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Land Degradation in Latin America and the Caribbean: A Framework to Measure its Costs

by

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César Morales (Global Mechanism)
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THE CONTEXT IN LATINAMERICA

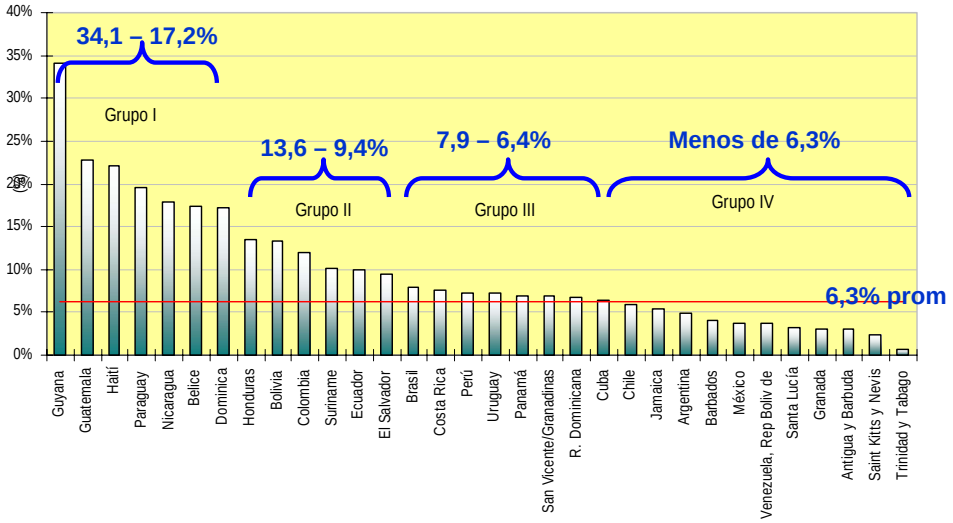
EVOLUTION AND MAIN TRENDS IN L.A. OF AGRICULTURAL SECTOR BETWEEN 1990 - 2005

- Good economic results (sectoral rate of growth higher than the global economy)
- Poor social results (Poverty and extreme poverty worst than urban rates)
- Poor results related the environment and natural resources: deforestation, lost of biodiversity, desertification and degradation of natural resources

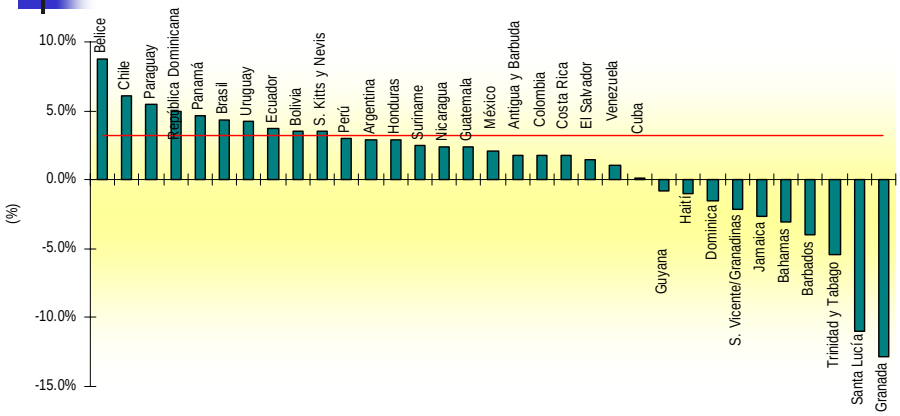
GROWTH MODALITY

- Few products (Cattle, soybean, fruits)
- Few producers (the most capitalized)
- Few markets

