THE GLOBAL PARTNERSHIP ON FOREST LANDSCAPE RESTORATION

BONN CHALLENGE 2011

Cost-benefit analysis for restoration decision making

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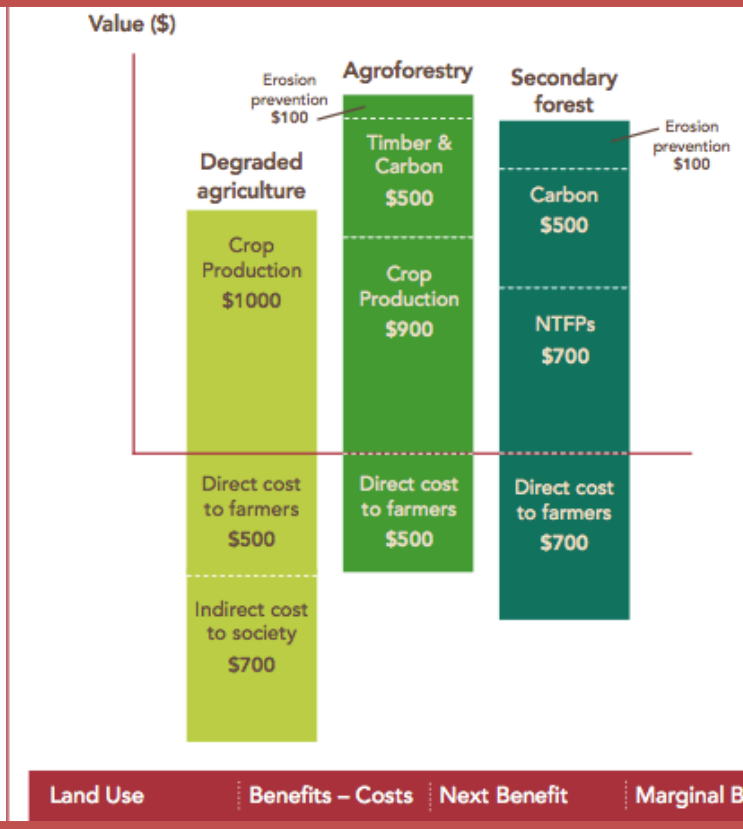
Cost-benefit analysis for restoration decision making

- Motivation
- Theory
- Steps



Why do a cost-benefit analysis?

- Some ecosystem services (ES) are traded and valued on markets and therefore considered in private land use decisions (mostly provisioning services)

- Many other ES are not because they bear characteristics of public goods: nobody can be excluded from their use, and markets cannot form

- Hence there are no or weak incentives for individual restoration/sustainable use efforts when ES are a primary benefit of restoration

Why do a cost-benefit analysis?

