Low Emissions Development Strategies (LEDS) Modelling Support - Mozambique

Mozambique Modelling Team

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4. Replacing SAB agriculture by AFS
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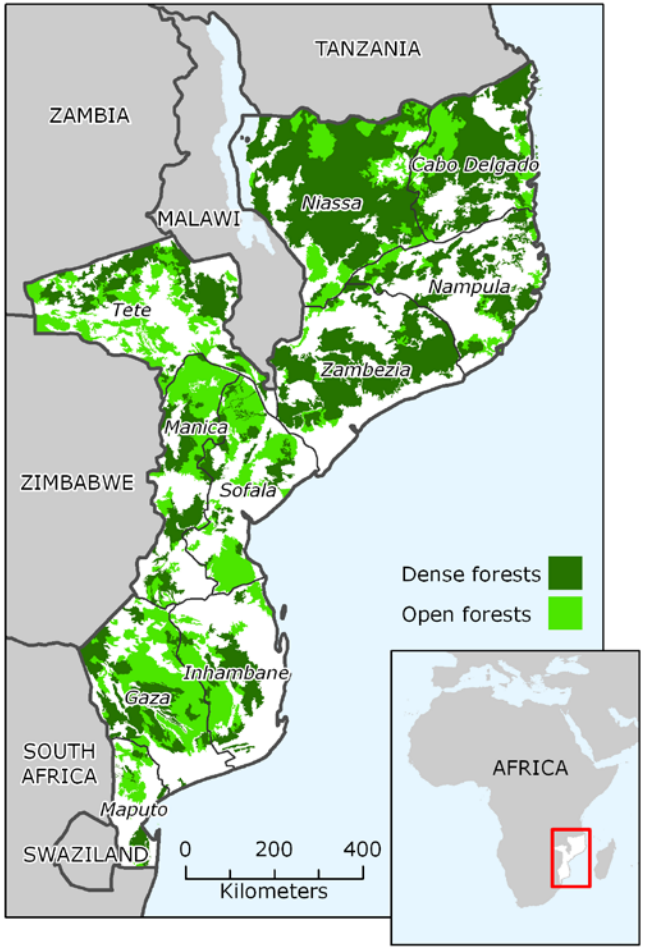
1. Background



