International Institute for Sustainability

The Economics of Restoration: Costs, benefits, scale and spatial aspects

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The Economic of Restoration

The Economies of Large Scale

Integrated Land Management and Aichi 5, 11 & 15

Public Policies and Large Scale Restoration

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Cost-benefit evidence…

Restored ecosystems provide a range of goods and services to humanity that in many cases will outweigh the costs of restoration

Table 3: Estimates of costs and benefits of restoration projects in different biomes

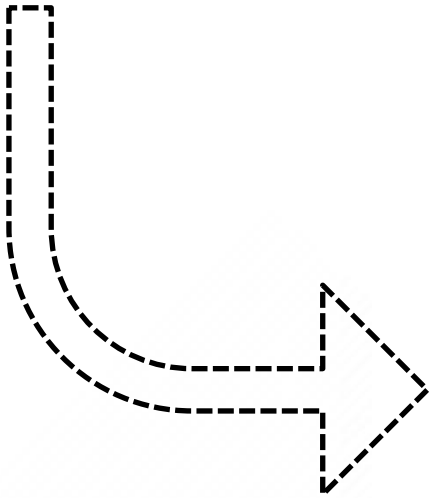
	Biome/Ecosystem	Typical cost of restoration	Estimated annual benefits from restoration (avg. scenario)	Net present value of benefits over 40 years	Internal rate of return	Benefit/cost ratio
		US$/ha	US$/ha	US$/ha	%	Ratio
1	Coral reefs	542,500	129,200	1,166,000	7%	2,8
2	Coastal	232,700	73,900	935,400	11%	4.4
3	Mangroves	2,880	4,290	86,900	40%	26.4
4	Inland wetlands	33,000	14,200	171,300	12%	5.4
5	Lakes/rivers	4,000	3,800	69,700	27%	15.5
6	Tropical forests	3,450	7,000	148,700	50%	37.3
7	Other forests	2,390	1,620	26,300	20%	10.3
8	Woodland/shrubland	990	1,571	32,180	42%	28.4
9	Grasslands	260	1,010	22,600	79%	75.1

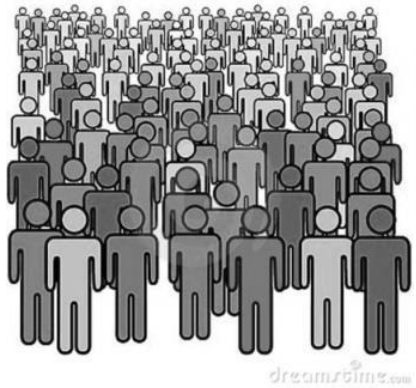
Note: Costs are based on an analysis of appropriate case studies; benefits have been calculated using a benefit transfer approach. The time horizon for the benefit calculation are 40 years (consistent with our scenario analysis horizon to 2050); Discount rate = 1%, and discount rate sensitivity by flexing to 4%, consistent with TEEB 2008). All estimates are based on ongoing analyses for TEEB (see chapter 7 TEEB D0 forthcoming). As the TEEB data base and value-analysis are still under development, this table is for illustrative purposes only.

Market Failures

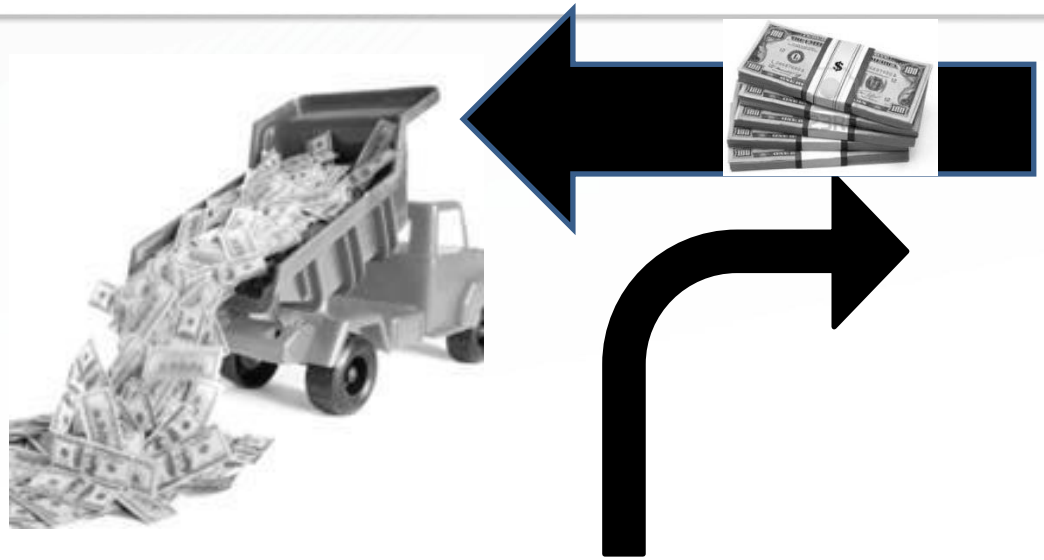
- ☑ Externalities
- ☑ Missing markets
- ☑ Incomplete markets
- ☑ Property rights issues
- ☑ Information failure
- ☑ Unstable markets

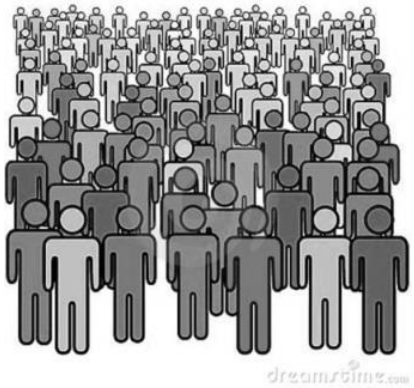
Paradigm shift - Current Prevalent Paradigm





