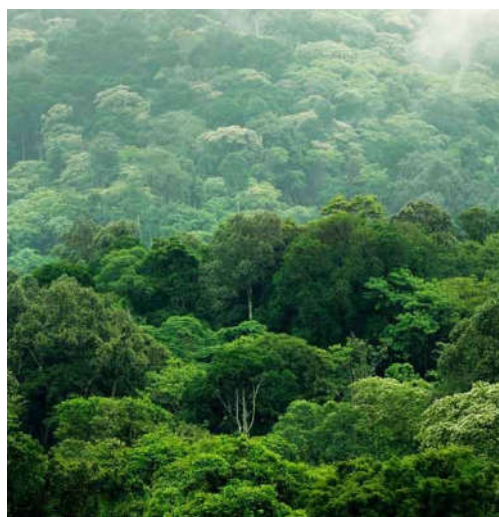


# Green transformations and its pathways to sustainability: a framework for measuring the land use sector of Costa Rica

Víctor Milla - CATIE

Seminar - The state-of-the-art of forest management models, methods and decision support systems - the SuFoRun experience

Solsona, Spain, September, 2017



Costa Rica: why the land use sector matters?

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# CO2e emissions in Costa Rica

Data for 2012. IMN 2015. 2006 IPCC Guidelines



## ENVIRONMENTAL AND FORESTRY SECTOR

- Mitigate 57% of total CO<sub>2</sub> emissions (7.4M tons/CO<sub>2</sub>/yr)

Mitigation capacity



- 52.4% of the national territory
- 26.94% is under public domain

Area



- 95,157 known species
- 5% of the world's known biodiversity

Biodiversity



- Forest production is 2% of GDP
- Tourism is 4% of GDP

Economic value



- 1million ha of private forests
- USD 25M /yr

PES System



- Annual gross deforestation is 30,000 ha/yr

Deforestation



- Exports in 2016: \$73.03 M
- Imports in 2016: \$116 M

Commercial trade



- 19,236 people in 2006
- 14,806 people in 2015

Employment



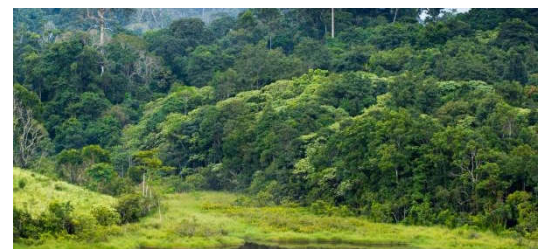
- 3,500 ha/yr, 1/3 of the area in 1997
- PES program covered only 2,330 ha in 2015

Reforestation



- 0.03% of PES funds, 3.7% of the national wood consumption
- 248,362 m<sup>3</sup> in 1998; 14,448 m<sup>3</sup> in 2015

Forest management activities



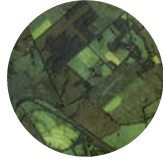


## AGRICULTURAL AND LIVESTOCK SECTOR



### Economic/Social impacts

- 11% of total employment
- Aprox. 230k persons employed
- 72% of rural employment
- 40% of total exports
- USD 3.5 billion / yr



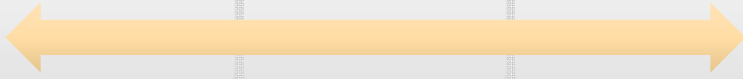
### Contribution in area of Costa Rica

- 47% of the national territory
- 43% pastures (1.4 M ha is cattle); 31% forests (mostly mature forests); 16% permanent crops (mostly coffee)



### Contribution in emissions of Costa Rica

- 37% of total CO2 (pastures) (1x)
- 50% of total CH4 (1.3 M cattle heads) (25x)
- 79% of total N2O (fertilizers) (298x)



## WATER

### Electricity production

- 75.3% of electricity supply
- Less than 1% of the energy matrix-fossil fuels
- 75% of hydropower generation potential has not yet been exploited

