CATIE: A PARTNER IN RESEARCH, EDUCATION AND INCLUSIVE GREEN DEVELOPMENT

Leida Mercado and Mariela Leandro
September 13th, 2023
Who is CATIE?

CATIE is a regional center, with strong international ties, that seeks to increase sustainable and inclusive human well-being in Latin America and the Caribbean through

1. Graduate education
2. Impact-oriented research
3. Technical cooperation and dissemination of knowledge
CATIE’S GOVERNANCE

Three governance bodies

1. Inter-American Board of Agriculture
2. Superior Council of Ministers (Agriculture Ministers of member countries)
3. Board of Directors.

REGIONAL MANDATE

• 13 member countries
• National offices
SYSTEMS APPROACH TO TACKLE COMPLEX PROBLEMS

- **Integrates**
  - Biophysical
  - Social
  - Economic
  - Cultural
  - Local and global issues
  - Sustainable- Climate Smart agriculture
  - Climate action
  - Initiatives on a Landscape/Territorial Scale
  - Governance
Education
GRADUATE PROGRAMS

The main GOAL is to train leaders with strong social responsibility, awareness and the tools and abilities to solve problems in a complex world.

We use a connected research education approach, meaning that our students learn through participation and research. Most of them are linked to research initiatives at the beginning of their studies, where they have the opportunity to apply what they learn in the classroom.
GRADUATE PROGRAMS

Academic Master Programs:
1. Agroforestry & Sustainable Agriculture
2. Tropical Forests & Biodiversity
3. Watershed management & Water Resources
4. Economics, Development & Climate Change

Professional Master Programs:
1. Watershed Management (Virtual)
2. Agribusiness & Sustainable Markets Management (Virtual)
3. Agroecological Intensification & Nutritional Food Security (Virtual)
4. Sustainable Tourism (Joint Program with UNT)
STRONG GENDER AND EQUITY APPROACH TO EDUCATION

MASTER’S PROGRAMME

<table>
<thead>
<tr>
<th>Gender</th>
<th>1947-1995</th>
<th>1996-2020</th>
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<tbody>
<tr>
<td></td>
<td>Students</td>
<td>%</td>
</tr>
<tr>
<td>Men</td>
<td>1130</td>
<td>90%</td>
</tr>
<tr>
<td>Women</td>
<td>133</td>
<td>10%</td>
</tr>
<tr>
<td>Total</td>
<td>1263</td>
<td>100%</td>
</tr>
</tbody>
</table>
Genetic improvement and Cacao AF systems
Genetic improvement and Coffee AF systems
Multi-strata agroforestry and food security system
Circular agroforest small ruminant systems
Silvopastoral based low carbon livestock systems
Sustainable forest management
Forest and mangrove restoration
Environmental economics
Climate finance
Gender sensitive Incubators and agibusiness
Sustainable water harvest systems
Tools for water management
Forest seed systems

Training 2022
Total: 14386
8488
5898

Number of people
- <50
- 50 – 300
- 300
- >1000
# Study Abroad Program 2023

<table>
<thead>
<tr>
<th>University</th>
<th>Total women</th>
<th>Total men</th>
<th>Total participants</th>
<th>Income in USD</th>
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<tbody>
<tr>
<td>Nebraska State University</td>
<td>5</td>
<td>19</td>
<td>24</td>
<td>$3,898</td>
</tr>
<tr>
<td>Georgia University</td>
<td>6</td>
<td>1</td>
<td>7</td>
<td>$1,007</td>
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<tr>
<td>Colorado State University</td>
<td>6</td>
<td>12</td>
<td>18</td>
<td>$5,414</td>
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<td>Nicholls University</td>
<td>12</td>
<td>7</td>
<td>19</td>
<td>$480</td>
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<td>Austin High School-Global Studies</td>
<td>46</td>
<td>108</td>
<td>154</td>
<td>$8,654</td>
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<td>Agnes Scott College</td>
<td>22</td>
<td>0</td>
<td>22</td>
<td>$2,706</td>
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<td>Ohio State University</td>
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<td>1</td>
<td>14</td>
<td>$1,954</td>
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<td>Prairie View A&amp;M University, Texas</td>
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<td>0</td>
<td>12</td>
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<td>Duke University</td>
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<td>Verto Education Spring 23</td>
<td>20</td>
<td>3</td>
<td>23</td>
<td>$89,355</td>
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<tr>
<td>Abeline Christian University</td>
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<td>Amigos de las Americas</td>
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<td>20</td>
<td>60</td>
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<td>Offbeat Travel</td>
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<td>4</td>
<td>9</td>
<td>$24,900</td>
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<td>Verto Education Fall 23</td>
<td>170</td>
<td>30</td>
<td>200</td>
<td>$777,000</td>
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<tr>
<td>Verto Education Spring 24</td>
<td>40</td>
<td>10</td>
<td>50</td>
<td>$194,250</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>416</strong></td>
<td><strong>219</strong></td>
<td><strong>635</strong></td>
<td><strong>$1,126,068</strong></td>
</tr>
</tbody>
</table>
Generation of knowledge from research and development initiatives
Examples of CATIE Collaborators from EEUU (Universities and Institutions)

