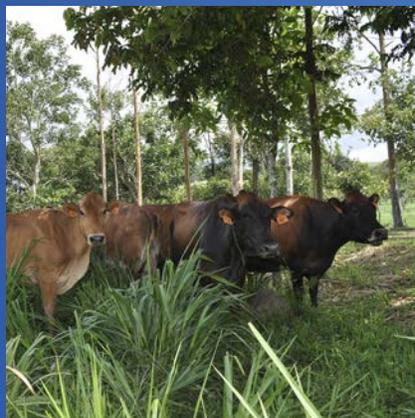
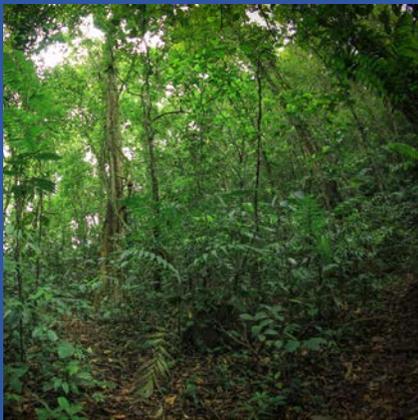


CATIE

Solutions for environment and development
Soluciones para el ambiente y desarrollo

Annual Report 2020



Presentation

In 2020, CATIE, its member countries, and the rest of humanity faced health and climatic emergencies that have affected the achievement global society of some of the proposed goals, as the countries have been forced to modify – at least in the short and medium-term – the priorities and ways of working of institutions, producers, rural families, and even consumers.

The crisis generated by the COVID-19 pandemic began to manifest itself in the region in March 2020, and in the following months, the problem escalated until it seriously compromised the economy of families and countries. This reality forced the countries to implement health emergency measures on the spot, which implied adjustments at all levels. This also required CATIE to adjust the modes of operation and support to the countries through its services. One of the most impacted sectors, where it was necessary to act quickly, was in the attention of local economies and food security.

At the time of the issuance of this Annual Report, many countries are still going through the third wave of very strong infections accompanied by more aggressive variants of the original virus and, in some cases, more deadly. The CATIE region does not escape this situation; therefore, the impacts of the Pandemic, in all aspects, cannot be accurately estimated yet.

Fortunately, CATIE has taken health protection measures and austerity in expenditure, which have allowed it to advance in the direction of its institutional mission, as shown in this 2020 Annual Report. This can be seen with the progress made in the modernization of educational programs, the management of new projects, the consolidation of research actions in the region and the countries, the start of institutional modernization processes by having a new enterprise and financial resource management system (ERP), and finalize its new Institutional Strategic Plan 2021–2030.

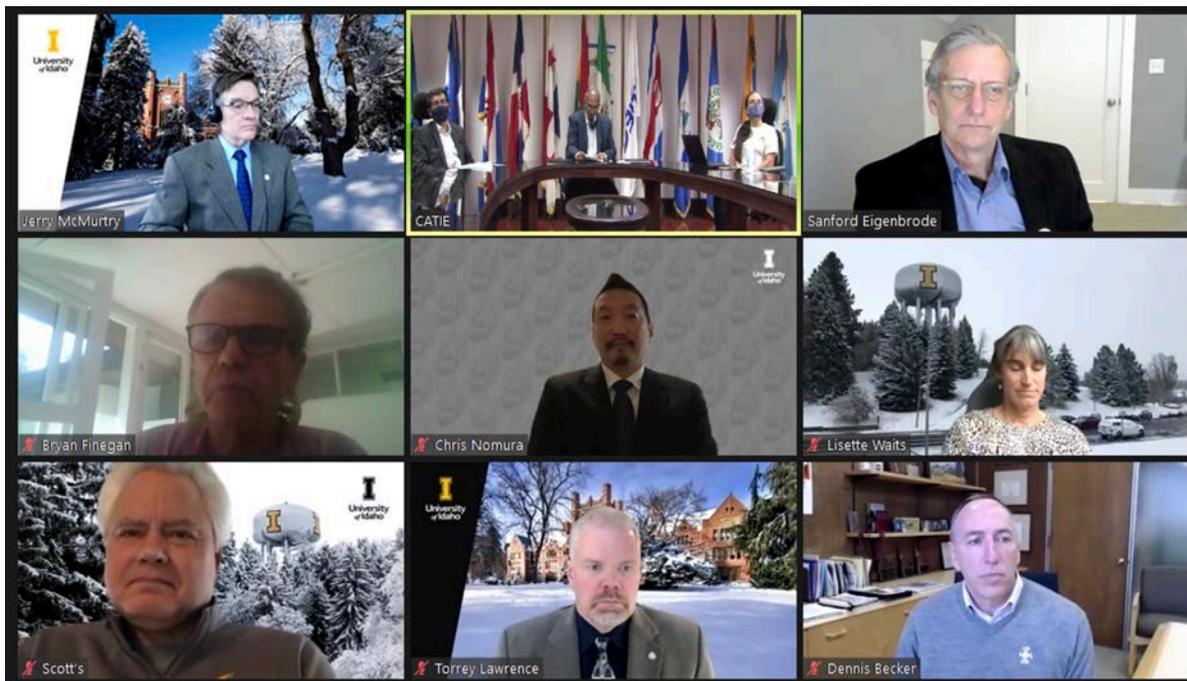
CATIE a quick view

Joint Doctoral Program CATIE and the University of Idaho: 20 years of training professionals

Since June 2001, CATIE and the University of Idaho have jointly taught a doctoral program, from which a total of 33 professionals (17 men and 16 women) have graduated. All from the United States, Mexico, Puerto Rico, Nicaragua, Costa Rica, Colombia, and Japan. In 2020, both institutions virtually signed an agreement through which they agreed to continue this program until July 2025.

This program has been an extraordinarily successful international partnership since its inception and has provided a unique opportunity for doctoral students interested in conducting interdisciplinary research focused on the sustainability of forestry, agriculture, and the health of rural communities in the American tropics. Its continuity will help to continue providing solutions to global problems, as well as to strengthen the international reputation of both universities.

In this doctoral program, whose official language is English, the student is awarded the title of Doctor of Philosophy, which is accredited by the University of Idaho and the National Accreditation System for Higher Education of Costa Rica (SINAES, by its acronym in Spanish); therefore, guaranteeing its quality and excellence.

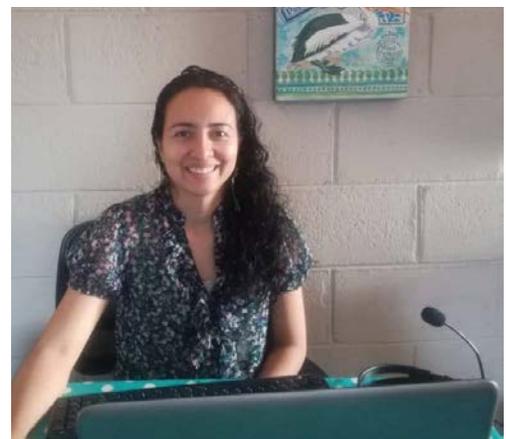


A graduate of CATIE is the new coordinator for Central America of the *World Migratory Bird Day*

Leticia Andino, salvadorian, biologist-ornithologist, graduated from CATIE with a master's degree in Management and Conservation of Tropical Forests and Biodiversity, is the new coordinator for Central America of the World Migratory Bird Day, a program of the NGO Environment for the Americas.

Leticia mentioned that, at CATIE, she acquired knowledge on management and conservation of natural resources, ecosystem restoration, livelihoods, ecosystem services, connectivity, etc. All have been key to awakening her interest in working closely with people and promoting social change towards the sustainable use of natural resources.

“It is an honor for me to have been considered for this position, and I hope to ensure that all Central American countries have a participation year after year in the World Migratory Bird Day campaign and that they are seen as a single region that works towards the conservation and protection of birds and their habitats” Leticia stated.



Progressing with solidarity in the Dominican Republic

The national program Progressing with Solidarity (PROSOLI, by its acronym in Spanish), executed by the Presidency of the Government of the Dominican Republic, has the CATIE seal of approval. Fausto Abel Ortiz Núñez, who graduated from CATIE's master's degree in Agroforestry and Sustainable Agriculture in 2020, is the current deputy director of the Family Farming project.

PROSOLI is the main social protection program of the Dominican government and it also is a major strategy for the eradication of poverty. Families in vulnerable situations are involved in this program, and it directs its actions towards comprehensive development through co-responsibilities for income generation, promoting food and nutritional security, health, and education.

“The experience at CATIE was, has been, and will be an achievement of which I will be extremely proud, for the simple fact of improving my knowledge to contribute directly to sustainable human well-being, inclusion, and the development of communities. Likewise, knowing and sharing this experience with friends, colleagues, and people from other cultures makes this another achievement in my professional life”.

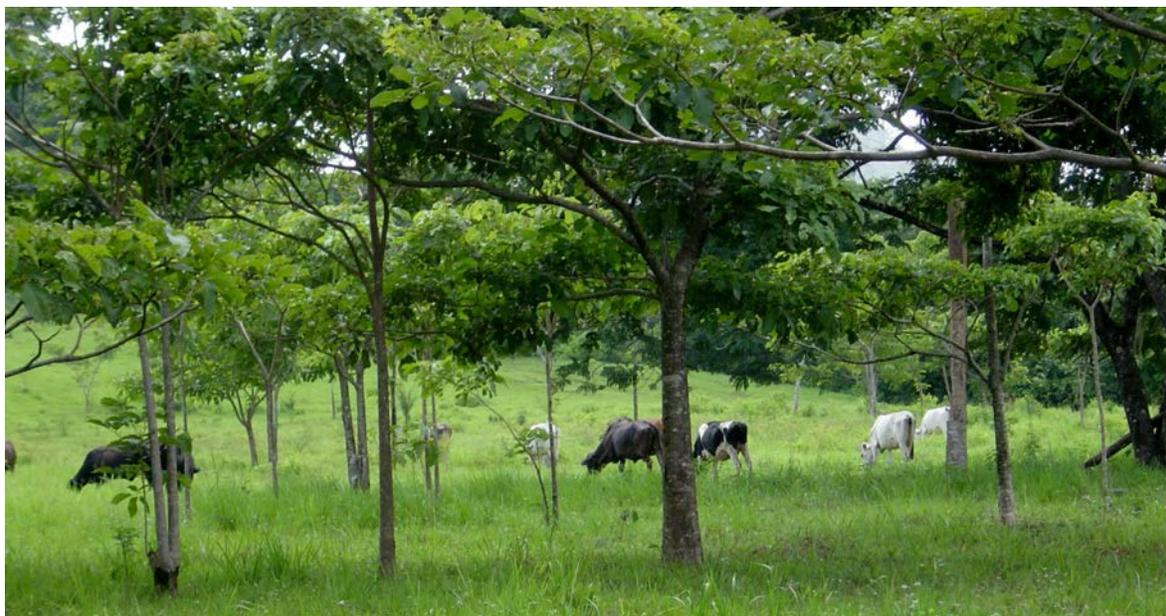


Organizations and leaders of the Honduran livestock sector align efforts to transform Honduran livestock into a low-carbon economy

National authorities and leaders of the public and private sectors, unions, NGOs, universities, and international cooperation institutions collectively invested many hours to propose ideas, discuss intervention strategies and achieve a consensus to design the Livestock NAMA Support Project (NSP). This project seeks to transform Honduran livestock through a technical assistance approach, which promotes the adoption of low-carbon and profitable technological packages for livestock farmers. It is accompanied by innovative financing to catalyze adoption in a massive and timely manner, and aligning policies and incentives to break down the barriers that limit the sector to reach levels of higher productivity and profitability, lower emissions, more carbon sequestration, and achieve sustained growth.

“What amazes me about the exercise we are doing with this Livestock NAMA is that the opinions of all sectors are being considered and agreed upon. This will really set a precedent for projects of this category”, stated Carmen García, representative of the National Milk Chamber (CAHLE, by its acronym in Spanish).

CATIE, as project leader, is coordinating with its local and international partners the formulation of the development document for the Livestock NAMA Project in Honduras. The expectation is to start project activities in 2021.



Strengthening community water management in vulnerable communities in Costa Rica through alliances and innovative actions

In the framework of the WAPP project, the Sustainable Economy, Environment and Agribusiness Unit and the global network *Environment for Development* (EfD) organized a hackathon in 2020, i.e., a virtual contest based on collaboratively solving a specific problem, using technology. Through the hackathon “Connecting youth + technology + water”, young Costa Ricans between the ages of 15 and 25 got involved in water management in their communities and designed solutions to improve the communication between the ASADAS (communal aqueducts) and the beneficiaries of the potable water service, to improve this service. The proposals of the young people will serve as input for the design of a mobile application (App) that will improve the water service in vulnerable rural communities through communication and community participation in the management of water resources.

