



# **Challenges of restoring miombo woodlands: the Mozambican experience**

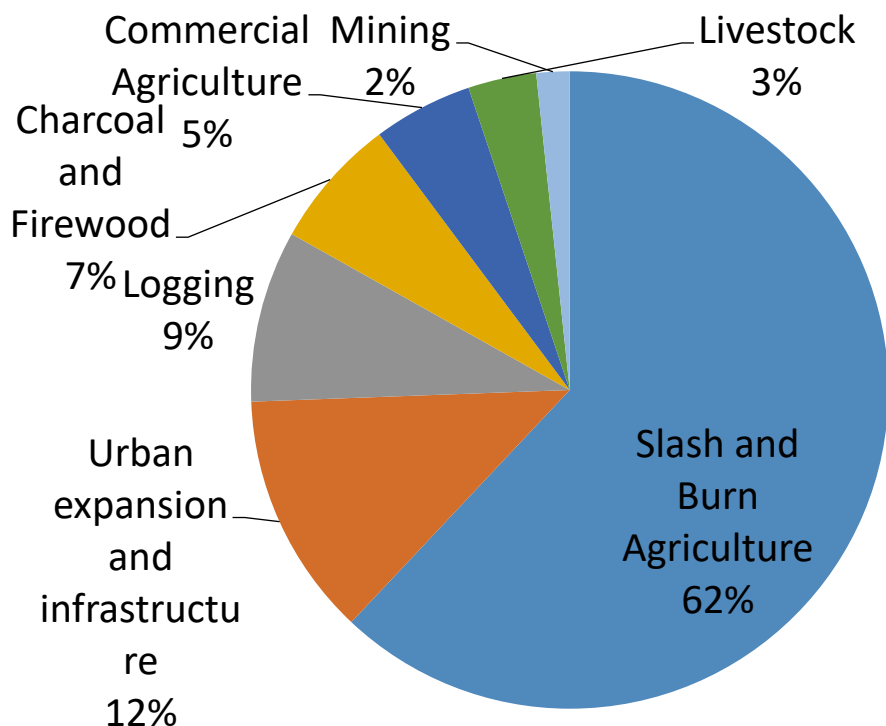
*Almeida Siteo*

Departamento de  
Engenharia Florestal,  
FAEF, UEM



# Introduction

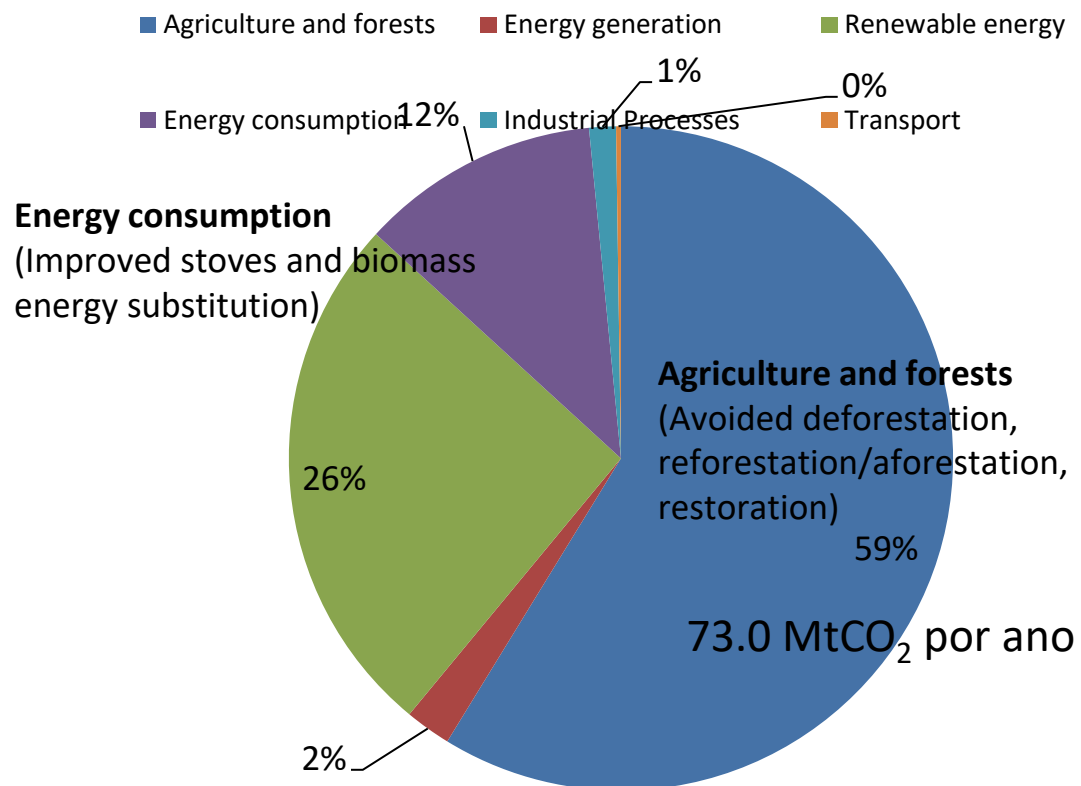
# Annual emissions of CO<sub>2</sub> from deforestation and forest degradation - Mozambique



