

An aerial photograph showing a landscape with a grid of agricultural fields, likely a plantation, and a winding road. The terrain is a mix of brown and dark green, suggesting deforestation and agricultural activity.

# Reducing Emissions from Deforestation in Developing Countries (RED)

World Bank – 27<sup>th</sup> May 2008

Bernardo B.N. Strassburg – [b.strassburg@uea.ac.uk](mailto:b.strassburg@uea.ac.uk)  
Centre for Social and Economic Research on the Global Environment  
School of Environmental Sciences  
University of East Anglia

# Introduction

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## Presentation based on

Strassburg et al. 2008, “An Empirically-Derived Mechanism of Combined Incentives to Reduce Emissions from Deforestation”

Estimates of national abatement curves to simulate mechanisms outcomes;

Currently being updated with data from

- Economics of Climate Change in Brazil (WB/UK)
  - Potential and Costs of RED in the Brazilian Amazon
- Eliasch Review

# Introduction

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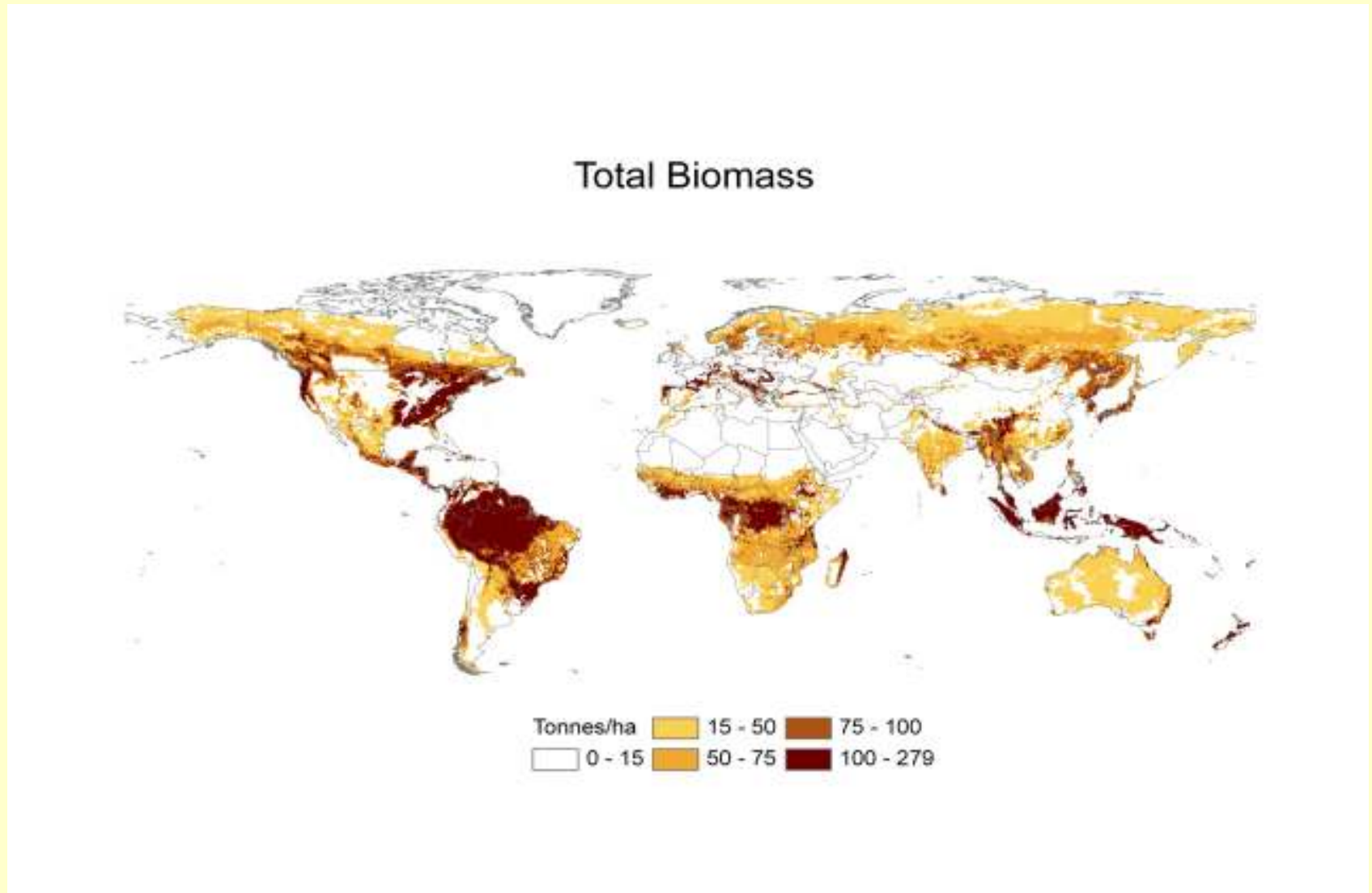
- Mainly focused on opportunity costs;
  - Private profits
  - Potential opp. costs. (not current/projected);

# Costs Estimations

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- Top 20 developing countries by forest area
- Data
  - Forest Area & Deforestation rates: FAO
  - Carbon density: FAO, Global & Regional Models

# Carbon content per ha



# Costs Estimations

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- Opportunity Costs: two approaches
  - “Field Approach”
    - Economic Returns from alternative land-uses and respective converted areas from the Stern Review
  - “GIS Approach”
    - GAEZ – FAO/IIASA
    - Map of current crop rents (Naidoo & Iwamura, 2007)
      - Map of Potential Crop Rents
    - Maps of spatial distribution of deforestation