<table>
<thead>
<tr>
<th>Universities / other institutions in US</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Wisconsin</td>
<td>![University of Wisconsin logo]</td>
</tr>
<tr>
<td>University of Vermont</td>
<td>![University of Vermont logo]</td>
</tr>
<tr>
<td>Texas Tech University</td>
<td>![Texas Tech University logo]</td>
</tr>
<tr>
<td>University of Idaho</td>
<td>![University of Idaho logo]</td>
</tr>
<tr>
<td>World Resource Institute</td>
<td>![World Resource Institute logo]</td>
</tr>
</tbody>
</table>
To convert discoveries into significant and measurable impacts that contribute to the advancement of sustainable development goals in the Latin American and Caribbean region.

Our objective:

Transdisciplinary and participatory approach to research, allows for direct interaction with external actors to collaboratively create and apply knowledge for the development of innovative solutions that respond to the needs and priorities of society.

Our approach
DIDVI

HOW DO WE WORK?

1. Livestock and Environmental Management
2. Agroforestry and Genetic Improvement of Coffee and Cacao
3. Agrobiodiversity and Food Security
4. Forests and Biodiversity in Production Landscapes
5. Watersheds, Water Security and Soils
6. Climate Action
7. Environmental Economics and Sustainable Agribusinesses
8. Gender and Inclusion
9. Biostatistics
Who are we?

Leida Mercado, PhD
Director, Research for Green and Inclusive Development Division
lmercado@catie.ac.cr

Dr. Leida Mercado is a Venezuelan Agronomist engineer with a M.P.S. and PhD at Cornell University. Previously she was leader of the Mesoamerican Agroenvironmental Program (MAP) also at CATIE, her work with MAP was focused on increasing the resilience to climate change at several scales in two Central American territories using the Climate-Smart Territories approach. She received research gate: https://www.researchgate.net/profile/Leida-Mercado
Google Scholar: https://scholar.google.es/citations?user=yMAXsicAAAAJ&hl=en

Rolando Cerda, PhD
Coordinator, Agroforestry and Breeding of Coffee and Cacao Unit
rcerda@catie.ac.cr

Agronomist engineer (UMSA, Bolivia), with a master in Ecological Agriculture and Agroforestry (CATIE, Costa Rica), and Ph.D. in Ecological and Agronomic Sciences (SupAgro, France). Dr. Cerda is specialist in agroforestry systems with perennial crops (coffee, cocoa, homegardens and others). He has worked in several projects of research and development at regional levels. He coordinated the development of farmer field schools, aiming to reach more than 10,000 rural families in Central America. He developed research on the assessment of multiple ecosystem services (provisioning, regulation of pests and diseases, soil quality, carbon sequestration) for the design/management of sustainable agroforestry systems.
Research Gate: https://www.researchgate.net/profile/Rolando-Cerda-2
Google Scholar:

Gretel Guerra, MSc
Coordinator, Gender and Inclusion Unit
gretelhenry@gmail.com

Coordinator of the Inclusion and Gender Unit. Previously she was Gender Focal Point and National Consultant on Gender and Economic Empowerment of Rural Women for the FAO Representation in Guatemala, her work in FAO Guatemala focused mainly on promoting and implementing the FAO Gender Equality Policy 2020-2030 and its Regional Gender Strategy for Latin America and the Caribbean 2019-2023, in field programs and institutional actions included in the FAO MPP in Guatemala 2021-2022. Advise and assist teams to support mainly the economic empowerment of rural women in order to achieve equality between men and women in sustainable agricultural production and rural development, to eradicate hunger and poverty. She teaches at the Rafael Landivar University in Guatemala on Interculturality, Decentralization and social management. She obtained her Bachelor’s Degree from the Complutense University of Madrid.
Who are we?