**Annual emissions: 12 MtonCO<sub>2</sub>/year**

Source: CEAGRE and Winrock (2016)

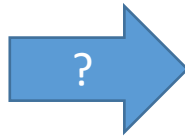
# Florestas como sumidouros: Potencial de Redução de Emissões de GEE



# What is being done to promote restoration?

- Enabling policies (Reforestation strategy, REDD+ strategy, Sustainable Development Program, etc.)
- The largest restoration initiative is the Zambezia Integrated Landscape Management Program (ZILMP)
  - By the end of 2019, more than 1500 smallholder farmers benefitted from the initiative (established about 1000 ha of agroforestry systems)
  - In the same period, Medium size farmers beneficiaries established 100 ha of plantations
  - Large scale operators established 10,000 ha of commercial plantations as part of the restoration efforts
- There are scattered restoration initiatives that include planting trees in form of different agroforestry arrangements (woodlots, syntropic agriculture, hedgerow intercropping, among others) using native and exotic tree species

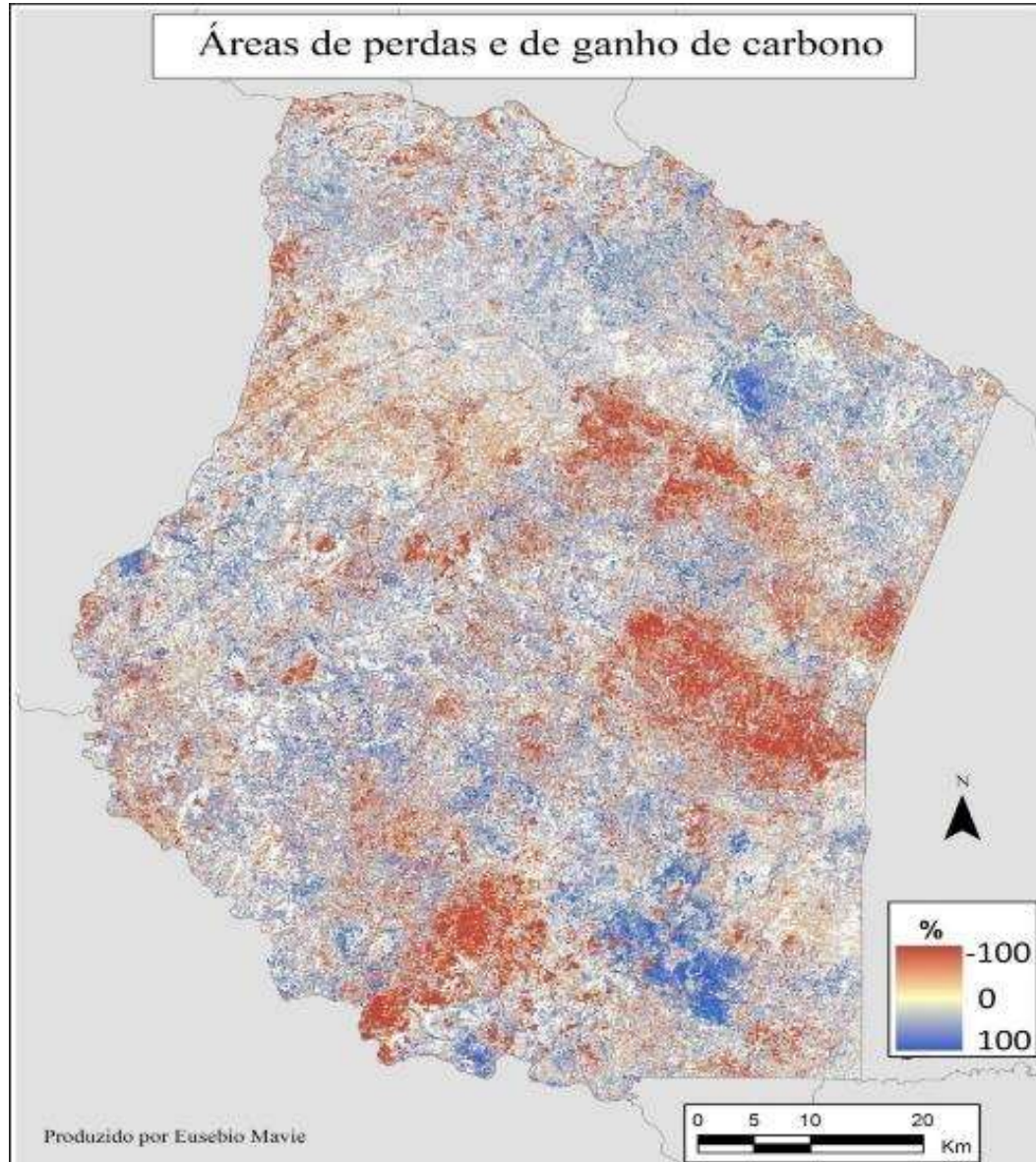
# Convert or conserve?



