



Solutions for the Inclusive Green Development
Soluciones para el Desarrollo Verde Inclusivo



Annual REPORT 2021

Presentation

The year 2021 is the first year of implementation of the Institutional Strategic Plan 2021-2030, which entails a series of institutional challenges both internally and externally to CATIE (Tropical Agricultural Research and Higher Education Center). It is important to point out that these challenges of implementing the strategic plan would not be possible without the strong support of the Board of Directors, the Superior Council of Ministers of CATIE, but equally important is the participation of a technical and administrative support team made up of women and men of high professional capacity and true institutional commitment.

It is a great pleasure for me to present this 2021 Annual Report to the CATIE Community, knowing that throughout the year we have faced the challenges still represented by the COVID-19 pandemic, CATIE continues to contribute significantly to Inclusive Green Development, as a central concept of its new strategic plan, through its three pillars of work: education, research and outreach. CATIE presents its value proposition based on the integral intervention of its three pillars and supports its theory of change towards transformation, relying on its strategic alliances and projects for scaling up innovations and development in the region to influence and achieve the necessary impacts on the topics of interest of Inclusive Green Development.

Through scientific research, education at the graduate school level, capacity building and coordinated support with strategic allies, the topics of interest to the region for Inclusive Green Development in agroforestry systems, ecosystem restoration, responsible management of natural resources, sustainable livestock, food security, agribusiness and genetic improvement in coffee and cacao are addressed. CATIE has positioned itself as a world reference in the conservation of biodiversity and the transformation of food systems based on agrobiodiversity to achieve the multiple objectives of a one health: animal, human and environmental welfare while respecting the planetary limits.

A transcendental point that CATIE makes an integral part of its intervention as will be seen throughout this Annual Report 2021 is the commitment of the institution through its research, education and projects with social inclusion and gender equity. To be consistent with this approach, from its new strategic plan, CATIE adjusts its structure and creates the Research Unit on Social Inclusion and Gender, which will allow it to develop and strengthen its interventions that meet the regional demand for rural development in such an important topic.



Muhammad Ibrahim, PhD
Director General

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I Section

CATIE in one look



Throughout 2021 and facing the challenges that the COVID-19 pandemic still depicts, CATIE (Tropical Agricultural Research and Higher Education Center) still contributes significantly to the Inclusive Green Development via its three work pillars: education, research, and outreach.

Through the scientific, educational, and strategic alliances work in order to approach the agroforestry systems, ecosystem restoring, responsible natural resources management, sustainable livestock, food safety, agrobusinesses and coffee and cacao genetic improvement, CATIE has positioned itself as a world benchmark in the biodiversity conservation and feeding systems transformation in order to achieve the multiple objectives of one health: animal, human and environmental wellness.

Throughout 2021 and facing the challenges that the COVID-19 pandemic still depicts, CATIE still contributes significantly to the Inclusive Green Development

Next: a look to the 2021 success through success stories.

Water Harvest Project in Nicaragua confirms profitability and scalability for producing families

The Water Harvest Project, implemented by CATIE in Corredor Seco de Las Segovias, Nicaragua, encourages the construction of infrastructure for the water uptake from springs or water deposits with productive ends such as, trickle irrigation and animal breeding. Through this initiative, the skills of more than 1900 productive people and rural promoters have been improved via 277 events.

The constant work with the Nicaraguan region has allowed around 1 600 families to introduce their new main items to their land plots (onions, tomatoes, pumpkin, bell pepper and sweet potato) in order to improve their income, produce diversification and food security in their homes. Likewise, 278 water harvesting works have been built that allow the storing of around 134 000 water cubic meters (m³), which are used on the crops watering and for livestock watering. Currently, 956 systems have been delivered and installed which are used to water approximately 68 crop blocks of: vegetables, tubers, and basic grains; around 3 900 hectares are being handled with agroforestry and silvopastoral systems; and more than 900 people at national and international level know by now about the water harvesting systems that are being promoted in that country.

Throughout the year, we were able to confirm the project investments are profitable for the producing people, since these are technological options with financial potential for the family income increase, as well as the scalability opportunity in other regions of Nicaragua.





Livestock industry transformation heading to a low carbon emission economy in Honduras

With NAMA Facility financing, CATIE developed a technical proposal for the NAMA Livestock Project in Honduras implementation and contribute to the Nationally Determined Contribution (NDC) and Sustainable Development Goals (SDGs).

By means of this project a methodology was propounded that will allow to transform 1200 farms in low carbon emission production systems via an innovation package that will improve productivity, profitability, and climate resilience; on top of that, will benefit 13500 people, including producers, relatives, extension officers and credit agents.

During the next five implementation years, the reduction expectation is 633 447 and 180 772 of equivalent carbon dioxide tons (tCO₂e) direct and indirectly. After 10 years, when project finishes, a direct and indirect mitigation of 7 159 902 and 303337 tCO₂e tons are contemplated.

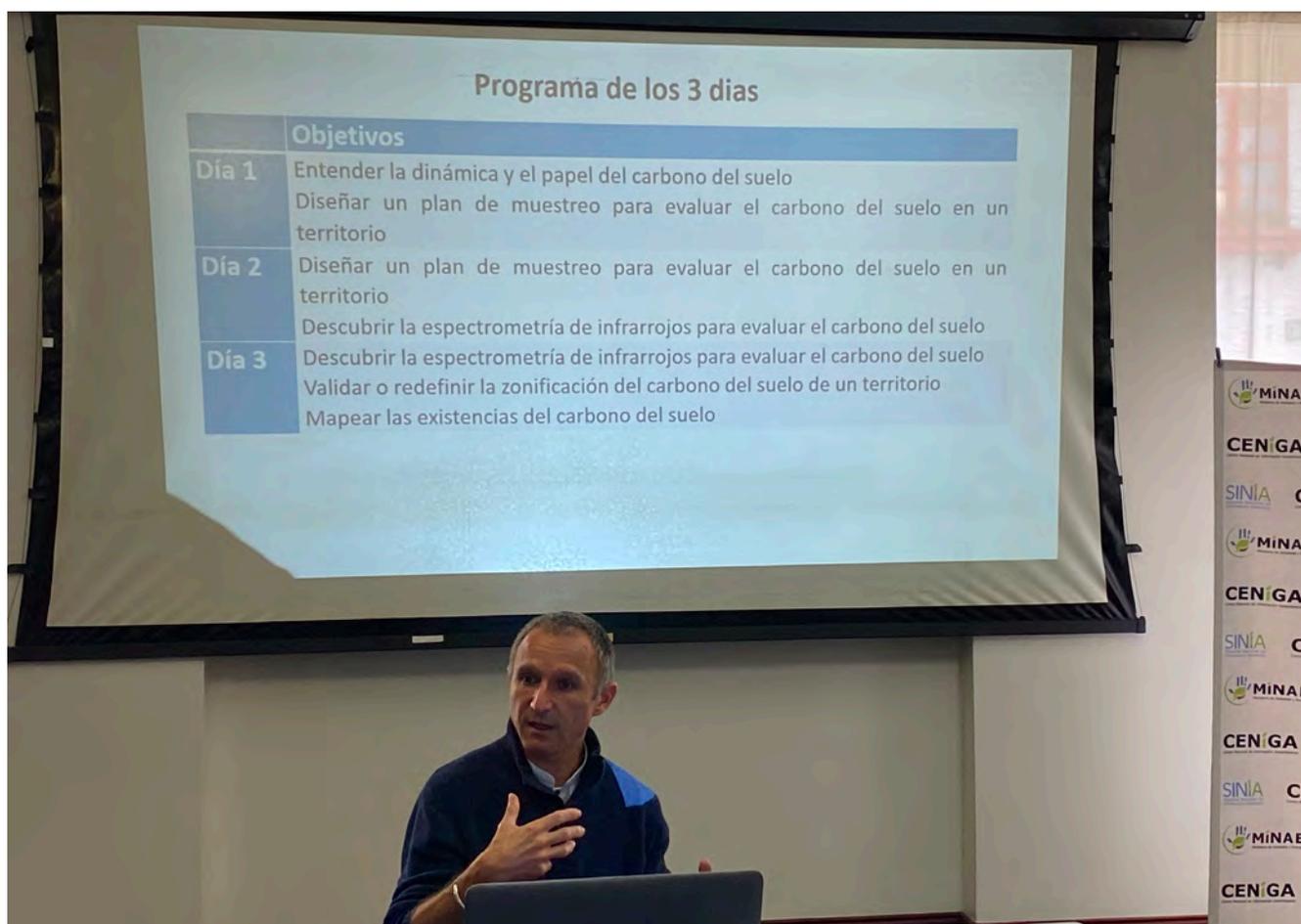
In order to achieve the proposed mitigation and transformation goals, the project budgeted 13588 million of Euros, of which 46,29 million of Euros are hoped to be moved to local resources, in addition to that, it is led in conjunction by the Department of Agriculture and Livestock (SAG; Spanish acronym), The department of Natural Resources and environment (MiAmbiente; Spanish acronym) of Honduras, with the technical support from CATIE.

The program will be monitored and evaluated via a digital platform that will generate performance indicators for decision making; a continuous learning cycle will be created; and metrics will be delivered to MiAmbiente so they can report the NAMA mitigations in the country's NDC.

Technical assistance to Costa Rica government on its decarbonization goal

Within the framework of the National Decarbonization Plan 2018-2050, CATIE alongside the CIRAD, Spanish acronym for “International Cooperation Center of Agronomic Research for Development”, indicated in January 2021 the technical assistance to the National System for Coverage and Land Usage and Ecosystems (SIMOCUTE; Spanish acronym), which belongs to National Center of Geoenvironment Information (CENIGA; Spanish acronym) and so to National Forestry Financing Fund (FONAFIFO; Spanish acronym).

During 2021 more than 100 national and international representatives were trained in order to strengthen their skills on geospatial developmental and analysis, land and ecosystems usage, also, the tools and methodologies implementation on remote sensing.





Agroforesta, the first agroforestry research platform

For more than 30 years, the work performed between CATIE and CIRAD has allowed to promote the Inclusive Green Development of Latin America and The Caribbean through positive research impacts of great agricultural relevance, in which the agroforestry related ones stand out.

As part of the results and scientific efforts achieved by both organizations, Agroforesta was born with the purpose of increasing competitiveness and sustainability of the agroforestry systems, with perennial crops in Mesoamerica thru the quantification, valuation, and development of all the potential environmental products and services, as well as all the side effects of the climate crisis.

In the end of 2021, people with broad expertise highlighted Agroforesta as the first agroforestry platform that has contributed significantly and scientifically to a higher education of international magazines and technical manuals.

Currently, the network is constituted by five partners: International Center of Agroforestry research (ICRAF, Spanish Acronym); Biodiversity International Alliance (CIAT) and PROMECAFE, alongside CATIE and CIRAD.

Strengthening of the strategic alliances with the Korean Embassy in Costa Rica for the scientific advance in Latin America and Asia

Since 2016, the cooperative relationship between CATIE and Republic of Korea has achieved to boost high agricultural relevance research in the region. During the Korean Ambassador visit in Costa Rica, Kim Jinhae, special emphasis was made to the work performed by CATIE alongside Korean institutions such as *Rural Development Administration (RDA)*, *National Institute for Forest Science (NIFOS)*, *Korea-Latin America Food and Agriculture Cooperation Initiative (KoLFACI)*, *Global Green Growth Initiative (GGGI)*, among others, especially in subjects such as: genetic improvement of cacao and coffee, cacao and coffee plantation handling under smart-climate agroforestry systems, Environmental services payments, forests and climate change.

After a successful visit and a reinforced strategic cooperation, we hope to give way to new research and development projects for the Latin-American and Asian Continent benefit.



Relations between France and CATIE gets reinforced

France's Europe and Foreign Affairs Minister Yves Le Drian visited CATIE headquarters in order to acquaint the institution's work, altogether with French scientists for the Latin-America and The Caribbean benefit.

In conjunction with France's Ambassador in Costa Rica, Philippe Vinogradoff, and a 12-member diplomatic committee, the Minister met with CATIE and CIRAD staff to promote the forest sustainable handling, cacao and coffee genetic improvement, and the promotion of the Mesoamerican forestry, as well as the skill strengthening via postgraduate studies and training programs.

“I'm very impressed by the work performed at CATIE and I congratulate Mr. Ibrahim for the management” -expressed Minister Le Drian during his visit.