# Field Approach

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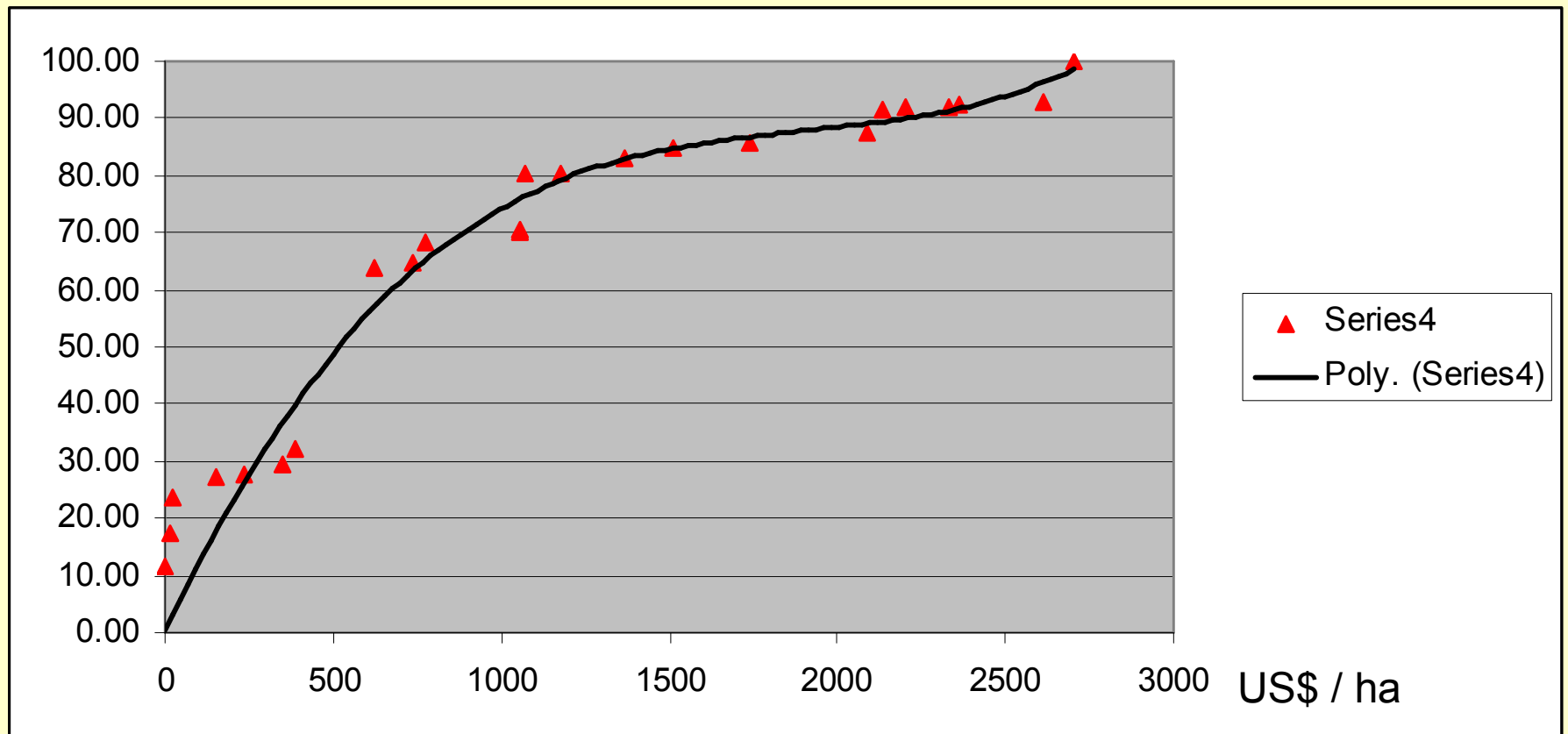
- Based on Grieg-Gran (2006)
- Estimates for economic returns and converted area for the alternative uses of land in 8 countries responsible for 50% of deforestation;
- NPV, 30 years,  $r=10\%$ , Medium scenario

# “Field Approach”

Alternative Land Use	Returns (US\$/ha)	% Land Used	Cumulative %
Beef cattle small scale/Manioc/Rice	2	11.55	11.55
Cassava monoculture	18	5.75	17.30
Rice Fallow	26	6.20	23.50
Dairy	154	3.51	27.02
Perennials (Bananas, sugarcane pineapples)	239	0.50	27.52
Annual food crops long fallow	346	1.75	29.27
Beef Cattle	390	3.06	32.33
Beef cattle medium/large scale	626	31.67	63.99
Cocoa without marketed fruit	740	0.87	64.87
Annual food crops short fallow	774	3.40	68.27
Small-scale maize and cassava	1,052	1.86	70.13
Cassava monoculture	1,053	0.45	70.59
Smallholder rubber	1,071	9.77	80.35
Oil palm and rubber	1,180	0.08	80.43
Cocoa with marketed fruit	1,365	2.62	83.06
Smallholder oil palm/Low-yield independent	1,515	1.65	84.71
Smallholder subsistence crops	1,737	1.13	85.84
Supported growers	2,085	1.77	87.61
Soybeans	2,135	3.82	91.43
High yield independent	2,205	0.49	91.92
Oil palm supported growers	2,330	0.21	92.13
Oil palm Independent grower	2,363	0.06	92.19
Tree plantations	2,614	0.50	92.70
Oil palm Large scale/government	2,705	7.30	100.00

# “Field Approach”

- % Reductions (y) per Incentive / hectare (x)