# Evaluating Low Emissions Development Strategies (LEDS)

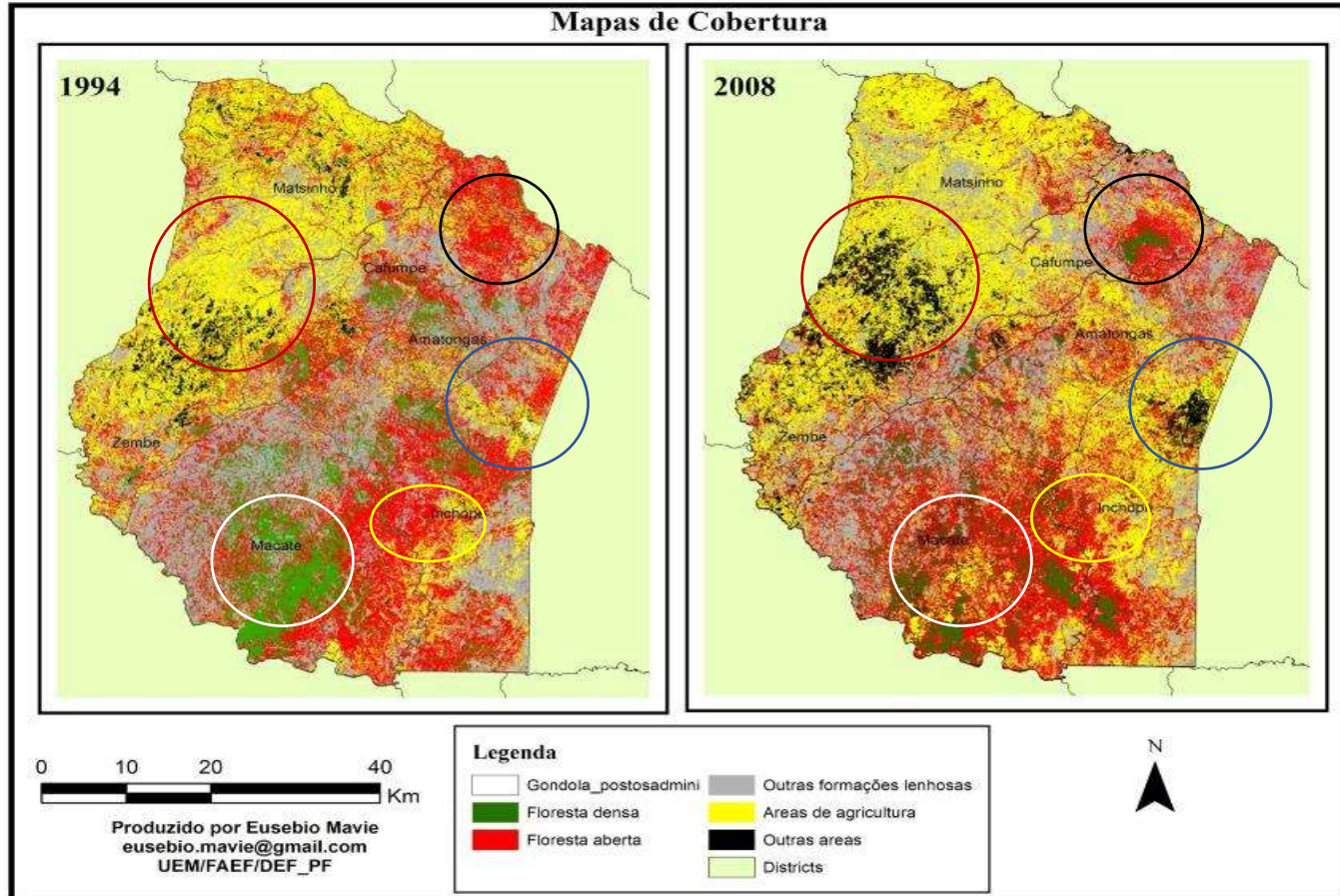
- (i) Understanding how miombo woodlands recover after abandonment of slash-and-burn
- (ii) Understanding the environment/investments in small- and medium-scale agriculture that has been put in place to facilitate the implementation of the National REDD+ strategy.
- (iii) Understanding the practices (technologies, inputs, crop systems, etc.) that have been introduced to stimulate reduction of SAB agriculture.
- (iv) Understanding the practices that have been put in place to stimulate tree planting by small farmers.

