Assessing Comparative Advantage and Leakage in Emission Reductions from Deforestation.

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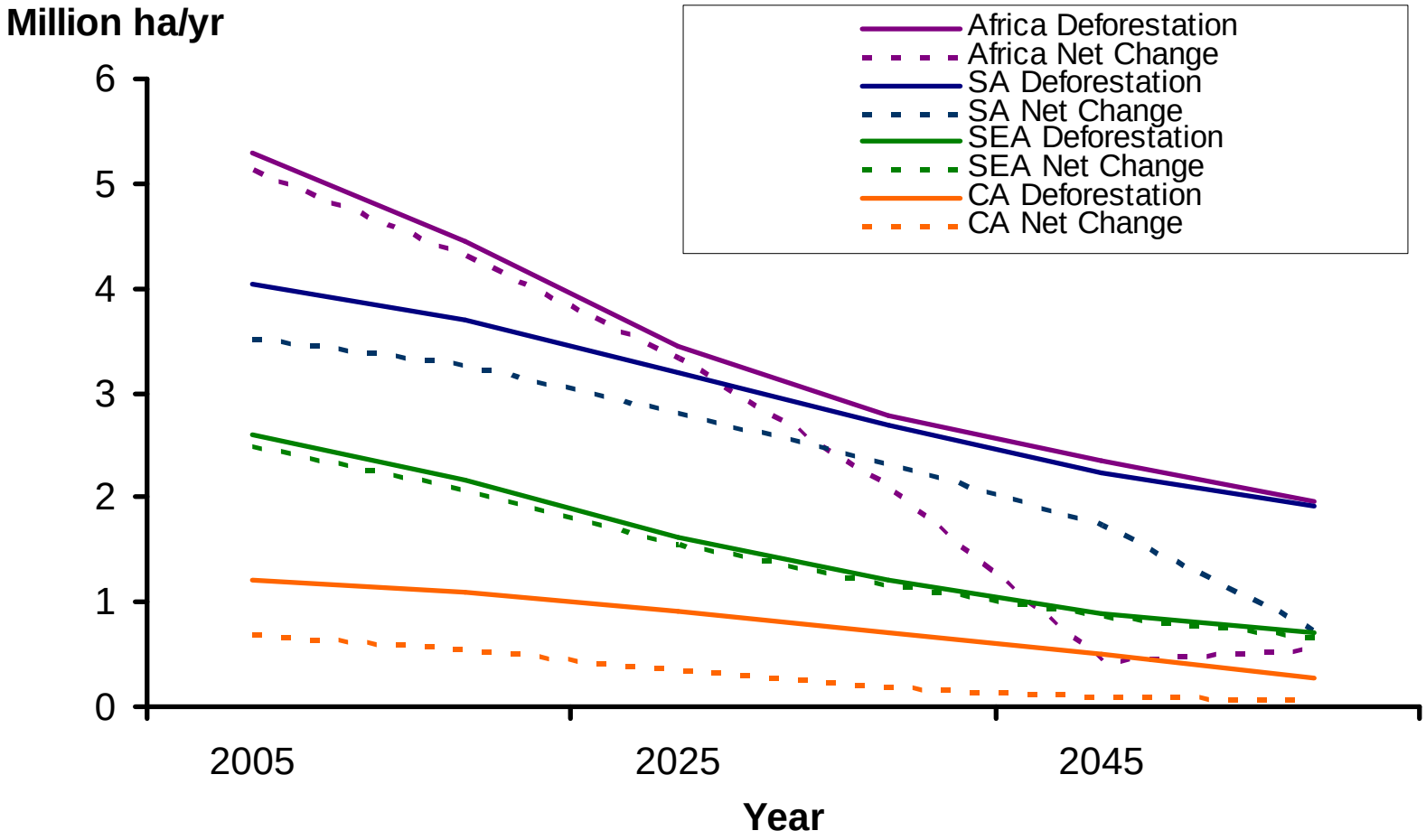
Issues addressed

- Economic Potential by Region and Activity
  - Estimates with a global forest and land use model
  - Afforestation, Reduced Deforestation, Forest Management
- Could reduced deforestation affect C prices?
- How important is leakage? How does it affect costs?