### Economic value

- US\$280 M in drinking water and sanitation activities
- 0.5% of GDP

### Agricultural production

- 75% of the water extracted
- 765 million cubic meters of water extracted in 2012
- Water delivered by irrigation districts to users is billed at \$0.01/m3

### Management

- Half of the water extracted for irrigation is lost
- Only 20% of the population is connected to sewage networks
- 5% of the country's wastewater is treated before being deposited in rivers
- 57% of rivers and estuaries of the country have high levels of pollution





CATIE provides effective solutions to challenges before the region and the world, challenges that are complex because they are highly interrelated—for example, agriculture and sustainable forestry, food and nutritional security, and degradation of ecosystems and the impact on poverty under current and future climate change scenarios. To meet these challenges, CATIE integrates various disciplines and avenues of knowledge, sectors, spatial scales and actors at all levels.



## Impact on productive activities

CATIE has broad experience and qualified personnel who work continuously to develop knowledge in productive areas that are vital to the region, among them:

Coffee



Cocoa



Climate change



Sustainable livestock production



Policy development



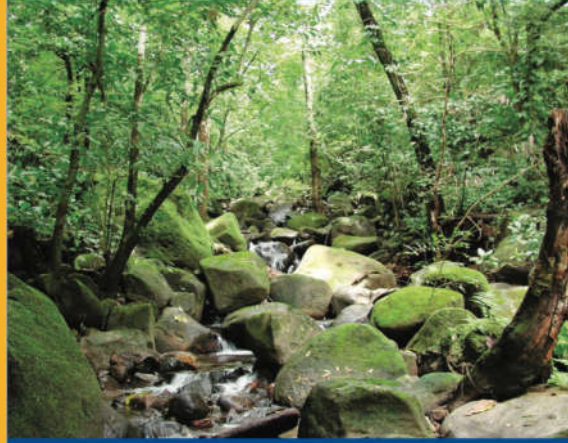
Forests



Watershed management



Biological corridors and protected areas



## Tropical Agricultural Research and Higher Education Center



CATIE combines science, graduate education and innovation to improve human well-being through integrated management of agriculture and natural resources in the rural areas of Latin America and the Caribbean.

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## Unique institution

We are an international university, based on the land-grant model in the United States, that integrates three basic functions: research, education and outreach, which implies extension and application of knowledge in the field. CATIE's mandate focuses on supporting sustainable management of agriculture and natural resources in Latin America and the Caribbean.

The nucleus of CATIE's work is knowledge management, which extends from its generation to its dissemination, use and adoption.

## Regional research platform

Through its extensive experience, CATIE has become a regional interinstitutional scientific platform for many international partners, among them CIRAD, CABI, ICRAF, Bioversity International, Heifer International and Conservation International. Diverse activities of other members of our Research Program (FTA, CCAFS, Humid Tropics and RTB) are also handled via this platform, which provides services and resources to catalyze collaboration among local, national and regional partners.

Among these collaborations are the National Offices and projects, the largest agricultural and natural resource library in the region, germplasm collections, key territories of the Mesoamerican Agroenvironmental Program (MAPNorway) and Model Forests, as well as regional research and development projects that constitute a large network of local and national partners.

## Destination for quality higher education

The nature of our Graduate School allows us to form professionals with a unique kind of education, based on the best scientific knowledge and an understanding of the realities of rural development in Latin America and the Caribbean.

CATIE's multicultural environment, with faculty, students and alumni from more than 50 countries, lends an international character to the Center that exists only in some prestigious universities around the world.

The institution offers nationally recognized master's and doctoral degrees, in addition to diplomas and courses in the countries, both distance and hybrid. In all cases, students have the opportunity to work in the field with real, concrete problems, which complements and validates their training process.

At the same time, CATIE enriches its contribution to preparation of leaders of change through its Training Program, which offers numerous alternatives for formation of human capital in the region.

## Spheres of action

We work in 15 countries in the Americas, with different levels of impact. Our efforts include transfer of technology and knowledge as well as influencing policy at different scales, which contributes to poverty reduction and to economic, social and environmental development in the region.