# Carbon Gain-Loss map in Gondola 1994-2008

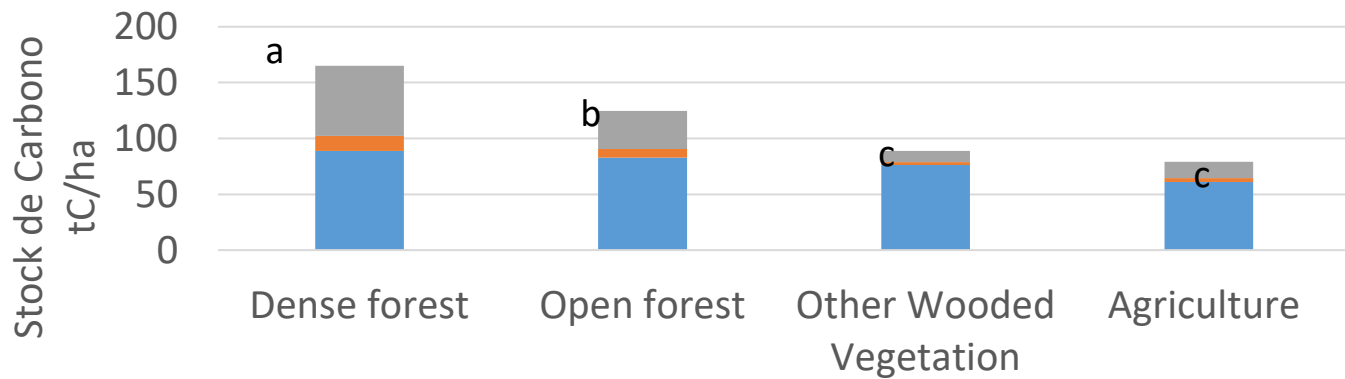




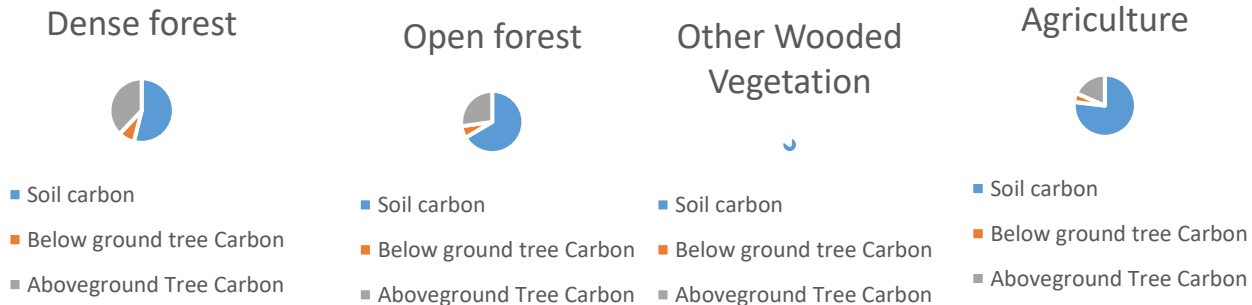
# Forest cover change in Gondola (Miombo)