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

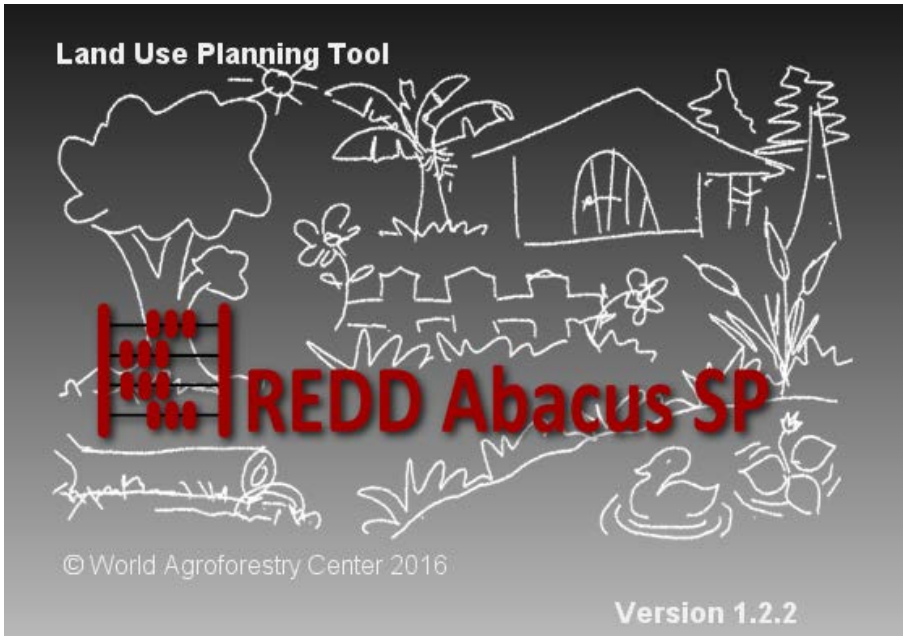
Modelling team constitution

- 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

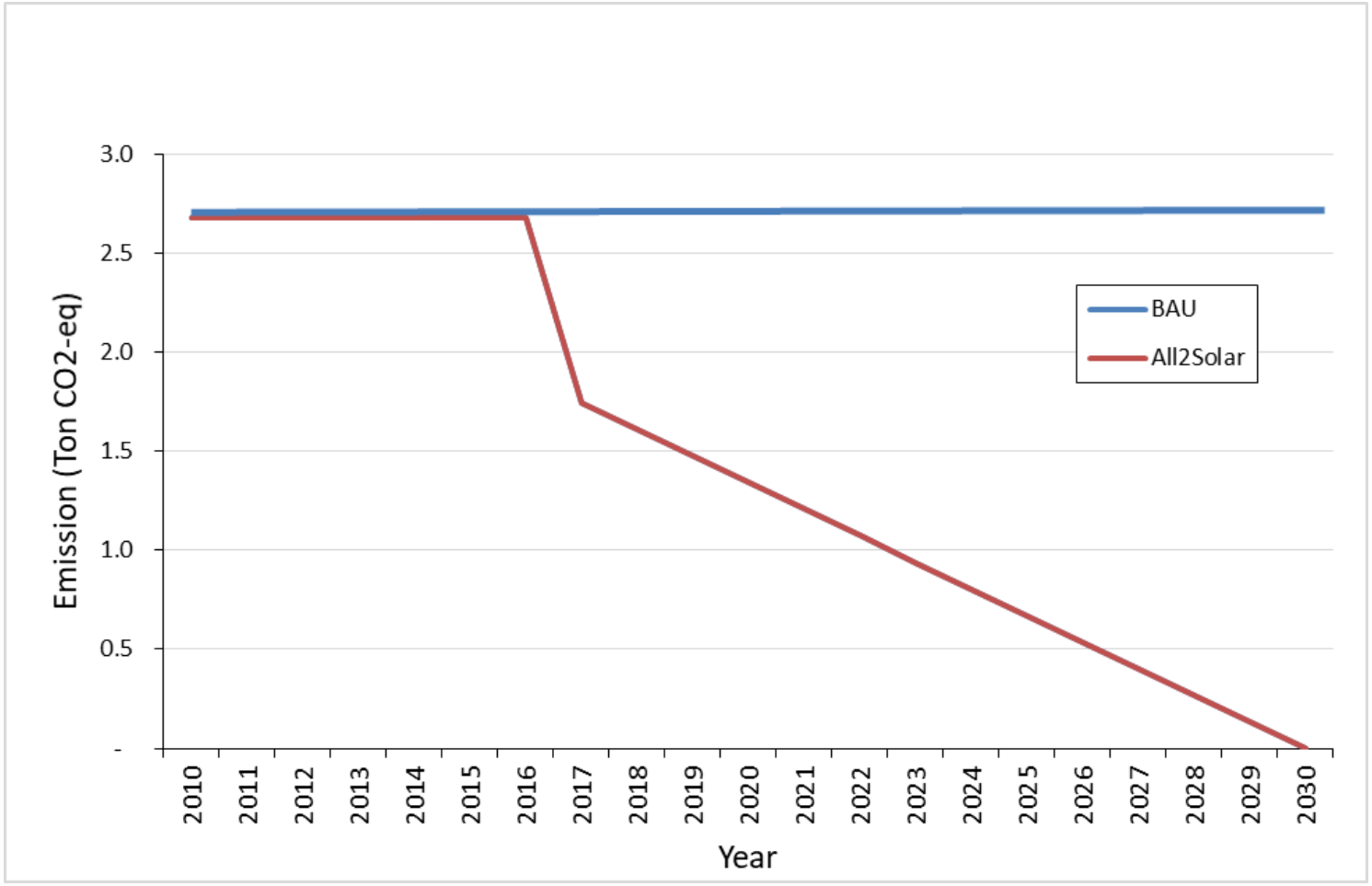
2. Model selection

LEAP

The Long-range Energy Alternatives Planning system



3. Replacing Fuel Pumps by Photovoltaic Pumps

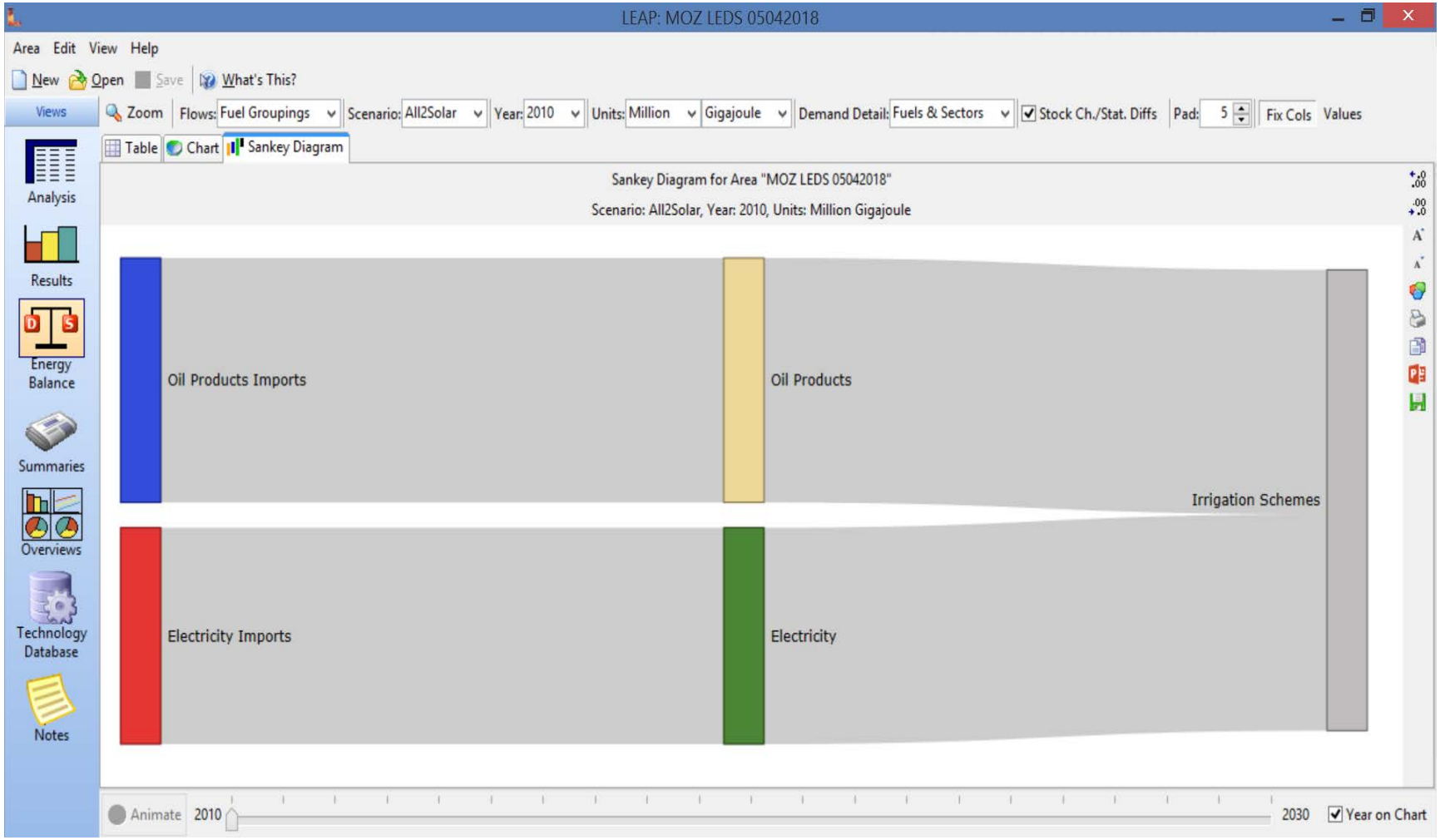


3. Replacing Fuel Pumps by Photovoltaic Pumps

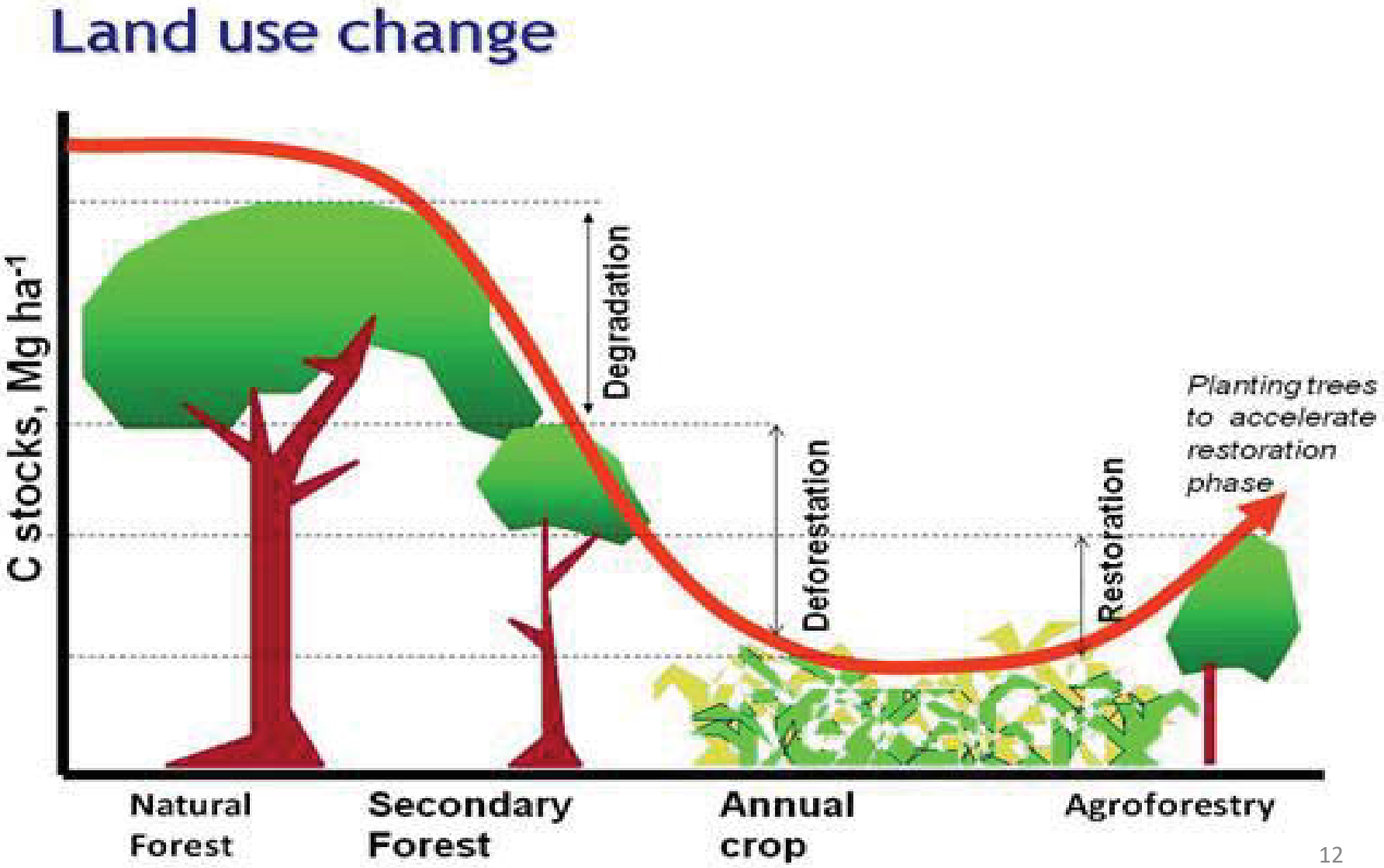
Energy Demand

3. Replacing Fuel Pumps by Photovoltaic Pumps

Energy Balance



4. Replacing SAB Agriculture with AFS



Data requirements and parameterization

Land use type	Description	C stock (Mg C/ha)	Profitability (NPV, $/ha)
PL	Plantation forests	363	200
FL	Natural forests	116	150
CS	Cassava	7	225
MZ	Maize	5	300
GL	Grassland	3	50
OL	Other land uses	1	25
Other			
AFS	Agroforestry systems	85	170
SolarIrr	Solar Panels	6	500
FuelIrr	Fuel Pumps	6	400