CONTRIBUTION OF THE AGRICULTURE SECTOR TO GLOBAL GROWTH



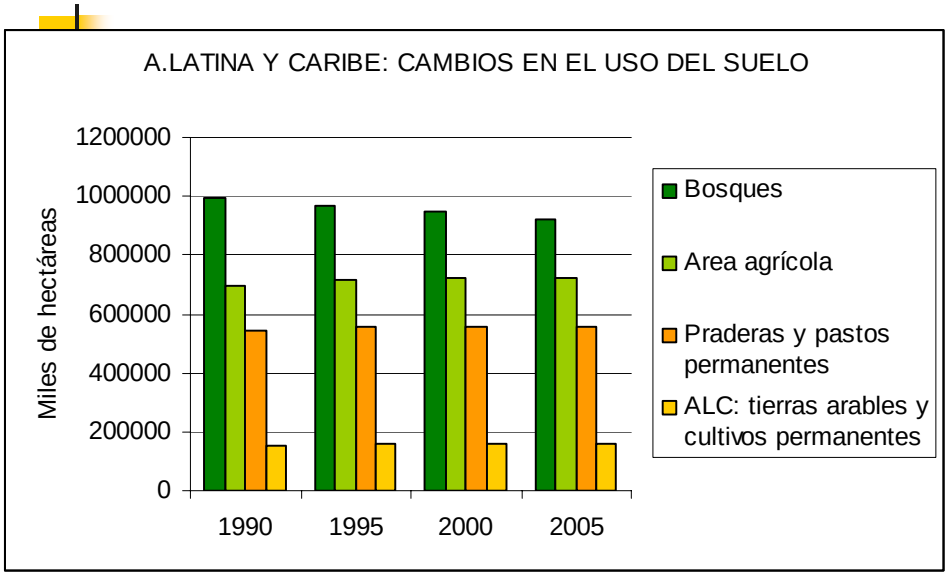
Latin America and the Caribbean: Growth Rates of Added Value of Agricultural sector (2000 – 2005)



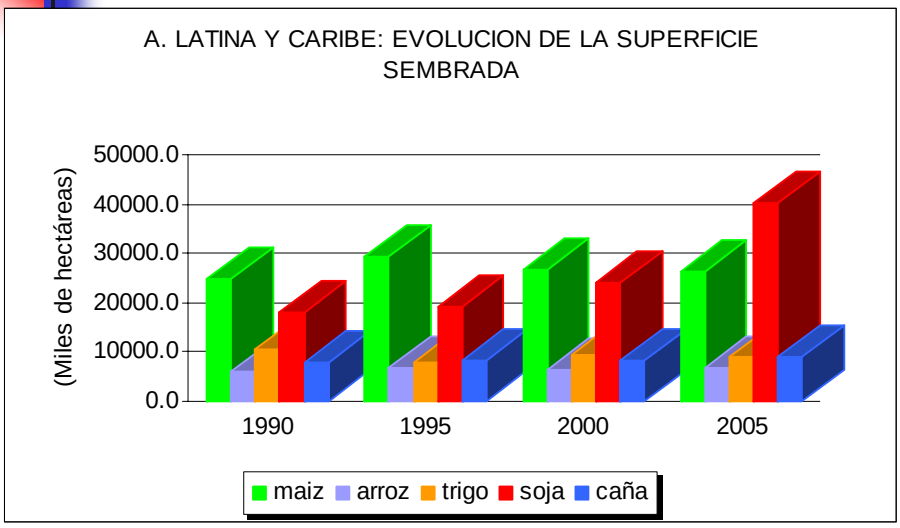
Main changes in soil use between 1990 y and 2005

- The forest area diminished around 69 million hectares
- The agricultural area growth around 26,5 millions hectares: 13,8 millions where dedicated to meadows and permanent pastures and 12,7 millions hectares to permanent crops and arable land.
- The number of cattle increased in 68,1 millions
- The soybean area increased around 22,4 millions hectares