Paradigm shift - Current Prevalent Paradigm





Paradigm shift

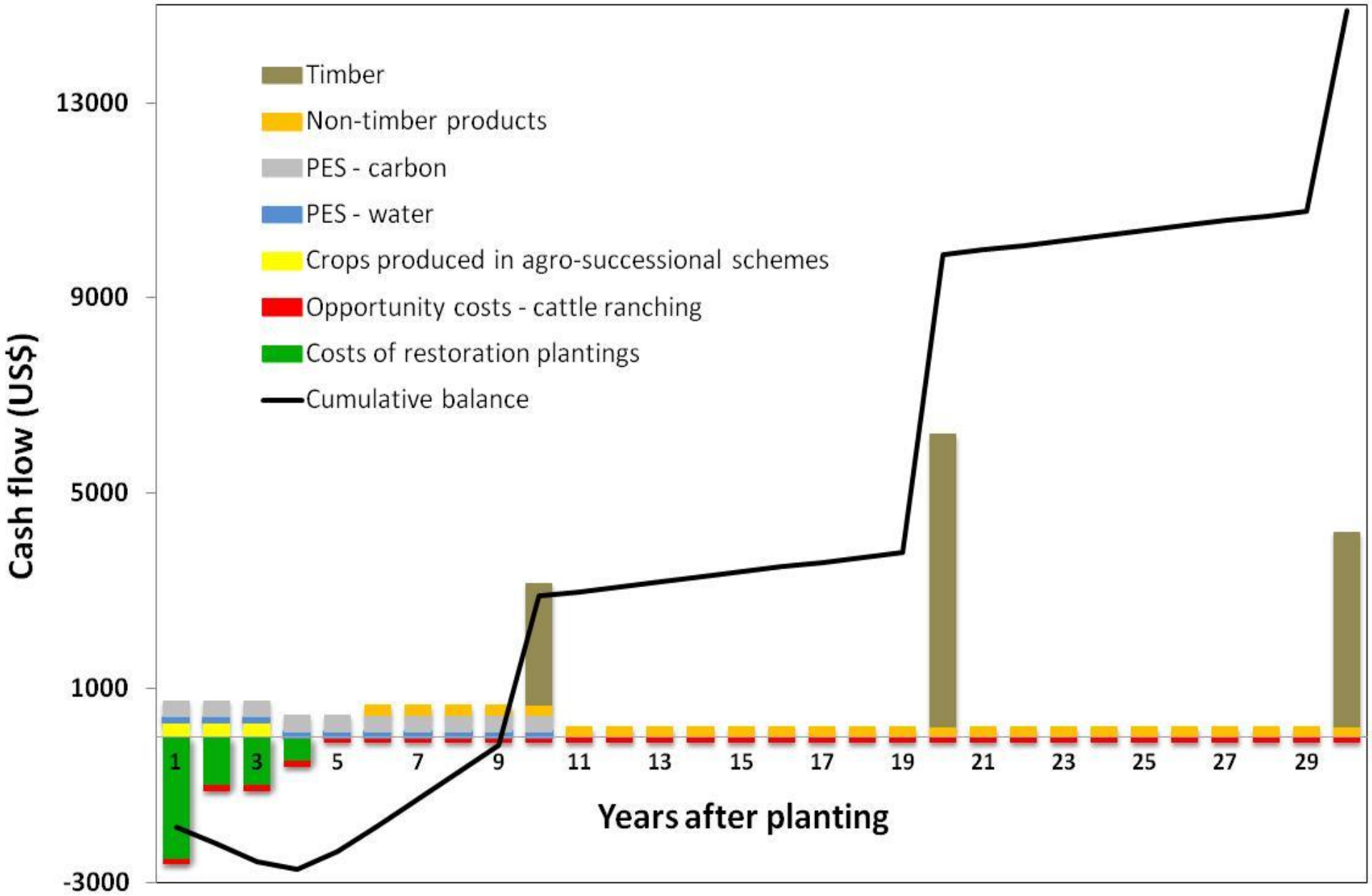
Current Prevalent Paradigm	New Paradigm
Restoration involves very high costs per hectare…	R&D and extension help to reduce costs…
… with no financial return for the land owner…	… and, in some cases, increase revenues…
… only has environmental benefits…	Restoration is an industry that create jobs, contributes to the general economy…
… and these environmental benefits are poorly perceived…	… and the resulting Natural Capital provides goods and services to humanity, including spiritual services and existence value of biodiversity
… and not internalised	… and should be at least partially internalised

One word of caution

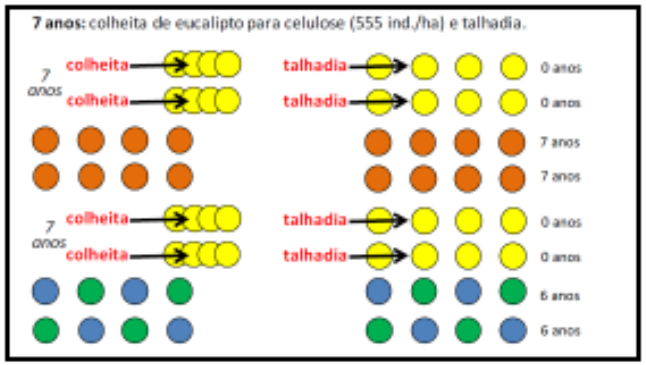
- Natural Capital, Ecosystems Services and similar approaches have a tremendous potential to help society realize the value Nature provides for humans;
- Included in these are spiritual and existence values (recognizing that biodiversity have value for us even if there are not direct or indirect benefits);
- These might be enough to justify “Ecocentric” restoration for wild habitat;
- But these approaches do not include a potential intrinsic value of nature, an ethical perception that other living beings have value in themselves;

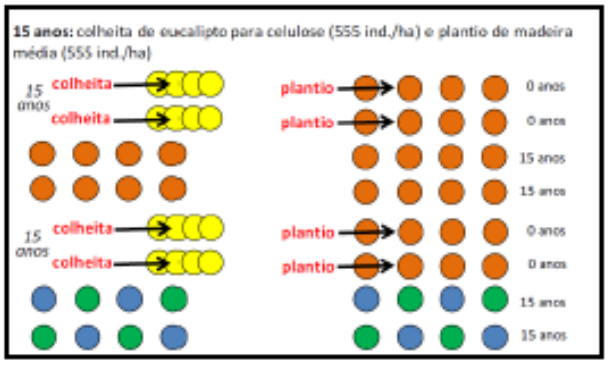
Tropical forest restoration: show us the money

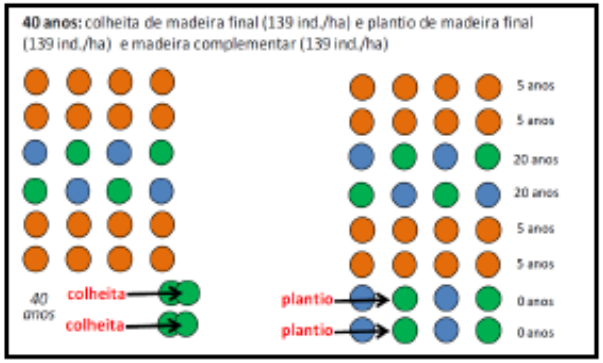
P.H.S. Brancalion, R.A.G. Viani, B.B.N. Strassburg & R.R. Rodrigues

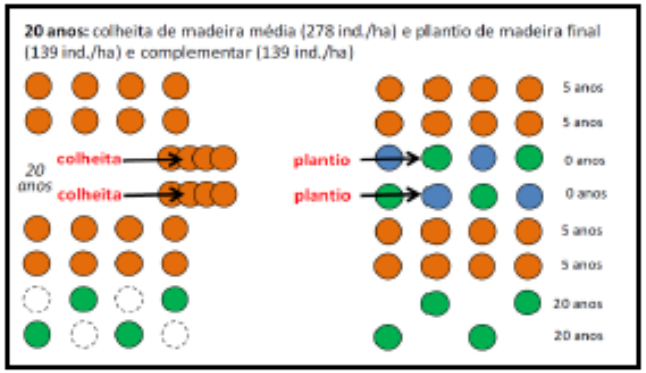


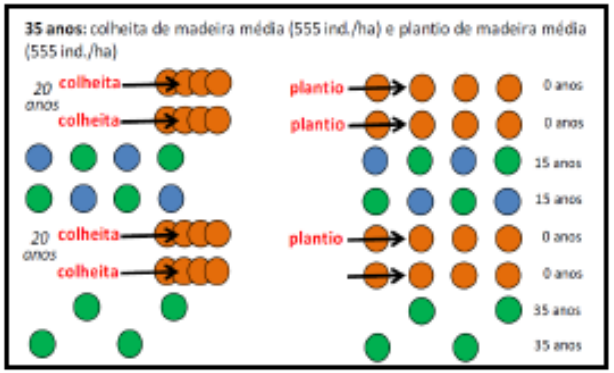
Financial analysis for commercial restoration systems (IIS, LERF, LASTROP)











	Cenários de produtividade (m^3/ha/ 40 anos)		
Taxa interna de retorno (taxa de desconto 6%)	Otimista (549,4 m^3/ha)	Intermediário (495,4 m^3/ha)	Pessimista (439,0 m^3/ha)
Preço Otimista	14,0%	13,3%	12,6%
Preço Intermediário	12,4%	11,7%	11,1%
Preço Pessimista	8,6%	8,1%	7,6%

Challenges

Time	• Very long time horizon (esp. for small-holder farmer)
Costs	• Current cost per hectare is very hingh, perception of opportunity costs, costs of transition
Returns	• Uncertainty com future prices
Risks	• Of production, of the market, legal aspects
Incomplete information	• Farmer and the society do not recognize the value of forests
Extension	• Even if the the will exists, there is a lack of extension for forest restoration
Incomplete market	• Externatilites are still not internalized, high costs of the transition in incipient markets