Along with this important result, alliances were established, and they had the support of the United States Embassy in Costa Rica, through the Central American Regional Security Initiative (CARSI, by its acronym in Spanish). They were also endorsed by private companies and public institutions, such as the Ministry of Science and Technology (MICITT, by its acronym in Spanish) of the government of Costa Rica.

“The contribution of young people will improve access to water, economic growth, and the reduction of inequality through the technologies created by each project”, Sharon Day, Ambassador of the United States in Costa Rica.



Improving food and nutrition security

CATIE and the Secretariat for Food and Nutrition Security of the Presidency of the Republic of Guatemala (SESAN, by its acronym in Spanish), with the support of the European Union, are working to strengthen the National Food and Nutrition Security System (SINASAN, by its acronym in Spanish). They are considering the municipality of Momostenango as the pilot site to develop multisectoral knowledge and information management processes, to prevent chronic malnutrition and improve food and nutrition security. The project of the Guatemalan National Nutrition Information Platform (PiNN, by its acronym in Spanish) integrated, in a platform, information derived from censuses, surveys, and specific studies, as well as administrative data from the public sector. This was done as a basis to rethink municipal management strategies, highlighting the population vulnerable to food insecurity and child malnutrition. The project seeks to strengthen the capacity of SESAN and municipal governments to operate and maintain the platform, monitor progress in achieving national goals to reduce chronic malnutrition, and use the information and evidence for the design and improvement of policies and multisectoral nutrition programs.



Harvesting water to adapt to climate change

The Water Harvest Project in Nicaragua, executed with the support of the Swiss Development Cooperation (SDC), aims to help 2500 families of small and medium producers, from 10 municipalities of the Dry Corridor in the north-central part of the country, establish systems more resilient to climate change and improve their food and nutritional security, ensuring an adequate systematization of learning. Some achievements, in 2020, were: the design and validation of a methodology for the selection of sites and beneficiaries of water harvesting, the diagnosis of 2304 family units as potential beneficiaries, the development of a new, more durable and lower-cost tank for water harvesting, and the formulation of a research agenda on water harvesting for the country. In addition, in the face of the COVID-19 emergency, a humanitarian aid initiative was developed with food packages and productive reactivation for a total of 1105 families in four municipalities (CATIE/MEFCCA/MAG/INTA/IICA, with support from SDC).



Sentinel Landscape Project of Nicaragua-Honduras

Through the Sentinel Landscape of Nicaragua and Honduras, research and long-term monitoring have been promoted as a key to the sustainable management of trees and forests in landscapes through 39 investigations. The majority were in Nicaragua (85 %), where 41 CATIE master's students were involved. 75 % of the theses are related to processes and drivers of changes in land use and governance.

GEOCATIE: geospatial information platform that integrates innovation and cutting-edge technologies

GEOCATIE is an intelligent digital platform that takes advantage of the many benefits of ESRI's ArcGIS tools and licenses, to empower and proactively satisfy the needs and institutional capacities for the management and processing of geospatial information. It is a platform of the new digital era, which creates connectivity in all areas of Research, Development, and Innovation (R+D+I) and allows monitoring, managing, and optimizing the educational, research, and administrative infrastructure of the institution. GEOCATIE has led CATIE to be at the forefront of digital technologies, promoting digital transformation strategies to boost institutional changes at an external and internal level. One of the great successes in 2020 was the institutionalization of a tool developed for monitoring governance in food and nutrition security within the National Information Platform on Nutrition of Guatemala. In addition, GEOCATIE positioned itself at the national and international level through open data on the different systemic approaches, projects, research, and institutional educational programs, which are available to partners, students, the scientific community, the government, etc.



CATIE and SESAN design a new tool that improves decision-making on food nutrition security in Guatemala

As part of the process of designing and implementing strategic tools for local planning, CATIE, in coordination with SESAN, the Delegation of the European Union in Guatemala, and the Municipality of Momostenango in Guatemala, officially presented the Municipal Information System of Food and Nutrition Security (SIMSAN, by its acronym in Spanish).

SIMSAN is a strategic computer tool for municipal planning, which has been generated within the framework of the activities of the National Nutrition Information Platform (PiNN) project. This tool is supported by the National Food and Nutrition Security Policy, and by the Law of the National Food and Nutrition Security System.

For CATIE, this municipal information system is strategic, since it facilitates political and technical decision-making to improve the effectiveness of interventions. In addition, it helps planning and monitoring how the interventions make it possible to achieve municipal, short, medium, and long-term goals. It also generates inputs to improve municipal investment and contributes to improving coordination between programs and projects aimed at preventing child malnutrition and improving food and nutritional security at the municipality level.

“CATIE’s support in the design and implementation of SIMSAN makes it possible to contribute effectively to the Municipality and the Municipal Food and Nutrition Security Commission in the analysis of information and decision-making. Thus, achieving better impacts through the different multisectoral interventions guided by SIMSAN”, Muhammad Ibrahim, general director of CATIE.



Livestock producers from the state of Jalisco in Mexico win national award for forestry merit

For its actions towards sustainability in livestock systems, the Local Livestock Association of El Limón, in Jalisco, Mexico, won the National Award for Forest Merit in the category of Water Management and Healthy Ecosystems. A total of 20 cattle producers from this municipality, belonging to the El Limón Field School, developed by the BioPaSOS project, were awarded.

BioPaSOS is implemented by CATIE, with the support of the Inter-American Institute for Cooperation on Agriculture (IICA), in coordination with the National Commission for the Knowledge and Use of Biodiversity (CONABIO, by its acronym in Spanish) and the Secretariat of Agriculture and Rural Development (AGRICULTURE), with funding from the International Climate Initiative (IKI, by its acronym in German).

In this Field School, the producer families strengthened their capacities in different topics, such as natural resource management, silvopastoral systems, good livestock practices, management of grazing areas, animal feeding and reproduction, and animal health, highlighting the great benefit of the implementation of silvopastoral systems (SSP, by its acronym in Spanish) and good livestock practices in their production units.

“With the arrival of the BioPaSOS project, we have begun to implement silvopastoral systems and carry out good livestock practices. When we entered the Field School, we were 20 livestock producers who implemented this type of system for production. Today, we are more than 70 producers. It is something we are doing to combat climate change, because we are planting trees, and at the same time, we obtain more forage for our cows”, said Antonio Jiménez, president of the El Limón Livestock Association and member of the BioPaSOS project Field School in Jalisco.



CIRAD and CATIE support Costa Rica in its goal towards decarbonization

With funding from the French Agency for Development (AFD, by its acronym in Spanish), the Center for International Cooperation in Agricultural Research for Development (CIRAD, by its acronym in Spanish) and CATIE will work together to build and execute a technical assistance package, which will support the government of Costa Rica in the strengthening and development of actions associated with the national decarbonization plan.

The work is focused on providing technical assistance to the National System for the Monitoring of Land Cover and Use and Ecosystems (SIMOCUTE, by its acronym in Spanish), which belongs to the National Center for Geoenvironmental Information (CENIGA, by its acronym in Spanish), as well as the National Forest Financing Fund (FONAFIFO, by its acronym in Spanish).

The national decarbonization plan is a radical transformation approach for Costa Rica. A political planning instrument and a long-term development vision that keeps the country in a global position of environmental leadership. In addition, this plan will allow the country to chart the transformative path towards a green, sustainable, and low-carbon economy. Specifically, it is an example of how the countries of the world can convert their development models towards low-carbon processes. For CATIE and CIRAD, it is a privilege to support these innovative lines of climate action.

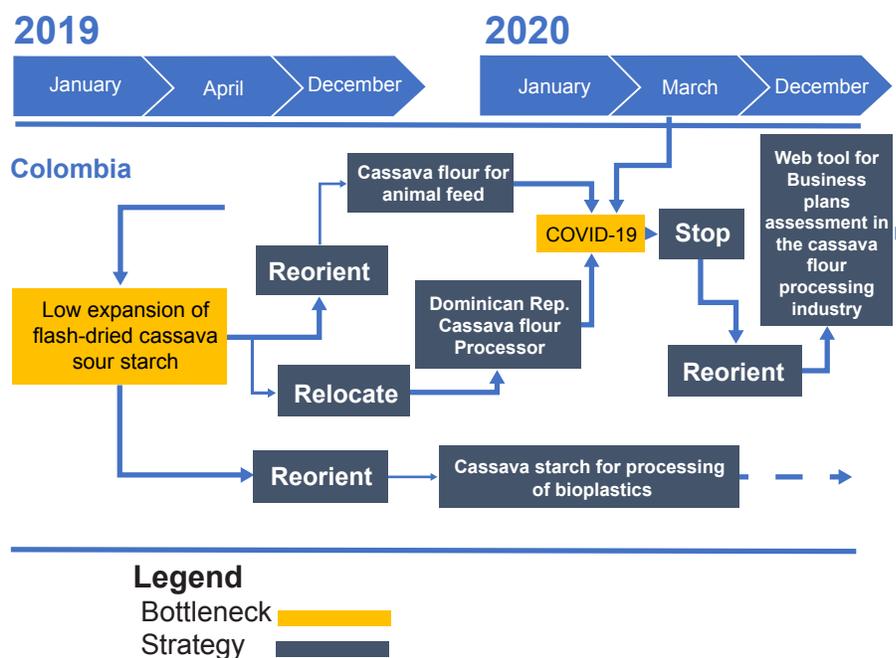


Assessing the benefits of using the “scaling up of technological innovations in agriculture” approach to achieve impacts on rural development: Bioversity International-CIAT and CATIE collaboration

One of the main challenges that research centers face is to ensure that the innovations resulting from their research lead to an impact on large-scale development. Important resources are invested in the design and testing of innovations to tackle challenges such as food insecurity, low productivity, and environmental degradation. However, many promising innovations fail to achieve large-scale impacts. A cost-efficient approach that facilitates the scaling of innovations through tools that support the development, implementation, and monitoring of scaling strategies can be of great help.

Bioversity International-CIAT, in collaboration with CATIE, is working on the analysis of the costs and benefits derived from the use of the Scaling Readiness Approach (SRA), which was designed by the CGIAR to support organizations, projects, and programs in their interest, to scale innovations and achieve large-scale impact. The cost-benefit analysis consists of measuring the costs and benefits related to the process of scaling up innovations in agriculture, comparing it with scaling actions that follow traditional processes.

The joint Bioversity International-CIAT and CATIE project estimates the benefits and costs of scaling up the innovation of a fast fresh cassava dryer for cassava flour production in Colombia, Nigeria, and the Democratic Republic of the Congo, as case studies. So far, progress has been made in the mathematical models, which will allow establishing the differentiated costs and benefits of scaling innovation, both at the level of cassava producers and processors.



CATIE in numbers

Graduates 2020



62 graduates
60 M.Sc. y 2 Ph.D.

28
women



34
men




14 countries

Total CATIE graduates



2689 graduates
2624 M.Sc. y 65 Ph.D.

797
women



1892
men




47 countries

Training events



240 training events: diplomas, courses and workshops (virtual and on-site).

16 816 trained professionals.

38%
women



62%
men



Publications



132
publications

- Articles in reference scientific journals.
- Articles in technical journals.
- Monograph.
- Articles in conference proceedings.
- Reports and other publications.
- Software.
- Thesis.
- Multimedia.

Genetic improvement of coffee and cacao



The **DNA of almost 2000 coffee accessions**

was characterized using molecular techniques, an extremely important basis for understanding and managing the genetic diversity of this crop.



More than **100 cacao clones** were evaluated for the detection of resistance against diseases, monilia and black pod.



More than **4000 materials** (seeds, twigs, grafted plants) for cacao production were delivered to producers in Costa Rica and Guatemala.

Implemented or Approved Projects



32 projects implemented for a total amount of **USD 6 163 000.**

EI CATIE responds through its Projects to 10 of the 17 SDGs, but with greater emphasis due to the nature of the institution to SDGs: 1, 2, 5, 6, 13 y 15.



New strategic alliances... new proposals



- Total proposals submitted: **122**
- Total proposals won: **27**
- Total amount of won proposals: **USD 15,7 millions**
- Total of Alliances with strategic organizations: **120**
- Global and regional: **9**
- Local: **115**



CATIE in the details

Higher education and capacity building for excellence

A certified quality Graduate School

After a rigorous evaluation process carried out by prestigious universities in Costa Rica, South America, and North America, the National System of Higher Education Accreditation (SINAES, by its acronym in Spanish) granted CATIE, on December 2, 2020, the reaccreditation for its International Doctorate in Sciences programs and its four academic master's degrees. Thus, guaranteeing that they comply with international quality standards.