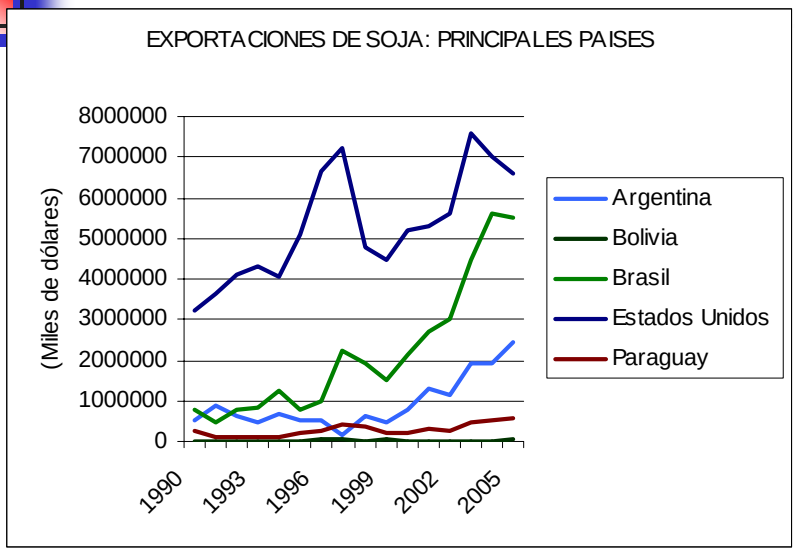
USE OF SOIL HAVE EXPERIENCED ENORMOUS CHANGES



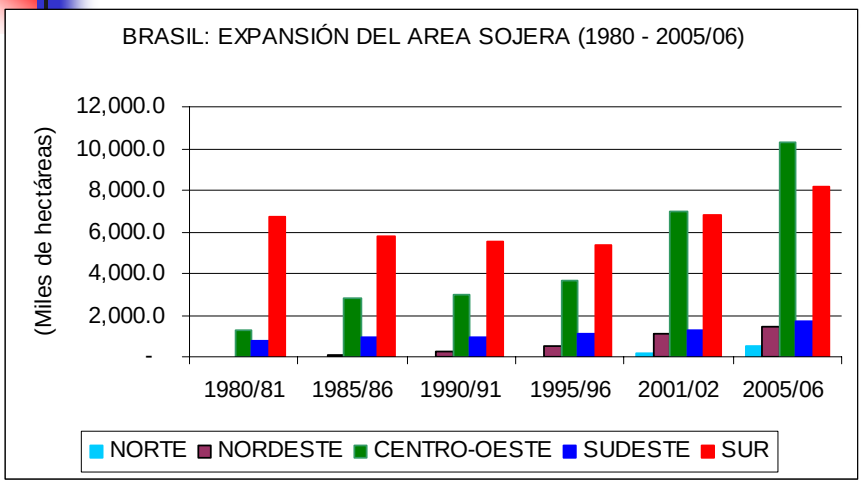
The most important expansion is Soybean area (22,4 millions hectares)



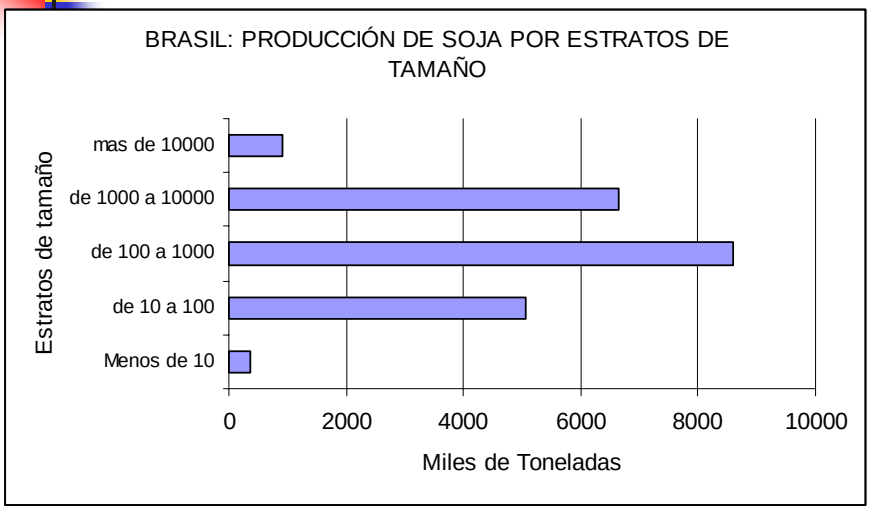
In USA, the soybean production reach the highest value in 2005 and then diminish while the Brazilian and Argentinean production increase strongly