# PhD Research: two big questions



## GREEN TRANSFORMATION



Pro-active restructuring of the economy in a way that respects planetary boundaries



Not about pitching public vs. private, developed vs. developing countries, or rising powers vs. old powers



Global governance approach on CC has failed



Need for massive public and private investment in new technological revolutions



More profound shifts in political power through new forms of public governance



The politics of accountability and participation; long-term change; knowledge and culture

how markets, states and citizens face the challenges of justice when it comes to reconciling development and growth

# GREEN TRANSFORMATION



Technocentric transformation: meet rising demands in greener ways



Marketized transformation: recognize, and value economically, the natural capital on which growth depends



State-led transformation: re-embed markets in stronger frameworks of state control



Citizen-led transformation: de-growth and bottom-up transitions

## Research at the Chair of Forestry Economics and Forest Planning, Uni-Freiburg

### - How to Measure a Green Transformation?

1

- Select preliminary indicators based on national policy documentation and international measuring frameworks
- Intertemporal period of time (1997-2017)

2

- Assess the importance and relevance of the indicators selected through a survey to national experts in the land use sector
- Statistic analysis using FA/PCA
- Final reduced list of indicators to be tested will be selected

3

- Measure the value of each indicator
- Normalization of the data into pure, dimensionless numbers
- Weighting each indicator from the factor loadings
- Non-compensatory aggregation to have a composite index (CI)



# Costa Rica Green Policies

## National Development Plan 2015-2018

- Increase agricultural value added, poverty reduction in rural area:
  - 9 Programs
  - 23 objectives
  - 37 indicators
- Strengthen the conservation and sustainable use of the genetic, natural and cultural heritage; Promote action on global climate change; Supply the country's energy demand:
  - 18 Programs
  - 19 objectives
  - 36 indicators



# Policies and Actions for the Agricultural and Livestock Sector

	<p><b>State Policy for the Agri-food Sector and the Costa Rican Rural Development 2010-2021</b></p> <ul style="list-style-type: none"> <li>• 4 Pillars</li> <li>• 15 Strategic Areas</li> </ul>
	<p><b>Policies for the Agricultural Sector and the Development of Rural Territories 2015-2018</b></p> <ul style="list-style-type: none"> <li>• 5 Pillars</li> <li>• 27 Strategic Areas</li> <li>• 126 Indicators</li> </ul>
	<p><b>Nama Coffee</b></p> <ul style="list-style-type: none"> <li>• 6 Main Actions</li> <li>• 8 Objectives</li> <li>• 27 Indicators</li> </ul>
	<p><b>Low Carbon Livestock Strategy</b></p> <ul style="list-style-type: none"> <li>• 10 Components</li> <li>• 33 Activities</li> </ul>

# Policies and Actions for the Environmental and Forestry Sector

	<p><b>National Forest Development Plan</b></p> <ul style="list-style-type: none"> <li>• 7 Strategic themes</li> <li>• 13 Policies</li> <li>• 45 Indicators</li> </ul>
	<p><b>National Biodiversity Strategy 2016-2025</b></p> <ul style="list-style-type: none"> <li>• 4 Strategic themes</li> <li>• 7 Sub-themes</li> <li>• 23 Targets</li> </ul>
	<p><b>Climate Change Strategy</b></p> <ul style="list-style-type: none"> <li>• 6 Strategic themes</li> <li>• 11 Results</li> <li>• 21 Actions</li> <li>• 23 Indicators</li> </ul>
	<p><b>Costa Rica REDD+ Strategy</b></p> <ul style="list-style-type: none"> <li>• 5 Main topics</li> <li>• 31 Actions</li> <li>• 52 Indicators</li> </ul>



# Preliminary set of indicators

## Area

Agroforestry  
 Area purchased by the state for conservation  
 Area purchased by the state for productive activities  
 Forests  
 Livestock  
 Private forests  
 Public forests  
 Reforestation