The re-accreditation process is continuous, and it involves a permanent commitment to improve teaching methodologies, infrastructure, equipment, admission processes, and communication, as well as the constant improvement of teaching and administrative staff.

“The re-accreditation demonstrates the quality of the education we are receiving. It commits us to excellence and gives us enormous competitive advantages at the labor level”, with these words Mabel Arcos, a second-year student of the Master’s degree in Agroforestry and Sustainable Agriculture at the Graduate School, reflected the feelings of the entire CATIE student community in the re-accreditation ceremony.



Education in times of pandemic

On March 11, 2020, the World Health Organization (WHO) raised the public health emergency caused by COVID-19 to an international pandemic. As a result of this statement, everyday life was modified, and how people related, taught, and learned was changed.

Even so, the demand for quality education offered by CATIE was maintained and, for the cohort that began in 2020, there were 250 applications. A total of 243 applicants were admitted, 85 for on-site master's degrees and 158 for virtual ones.

Given the privileged situation of CATIE's headquarters, where most of the students and professors reside on campus, on May 8 on-site classes were re-established, with all the biosafety measures instructed by the Costa Rican Ministry of Health.

For the Training Unit, the start of the health crisis caused by the COVID-19 pandemic was challenging, but it quickly focused on identifying demands and topics of interest, and on designing and implementing training and education activities in a virtual modality. The students, who were receiving on-site training, completed their respective courses and, subsequently, returned to their countries of origin. The virtual training offer started with great acceptance and obtained excellent evaluations from the students.

First virtual graduation

After 74 years of existence of the Graduate School, the 2020 academic cycle culminated with the first virtual graduation.

A total of 60 students, 27 women and 33 men received their respective master's degrees, and two students (one female and one male), their doctoral degrees.

See ceremony at <https://bit.ly/3bmQRgm>



All of this planned work allowed for important achievements, which are detailed below:

Internship program (on-site). With the National Program of Agrarian Innovation of the National Institute of Agrarian Research (PNIA/INIA, by its acronym in Spanish) of Peru, the implementation of the internship program was completed, which sought to strengthen individual and collective capacities in agroforestry, forests, coffee, cacao, climate change, agribusiness, hydrographic basins, protected areas, productive chains, biostatistics, geographic information systems, etc. Among the actions implemented, a total of 119 interns were received.

Peruvian technicians strengthen their capabilities (virtual). About 31 technicians (27 men and four women) from the National Institute of Agrarian Innovation (INIA, by its acronym in Spanish) of Peru received training to strengthen their skills in research management, technological development, agricultural innovation, technical assistance, and agricultural extension. During the closing event of the course, the participants highlighted the technical capacity that exists in CATIE, the pedagogical mediation that the teachers carried out in the virtual environments, the continuous support they received, and thanked the institution for contributing to the formation of human capital in Peru.

Certificates in climate finance (virtual). Through the strategic alliance between EUROCLIMA, CATIE, and professionals from the region, two certification courses on climate finance were implemented. In the certificate courses, 68 professionals (37 men and 31 women) were trained in the formulation of proposals for climate finance, who prepared 23 concept notes, and group work on livestock, agriculture, food security, and agroforestry issues.

Updating of programs and use of technology. As part of the constant improvement process, the Graduate School carried out an external analysis of the master's degrees it offers. Among the recommendations, the need to review and update the common core of all master's degrees is highlighted to ensure that all students understand the holistic nature (ecological-social-multiscale) of CATIE's work since its foundation. On the other hand, it was recommended to evaluate the possibility of teaching courses and programs in a bimodal way (on-site-virtual), to increase the incidence in the region. As a complement to the academic improvements that are being made, funds were sought to renovate the equipment and property of the Graduate School. These improvements will be implemented in 2021, thanks to the generous support of the American Schools and Hospitals Abroad (USAID-ASHA) office.

Research for Inclusive Green Development

Towards a new strategy to face the challenges

The operational adaptations that CATIE had to carry out in its activities in the region, due to the COVID-19 pandemic, are likely to become permanent changes in the way it works from now on.

In 2020, it became clear that CATIE's partner countries and donors expect that, by 2030, institutional projects will contribute to reducing the risk of new zoonoses and mitigating the effects of existing ones. The capacities of the technical team that make up the Research Division for Inclusive Green Development place CATIE, favorably, in the face of this challenge. This is because many of the strategic measures related to zoonoses are based on issues in which CATIE is a leader: 1) participatory landscape management, 2) reduction of degradation of ecosystems and their biodiversity, 3) restoration and sustainable use of ecosystems and their biodiversity, 4) sustainable livestock farming, and 5) adaptation to climate change.

The pandemic has left two great lessons: the first one is that the human being is extremely vulnerable at this time, which for many should be called the Anthropocene. The second one is that the need is evident for the year 2020 to be considered as a year of transition towards a new decade, in which paradigm shifts and transformations such as those proposed in the Sustainable Development Goals and the goals of the United Nations Decade for Ecosystem Restoration, must be achieved.

Under this scenario, CATIE's work commitment will be to support the countries, non-governmental organizations, indigenous people, producers, and the private sector, for the necessary transformations are achieved.

For decades, CATIE has stood out in the origin and evolution of strategies for the sustainable use of land and water – always focused on improving human well-being – with its units of Agroforestry and Genetic Improvement of Coffee and Cacao (UAMGCyC, by its acronym in Spanish), Forests and Biodiversity in Productive Landscapes (UByBPP, by its acronym in Spanish), Livestock and Environmental Management (GAMMA, by its acronym in Spanish), and of Watersheds, Water Security and Soils (UCSHyS, by its acronym in Spanish). The work of these units remains at the forefront in their respective issues, along with other units that have more recent lines of work, but where CATIE has also been a protagonist, such as the Economy, Environment and Sustainable Agribusiness (UEAyAS, by its acronym in Spanish), Climate Action (UAC, by its acronym in Spanish), and Agrobiodiversity and Food Security (UAYSA, by its acronym in Spanish).

The two units that represent collaborations with strategic international partners are, firstly, evidence of CATIE's international prestige as a partner and, secondly, key instances for supporting countries such as the Scientific Collaboration Platform (PCP, by its acronym in Spanish) CIRAD/CATIE, which is dedicated to modern agroforestry, and the Central American office of the global Environment for Development (EfD) network, coordinated from Sweden, and innovative in its mission of generating science for decision-making.

Interdisciplinary and collaborative work of the units

The work carried out by the institution is interdisciplinary and collaborative, and based on three important elements:

1. The territorial approach. As an outstanding example of joint actions in territories for research, technical assistance, and education for development at multiple scales are the actions developed by the Livestock and Environmental Management Unit, with the support of the Watersheds, Water Security and Soil Unit, in three Mexican states through the BioPasos project. This project promotes the conservation of biodiversity through climate-smart agrosilvopastoral practices in landscapes dominated by livestock. In the same way, collaboration with the Latin American Model Forest Network gave rise to a new project: Restoration, which will promote actions to restore ecosystems at a territorial scale, strengthening capacities while promoting climate action within the framework of the United Nations Decade goals for ecosystem restoration. Another new strategic project, managed during this year, is the one to be implemented with GIZ and IUCN, and with funds from IKI/BMUB to promote adaptation, based on ecosystems at the territorial scale.

2. Cross-cutting contribution of economics. CATIE was a pioneer in the application of environmental economics to the development of the scientific bases for the policies that govern the use of land and water in the region. This approach has been established in the work of the Environmental Economy and Sustainable Agribusiness Unit and the consolidation of the global Environment for Development (Efd) network as part of the Center's research units. An important achievement for CATIE is having successfully negotiated the extension of the global network for the period 2021-2024.

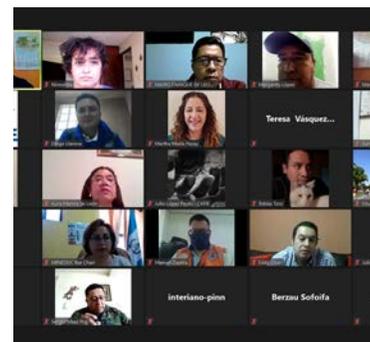
3. Emphasis of our work on climate action. The current Climate Action Unit (UAC, by its acronym in Spanish) is the technical and scientific nucleus of this line of work. The UAC develops its projects, innovating in the areas of blue carbon in urban areas and collaborating closely with the other units, each of which works on climate action. For example, in the development of livestock with low greenhouse gas emissions with the Livestock and Environmental Management Unit, in the adaptation to climate change in cacao production with the Agroforestry and Genetic Management of Coffee and Cacao Unit, in the demonstration of the importance of trees in the resilience of urban watersheds with the Watershed, Water Security and Soil Unit, and in the improvement of water management in vulnerable areas of Costa Rica with the Efd global network. With IICA, the AGROINNOVA project was implemented, which promotes resilient agroforestry systems in the dry corridor in Central America, to improve food and nutrition security for vulnerable rural populations.

Development of ICT applications and leadership in environmental management

Information and Communication Technologies (ICT) are a diverse group of practices, knowledge, and tools related to the consumption and transmission of information. They were developed from the disruptive technological change of recent decades, especially in the framework of the rise of the Internet. During 2020, CATIE made progress in the development of ICT applications in the management and monitoring of silvopastoral and agroforestry systems, as well as mangroves, in Central American countries.

The emergence of the COVID-19 pandemic, significantly, affected the plans of the projects carried out by CATIE. This condition was due not only to restrictions for CATIE personnel to move around the region but also within the countries themselves, because of the rigorous health measures that governments took to control the pandemic. At the institutional level, various sanitary measures were taken, and it was necessary to make significant adjustments to operating procedures. They went from regular visits to the use of virtual media, informal means of communication were used, such as WhatsApp, and groups were created for frequent consultations and real-time meetings, also the Teams and Zoom platforms were used for training activities with producers and technicians. This had a negative impact on the delivery of products (delays) and, therefore, on the execution of funds and project progress. However, the institution reformulated its work plans and asked partners and donors for new product delivery dates, who understood the situation without inconvenience.

Furthermore, the leading role of research units in the growth of environmental management in urban areas and the urban-rural interface is highlighted, as well as the development of knowledge, which will be the basis for the sustainability of the ecosystem services provided by protected wild areas to the growing urban populations of the countries in the region. The Climate Action Unit supported municipalities of the city of San José, Costa Rica, in the development of a Digital Atlas and the knowledge of ecosystem services provided by green infrastructure. While the Watershed, Water Security, and Soil Unit fostered its knowledge of the importance of trees in urban watersheds. The Unit for Forests and Biodiversity in Productive Landscapes developed, based on scientific evidence published in international journals, a proposal for the management of protected mountain areas (ASP, by its acronym in Spanish) for the adaptation to climate change, which is an urgent need for the maintenance of the ecosystem services that these ASPs provide to urban areas. Finally, the Environment for Development Unit (EfD) demonstrated, with scientific evidence, that ASPs in Costa Rica play a fundamental role in mitigating the effect of floods on the human population that lives near them.



Innovative tools and methodologies

In 2020, the Climate Action Unit used unmanned aircraft and cloud processing to generate 3D images and submeter digital elevation models for the development of ecological assessments, the detection and characterization of mangrove degradation, and the planning of interventions for the rehabilitation of these ecosystems. Also, they used the geospatial information technology platform GEOCATIE as an integral solution in the various projects developed by the Ecosystem Modeling Laboratory. This fostered an innovation and process control structure that monitors, manages, collaborates, and optimizes workflows in an open, distributed, and extensible nature in all of CATIE's strategic areas.

On the other hand, within the framework of the Livestock Transformation program in Honduras, the Life Cycle Analysis methodology was promoted to calculate the mitigation potential of the proposed technologies and practices. This consists in the calculation of the emissions of greenhouse gases (GHG), applying the attributional life cycle principles with a farm scope, using estimates that consider Tier 1 and Tier 2 levels of the Intergovernmental Panel on Climate Change (IPCC). On-farm carbon sequestration was subtracted from total emissions using factors calculated by CATIE in Central America. To avoid favoring practices that reduce emissions at the expense of productivity, total net GHG emissions were expressed in units of GHG emission intensity, such as kg CO₂e per kg of beef or milk. In the application, a diagnosis was made on the farm and the variables of the model were collected. Based on the diagnosis, the most appropriate technological package is defined, and the simulation is run again. Finally, the difference between the current scenario versus the intervention is the mitigation potential of the intervention. This ex-ante evaluation is useful for making timely decisions before intervening on a farm and it has to be systematized, for decision-making to be instantaneous.