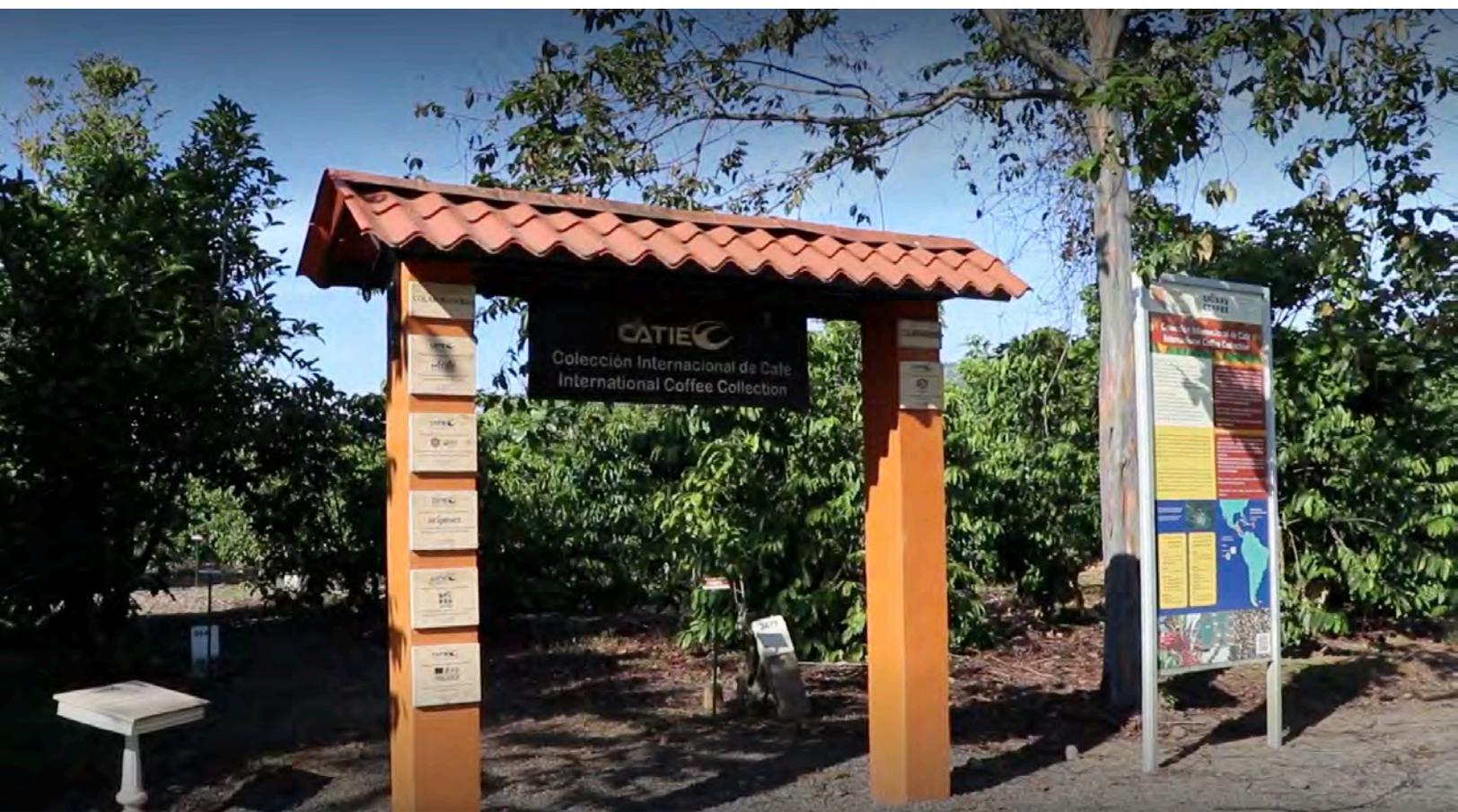


Contributing to the discovery of new coffee genetic groups

CATIE's International Coffee Collection, conserves high scientific importance genetic resources, turning itself in the fourth largest worldwide and the only one located outside the African continent.

In the last two years; 2020 & 2021; CATIE contributed a large amount of the germplasm necessary to prove and determine the existence of two new coffee genetic groups: Yemen 2020 and Sudan 2021.

Before 2020, the most recent genetic group was discovered in Kenia during the 1910s. Nowadays. Via molecular markets, the validation of new coffee centers has been accelerated, confirming in 2021, the fifth genetic group of arabica coffee (located in Sudan), which shows great potential to improve the crop's quality.



CATIE researcher is named by the International Cacao Organization (ICCO) as part of its expert's board

The CATIE's Coffee and Cacao Agroforestry Research and Genetic Improvement Unit researcher Adriana Arciniegas-Leal, was named, by unanimous decision, as a member and representative for the Central American region of the Ad-Hoc Panel of experts of the ICCO. Mentioned panel complies with the main role of establishment of different roles of evaluation, review, and recommendations for the achievement of the export volumes of cacao bean in the fine and smell categories on each of the production countries.

ICCO integrates all world's cacao productive and exporter countries. Its international board is conformed by 12 experts with a minimum of five years of professional experience endorsed by a high scientific level, technical rating and with knowledge in diverse disciplines of cacao growing.

“I feel very felicitous, blessed, proud and with a great responsibility. I consider this as a very important opportunity to share my knowledge and technical versatility that I possess about the crop (...)”

-Arciniegas-Leal



Strengthening food and nutritional security in Guatemala (PiNN project)

In alliance with the Republic of Guatemala's Department of Food and Nutritional Security (SESAN; Spanish Acronym), CATIE works in the implementation of the second phase of the National Nutrition Informational Platform Project (PiNN; Spanish Acronym), financed by the European Union (EU).

With the goal of contributing with the reduction of chronic malnutrition and to achieve the nutritional goals of 2020-2032 (reduction of 10% of chronic malnutrition in children under 2 years old by 2020 and at least 25% in children under 5 years old by 2032) and strengthen SESAN's and local government's capabilities, eight municipal informational systems; one department's food and nutrition security informational plan have been implemented; more than 1100 people have been trained in food and nutrition public security policies, as well as data analysis and interpretation.



Graduate school students use top-tier technologies in their learning processes

With the purpose of investing in top-tier learning platforms on CATIE's graduate school, *American Schools and Hospitals Abroad* (ASHA) program, part of United States Agency for International Development (USAID), donated a total amount of USD \$500 000.

The Project allowed the educational area to be supplied with top-end technology supplies, such as: smart screens, computers, servers, routers, and a fiber optics network. On top of that, new ergonomic furniture for the classrooms and offices has been acquired; an advancement that allows improvement in the student's learning process.

In pursuit of promoting the virtual and bi-modal courses, this acquired equipment contributes to the academic excellence among the student's community.



Good practices in birds and bees conservation

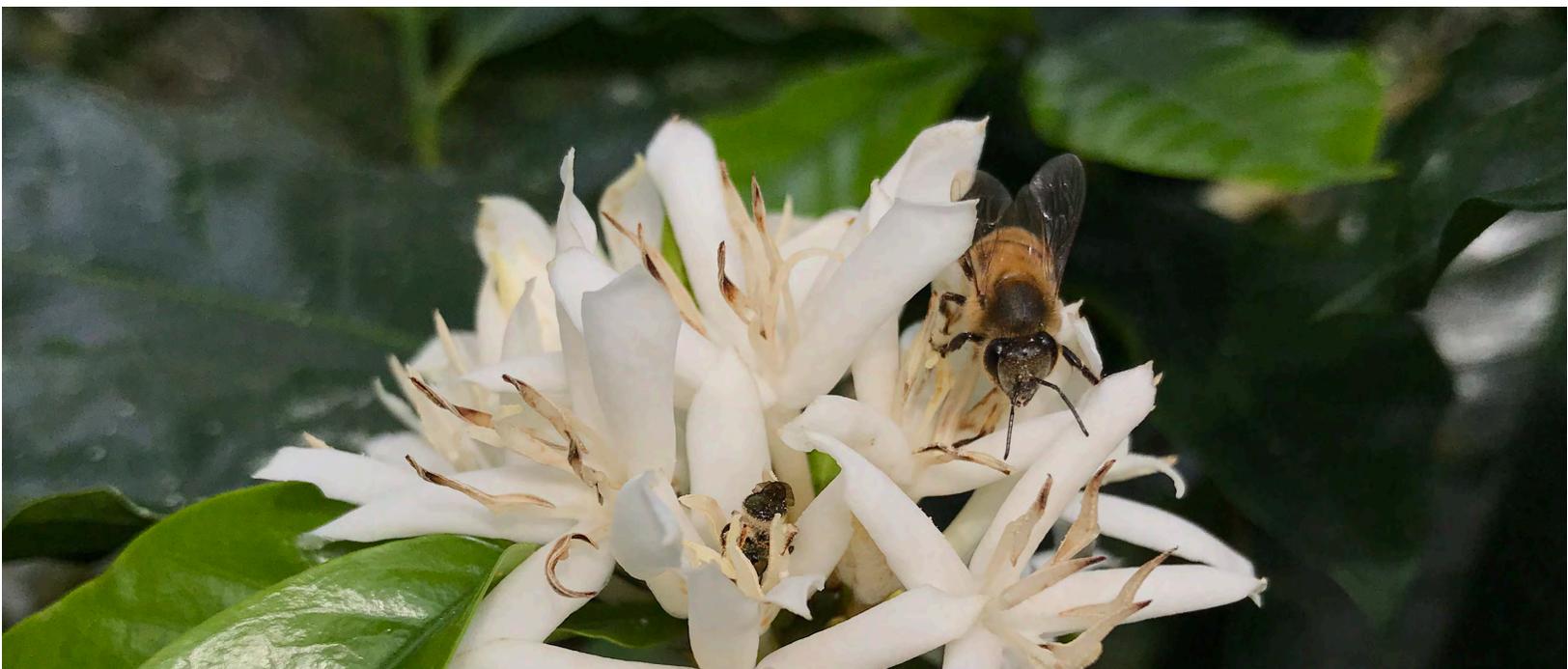
With the purpose of stand out among coffee growers and technicians the importance of animals such as bees and birds in the sustainable coffee production, the Neotropical Migratory Birds Conservation Via Eco-Systemic Services Handling in Coffee Farms Project, published a good practice guide for the birds and bee conservation, as well as the eco-systemic services provided to the productive families.

Throughout this study, it was demonstrated that birds are capable of removing up to 15-18% of coffee's berry on plants. Also, it was found that there can exist up to 25 different bird species that feed from coffee berry.

Additional to the research, economic calculations were made to quantify bird's contribution to plague control, it was confirmed that, in different regions and studies, the birds' contributions to coffee plantations help to avoid a loss of up to USD\$ 450 per hectare.

This study also demonstrated that bees help the coffee plants to produce bigger fruits. Visualizing alongside other research, that coffee fruit weight in different coffee plantations of Latin America, could increase up to a 27%.

Likewise, thanks to bee pollination, we could demonstrate a loss reduction of up to USD \$1 800 per hectare each year.



Biological Monitoring for the biodiversity and human wellbeing conservation in the Guatemalan Central Volcanic Chain

This initiative includes the implementation and development of a biologic monitoring process to orient the land conservation and sustainable use in priority areas, which will allow the connectivity between landscaping and endangered species conservation, especially in the zones with high value systems on which human activity is interspersed.

The Acatenango volcanic complex and El Socó mountain, conform a social-economic system prioritized by the National Protected Areas Council (CONAP, Spanish acronym), which covers a 12 500 hectare extension, distributed in 2 national importance hydrographic watersheds, this constitutes a priority area for the conservation of land ecosystems with high hydric load, presence of endemic associated species, vast biodiversity and high relevance for touristic, agricultural and recreational activities.

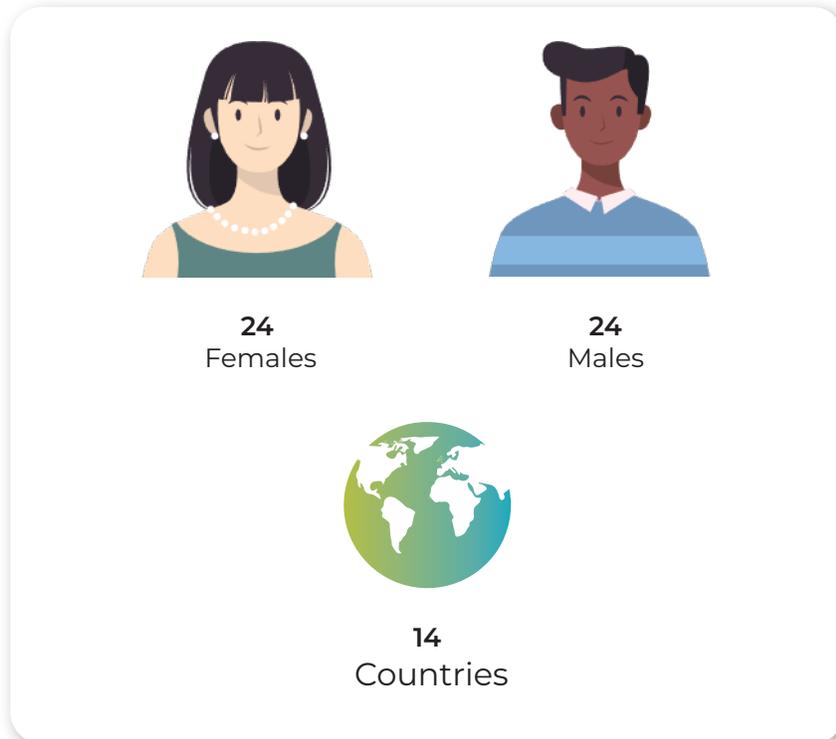
The data obtained via this monitoring, evidences the importance of expanding the protection and sustainable ecosystem interventions, and the linkage of scientific-technical efforts in the implementation of economic-productive actions for the people that inhabit the zone. By this means, a 23 young people group was conformed, (43% females and 57% males) in both municipalities to train them as new community tourism guides, which will contribute to the income diversification, improve family wellbeing, and reach the landscaping restoration goals.



II Section

CATIE in numbers

Graduates 2021



Training events:



Training events: certification, courses, workshops



3860
Females



7717
Males

Publications:



Outreach and global alliances



Broadcasting and positioning

Social media growth



59 827
+ 7 432 new followers



5 067
+ 1 998 new followers



7 932
+ 581 new followers



3 915
+ 558 new followers

News posts on the website and social media



News published by regional media



III Section



CATIE in details



Educating with excellence for the strengthen of the region capabilities

Education in all modes: on-site, virtual, and bimodal

Throughout different high-quality tools, the Graduate and Training school has been strengthened with ergonomic equipment and furniture to reinforce the on-site, virtual, and bimodal education.

The strengthen of the remote education allowed that, even facing the COVID-19 pandemic restrictions towards on-site activities, students from different countries were able to successfully continue with their academic programs.

Consequently, just like 2020, the graduation ceremony was done virtually and 61 master's degree diplomas in different currently offered majors were delivered. In turn, in 2021 261 applications were received of which 231 were accepted: 75 for on-site master's degree and 156 for virtual.