5. Scenario development

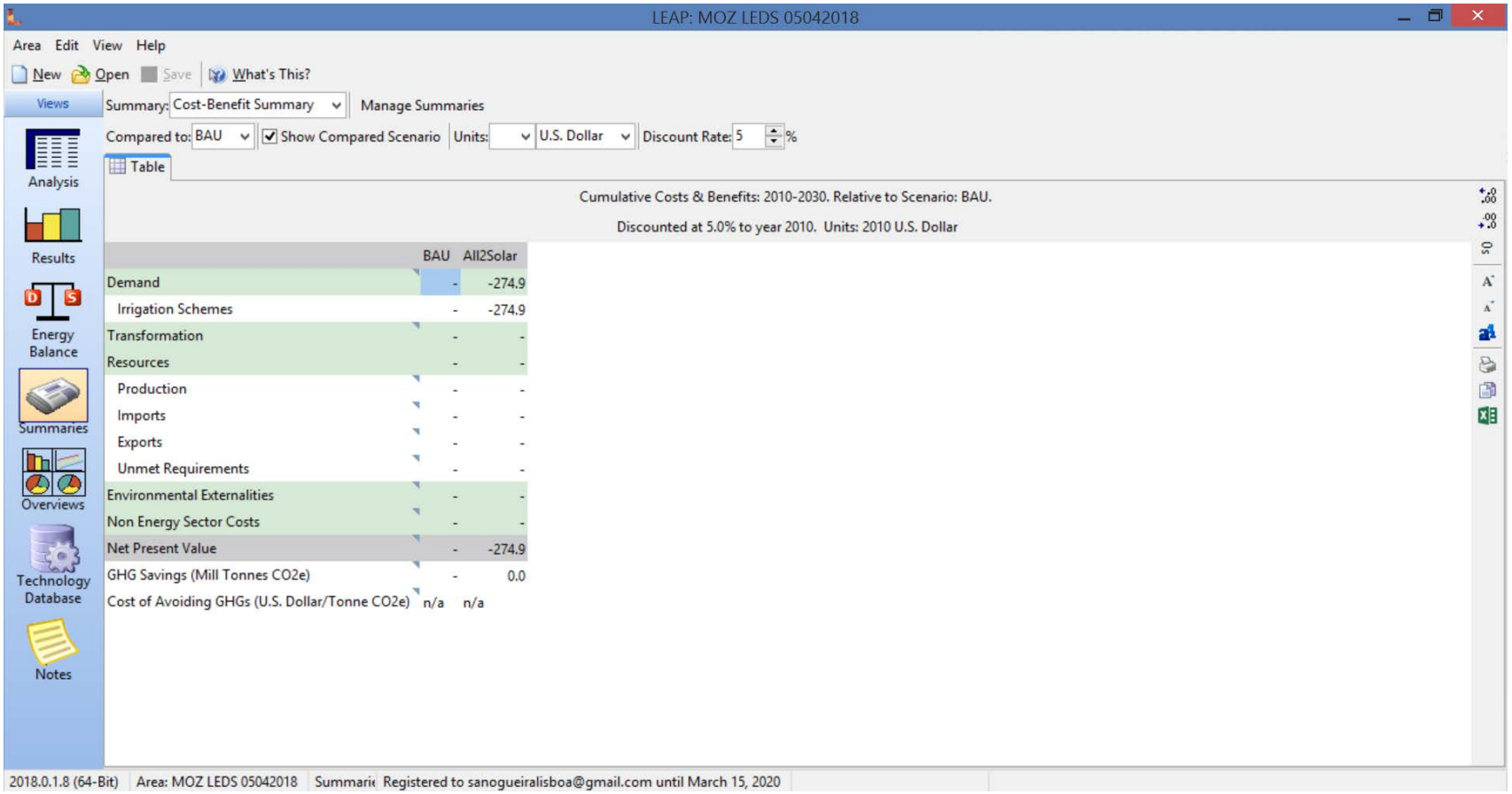
- BAU (Business-as-Usual)
  - Land use matrix based on the current land conversion processes
- Replace all fuel-based irrigation pumps by photovoltaic-based irrigation pumps
  - In irrigated agriculture, replace 100% of fuel pumps by photovoltaic pumps
- Replace 50% of the SAB based maize systems by AFS
  - In SAB maize systems, replace 50% by AFS

Land use transition matrix (Area x10^6 ha)

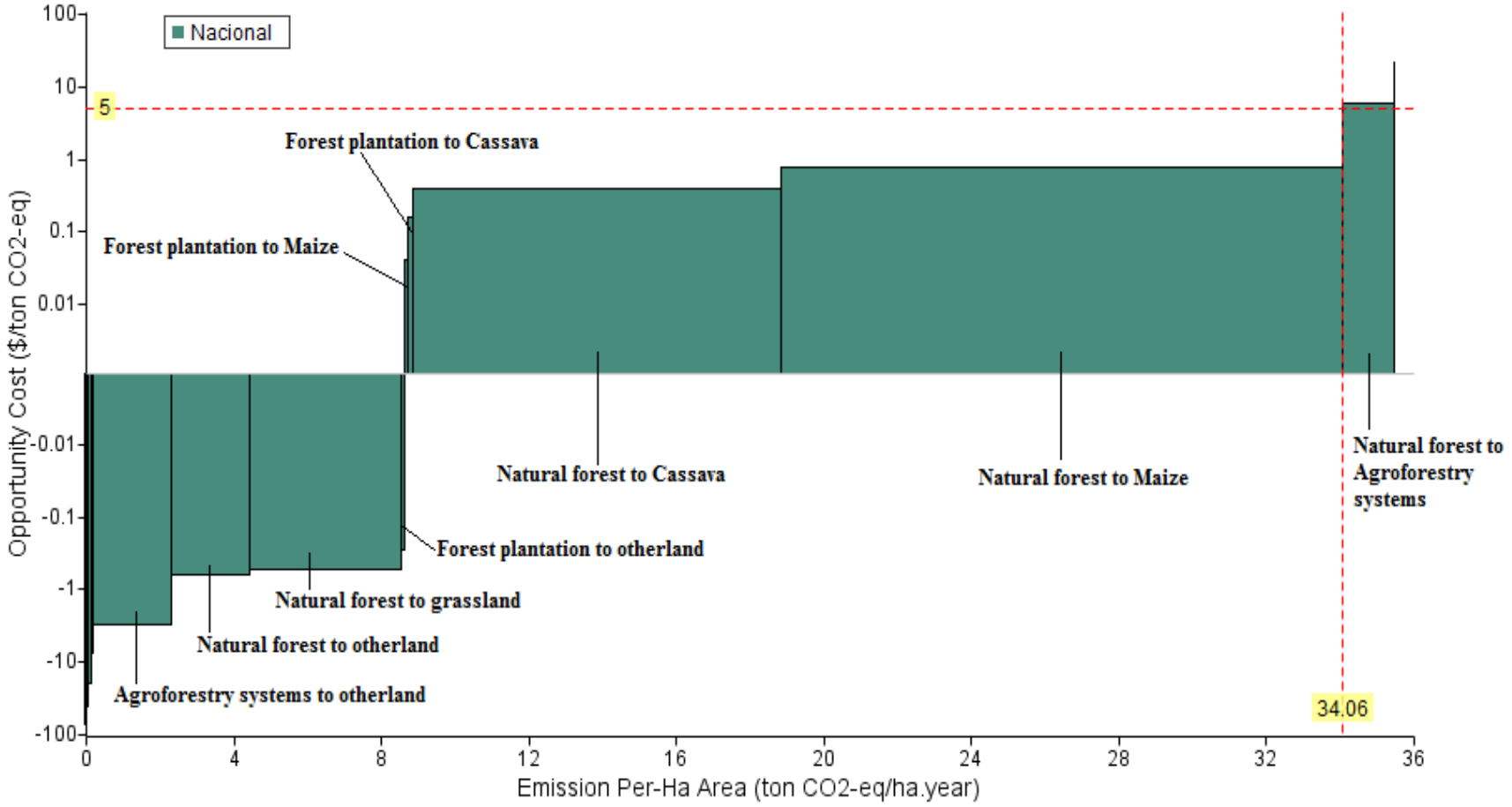
		2014									
		PL	FL	AFS	CS	FuelIrr	SolarIrr	MZ	GL	OL	Total
2010	PL	0.031	0	0	0.005	0	0	0.01	0	0.005	0.051
	FL	0.799	31.954	0.999	1.997	0	0	2.996	0.799	0.399	39.943
	AFS	0	0	5.011	0	0	0	0	0	0.557	5.568
	CS	0.029	0.038	0.019	1.611	0	0	0.01	0.009	0.191	1.907
	FuelIrr	0	0	0.0073	0	0.5256	0	0.1825	0.0146	0	0.730
	SolarIrr	0	0	0	0	0	0	0	0	0	0
	MZ	0.059	0.079	0.039	0.02	0.64	0	1.952	0.018	0.393	3.200
	GL	1.8	0.12	0.18	0.3	1.2	0	0.6	7.2	0.6	12
	OL	0.168	0.419	0.419	0.67	0	0	0.922	0.754	13.405	16.757
	Total	2.886	32.610	6.674	4.603	2.366	0	6.673	8.795	15.550	80.156