CATIE's Biostatistics Unit developed object detection algorithms using convolutional neural networks (artificial vision field) for the identification and counting of the coffee berry borer (*Hypothenemus hampei*, Coleoptera: Curculionidae), and algorithms for the segmentation of satellite images or drones, also using convolutional neural networks, regression trees or a vector support machine. For the project Socioeconomic and Environmental Sustainability of Agroforestry Coffee (SEACAF, by its acronym in Spanish), the Biostatistics Unit developed an instrument for collecting biophysical information, and built and refined the databases of socioeconomic and biophysical information. Likewise, with the Scientific Cooperation Platform (PCP, by its acronym in Spanish) CATIE/CIRAD validated the estimation of the sample size, according to the observed incidence and number of farms per category, and mapped the incidence of coffee rust based on the climatic conditions in Central America and the Dominican Republic.



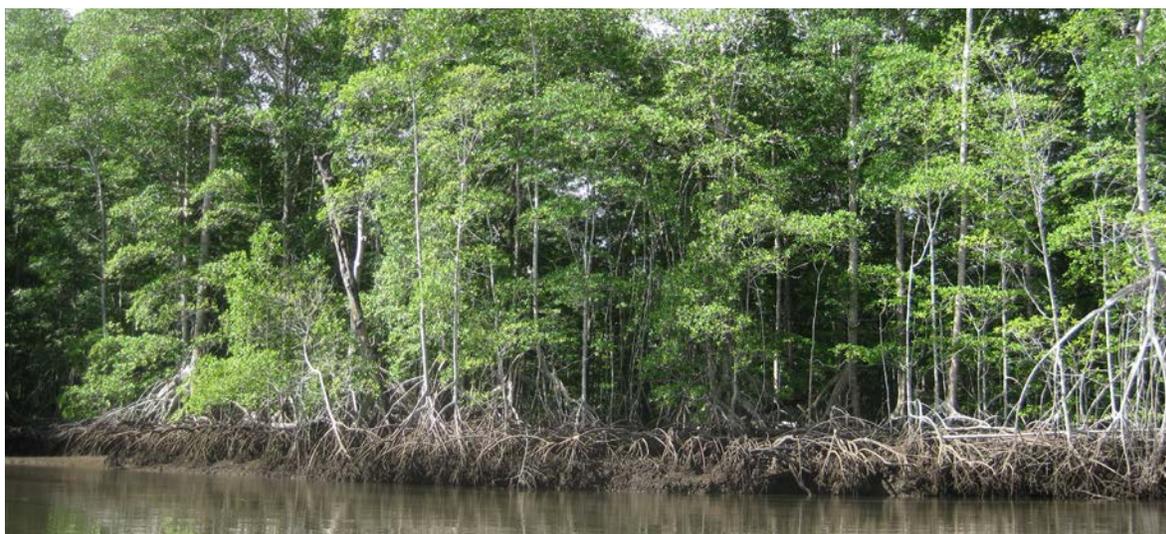
Policies that have had an impact

Through the blue carbon work package, CATIE worked together with the Costa Rican Climate Change Directorate to include goals for the restoration, conservation, and sustainable management of mangroves in the new Nationally Determined Contribution of Costa Rica to the United Nations Framework Convention on Climate Change (UNFCCC).

Moreover, the actions implemented have made it possible to carry out political advocacy at different levels, involving local, national, and regional actors, in the work areas of the unit. Emphasizing climate action and economic development, all aligned with national plans, including:

- The promotion of the circular economy with municipal governments contributed to Costa Rica's circular economy roadmap (2030 goals, OECD, by its acronym in Spanish) and national commitments, such as the 2020-2050 Decarbonization Plan and the Sustainable Development Goals (SDGs).
- At a community level, work was done with leaders, young people, and other key actors in aspects of governance, accountability, transparency, and involvement of the population in decision-making at the local level. This allows promoting processes with a bottom-up approach, focused on the needs of rural communities, such as community water management, which is responsible for providing this resource to more than a quarter of the Costa Rican population and higher percentages in other countries in the region.

In the region, CATIE has supported the different national authorities of Mexico, Honduras, Panama, and Costa Rica, to generate technical inputs for the implementation of projects for the fulfillment of the country's goals and commitments of their nationally determined contributions (NDC), and strategies and plans for the conservation of biodiversity. All as a contribution from the productive livestock sector.



Commitment to gender equality and social inclusion: creation of the Social Inclusion and Gender Unit

CATIE's Inclusive Green Development approach promotes the actions necessary to ensure intergenerational equity, the real participation of various groups in society, as well as the maintenance of the capacity of our natural capital to provide ecosystem services, on which the well-being of people depends.

At CATIE, we have promoted institutional policies that respond to the inclusion of social groups whose rights have historically been violated, such as indigenous people: their autonomy, sovereignty, governance, and the prior informed consent that should prevail whenever working together with our native people. On the other hand, the institutional gender equity policy has shown effective results in the real participation of women in the decision-making processes of programs and projects promoted from headquarters and in the institution's mandate countries, as well as in our educational offer. Women's roles are especially crucial in the agricultural workforce, with a critical nexus regarding food security, sustainable enterprise development, research, academia, and policymaking and setting. In the same way, the importance of the knowledge of our indigenous people and the need to revitalize their wisdom, the vindication of their rights, their development, and defense of their territories and natural resources is key to generate genuine and sustainable development processes following the identity of this sector of the population.

CATIE, as a regional center, assumes leadership in gender and social inclusion issues in higher education and research and takes them further through external projection, as well as in the implementation of affirmative actions for the recognition of spaces of access to resources, opportunities, and the well-being of all people. For this reason, in 2020, CATIE, at DIDVI, has created a new Research Unit on Social Inclusion and Gender. From this Unit, CATIE will promote the design and implementation of gender and social inclusion approaches in all phases of the Center's research and development activities. We look forward to having our team of specialists, and technical and support staff by 2021.



Climate action

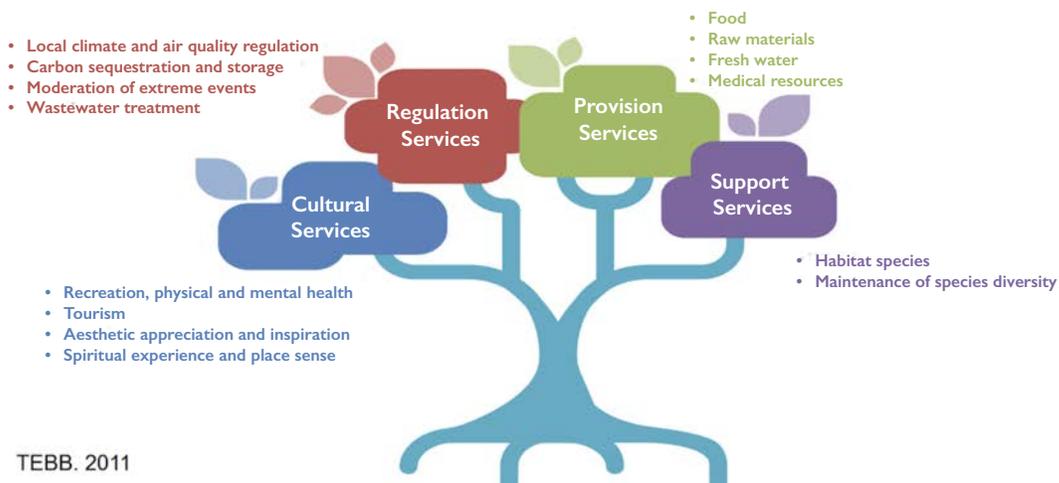
The Climate Action Unit successfully developed several projects in numerous Latin American and Caribbean countries, with funding from various sources. In urban and peri-urban areas, the Digital Atlas of the Greater Metropolitan Area of Costa Rica was developed (<https://sites.google.com/view/atlas-v1-1/inicio>). This Atlas is a geospatial platform that brings together the main and most recent information related to ecosystem services, biodiversity, urban warming, green infrastructure, use and vegetation cover, and ecological connectivity of the 32 metropolitan cantons. The Atlas, the first of its kind in Costa Rica and the region, is an extremely important tool to support decision-making in the management of the metropolitan territory, such as ministries, public entities, decision-makers, local governments, management committees of interurban biological corridors, researchers, and civil society in general. In addition, an evaluation of the green infrastructure and its relationship with the heat islands in the canton of La Unión, Costa Rica, was initiated. This project will conclude in 2021.

Success story

In 2020, the implementation of the project Mechanisms and Networks for the Transfer of Climate Change Technologies in LAC was successfully completed. Through it, we advise governments and build state-of-the-art digital platforms for forest monitoring in Suriname, Dominican Republic, Mexico, Brazil, and Costa Rica. The final presentation of the project is available on the website: <https://vimeo.com/475078355>

On the subject of blue carbon, three significant initiatives were developed in the Dominican Republic and Costa Rica. The first two are focused on rehabilitating the social, environmental, and economic resilience of mangroves in the face of incremental climatic threats from extreme events and human action. Both projects are in the initial stages of implementation, and the significant restrictions imposed on fieldwork by the pandemic have delayed their progress, which is expected to recover during 2021. Through these two projects, an innovative climate action model is being tested, which includes integrated interventions at the landscape level in combination with sustainable productive transformations to promote the rehabilitation of favorable ecological conditions, to maintain the stability of mangrove ecosystems, and restore their functioning. During the first phase of the third initiative, we advised the Government of Costa Rica for the inclusion of blue carbon goals and metrics in its Nationally Determined Contribution sent to the UNFCCC at the end of 2020.

Urban Ecosystem Services



Livestock and environmental management

In each territory where actions were carried out, the BioPaSOS sustainable livestock project managed to establish and consolidate a learning platform, a research agenda, and joint work with the Ministries of Agriculture to promote sustainable livestock and influence policies. In each territory, a network of plots was created for researching and monitoring sustainable livestock issues, to obtain databases on geospatial aspects on farms, on the water footprint in livestock landscapes, and carbon monitoring on livestock farms. Likewise, the project prepared and distributed, for each territory, an analysis document on livestock value chains in the territories of influence, as well as numerous documents and tools, to communicate sustainable livestock production issues. In three learning communities, through Field Schools, BioPaSOS graduated 1231 producers trained in sustainable livestock issues, 70 % were men and 30 % women.

The Livestock and Environmental Management Unit made a great effort in its key functions of characterization of model farms, implementation, monitoring, and evaluation of improvements in livestock production systems. This included the use of digital tools of climate-smart innovations (among them were the silvopastoral options to contribute to climate resilience), and training on these topics. These investments for both, cattle (beef) and dual-purpose, were made through the *Livestock Belize* projects, financed by IDB-MIF through the *Belize Livestock Producers Association* (BLPA), the LACTIS project funded by FONTAGRO (INIA Uruguay), and the DEIT project funded by the Help in Action Foundation and Technoserve consortium, within the framework of the Inclusive Territorial Economic Development Program (DEIT, by its acronym in Spanish), in the Honduran sector of the Gulf of Fonseca. In this last project, a diagnosis for the livestock production chain was carried out, as well as for the investment climate for the livestock chain in the region. A protocol was developed for the entry or registration of farms in the NAMA Livestock program.

Success story

Livestock producers from the states of Mexico: Jalisco, Chiapas, and Campeche, within the framework of the BioPaSOS project (with funds from IKI/BMUB), acquired new knowledge and developed skills to motivate and sensitize other actors about the benefits of livestock sustainable production, with the implementation of good production practices. They recognize the importance of their work and are empowered in their role as livestock farmers to be agents of change. In total, 277 Mexican women have actively participated in the BioPaSOS Field Schools.

“BioPaSOS has given us tools to realize all that we contribute to livestock. Now, we are putting into practice what they taught us on our farm, and we are seeing better results. When I learned about the experience of other women, I found things that helped to me.”, stated Laura Madera, farmer from Jalisco.



Along the same lines, the productive, socioeconomic and environmental evaluation of credits granted to milk producers in Costa was developed, and financial and environmental analyzes were obtained. A great contribution to the offer of technical assistance on the sustainable intensification of livestock and natural resource management was achieved with the support of *The eco.business Sustainability Academy*, holding five webinars with a total of 487 participants from Latin American countries.

The most important strategic advance achieved during 2020 was in the Program to Support the Transformation of the Honduran Livestock Sector into a Low Carbon Economy, which is financed by the NAMA Facility, through GIZ. For this program, the proposal was structured for the preparation of the Proposal Development Document (PDD), which is designed to overcome the barriers that currently limit the development of an efficient and low-carbon livestock sector.

Agroforestry and genetic improvement of coffee and cacao

Under a strategic research approach, the PROCAGICA project (IICA-CATIE-EU) continued with important contributions to the agroforestry coffee growing in the region. It contributed to the strengthening of research and transfer platforms such as PROMECAFE and national coffee institutes. In addition, research work and participatory demonstration of technologies continued in a network of 200 plots in Central America, where important issues such as the design and comprehensive management of agroforestry systems, improved coffee varieties, effective chemical and organic control protocols for pest and disease control, and mechanization in the management of shade in coffee plantations are discussed and evaluated.