Additionally, all the training events were delivered virtually, thanks to an intense platform modernization process that allowed to fulfill the demand of all majors, so did the implementation and use of new tools such as Persusall and Turnitin to facilitate objective and transparent grading in the educational activities.

Master's programs get approval from Costa Rica's Civilian Service

After a rigorous evaluation process, CATIE's master's degree academic programs were integrated inside the Specialties Descriptive Manual from Costa Rica's Civilian Service General Management (DGSC; Spanish Acronym); which will benefit graduate students (Costa Ricans and foreigners) that are willing to apply for a public sector position.

The incorporation of the master's degree programs inside this regime, will allow graduates to have their academic degree backed up by a recognition of their demonstrated degree, capabilities, and achievements as well as the opportunity of a better work stability inside public administration

"The inclusion of our master's programs in Costa Rica's Civilian Service, provides an opportunity to our graduates that work in the country to be change leaders and promote the Inclusive Green Development, the same way it is being done by their peers in other Tropical America countries."

Roberto Quiroz, Graduate School Dean.

The Virtual Master's degree in Agrobusinesses and Sustainable Markets joins CONAPE's financing offer

In May 2021, The Virtual Master's degree in Agrobusinesses and Sustainable Markets was incorporated as part of the financing offer from Student's Loan National Commission (CONAPE; Spanish acronym), with makes possible to Costa Ricans to apply for a more accessible financing program for their major studies and rely on better opportunities to take the academic program.



Inclusive, equitable and quality education

Whereby SDGs and Institutional Strategic Plan (PEI; Spanish acronym), Graduate School looks to promote an inclusive education with better opportunities to all people; to offer the necessary resources so students from all over the globe can access to a quality formation on the Inclusive Green Development; to have a flexible and adapted to the current demands in education, that include: on-site, virtual, and bimodal courses, as well as training programs on: professional and technical updates with community level producers.

To achieve with these commitments, we propound to innovate in the professional update program to offer courses and certificates with the credits, quality, and strictness of the master's degree program that the institution offers, with the sole purpose to allow regional professionals to obtain high level education with the required flexibility. Hence, by 2022 the bimodal master's degrees in coffee and livestock pilot plan will start due to high demand.

Success Story: beyond the lecture hall

José Fernando González-Maya is a graduate student from CATIE's Master's degree in Management and conservation of Tropical Forests and Biodiversity, class of 2005-2006. Since then, he has been mainly linked to the Latin American ecosystems and, tropical biodiversity research and conservation, allowing him to obtain several national and international recognitions.

Currently head professor and researcher in Universidad Autónoma Metropolitana- Unidad Lerma, Mexico; he is scientific director of ProCAT Colombia and ProCAT International; acts as co-president of The Small Carnivore Specialist Group from Species Survival Commission (SSC), International Union for Conservation of Nature (IUCN); and is a C class Head researcher professor of the Fellow of The Linnean Society of London.



“Attending to CATIE is an unforgettable experience that marks the life of the ones who had the privilege of receiving education in its facilities, not only from the academic perspective but also in the personal growth. Academic life at CATIE is enriching and leaves life and formative lessons that mark the rest of our professional careers”



Research for Inclusive Green Development

Alongside with diverse Latin America and Caribbean countries, CATIE has overseen promoting a route to reach the Inclusive Green Development (IGD) that will allow to secure the intergenerational equality, full participation of different society groups and the maintenance of the natural capital capacity to provide the eco-systemic services on which the human wellbeing relies on.

In the last four decades, IGD takes sustainable development concept as the one that satisfies the current generation needs without compromising the future generations wellbeing, it aims to end poverty, protect the planet, and improve life conditions to all people. Via these concepts, the following characteristics have been established:

- Better rural income and Jobs with gender equality and inclusion.
- Food and nutritional security based on agrobiodiversity.
- Rural communities' resilience to climate change.
- Comply with Nationally Determined Contribution (NDC) goals.
- Eco-systemic services that will result in human, animal and environmental wellbeing (One Health)

The articulated work between all research units that conform CATIE has allowed this institution to develop actions that comply with a IGD and position itself as a climate change resilience leader, the mitigation through-out a nature-based solution and bigger resource distribution equality.



Livestock with a sustainable and environmental approach

The Sustainable Livestock and Environmental Management Unit (GAMMA: Spanish Acronym) work towards the traditional livestock farming system transformation into a low carbon production, has directly contributed with the established SDGs for zero hungry, quality education, gender equality, decent jobs and economic growth, responsible production and consumption, climate actions, life in land ecosystems and goal achievement alliances.

With different Latin America regional organizations, institutions and groups support and trades creations, important actions were achieved towards a resilient population advancement and climate change adaptation.



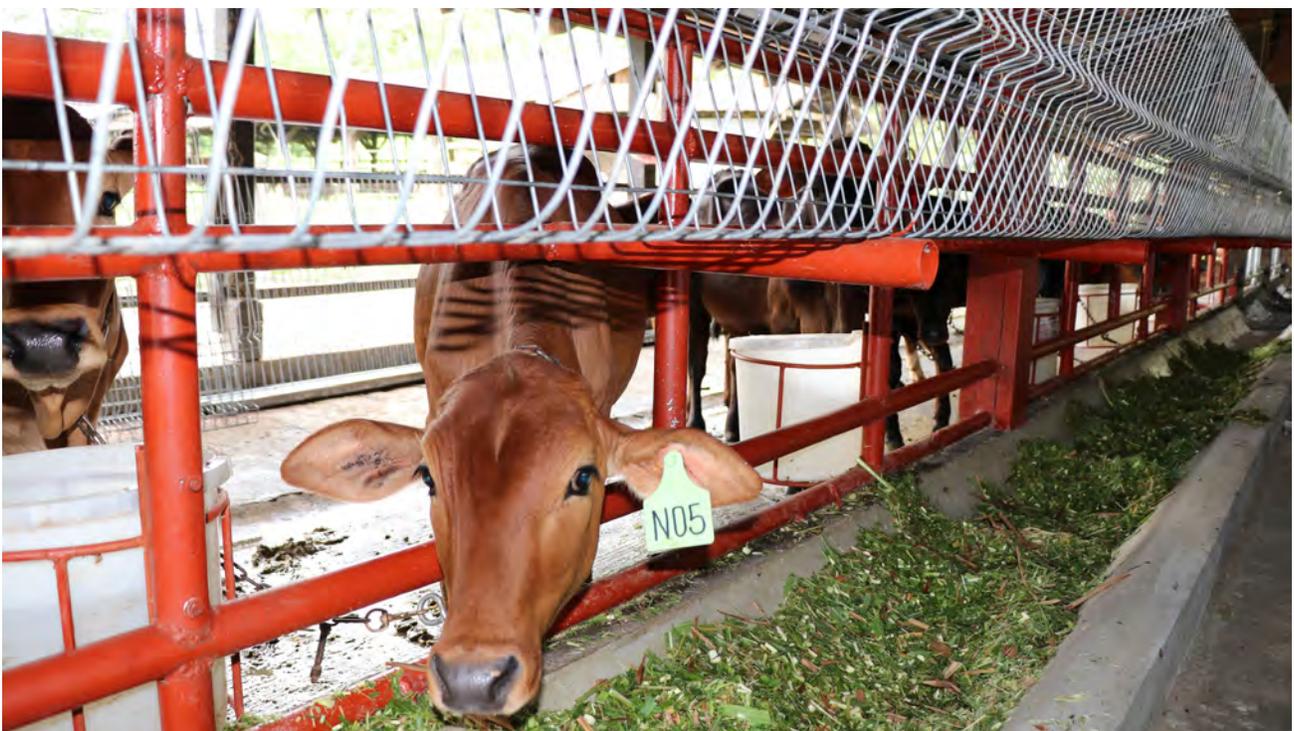
● Capabilities Strengthening via country Schools (ECA) for livestock farming systems transformation

Throughout the Biodiversity and Agrosilvopastoral Livestock Landscapes project, as known as BioPaSOS, CATIE continued to strengthen its associate's network via collaboration agreements in Mexico, Jalisco, Chiapas and Campeche, for a livestock farming sector transformation towards a low carbon economy, as well as the sustainability actions promotion for the capabilities reinforcement of the producers, technics and local partners via the creation of exchanges, networks, trainings, publications as well as technical and educational documents.

As part of these efforts results, we highlight the creation of the Young and Women Monitors of the Biodiversity in Agribusiness Landscapes of the Campeche State (Bio-Cam; Spanish Acronym) in collaboration with the National Conservancy and Biodiversity Usage Commission (CONABIO; Spanish acronym) and the Livestock Breeders Sustainable Agroecosystem Work Group of Campeche State (AGS-CAM; Spanish acronym)

This Project has also implemented virtual national and international forums on which more than 700 people from 27 different countries have participated, with the objective of learning more deeply about the sustainable and biodiversity conservation production. It intends to visualize CATIE's work in Mexico and Latin America via scaling actions and result massification.

Moreover, the capability work has been fundamental for the Peruvian Amazon Sustainable Productive Landscapes, which seeks a higher competitiveness and better income for the families; improve the biodiversity conservation as well as increase the climate change resilience in the prioritized areas of the provinces of Huánuco y Ucayali.



Throughout the ECA approach, the training of Peruvian producers was given to implement good practices, livestock breeding innovations and the silvopastoral systems implementation. Only in 2021, 560 people registered as participants, which 20% were women, 11 ECAs were organized, 12 prototypes were selected, 12 livestock breeder promoters and a total of 72 training events took place.

Within the main aspects to highlight, the best part was a bigger women participation in the activities took place, group interaction improvement, local capabilities reinforcement, technical staff and project promoters to facilitate the ECA process to producer's groups.

Under ECA's approach, the Amazonian Forest Conservancy and Sustainable Production Program (PROAmazonia) project was worked and an agreement between responsible parts to implement the training and technical assistance program for the sustainable livestock breeding in the provinces that conform the Amazonian Special Territory Circumscription (CTEA; Spanish acronym) which contemplates five training modules intended to 3 500 producers: farm plans, forage banks, rotational pasturing, eco-systemic services and productive registries.

During the first cycle of the training phase, 101 ECAs were conformed, distributed in the Sucumbíos, Orellana, Napo, Morona Santiago y Zamora Chinchipe Provinces of Ecuador, which has a total participation of 1806 livestock breeders (38% women)

On their behalf, from the Caribbean area, the Mangrove Project for development in Montecristi, Dominican Republic, has also utilized the ECA methodology approach to reinforce the livestock breeding good practices and implement silvopastoral systems, as well as promote the conformation of learning communities. The project contributes to guarantee a healthy life to all people, to empower women and girls, to encourage sustained, inclusive, and sustainable economic growth, and fulfilling and productive work.



● Establishment of model farms adapted to climate change

In 2021, 30 productive people were selected to start a development process of their farms as model farms of sustainable livestock breeding in the Gulf of Fonseca, Honduras Region via the DEIT project, financed by the consortium between Aid in Action Foundation and Technoserve in the Territorial Inclusive Economic Development (DEITSUR) mainframe, the beginning of the implementation process of actions such as forage banks, rotational pastoring, pasture improvement, and silvopastoral systems.

Actions taken in the mentioned farms will be retaken with future initiatives to consolidate a pilot farm network in the area and the country, with the purpose of supporting the research and transfer of key sustainable livestock breeding technologies.

Furthermore, via *The Belize Livestock Producers Association* (BLPA) proposal to increase the livestock farms production increase in a climate change scenario, CATIE was identified as a technical partner to provide the necessary services to promote the adoption of climate resilient practices and green financial products to increase the livestock production in Belize.

Based on an auditing exercise applied to 10 model farms. A group of climate smart livestock breeding innovations that intend to work as testing fields and as “laboratories” for participative learning from breeders and technicians was identified. Inside the identified new developments, we can find degraded pastures rehabilitation and/or renovation; improved pastoralism practices, implementation of *Leucaena leucocephala* in pastures as a cropping option in alleys, living fences installation, disperse tree plantation in meadows, improvement and construction of water reserves, forage conservation like ensilage storing of severed pastures and mineral and non-protein nitrogen supplementation via multi-nutritional blocks.

● Carbon capture and biodiversity conservancy actions

The IKI-TonF Project benefiting from the trees inside the farms potential of carbon capturing and biodiversity goal achievement, financed by the International Climate Initiative (IKI; German acronym) from the German Federal Department of Environment, Nature protection, Nuclear Safety and Consumer Protection, seeks to improve the biodiversity conservation capacity in the governments of Uganda, Rwanda, Indonesia, Peru and Honduras. CATIE participates actively in the later one.

Via a roadmap to impulse trees on farms (TonF) in the different livestock breeding areas of each country, during 2021 three impact routes were started:

- Increase TonF visibility focused on live edge fences and other lineal arboreal elements.
- TonF options implementation in a farm level which include diversified live edge fences with timber trees at the boundaries. Thanks to CATIE and American Bird Conservancy (ABC), around 5000 timber and fruit trees were planted in farms.
- Creation of a normative mainframe for TonF. In 2021, the project supported the consolidation of the National Sustainable Livestock Breeding Platform (PNGS; Spanish Acronym) as the integrated governing entity by public, private, academic, and international cooperative sectors with the goal of boosting a transformation and sustainable livestock breeding development.

Sustainable intensification of dairy production

The Dairy Sustainable Intensification project (LACTIS; Spanish acronym) has a goal of contribute to the development of a public-private cooperation platform on sustainable intensification of the dairy sector in Latin America and the Caribbean, which is already in place in different countries. In Costa Rica, this project is implemented by CATIE and the National Institute of Agricultural Technology Innovation and Transfer (INTA, Spanish acronym)

During 2021, the monthly monitoring and evaluation of the planned improvements was launched in two pilot farms via the ML2 tool, which allows to process field data with productive and socioeconomic indicators that in the future will facilitate productive families together with technicians to make decisions and make appropriate adjustments in their farm plan implementation.