# GIS Approach

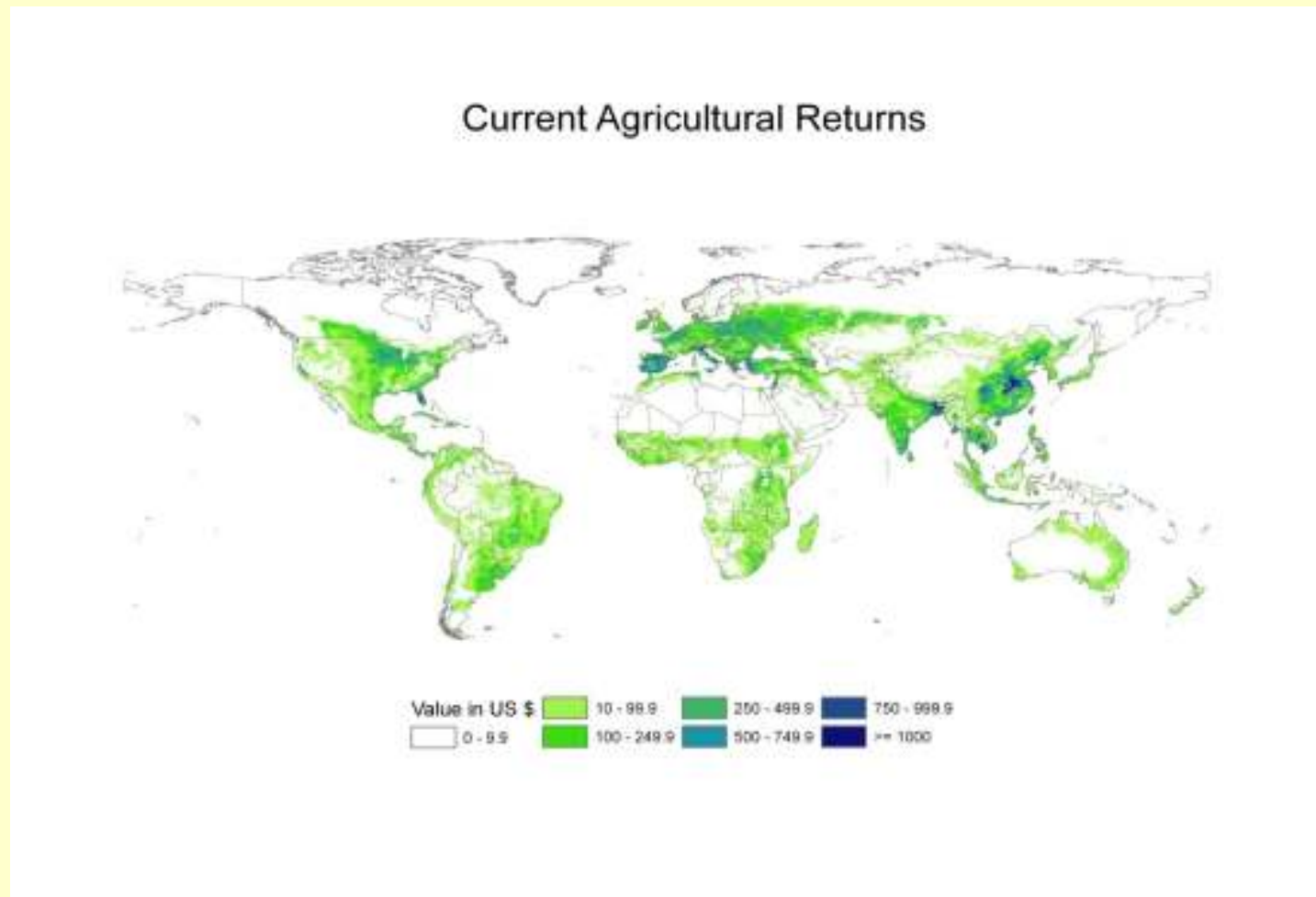
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- Data from Naidoo & Iwamura (2007)
  - GAEZ – FAO/IIASA
    - Potential production top 18 crops for 5' cells, as a function of Climate, soil, irrigation potential, level of inputs (medium);
    - Livestock map (FAO, 2006)
  - Producer prices, average 1991-2002
- NPV 30 yrs,  $r=10$ , profit=15% sales

# “GIS Approach”

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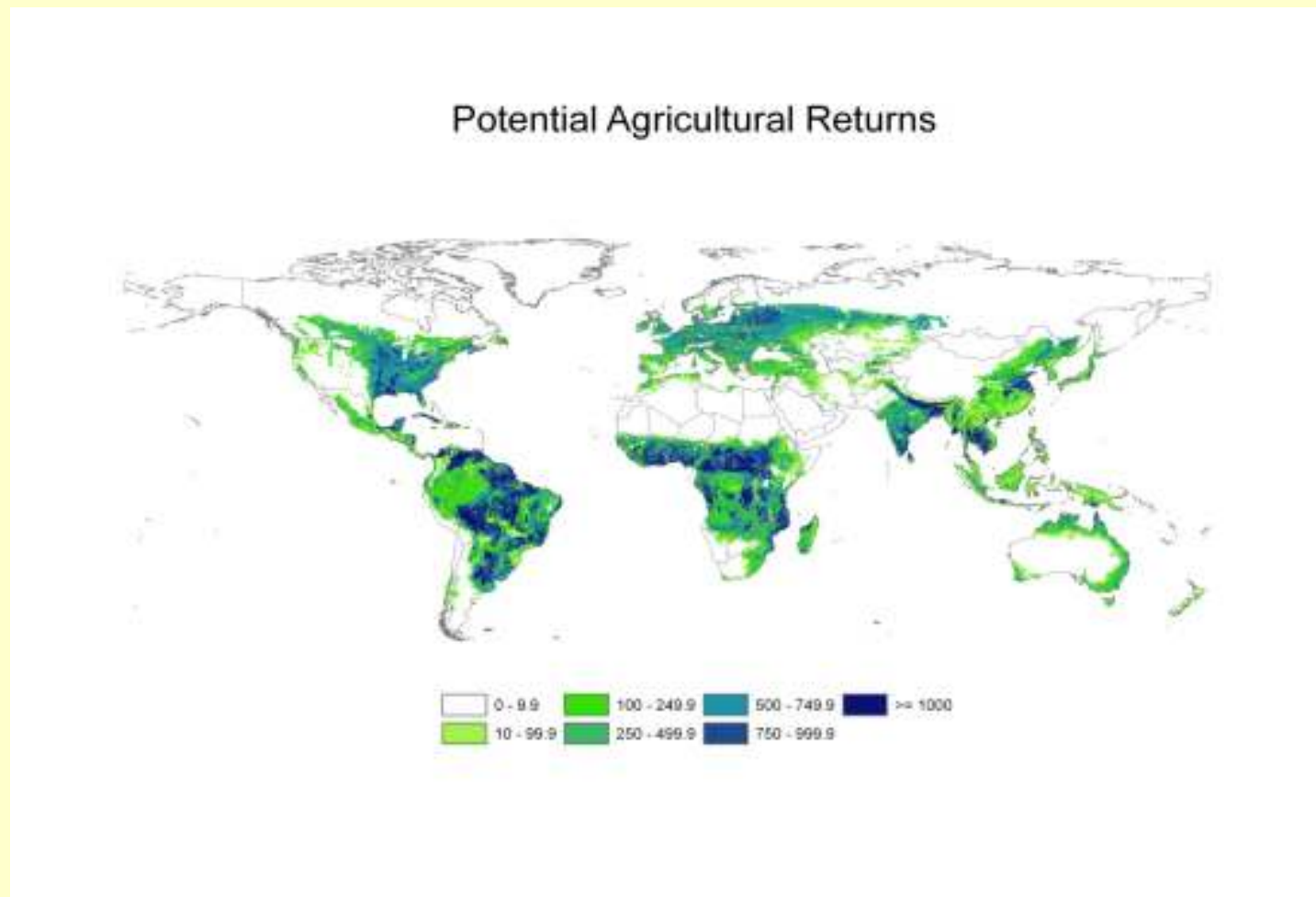
- Map of Current Crop Returns