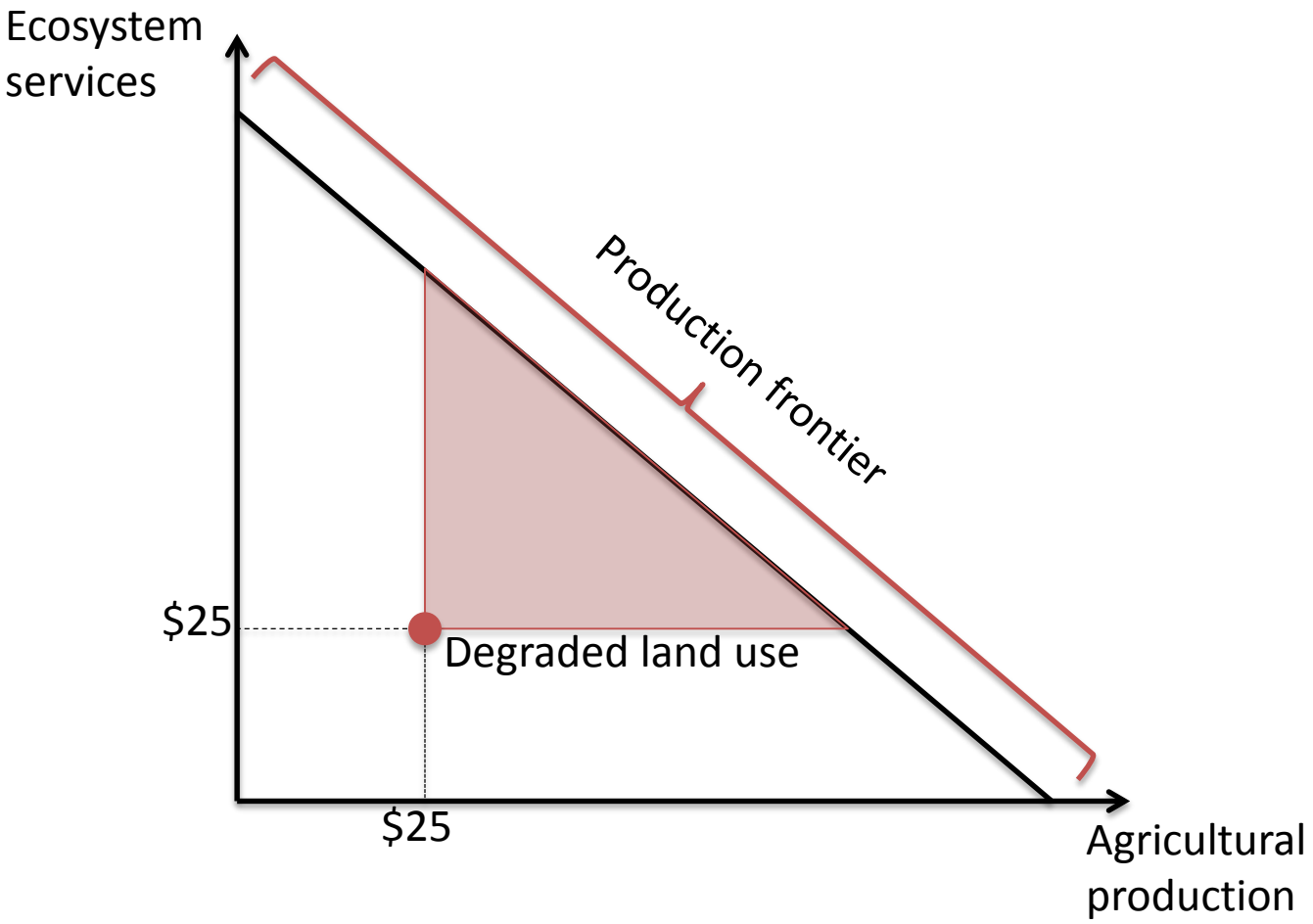
- CBA is a tool to identify the potential social and environmental impacts of a project or policy and inform social decision
- It is especially useful in the context of market failures (e.g. public goods) to show that alternatives to business-as-usual can be more socially desirable
- Important to include values of ecosystem goods and services in CBA because omitting them biases land use decisions towards uses which favor the production of marketable goods and services
- CBA can determine how large a share of restoration's value is composed by public ES and identify missing markets that if created would make restoration profitable from a financial accounting perspective, something that remains a challenge.

Steps in a cost-benefit analysis

1. Specify the set of restoration transitions
1. Decide whose benefits and whose costs count
1. Catalogue the impacts and select the measurement of indicators
1. Predict the impacts quantitatively over the time horizon of the project
1. Monetize all impacts
1. Discount benefits and costs to obtain present values
1. Calculate NPV of each alternative
1. Perform sensitivity analysis
1. Make policy recommendation

Basic theory of cost-benefit analysis

- The concept of *Pareto Efficiency (at least some are made better off and no one is made worse off)* is used to operationalize CBA
  - Achieving efficiency means resources (i.e. land, labor, and capital) are used in their highest valued uses in terms of creating goods and ecosystem services