Furthermore, experimental parcels were established in the farms to generate more information and demonstrate on-site advantages of a good pasture handling in terms of availability and quality. Also, on-site and virtual workshops took place to address record handling, pasture handling and silos generation and bio-manure for the pasture improvement.

Success story: highlighting women's work in the livestock breeding sector

The Peruvian Amazonia Sustainable Productive Landscapes Project (PPS, Spanish acronym) has confirmed in their Country Schools (ECA, Spanish acronym) a 20% participation of their training processes have been females, highlighting the contribution and daily work that they performed in the livestock breeding sector, which includes activities such as milking, cheese preparation, livestock tack, cures, calves keeping, dosages, crop management and animal raising. Juana Espiritu is one of the ECA participants. She participates specifically in the ECA of Nuevo San Juan, Curinama district, Ucayali, Peru.



Contributing to the SDG





Adding to the food security

After a hard collaborative work, the Agri-biodiversity and Food Security Unit alongside Anthesis-Lavola, the NAMA rice and NAMA Musaceae as part of their contribution with Interamerican Development Bank (IDB), in the project execution named “Support to the policy reforms and implementations based on nature and climate intelligent agriculture that contribute to the Costa Rica Decarbonization National Plan.”

The NAMA Rice proposal focuses itself in mainly promoting actions of emissions reduction in the national rice production via three main measures: The first one focuses in a change on hydric regimes, The second one in the usage of adapted varieties and the third one in a new fertilization practices adoption to reduce emissions.

Throughout the strategy to be implemented, an emission lined based study was formulated by year 2030, which establishes potential reduction and GEI emissions reduction scenarios as well as the operational design, investment plan, NAMA ´s monitoring, revision, and verification system proposal (MRV) and the change theory proposal that englobes the desired transformational process.

On its behalf, for NAMA Musaceae the conceptual note was analyzed (elaborated by the Costa Rican Government in 2020) and hand to hand with a deep analytical and documental research, a technical document was created for the pursuit of the banana growing sector contextualization, analysis of the identified barriers and the creation of a base line emission for the sector towards 2030, as well as the selection and prioritization of the NAMA rules incorporation depending on the agricultural interest.



For the technical document development, four priority work measures were defined, which focus on increasing the CO₂ levels removal, reduce the CO₂ emissions generated by airplanes during aerial fumigation, reduce the nitrous oxide (N₂O) emissions and to reduce the electricity consumption.

Aside from the technical activity, a NAMA Musaceae operational design document was created which offers five fundamental implementation mechanisms such as technical assistance, innovation and development, marketing and commercialization, financing, and governance.

In corollary of the operative document and in tune with the financial mechanism, a third document was generated, named investment plan, which determines the required resources to implement the priority NAMA measures and the creation of enabling conditions. Through a pilot plan with a two-year duration, 15 farms distributed in the productive areas and filtered by size and production systems will be intervened.

Through the investment plan a conservative scenario is visualized, that assumes the transformation of around 26 380 hectares (60% of the planted national area) during 2023-2032 and an optimistic scenario that believes the resource mobilization conditions will be the appropriate to transform 43 443 hectares (100% of national area). Under the conservative scenario, we estimate the pilot plan actions will have an approximated cost of USD \$ 577 500 yearly for export-grade banana and USD \$ 207 500 for other Musaceae.

All the presented documents have been created with the participation of strategic partners from the Country's Musaceae sector and its approach has been presented to the National Technical Committee, constituted by representatives from Department of Agriculture (MAG, Spanish Acronym), Department of Environment and Energy (MINAE, Spanish acronym), National Banana Corporation (CORBANA, Spanish Acronym), University of Costa Rica (UCR), National Meteorology Intitute (IMN, Spanish acronym) and the National Innovation and Technology Transfer Institute (INTA, Spanish acronym).





Improved coffee and cacao trees in association

The Coffee and Cacao Improvement Agroforestry Unit has been in charge of combining the research, technology and education for the training and development of regional and international level projects, as well as the constant maintenance of the international coffee and cacao collections to reinforce the adaptation to climate change and guarantee food security.

Next: area highlights during 2021.

● Successful long term projects finalization

Started in 2016 the CATIE-PROCAGICA-IICA project financed by the European Union (EU), finished in 2021 with high importance achievements, which allowed the regional and national platforms reinforcement such as Regional PROMECAFE Platform, Coffee Rust Monitoring and Research Platform, Genetic Improvement Platform, and the Coffee and Climate Platform. All of them count with sustainability knowledge management mechanisms.

In addition, we outstand the updated diagnosis and improvements to the transfer of technology and capability reinforcement systems in the coffee grower sector, more than 200 research and demonstration parcels located in farms allowed to evaluate improved coffee varieties, establish integral plague and disease control protocols, improve the coffee plantation shade designs, mechanize in a low-cost method the shade and ground weeds handling, bio-supplies, water harvesting and irrigation. Throughout the research, monitoring, and studies on the coffee rust species in Central America, Mexico, Dominican Republic and Jamaica, the project contributed to adjust this disease handling plans for the future, as well as the training of 1800 people in the sustainable coffee growing subject.

Although the Project ended in terms of field execution, it will continue to deliver scientific postings that will facilitate relevant information to the decision-making people in the coffee growing sector.

On its behalf, the Forests, Trees and Agroforestry (FTA) work finished after 10 years of partnership with CATIE, FTA worked in a global network conformed by eight territories, known as sentinel countries, which CATIE was in charge of the landscape located in Nicaragua-Honduras. Through this program we studied with standardized methodologies the measurement of the change impulsive factors for forestry coverage, their impacts in life and in the eco-systemic services provision, as well as the necessary models and approaches for the forest and tree handling outside the forest in sentinel landscapes.

Regional Importance Project Advances

Alongside the Korean cooperation Initiative for the Feeding and Agriculture in Latin America (KoLFAI), in 2021 the establishment of a network was created with the compounded participation of more than 40 farms with coffee tests in eight countries of the Latin-American region to evaluate more than 100 technologies. Also, 44 professionals were trained in two virtual courses and individual sessions regarding pruning and fertilization.

Same as the regional coffee project, KoLACI also finances a cacao regional project on which agroforestry designs are evaluated and an increment of up to 60 research parcels in eight countries of the Latin-American region and Caribbean. Currently exist forty databases that will allow to publish technical papers backed up by real evaluations.

On its behalf, the Chocolate4All project developed in Honduras in alliance with *Heifer International* and *CATIE* has reached the training of 1000 ECA mode producers. Perform agroforestry studies and land fertility in more than 400 farms, generate written manuals and digital animations for technicians and producers and to provide technological devices such as drones and software for the diagnostic and redesign of the cacao plantation fields.



● Caribbean joined coffee and cacao project development

Inside the combined work performed by the unit, we find the development of the Country Schools (ECA) in Dominican Republic, which are financed by the Biodiversity and Productive Landscapes Program from the United Nations Development Programme (UNDP) in alliance with the Dominican Coffee institute (INDOCAFE), the National Cacao Commission and the CACAO Department of the Agriculture Ministry. Under this initiative 14 technical guides have been created, 10 flip charts and other materials for facilitators, united with this, around 50 people got trained with CATIE to handle the ECAs. This methodology will continue in 2022 and will benefit 300 producers.

In Haiti, alongside the *Agricultural and Agroforestry Technological Innovation Programme* (PITAG) initiatives and national and international institutions, CATIE and CIRAD contributed to raise details diagnostics in socioeconomics, agroforestry, and crop agronomy, which will allow by 2022 to propose improved models of agroforestry systems for the diversified production increment.

● Genetic conservation and rationalization of the International Coffee Collection

In 2021 a work team between Crop Trust (CT), Food and Agriculture Organization (FAO) and CATIE was formed with the goal of defining a rationalization and conservation long term strategy for the genetic coffee resources.

Due to previous statement, the collection will be reduced from 1976 accessions to 1104, which correspond to the most diverse and unique. Also, these accessions will be reestablished in the CATIE's farm La Montaña and will be duplicated in another farm in Grecia, Alajuela, Costa Rica.

Also, the diagnosis study of the strategy concluded that 80% of the collection's accessions are endangered, so 165 of the most endangered accessions were rescued, these are the ones that represent a higher loss risk and were transferred to a greenhouse. Finally, the strategy to perform a fundraising of USD \$6.2 million during the next eight years to maintain the collection perpetually was created.



Advances in Coffee Hybrids evaluations

In the trial of 46 hybrids established in Aquiares, Turrialba, Costa Rica, alongside World Coffee Research (WCR), four of them have been pre-selected, which will be introduced into CATIE's Biotechnology Laboratory for the plant's propagation. Also, will be included into the multi local trials in order to be validated in different agroecological conditions of the region.

Also, after negotiations with WCR took place, CATIE will be the campus for the global breeding initiative for the production of quality seeds of crops selected from Africa, Asia and America, that will be distributed to producing countries of Latin America for its validation.



Introduction of new accessions in the International Cacao Collection and new clones' development

By 2021 more than 25 accessions were introduced to achieve the conservation of 1250 accessions in two CATIE farms where the collection is located: La Montaña, Turrialba and La Lola located in the country's Atlantic zone. Also, the molecular analysis was completed in all the accessions stored in the geo-plasm bank, these results will allow to evaluate the conserved genetic diversity in the collection, the missing diversity, the duplicate conditions, and the possible identification errors.

That same year, a cacao core collection creation program was initialized, facilitated by Nestle, which seeks to represent a 95% of the genetic species diversity *Theobroma cacao* L. This consortium is conformed by CATIE, Nestle, Reading University, Pennstate University and CIRAD.

On the other hand, CATIE has already identified eight new promissory clones with potential to be liberated in the region. In 2021, progress was made with the characterizations and will culminate in 2022 with the aim of producing a catalog of clones for dissemination. Likewise, the cacao project with MARS-Wrigley was extended until 2022, which is aimed at researching the use of accessions from the collection to identify promising materials that show resistance and/or tolerance to the phytophthora disease (*Phytophthora megakarya*).

Apart from the international unions, an alliance was also established with the University of Costa Rica (UCR), the National University (UNA) and the Technological Institute of Costa Rica (ITCR) to achieve advances in the biochemical characterization of the new clones. of cacao to release.



● Agroforestry trials of coffee and cacao to strengthen the scientific knowledge of the region

CATIE continued to maintain the coffee agroforestry trial and celebrated 21 years of generating technical and scientific publications, as well as a summary of the advances in the Agroforestry Magazine in the Americas.

Regarding cacao trials, by 2021 all the necessary preparations were made for the establishment of two new essays; an agroforestry trial in alliance with Agroforesta to evaluate new CATIE clones, types of shade and types of management; and another trial in alliance with the private company LINDT Sprüngli to study high grain quality clones and diversified shade types.

● Technology development and innovation in agroforestry systems

Through the articulation of several projects, CATIE has developed important digital technologies that represent innovations for management systems in agroforestry. During 2021, in partnership with the Laboratory of Photogrammetry of the ITCR three were developed. Tutorials to highlight the use of high-resolution images and photogrammetric applications for analysis of agroforestry systems, for example: the detection of trees in cattle landscapes.

Within the framework of the FTA, IKI-TonF and Chocolate4All projects in Honduras, efforts were made to develop various instruments and software based on the use of remote sensing, drones, and simulation models (www.shademotion.net) for inventory and management of trees on farms, this with the aim to help producers and companies to optimally design their agroforestry systems.

For its part, together with experts from IBM, it developed a module on agroforestry systems (Based on use of satellite remote sensing, photography high resolution and radar, drones with devices LiDAR and physiological models of crops) to analyze the spatial structure of agroforestry systems and, in this way, improve the capacities of the Watson for Agriculture (WxA) platform to alert and advising coffee and cacao producers throughout the world.



Success story: the best cacao

Justina Rodríguez, resident of Quebrada Pinzón, in Bocas del Toro, Panama, is one of the producers who, with the support of the Ministry of Agricultural Development (MIDA) and CATIE, has achieved a notable improvement of the cacao plantation, which ensures that the clones used *"are the best cacao I have seen so far."*

"At the beginning it was quite difficult, but we continued to work with faith and hope that the project was going to work, and today everything looks different.

It is very beautiful, and I would like to see all the rest of the farm producing like this", Mentioned Rodríguez, satisfied due to the increased production of cacao and all products harvested on her parcel.





Latin American Scientific Network of Agroforestry: Agroforesta

The Agroforesta platform brings together regional and international institutions that conduct research and teach about agroforestry, with the purpose of contributing to increasing competitiveness and sustainability agroforestry systems with perennial crops in Mesoamerica, through the quantification, valuation and development of all potential environmental products and services, taking into account the scale of the farm or landscape and the effects of climate change.

Currently, Agroforesta is made up of five partners: the International Center for Research in Agroforestry (ICRAF), the Bioversity International-CIAT Alliance, PROMECAFE, CATIE and the Cooperation Center International Agricultural Research for Development (CIRAD).

Its main function is to be a bridge, a catalyst, to build joint projects, train students and professionals, publish scientific articles, among others.

In 2021, Agroforesta continued to support research projects that respond to its strategic lines, in which the five organizations that comprise it are involved. Among the investigations stand out:

Study of the entomofauna in an agroforestry or organic system of cacao vs. a conventional one.

- Support in the construction of rainwater storage tanks for the management climate risk of small producers.
- Models of citizen participation and participatory workshops on agroforestry dynamics. with the key actors of the Turrialba-Jiménez observatory.
- Long-term trials of coffee and cacao.
- Livestock sector workshops in Nicaragua with producers and technicians to validate a tool decision-making process that stimulates the participation of key actors in the sector agriculture in the definition of public policies.

In addition, in 2021 the work of Agroforesta was evaluated, from the period 2015 to 2020, by three international experts recognized. In its report, the evaluation committee recognized the importance of the platform and the achievements achieved.