Global forestry and land use model

- Optimizes *harvests*, *management intensity*, *access*, and *forest area* from ~250 supply regions
  - Encompasses all forests in the world
  - Supply of forest land from agriculture via land rental (supply) functions.
- 200 year time horizon
  - 10 year increments.
- Results aggregated into 13 regions, although more detailed information available within each region.

Base case annual deforestation (2005 – 2055)



How much deforestation is this?

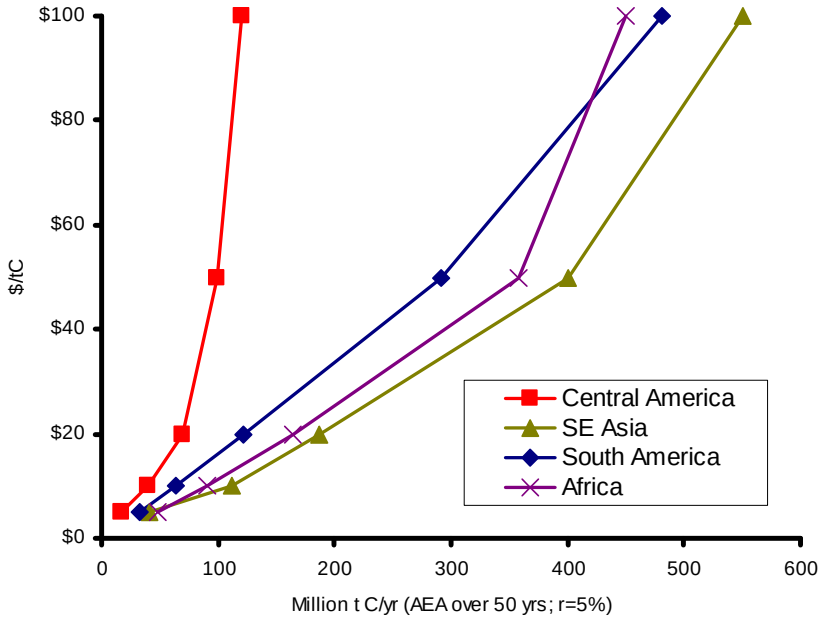
Baseline Case (2005-2055)

	Area Change		Carbon Change	
	Deforest.	Net Chg.	Deforest.	Net Chg.
	Million ha	Million ha	Cum. Pg	Cum. Pg
2005 - 2055				
South America	158.6	136.4	17.3	16.7
Central America	44.1	18.5	4.6	4.5
SE Asia	85.1	81.4	16.0	15.9
Africa	183.1	153.3	18.8	18.6
Total	470.8	389.5	56.7	55.7
Avg. Annual	9.4	7.8	1.1	1.1

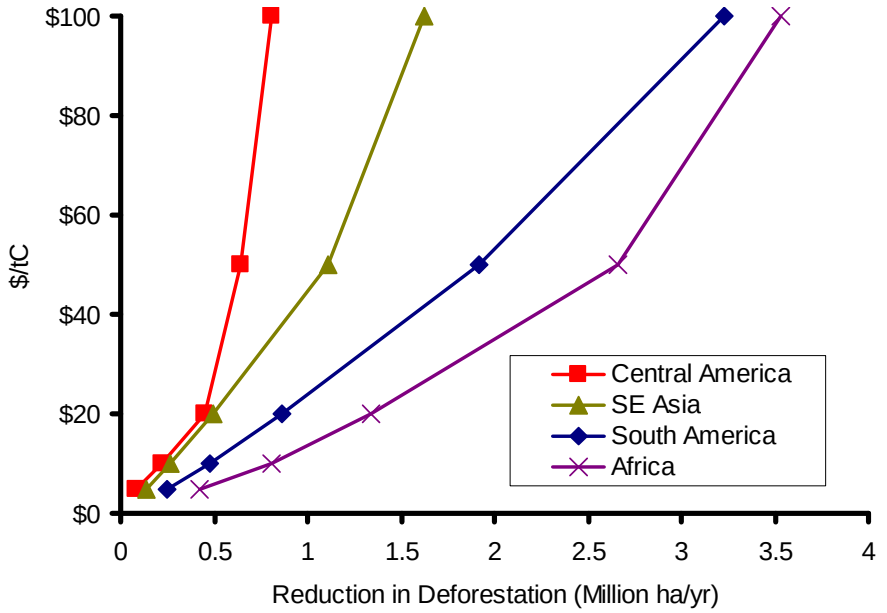
Comparative advantage?