In Brazil the area expansion occurs mainly in central west region



The main part is produced by the biggest and the most capitalized producers



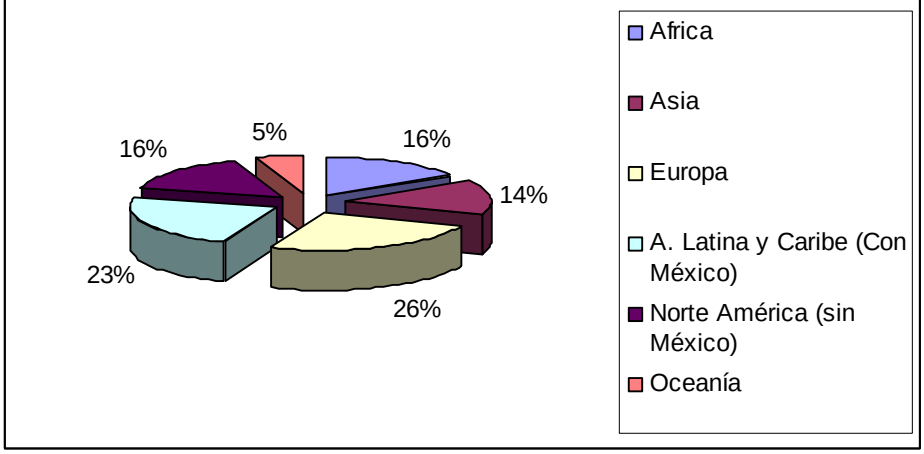
In Argentina the most dynamic soybean area in terms of growth, are the Provinces of Chaco, Entre Ríos and Santiago del Estero

Provincias	Hás (2006)	% crecimiento 1990 - 2006
Buenos Aires	2.396.800	182,5
Córdova	3.093.718	247,5
Chaco	592.309	1.184,6
Entre Ríos	1.247.900	2.277,2
La Pampa	164.700	549,0
Salta	381.500	399,5
Santa Fe	1.566.290	78,8
Santiago del Estero	647.080	892,5
Tucumán	200.518	241,6

The forests

- Latin America and the Caribbean contributes with 23% of the total forest area in the world (924, 2 millions of hectares)
- From this total 831,5 millions hectares are located in South America; 64,2 millions in Mexico; 22,4 en Central America, and y 6,0 in the Caribbean.
- Temperate forests covers around 52 millions hectares located mainly in Argentina, Chile and Uruguay, and the highest areas in some tropical countries.