## Biodiversity conservation

Critical Habitat Protection  
 Threatened and endangered species  
 Tree species

## Carbon emissions and sequestration

Agr./liv. areas with new low emission technologies  
 Carbon sequestration in forests  
 CO2 Emissions in the agr./liv. sector  
 CO2 Emissions in the env./forestry sector  
 CO2 Emissions per Capita  
 Forest carbon credits value

## Climate change commitment

Head of State's advocacy for green issues  
 National and International Climate Policy

## Economic incentives

Area under payments for environmental services  
 Private budget for mitigation and adaptation  
 Producers with economic incentives for sustainable practices in rural territories  
 Public budget for mitigation and adaptation

## Water

Access to Drinking Water  
 Area with new irrigation infrastructure  
 Share of Renewable Energy in Total Primary Energy  
 Supply

## Environmental damage

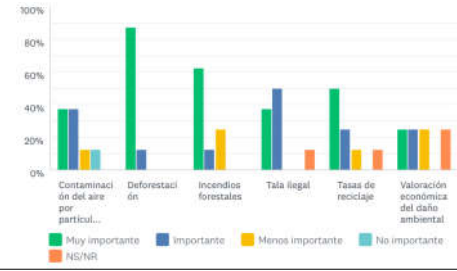
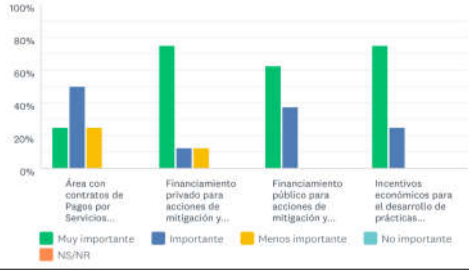
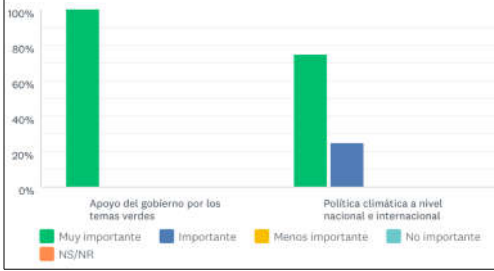
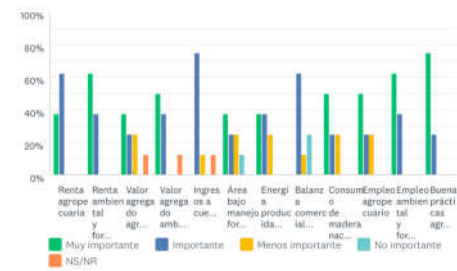
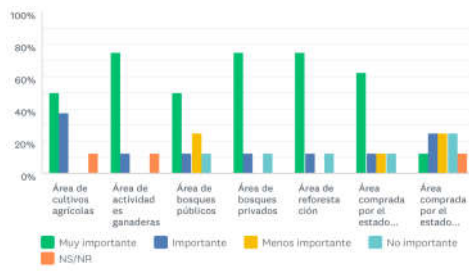
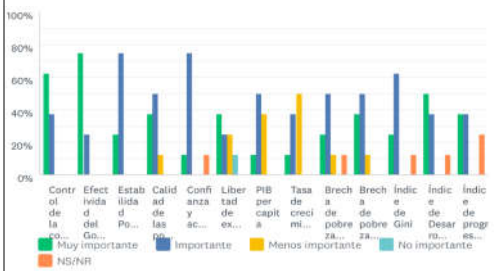
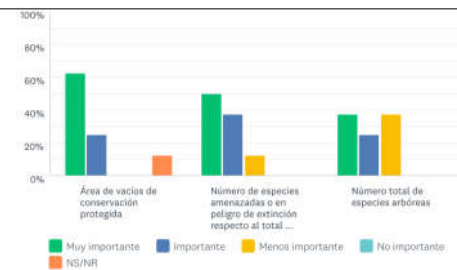
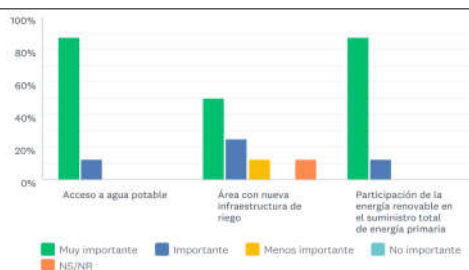
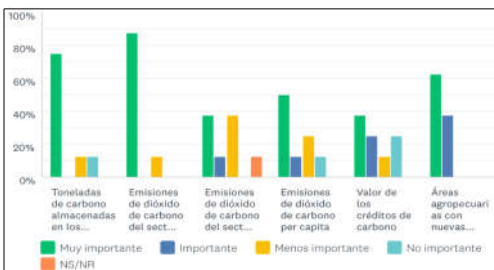
Air Pollution - Average Exposure to PM2.5  
 Deforestation  
 Forest fires  
 Illegal logging  
 National recycling rates  
 Valuation of environmental damage