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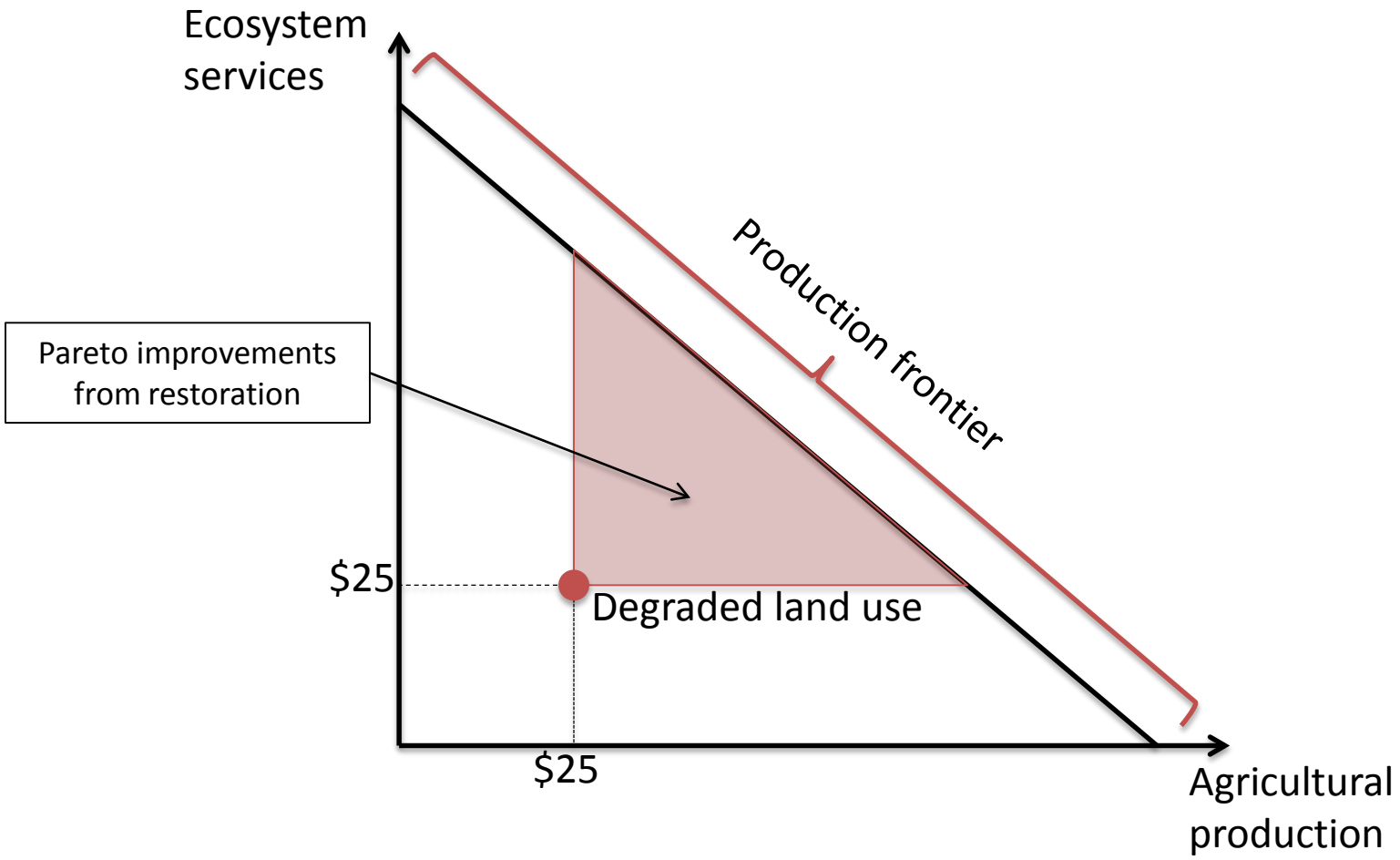