The evaluation committee recommended keeping the balance between research projects and development projects, expand the geographic area to Andean countries and the Caribbean, as well as incorporating new partners with expertise in the areas topics to expand. In addition to this, it was indicated that Agroforesta should improve its visibility and communication to increase the external perception of the scientific community on the platform and attract new partners and researchers.

The Agroforesta steering committee approved its report in December 2021, therefore, the expansion of the geographical area and the integration of new partners are topics that will be discussed in 2022. These debates demonstrate the dynamic of the platform, which adapts to the evolution of the context, but always with a firm base constituted by the core group of partners.

Also, in 2021 the new website www.agroforesta.org was built and updated, seminars were resumed to present the results of the activities of the platform, the Best of Agroforesta files were created to disseminate the best scientific publications of the platform and were financed seven specific activities. Likewise, Agroforesta organized a workshop with the presence of the Ambassador of France and the representative of the French Agency for Development (AFD) in Costa Rica with a visit to the collections international coffee and cacao from CATIE. The success of this visit subsequently led to the visit of the French Foreign Minister to the headquarters of CATIE, in December.

Another notable achievement of Agroforesta is that within the framework of the PROCAGICA program (CATIE-IICA-EU) the Agroforestry Magazine in the Americas was reactivated (N° 51, 2021), whose edition contemplated the results of five years of implementation interinstitutional in seven countries, as well as a summary article 20 years of long-term trial research in an agroforestry system with coffee, which is supported by the platform.

One of the evaluators, Luis Pocasangre, from Earth University, expressed: *“the platform has many significant results, be they scientific publications, a high number of trained master's and doctoral students, and participation in several regional projects with an important impact for producers of coffee and cacao”*





Forests and biodiversity in Productive Landscapes

Through long-term ecological research, sustainable management of natural forests and biodiversity, as well as landscape restoration and climate finance strategies, the work done from the Forests and Biodiversity Unit in Productive Landscapes (BBPP) has achieved a significant impact in the SDGs of ending poverty, quality education, decent work and economic growth, climate action, life of terrestrial ecosystems and alliances to achieve the objectives.

During 2021, the measurement of nine Permanent Sampling Plots (PPM) of 1 ha was completed in the primary forest demonstration site Corinto. Since 1988, CATIE has maintained periodic measurements of tree vegetation within the PPM, which makes it, at the regional level, the site with the basis of more complete and detailed data for studies on ecology, wood production and management impacts in natural forests.

In addition, it has contributed to the remeasurement of PPM in La Tirimbina natural forests, allowing the generation of robust information to support the management of tropical rainforests, as well as the remeasurement of 29 permanent plots for long-term research on the impacts of climate change in mountain forests.

For its part, the Secondary Forests Project and the Chair of Ecology installed new demonstration sites for long-term research in active and passive restoration areas on CATIE's commercial farm, to capture and store carbon and, at the same time, time, function as laboratories for monitoring studies of restoration processes, as well as training spaces for students and forestry technicians.

The work in restoration, conservation and climate risk management by the unit allowed the creation and signing of an agreement with the National Meteorological Institute (IMN) for collaboration on issues of support and capacity building in the management of climatic stations, maintenance, registration, purification, and analysis of data, which will allow CATIE to strengthen its studies on issues of agricultural and forestry production.

Likewise, as part of the climate financing efforts, CATIE was contracted by Expertise France and its EURO-CLIMA+ program to provide a training service in Bolivia, Chile, Costa Rica, Ecuador, Honduras and Panama. The main objective is to develop concept notes to be presented to climate finance funds, such as the Green Climate Fund (GCF), the Adaptation Fund (AF) and the International Climate Initiative (IKI).

Management and participation in new projects

The Chair of Ecology participates in the Program Scaling Up Ecosystem-based Adaptation Measures (EbA) in rural Latin America, whose purpose is to produce benefits for the owners of farms and residents in prioritized landscapes of Costa Rica, Guatemala, and Ecuador, through the application of agroecological measures.

In turn, in 2021, funds were obtained from the FS-PI-ARCHAC call n°2020-21 of the Secretariat of the Agricultural Council of Central America (SCAC), where seminars were organized between Central American and French leaders of forest ecosystem monitoring plot networks. Central American and intertropical countries for the exchange of experiences and joint strengthening for the monitoring of disturbed tropical forests in Central America, as well as the promotion of sustainable management in tropical forests as a nature-based solution.



Impact on capacity building

In the field of capacity building, he prepared, coordinated, and participated in various talks, courses and workshops related to climate finance, diversified management of natural forests. tools for the sustainable management of secondary forests; and restoration of forest landscapes. In addition, master's and doctoral theses were supervised and a webinar was organized to determine the timber potential of secondary forests. The latter was carried out together with the National System of Conservation Areas (SINAC) and was aimed at forest managers in the region.



Success story: ACTIVA-CATIE a platform for the incubation of enterprises in the rural forest sector

Through the ACTIVA-CATIE project, a contract for around USD 180 000 was signed with the Development Banking System (SBD) in Costa Rica for the granting of non-reimbursable financing to enterprises forestry in the rural sector. Thanks to the resources obtained, 23 enterprises have been incubated; 15 in the prototyping phase; and eight in the start-up phase.

However, although the results achieved to date correspond to funds mobilized from Costa Rican public banks, the project aims to generate interest among private investors and in other countries in the region, such as the *Emprende Bosques 2021* event, which promoted models of high value business based on the sustainable management of the forests of Guatemala.

In turn, the comprehensive approach of the initiative is expected to contribute to more key actors, not only from the issue of investment in forestry and rural enterprises, but also from the importance of secondary forests as livelihoods for rural communities and as crucial agents for greenhouse gas (GHG) mitigation and adaptation to the effects of climate change.



Contributing to
the SDG





Data analysis for robust research

Given its transversality, the Biostatistics Unit is associated and provides technical advice in the analysis of data from CATIE's different research units. In addition, it supports the Postgraduate School in the training of leaders, giving courses at the postgraduate level and training.

Specifically, during 2021 it collaborated with:

- The National Information Platform on Nutrition (PiNN), coordinated by the CATIE National Office in Guatemala. For this platform, its databases related to food security were adapted and curated and training courses were given to strengthen the capacities of the different actors in statistical analysis.
- The Socioeconomic and Environmental Sustainability of Agroforestry Coffee (SEACAF); Information collection instruments were created using the World Bank's Survey Solutions platform, in which mobile devices are used (Computer-Assisted Personal Interviews). In addition, their databases were built, adapted, and curated, and with the different groups of researchers, information analysis proposals were developed for publication in events and scientific journals.

On the other hand, Biostatistics also reviewed and updated the innovative tools and methodologies that it has developed over the years, related to CATIE's research areas. Among them, for example, the satellite image processing methodology through the development of a land use classification algorithm. This methodological tool has allowed CATIE's Environmental Modeling Laboratory to implement different investigations, which have resulted in the creation of land use maps in the region, generating publications to facilitate decision-making and the creation of public policies.

In turn, Biostatistics worked in 2021 on the creation of a participatory simulation tool for the management of the coffee berry borer (*Hypothenemus hampei*) at a landscape scale. This tool is developed in collaboration with CIRAD, the Coffee Institute of Costa Rica (ICAFFE), the Nicaraguan Institute of Agricultural Technology (INTA) and the Institute of Agricultural Science and Technology (ICTA) of Nicaragua, together with coffee producers from the Turrialba region, Costa Rica, and northern Nicaragua. As part of this project, a detection and counting tool for the coffee berry borer was generated using computer vision.

Other efforts made during the year focused on maintaining and strengthening the relationship with external partners, specialists in data analysis, for example, professors from the National University of Córdoba in Argentina, the University of Mayagüez in Puerto Rico and CIRAD researchers, the National University of Costa Rica (UNA) and the University of Costa Rica (UCR).

Contributing to
the SDG



Success story: leaving traces on professionals in the region

Oscar R. Lanuza, of Nicaraguan nationality, is currently a tenured professor at the Autonomous University of Nicaragua (UNAN Managua), at the Estelí Multidisciplinary Regional Faculty; He graduated in 2016 from CATIE's Academic Master's Degree in Management and Conservation of Tropical Forests and Biodiversity.

His time at CATIE, especially the Biostatistics Unit, indicates that it was an extraordinary experience as it allowed him to meet professors and researchers with extensive scientific experience, as well as to form bonds of friendship and scientific cooperation that have lasted until today.

During his stay, Oscar participated in the International Diploma in Biostatistics, which he indicated is one of the most complete courses in the Latin American region on the subject. The diploma activated his curiosity about biostatistics and led him to participate in other courses such as: R programming, multidimensional data analysis focused on ecological communities; applications with the QEco software, among others.

In these courses, he learned many updated tools and techniques for the analysis of ecological and agronomic data, achieving greater ability and independence to develop high-quality scientific research processes that he now shares with the teachers and students of his faculty in Estelí. In turn, this acquired knowledge, they comment, has been essential for them to advance in their doctoral studies in Terrestrial Ecology, at the Autonomous University of Barcelona, Spain.





Environmental economics and sustainable agribusiness

From the standpoint of the Economy, Environment and Sustainable Agribusiness Unit, CATIE carried out various actions to support initiatives focused on low-emission development, addressing the challenges arising from climate change. This is how it generated applied research, provided advice, and strengthened the capacities of key actors in Latin America.

In addition, given the existing interest between the National Institute of Forestry Sciences (NIFoS), of the Republic of Korea, and CATIE, during 2021 the cooperation agreement was signed that will last for a period of five years, to address through of the investigation the topic of payment for environmental services (PES).

One of the goals that is expected to be achieved through the research is to use the experience that Costa Rica and CATIE have in the development of PES programs and models, which can serve to strengthen the governments of countries that are facing the gradual deterioration of key forest ecosystems, in the design of public policies that can generate incentives to face forest degradation and deforestation.

Another relevant milestone was the signing of a new agreement for a period of five years with the Environment for Development Initiative, which reinforces the actions in the region, guaranteeing, in turn, confidence in CATIE. The relationship and presence of EfD will foster the development of more research that addresses priority issues for the achievement of the SDGs, hand in hand with renowned international academic institutions, specialist researchers in various areas of environmental economics. In turn, it will make it possible to strengthen the capacities of the governments of the Central American region, as a priority area of incidence.

Research and technical assistance that provides solutions

Various research and technical advisory projects led the work carried out in environmental economics and sustainable agribusiness during 2021, covering different countries in the Latin American region.

At the regional level (in Costa Rica, Guatemala and Ecuador), the Program Scaling Up Ecosystem-based Adaptation Measures (EbA) in rural Latin America began to be executed, with financing from IKI and under the leadership of the German Cooperation GIZ, whose implementation is by CATIE and IUCN, in consortium. The purpose of the program is to increase the adoption of Ecosystem-based Adaptation practices (EbA) in country planning, incorporating them into the NDCs and supporting the goals proposed in 2020, the sectoral plans (mainly for agriculture and water) and the implementation of National Adaptation Processes (NAP), thus facilitating Latin America and the Caribbean to meet their national adaptation goals and objectives.

One of the lines of action of this program will be the development of training, which strengthens the capacities of multiple actors, including the national and local government, civil society organizations, the private sector, service providers and vulnerable rural communities. The sustainability and expansion of EbA measures in the target countries will be guaranteed through the development of innovative financial instruments and products, the strengthening of governance mechanisms, and the exchange of knowledge in support of EbA policy and its implementation in the field.

In the region, CATIE in turn implemented technical assistance for knowledge management of the Forests, Biodiversity and Ecosystems (BBE) component of the EUROCLIMA+ Program. This consultancy was developed for GIZ and Expertise France (EF) within the framework of the EUROCLIMA+ Program and it allowed different projects implemented in nine Latin American countries to have tools for knowledge management under the experience capitalization approach. One of the main results was the Toolkit for Knowledge Management, which compiled the largest amount of information and products created and was considered by the EUROCLIMA+ Secretariat to generalize it and that its content becomes useful for any interested project in knowledge management of their experiences and lessons learned. The process of adapting the guide will be carried out by EUROCLIMA+ in 2022.

Water management in Honduras, Nicaragua, Panama, Colombia and Bolivia was another area of work in 2021. In particular, an investigation was launched on the social and ecological factors that affect the performance of community water organizations in said countries, with the purpose of determining what institutional, environmental and climatic conditions affect the performance of these organizations, as well as examining under what climatic, environmental and socioeconomic conditions successful institutions emerge within community water organizations for water and sanitation management. It is highlighted from this project that it is still in process, has collaborations of researchers from the University of Montana and Duke University and is funded by EFD.

For its part, the management of coastal marine resources with the Collaborative Program for the Sustainable Management of Marine-Coastal Resources (CMaR) continued its execution, with an international scope that involves Chile, China, Central America, India, South Africa, Tanzania, and Vietnam. The program aspires to provide useful policy advice by having an adequate understanding of the institutions mediating the complex and adaptive relationship between human societies and coastal ecosystems.

As another key issue, efforts were made in the region to empower local governments in Latin America to facilitate a transition to a circular economy. This project was financed by the Konrad Adenauer Association (KAS), through the Regional Program for Energy Security and Climate Change in Latin America (EKLA) and brought together approximately 20 professionals related to local governments from Argentina, Chile,

Costa Rica, Guatemala and Peru, who were trained on circular economy, in order to train other people as part of a multiplier process, reaching about 100 more people trained on the subject.

Likewise, in Guatemalan territory, CATIE supported the implementation of the National Development Strategy with Low Greenhouse Gas Emissions, through the integration of the circular economy in the municipal development plans of Quetzaltenango and Guatemala City. In both municipalities, the project was socialized with the mayors' offices and with the neighbors, a collection of waste and common solid waste was carried out and the waste and waste were characterized. In the case of the municipality of Guatemala City, a workshop on the characterization of residues and industrial solid waste was also facilitated, accompanied by a technical visit to the industries of said municipality.