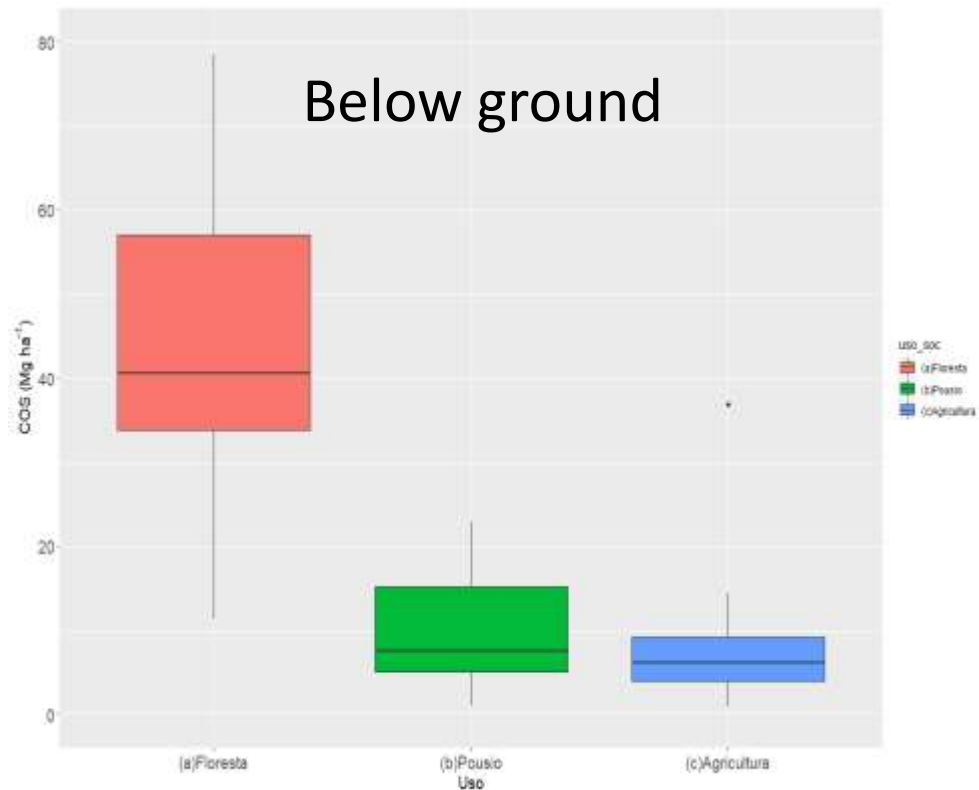
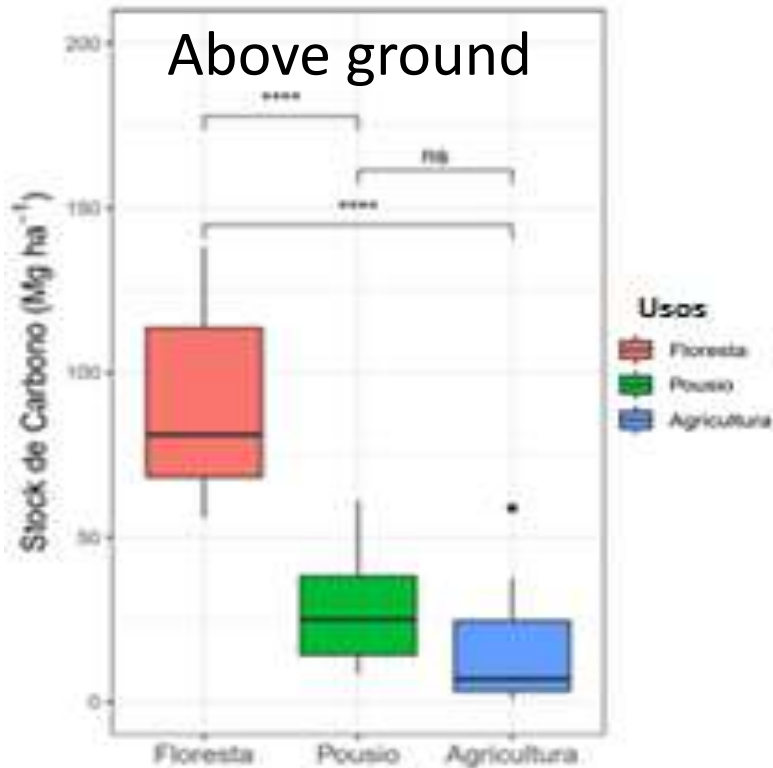
# Carbon stock change with forest crown cover (Miombo)