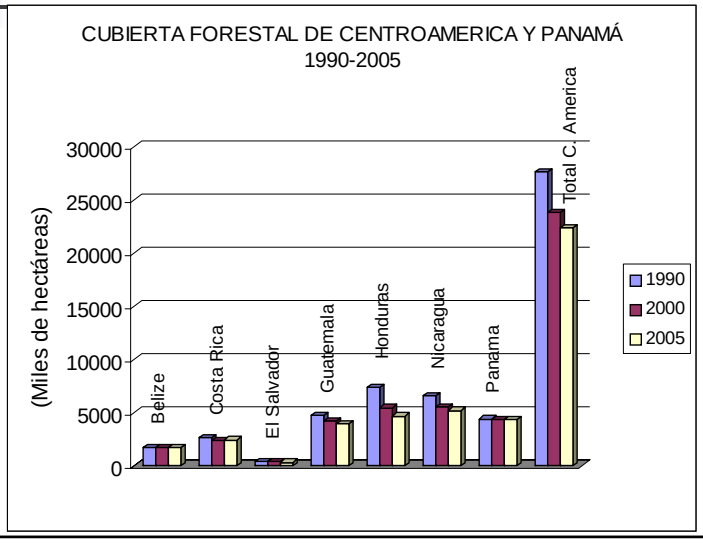
SUPERFICIE CON BOSQUES EN EL MUNDO



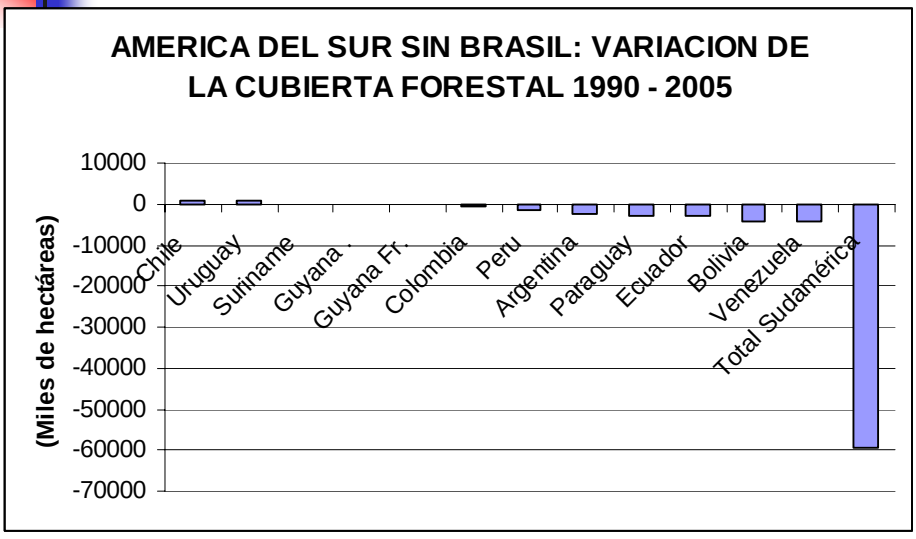
The forest area in LAC decrease rapidly; its rate of diminishing is more than the double of the rest of the world. The exception is the growth of the Caribbean region

	Area (1000 hectares)		Annual change (1000 Hectares)	Annual rate of change (%)
	1990	2005	1990-2005	1990-2005
Caribbean	5.350	5.974	624	0.74
Mexico	69.016	64.238	-4.778	-0.48
C. America	27.639	22.411	-5.228	-1.39
S.America	890.818	831.540	-59.278	-0.46
L. America and the Caribbean	992.823	924.163	-68.660	-0.48
World	4.077.291	3.952.025	-3.682.066	-0.21

Proportionally, C. America is the region more affected by deforestation in spite off the case of C. Rica (2000-2005)



Brazil in S. America followed by Venezuela, Bolivia, Ecuador Paraguay and Argentina, have the most important loses, while Chile and Uruguay have increase their forest area



MEASURING DEGRADATION

- Few works to measure the economic and social impact of degradation in Lac and the world
- Existing works examine mainly erosion loses referred mainly lo at local level
- Results obtained shows high values

In 2003 the Global Mechanism supported by W. Bank organized the following research;

ASSESSING THE EXTENT, COST AND IMPACT OF LAND DEGRADATION AT THE NATIONAL LEVEL: FINDINGS AND LESSONS LEARNED FROM SEVEN PILOT CASE STUDIES

L. Berry, J. Olson, and D. Campbell

The research included the following cases studies;

1.- CHINA
2.- ETIOPIA
3.- MEXICO
4.- UGANDA
5.- RWANDA
6.- CHILE
7- INDONESIA

Main findings

- Some countries can show good sustainable practices at low costs
- Exist a close relation between poverty and degradation
- A reduction of productivity causes by degradation (3% to 7% of Agricultural GDP)
- Investments required to remedy the situation are less than the cost of degradation

- Applied policies can affect significantly
- Information about cost are insufficient, inconsistent and incomplete
- In spite off this, it is possible to initiate actions to combat degradation
- A clue recommendation refers to the policy framework in order to facilitate migration from more affected areas

STUDY RESULTS

	Degradation	Costs of degradation	Answer	Type of answer
China	Extended, esp. N y E	US$ 7,76 billons direct; 31 no-direct; 4% GDP	US$ 1- 2 billones annual	Forestation, infraestruct.
Etiopia	50% of highlands	4% of GDP Direct: poverty increase	0,2-0,5 Agr. GDP	Fertiliz, infraestruct.
Mexico	65% of total area	US$ 3,5 billons migration	Hard to quantify	Change in reforestation policies
Uganda	60% of total area	4% of GDP	Hard to quantify	Central policies
Rwanda	Extreme, est SO	3,5 of Agr. GDP, poverty increase	Hard to quantify	Central policies
Chile (IV R)	Extended	50% wheat, 23% goats	Not known	Not known
Indonesia	Varieted	0-4% GDP agr.	Not known	Soil manag. & water

OTHER STUDIES

- Costa Rica; Solórzano, 1991:
  5 –13,3% del VAA. Take in account erosion cost

- Mexico; McIntire, 1994
  2,7% - 12,3% of Added Agric. Value in Corn. Take in account erosion costs