# “GIS Approach”

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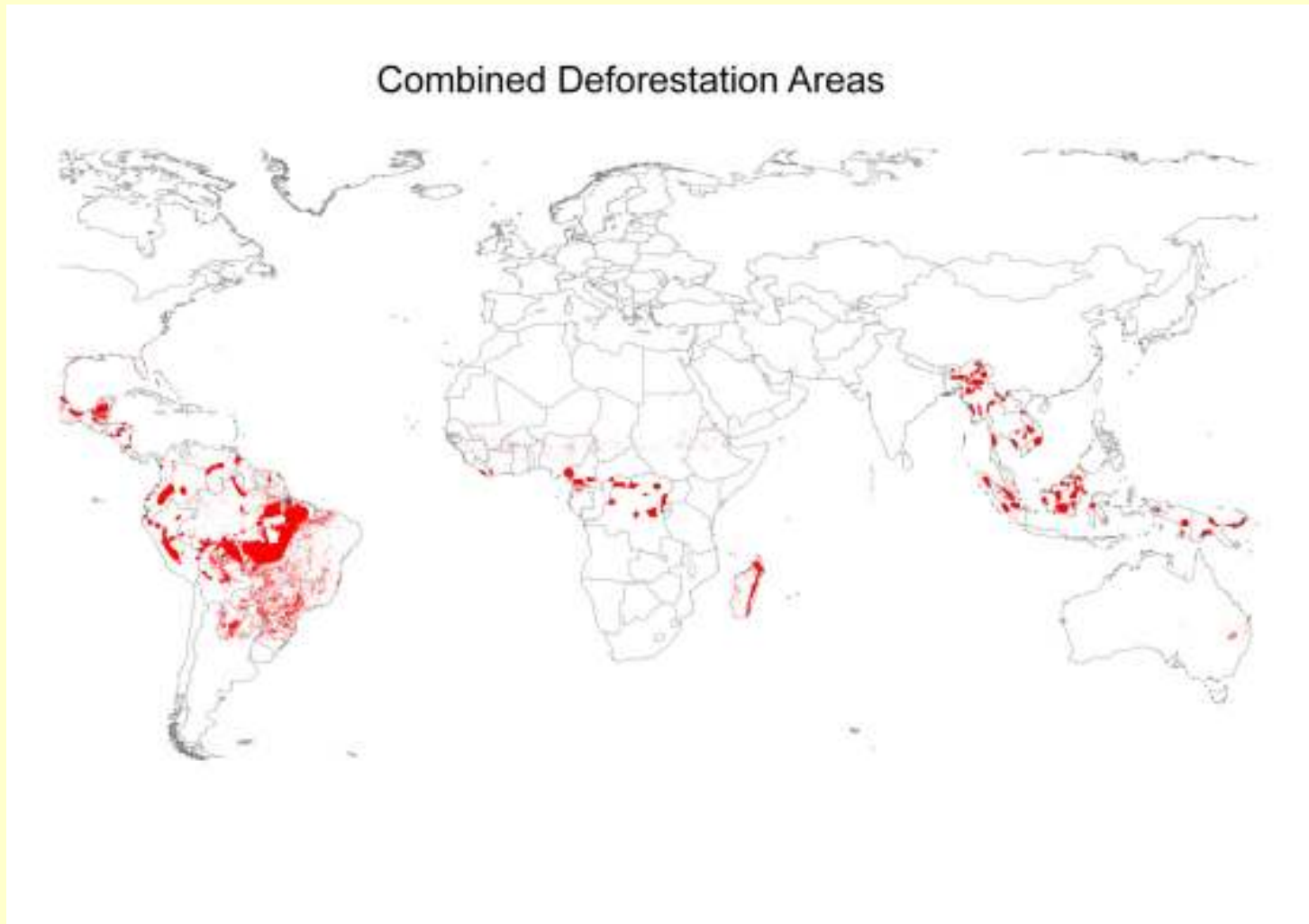
- Map of Potential Crop Returns



# “GIS Approach”

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- Map of Deforestation Areas



# “GIS Approach”

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- Potential Returns in Deforestation Areas