## Productivity

Agriculture and livestock rents  
 Area under forest management  
 Balance of trade in forest products  
 Employment  
 Energy from forest biomass  
 Forest rents  
 Good farming practices  
 International tourism receipts  
 Value added  
 Wood consumption

## State effectiveness

Control of Corruption  
 Gini Index  
 Government Effectiveness  
 Gross domestic product per capita  
 Growth rate of real GDP per employed person  
 Human Development Index  
 Political Stability and Absence of Violence/Terrorism  
 Poverty gap at national poverty lines  
 Regulatory Quality  
 Rule of Law  
 Rural poverty gap at national poverty lines  
 Social Progress Index  
 Voice and Accountability

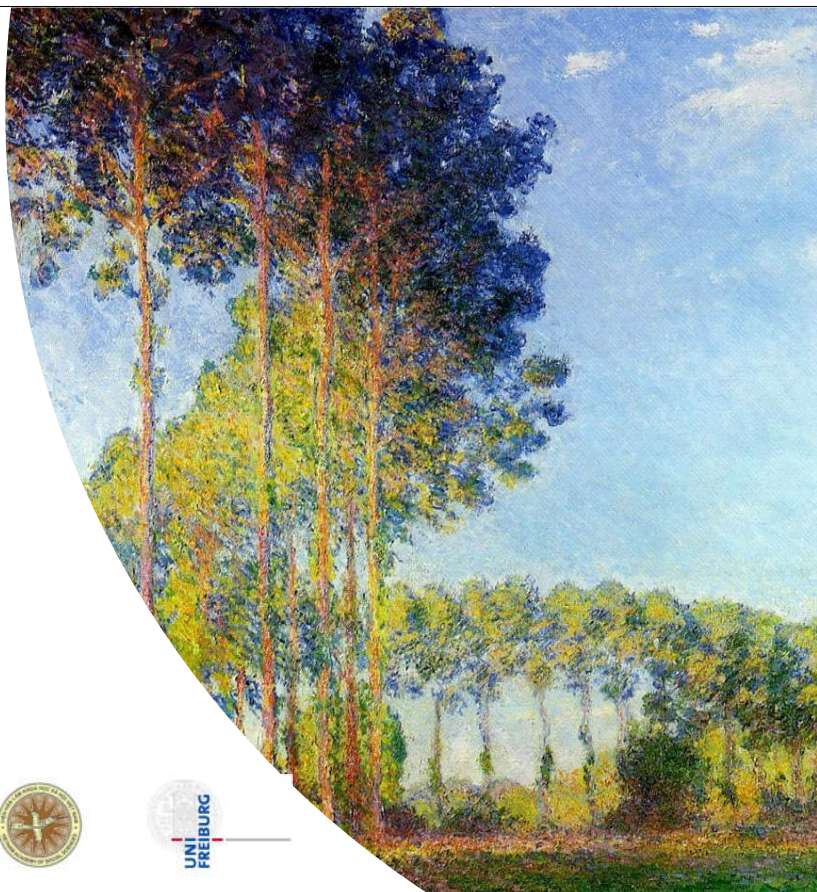




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# Thanks!



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UNIVERSITÄT  
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SOAS  
University of London