Pablo Imbach, PhD
Coordinator, Climate Action Unit
pablo.imbach@catie.ac.cr

Graduate of Agronomy at the University of Costa Rica, with a Masters in Integrated Watershed Management CATIE. His doctoral thesis is on the impacts of climate change on the hydrological functions of ecosystems in Mesoamerica. He has experience in issues related to CDM forestry projects and in recent years in large-scale modeling of ecosystem services in climate and land use change scenarios.

Research Gate: https://www.researchgate.net/profile/Imbach-Pablo
Google Scholar: https://scholar.google.com.ar/citations?hl=es&user=CJGx0aUAAAAJ

Róger Madrigal, PhD
Coordinator, Environmental Economics and Sustainable Agribusinesses Unit
rmadriga@catie.ac.cr

He is an environmental economist and received his Ph.D. from the University of Freiburg, in Germany. Hi is Director and Senior Research Fellow at EfD-CA. Dr. Madrigal specializes on governance and community-based approaches mostly for water resources management and coastal resources, design and implementation of financial mechanisms for the provision of terrestrial and marine ecosystem services, economics of climate change and water economics.

Research Gate: https://www.researchgate.net/profile/Roger-Madrigal-Ballestero

Alejandra Martínez, PhD
Coordinator, Forests and Biodiversity in Productive Landscapes Unit
amartinez@catie.ac.cr

A tropical applied ecologist broadly interested in biodiversity conservation in human-modified landscapes. Most of her work focuses on understanding the conservation value of agricultural land uses using bird communities as proxies of biodiversity. She is particularly interested in experimental methods that allow measurement and quantification of ecosystem services and in understanding the trade-offs between biodiversity conservation, ecosystem service provisioning and food production.

Research Gate: https://www.researchgate.net/profile/Alejandra-Martinez-Salinas

Laura Benegas, PhD
Coordinator, Watersheds, Water Security and Soils Unit
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Dr. Laura Benegas Negri is Paraguayan, Agronomist Engineer from the National University of Asuncion; Magister Scientiae in Integrated Watershed Management, from the Tropical Agricultural Research and Higher Education Center (CATIE), PhD in Soil Sciences, from Swedish University of Agricultural Sciences (SLU). Her lines of work include both academic and developing approaches, as well implementing project’s in topics such as watershed management, co-management, and planning, adaptation and resilience to climate change, biophysical processes of the soil-plant-atmosphere relationship using water stable isotopes, and analysis of nature-based solutions in urban watersheds.

Research Gate: https://www.researchgate.net/profile/Laura-Benegas
Who are we?

Claudia Sepúlveda, MSc
Coordinator, Livestock and Environmental Management Unit
csepul@catie.ac.cr

Sergio Vilchez, PhD
Coordinator, Biostatistics Unit
svilchez@catie.ac.cr

Ms. Sepulveda is a Colombian-Costa Rican, researcher, and teacher, with a Bachelor’s degree in Agricultural Business Administration from the University of Santa Rosa de Cabal and a master’s degree in Tropical Agroecology from the same university. She has been working as the leader of the Livestock and Environmental Management Unit since 2002. She has experience in coordinating and implementing research, training, and development activities aimed at designing agroecological production systems for sustainable livestock development. Additionally, she has expertise in value chain approaches and the generation of environmental services for the adoption of various innovative market mechanisms. She also provides postgraduate teaching and student advising for master’s programs and formulates proposals for resource management and research.