Research on new breeds of Coffee Rust was also an important action in 2020. The collaborative action, coordinated by CATIE-PROCAGICA-IICA, with the participation of PROMECAFE, the National Coffee Institutes, and the support of the Federal University of Viçosa -Brazil, allowed to update the knowledge about the changes generated in the compound of rust races present in the region. This largely explains the greater virulence and impact of the disease, even making coffee varieties that were previously tolerant/resistant susceptible to it. Methodologies have been developed, and regional capacity has been strengthened, to continue the monitoring and studies of the races that will be decisive for the technical assistance, capacity building, and genetic improvement programs with new improved varieties of coffee.



Success story

In 2020, an 18-month extension to the KOLFACI cacao project was approved. This is a regional initiative that is training researchers and technicians, and producing important information on the costs and benefits of modern cacao agroforestry systems (improved varieties, good practices, well-designed shade canopy) in a network of plots established in eight countries: Honduras, Guatemala, Nicaragua, Panama, Costa Rica, the Dominican Republic, Colombia, and Peru.

On the other hand, the project called Socioeconomic and Environmental Sustainability of Agroforestry Coffee (SEACAF, by its acronym in Spanish), developed by the University of Greenwich (United Kingdom), CATIE, and the University of the Valley (Guatemala), advanced in its actions to evaluate costs, benefits, and trade-offs between intensification and sustainability of coffee plantations.

The effects of climate change on the sustainability of coffee and cacao in the region, and on the livelihoods that depend on these crops, were another strategic research topic that was worked on in 2020, with the culmination of the Collaborative Framework for Cacao Evaluation on Climate Change project, which was funded by The Bioversity, CIAT Alliance, and WCF. It had the participation of partners from Brazil, Colombia, Costa Rica, Ivory Coast, the United Kingdom, France, and international institutions. Likewise, the coffee trial turned 20 years old, and a new cacao trial was established, which is shaping up to produce valuable information for cacao farming in future years.

CATIE continued with its research on the production of healthy cacao pods and with the analysis of an 18-year trial on the incidence of climate-related diseases. In the second phase of this trial, the effect of climate change will be assessed from the evaluation of physiological criteria in cacao clones, to define new selection criteria in genetic improvement programs.

Technical assistance and training were key in Honduras, where CATIE worked with the Heifer International consortium in the Chocolate4All project. The local technical team trained more than 400 families in pruning, integrated pest management, genetics, and cocoa grafting. While the researchers analyzed the soil fertility and nutrient balance of 450 farms and developed a drone-software device called Shademotion, which will allow an advanced agroforestry diagnosis to improve cocoa plantations.



Within the framework of the Trees on Farms Project (IKI-TONF), a series of webinars were offered, where advances related to the use of participatory tools for the design of agroforestry intervention options and the development of intervention opportunities with trees in farms in the project areas were presented.

CATIE has been a member since 2012 of the Forests, Trees, and Agroforestry (FTA) consortium of the CGIAR system, a long-term applied research initiative that seeks to understand why, how much, how, where, and what to do to guide changes in the presence of forests, and trees outside the forest, in any territory or landscape. In 2020, the products contributed to the FTA include technological devices and applied research to evaluate the ecological functions of trees in agricultural landscapes. The information generated is key in the design of good practices and in determining the associated ecological and economic costs and benefits. In 2020, these actions were presented at the FTA international virtual scientific conference, and the preparation of technical and scientific articles began. For example, it was estimated in Catacamas, Olancho, Honduras that, in an area of 25 thousand hectares of agricultural landscape, farmers have established 1,730,295 linear meters of fences, where 67 % of which are living fences that cover 1,590 hectares (6.36 % tree coverage). About 571,301 m of dead fences could be converted to live fences. If we think about wood production, it is estimated that 1 km of living fence is equivalent to 1 ha of pure block forest plantation. Honduras has about 3 million hectares of pastures; therefore, the timber production potential for the fences of cattle farms is equivalent to 207,630 ha of pure forest plantations. In addition to serving to regulate grazing intensity and animal productivity, living fences provide producers and society in general with other goods (wood, fruit, firewood) and ecosystem services (shade, habitat for flora and fauna by improving connectivity in the landscape, regulation of the hydrological cycle, atmospheric carbon storage and others) of great value.

Finally, in 2020, the new policy for the acquisition and distribution of germplasm of CATIE was defined and approved, and financing was obtained for the conservation of germplasm of cacao, coffee, fruit trees, and orthodox seeds. With the support of the Crop Trust, the coffee collection was evaluated, and the recommendations of the study are being implemented to improve the conditions of the collection, with an emphasis on wild and ancient genetic groups. Furthermore, important projects, industries, and institutions such as MOCCA (Maximizing Opportunities in Coffee and Cacao in the Americas), PROCAGICA, Nestlé, Felco, San Francisco Bay Coffee, USDA, WCR, and FAO have contributed funds. The work in the collections is complemented by innovations in the management of the Botanical Garden, achieving important improvements in infrastructure and labeling, and the preparation of two more gardens, one of the Bromeliaceae family with 35 identified species and a garden of plants for medicinal use.

In 2020, work was done with the Mesoamerican Scientific Platform for agroforestry (PCP, by its acronym in Spanish – <https://www.pcpagroforestry.com>). The researchers of this platform contributed to 16 projects of CATIE, and its partners in Latin American and Caribbean countries, and have generated at least 60 publications (50 % indexed scientific articles).

Sustainable economy, environment, and agribusiness

In 2020, CATIE carried out various actions to support, from the perspective of environmental economics, initiatives focused on low-emission development, addressing the challenges derived from climate change and variability. This is how it generated applied research, provided advice and strengthened the capacities of key actors, including technicians from the ministries of agriculture, environment, and development institutions from various countries in the region, such as Belize, Guatemala, Costa Rica, Jamaica, and Paraguay, among others.

Other achievements in this area include support for key platforms such as the Scientific Council on Climate Change (4C) and the Citizen Consultative Council on Climate Change (5C) of Costa Rica, to solve the knowledge gaps identified in the first phase of the LATINOADAPTA project (a research initiative that seeks to identify and analyze knowledge gaps in adaptation, which affect the development and implementation of policies and measures related to climate change in six Latin American countries), the participatory development of the climate change research agenda as a basis for climate action in Jamaica, and the development of a vulnerability analysis in the extended dry corridor in Guatemala, focusing on broadening the understanding of adoption processes by the most vulnerable populations.

In 2020, one of these actions focused on promoting the circular economy approach. This approach seeks to break the linear logic of extracting, producing, consuming, and discarding, by modifying the current production and consumption patterns to make the most of resources and minimize waste generation. Thus, avoiding negative impacts on the environment and health. To this end, the project “Towards a circular economy of local governments” was successfully implemented. As a result, the “Step-by-Step Guide to Facilitate the Transition of Local Governments Towards a Circular Economy: The Case of Costa Rica” and a study on solid waste management in the Municipality of Turrialba was developed. In this way, it is expected to facilitate the contribution of local entities to the achievement of climate action objectives, including NDC, decarbonization plans, and strategies for the adaptation and mitigation of climate change.

Within the framework of the Socioeconomic and Environmental Sustainability of Agroforestry Coffee project (SEACAF, by its acronym in Spanish), the gathering of information was successfully developed to evaluate the economic, social, and environmental trade-offs between agroforestry systems and coffee monocultures. In this study, the contribution of different capitals to livelihoods was emphasized. The results of this initiative will provide evidence to support the formulation of agricultural and environmental policies in the region.

Success story

In 2020, CATIE promoted the successful, sustainable, and inclusive insertion and escalation of MSMEs (especially, associative companies) in value chains, through the implementation of the Virtual Exhibition of Costa Rican Artisanal Chocolate, where it created a space for interaction in which the MSMEs of Costa Rica shared their products with the population and potential buyers.



Watersheds, water security, and soils

The processes of the hydrological cycle represented the main research topic, particularly regarding the relationship of silvopastoral practices, or sustainable livestock farming, with the infiltration of water into the soil. On this topic, the Watersheds, Water Security, and Soils Unit collaborated with the BioPaSOS project by investigating the water ecosystem service in livestock landscapes in the Mexican states of Jalisco, Campeche, and Chiapas. It also implemented a simplified methodology that made it possible to compare the water footprint of producers with different levels of intensification and livestock practices. These investigations made it possible to contribute to decision-making at multiple levels. Finally, the BioPaSOS project was supported in the analysis of the planning process for adaptation to climate change in the Mexican states where it operates, where water resources are a key axis for mobilizing adaptation actions.

Another main research topic was the work developed in urban watersheds and their resilience. In 2020, the research entitled “Measuring sustainability in cities: valuing trees and their services” was followed up, submitting an article to an international scientific journal. Through other means of communication, awareness was raised about the importance of trees in urban watersheds and the role of riparian vegetation as a key point to maintain green infrastructure in cities that have watercourses.

Success story

In 2020, technical assistance was provided to Haiti, responding to the urgent needs of one of the countries with the greatest demand for technical cooperation in the region under CATIE's mandate. The projects developed in Haiti focused on watershed planning and commune development, aiming at food security and evaluating the resilience of their territories to the impacts of climate change and variability. The actions were financed by GEF Canada, KOIKA, and UAE, all channeled through UNDP.



Forests and biodiversity in productive landscapes

CATIE collaborated with the CGIAR international agricultural research consultative group within the framework of its Forests, Trees, and Agroforestry (FTA) research program. In the priority on the restoration of FTA, four research works were developed on the restoration of tropical forests through natural regeneration: 1) development of a decision-making tool, 2) the potential for wood production in secondary forests of Costa Rica and Nicaragua, 3) the storage and productivity of biomass above the ground and its relationship with environmental variables in natural forests in Costa Rica, in collaboration with the Forest Ecosystem Observatory of that country, and 4) the restoration and governance of landscapes forest in the Nombre de Dios National Park of Honduras.

In 2020 and despite the effects of the COVID19 pandemic, the project Development of Sustainable Forest Models and Links with Private Financing for Secondary Forests, financed by the International Climate Initiative (IKI, for its acronym in German), continued its actions in Costa Rica, Honduras, El Salvador, and Guatemala. It contributed to strengthen the governance of the forest sector in each country and to generate enabling conditions for the management of secondary forests. In 2020, the project carried out a diagnosis of the systems of the Forest Conservation Institute (ICF, by its acronym in Spanish) of Honduras, to facilitate the approval of online management plans, and it supported the National Forest Institute (INAB, by its acronym in Spanish) of Guatemala with the preparation of a technical proposal for the implementation of the Credit Guarantee Program (PGC, by its acronym in Spanish) for its forestry sector. Regarding investment opportunities for secondary forests, two business models were developed for demonstration areas of secondary forest forestry management in El Salvador and at the Zamorano University in Honduras. In both, the sustainable management of secondary forests is related to business opportunities in the countries, which promotes the sustainability of these forest ecosystems. In the demonstration areas, a long-term investigation was developed on the productivity of the forest, and the investigations were evaluated during 2020. Finally, on management techniques, the project implemented an international virtual course, two on-site workshops for officials of the National System of Conservation Areas (SINAC) of Costa Rica, and a workshop on tools for entrepreneurship in the forestry sector.

Success story

The Socio-ecological Restoration of Forests, Landscapes, and Ecosystem Services Resilient to Climate Change project, funded by the National Institute of Forest Sciences of the Republic of Korea (NIFOS), researched the adaptation of highly vulnerable mountain forests to climate change, in the mountain range of Talamanca, Costa Rica. To disseminate its actions, it held two webinars with the participation of 150 officials from the National System of Conservation Areas (SINAC, by its acronym in Spanish), with whom the results of the research were shared and management measures for adaptation were discussed. In addition, a participatory training plan was developed for key actors related to the management of mountain forests in protected wild areas and biological corridors, and based on this plan, five courses were designed in the on-site and virtual modality.



Global network: *Environment for Development, EfD*

The Environment for Development Unit (EfD), with international and national partners, completed several research and development initiatives that generated evidence for decision-making. Through these, it contributed to the strengthening of the capacities of different actors, some methodologies and tools were developed to improve decision-making, and transition processes to more resilient development models were supported.

Among these initiatives, stands out the project “Accountability, use of technology and citizen participation for the improvement of water supply services in vulnerable communities in Costa Rica” (WAPP) supported by the Costa Rican Institute of Aqueducts and Sewers (AyA) and the United States Embassy in Costa Rica. WAPP aims to improve local water management and accountability mechanisms in at least 50 community water organizations in vulnerable rural areas of Costa Rica. Regarding technical assistance, EfD along with Costa Rican government organizations supported 15 Costa Rican municipalities to make the transition towards circular economy models. Knowledge and tools were generated, which allow municipalities to overcome the barriers to sustainable economic development to reduce the pressure on ecosystems and promote the reactivation of the economy and the generation of employment. Within the framework of the project, workshops were held to consult and validate the Guide Towards a Circular Economy Approach in Local Governments of Costa Rica: the case study of Turrialba, with representatives from 14 municipalities in the country. Through this process, EfD and CATIE facilitate local governments to include the circular economy in their territorial and financial planning tools to contribute to the achievement of Costa Rica’s NDC and climate policy objectives.