Supply Curves for Reducing Deforestation (2005 – 2055)

Carbon Supply (AEA - Million t C/yr)



Land Supply (Million ha/yr)



What do these C prices mean on the ground?

Annual Rental Values ($/ha/yr)

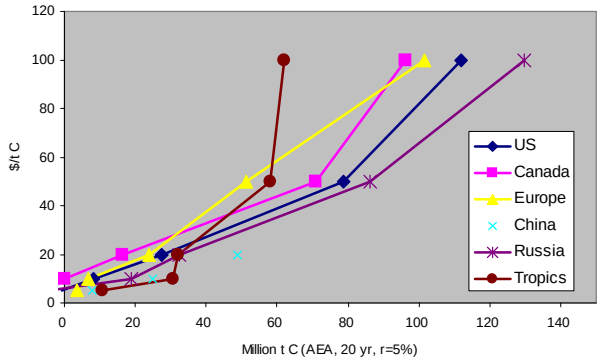
	P^C = \$5 tC^{-1}	P^C = \$50 tC^{-1}	P^C = \$100 tC^{-1}	tC/ha
South Amer.	\$29.84	\$298.46	\$596.98	121
Cent. Amer.	\$23.22	\$232.66	\$465.83	94
SE Asia	\$32.93	\$329.55	\$659.37	136
Africa	\$24.97	\$249.83	\$499.79	101

Annual Rent/ha = (R^c)*(tC/ha)

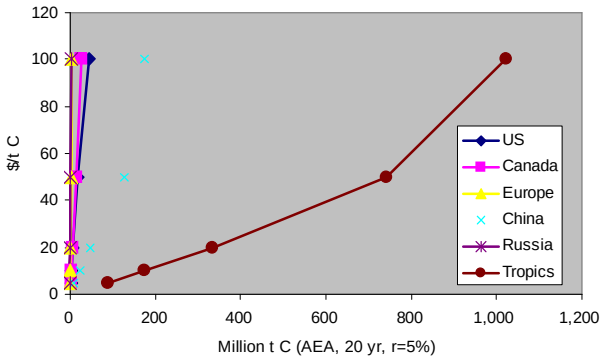
Comparison over forest options

Constant Carbon Prices, AEA, **20 yrs**, r=5%

Aging, Mgmt, Set-Asides



Afforestation/Red. Defor.