Research Gate: https://www.researchgate.net/scientific-contributions/Claudia-Sepulveda-20549452
Google Scholar:

Sergio Vilchez Mendoza is a Nicaraguan ecologist with more than 15 years of experience in numerical ecology and statistical modeling. Based at CATIE, Costa Rica, as the Coordinator of the Biostatistics Unit, Sergio is involved in projects related to biodiversity conservation in agricultural landscapes. Sergio received his M.Sc. in Management and Conservation of Tropical Forests and Biodiversity at CATIE, and is currently enrolled in the Ph.D. program in Agricultural Sciences at the University of Montpellier, France, focusing on developing a multi-agent model of coffee berry borer, to understand the role of landscape configuration, plantation characteristics and agricultural management on coffee berry borer infestation, and to explore the role of a cooperative management that considers different spatial scales.

Research Gate: https://www.researchgate.net/profile/Sergio-Vilchez-Mendoza
Google Scholar: https://scholar.google.com/citations?user=VWGyeYsAAAAJ

Reinhold Muschler, PhD
Coordinator, Agrobiodiversity and Food Security Unit
rmuschler@catie.ac.cr

Prof. Muschler is a trained Geo-ecologist (University of Bayreuth, Germany: 1984-1988) with an M.Sc. (1991) and Ph.D. (1998) in Agroforestry and Farming Systems from the University of Florida. His area of expertise is on redesigning tropical smallholder agroecosystems and livelihoods towards improved environmental sustainability and food security under climatic stress. In order to reconcile production and protection goals, he applies principles of agroecology and agroforestry to increase ecosystem health and resilience, to augment soil carbon sequestration, and to promote a wider use of agrobiodiversity for climate-smart production systems and landscapes. The species for diversification include underutilized trees and crops that are locally adapted, stress-tolerant and nutrient-dense.

Research Gate: https://www.researchgate.net/profile/Reinhold-Muschler
Google Scholar:
SOME EXAMPLES OF OUR WORK
Agroforestry and Breeding of Coffee and Cacao
LINES OF WORK

• Breeding of coffee and cacao
  
  *Highly productive varieties, tolerant/resistant to pests, High quality*

• Design and management of sustainable agroforestry systems
  
  *Good agronomic and agroforestry practices; adaptation and mitigation*

• Provision of ecosystem services and balance of *trade-offs*
  
  *Provision (cacao, coffee, timber, fruits); regulation (carbon sequestration, pests and diseases)*
  
  *Support (pollinization, soils)*

COUNTRIES:
Costa Rica, Panama, Nicaragua, Honduras, Guatemala, Belize, El Salvador, Mexico, Brazil
CONSERVATION/BREEDING OF COFFEE AND COCOA

COLLECTIONS
• ≈ 2000 coffee accessions (35% wild)
• ≈ 1250 cocoa accessions (10% wild)
• Public domain

IMPROVED MATERIALS (RELEASED)
• 5 coffee hybrids
• 6 cocoa clones

FUTURE MATERIALS: at least 4 new cocoa clones; 50 families of coffee hybrids

ALLIANCES:
Cocoa, we work with Cocoa Research Center in Trinidad & Tobago for genetics analysis

Coffee, we work with World Coffee Research for global breeding programs
CATIE is a key partner of the Global Coffee Breeding Network (INNOVEA)

- Renewed MOU with World Coffee Research/New office of WCR in CATIE with a breeder expert
- CATIE-WCR will distribute seeds of hundreds of improved varieties to LAC, Asia, Africa
- Expected research results: new protocols for seed and plant-in-vitro distribution; genotype and phenotype results of new promising varieties; performance of new varieties in field trials across LAC

Meeting held in CATIE campus/Place of the future breeding factory. Nov 2022.
TRANSFORMA-INNOVA (2022-2026; IKI/EU): multi-unit collaboration

It supports the climate-smart transformation of the coffee, beef/milk, and banana sectors in Costa Rica through:

• The development and implementation of Good Agricultural and Manufacturing Practices
• Leverage of green financing
• Support for model farms / operations
• Innovative products for emerging markets
• Upscaling for impact
• Evolution of MRV systems (landscape level)

The program generates benefits for mitigation + adaptation + biodiversity
New Initiatives KoLFACI

- Two new projects on cocoa and coffee 2023-2026

**Geographic areas:** 10 countries covering LAC: Bolivia, Perú, Colombia, Panamá, Costa Rica, Nicaragua, Honduras, El Salvador, Guatemala, Dominican Republic

Cocoa project will continue research and dissemination of CSA practices

Coffee project will continue research on varieties* pruning, dissemination, support to breeding