Finally, the year 2020 saw the implementation of CMaR (Sustainable Management of Marine-Coastal Resources), an ambitious long-term research program that has the technical support of the University of Gothenburg and members of the network EfD centers around the world. The objective of CMaR is to advise decision-making regarding the management of ecosystems in marine-coastal areas, specifically on issues of improving waste management that negatively impact them, the sustainable management of small-scale fisheries, and the design of public policies that favor the well-being of vulnerable populations (women and youth) directly dependent on marine resources.

Success story

In 2020, two investigations were completed, one in collaboration with the University of Vermont, on the role that protected areas play in Costa Rica in reducing the risk of hydrological disasters, as well as the indirect effects of these areas (such as tourism) on the population, and the other one, in collaboration with universities in three countries, to determine the negative effects of high temperatures and abnormal rainfall.



Agrobiodiversity and food security

The AGRO-INNOVA (IICA-CATIE) project is part of the DeSira Program of the European Union, whose general objective is to contribute to improving climate resilience and food security in highly vulnerable households of small producers in Central America. The project began actions in May 2020, after delays due to the pandemic, and is expected to be completed in September 2023. CATIE's participation in this project contributes to the execution of two great results: the first one is to work with small producers for them to have management models for the development and establishment of strategies for innovation, by strengthening capacities in agricultural production and livestock, through multi-layer agroforestry systems (SAFM, by its acronym in Spanish); and the second one is to work to articulate strategies for knowledge management in SAFM that strengthen the capacities of research institutes, ministries of agriculture, universities, organizations of small producers, and producers and their families.

Success story

In 2020, CATIE worked with IICA on the AGRO-INNOVA project, which applies concepts and tools from ecological agriculture that improve mitigation and adaptation technologies to climate change for the production of basic crops, through public-private research, innovation, and extension in multi-layer agroforestry systems (SAFM, by its acronym in Spanish). This project aims to preserve the biodiversity of seeds, increase productivity and improve food security for highly vulnerable families in the Dry Corridor of Central America.



Featured publications of 2020

- Albers H. J; Preonas, L; Capitán, T; Robinson, E.J.Z. & Madrigal-Ballester, R. (2020) *Optimal Siting, Sizing, and Enforcement of Marine Protected Areas*. *Environmental and Resource Economics*. 77. Pp. 229–269. Available at <https://doi.org/10.1007/s10640-020-00472-7>
- Alpizar, F; Carlsson, F; Lanza, G; Carney, B; Daniels, R.C; Jaime, M; Ho, T; Nie, Z; Salazar, C; Tibesigwa, B. & Wahdera, S. (2020) A framework for selecting and designing policies to reduce marine plastic pollution in developing countries. *Environmental Science & Policy*. 109. Pp. 25–35. Available at <https://doi.org/10.1016/j.envsci.2020.04.007>.
- Alpizar, F; Bernedo del Carpio, M; Ferraro, P.J. & Meiselman, B. (2019) The impacts of a capacity- building workshop in a randomized adaptation project (online). *Nature Climate Change*. 9. Pp. 587-591. Consulted on March 4, 2020. Available at <https://www.nature.com/articles/s41558-019-0536-3>
- Álvarez, F; Casanoves, F; Suárez, J.C. & Pezo, D. (2020) The effect of different levels of tree cover on milk production in dual-purpose livestock systems in the humid tropics of the Colombian Amazon region. *Agroforestry Systems*. 95. Pp. 93–102. Available at <https://doi.org/10.1007/s10457-020-00566-7>
- Arndt, C; Misselbrook, T.H; Vega, A; González-Quintero, R; Chavarro-Lobo, J.A; Mazzetto, A.M. & Chadwick, D.R. (2020) Measured ammonia emissions from tropical and subtropical pastures: A comparison with 2006 IPCC, 2019 Refinement to the 2006 IPCC, and EMEP/EEA (European Monitoring and Evaluation Programme and European Environmental Agency) inventory estimates. *Journal of Dairy Science*, 103(7). Pp. 6706-6715. Available at <https://doi.org/10.3168/jds.2019-17825>
- Cerda, R; Jacques, A; Harvey, C.A; Gary, C; Tixier, P. & Allinne, C. (2020) Coffee agroforestry systems capable of reducing disease-induced yield and economic losses while providing multiple ecosystem services. *Crop Protection*. 134. Pp. 1-14. Available at <https://doi.org/10.1016/j.cropro.2020.105149>
- Corona-Figueroa, M.F; Ríos, N; Castelblanco-Martínez, D.N; Vilchez-Mendoza, S.J; Delgado-Rodríguez, D. & Niño-Torres, C.A. (2020) Searching for manatees in the dark waters of a transboundary river between Mexico and Belize: a predictive distribution model. *Aquat Ecol*. 55. Pp. 59–74. Available at <https://doi.org/10.1007/s10452-020-09810-9>
- Daye, A.A; Silva-Rodríguez, E.A; Albert, S; Chapman, M; Zukowski, B; Ibarra, J.T; Gifford, G; Echeverri, A; Martínez-Salinas, A. & Sepúlveda-Luque, C. (2020) Applying conservation social science to study the human dimensions of Neotropical bird conservation. *The Condor Ornithological Applications*. 122(1). Available at [DOI: 10.1093/condor/duaa021](https://doi.org/10.1093/condor/duaa021)
- Gassner, A; Dobie, P; Harrison, R; Vidal, A; Somarriba, E; Pythoud, F; Kumar, C; Laumonier, Y. & Chhatra, A. (2020) Making the post-2020 global biodiversity framework a successful tool for building biodiverse, inclusive, resilient and safe food systems for all. *Environmental Research Letters*. 15(10). Available at <https://doi.org/10.1088/1748-9326/abae2b>
- Esquivel, J; Park, B.B; Casanoves, F; Delgado, D; Park, G-E. & Finegan, B. (2020) Altitude and species identity drive leaf litter decomposition rates of ten species on a 2950 m altitudinal gradient in Neotropical rain forests. *Biotropica*. 52(1). Pp. 11-21. Available at <https://doi.org/10.1111/btp.12730>
- Lassoa, E; Corrales, D.C; Avelino, J; de Melo, E; Filho, V. & Corrales, J.C. (2020) Discovering weather periods and crop properties favorable for coffee rust incidence from feature selection approaches. *Computers and Electronics in Agriculture*. 176(105640). Available at <https://doi.org/10.1016/j.compag.2020.105640>

Müller, A; Bouroncle, C; Gaytán, A; Girón, E; Granados, A; Mora, V; Portillo, F. & van Etten, J. (2020) Good data are not enough: Understanding limited information use for climate risk and food security management in Guatemala. *Climate Risk Management*. 30(100248). Available at <https://doi.org/10.1016/j.crm.2020.100248>

Scalabrin, S; Toniutti, L; DiGasparo, G; Scaglione, D; Magris, G; Vidotto, M; Pinosio, S; Cattonaro, F; Magni, F; Jurman, I; Cerutti, M; Liverani, F.S; Navarini, L; DelTerra, L; Pellegrino, G; Ruosi, M.R; Vitulo, N; Valle, G; Pallavicini, A; Graziosi, G; Klein, P.E; Bentley, N; Murray, S; Solano, W; Hakimi, A; Schilling, T; Montagnon, C; Morgante, M. & Bertrand, B. (2020) A single polyploidization event at the origin of the tetraploid genome of *Coffea arabica* is responsible for the extremely low genetic variation in wild and cultivated germplasm. *Scientific Reports*. 10(4642). Available at <https://doi.org/10.1038/s41598-020-61216-7>

Taillie, P.J; Roman-Cuesta, R; Lagomasino, D; Cifuentes-Jara, M; Fatoyinbo, T; Ott, L.E. & Poulter. (2020) Widespread mangrove damage resulting from the 2017 Atlantic mega hurricane season. *Environmental Research Letters*. 15(6). Available at <https://doi.org/10.1088/1748-9326/ab82cf>

van Wijk, M; Hammond, J; Gorman, L. S; Adams, A; Ayantunde, D; Baines, A; Bolliger, C; Bosire, P; Carpena, S; Chesterman, A; Chinyophiro, H; Daudi, P; Dontsop, S; Douchamps, W.D; Emera, S; Fraval, S; Fonte, L; Hok, H; Kiara, E; Kihoro, L; Korir, C; Lamanna, C.T.M; Long, G; Manyawu, Z; Mehrabi, D.K; Mengistu, L; Mercado, K; Meza, V; Mora, J; Mutemi, M; Ng'endo, P; Njingulula, C; Okafor, T; Pagella, P; Phengsavanh, J; Rao, R; Ritzema, T.S; Rosenstock, T; Skirrow, J; Steinke, C; Stirling, J.G; Suchini, N; Teufel, P; Thorne, S; Vanek, J; van Etten, B; Vanlauwe, J; Wichern, V. & Yameogo. (2020) The Rural Household Multiple Indicator Survey, data from 13,310 farm households in 21 countries. *Scientific Data*. 7(46). Available at <https://doi.org/10.1038/s41597-020-0388-8>

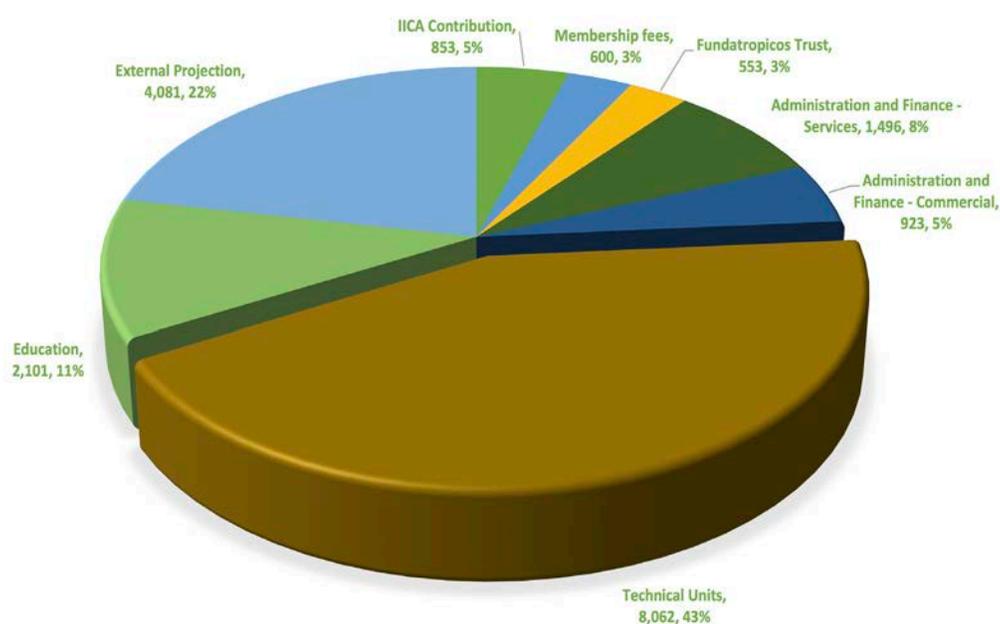


Our finances

The year 2020 represented one of the most challenging periods for the financial health of the institution since its creation. The impact of the pandemic, caused by COVID-19, on the global economy also directly affected access to donation and financing resources, which affected the financial health of the institution.

CATIE had to take extreme measures to prevent the economic impact of the pandemic from having a strong impact on the operation of the Center. For this, a weekly monitoring system was established, which allowed a permanent assessment of the financial health of the institution and, thus, take measures in time to avoid impacts of greater dimensions. Commercial activities also suffered an important impact, especially those dedicated to the attention of visitors, such as the Botanical Garden, the lodging area, the cafeteria, and transportation.

Despite everything, at the end of the 2020 period, CATIE closes with a positive balance of USD 13,000. The entire CATIE family made a valuable contribution to avoid a greater impact on the financial health of the institution.