# “GIS Approach”

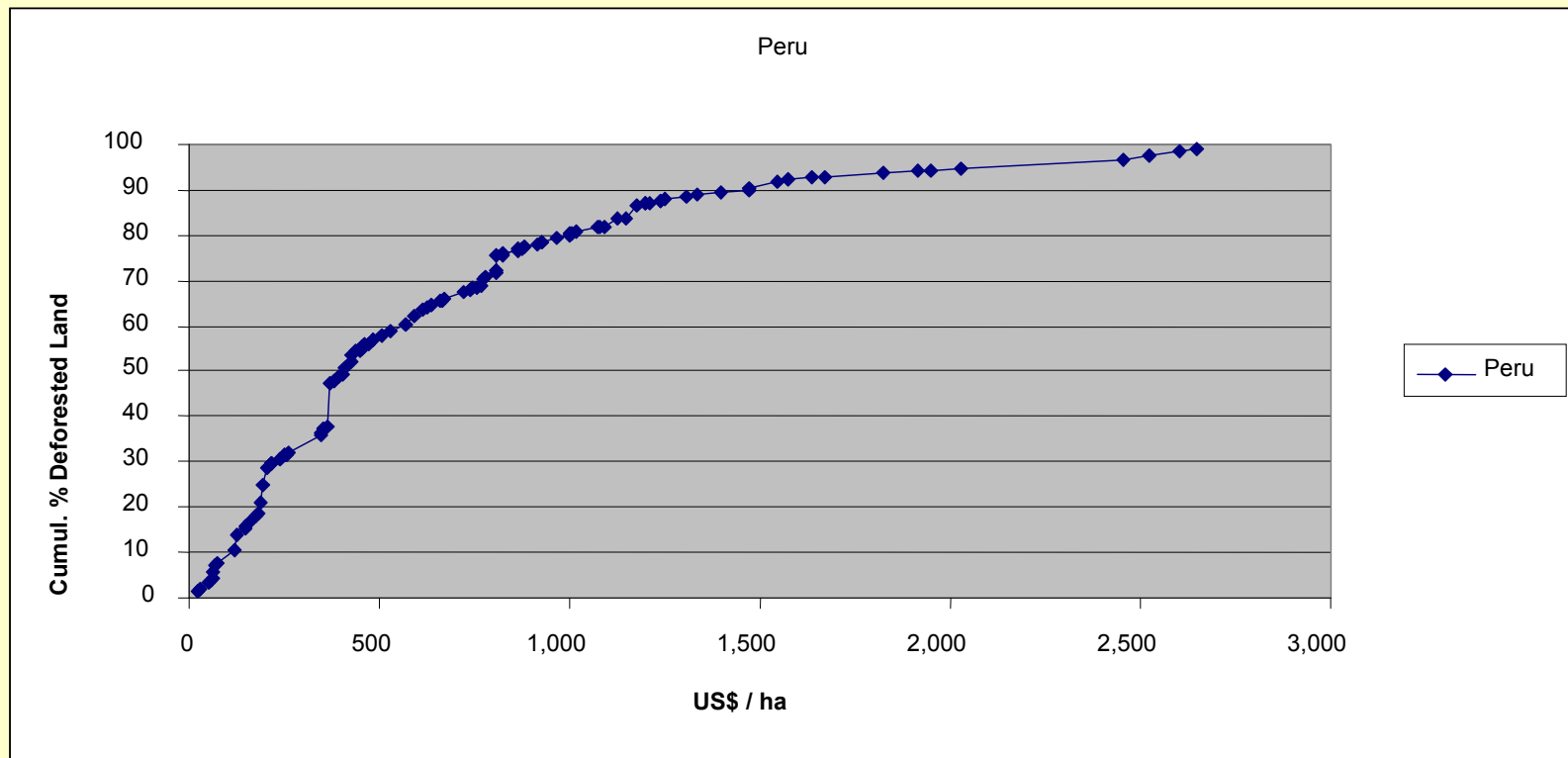
- Potential Returns in Deforestation Areas

Peru – GIS Approach

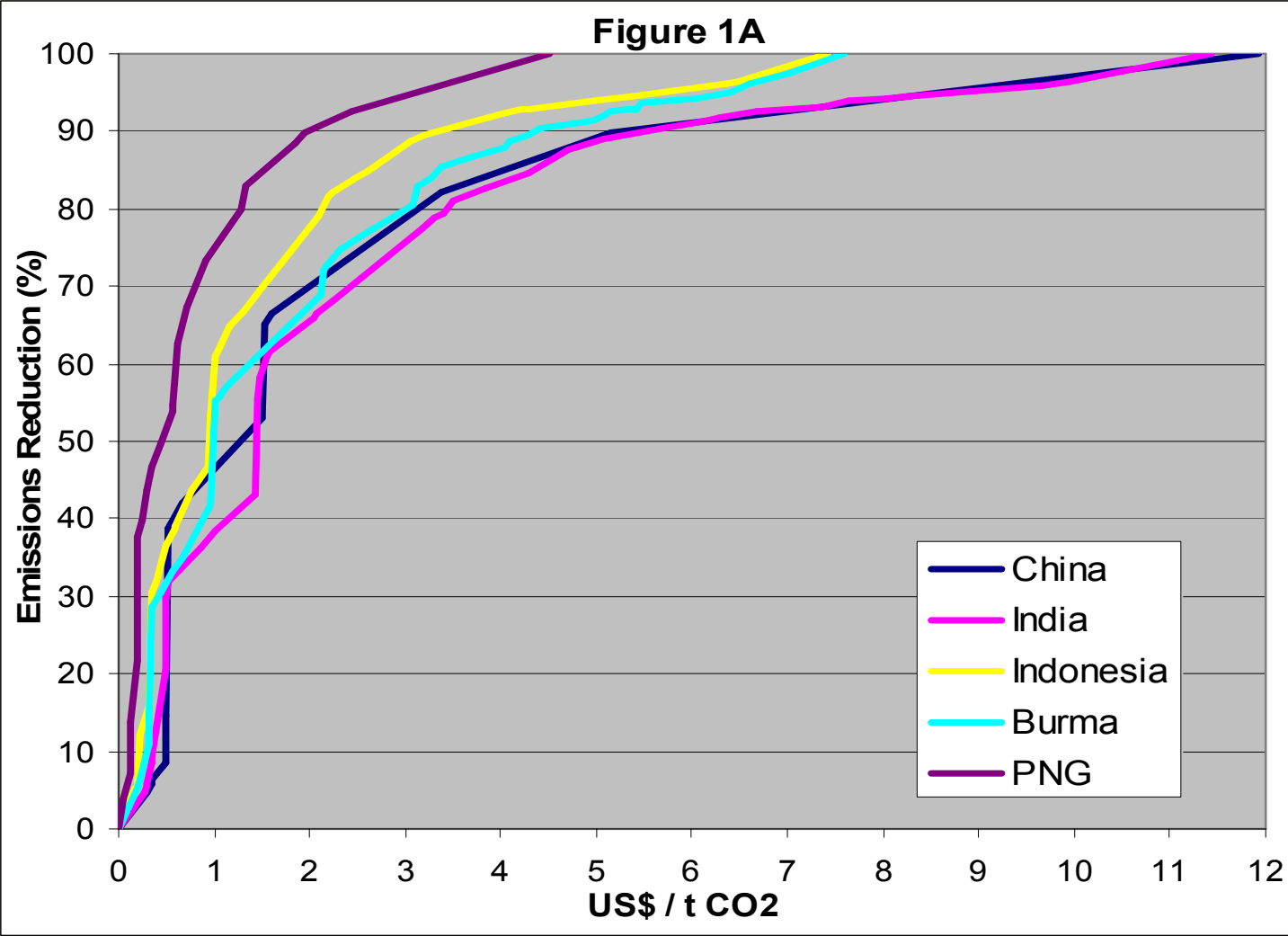
	Return (US\$ ha <sup>-1</sup> y <sup>-1</sup> )	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	22.54	1	0.0	0.0	0.0
	27.32	3	0.1	0.1	0.2
	52.74	1	0.0	0.0	0.2
	59.22	1	0.0	0.0	0.3
	61.84	15	0.7	0.7	1.0
	64.16	59	2.8	2.8	3.8
	68.68	48	2.3	2.3	6.0
	72.78	9	0.4	0.4	6.5
	116.98	22	1.0	1.0	7.5
	122.65	124	5.9	5.9	13.4
	146.69	1	0.0	0.0	13.4
	148.78	7	0.3	0.3	13.8
	158.22	29	1.4	1.4	15.1
	177.67	11	0.5	0.5	15.6
	180.30	7	0.3	0.3	16.0
	185.51	105	5.0	5.0	20.9
	192.47	149	7.0	7.0	28.0
	206.05	131	6.2	6.2	34.2
	216.41	2	0.1	0.1	34.3
	218.35	3	0.1	0.1	34.4
	238.14	2	0.1	0.1	34.5
	239.85	3	0.1	0.1	34.6
	250.78	1	0.0	0.0	34.7
	257.56	2	0.1	0.1	34.8
	262.25	9	0.4	0.4	35.2
	264.00	2	0.1	0.1	35.3