**Amount for CATIE = 1 million USD (+ 1 million UDS for the countries)**
Key partners: institutes of coffee, institutes of research/technology, departments of coffee/cocoa of the ministry of agriculture of the countries

**Expected results:** coffee/cocoa yields are at least tripled thanks to the technologies in study; 40 technicians apply new knowledge and skills; >1000 farmers trained on the new technologies
Livestock and Environmental Management
We work on the Sustainable Intensification of Livestock Production Systems

- Rehabilitation of degraded pastures for productivity
- Conservation of biodiversity and ecosystem services in landscapes dominated by livestock
- Intelligent integration to the market and responsible consumption and productive efficiency.
- Incentives and financial mechanisms for the adoption of technology that allow the transformation of the livestock sector
- Support for the development of public policies for the sustainable management of livestock systems
EVOLUTION OF LIVESTOCK SUSTAINABLE INTENSIFICATION IN COSTA RICA

PRODUCTION has increased due to higher milk and meat productivity

GRAZING AREA decreased from 2.4-1.3 million ha due to intensification

FOREST COVER increased due to Policies of PES and the Private sector engagement

1Sepsa, MAG, CATIE, CORFORGA; 2CORFORGA, CNP, IICA, 3 CNPL, CNP, 4. FAOSTAT, 5. FONAFIFO- Database
SYNERGIES BETWEEN ADAPTATION AND MITIGATION

- Genetic improvement-tropical dairy breeds: > 5000 kg/lactation
- Shade trees in pastures - reduce temperatures - 4 to 8 °C, and heat stress to animals
- Milk yields improved by 10 to 15%
- Compared to open pastures
- Decrease emission intensities:
  - 2.2 vs 1.5 kg CO2/kg milk (traditional vs agro-silvopastoral)
- Increase Carbon sequestration in system: 1.5 to 5 tCO2/ha/year (Ibrahim et al. 2018, Andrade et al., 2019)

Fuente: base de datos Finca de CATIE (2016)
Impact of Mitigation practices on Enteric Methane, productivity and emissions

<table>
<thead>
<tr>
<th>Reduction of emission intensity</th>
<th>Change in production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve pasture and good management</td>
<td>600 Cardoso et al. (2016)</td>
</tr>
<tr>
<td>-50</td>
<td></td>
</tr>
<tr>
<td>Strategic suplementation in dry season</td>
<td>300 Vega (2016)</td>
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<tr>
<td>-48</td>
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<tr>
<td>Crossbreeding</td>
<td>30 Villanueva et al. In press</td>
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<tr>
<td>-19</td>
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</table>
Agrobiodiversity and Food Security
Supporting food and nutritional security for local communities in the Dry Corridor


- Population particularly vulnerable to the impacts of climate vulnerability and change
- Addressed poverty, food and nutrition insecurity, gender inequality, degradation of ecosystem services and vulnerability to climate change.
- Focused its interventions on nutritional education and sustainable diversification and intensification of home garden and farm production to improve food nutrition and income.
- Promoted the use of agroecological/agroforestry systems incorporating local biodiversity.
MAP successfully improved the relation between production diversity and dietary diversity and increased both the farm based and purchased based parts of dietary diversity.

The participation of women in household decisions also increased.
Adaptation of agriculture to climate change through water harvesting and agroecological intensification

• Establishing productive systems that are more resilient to climate change and improve food and nutritional security.
• 2,500 families benefited
• Productivity increased by near 20% compared to traditional systems
Production in two years of 5 goats
- 6156 liters of milk
- 944 liters of yogurt
- 148 kg of cheese
- 91 kg of eggnog
- 13 kg of sweet milk
- 786 kg of manure

9600 liters of urine
- 4360 kg of manure
- 9600 l of urine
- 6240 kg of compost

615 liters of whey
Used as a biostimulant

- 254 kg of lettuce
- 212 kg of cabbage
- 302.4 kg of garlic
- 990 kg of radishes
- 2203 kg of banana
- 600 kg of plantain
- 622 kg of vainica
- 360 kg of beans
- 558 kg of corn
- 233 kg of hot pepper

18200 kg of tithonia/366 m²
1800 kg of morera/107 m²
9570 kg of cuba-22/294 m²
Fresh biomass/two years

220 PMT

820 kg of crop residues
1228 kg of silage/100 m²
by corn cycle

980 PEDAGOGICAL VISITS
- 18 Countries
- 12 Governmental and international organizations
- 15 Farmer organizations
- 10 Costa Rican colleges
- 14 National and international universities

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27 de Abril, Verto-Education etc.