Some possible solutions

Time	• Non-timber products, consorcium with the species of fast growth, PES
Costs	• R&D, dissemination, experience, scale
Returns	• Consolidation of the markets, warranty for the demand/prices, consorcium with the leading species
Risks	• R&D, consolidation of the market, simple and clear legal frame
Incomplete information	• Roboust research and research-based dissemination
Extension	• Better extension from public sector, incentives for private extension
Incomplete market	• Internalization of the benefits, PES

Structure

The Economic of Restoration

The Economies of Large Scale

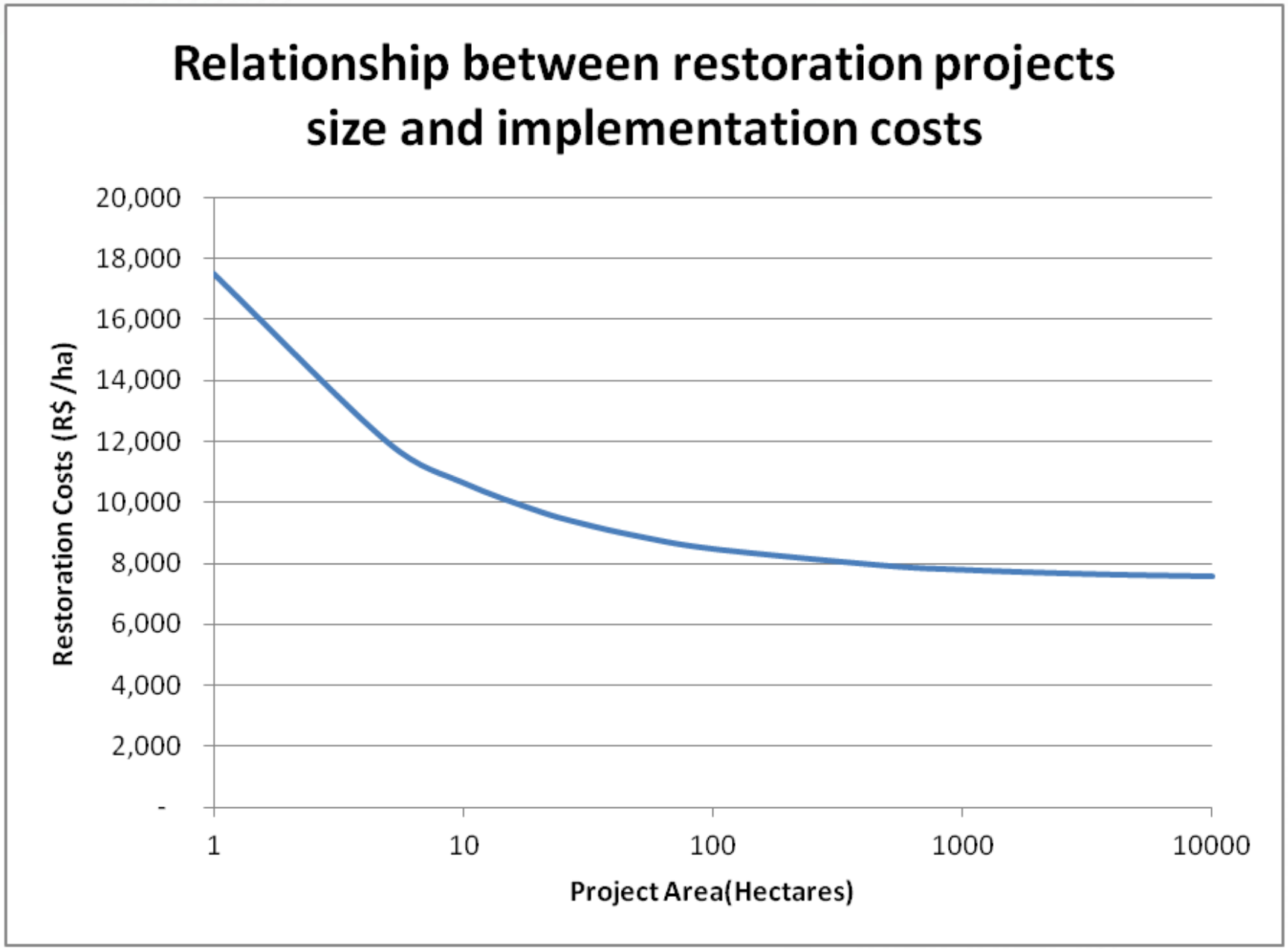
Integrated Land Management and Aichi 5, 11 & 15

Public Policies and Large Scale Restoration

The Economies of Scale and Spatial Prioritization of Restoration

Ecological value	Economic value
connectivity	economies of scale due to reduced costs
potential habitat	higher resiliency
water	lower border effects
carbon	reduced conflicts and opportunity costs
border effects	increased value of services
conflict with other land-uses	

The Economies of Scale of Restoration



Will be higher when monitoring is included…

The Economic of Restoration

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Integrated Land Managment and Aichi 5, 11 and 15

- Population and Consumption increase means we need to double or triple food production by 2050;

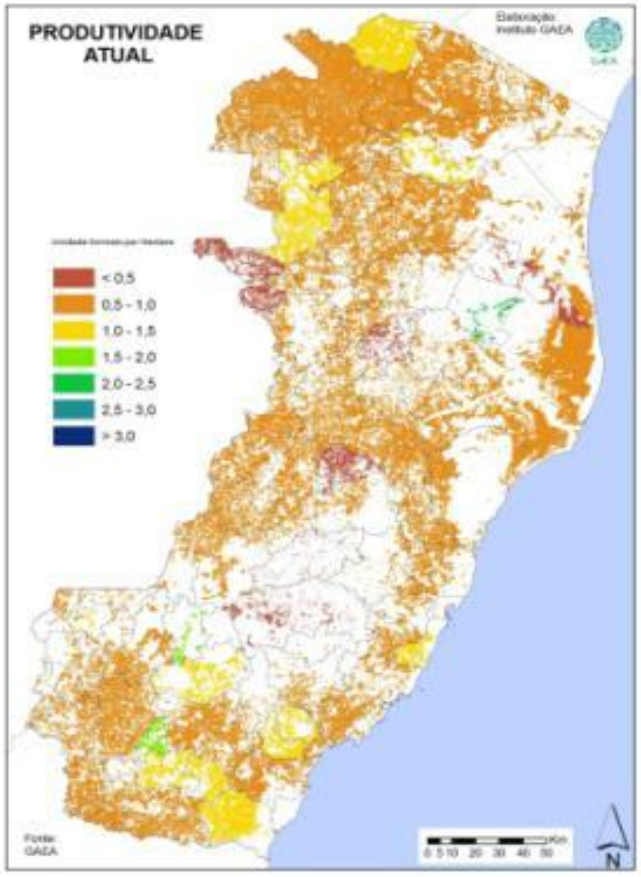
- Land-use Change second (17.5%) major driver of Climate Change (IPCC, 2007) and single largest driver of biodiversity loss (Baille et al., 2004);