6. Results

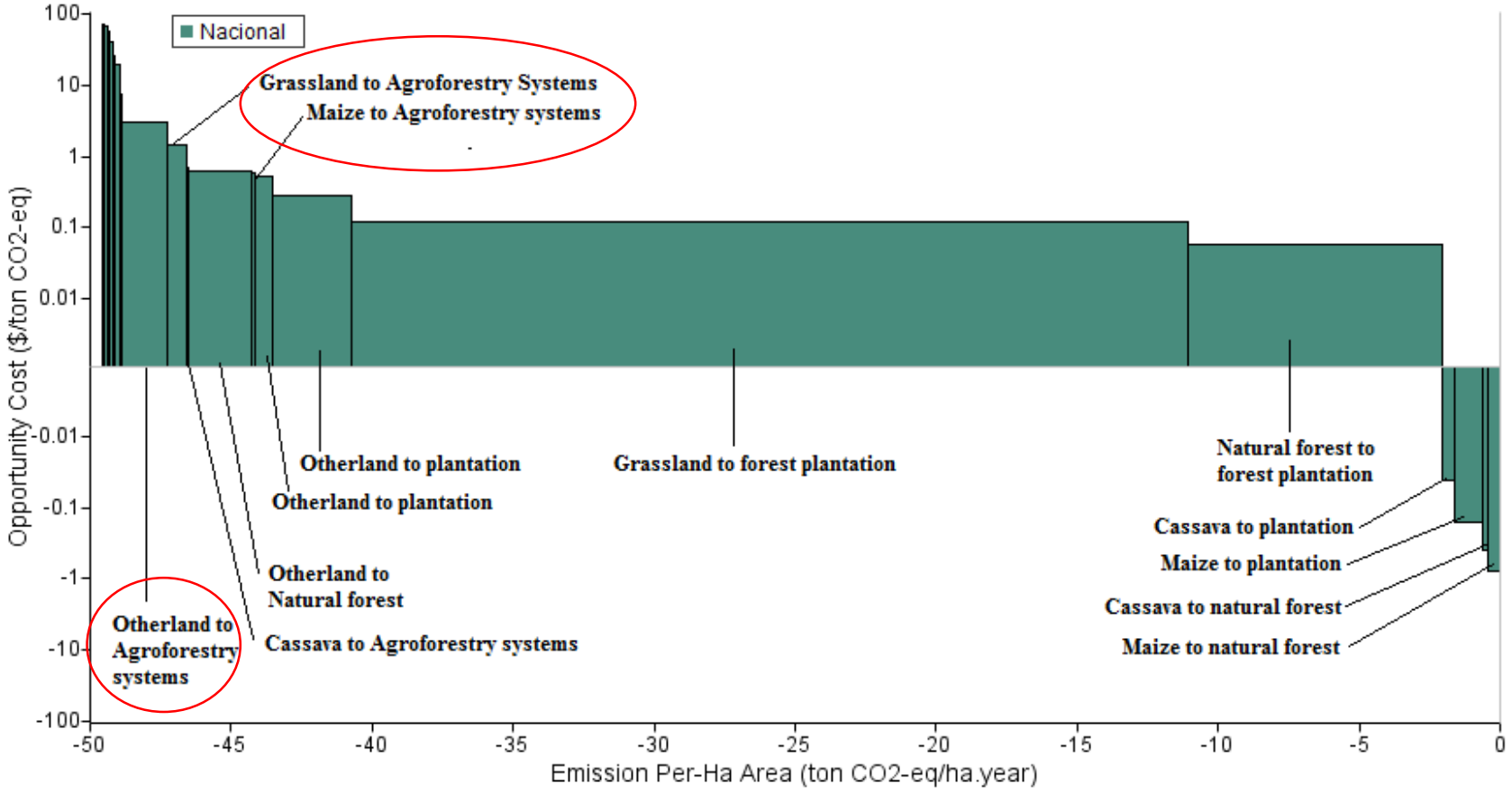
Cost & Benefits relative to Business as Usual



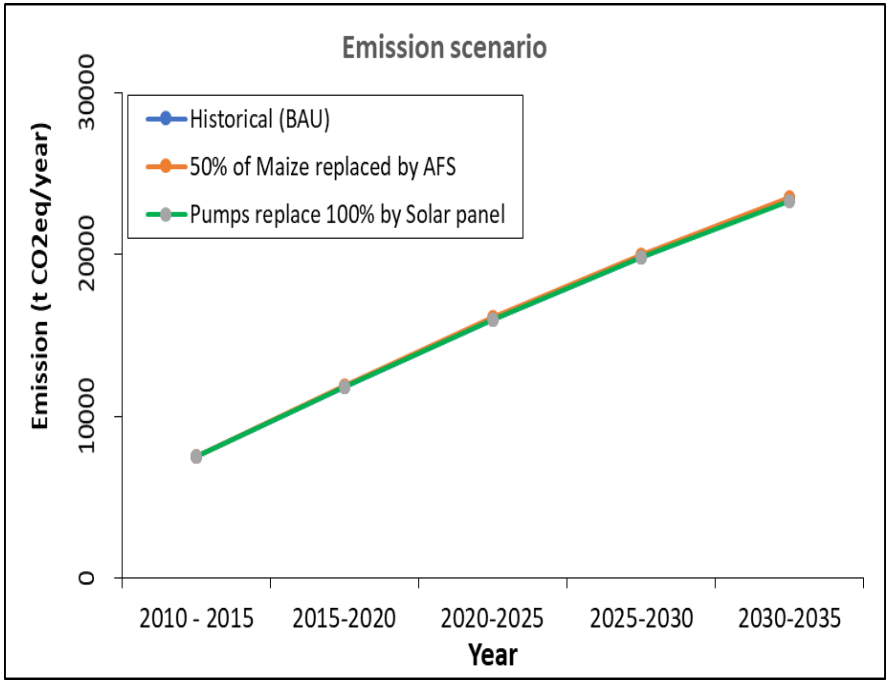
Opportunity cost curve from 2010 to 2014 (emission avoidance from land use systems conversion