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1. Analysis of a prototype of agrosilvopastoral gardens through circular economy.
2. Evaluation of the financial and commercial viability of a prototype of agrosilvopastoral orchards through circular economy.
3. Dairy market research
   Goats in Turrialba and Jimenez, Costa Rica
Forests and Biodiversity in Productive Landscapes
Use of Nature-based Solutions to Increase Resilience to Extreme Climate Events in the Atlantic Region of Central America

- Actions to strengthen climate resilience of communities and ecosystems in the coastal Atlantic region of **Belize**, Guatemala and Honduras
- Three key components
  - Mainstreaming restoration in regulatory frameworks and land use planning
  - Implementing adaptation measures in selected landscapes
  - Investing in capacity building, knowledge generation and information dissemination
Impacts of forest patches on pollinators
Impacts of forest patches on bee pollination and coffee production

ANOVA: p < 0.001

<table>
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<tr>
<th>Forest patches</th>
<th>Deficit in pollination (open-manually)</th>
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<tbody>
<tr>
<td>Close</td>
<td>-0.04</td>
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<tr>
<td>Medium</td>
<td>-0.06</td>
</tr>
<tr>
<td>Distant</td>
<td>-0.08</td>
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</table>

20% reduction - more distance from forest patches
Pathways for climate action: adaptation, mitigation and synergies with risk reduction and sustainability goals

Risk and vulnerability assessments

Bottom-up participatory assessments at national level

Adaptation strategies

Finance strategies (i.e. agricultural sector)

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**Investment portfolio for agricultural risk management in Rwanda**

<table>
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<tr>
<th>Blueprint group</th>
<th>Blueprint</th>
<th>Risk groups</th>
<th>Systems/Value chains</th>
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<tbody>
<tr>
<td>1. Resilient practices for livestock</td>
<td>1.1 Supplementary food and water</td>
<td>Water deficit</td>
<td>Cattle, goat</td>
</tr>
<tr>
<td></td>
<td>1.2 Livestock health management practices</td>
<td>Pest and diseases</td>
<td>Cattle, goat, poultry</td>
</tr>
<tr>
<td></td>
<td>1.3 Meat value chains</td>
<td>Water deficit, P&amp;D</td>
<td>Meat</td>
</tr>
<tr>
<td></td>
<td>2.1 Technologies to prevent water logging, erosion and nutrients leaching</td>
<td>Loss of soil properties</td>
<td>Avocado, beans, cattle, maize, potato</td>
</tr>
<tr>
<td></td>
<td>2.2 Conservation agriculture</td>
<td>Pest and diseases</td>
<td>Beans, maize, potato</td>
</tr>
<tr>
<td></td>
<td>2.3 Nature-based solutions</td>
<td>Loss of soil properties</td>
<td>Beans, cattle, goat, maize, potato</td>
</tr>
<tr>
<td></td>
<td>2.4 Value chains</td>
<td>Water deficit</td>
<td>Beans, cattle, goat, maize, potato</td>
</tr>
<tr>
<td></td>
<td>3.1 Crop and breed choices</td>
<td>Precipitation excess, P&amp;D, Loss of soil properties</td>
<td>Meat, potato*, bean leaves, maize flour, maize grain, banana feed</td>
</tr>
<tr>
<td></td>
<td>3.2 P&amp;D management for crops</td>
<td>Water deficit, Pest and diseases</td>
<td>Cattle, goat, maize</td>
</tr>
<tr>
<td></td>
<td>3.3 On-farm practices for value chains</td>
<td>Pest and diseases</td>
<td>Banana, maize</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Precipitation excess, Water deficit, P&amp;D</td>
<td>Maize flour*, banana feed, bean grains, meat, potato</td>
</tr>
<tr>
<td>4. Water technologies</td>
<td>4.1 Irrigation for crops</td>
<td>Water deficit</td>
<td>Beans, maize</td>
</tr>
<tr>
<td></td>
<td>4.2 Water technologies for livestock</td>
<td>Water deficit</td>
<td>Cattle, goat</td>
</tr>
<tr>
<td></td>
<td>4.3 Water technologies for value chains</td>
<td>Precipitation excess, Water deficit, Loss of soil properties</td>
<td>Banana feed, cassava, coffee, potato, meat</td>
</tr>
<tr>
<td>5. Climate and weather services</td>
<td>5.1 Weather advisories</td>
<td>Winds; hail</td>
<td>Beans</td>
</tr>
<tr>
<td></td>
<td>5.2 Hydrometeorological warnings</td>
<td>Loss of soil properties</td>
<td>Avocado, banana, beans*, cattle, maize, potato</td>
</tr>
<tr>
<td></td>
<td>5.3 Seasonal forecast</td>
<td>Water deficit</td>
<td>Beans, cattle*, goat, maize, poultry</td>
</tr>
<tr>
<td></td>
<td>5.4 Pest and disease</td>
<td>Pest and diseases</td>
<td>Banana, beans, cattle*, goat, maize, poultry</td>
</tr>
<tr>
<td>6. Value chains</td>
<td>6.1 Rice value chains</td>
<td>P&amp;D, Loss of soil properties</td>
<td>Rice</td>
</tr>
<tr>
<td></td>
<td>6.2 Postharvest infrastructure and</td>
<td>Precipitation excess, Water deficit, P&amp;D, Loss of soil properties</td>
<td>Banana feed, cassava, potato, maize flour,</td>
</tr>
</tbody>
</table>