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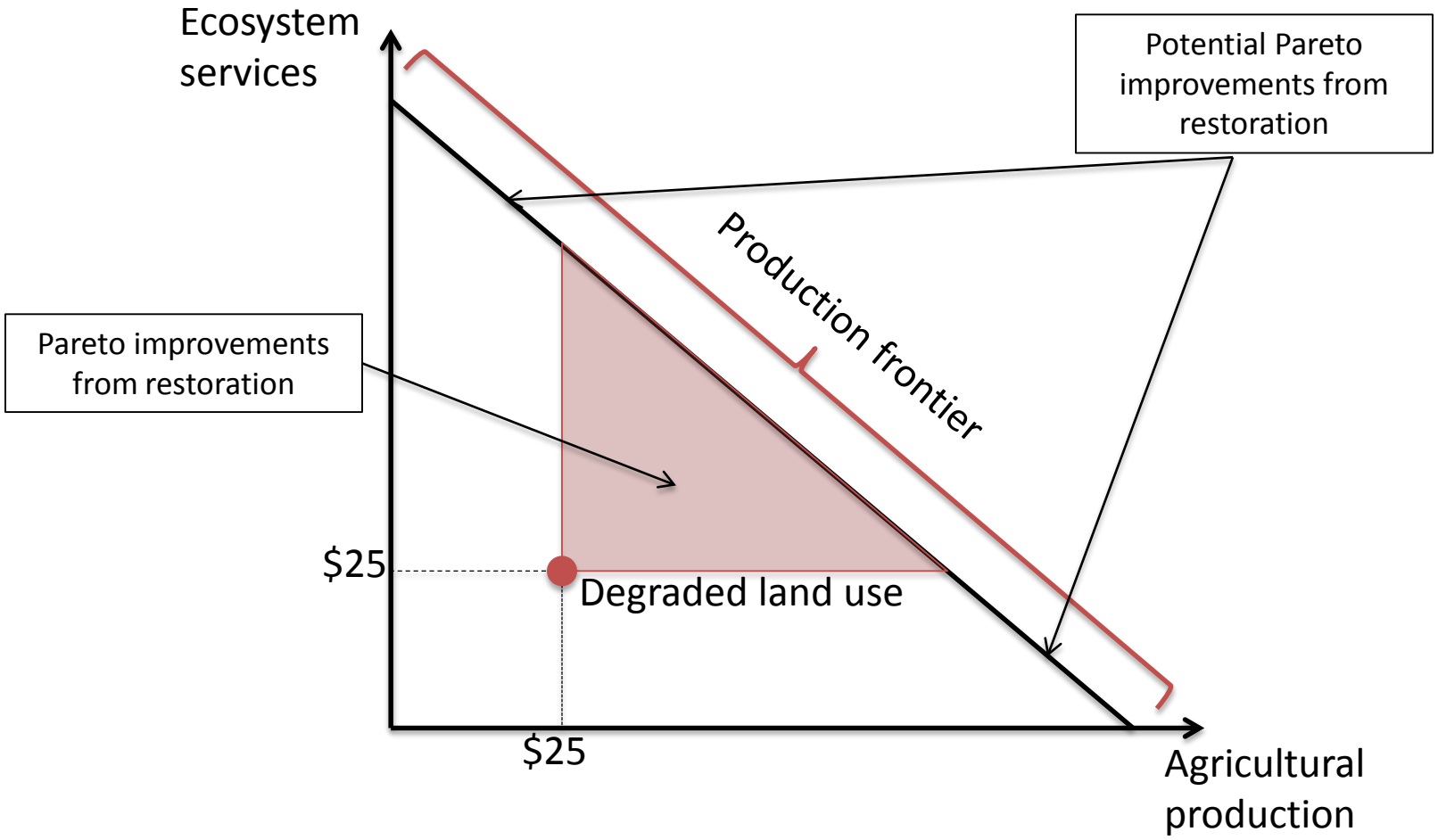