APPROACHES TO MEASURE AND DATA

- Relative Costs of availability and quality of water
- Costs of soil erosion
- Costs related to less productivity
- Indirect Costs
- Migration Costs
- Costs of mitigation

Scope and limitations

- Measures of erosion at local level does not take in account externalities (positive or not) for other locations (such as sedimentation)
- Does not measure other kind of degradation such erosion caused by wind and weed invasion, etc.)
- Usually does not measure the long term impacts
- Does not take in account poverty effects and migratory flows

Measures at regional and national level

- Usually measure only production losses
- Biodiversity losses are usually excluded
- Poverty and malnutrition are not considered
- Few occasions are take in account factor such as gender, ethnicity, income distribution and the relation between poverty and degradation
- Opportunity cost are not take in account, specially related to some expensive crops and investments in non agriculture activities

What was measured

I Variations of natural capital: forest, land, water, flora and fauna

- Environment services: Climatic factors regulation, water, landscape, Genetic capital

II Variations of Economic capital
Fix Capital
Direct production Costs
No direct Costs
Opportunity Costs due to less investment in affected areas
Costs of remediation
Social and economical Variables (gender, ethnicity, etc)

III.- Costs of infraestructure affected

IV.- Human Capital:

Food, health, housing, etc.
Job/emploiment
Migration, remitances
Food insecurity

V.- Social Capital

destruction of traditional knowledge and rural institutions

Study presented to CDS (ONU)

- Deforestation was measured
- Costs of Carbon liberation to atmosphere were made

Deforestation implies enormous losses because non retained carbon liberated to atmosphere. In spite of it is difficult, losses can be estimated

Estimations	Losses 1990 - 2005	Annual losses	Losses/added Value (%)
	US$ Millions		
a) Price US$ 2,73/ ton CO2 (or US$ 10/ ton C)	68.604	4.573,6	3,3
b) Price US$ 6,8/ ton CO2	170.881	11.392	8,1

Emissions of Methane (CH4) must be added to losses due to non retention of Carbon

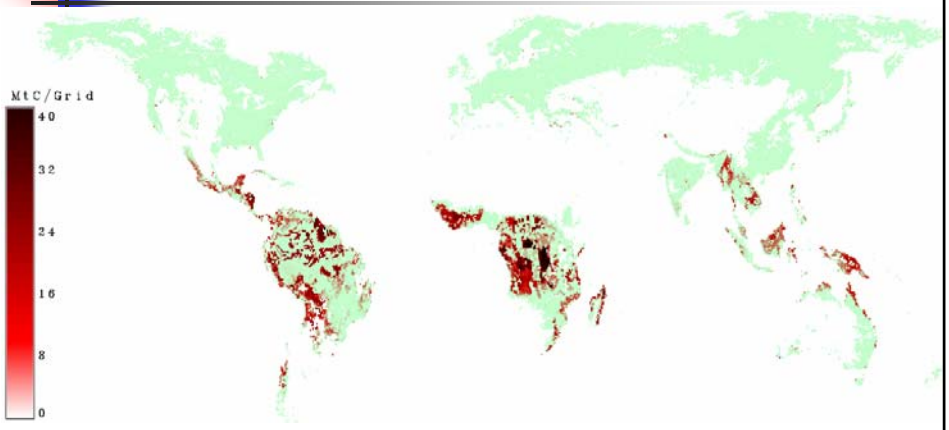
- Between 1990 - 2005 cattle expanded in more than 68,1 millions of animals
- According estimatives made by some different cientific centers each animal produce at least 44 Kg of Methano (CH4) by year in semi estensive pastures.
- According that each year are emitted around 200.000 tons of methano. This component is much more toxic and difficult and expensive to eliminated than CO2

The importance of pricing Carbon in relation to the deforestation

- A recent research in Austria, developed a model of impact and determined the different levels of carbon prices in order to stop deforestation.
- A payment of an incentive of US$ 6 by hectare every 5 years in areas threatened by deforestation, could reduce this one in a 50%.
- The application of a tax of US$ 12 by deforested hectare, could also reduce to half the process.
- Predicting the deforestation-trend under different carbon-prices. Georg E Kindermann*1,2, Michael Obersteiner1,3, Ewald Rametsteiner1,2 and Ian McCallum1, 2006