On the other hand, in support of the Guatemalan government, a project was developed that evaluated the vulnerability of the extended Dry Corridor to the effects of climate change; an effort that was added to the country's goal of fulfilling its climate commitments and guiding its development towards low carbon emissions economies that are resilient to the effects of climate change.

This project, financed by the Climate Technology Center and Network (CTCN), generated information and capacities to support the implementation of adaptation measures in the Dry Corridor, in the agriculture, livestock and food security sectors. To do this, a vulnerability analysis was carried out that developed five analyzes at the municipal level, specifically in the municipalities of San Miguel Chica, Salamá, San Agustín Acasaguastlán, Morazán and Rabinal, identifying the population and areas at high risk of climate change. Then, in a participatory manner, adaptation actions were identified in the agricultural, livestock and food security sectors, to be implemented in these areas as a priority in the short and medium term. In total, 27 workshops were organized, in which 185 people participated, 35% women and 65% men. Also, the management of funds was streamlined to implement the identified adaptation measures, based on the preparation of two project proposals.

Continuing in Central America, but now in Costa Rica, work was done on productive insertion through training, technical advice and support for people outside the labor force of the families of the DOLE banana company. Women's skills were strengthened to develop enterprises, based on local resources and opportunities. After the process, the development of a pilot project began in Valle La Estrella, with 24 women, which will be scaled to three other areas of the country (Guácimo, Siquirres and Sarapiquí) based on the results obtained, under the framework of the program of social responsibility of DOLE.



Another relevant initiative in Costa Rica was the project Accountability, use of technology and citizen participation for the improvement of water provision services in vulnerable communities of Costa Rica (WAPP for its acronym in English). To date, this project has allowed people who manage communal aqueducts, as well as the aqueducts themselves in rural and vulnerable areas of Costa Rica, to be strengthened. In 2021, a training process was carried out on tools to improve the accountability of the ASADAS, having a total of 17 leaders from 12 aqueducts in the country with a better understanding of the issues and being 64% women.



Additionally, a mobile application called ASADAS+ was designed and developed to improve community water management in Costa Rica, which is in its final stage. It is important to mention that this application was developed in response to the needs that the communal aqueducts have stated they need to solve. This application will be available in 2022 and available to all ASADAS and water consumers.

On Costa Rican soil, progress was also made with a project to strengthen the PES monitoring scheme of the Forest Financing Fund (FONAFIFO). The project is in the process of identifying the impacts of PSA on water resources in Costa Rica, as well as establishing a monitoring program that will generate future evidence of the evolution of the impact of PSA on water resources. In addition to this, it has contributed to strengthening the capacities of FONAFIFO to manage the PES program more effectively.

Once again, the circular economy and the role of local governments was another area of work in Costa Rica that led to the official launch, by the Costa Rican Ministry of Environment and Energy (MINAE) and the Institute for Development and Consulting, as the main result. Municipal (IFAM), of the Step-by-Step Guide to Facilitate the Transition to a Circular Economy from Local Governments. This guide, in addition to providing theory on the circular economy, analyzes the link between the circular economy and the SDGs, as well as practical aspects that enable local governments to take action. The guide, created in 2020 and launched in September 2021, served as the basis for the training process for representatives of 25 local governments from Argentina, Chile, Costa Rica, Guatemala and Peru.

Finally, with funding from the Forever Costa Rica Association, a diagnosis was started on the possibilities of developing green infrastructure on the Caribbean and Pacific coasts of the country; The objective is to characterize and evaluate the benefits and costs of the different green infrastructure options on these coasts to provide elements that allow the implementation, at scale, of nature-based solutions based on their revenue. At this time, progress has made it possible to initiate the establishment of alliances and identify priority areas for intervention.

In Salvadoran territory, progress was made in a project that designed a program of public incentives for the restoration of ecosystems and landscapes, which grouped several economic instruments, in order to promote the restoration of ecosystems and landscapes, with emphasis on productive agricultural, livestock and livestock landscapes. of forest. This program represented one of the implementation mechanisms of the National Plan for Reforestation and Restoration of Ecosystems and Landscapes of El Salvador.

Nicaragua was another Central American country in which actions were developed. In this case, it was carried out a cost-benefit analysis of the water harvesting systems implemented in the country to determine if these are financially profitable from the perspective of the producing families. The study counted with financing from the Swiss Cooperation in Central America (COSUDE). As main results It was found that the

water harvesting works are profitable from the private perspective and that the profitability of the water harvesting works increases in the scenarios where greater climatic impacts on the availability of water, because the works allow the producing families prevent further loss or weather damage. Additionally, families benefit because increase the number of sowing seasons during the year (due to the possibility of producing in dry season), also increase the cultivated area with annual and perennial crops. Therefore, it is profitable and desirable to invest in water harvesting works, especially in places where it is estimated there will be low availability of future water, as is the case of the Dry Corridor of Nicaragua.

On the Caribbean side, the Dominican Republic followed up on the Mangroves for Development project to overcome the setbacks due to the pandemic and achieve its reactivation in 2022. The result of this project will be the design of a financial mechanism to restore and conserve mangroves, same that if properly applied would positively impact the country and the Monte Cristi area, an area bordering Haiti, where poverty rates are high.

In addition, in Belize, within the framework of a consultancy, people from public institutions were trained, who were provided with a training manual on Climate Smart Agriculture. An important factor to highlight is that this initiative made it possible to strengthen relations with the Belizean government, especially, through the Ministry of Economic Development and Petroleum.

Specifically in Jamaica, with the support of CTCN, a change research agenda was developed climate 2020-2030. This agenda was presented by the Jamaican government in July 2021 and is the result of a process of co-creation with the academy, the research and development centers of the country and the private sector to support climate change objectives in the key sectors identified for a first phase: agriculture and fishing; water, human settlements, and infrastructure; waste and energy. The sectors were prioritized through a multi-criteria analysis that took into account the economic impact, the need for new knowledge to address problems related to climate change and climate, environmental and social impact.

The successful implementation of this agenda will result in better knowledge in the identified sectors, which will contribute to the generation of economic benefits through investments in strategies multi-scale mitigation and adaptation strategies for various sub-sectors. In addition, it will improve the taking of decisions through research to identify strategies that maximize social benefits by address climate change, rural poverty and food security. The adequate financing of this research and innovation agenda and the strengthening of human resources will be essential to achieve success.



Training processes

With the aim of contributing to the strengthening of human capital capacities in Latin America and El Caribbean in 2021 three courses and a diploma were developed. Below is a summary of what achieved in these processes:

Course or diploma	Results
Diploma in Associative Rural Enterprises (DERA)	24 trained professionals (50% women) 9 countries
Course in Impact Assessment of Projects and Programs	20 virtual sessions for professionals from the World Vision team, Guatemala
Basic Courses for the Administration of Rural Businesses	12 members of the Aknama Ethnotourism and Educational Services organization in Talamanca, Costa Rica, trained (75% women)
Introduction to Capacity Works	EbA LAC Program staff trained

Success Story: Informed Decisions on educational public policy

“There are two main problems at the climate level that have affected the institution. For example, when you do very hot or when it rains,” said Ana Cecilia Esquivel, a teacher at the Javillos School in Turrialba, Costa Rica, about the impact of weather conditions and school performance.

“When it rains, students decrease, they don’t come, absenteeism is older and when it is very hot then the students do not have the same disposition in their learning and the teaching staff wear themselves out more trying to call the attention for the student to master the content that is being taught”, added the teacher.



This testimony highlights the importance of the research carried out by Laura Villalobos, International Associate of EfD Central America, of CATIE, entitled Effects of climate variability on development school, whose results come to provide evidence for decision-making on policies educational institutions, for example, in aspects such as educational infrastructure. According to Villalobos, there is a need for measures to be taken to close regional educational gaps.

This research is developed by a group of researchers from Costa Rica, Colombia, and Mexico.

Contributing to
the SDG





Watersheds, water security and soils.

As part of the water resource planning line of the Watershed Unit, Water Security and Soils, progress was made in advising the Ministry of the Environment of Haiti with the inventory of water resources of the country, the current condition of this resource and projections regarding climate change. Within this advice, the proposal of solutions based on nature and mixed (structural and non-structural) is located to face, adapt, and build resilience against climate change, for which reason it is also constructing a proposal for a legal and regulatory framework for the management of water resources in the face of the situation current climate.

Within the framework of advisory projects, a preliminary analysis was generated in the Reventazón river watershed, in Costa Rica to support the management of a pilot project before the Climate Change Adaptation Fund, in support of the World Resources Institute (WRI). The study analyzed the socio ecological system that is presented in this watershed and seeks to propose nature-based solutions for future financing schemes. Likewise, work is being done on institutional coordination with the meteorological agencies of the countries of Central America and the Caribbean, in order to support the analysis of the feasibility of incorporating meteorological data real and field measurements in the parametric model of insurance associated with excess rainfall of the Caribbean Catastrophe Risk Insurance Facility (CCRIF).

● Better capacities for water harvesting

In coordination with the Water Harvest Project, implemented in Nicaragua, CATIE developed the diploma entitled Water Harvesting for Nutritional Food Security and Adaptation to Change Climate, through which it trained 25 technical professionals from the Dry Corridor area, in the territory Nicaraguan, improving their skills in food and nutritional security issues.

● Implementation of innovative tools and methodologies

The use of innovative tools and methodologies was reflected, for example, in the line of research of stable isotopes of the water, which was applied to the harvest of runoff water for agricultural uses in aquifer infiltration and recharge processes. Likewise, progress was made in the development of tools of programming based on learning machines and neural networks oriented to the zoning of the land use; and algorithms have been developed for prioritizing suitable sites for harvesting runoff water. This generated a tool based on QGis (plugin), with the aim of evolving towards a mobile application that allows reaching a wider audience of users.

In addition, work was done on incorporating the use of hydro informatic tools to automate processes based on programming and, in turn, understand the water and climate dynamics at the level of watershed and landscape.

● Incidence in water resources policies

Through its research work on the subject of water resources, CATIE has influenced the generation of the regulation and policy of water resources and climate change in Haiti, as well as in a proposal that allows the Institute National de Ressources Hydriques (INHARY) to improve its operations, specifically with the proposal of a legal framework for water management and, in this way, facilitate adaptation to climate change and the creation of a water advisory committee.

● New projects in urban watersheds

With the financial support of the World Bank, the Exécution de mesures non-structuelles project was managed pour réduire l'érosion et atténuer les risques d'inondation dans les sous-bassins versants de Zetrier et Belle Hotesse, Cap-Haïtien, in conjunction with the Ministry of Public Works, Transport and Communications of Haiti, which will allow the development of the line of work in urban watersheds or smart cities in water (water smart cities) and continue with the focus on Nature based Solutions in cities.

For its part, within the planning work with an emphasis on urban watersheds, an advisory for the Municipality of Tegucigalpa, in Honduras, in the elaboration of its municipal planning plan territory and its urban development master plan, with a focus on adaptation to climate change and comprehensive disaster risk management (GIRD), specifically for the central district municipality. Through this project, the approach to the topic of watershed planning will continue, with its modeling and the multisectoral arrangements necessary for their management.

Contributing to
the SDG





Towards a climate-smart route

Given the growing challenges the planet is currently facing, CATIE has been in charge of developing innovative technologies, mechanisms and tools through the Climate Action Unit to protect the wide range of natural and productive ecosystems in the region and the world.

● Atlas of ecosystem services of the Greater Metropolitan Area in Costa Rica

Within the framework of the Biodiver-City project – Establishment of Interurban Biological Corridors, cooperation between the governments of Germany and Costa Rica allowed the development of the Atlas of Ecosystem Services of the Greater Metropolitan Area (GAM) in Costa Rica, also known as the Green Atlas, to promote urban development alongside nature’s benefits. The Green Atlas is a one-of-a-kind tool at Costa Rica level, and feeds data and geospatial information to multiple audiences for decision making.

The information provided by the atlas is grouped into two analysis regions: the GAM, made up of 31 cantons; and the interurban biological corridors of the Torres River, the María Aguilar River and the cantons of San José, Montes de Oca, Curridabat and La Unión. Likewise, it is structured across several thematic axes, including ecosystem services, biodiversity, urban heating, green infrastructure, land use and cover, and ecological connectivity. The Green Atlas was co-developed with Municipalities to support their urban planning efforts.

Commissioned by the German cooperation for development -GIZ-, the instrument was developed by CATIE under close articulation with MINAE, the National Center for Geo-environmental Information (CENIGA), SINAC and the technical support of the Helmholtz Institute of Environmental Studies (UFZ).

● Integrated research in Costa Rica´s Blue Carbon strategy

The Climate Action Unit has been supporting the Blue Carbon agenda for almost a decade with work that started with research focused on assessing carbon stocks across different geographies and evolved into supporting national level integrated strategies, methodologies and information.

As part of the line of work on blue carbon, the Ecosystem Modeling Laboratory has been implementing three studies during 2021 to support the comprehensive mangroves monitoring system in Costa Rica:

1. CI-PEW Blue Carbon Project

With the purpose of supporting the commitments of the United Nations Framework Convention on Climate Change (UNFCCC), the Blue Carbon project consisted of developing methods and technical guidance to update the national inventory of blue carbon and the baseline of Costa Rica. The project produced four main outputs:

- a. Methodological guide and technical assistance for the improvement of the blue carbon inventory and baseline.
- a. Analysis of the historical dynamics of land use-cover in mangrove ecosystems in the January-April 2021 period.
- a. Facilitate the development of a monitoring platform for coastal wetlands.
- a. Strengthening of technical capacities in the use of earth observation tools and data.