- For $100/t C ($27/t CO2), over next 20 years…

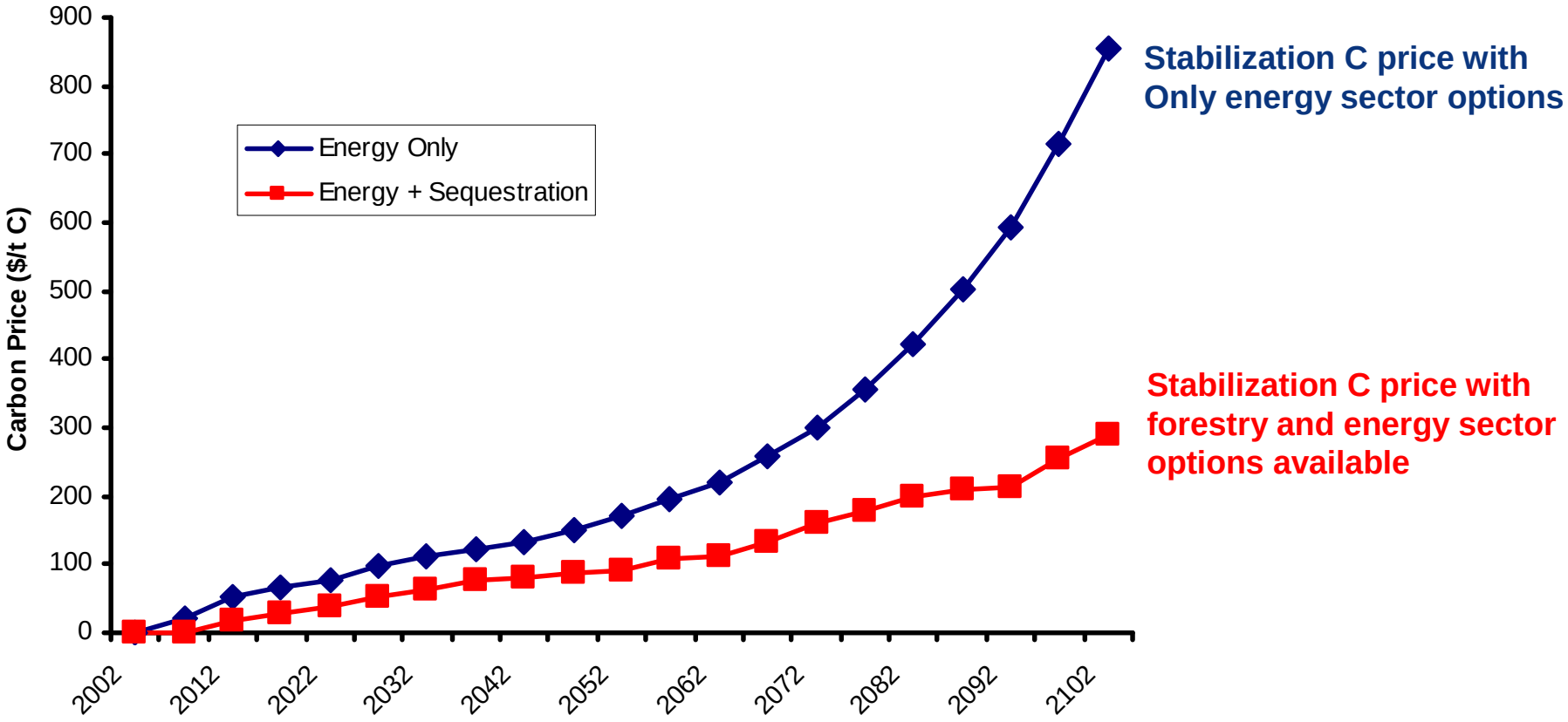
Action	Gt (Pg) C/yr	Gt (Pg) CO_2/yr
Reduce Deforestation	1.0 – 1.2	3.7 – 4.4
Aging, Mgmt, Set-Asides	0.4 – 0.5	1.4 – 1.8
Afforestation	0.1 – 0.3	0.4 – 1.1

Can land use reduce overall costs?

Link For/Land Use model with WITCH model (Tavoni et al., 2007)

Examine 550 ppm stabilization policy

- **Adding Forestry Reduces Carbon Prices by 40-50% over Century**
- Reduces Average Rate of Price Growth from >7% to 3.8% per year.



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Comprehensive approach?

- Includes all options in land use
  - Afforestation
  - Reduced deforestation
  - Forest management
  - Forest products
  - Soil carbon, including agriculture
- Accounts for carbon at the country level and adjusts the value of credits relative to country results.