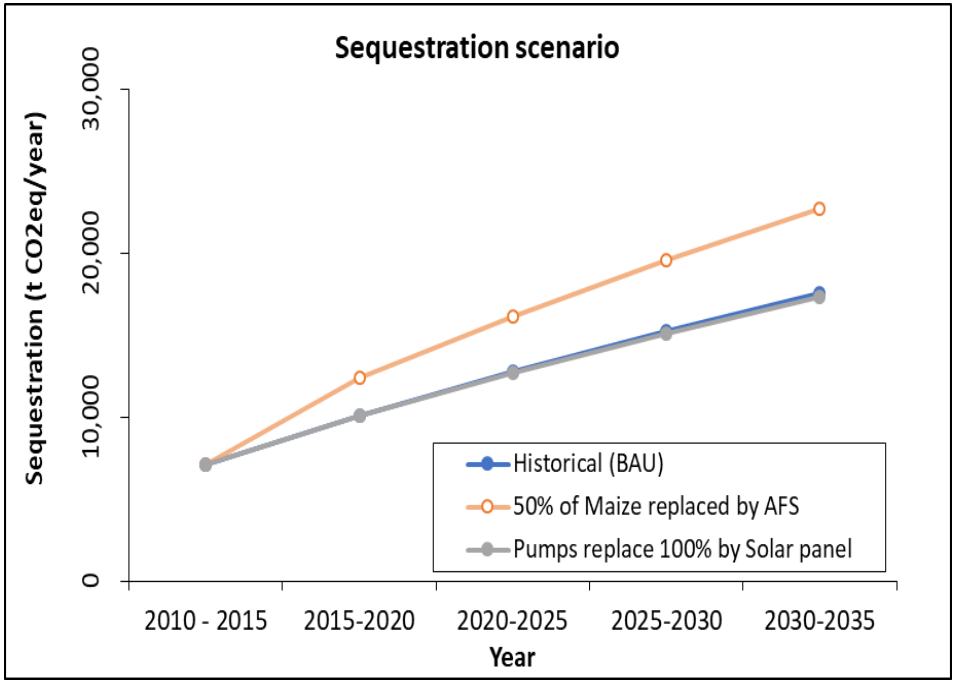


Opportunity cost curve from 2010 to 2014 (sequestration from land use systems conversion)