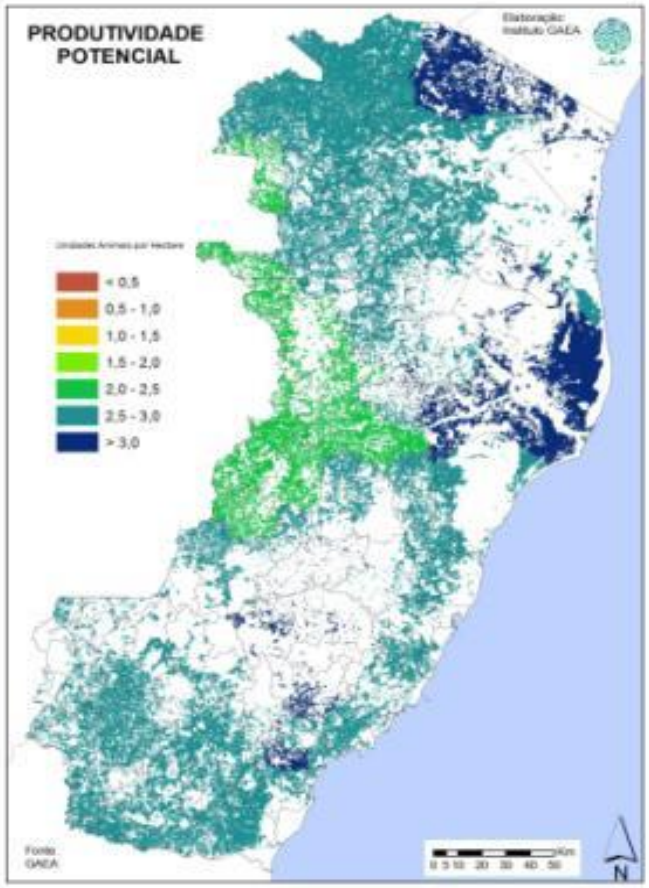
- “Competition for land” between natural systems and agriculture (Lambin and Meyfroidt, 2011 *Global land use change, economic globalization, and the looming land scarc*ity, PNAS; Smith et al., 2010 *Competition for Land*);

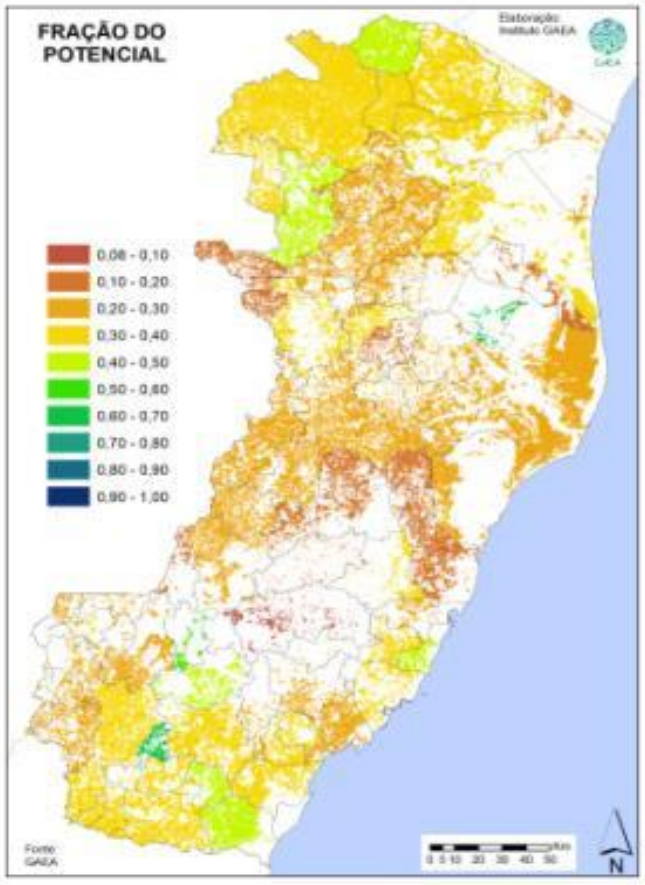
Case study – Espirito Santo state

- Espirito Santo State – ambitious plans to increase croplands and forestry area by 75% (+684.000 ha) and increas the natural forest cover area by 50% (+ 200.000 ha)
- So far, no plans to increase the state area…
- Investigated the potential of improving the use of current pasturelands to avoid a conflict for land;

•Based on amodel developed by IIS and EMBRAPA, using climatic and edaphic data, we estimate the sustainable carrying capacity of the state's existing pasturelands to be 5,08 mil Animal Units (AU). Currently this pasturelands hold 1,47 mil AUs, or 29% of the sustainable carrying capacity.