1. Specify set of restoration transitions

Agriculture → Agroforestry

Poorly managed woodlots → Well managed woodlots

Deforested land → Naturally regenerated forests

2. Decide whose benefits and costs count

- Can be differentiated at local, provincial, national, or global levels
  - Analysis of projects that have climate, biodiversity, or trans-boundary watershed issues should consider a global perspective
- Can be split according to gender
- Can be split according to property rights (property right holder vs. non-holder)
- Residents and non-residents

3. Catalogue impacts and choose indicators

One ecosystem, many different services and benefits

What do we get from these land uses and how do we measure their levels?

A water purification plant
A flood control mechanism
Habitat for biodiversity
Food
Beauty
A place of worship
A cure
A way of life
A paradise for tourism

4. Predict impacts quantitatively

- Restoration has impacts on the production of ecosystem services and commodities over time and these impacts must be quantified
- For example, moving from agriculture to agroforestry would require estimates of crop yields, carbon sequestration, timber/fuelwood production, and erosion for both land uses before the most efficient land use could be identified
- This is also the most challenging aspect of CBA because we don't always have a complete understanding of how the complex systems work, especially when we make a significant change

5. Value impacts

- Economic valuation places monetary value on changes in ecosystem goods and services and puts ecological and biodiversity values ‘on an equal footing’ with other economic benefits and costs, BUT:

- Some values cannot be measured
    - (e.g., intrinsic, religious values)
    - but need to be **recognized** nevertheless.

- Others can be measured but are difficult to monetize
    - their values need to be **demonstrated** (by other tools).

- Still others can be measured and monetized
    - their value can be **captured** by applying economic valuation tools**.**

- Choice of valuation technique generally depends on the impact to be valued and the availability of resources, time and data for the study

6. Discount benefits and costs

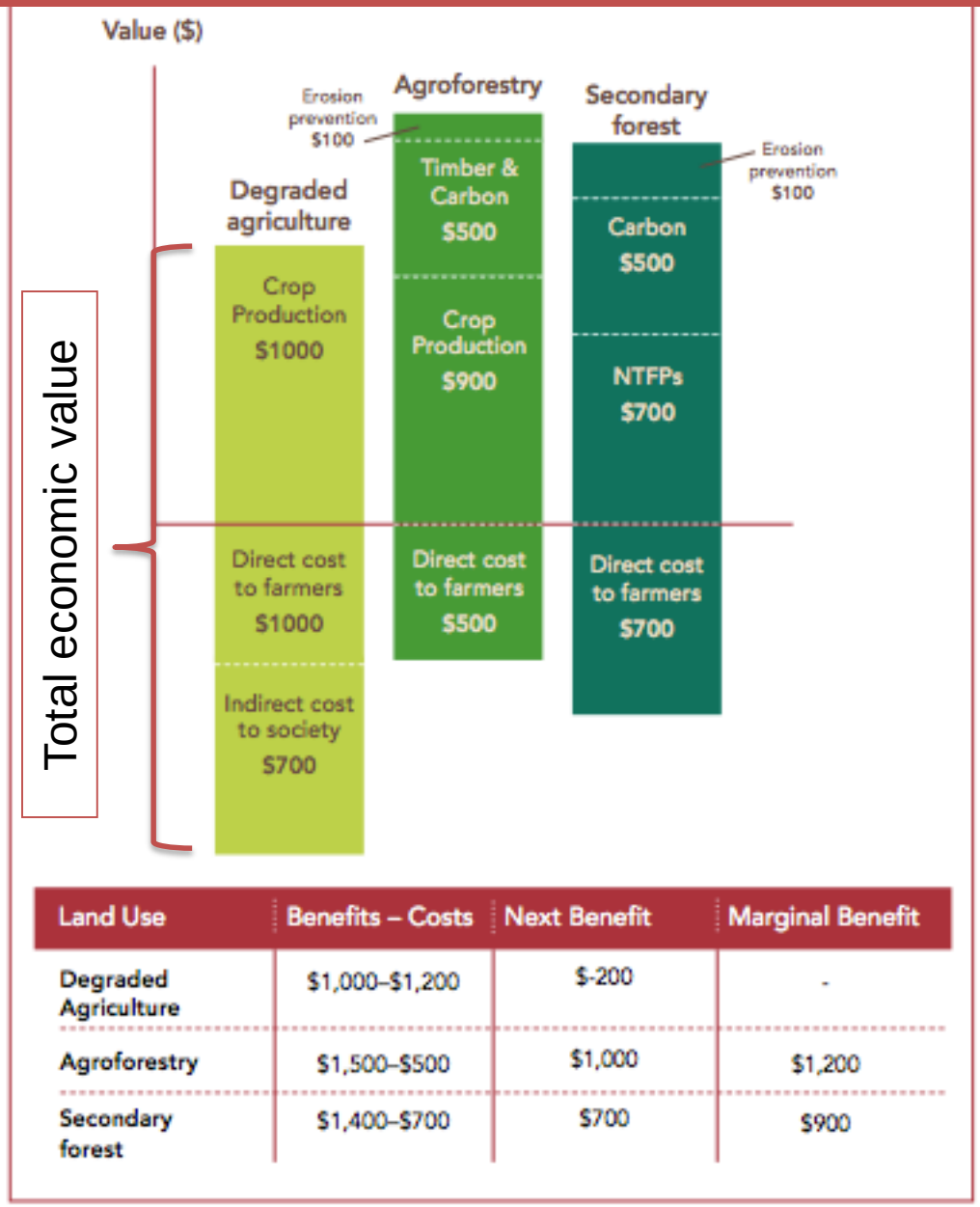
- Restoration decisions have consequences that occur at different times in the future