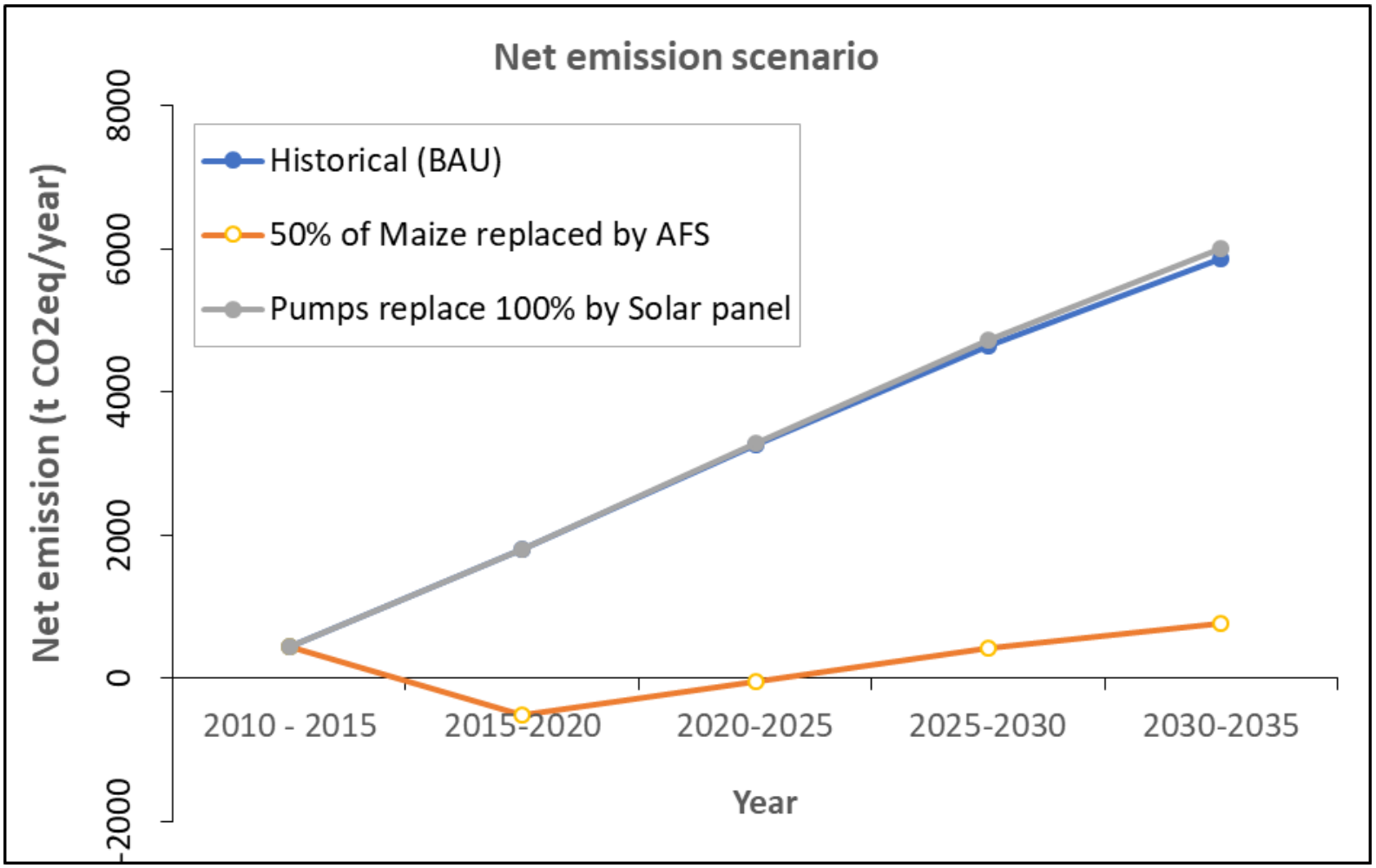


Scenario analysis

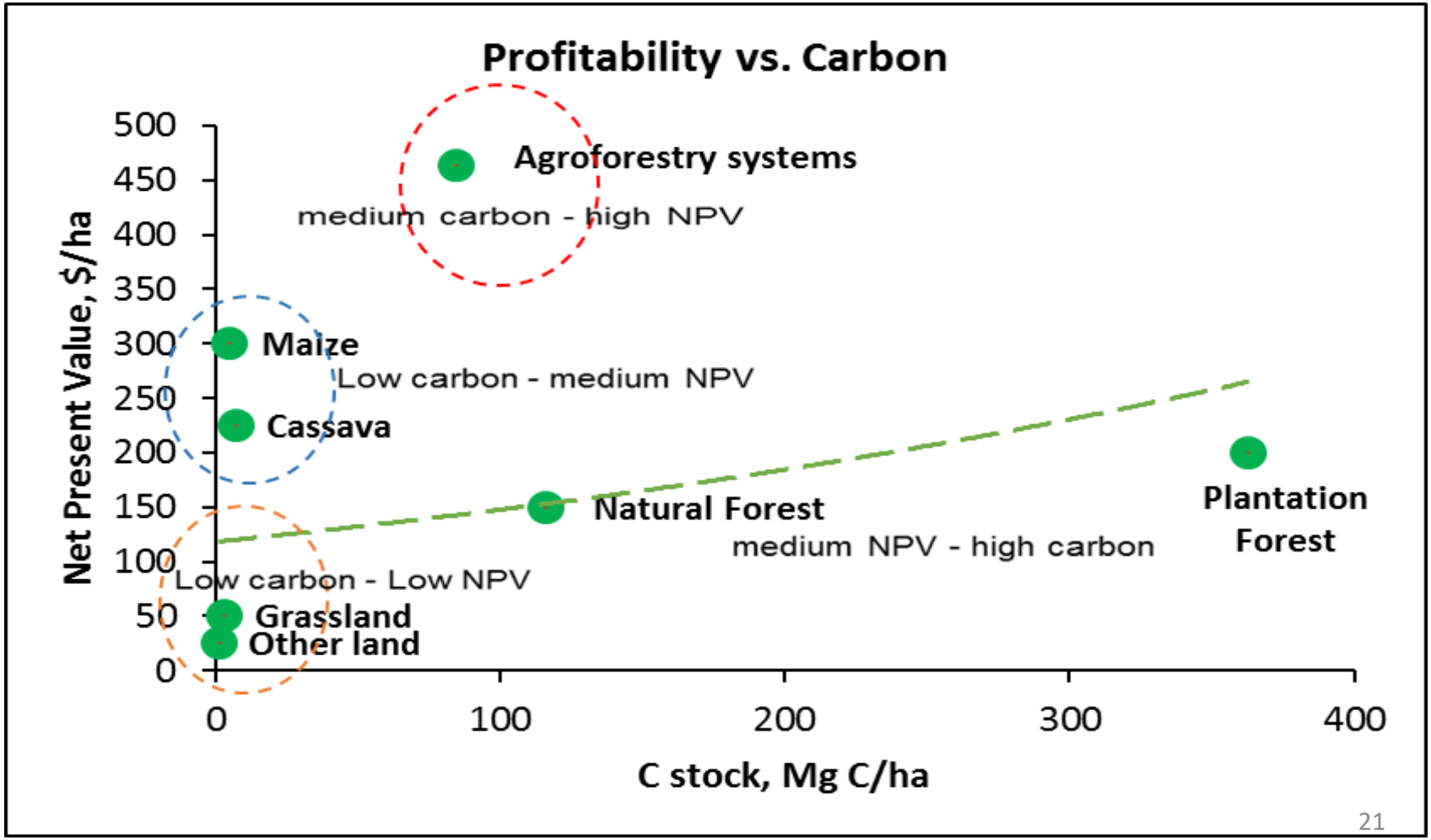




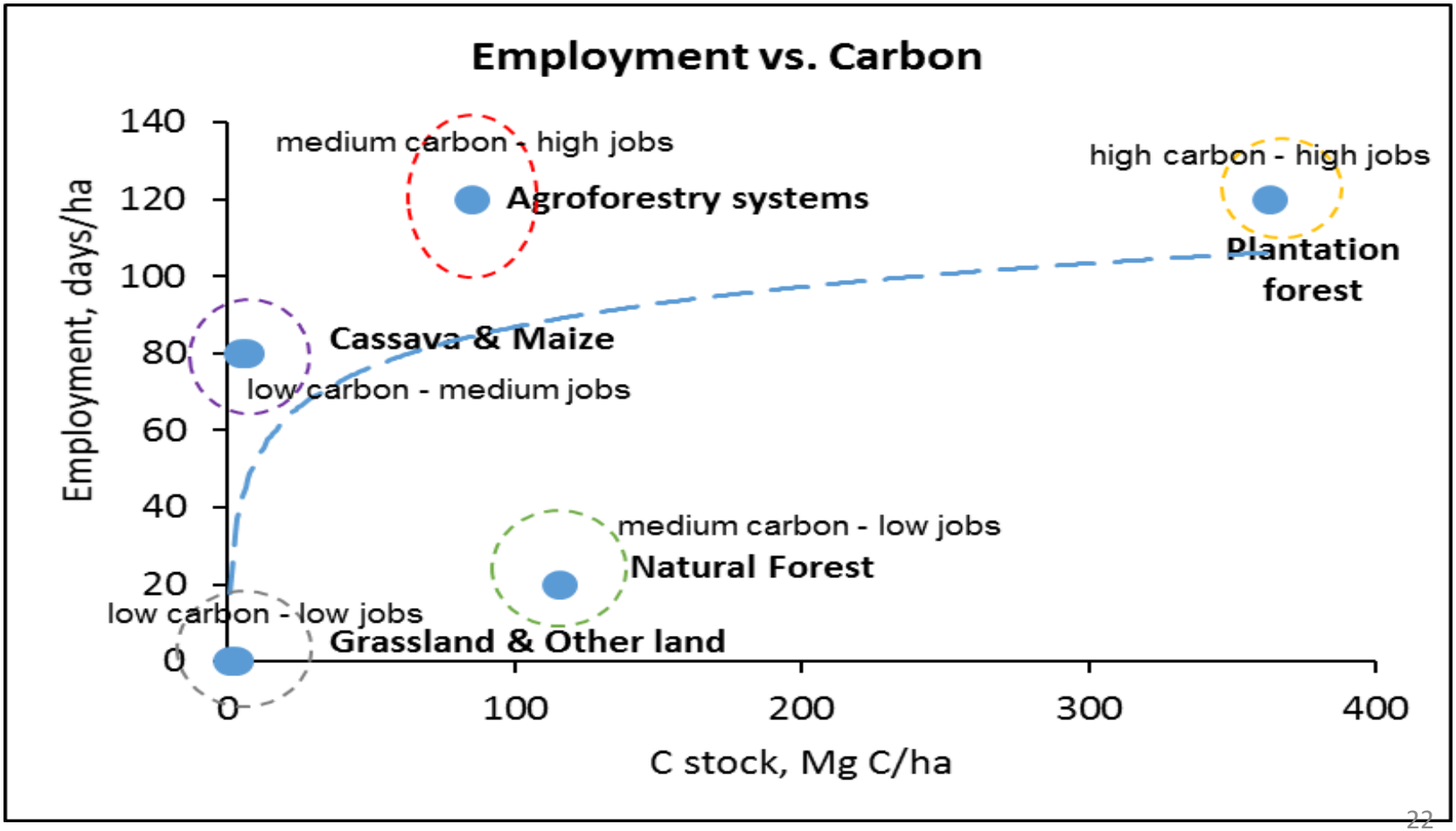
Net emissions



Cluster analysis between profitability and carbon stock amongst land cover