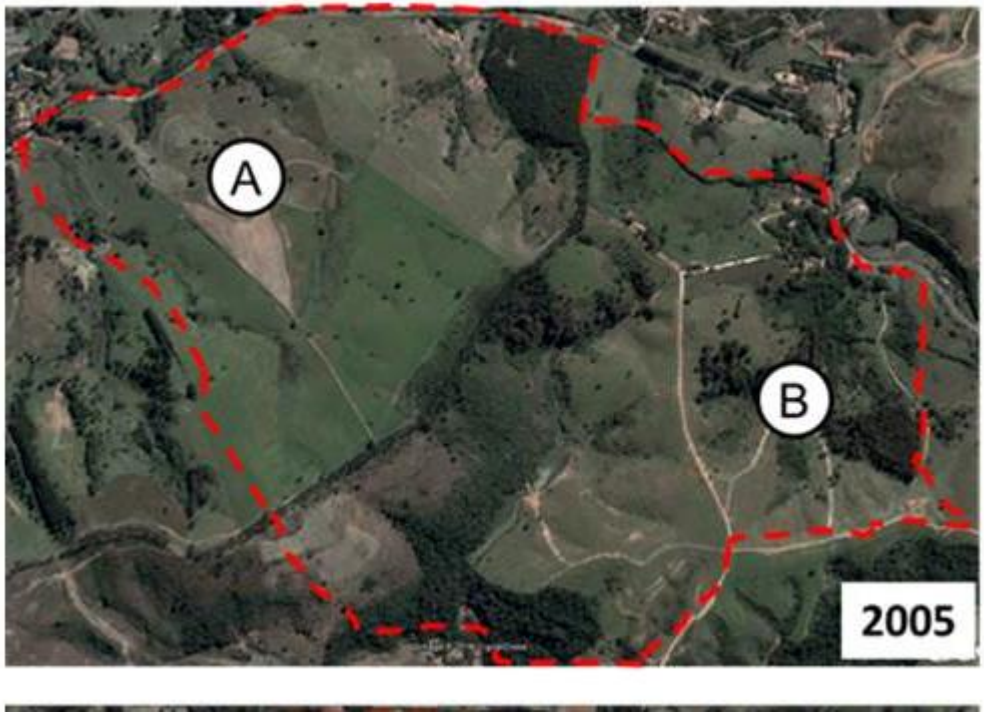


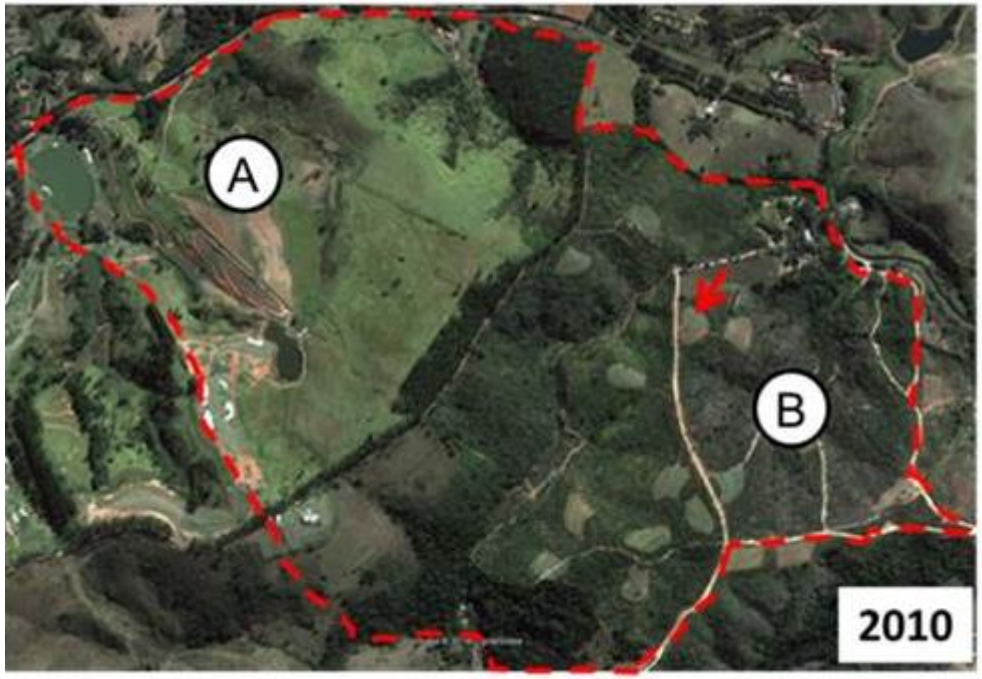


Latawiec AE, Strassburg BBN, Brancallion P, Rodrigues R., Gardner, T. *under review (Frontiers in Ecology and Environment)*

Case study – Espirito Santo state

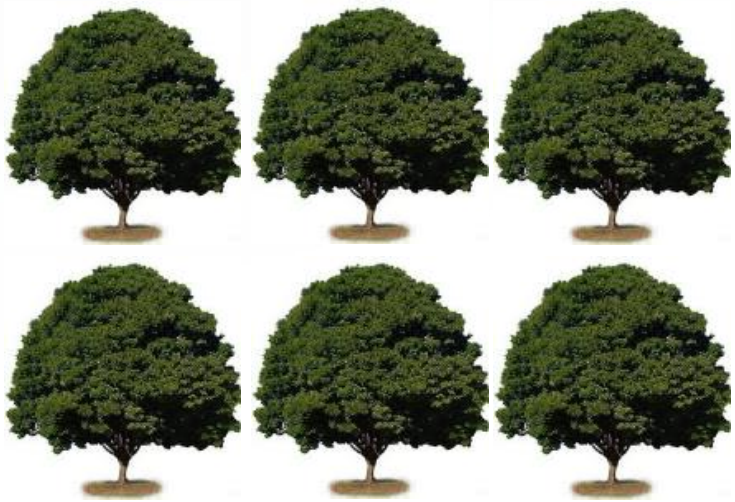
Land-use indicators of Espírito Santo State, Atlantic Forest region, Brazil.	Current situation	Scenario 1: Increasing cattle ranching productivity for increasing croplands and forest plantations areas	Scenario 2: Increasing cattle ranching productivity for increasing croplands, forest plantations and to meet ecological restoration targets
Cropland area (thousand ha)	701	985	985
Plantations forest area (thousand ha)	211	611	611
Pastureland area (thousand ha)	1,760	1,070	840
Stocking rate (AU/ha)	0.81	1.15	1.61
Sustainable stocking capacity (%)	29	42	58
Total native forest cover (thousand ha)	509	509	745
Restored forests (thousand ha)	0	0	236
Native forest cover increase (%)	0	0	**50%**

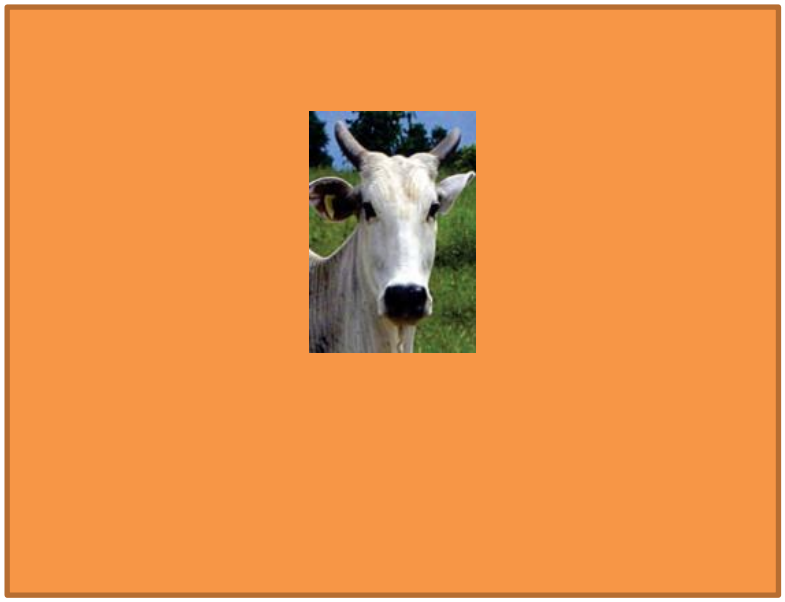




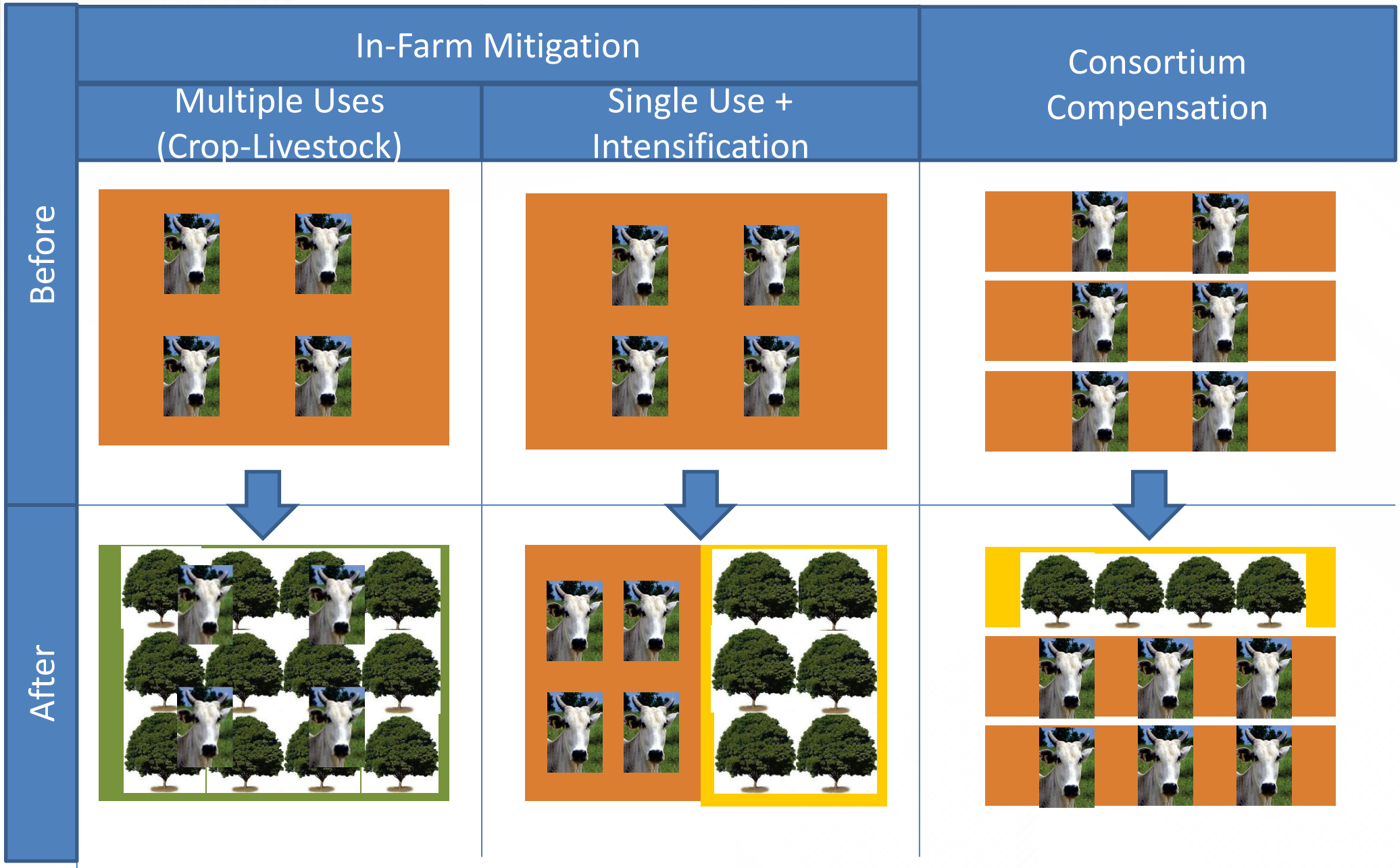
Latawiec AE, Strassburg BBN, Brancallion P, Rodrigues R., Gardner, T. *under review (Frontiers in Ecology and Environment)*