- Discounting makes events at different points in time comparable by assigning a weight to future events

- There is a lot of debate over the 'correct' discount rate to use
  - When the welfare of future generations is important lower discount rates are recommended (Stern Report famously used 0%)
  - Most climate change analyses use discount rates between 0 – 3%
  - Most oversight agencies often specify which discount rates to use

7. Calculate Net Present Values

Restoration decision-making is not based on the Total Economic Value of a landscape, but rather on restoration's ability to *change* that value



Land Use	Benefits – Costs	Next Benefit	Marginal Benefit
Degraded Agriculture	$1,000–$1,200	$-200	-
Agroforestry	$1,500–$500	$1,000	$1,200
Secondary forest	$1,400–$700	$700	$900

8. Perform sensitivity analysis

- Every analysis will have uncertainty about the magnitude of impacts
- Sensitivity analysis helps determine just how sensitive our results are to these uncertainties
- In other words, it asks ‘how much do our results change when the value of an uncertain parameter changes and does this significantly change our policy recommendations?’

8. Perform sensitivity analysis

Several approaches:

1. Partial sensitivity analysis – Assesses how net benefits change as we vary single assumption

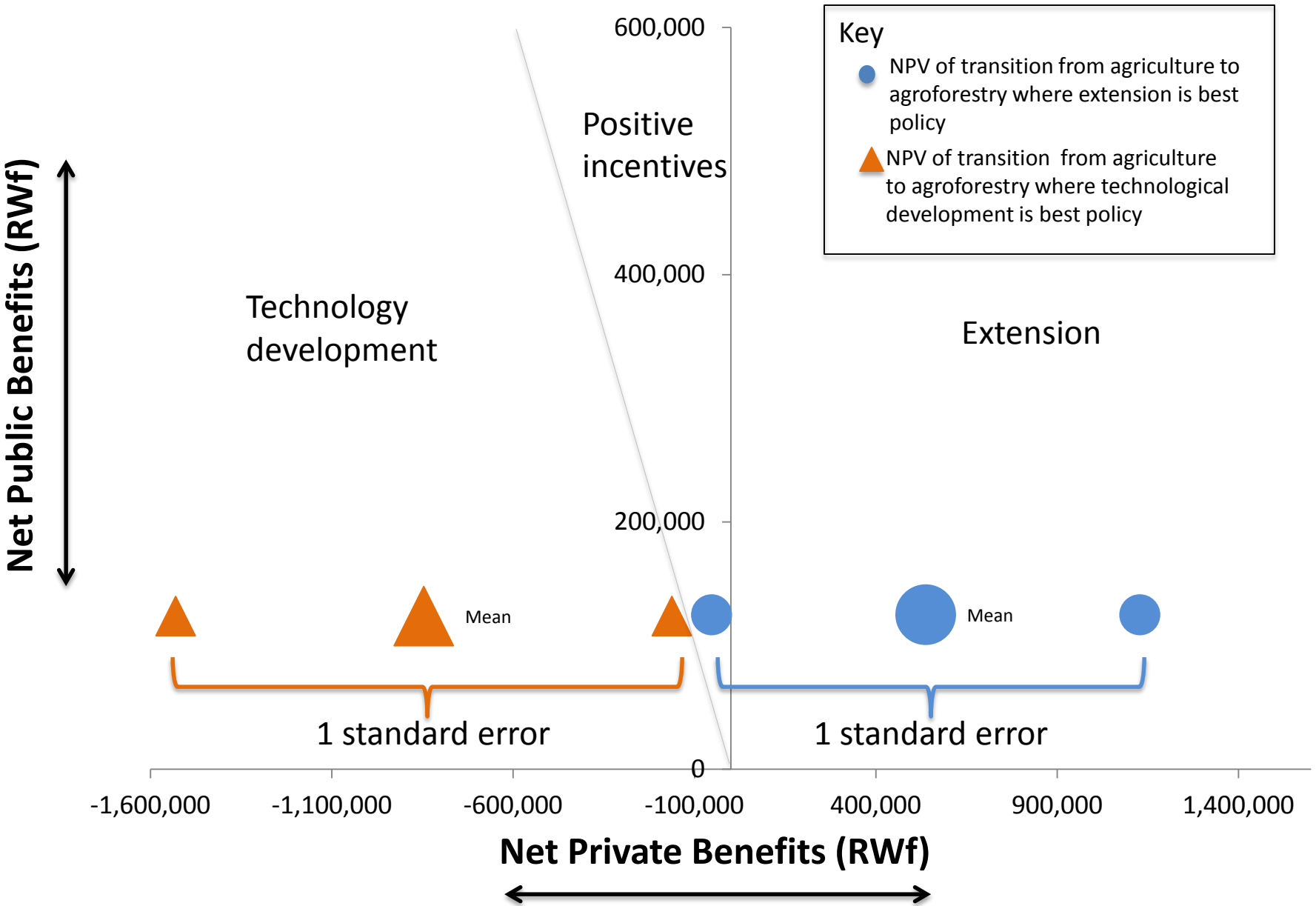
1. Worst-case, best-case (scenario analysis) – Does any combination of reasonable assumptions reverse our conclusions?

1. Monte Carlo – What distributions of net benefits results from treating key parameter values as draws from a probability distribution?