Through the developed products, it seeks to meet country demand on knowledge development, and supporting policies for the conservation and restoration of mangroves and innovative finance mechanisms and environmental conservation in the country. In addition, it is supporting a national-level processes allowing Costa Rica to include and report blue carbon within its National Inventory of Greenhouse Gases (INGEI) and Monitoring, Reporting and Verification (MRV) systems towards UNFCCC goals.



2. Baseline creation for the integral monitoring system of the mangrove ecosystems of the Gulf of Nicoya

As part of the efforts in the Regional Strategy for the Management and Conservation of Mangroves in the Gulf of Nicoya, the project unites different initiatives within SINAC, such as the National Forest Inventory Program (INF) and the National Monitoring System Forestry (SNMF), to the establishment of a comprehensive monitoring system for mangrove ecosystems and blue carbon monitoring.

The project's objective was to establish permanent monitoring plots that provide updated data on extension, characteristics, biomass, health and current status of the mangrove ecosystem. For this, SINAC coordinated joint efforts from the National Wetlands Program and the INF to increase the number of permanent parcels within the mangrove ecosystems of the Gulf of Nicoya area.

To achieve this, we started from the collection of information embodied in the Regional Strategy for the Management and Conservation of Mangroves in the Gulf of Nicoya for implementing processes and methodologies to ensure the integration of monitoring actions to support long-term mangroves' management.



3. Ecological rehabilitation of the mangrove ecosystem in the Estero Puntarenas Wetland and associated mangroves

Altogether with an interdisciplinary team of professionals and experts in environmental and social sciences and in biodiversity management, the most ambitious mangrove restoration action in the country started activities across 300 hectares in the Estero Puntarenas Wetland and Associated Mangroves (HEPyMA) area. The project was developed in collaboration with national authorities and through community participatory processes. The main project goals can be summarized as follows:

1. Identification of sites in the HEPyMA ecosystem that present adequate conditions for their rehabilitation and restoration.
2. Develop a mangrove rehabilitation and restoration plan through a participatory process with the communities.
3. Mangrove rehabilitation in selected areas.
4. Developing a monitoring system for mangrove rehabilitation and carbon stocks.
5. Strengthen institutional and community capacities in mangrove rehabilitation processes.



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IV Section

Finances and corporate services



● Healthy numbers

CATIE, in the last six years, has carried out commendable work in all its fields of action, but especially in managing the administration and its finances, to the point that it has once again had a budget such as that of the years 2014 or 2015, closing their financial statements in a positive way, maintaining an adequate management of assets, liabilities and equity of the institution.

The increase in its budget is due to the success in achieving the proposals made to donors which have returned to the institution, among them we can mention SIDA, GIZ, UNDP and IKI. Certainly, the COVID-19 pandemic brought a series of limitations that were overcome during the 2021, resulting in the resumption of 100% payment of staff salaries without undermining institutional finance.

However, each year is a new challenge for the institution due to the nature of its constitution and the way of its financing, for which a consolidated solvency must be shown in the execution of the projects, in the generation of its own resources, in the recovery of the partners' fees and an adequate austerity in the execution of their expenses. In addition to this, CATIE has the challenge of continuing to remain as a leading institution in the management of regional research and development projects, from the perspective of different cooperators.

To respond to these challenges, CATIE intends to continue seeking resources to strengthen its trust, currently managed by Fundatropicos, as well as to continue participating in proposals for the management of Projects. On the other hand, it is intended in the short term to have a new and modern computer system and reporting, which allows generating efficient and timely information for decision making.

For the year 2021, the income expectations were met and once the commitments were covered, CATIE obtained a positive result, maintaining a positive cash flow.

Finally, the institution continued the process of renovating the buildings and updating the equipment of the administrative and educational area of the campus, thanks to the contribution of American Schools and Hospitals funds Abroad (ASHA of the United States Agency for International Development (USAID) and participation in the Verto Education program, with an investment of approximately USD 700,000.

● Human resource development

The management of the Human Development area was oriented in 2021 to make contributions in accordance with the PEI, seeking rationalization and optimization of available human resources; In addition to developing and retain an existing human resource and highlight high-potential people within your role of work.

The issue of gender equality continued to be a priority, which is why salary analyzes were carried out with the to maintain fairness. Also, the integration of the participation and appointment of women in management, coordination, leadership, representation, and liaison positions in countries. Of three addresses that make up the institution, one of them is occupied by a woman. On the other hand, the units of investigation have the leadership of three women: while in the countries as representatives and links there are four women.

In this same sense, the coordinator vacancy for the Inclusion and Gender Unit was published, whose objective is to lead research and the mainstreaming of the gender approach in research, education, and outreach actions.

As for the generational change, an imminent process within the institution, 2021 marked its beginning; the administration and finance area was strengthened with the hiring of new collaborators.

Staff training was covered through agreements with cooperatives, schools, and public institutions, according to your position.

At the level of institutional regulations, the revision of the regulations for consultants was concluded to update and apply changes in accordance with institutional practice and partner requirements.

Finally, progress was made with the development of a gender policy and a teleworking policy, with which it is estimated to count in 2022.

Commercial area and fundraising

The year 2021 represented a great challenge for CATIE's Commercial Area, in the context of the pandemic and the crisis generated important pressures on the financial performance of the area, forcing the team of work to manage innovative solutions.

However, the commercial activity that generated the most financial income in the area was the visitation of 300 students from different North American universities, organized by the company Verto Education. This activity generated close to USD 1,000,000 in income during 2021 and of that, approximately 40% was allocated to infrastructure improvements and indirect costs, representing a highly relevant income for the institution.

The Forest Seed Bank and the Biotechnology Laboratory strengthened and expanded their actions propagation of coffee hybrids. Despite being a complex year, the growth of this commercial activity was profitable and exceeded revenue expectations.

For its part, the Botanical Garden, which depends practically 100% on the income generated by visits of tourists, has experienced a slow financial recovery. One of the innovative strategies that were implemented during the year was to organize sports and recreational activities on campus of CATIE that attracted visitors.

In addition to the pressure generated by the economic context, the agricultural activity of sugar cane, within of CATIE's Commercial Farm, reflected a complex year as a result of the difficult situation of the sugarcane sector of Turrialba. The Ingenio Juan Viñas processing factory, the only one in the region, has been progressively reducing the reception of sugar cane from local producers, including CATIE, which affected the annual performance of the cane business.

● Creation of the IICA-CATIE Investment Fund

Thanks to an agreement between IICA and CATIE, it was decided to create the IICA-CATIE Investment Fund to finance the development of productive and commercial activities. This fund is financed with a percentage of the contribution that IICA makes to CATIE's basic budget. In 2021, two productive projects were financed; one to strengthen and expand the propagation program of coffee hybrids and another to improve the infrastructure and the efficiency of the processes of the dairy farm. These two projects will begin to generate effective income from 2022, allowing materialize an early recovery of investments.

It is expected that by 2022 new productive investments will be implemented that will give sustainability to this Investment fund.

● Fund-raising

During 2021, the work and link with the Tropics Foundation in the United States of America was strengthened and with Fundatropicos in Costa Rica. Both foundations went through important restructuring processes and reorganization that seek to improve their capacity to generate income for CATIE.

Tropics Foundation strengthened its Board of Directors, restructured its strategic approach and redefined its fundraising strategies. The foundation will manage funds for the scholarship program of the School of Postgraduate studies at CATIE and for some other research initiatives, such as the conservation and genetic improvement of coffee and cacao.

For its part, Fundatropicos redesigned its governance by creating an investment committee and the hiring of an investment advisory firm that rethought the strategies aligned with the policy of investment but adapted to the current conditions of the national and international markets. This seeks to increase the return on the investment portfolio while maintaining the historical risk levels that has managed the trust.

V Section



CATIE in the region

In 2021, CATIE, from the management of the Directorate of Outreach and Global Alliances, in coordination with the National Offices and Liaison Offices continued to work in the context of COVID-19, with the precaution of maintaining the health standards of each country, as well as respecting the guidelines from the headquarters in Costa Rica. Priorities were maintained to continue with the execution of the national projects and support for regional projects, coordinating with the forms of work of the institutions, of producers, rural families and local partners.

Considering the effects of the pandemic and the situations in each country, the contribution of the National Offices was aimed at making efforts to reactivate the activities mandated by CATIE. The country representatives increased their efforts to keep active the commitments for the execution of projects and manage new initiatives. Also, training continued in the virtual modality, as well as with the construction of new regional and national alliances.

In turn, the National Offices were integrated into the management of new regional initiatives led by CATIE's research units, which included different countries, providing information and managing the participation of local actors. Likewise, each National Office continued to search for new local opportunities, articulating proposals in coordination with said units.

The adjustment to the new reality has not been an extreme limitation to maintain the level of initiative management nationals. Below is a brief description of the main initiatives for 2021:

- Second phase of the National Information Platform Project (PIN II), Guatemala
- Amount: USD 2,900,000, by the European Union.
- Additional resources for the Project Adaptation of Agriculture to Climate Change to through the Water Harvest in Nicaragua (Water Harvest-Phase II)
- Amount: USD 1,000,000, by COSUDE.
- Allocation of resources for the Center for Extension and Use of Research in Peru
- Amount: USD 1,000,000, by USAID.
- Signing of an agreement with ONCGWA, a non-governmental organization from Spain, to finance the Project Nature as a Safeguard of the Human Right to Water in the Context of the COVID 19 in Nicaragua.

It should be noted that resources of smaller amounts were obtained in Haiti, the Dominican Republic, El Salvador, Colombia, Bolivia, and Belize, oriented mainly to training and short-term technical services.

At the regional level, the Office of Global Alliances, together with the investigation units, achieved important resources, which, integrated into national efforts, add up to USD 15.7 million.

This was achieved thanks to good coordination and permanent communication with the units of CATIE research and the National Offices in the member countries, who played a key role for the success of these initiatives.

Additionally, the National Offices successfully conducted 12 national and regional projects, among them:

Nationals

- National Nutrition Information Platform Project (PiNN-Phase I), Guatemala
- Adaptation of Agriculture to Climate Change through Water Harvesting in Nicaragua Conservation and Sustainable Management Project of the Acatenango Volcano Forest Landscape, Cerro Sanay and Montaña El Socó, in Guatemala
- Project Towards a Productive Coffee Sector, Inclusive and Adapted to Climate Change, in Peru
- Comprehensive Amazon Forest Conservation and Sustainable Production Program, PROAmazonía, Ecuador
- Mangroves for Development Project Strengthening Livelihoods and Climate Resilience in the Caribbean of the Dominican Republic Regional

Regionals

- Climate Change Adaptation Project in the Dry Corridor of Guatemala
- Technical assistance for the Tropical Forest Protection and Watershed Management Program in the Trifinio Region
- Adapted Agroforestry Systems Project for the Central American Dry Corridor (AGROINNOVA)
- Central American Program for Comprehensive Management of Coffee Rust (PROCAGICA)
- Program Scaling Up Ecosystem-based Adaptation Measures (EbA) in rural Latin America in Costa Rica, Guatemala and Ecuador
- Project Development of Sustainable Management Models for Secondary Forests and their Links with Private Financing

The National Offices were also key players in the management of agreements and in obtaining scholarships for postgraduate studies at CATIE, provided by governments in the case of the Dominican Republic and Panama.

The most relevant actions in each country are detailed below:



Mexico

CATIE's actions in Mexican lands have been made up of through training, research, public policy management and alliances between the country's partners. Projects like Bio-PaSOS, which is executed in the states of Jalisco, Chiapas and Campeche, has made a significant contribution to strengthening the capacities of more than 1,200 producers on sustainable livestock issues and good farming practices.

In addition, it has achieved the establishment of networks of young people and women to monitor biodiversity in the state of Campeche, using the iNaturalist mobile application, as well such as the signing of collaboration agreements and master conferences by the Livestock and Environmental Management Unit.

Currently, CATIE has more than 21 agreements and 10 cooperation agreements in Mexico, with which Spaces for collaboration have been opened at the local level and, in this way, it has contributed the country with strategies and processes to improve the livelihoods of rural families, and promote academic, investigative and political synergies.

Therefore, under the understanding that cattle ranching is one of the most important land uses in the three states mentioned and, on which thousands of Mexican families depend, the coordination of AGRICULTURE; the SADER of the state of Jalisco; the SA-GyP of the state of Chiapas; the SDR of the state of Campeche; and with the support of CATIE and IICA, signed the Declaration on Sustainable Livestock Mexico, 2021.

Through the declaration, the signatories committed to promoting sustainable livestock with the participation of partners and allies from research centers, universities, society civil society, financial institutions, companies in the agri-food sector and international organizations that contribute to generate and use knowledge with social equity, as well as improve productivity and management sustainability of biodiversity and natural resources.

Sustainable livestock farming will allow the implementation of good livestock practices, such as silvopastoral systems, to develop production systems that are more resilient to climate variability, productive and, therefore, that improve the well-being of families.



Guatemala

During 2021, the development of new projects and consultancies was possible in Guatemalan lands, such as the Strengthening of the Transparency Framework Through National Capacity Building to Implement the Paris Agreement in Guatemala, as well as Services for the Development of a Risk Promotion Policy and your Investment Plan; updating and analysis of irrigation potential from Guatemala; proposal for the Irrigation Investment Plan 2023-2032; Y the proposed Irrigation Promotion Policy 2023-2032.

Among the contributions for Guatemalan families, impact was made on 111 families through training processes with the methodology of FFS, which addressed issues focused on agroforestry systems, climate change, water and soil management. Also, he was trained to 1,373 professionals, technicians, decision makers, local authorities and national for institutional strengthening processes.