# “GIS Approach”

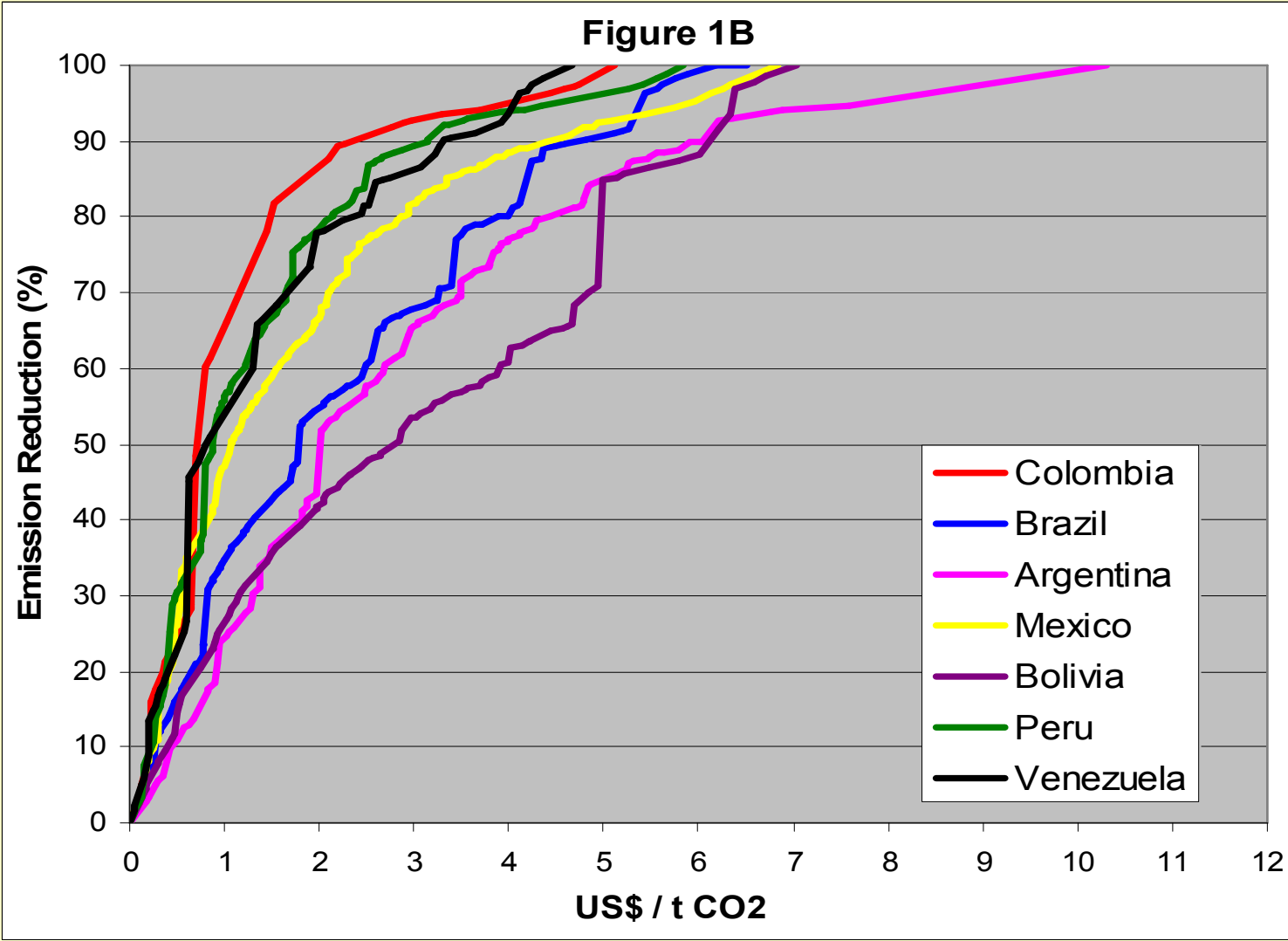
- Potential Returns in Deforestation Areas