BLUEPRINT 2.1: Technologies for preventing water logging, erosion and nutrients leaching
Pathways for climate action: adaptation, mitigation and synergies with risk reduction and sustainability goals

Risk and vulnerability assessments
- Bottom-up participatory assessments at national level
- Adaptation strategies
- Finance strategies (i.e. agricultural sector)

Transitioning to adaptation
- Climate and Weather Services
- Translation, dissemination
- Access and use of information
- Information systems

Investment portfolio for agricultural risk management in Rwanda
SCALING PROBED AGRICULTURE INNOVATIONS TO BUILD RESILIENCE IN THE CENTRAL AMERICAN DRY CORRIDOR - TRIFINIO

- This four-year project (2022-2026) funded by Sweden, will address the negative impacts of climate change – drought aggravation and other extreme events - on the most vulnerable CADC communities.
- This will be achieved using two main pathways and a cross-cutting inclusion and equity approach:
  - **PATHWAY 1.** Scaling Agricultural Innovations for Adaptation (rainwater harvesting and agroecology) using attractive business opportunities for rural youth as scaling mechanism.
  - **PATHWAY 2.** Ensuring an enabling environment (capacity development, governance and finance).
Environmental Economics and Sustainable Agribusinesses

Multidisciplinary team that uses environmental economics and the promotion of sustainable agribusiness management to promote the achievement of sustainable development goals in the Latin American and Caribbean region.
Design of Payment for Ecosystem Services (PES) in Yallahs and Hope River Watershed Management Units in Jamaica

Funded by Interamerican Development Bank (IADB)

Objective: To provide financial incentives to small-scale farmers to improve land use practices that:

i. Benefit water quality and availability to households and industries

ii. Increase resilience to climate change impacts

Highlight: CATIE designed the PES from scratch, and after years of consultation and political debate, it is closer to being included in Jamaica’s new watersheds law.
SCOPE is funded by the **Environment for Development (EfD)**: CATIE has been part of this global network on environmental economics since 2007.

**Goal:** Promote the use of **economic incentives** to:
- Minimize food loss and waste.
- Reduce, reuse, and recycle in production processes.
- Encourage sustainable and efficient food production systems.