Competition for land, leakage





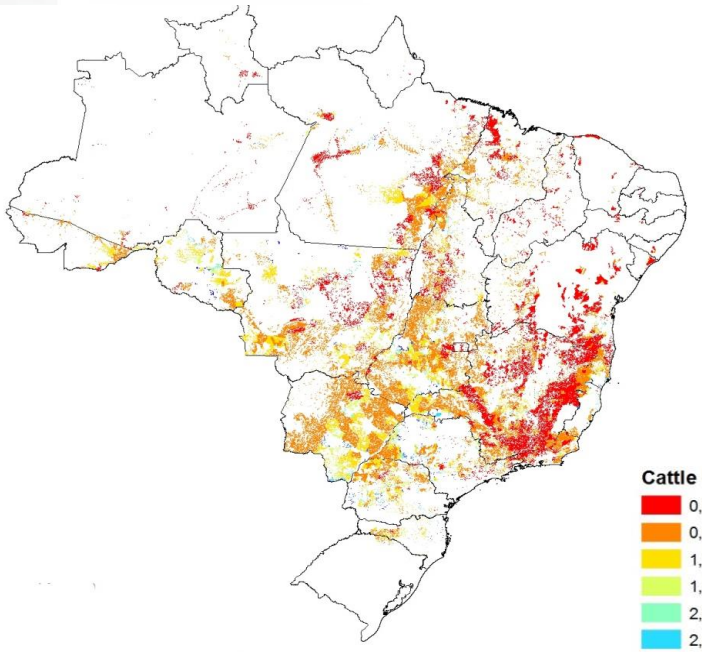
The “Land Neutral Ecological Restoration” Mechanism



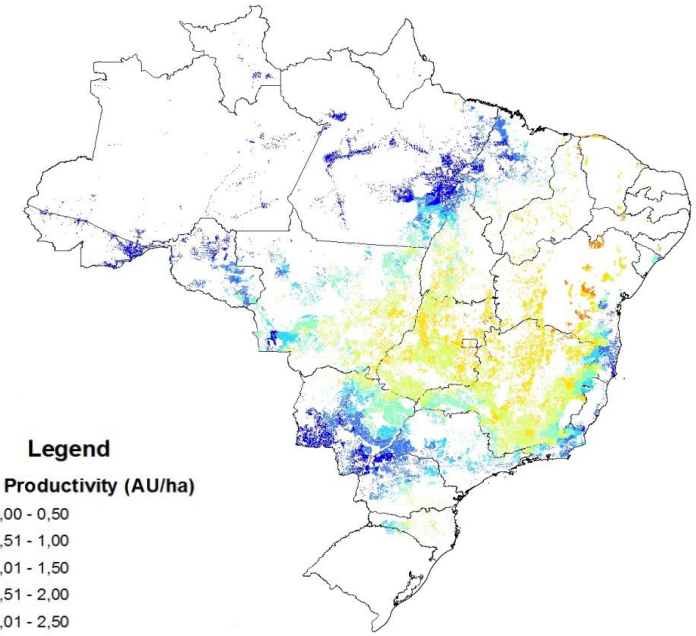
Avoiding the “Conflict for land”

- Current productivity : 118 million Animal Units;
- Potential sustainable carrying capacity: 367 mi Animal Units;
  - ➢ Current productivity only 32-34% of potential

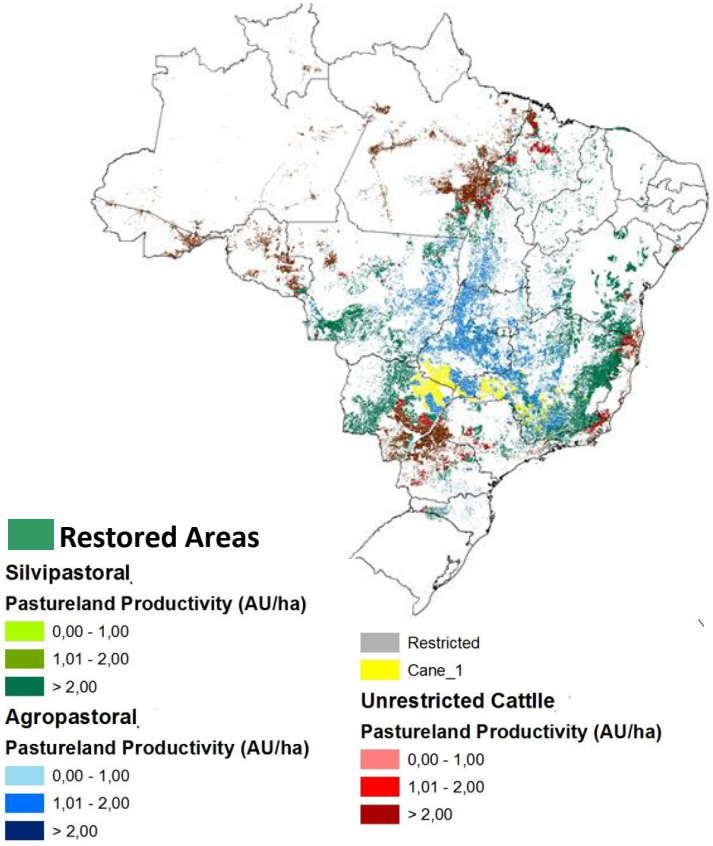
Current Productivity



Potential Productivity



All 2040 production targets + 36 million hectares restored



Strassburg, Latawiec et al. *(submitted)*

Integrated Land Managment and Aichi 5, 11 and 15

- Need to consider reduction in deforestation (Aichi 5), conservation (Aichi 11) and restoration (Aichi 15) in the context of an Integrated Land Management
- Improving the use of current agricultural lands can diminish the pressure for new agricultural land (Aichi 5, 11) and free up areas for restoration (Aichi 15);
- Danger of rebound effect
- Large scale restoration unavoidably brings the question of competition for land, leakage etc;
- Landscape approach, Integrated Land management etc
- Strong synergies with agricultural goals;

The Economic of Restoration

The Economies of Large Scale

Integrated Land Management and Aichi 5, 11 & 15

Public Policies and Large Scale Restoration

Support early R&D

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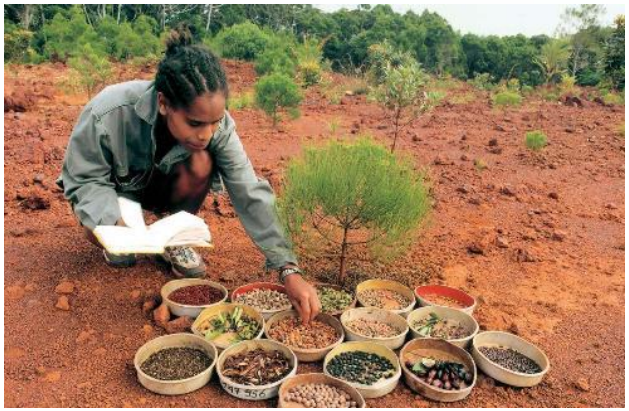
SOCIETY FOR
ECOLOGICAL
RESTORATION