Structure and source of income

IICA Contribution	853.000
Membership fees	600.000
Fundatropicos Trust	553.000
Administration and Finance - Services	1.496.000
Administration and Finance - Commercial	923.000
Technical Units	8.062.000
Education	2.101.000
External Projection	4.081.000
Total	USD18.669.000

CATIE enters a new era by adjusting its Fundraising Strategy and modernizing its trust

In January 2020, the Board of Directors of the Tropics Foundation met in Atlanta, United States, to redefine its strategic approach to update its role within CATIE's institutional fund management strategy. As a result of this exercise, the foundation has a clear vision and mission, as well as a consolidated strategy to regain its relevance and, once again, represent an important way of managing funds for the institution in the United States of America. Clear advances have been made in collaborative fundraising management strategies with partner universities, such as the University of Idaho and Pennsylvania State University. In addition, the Tropics Foundation, in partnership with CATIE, secured the first grant from USAID's American Schools and Hospitals Abroad (USAID/ASHA) for almost USD 500,000 to finance the renovation of furniture and the technological update of the Graduate School of the CATIE.

Fundatropicos, for its part, began a transition towards a much more modern, agile, and efficient operating structure and corporate governance, which will allow it to improve its administration, governance, and decision-making processes. This, in turn, will lead to an increase in revenue due to the interest generated by the CATIE trust, which allows it to finance an important part of the basic budget. In addition, the Board of Directors is defining how to expand this trust to increase the economic contribution to CATIE and have a direct impact on the long-term financial sustainability of the institution.



CATIE in the region

New alliances... new proposals: challenges, achievements, and opportunities

In 2020, CATIE, its member countries, and the rest of humanity faced health and climatic emergencies that have affected the achievement of some of the proposed goals, as the countries have been forced to modify – at least in the short and medium-term – the priorities and ways of working of institutions, producers, rural families, and even consumers. The crisis generated by the COVID-19 pandemic began to manifest itself, in the region, in March 2020, and in the following months, the problem escalated, until it seriously compromised the economy of families and countries.

In the case of the Central American countries, the problem was exacerbated at the end of the year with the appearance of hurricanes Eta and Iota, with strong consequences of destruction in the productive and communication infrastructure. Coordinated action between the National Offices, the Directorate for External Projection, and Global Alliances were essential to monitor the impacts of these emergencies on CATIE's actions in the countries. Also, to seek mechanisms to continue operating and, thus, to respond to existing commitments with countries and donors. In addition, these challenges made it possible to analyze how to generate new opportunities for post-pandemic recovery and increase resilience capacity in the face of future events.

In the early stages of the pandemic, the efforts of governments and donors were focused on the development of mechanisms and options to control the spread of the virus and the treatment of patients, which affected in many cases the production and natural resource management processes. These are CATIE's thematic areas of strength. This led to the postponement and even cancellation of contests for proposals where CATIE was participating or was going to partake. Likewise, the possibility of face-to-face interaction with national partners affected, in the first stage, our actions in the countries. However, after adjusting to the new reality, it has been possible to exceed the goals proposed for the number of projects and strategic alliances that CATIE had proposed.

Despite the crisis caused by the pandemic, fundraising goals were exceeded, reaching a total of USD 15.7 million in approved proposals. This was achieved thanks to good coordination and permanent communication with CATIE's technical units and National Offices in the member countries, who played a key role in the success of these initiatives.

Moreover, the Office of Global Alliances contributed to reposition and strengthen CATIE's presence in South America. In 2020, five successful proposals for an amount of USD 3 million were managed in Colombia, Peru, Ecuador, and Bolivia. Furthermore, alliances were consolidated with some strategic partners such as UNDP in the Amazon (Ecuador and Peru), Guatemala, Haiti, the Dominican Republic, and Panama.

CATIE's actions in the countries did not stop as a consequence of the pandemic, instead they were adjusted to the new reality. Perhaps the most important change was the greater use of digital media and a detailed review of CATIE's actions in each of the countries, through a series of virtual seminars that allowed to learn about the successful experiences and the limitations that the countries faced.

The National Offices provided administrative and technical support to regional or binational projects and facilitated their operation. This action was necessary due to the impossibility of the headquarters technicians to visit the countries, given the international travel restrictions associated with the COVID-19 pandemic. Therefore, they facilitated and participated in the development of new project proposals to be developed in the countries. An example of the latter is the case of the PROAMAZONIA projects in Ecuador, and Sustainable Amazon Landscapes in Peru, both with UNDP. These are now part of the agenda of the Livestock and Environmental Management Group (GAMMA, by its acronym in Spanish). Nevertheless, the Representatives of CATIE, in Ecuador and Peru, collaborated in the design of these projects and participated actively in facilitating contacts with the UNDP officials responsible for the project, as well as in identifying and contacting the national partner institutions in those projects. Both cases illustrate the catalytic role of the National Offices in the identification of partners and new opportunities for CATIE action in the countries, but also contribute to the analysis of the institutional context in which the projects will operate.

Additionally, the National Offices successfully conducted national projects such as the National Information Platform on Nutrition (PiNN, by its acronym in Spanish) in Guatemala, the Adaptation of Agriculture to Climate Change through Water Harvesting in Nicaragua, the Climate Vulnerability Diagnosis and Climate Change Adaptation Plan for the Santa María River Basin in Panama, the Sustainable Management of Forests in the Andean Region in Colombia, the Development of an Integrated and Comprehensive Agroforestry Policy Framework in Belize, the Technological-Financial Alternatives for the Renovation, Rehabilitation, and Promotion of Coffee Plantations in the Dominican Republic, among many others. The National Offices were also key actors in obtaining scholarships for postgraduate studies at CATIE, provided by the governments in the case of Colombia, Honduras, and the Dominican Republic. The most relevant actions in each country are detailed below.

Belize

CATIE, in this member country, developed several projects during 2020. Among them, we can mention the Development of an Integrated and Comprehensive Agroforestry Policy Framework for Belize, executed in conjunction with the Office of Climate Change of the Ministry of Sustainable Development, Climate Change, and Disaster Risk Management of Belize, along with funds from the Office of Climate Change and the Center for Climate Technology (CTCN, by its acronym in Spanish). This project seeks to promote agroforestry, silvopastoral, and agrosilvopastoral systems, which should contribute to increasing the well-being and income of the rural Belizean population. In this context, the policy seeks not only to contribute to achieving food security but also to meeting national and international goals for the conservation of natural resources. It was formulated and validated through a broad participatory and inclusive process, which took about a year and a half, with consultation workshops with the different actors, both from public institutions, non-governmental organizations (NGOs), academia, and producers. An important aspect of this effort was to incorporate the perspective of the stakeholders involved to ensure the effective participation of rural women in agroforestry policy, which constitutes a milestone for Belize and the Central American region in general.

Other projects that were supported were the Resilient Rural Belize, under the Ministry of Economy and Petroleum; the Improving Livestock Productivity and Climate Resilience in Belize, conducted with the Association of Livestock Producers of Belize (BLPA, by its acronym in Spanish) with financing from the Innovation Laboratory of the Inter-American Development Bank; the project Value Chain Market Assessment for Each Priority Area identified in the Resilient Rural Belize Program (RRB); and the Climate Vulnerability Assessment for eEach Priority Area identified in the Resilient Rural Belize (RRB) Programme, both with IFAD financing.



Bolivia

While the process to formalize CATIE's National Office in Bolivia is being reactivated, in 2020, the project "Evaluation of the interaction of varieties due to pruning in coffee cultivation" was continued. It is developed by the Unit for Genetic and Agroforestry Improvement of Coffee and Cacao of CATIE, in collaboration with the National Institute for Agricultural and Forestry Research (INAF, by its acronym in Spanish). This is part of a study conducted in eight countries with funding from KOLFACI, which seeks to develop innovative technologies that combine promising and traditional coffee varieties subjected to different types of pruning, and to determine the most appropriate fertilization doses for each combination, based on a projection of the balance of nutrients, costs, and income. In addition, this project is the basis for actions to strengthen the capacities of researchers and students in the participating countries.

Also, a course was developed for the Certification for the Training of Azero and Guadalquivir Watershed Managers, which was developed in coordination with the Gabriel René Moreno Autonomous University (UAGRM, by its acronym in Spanish), in conjunction with the Vice Ministry of Water Resources and Irrigation (VRHR, by its acronym in Spanish), dependent on the Ministry of Environment and Water (MMAyA, by its acronym in Spanish) and the support of GIZ. In this course, developed in virtual format for six months, 16 women and 24 men, among which there were municipal technicians, representatives of different universities, leaders, and authorities of the municipalities of the Azero and Guadalquivir watersheds, who were selected for their leadership and active work, favoring the management of watersheds and the management of their natural resources.



Colombia

CATIE's Office in Colombia actively participated in the preparation of various proposals with local and international partners. These include: Promoting sustainable livestock production with a comprehensive territorial management approach for the protection of Amazon and its populations, submitted for funding from the Norway International Climate and Forest Initiative (NICFI); USAID's appeal titled Amazon Forest and Biodiversity Activity; the "Support Program for the implementation of the National Climate Change Strategy (NDC) in agricultural value chains in Colombia" and the "Support Program for Colombia in the implementation of its NDCs – Strengthening MRV and M&E systems", both with financing from GIZ; the project "Formulation and implementation of a strategy to support the sustainable transformation of low-carbon livestock agroecosystems in prioritized landscapes of the Orinoquia" with funds from the Ministry of Agriculture and Rural Development; and the proposal "Design of a Roadmap for the Development of a Green Growth Plan for the Department of Huila", submitted to the Sustainable Trade Initiative (IDH, by its acronym in Spanish).

Likewise, CATIE, in Colombia, partnered with the Sustainable Livestock Table of Colombia, FAO-Colombia, CIAT, and the National University of Colombia/Medellín campus to organize the Sustainable Livestock Discussion, which consisted of four modules: 1) greenhouse gases, 2) biodiversity, 3) markets, and 4) consumption and agricultural extension. CATIE was responsible for organizing the second module entitled "Biodiversity, landscapes, and ecosystem services", in which CATIE researchers participated as speakers. The panels had a participation of more than 1800 people from 21 countries.



Ecuador

The CATIE Office in Ecuador made efforts to consolidate agreements with government institutions, such as the Ministries of Agriculture and Livestock and the Ministry of Environment and Water; the IKIAM Amazon Regional University and the Secretary of the Environment of the Metropolitan District of Quito. The latter is interested in learning about CATIE's experience in the payment system for environmental services and its potential application in livestock systems. Also, it requested CATIE, in coordination with the Embassy of Costa Rica in Ecuador, to facilitate meetings with the government to analyze the country's Decarbonization Plan. Subsequently, the municipal authorities will share their experiences with the establishment of the urban trains (subway) that are of interest to Costa Rica.

At the end of November 2020, after several phases, partly delayed by the COVID emergency, the Agreement was signed between the Responsible Parties of the Comprehensive Amazon Program for Forest Conservation and Sustainable Production *PROAmazonía* and CATIE. In this case, CATIE will be responsible for the design and implementation of a Training Program and the technical assistance for the sustainable production of livestock in the provinces of the Special Amazon Territorial Circumscription (CTEA, by its acronym in Spanish). These actions will be coordinated by CATIE's Livestock and Environmental Management Unit (GAMMA, by its acronym in Spanish) in collaboration with CATIE's office in the country.

El Salvador

In 2020, the Office in El Salvador has provided support to regional projects operating in the country, such as the Central American Program for the Comprehensive Management of Coffee Rust (PROCAGICA, by its acronym in Spanish) with IICA and CIRAD, the Adapted Agroforestry Systems Project for the Central American Dry Corridor (AGRO-INNOVA, by its acronym in Spanish) with IICA and the EU, and the Project Development of Sustainable Forest Models for Secondary Forests in Central America, with links to Private Financing with IKI funds.



Guatemala

CATIE's Office in Guatemala conducts three projects at a national level. a. "National Information Platform on Nutrition (PiNN, by its acronym in Spanish)", which operates in the municipality of Momostenango as a pilot site. It works in coordination with SESAN and with financial support from the European Union, whose purpose is to develop management processes of information and multisectoral knowledge for the prevention of malnutrition, and improving food and nutrition security, serving as a model for actions at a national level. b. "Territorial Co-management for the Conservation and Sustainable Management of the Volcanic Complex Acatenango-Fuego, Cerro Sanay, and Montaña El Socó", in collaboration with the Fund for the Conservation of Tropical Forests (FCA, by its acronym in Spanish) and the participation of various government institutions (CONAP, INAB, INGUAT, and the Municipalities of Acatenango and San Andrés Itzapa). This project strengthens and promotes local and municipal alliances for the conservation and sustainable management of forests, soils, and water in the forest landscape, as well as the development of community and nature tourism in the territory. And, c. "Sustainable Economic Development and Territorial Governance Project in the Sarstun River Adjacency Zone", with the Foundation for Ecodevelopment and Conservation (FUNDAECO, by its acronym in Spanish), which aims to strengthen the capacities of partner institutions to implement rural extension processes in agroforestry systems with cacao, cardamom, pepper, and other crops, as well as silvopastoral systems. These systems contribute to the sustainable management of natural resources, the generation of economic benefits for communities, and the construction of processes for social participation, to reduce conflicts in the Sarstun River Adjacency Zone, located between Guatemala and Belize.