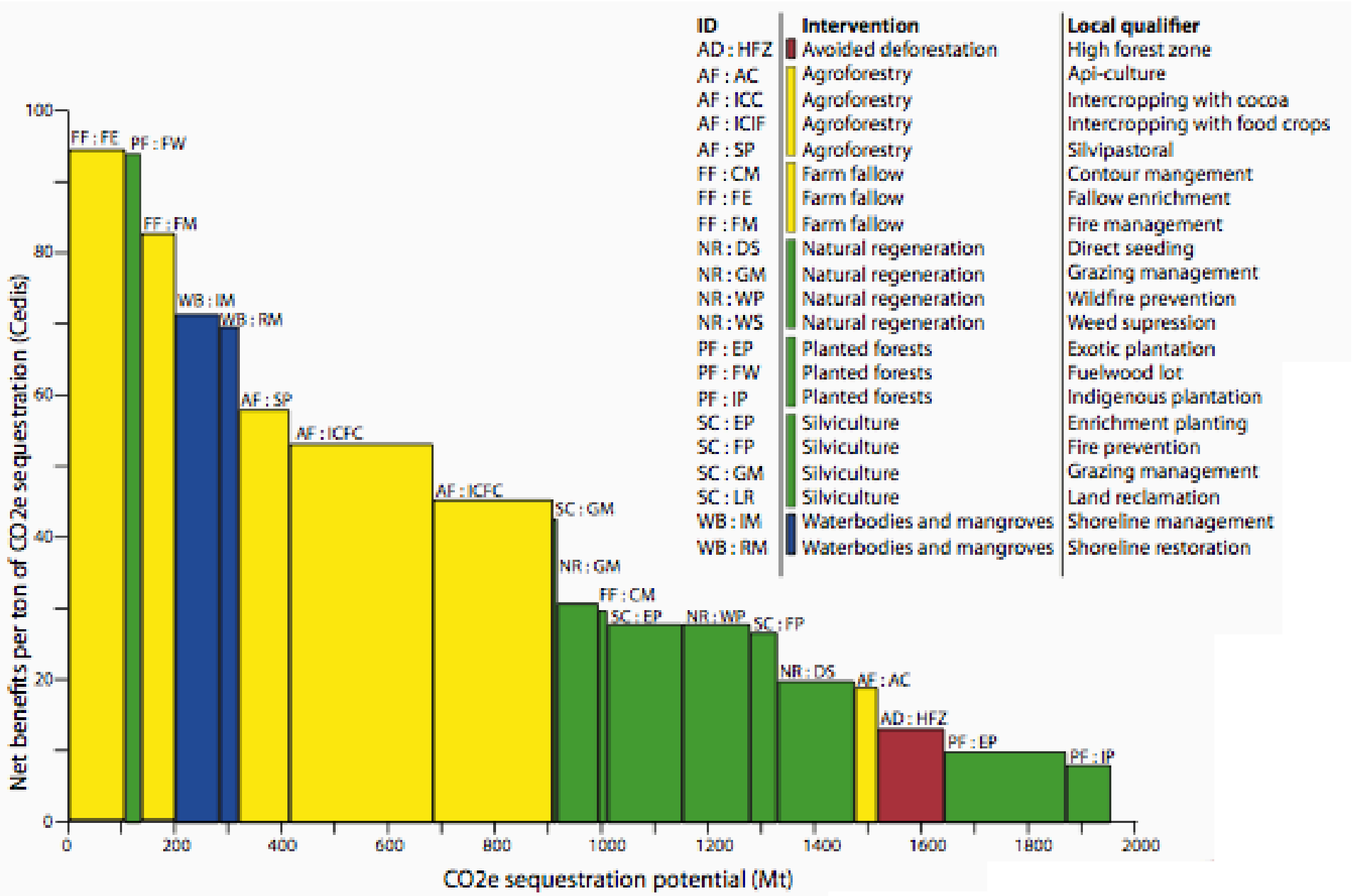
9. Make policy recommendations

- From a pure efficiency perspective, the alternative with the largest NPV should be recommended
- Of course, other factors will also enter the conversation and influence the ultimate decision about how to proceed
- That is, CBA provides helpful analysis that can influence the conversation about what to do and where, but it is not the whole conservation

9. Make policy recommendations: Rwanda



9. Make policy recommendations: Ghana



9. Make policy recommendations: Rwanda

- The return-on-investment (ROI) calculates the amount of value that would be generated by every RWf invested in the restoration transition

- ROI framework allows a fair comparison between restoration and other development projects