Support the development of restoration supply chain

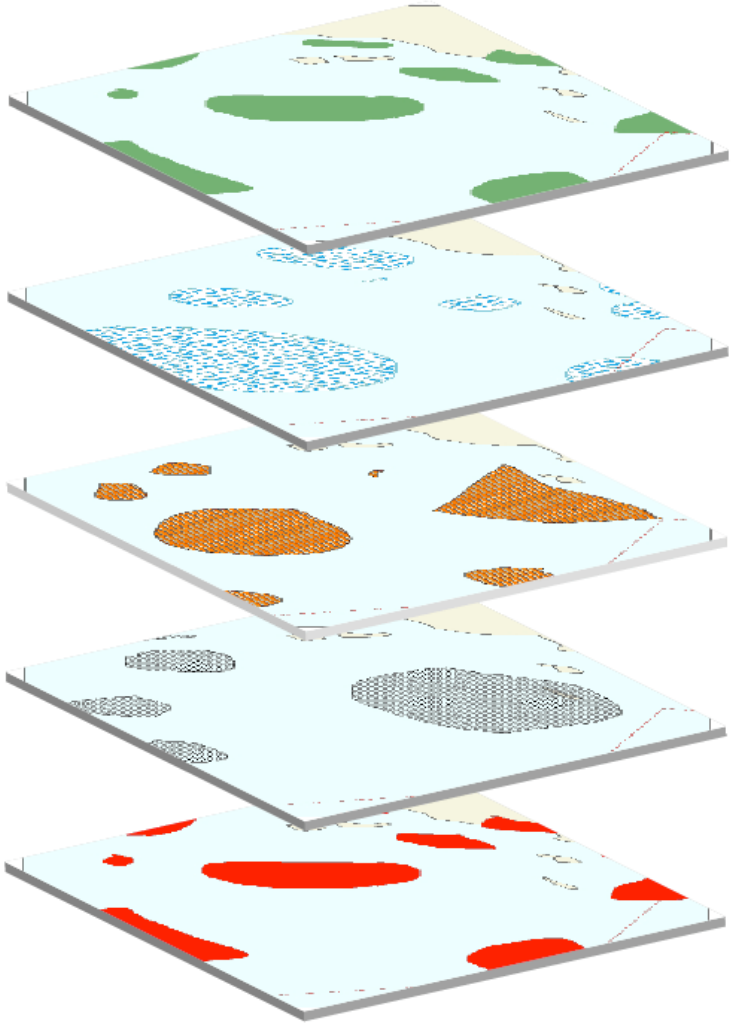
Enabling conditions for:

- Seed collectors
- Tree nurseries
- Tree planters
- Project developers



Through planning, training, clear legislation, incentives, demand

Spatial planning and zoning



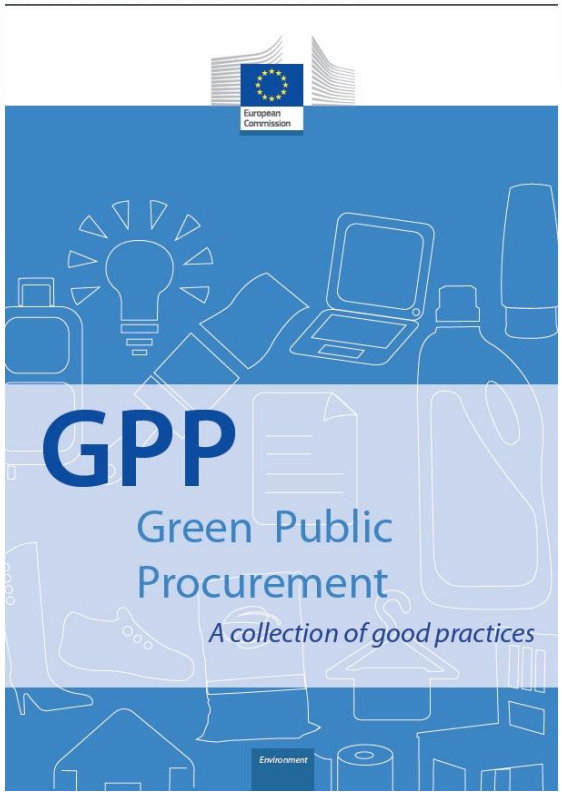
Multi-objective prioritization planning:

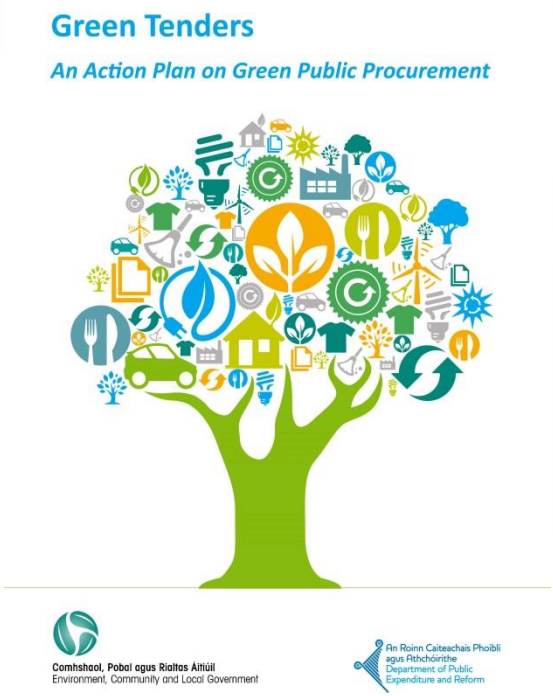
- Conciliate production and conservation/restoration;
- Restoration for habitat provision
- Restoration for other ecosystems services
- Maximize economic returns, reduce costs
- Maximize social returns