As part of the projects developed during 2021, the following stand out:

Conservation and Sustainable Management of the Forest Landscape Acatenango Volcano, Cerro Sanay and Montaña El Socó: this project achieved 100,000 forest templates produced and delivered; train and certify 30 firefighters; establish 198 ha with agroforestry systems (SAF); benefit 45 families through incentives for soil conservation and SAF; engage 177 people in exchanges of experiences; train 23 new community tour guides; design and launch the campaign “Discover, love and preserve”; and involve more than 60 families in training modules on soils, SAF and good agricultural practices.

Phase I of the National Nutrition Information Platform Project (PiNN): More than 1,130 people participated in capacity building processes; the Information System was strengthened, Monitoring and Warning of Food and Nutritional Insecurity (SIINSAN); information systems were incorporated departmental and municipal to SIINSAN2; eight Municipal Information systems were established Food and Nutrition Security (SiMSAN) in Totonicapán; and six inputs for advocacy were developed and strengthening of public policies, among others.

Economic Development and Sustainable Territorial Governance in the Sarstún River Adjacency Zone, Guatemala: 12 community leaders were trained in FFS and farm plans; as well as 89 families in themes of agroforestry productive diversification and 45 technical people through workshops. In addition, they established 99 ha of SAF and 82 farm plans were developed and implemented.

Phase II of the PiNN Project: through this project, seven regional socialization workshops have been developed of the operating cycle and scaling of the SIDESAN and SiMSAN systems. Also, materials were disclosed informative to 425 delegates and monitors of SESAN; a methodological guide was prepared for workshops regional; and the state of the art of the SDGs, climate change and food systems. All these contributions to add to food and nutritional security.



Belize

In this country, CATIE and the private sector joined forces for the development of a productive and resilient livestock. The Association of Belize Ranchers (BLPA) has worked with CATIE for three years in the evaluation and dissemination of innovations that contribute to the rehabilitation of degraded pastures, the implementation of silvopastoral options and other interventions that contribute to reducing GHG emissions, lessen the impacts of climate change and increase productivity and income in beef cattle in that country. Throughout this process, it has been promoted the application of agroecological principles in production livestock, through the implementation of technologies that CATIE has tested for several years in different countries of Mesoamerica.

Among the technologies tested on model farms in three districts (Belize, Orange Walk and Key) are the establishment of pastures improved that have shown high production and nutritional quality, but above all adaptation to ecological and management conditions prevalent in Belize; the incorporation of the legume *Leucaena* in alleys in association with pastures; setting up systems intensive rotation using living fences with solar cells; installation of water harvesting systems for animal drink; and the use of feeding strategies in the dry period, such as silage and multi-nutritional blocks. This project has also allowed the development of capacities for the sustainable intensification of livestock Belizean, both in leading producers of the three participating districts, as well as in personnel technician of the Ministry of Agriculture, Food Safety and Entrepreneurship.



Dominican Republic

In recent years, the Dominican Republic has become a member of CATIE, which has allowed develop actions in the country to provide a timely response to the demands and needs in different areas of the agricultural sector.

Its activities have focused mainly on the agri-food sector in conjunction with various ministries, the academic sector, international cooperation, and the private sector. The latter includes companies, non-governmental organizations (NGOs), consulting firms and institutions.

Below is a summary of the most relevant activities carried out:

- Establishment of coffee plots under agroforestry systems, training for technicians and producers on issues of coffee production chain, and the development of manuals on coffee production systems.
- Research and validation of cacao clones tolerant to diseases, as well as training for technicians and producers.
- Accompaniment to the General Directorate of Livestock of the Ministry of Agriculture in the training of human resources and training for technicians for sustainable production.
- A study of the measurement of CO₂ in plantations was completed. non-forested at the country level; An instrument was designed forest monitoring and the technicians who are currently responsible for this were trained. monitoring.
- Under the Training Unit of the Postgraduate School, seven guides are currently being worked on techniques in different areas and production chains.
- In the field of capacity building, CATIE has graduated until 2021, at the level of master's degree, to more than 90 professionals from the Dominican Republic.
- The cooperation framework agreement was signed with the country's Ministry of the Environment Dominican, in which the Mangroves for Development project is registered as one of the priorities of the ministry's strategic plan. Together, we will work to successfully achieve the sustainability of prioritized actions.



Honduras

For more than 35 years, CATIE has been constant in providing support to Honduran country in priority areas for job creation and income through coffee, cacao, and sustainable livestock. In addition, the joint work has been emphatic in the proper management of watersheds, forest restoration, forest management, increase in the welfare of rural families with business plans and market strategies for the agri-food sector, as well as as the attention in an improvement of the ecological and rural tourism.

In turn, an issue of great importance for CATIE was the accompaniment in the transfer of methodologies applied to systems of sustainable production, which contribute significantly to the NDCs. Through important contributions in the different sectors productive, the institution has achieved:

- Modernize the coffee subsector. In this sense, the PROCAGICA project introduced two new coffee varieties that contribute to strengthening the genetics of the crop and will allow against new strains of rust.
- Approval of the Livestock NAMA proposal, which will be an essential support to promote the transformation of the livestock production system towards a substantial reduction of emissions and, at the same time, improve family income.
- Contribute, through the Chocolate4All project, to the country's commitments in its NDCs and more than 1,100 producers from the department of Olancho have attended: in addition to eight local organizations. Also, assistance was provided to 125 producers of the PECH ethnic group.
- Begin the implementation of the low-emission sustainable livestock component through of two ECAs and 10 demonstration plots, together with the Program for Inclusive Development Territorial Economic Commission (DEIT) of the Swiss Agency for Development and Cooperation (SDC).
- Implement the sustainable farm model, which has made it possible to serve 450 producer families to incorporate timber and fruit trees that diversify family income and provide environmental stability.



- Together with INNOVATERRA, form a consortium to prepare the Municipal Planning Plan Territorial Plan (PMOT) and the Master Plan for Urban Development (PMDU) with a focus on adaptation to climate change and comprehensive disaster risk management.
- Prepare a proposal before the Adaptation Fund to develop the Uses of Solutions project. Based on Nature to Increase Resilience to Extreme Weather Events in the Atlantic Region of Honduras, Belize and Guatemala, this project will generate a in 55,000 inhabitants of the marine-coastal line of the municipalities of Omoa, Puerto Cortés and part of San Pedro Sula.

In follow-up to capacity building and knowledge management, CATIE also contributed with the training of the country's human resources and, by 2021, more than 170 people have graduated from the programs master's degree, in addition, the institution has promoted in the country training in the issues of sustainable livestock and water resource management.



El Salvador

- During 2021, the National Office of El Salvador developed three projects under the modality consulting. The first of them was a social and environmental analysis of the river watershed Goascorán for PMA, in order to evaluate the project that they would present to the Green Fund of Climate, whose objective is to strengthen the capacity of adaptation to climate change of vulnerable households in the degraded Goascorán transboundary watershed in El Salvador and Honduras, providing communities with integrated management tools and services climate risks that improve their resilience to climate variability and change.
- To develop this consultancy, a diagnosis of the current situation of the watershed and of the municipalities and communities, in which, through focus groups, the environmental situation and in terms of inclusion of gender and indigenous people, in coordination with the municipal governments. The main result of this consultancy was that they reflected the needs of the intervened communities, emphasizing women, youth, and indigenous peoples, so that their requirements are taken into account in the development of the WFP project.
- The second consultancy was for the Latin American Coordinator and the Caribbean of Small Producers and Workers of Fair Trade (CLAC), in which CATIE elaborated the guidelines for a regional public policy in the face of change from the perspective of small producers' fair trade. For this purpose, consultations were made to leaders of the coordinators national and other actors from different countries considered, as well as consultation workshops and virtual validation. At the end, documents and communicative materials will be generated to share with small producers. This proposal is developed within the framework of the Project INTERCAMBIO: Advocacy and Regional Leadership in Climate Change, which seeks to support the producers in their efforts to influence and adapt to climate change in five countries (Bolivia, Ecuador, El Salvador, Guatemala, and Nicaragua).



El Salvador

- Finally, the third consultancy was for the Salvadoran Coordinator of Small Producers (CESPPO) and consisted of developing training courses on leadership, climate change and productive activities in coffee. 17 technical people from the organizations and cooperatives that are part of CESPPO, which is the national figure that represents the small, organized producers under the fair-trade system in El Salvador. Also, Developed regional guide on advocacy, leadership, and change.
-
- Course participants ranged from 16 to 55 years old, with 40% of participants under 25 years old. Regarding the composition of the group by gender, there was 40% women and 60% men. The training consisted of five sessions, the topics addressed were: climate and climate change; adaptation, mitigation and vulnerability to change climate; leadership, incidence and gender equality; as well as adaptation and mitigation practices to climate change. One of the methodological elements used during the training was the Methodology for the Analysis of Vulnerability in Coffee Farms, developed by CATIE.



El Salvador

CATIE's work in the Salvadoran territory for 2021 was carried out with the support of multiple partners to different scales:

National:

- Ministry of Agriculture and Livestock
- Ministry of Environment and Natural Resources

Local:

- Municipal governments of Pasaquina, Anamorós, Lislique and La Unión

Regional:

- Central American Integration System (SICA)
- Central American Commission for Environment and Development (CCAD)
- Regional Committee for Hydraulic Resources (CRRH)
- OIRSA
- Trifinio Plan Commission
- World Food Program (WFP)
- USAID

Organizational and non-governmental:

- Latin American and Caribbean Coordinator of Small Producers and Workers of Fair Trade (CLAC)
- Salvadoran Coordination of Small Producers (CESPPO)
- Environmental Investment Fund (FIAES)

Academic:

- University of El Salvador, Faculty of Agronomy



Through the implementation of agroforestry systems (SAF) of coffee, the introduction of F1 hybrids and their assembly in validation trials, as well as the supply of wild varieties of coffee, the CATIE supports Panama's efforts to maintain the quality of its production and establish adaptation strategies to climate change for the coffee sector.

Through the Adaptation Fund (implemented by NATURA and the Ministry of Agricultural Development), CATIE, together with the Renaissance Producers Association, executed a project to establish coffee SAF and restore the gallery forest in the Caisán river sub-watershed and in the Renacimiento district.

With the implementation of the project, methodologies were used to assess the vulnerability of 25 farms coffee plantations in the face of the adverse effects of climate change, of which 14 of them are managed by women.

In two ha of each farm, coffee SAFs with disease-resistant varieties were established, such as rust, this to turn them into providers of this variety for other producers region of. Likewise, the introduction of six F1 hybrids produced by CATIE (Central American, Casiopea, Excelencia, Milenio, H3 and Esperanza) and were distributed in eight different farms to assess their performance.

On the other hand, CATIE delivered seeds of wild coffee material to the germplasm bank of the Institute of Agricultural Innovation of Panama (IDIAP) to strengthen and expand the country's genetic heritage in this crop.



Colombia

CATIE in Colombia participated in the preparation of various proposals with local and international partners on different themes: forests and biodiversity, sustainable transformation of livestock agroecosystems, forest inventory, infrastructure green short and medium term for the management of water resources, implementation of good farming practices, One Health, innovations climate-smart environments for livestock, climate resilience in livestock systems and risk reduction of ecosystem-based disasters. To all these calls was applied with the purpose of responding to the demands and needs of the country in environmental aspects, agriculture and natural resources.

On the other hand, in 2021 the institution continued to operate two Projects; one on improving cacao production using improved germplasm and climate-friendly farming practices intelligent; and the second on systems strengthening of Monitoring, Review and Verification (MRV) and monitoring and evaluation around adaptation and mitigation measures in value chains of milk and meat, in two pilot areas of the Colombian Caribbean.

In addition to this, CATIE was present at several events held out on Colombian soil, including:

- Summit Nariño Innova 2021, a space in which global science trends were discussed, technology and innovation in the agricultural and agribusiness sectors, alternative energies, environment, biodiversity and water, cultural industry and information technology and communication, human development and health. CATIE presented its One Health approach at the integrity of the territory.
- Socialization day of final results and products of new knowledge, as elements generators of public policies for development and social welfare in the department of Magdalena. CATIE made scientific investigative contributions addressing the subject of perspectives of public policies as elements that generate change in populations resilient to climate variability and change in tropical dry forest regions.
- International Agricultural Innovation Fair - El Campo Innova, organized by the Ministry of Agriculture and Rural Development, virtually, from September 22 to 25.



Colombia

- International Fair of the Environment (FIMA), CATIE exhibited with the help of researchers from the areas of watersheds and climate action about solutions based on the nature and cities, also presenting the +Ríoslimpios projects and the Atlas of Services Ecosystems of the GAM of Costa Rica.

Another item that was addressed was capacity building through a workshop on how to establish silvopastoral systems and their benefits, as well as the creation of farm plans. The training was directed producers and associates of the Cooperative of Milk Producers of the Atlantic Coast (COOLECHERA). In total, 28 people participated in person and 30 virtually.

The creation of alliances to carry out joint work was also followed up during 2021 in Colombia. In this sense, 11 cooperation agreements were negotiated, which involved institutions such as the Colombian Federation of Livestock Farmers (FEDEGAN), the FAO, the University of the Amazon, the Institute technology of Putumayo, the University of Nariño, the National University of Colombia, the Pontifical Javeriana University, the Guaya canal Foundation, Brinkman Group, COOLECHERA and the National University Distance Open (UNAD).



CATIE in Peru focused its efforts on following up on actions of six projects that are developed in the country on the topics of:

1. Productive coffee sector, inclusive and adapted to climate change.
2. Improving cacao production through the use of improved germplasm and climate-friendly farming intelligent practices
3. Initiative 20x20 for the restoration of 20 million hectares of degraded land in Latin America and the Caribbean.
4. Model Forests, in the territories of Pichanaki, Huayabamba River Abiseo and Villa Rica.
5. Mechanisms and networks for the transfer of related technology with climate change.
6. Sustainable intensification of livestock in productive sustainable landscapes.



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Annual REPORT 2021