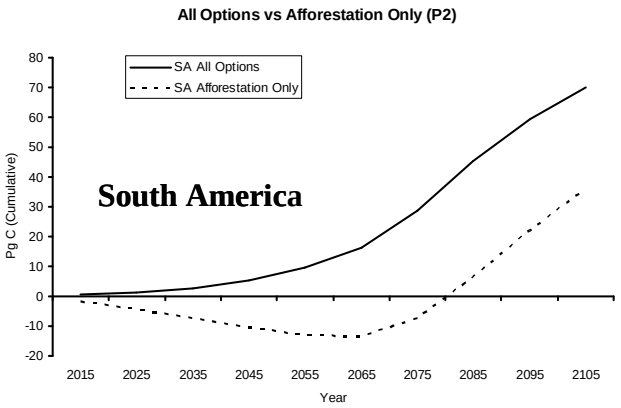
- Enhances overall efficiency of program.
- A step to control/manage leakage.

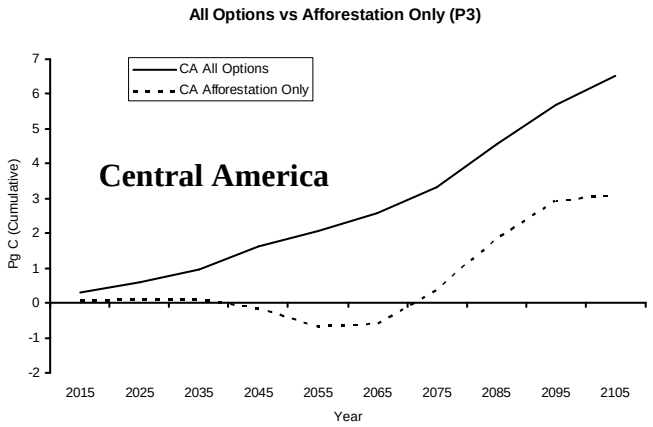
Afforestation only vs. comprehensive approach

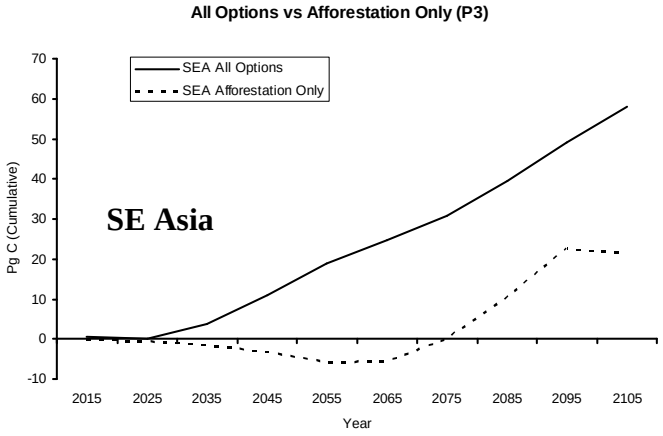
P^C_0 = $18/t C
Rises to $916 by 2100

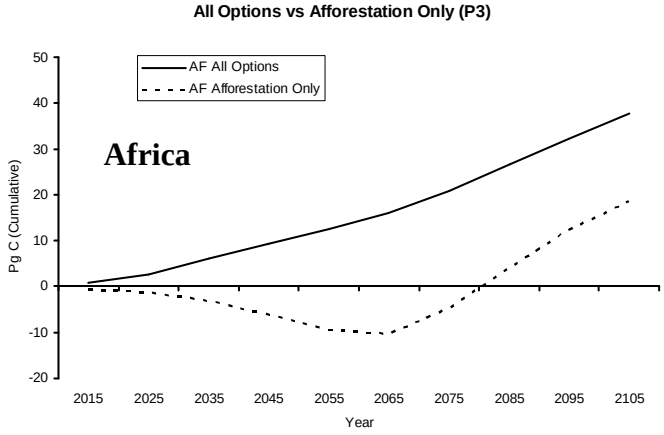
Afforestation scenario generates little net carbon In tropics (and globally) in the near-term, suggesting large potential leakage.

Over longer-run gains are 30-50% lower than if all options included.