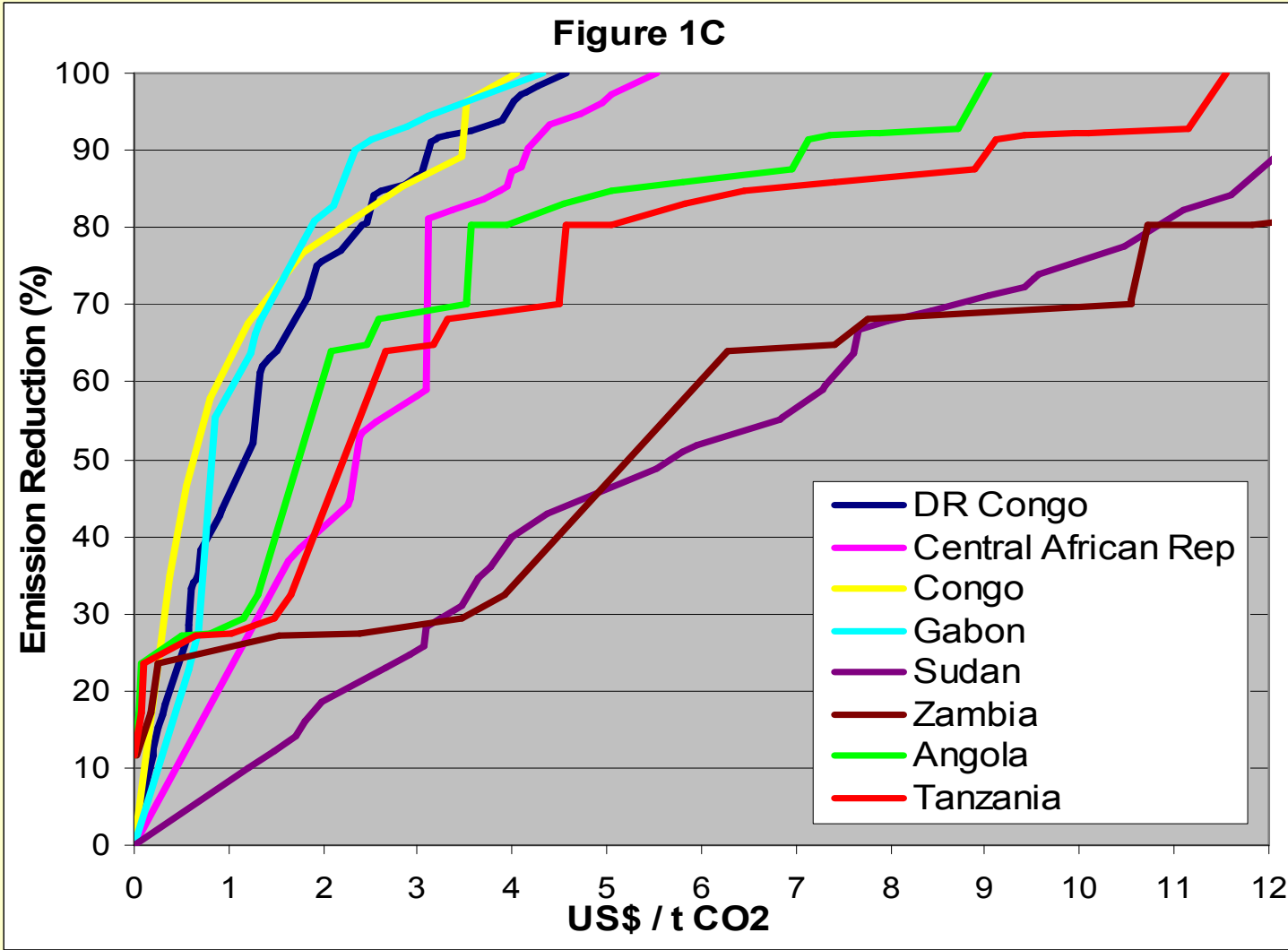
# Potential Reductions per Base Incentive (Asia)