Extension services

- Provide public extension
- Create conditions for private extension

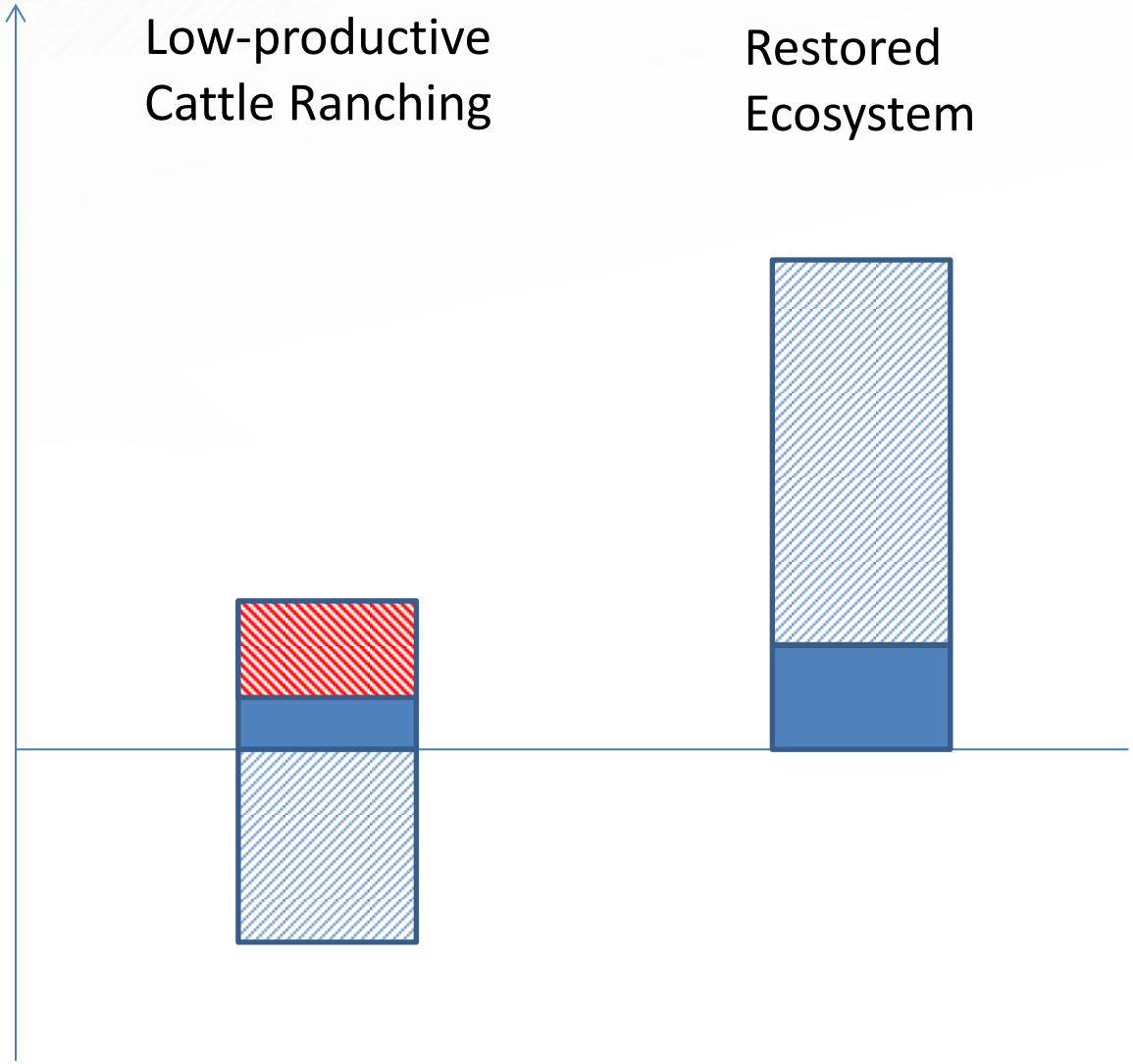
Be part of the demand for restoration products





Governmental purchases directed towards restoration products can create a substantial and predictable demand for restoration products

Level the playing field

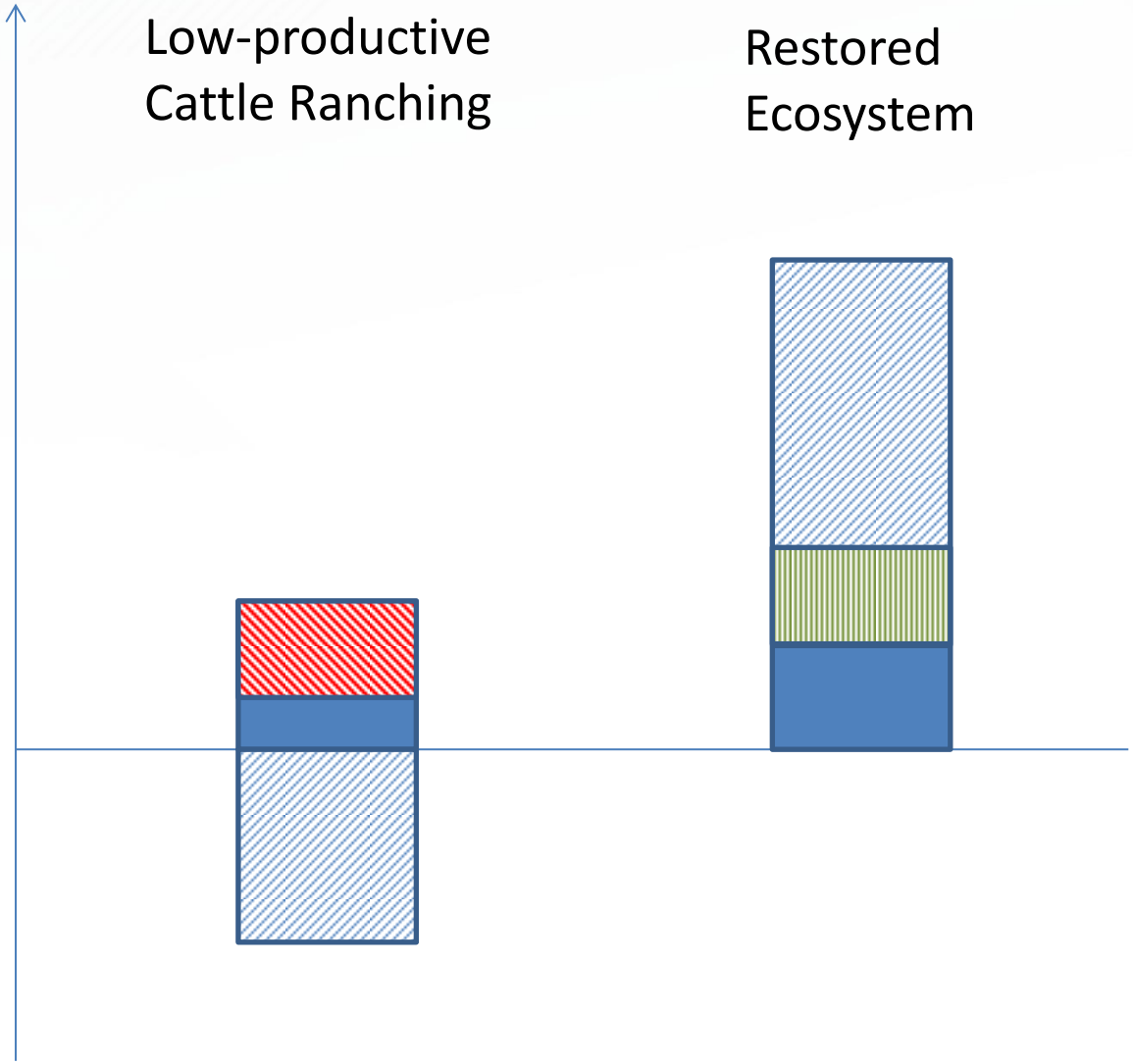


Perceived Value

Not Perceived Value

Subsidies

To further level the playing field



Perceived Value

Not Perceived Value

Subsidies

Partial PES

The current playing field

Public policies:
providing enabling conditions for large scale restoration

- Support R&D for all stages of the restoration process
- Help develop a restoration chain
- Level the playing field by:
  - Reducing subsidies for competing land uses
  - Internalizing benefits
- Provide extension services or enabling conditions for private extension
- Guarantee farmers rights to benefit from some restoration systems, clear property rights for trees as well

Public policies:
providing enabling conditions for large scale restoration

- Spatial prioritization
  - to allocate spatially different restoration systems for different goals
  - to minimize conflict for land and maximize synergies
- Provide long term finance and/or secure conditions for private financing
- Help create market for restoration products and services
  - Support for processing chain
  - Public procurement
  - Reduce risks
- Create awareness (w/ academia, NGOs, artists)

Take home messages

- Need to reduce restoration costs (inc. natural regeneration)
- Restoration provides services and sometimes products
- Services should be partially internalized
- Some restoration systems can be economically competitive
- Restoration is an economic sector that provides jobs and increases GDP, and we should make this more clear
- Large scale has economies of scale, and increases the potential for proper prioritization
- Large scale restoration can increase competition for land, leakage
- Integrated Land Management binds Aichi targets 5, 11 and 15, and connect them with agricultural goals
- Public policies have a fundamental role


Thank you
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