■ Soil carbon ■ Below ground tree Carbon ■ Aboveground Tree Carbon



# Above and below ground Carbon



 Forest

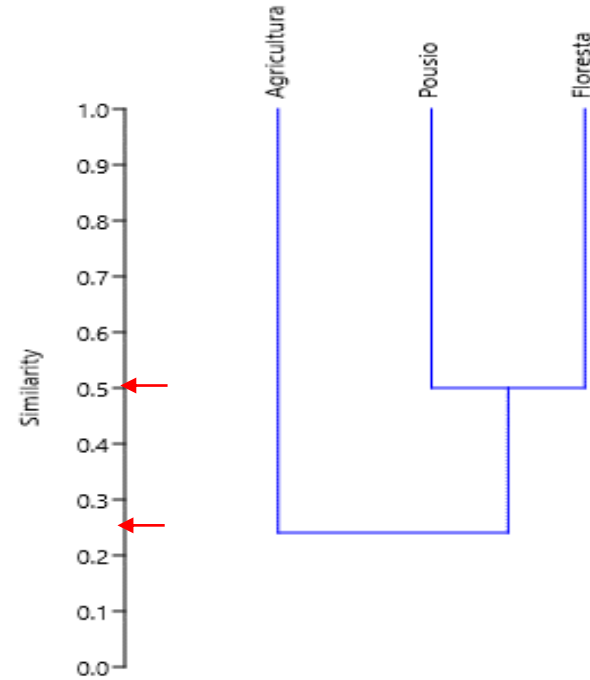
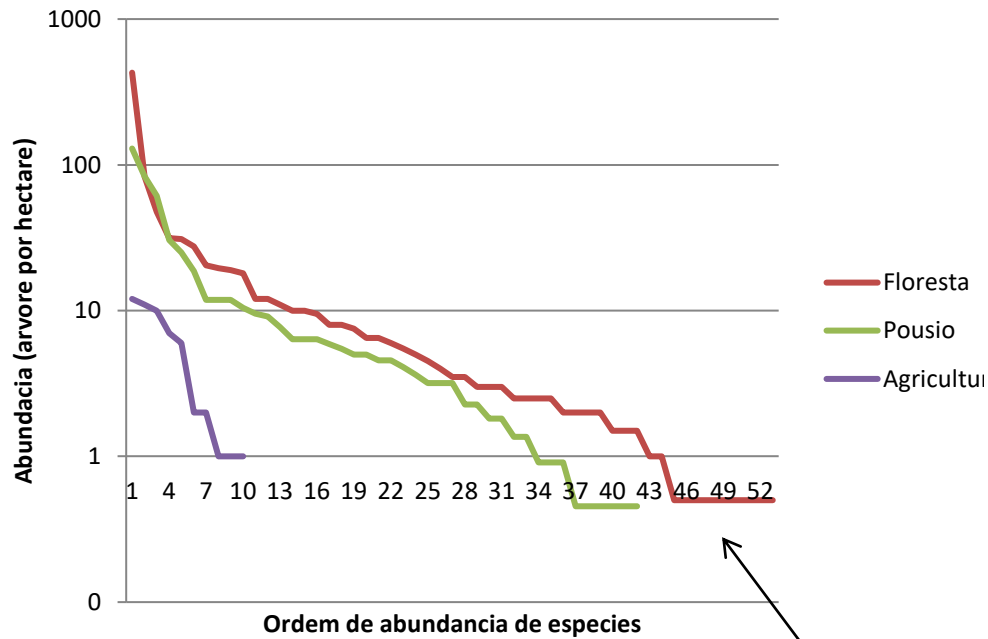
 Fallow