# Potential Reductions per Base Incentive (Americas)



# Potential Reductions per Base Incentive (Africa)

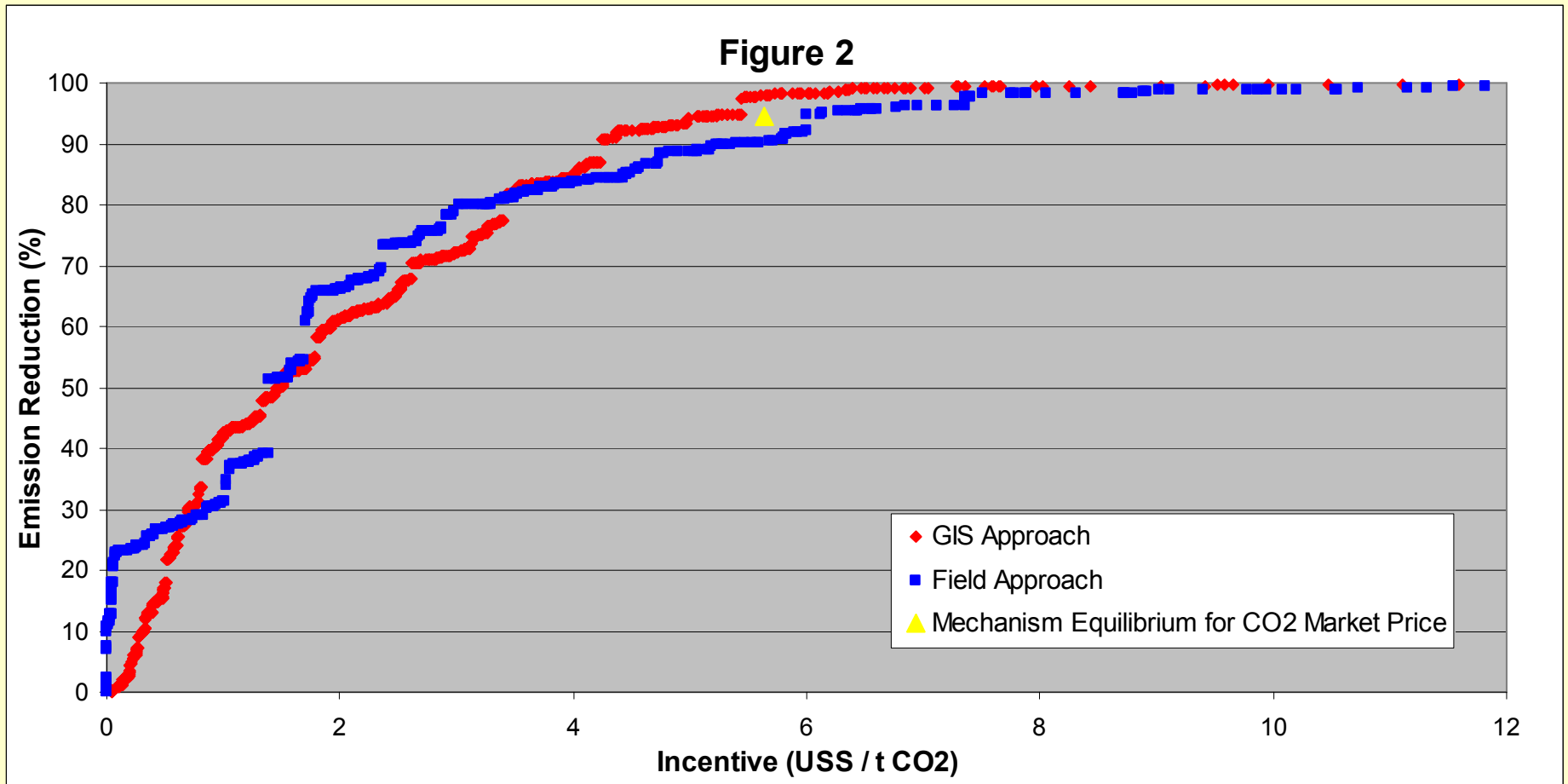


# Comparison of both approaches

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- We weighted the national estimates of our 20 countries (~ 77% forests in developing countries) to produce a global relations between base incentive and consequent reduction in emissions, for both approaches;

# RED (%) per base incentive

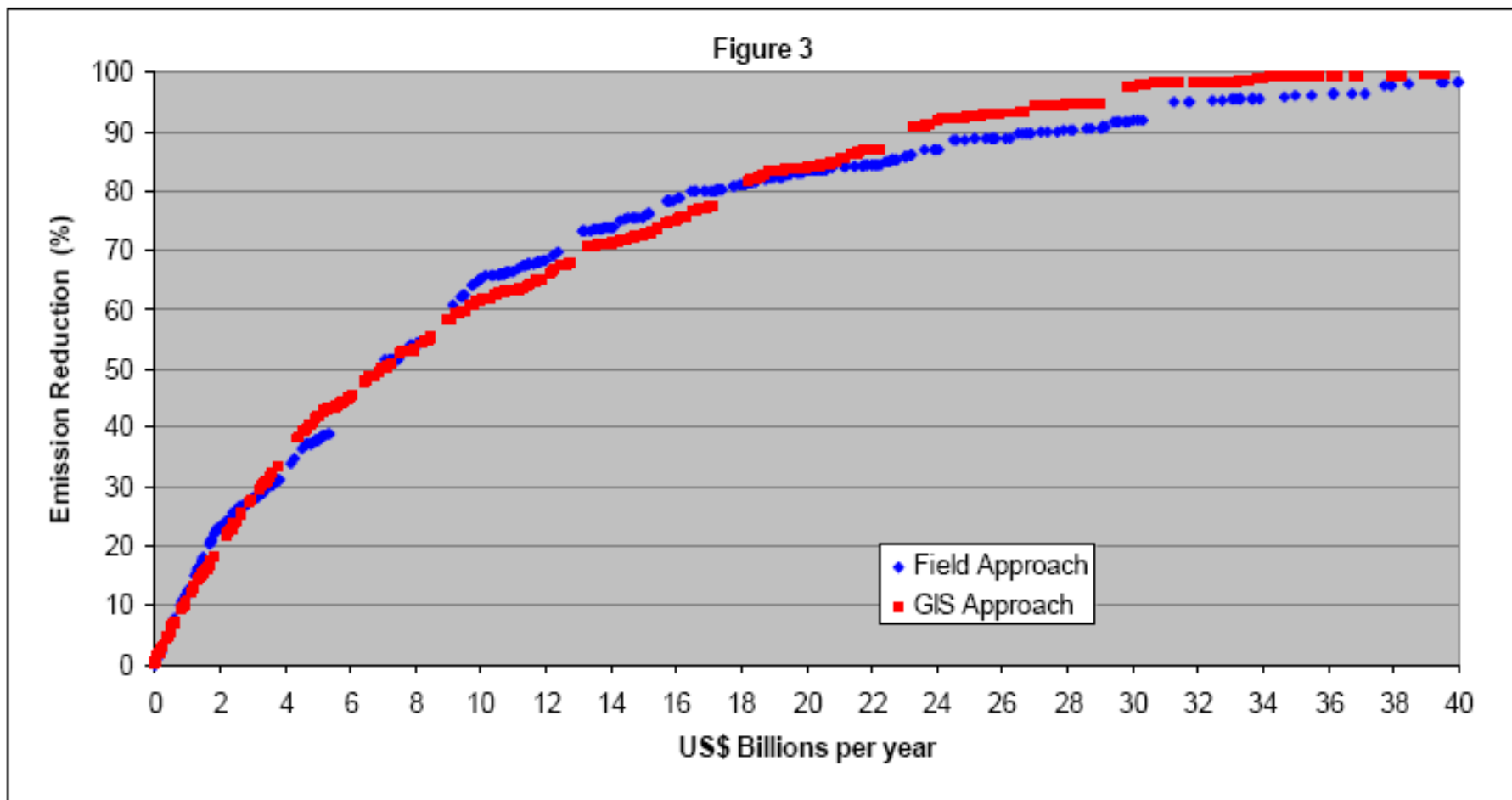


# Global Costs of RED

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- No price discrimination (  $p \times q$  )
- Transaction costs : 5.5% total costs
- Protection and management costs:
  - US\$ 3.8/ha , for the fraction of forests equal to fraction of reduced deforestation (e.g. protect 80% of forests to reduce annual def by 80%)

# Global Costs of RED



# Commentary

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## Three distinct issues:

- “Fair” Compensation:
  - Maximum potential net national benefits of alternative activities (related to Op. Costs)
- Implementation costs of policies to reduce deforestation
- Costs of a RED mechanism
  - Highly dependant on type of mechanism

# Conclusions

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- Opportunity costs estimated:
  - Potential private profit
  - Medium scenario/medium inputs
  - Not account for:
    - Costs of infrastructure expansion (-)
    - Wider national benefits of converting the forests (+)
    - National benefits of conserving the forests (-)
    - High inputs (+)

An aerial photograph of a deforested landscape, showing a grid pattern of cleared land and remaining forest. The text is overlaid on this image.

# Reducing Emissions from Deforestation in Developing Countries (RED)

Thank  
You

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Bernardo B.N. Strassburg – [b.strassburg@uea.ac.uk](mailto:b.strassburg@uea.ac.uk)  
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