Cluster analysis between carbon stock and employment amongst land cover



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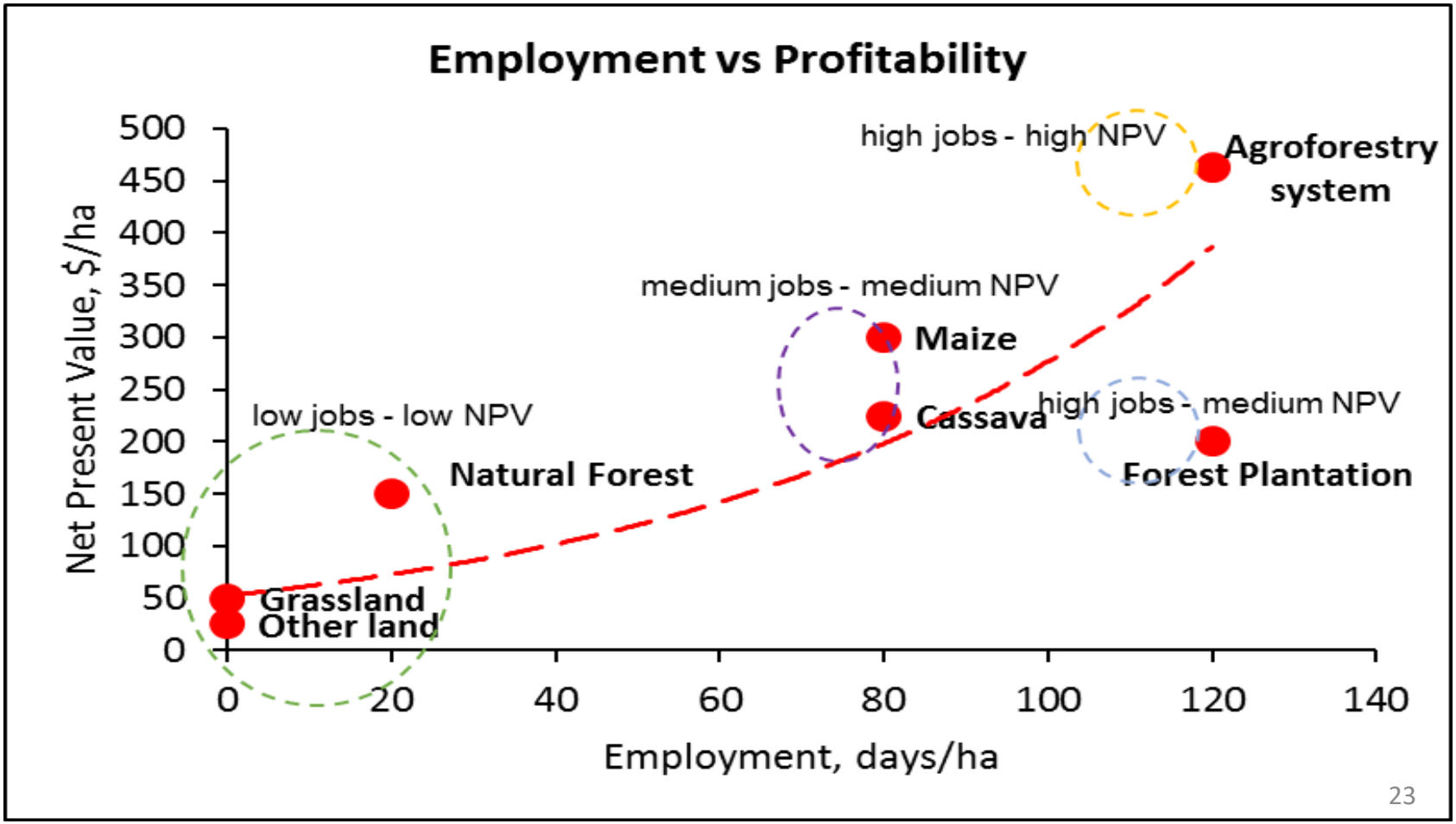

7. Conclusions and Lessons Leaned

- 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!