**Countries/regions:** Central America, Chile, Vietnam, China, India, Nigeria, South Africa, Tanzania.

**Time frame:** 2022 – 2026.

**Expected outputs:**
- 8 peer-reviewed papers
- Participation in international conferences
- Policy engagement
Water is the basis of life, the main component of living beings and there is a continuous water-soil-plant-atmosphere system, based on the water cycle. Furthermore, it is a scarce resource. The increase in water scarcity globally and strongly affects ecosystems, human health, and food security.
Methodological tool to support development of Water harvesting solutions

https://cosechah2o.web.app/
Nature based solutions in urban watershed: Cap Haitien

“Building resilience under disaster risk management approach”
Strategic projects focused on the SDGs

- Sustainable livestock intensification
- Coffee and agroforestry
- Cocoa and agroforestry
- Food security
- Watershed management and security restoration
- Agribusiness
- Ecosystem based adaptation
- NAMAS mitigation
- Biodiversity in landscapes
- Indigenous-inclusion
- Environmental economics
- Mangroves and blue carbon
Inclusive green development competitive research fund

Established in 2023 to support the research ideas of junior researchers.
<table>
<thead>
<tr>
<th>Project</th>
<th>Amount (USD)</th>
<th>Co-financing</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiversity, ecosystem services, and human well-being in the Trifinio region: the role of secondary forests.</td>
<td>30 000</td>
<td>6 000 +</td>
<td>Asdi-ESCALAR Adaptation Fund Project (CATIE and WRI) -TBC</td>
</tr>
<tr>
<td>Determination of the productive and socioeconomic impact of the dispersal and arrival of <em>Moniliophthora rorera</em> (moniliasis) in cocoa-producing Caribbean countries and proposal of prevention, diagnosis, and control strategies</td>
<td>30 000</td>
<td>100 000</td>
<td>FFAR (Foundation for Food &amp; Agriculture Research)</td>
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<tr>
<td>Economic valuation of native pollinators of pitahaya (<em>Hylocereus spp.</em>, <em>Cactaceae</em>) in Costa Rica for the adaptation of dry tropics food systems to global challenges (PoliPitahaya).</td>
<td>24 400</td>
<td>14 000</td>
<td>In-kind contribution from personnel Universidad Nacional, Costa Rica</td>
</tr>
<tr>
<td>Generational integration in the sustainable agri-food value chain of coffee as a strategy to reduce youth migration in rural areas of Costa Rica, Guatemala, and Honduras.</td>
<td>15 000</td>
<td>12 000</td>
<td>In-kind contribution personnel from CIRAD</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>94 000</strong></td>
<td><strong>132 000</strong></td>
<td></td>
</tr>
</tbody>
</table>
Innovation and technology for rural development

Unit of Forests and Biodiversity in Productive Landscapes (UBBPP) of CATIE
Laboratory that supports **entrepreneurship and innovation** for rural development and sustainable management of natural resources in Latin America and the Caribbean (LAC).

We integrate **advanced methodologies** for the development of innovations available to rural people.

We **facilitate networking** between actors interested in the rural sector, such as development banks, international cooperation, productive value chain actors, and investors, among others.
Services and Solutions

- Training and advice
- Development of experiments and prototypes
- Promotion of Innovation
- Business Education
- Net working
- Added value
52 Costa Rican Rural Enterprises

+ de 30% Women-led entrepreneurship

+ de USD 550,000 In seed capital leveraged with the Development Banking System (SBD) of Costa Rica

Agricultural
Forest
Ecotourism
Technology and innovations for the rural sector
Location of our portfolio

1era convocatoria
- Baby Wood
- Finca Xoloitzcuintle
- Honguito
- Mariposario Agronatura
- Quercus
- Smatter

2da convocatoria
- bios Oldhamii
- Blanco & Negro Sostenible
- Bosque Vivo
Supported ventures

<table>
<thead>
<tr>
<th>Year</th>
<th>Ventures</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>8</td>
</tr>
<tr>
<td>2021</td>
<td>15</td>
</tr>
<tr>
<td>2022</td>
<td>30</td>
</tr>
<tr>
<td>2023</td>
<td>70</td>
</tr>
</tbody>
</table>
Conecta
Comunidad de líderes de incubación en Centroamérica

Laboratorio de innovación y emprendimiento del CATIE
Innovation, livelihoods, inclusion
Supporting sustainable ventures
OUTCOME: Apply computer science theory and software development fundamentals to produce computing-based solutions – for improving agriculture processes, precision agriculture, robotics use in agriculture

• Undergraduate students can execute research or graduate projects at CATIE
• Develop collaborative research projects
• Develop joint initiatives within ACTIVA
WE LOOK FORWARD TO DISCUSSING POTENTIAL COLLABORATION THANKS!