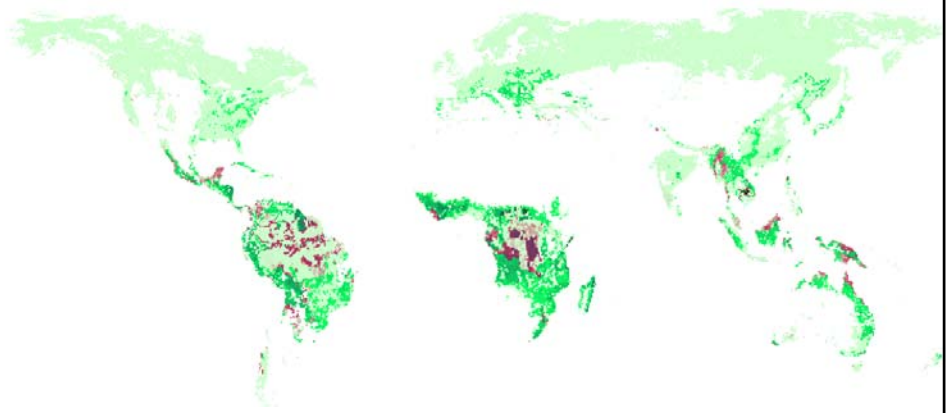
Situation without prices for carbon (the dark color are deforested areas)

Predicting the deforestation-trend under different carbon-prices. Georg E Kindermann*1,2, Michael Obersteiner1,3, Ewald Rametsteiner1,2 and Ian McCallum1, 2006



Situation with price for carbon (12/tonelada US$)

Predicting the deforestation-trend under different carbon-prices. Georg E Kindermann*1,2, Michael Obersteiner1,3, Ewald Rametsteiner1,2 and Ian McCallum1, 2006



THE MODEL CEPAL/GTZ

- Given to the close relation Poverty/Degradation, it was settled down a theoretical frame based on the contributions of the approaches of family farmers.
- A simple explanatory model was constructed that it included as variable of adjustment, the over exploitation of the farmer's family work and the migration.
- A model with trans logarithmic functions of production was considered to measure the effects the degradation on Land, Capital and Work and all the possible inter-relations between these variables

- The model was tested with the microdata of the Agricultural Census of Chile for IV the Region
- The results were the direct and crossed elasticities and their effects on T, K and L
- This allowed to measure the impact of overgrazing on land degradation and the consequences of degradation in terms of poverty.

ADVANTAGES

- This method is based on censuses and households surveys and all the countries have this information, which allows comparability.
- The model has been properly tested
- It is cost effective
- It is possible to include the effects of climatic change in the production.

LIMITATIONS

- It does not measure impact of externalities
- It does not consider mitigation costs and
- It does not consider indirect costs

The measurement using the model

- The production function allows to capture the effects of the loss of fertility, to which the costs of emission of GEI can be added exogenously, lost species (if the information exists), and a balance of the Costs/Benefits of the Migration.

The last contributions

FAO GLADA project

Global Assessment of Land Degradation and Improvement; Identification by remote sensing (2008)

Z G Bai, D L Dent, L Olsson, M E Schaepman

- **Land degradation is a global environment and development issue.**
- Up-to-date, quantitative information is needed to support policy and action for food and water security, economic development, environmental integrity and resource conservation. To meet this need, the Global Assessment of Land Degradation and Improvement (GLADA) uses remote sensing to identify degrading areas and areas where degradation has been arrested or reversed. Within the parent LADA program, this screening will be followed up by field investigations to establish the situation on the ground.

- Land degradation is defined as a long-term decline in ecosystem function and productivity and measured in terms of net primary productivity.

- Land degradation is cumulative – this is the global issue
- Analysis of 23-year GIMMS NDVI data reveals a declining trend across some 24 per cent of the global land area.
- Almost 20 per cent of degrading land is cropland - more than 20 per cent of all cultivated areas

- Some 16 per cent of the land area shows an increase in climateadjusted net primary productivity
- There is only a weak correlation with biophysical factors other than land cover
- About 1.5 billion people depend directly on the degrading areas