historical (BAU)
- 50% of Maize replaced by AFS
- Pumps replace 100% by Solar panel

**Sequestration scenario**

- Historical (BAU)
- 50% of Maize replaced by AFS
- Pumps replace 100% by Solar panel
Net emissions

Net emission scenario

- Historical (BAU)
- 50% of Maize replaced by AFS
- Pumps replace 100% by Solar panel

Net emission (t CO2eq/year)

Year

2010-2015
2015-2020
2020-2025
2025-2030
2030-2035
Cluster analysis between profitability and carbon stock amongst land cover

![Graph showing the relationship between net present value and carbon stock across different land cover types.]
Cluster analysis between carbon stock and employment amongst land cover
Cluster analysis between profitability and employment amongst land cover

**Employment vs Profitability**

- **Net Present Value, $/ha**
- **Employment, days/ha**

- **Low jobs - low NPV**
  - Grassland
  - Other land

- **Medium jobs - medium NPV**
  - Natural Forest

- **High jobs - high NPV**
  - Maize
  - Agroforestry system
  - Cassava
  - Forest Plantation
7. Conclusions and Lessons Leaned

- We can´t say much in terms of numerical results, but tendencies, and data requirements
- There is a great deal of opportunities to reduce CO2 emissions, and increase CO2 sequestrations from the Agricultural sector
- Agroforestry options in place of SAB agriculture provide not only increased sequestration, but also increased economic returns and more job opportunities
- Use of Photovoltaic water pumps for irrigation, apart from reducing emissions, provides increased economic returns
- The shortage of information was the most limiting factor, revealing weaknesses in research and national GHG inventories
- A team of national modellers has been trained and made available to assist in processes such as GHG inventories (they know the data needs and the missing information) and the INDC preparation
Thank you!