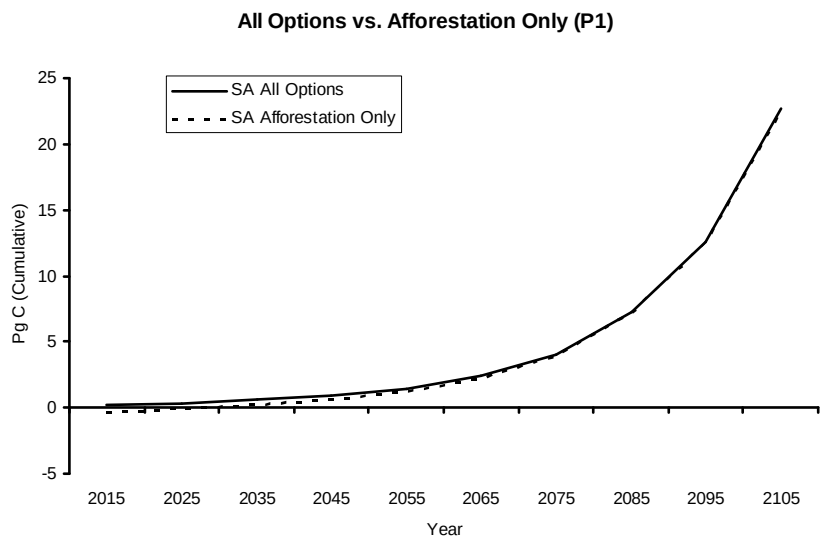


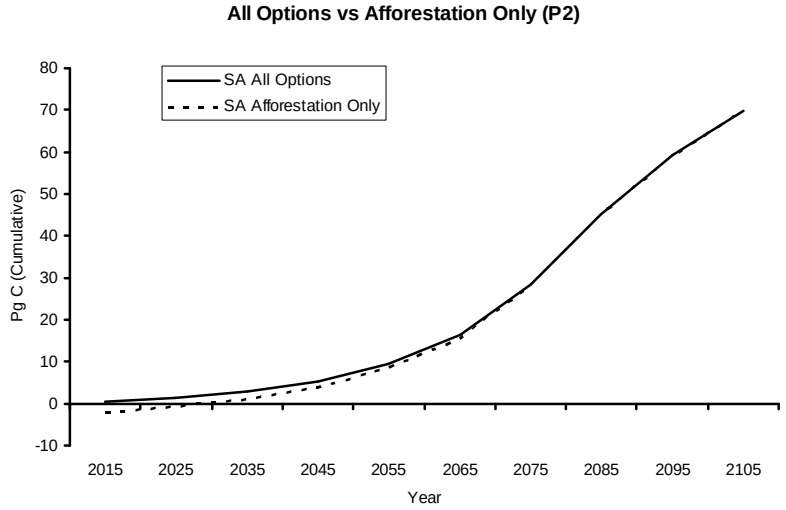


Delaying decision on deforestation so far not too problematic…

- Same price scenarios as before, but different policies
  - All options (aff./red defor/mgmt/rotations/products)
  - Afforestation only until 2025, then all options available.
- Can ultimately obtain close to the "optimal" levels of carbon in tropical forests by introducing comprehensive programs as soon as possible.

Comparison for South America Only





Conclusions

- **Can potentially sequester 1.0 – 1.2 Pg C/yr over 20-50 years through reduced deforestation in tropics for less than $100 per t C**
  - Cost is $17-$18 billion/yr.
- **Reducing deforestation and afforestation are a large proportion of global potential**
  - > 80% of carbon potential in tropics.
  - **Note**: Things that increase land opportunity costs, e.g. biofuels, would also increase costs of reducing deforestation.
- **Scale of carbon could be large enough to influence carbon prices if traded globally.**
  - Under stabilization policy analyzed, up to 50% reduction in C prices in global market.
- **Focusing only on afforestation reduces efficiency (e.g. leakage occurs)**