 Agriculture



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# Species composition and similarity



# Forests or Agriculture?

Land use and land cover	Farming or forest exploitation system	Undiscounted cash flow			Discounted cash flow		
		NPV (\$/ha)	IRR (%)	PP (years)	NPV (\$/ha)	IRR (%)	PP (years)
Forest	Charcoal production (Zambézia system)	\$ 18 161,23	13%	7,79	\$ 10 422,78	3%	13,75
	Charcoal production (Gaza system)	\$ 32 945,91	19%	5,23	\$ 15 790,57	6%	8,67
	Firewood harvesting (Without transport cost)	\$ 40 563,12	70%	1,59	\$ 19 546,17	52%	1,74
	Firewood harvesting (Including transport cost)	\$ 14 097,59	14,20%	6,77	\$ 5 554,53	1,96%	15,93
	Stake harvesting	\$ 144 896,63	45,80%	2,18	\$ 70 628,76	30,18%	2,69
	Timber logging (Zambézia system)	\$ 941 955,14	13,76%	7,12	\$ 279 589,58	1,57%	14,80
	Timber logging (Inhambane system)	\$ 13 133,88	3%	18,77	\$ -2 146,07	-8%	30
Agriculture	Monocropping (Maize)	\$ 46 950,47	30%	3,09	\$ 22 255,29	16%	4,84
	Monocropping (Cassava)	\$ 182 095,96	57%	1,89	\$ 84 769,46	40%	2,21
	Intercropping (Maize & Cassava)	\$ 739 658,38	298%	0,62	\$ 362 116,56	255%	0,78
	Intercropping (Maize & Pigeon pea)	\$ 61 753,60	32%	2,80	\$ 30 173,84	18%	4,22
	Intercropping (Maize & Cassava & Cowpea)	\$ 454 462,81	192%	0,38	\$ 222 303,89	161%	0,36
	Intercropping (Maize & Cassava & Pigeon pea)	\$ 481 529,82	272%	0,57	\$ 235 584,36	232%	0,59

# Alternatives to slash-and-burn

		INDICADOR				
Consortiação	Cenário	NPV (MZN/ha)	TIR (%)	RBC	Payback (anos)	
SLASH AND BURN AGRICULTURE	MI+FB	1	87792	47%	1.9	1.73
		2	51011	22%	1.6	3.21
	MI+MD	1	215920	86%	2.7	1.11
		2	192703	74%	2.6	1.26
	MI+FB+MD	1	276692	123%	3.1	0.76
		2	253105	105%	2.9	0.90
ALTERNATIVES TO SLASH AND BURN (HIGH INPUTS)	MI+FB	1	213381	56%	2.2	1.68
		2	132821	31%	1.7	2.71
	MI+MD	1	290759	76%	2.7	1.34
		2	243687	61%	2.4	1.59
	MI+FB+MD	1	457620	126%	3.2	0.78
		2	377060	101%	2.8	0.98

# Lessons for restoration



- Natural restoration (regrowth) plays an important role in miombo woodlands
  - Recover ecosystem functions (biodiversity, biomass and carbon stocks)
- Investments are needed to counteract the drivers of deforestation and forest degradation
- Slash-and-burn alternatives seem to have high potential to reduce deforestation and forest degradation
- Agriculture is more profitable than forestry in the short term. High investments are needed to make forestry activity profitable, but with low inputs, converting forest to agriculture is more feasible for the actual conditions
- Local communities will stop converting forests when they have access to resources to invest in high productivity agriculture
  - Crop productivity
  - Food security
  - Land use governance
  - Just employment
  - Education



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# Transform the next generation

- If we don't give them the education, power, and resources for an improved agriculture:
  - They will cut down the next **3 Million hectares** of forests with emissions of **659 Million tonnes of CO<sub>2</sub>** by 2030 in Mozambique
  - They will be more poor and vulnerable to climate change than we are today







**Obrigado**