In addition, it supported the development of various projects that operate at a regional level, in which CATIE participates, such as the Central American Program for the Comprehensive Management of Coffee Rust (PROCAGICA, by its acronym in Spanish), the Adapted Agroforestry Systems for the Central American Dry Corridor (AGROINNOVA, by its acronym in Spanish) project; both in collaboration with IICA. It also supported the Ibero-American Model Forest Network (RLABM, by its acronym in Spanish) with FAO, CIFOR, and CUSO as strategic partners. CATIE was key in the implementation of the Scaling of Ecosystem-Based Adaptation



Measures (EbA) project in rural Latin America, the project Development of Sustainable Forestry Models for Secondary Forests in Central America with links to private financing (IKI), the Promotion of the Management of the Trinational Ecosystem of the Mayan Forest Mexico-Belize-Guatemala initiative, had the collaboration of the institutions responsible for the management of natural resources and protected areas in the three countries that operate with IDB funds/regional public goods. Furthermore, CATIE, in Guatemala, was selected to administer the project Strengthening and Scaling up Biosafety Capacities for the Full Implementation of the Cartagena Protocol on Biosafety, which was executed by CONAP with UNEP funds. Also, it administers the project Strengthening the Transparency Framework through the Creation of National Capacities to Implement the Paris Agreement in Guatemala (CBIT, by its acronym in Spanish), which is managed by the Ministry of the Environment, with the financial support of UNDP.

On the other hand, it was a facilitator of the organization and development of webinars with the Low Emissions Livestock Group, where the ministries of Agriculture and Livestock, and the Environment, universities, and the private livestock sector, among others, participated.

The purpose of this project is to contribute to the conservation and restoration of forest landscapes in the Central Volcanic Chain, emphasizing the goods and services of the ecosystems that improve the livelihoods of its inhabitants. Therefore, in 2020, efforts were developed to strengthen the local institutional capacities aimed at the conservation, sustainable management, and restoration of the forest landscape and the development of a knowledge management process with the participation of municipal officials, institutions, community leaders, local organizations, forest rangers, and families. All this with the participation of institutions of national responsibility, such as CONAP, INAB, and INGUAT, but also the municipalities of the districts of Acatenango and San Andrés Itzapa. In addition, a biological monitoring system based on camera traps and acoustic monitoring was implemented in areas of high importance for biological conservation, and more than 200 ha of natural forests were incorporated for conservation, with forest incentives. Likewise, Farmer Field Schools (ECA, by its acronym in Spanish) were established on issues of soil conservation and the use of agroforestry systems.



Haiti

The Republic of Haiti has gone through a period of strong political instability in 2020, which did not allow the development of fieldwork with the required intensity. However, there was a strong interaction with the Ministries of Agriculture and Environment for the elaboration of proposals on the topics of interest of each ministry. Also, work was carried out on the development of the *Kafe Makaya* project, under the leadership of OXFAM/Quebec, and in collaboration with the *Fondation Nouvelle Grand'Anse*. This project aims to strengthen the coffee sector and improve the income of 2600 producer families in southern Haiti, through the application of agroecological and organic production approaches using agroforestry systems.

Honduras

CATIE, in Honduras, dedicated efforts to consolidate and update existing agreements, such as the one signed with the Secretary of Agriculture and Livestock (SAG, by its acronym in Spanish), as well as new agreements with the National University of Agriculture of Catacamas (UNAG, by its acronym in Spanish) for the training of its human capital at the of masters and doctorates. Likewise, agreements with the Presidential Commissioner for Climate Change on the issue of decarbonization, with the Presidential Watershed Commission to present proposals for the comprehensive management of the post-hurricane IOTA and ETA watersheds, and a strategic alliance with INNOVATERRA to address-land use planning in urban areas.

The Office facilitated CATIE's contract, with the NGO Help in Action, for the Sustainable Livestock project in the region of the Gulf of Fonseca (DEIT, by its acronym in Spanish), which has technical support from CATIE's Livestock and Environmental Management Unit (GAMMA, by its acronym in Spanish). It also developed studies on the competitiveness of the chain and the investment climate for the livestock sector. In addition, it worked on the establishment of model farms, which will be used for the training of producers, as well as for the development of environmental and climatic indicators, and a protocol for the registration of information on the farms. Moreover, CATIE, in Honduras, supported other institutional projects that operated in the coun-

try, such as the project Taking Advantage of the Potential of Trees on Farms for Biodiversity (IKI TonF) with ICRAF, the initiative Transforming the Honduran Livestock Sector into a Low-carbon Economy (NAMA-Livestock) with the participation of SAG-DICTA, MiAMBIENTE, UNAH, and others. Also, the project Digitizing the Cacao Value Chain in Honduras: Innovative Technologies to Increase the Value, Profitability, and Resilience of Cacao Producers in Olancho (Chocolate4All), in consortium with Heifer International and UNAH, and with the financial support of the IDB; and the Conservation of Migratory Birds in Olancho project with the American Bird Conservancy Association. Additionally, in 2020, regional projects were supported from Honduras, such as the Ibero-American Model Forest Network (RLABM, by its acronym in Spanish), the project Scaling Up Ecosystem-Based Adaptation Measures in Rural Latin America, and the Sentinel Landscape Network of the CGIAR Program on Forests, Trees, and Agroforestry (FTA) led by ICRAF.

A relevant fact in 2020 was the procurement of financing for five master's students with the Presidential Scholarship Program 2020, and others with the Agroforestry Scholarship Program of the Presidency of the Republic for the Forest Conservation Institute (ICF, by its acronym in Spanish).



Nicaragua

In 2020, CATIE, in Nicaragua, was part of several regional projects operating in the country, such as the Central American Program for the Comprehensive Management of Coffee Rust (PROCAGI-CA, by its acronym in Spanish), the project Agroforestry Systems adapted for the Central American Dry Corridor (AGROINNOVA, by its acronym in Spanish), both in collaboration with IICA; the CGIAR Program on Forests, Trees, and Agroforestry (FTA, by its acronym in Spanish), and the initiative Development of Sustainable Forestry Models for Secondary Forests in Central America, with links to private financing with IKI funds.

Other strategic actions include the Study on the Adaptive Capacity of Agricultural Landscapes in 10 Municipalities of the Country, with the collaboration of the Ministry of Family, Community, Cooperative, and Associative Economy (MEFCCA, by its acronym in Spanish), and the project Adapting Agriculture to Climate Change Through Water Harvesting, with financial support from SDC. In support of the latter, CATIE and IICA established an alliance to promote agribusiness and the design of municipal public standards related to water harvesting, to contribute to making the productive and economic development of small producer families living in the territory more sustainable and diversified. In addition, the response to a request from the Ministry of Agriculture and Forestry (MAGFOR, by its acronym in Spanish) was coordinated for the training of 20 professionals from the National System of Production, Consumption, and Trade in Artificial Insemination Techniques, who in turn will train and accompany technicians and leading producers in the application of these animal biotechnology tools.

The Nicaragua-Honduras sentinel landscape is part of the Mesoamerican Biological Corridor, and it is part of a network of seven sentinel landscapes in different regions of the world (Africa, India, Asia), which present marked differences in culture, ecology, natural resources, and land use. Especially, tree coverage as a result of deforestation processes, and in some cases, reforestation, often linked to national and regional development policies and social processes such as migration. In 2020, the project developed 39 publications conducted in Nicaragua, which analyzed the drivers of change in land use and governance. Some of these publications are master's research theses from CATIE's Graduate School.



Panama

In 2020, the following projects were executed at a national level with the financial support of the Adaptation Fund, and administered by the World Bank: Detailed Diagnosis of Climate Vulnerability and Proposal of an Adaptation Plan to Climate Change for the Santa María River Watershed, and Establishment of Riverside Reforestation and Agroforestry Projects with Coffee Systems and Soil Conservation in the Caisán River Sub-Watershed (Renacimiento, Chiriquí province). Likewise, through the PROCUENCAS initiative, the technical capacities of professionals and strategic partners of the Ministry of the Environment were strengthened with financial support from CAF.

Additionally, it supported, together with FAO and IICA, the review of the National Climate Change Plan for the agricultural sector, prepared by MIDA and MiAmbiente, as well as the elaboration of the National Strategic Plan of the Agricultural Sector. Also, CATIE, in Panama, together with the Livestock and Environmental Management Unit (GAMMA, by its acronym in Spanish), is acting as a catalyst in the development of the NAMA Strategy for the livestock sector, to turn it into a green, recovered, and low-carbon economy. These actions are coordinated with the Ministries of the Environment (MiAmbiente, by its acronym in Spanish) and of Agricultural Development (MIDA, by its acronym in Spanish), along with private sector institutions such as ANAGAN.

On the other hand, on the issue of integral management of hydrographic watersheds, CATIE, in Panama, prepared a study on climate vulnerability and a plan for the adaptation to climate change for the Santa María River watershed. This study was implemented by the NATURA Foundation and the Ministry of the Environment, with funding from the Adaptation Fund. It collects basic, biophysical, and socioeconomic information for planning actions in one of the largest and most populated watersheds in Panama. The Santa María River watershed presents situations of poverty in its upper part, and strong pressures for agricultural activities along it. The study, which was carried out in a participatory manner, made it possible to detail the environmental situation and generate a complete geodatabase but, in addition, it expanded its contribution with a vulnerability study on variation and climate change, as well as a proposal for adaptation measures.



Peru

CATIE's Office in Peru concentrated its efforts on two projects of importance to the country, which were assigned to CATIE. One was to support the CARAL 2020 contest, aimed at the selection and promotion of impact innovations for the improvement of family agriculture, which was organized by the National Program for Agrarian Innovation (PNIA, by its acronym in Spanish) of Peru. In this contest, three CATIE officials participated, one in the organization and coordination of the entire process, and two as members of the evaluation committee. The contest was designed to promote agricultural innovation by documenting, disseminating, and awarding successful cases of technological, institutional, and organizational innovations, to make visible and recognize the agricultural research and innovation efforts developed in the country by different actors, such as academia, NGOs, private companies, and organized groups of producers. It also sought to facilitate the application of the results achieved through partnerships, knowledge management, and training. A total of 169 cases were received, and 20 of them were awarded in topics such as agrobiodiversity, resilience to climate change, food and nutrition security, and the valuation of local genetic resources for the agricultural sector. The winning cases directly impacted 50 650 families, and indirectly, another 200 778. The contest made it possible to demonstrate that investment in research for development is profitable, but requires a period of growth; also, associativity, strategic alliances, and the value chain approach are essential for success.

The other project was the achievement of the component "Strengthening Capacities for the Sustainable Intensification of Livestock in the Ucayali And Huánuco Regions", which is part of the Sustainable Productive Landscapes in the Peruvian Amazon project, administered by UNDP, with resources from the Global Environment Fund (GEF). The technical actions of this initiative are in charge of CATIE's GAMMA unit.

On the other hand, another area of action was to facilitate activities for the development of capacities of leading professionals and farmers in various areas, in which CATIE has recognized strength. For example, agroforestry systems of coffee and cacao, natural resource management, and sustainable livestock. These activities ranged from theoretical-practical training events at CATIE

headquarters, lasting from two weeks to five months, in which there were a total of 101 participants. On the other hand, two virtual courses were offered, one on governance and management of biodiversity in forests (SEFOR-GIZ) with 40 participants, and the other one was the 32nd International Course on Forest Management (FAO-EU-FLEG) with 12 participants.



Dominican Republic

CATIE, in the Dominican Republic, worked actively in the search for new projects to position CATIE in the country, emphasizing actions related to capacity building through short-term and post-graduate events. Under the coordination of the Higher Institute of Agriculture (ISA, by its acronym in Spanish) and the Autonomous University of Santo Domingo, 60 professionals were trained in integrated pest management and on competitive sustainable livestock with low carbon emissions. These were coordinated with the Directorate of Change Climate of the Ministry of the Environment and CEDAF, and more than 50 professionals from different Dominican institutions were trained.

About 27 Dominicans (seven women and 19 men) were part of CATIE's master's program, with scholarships from the Ministry of Agriculture and the Ministry of Higher Education, Science, and Technology (MESCYT, by its acronym in Spanish). Sixteen of them graduated in 2020, and the remaining 10 completed courses and traveled to their country to develop their thesis work. The country has recognized the importance of investing in the education of its graduates in CATIE's Postgraduate Program, for this reason, a new agreement was worked out between MESCYT and CATIE. The agreement constitutes an opportunity for quality training and personal and professional growth for up to 30 young Dominicans, who will join in the next two years. Additionally, the agreement considers CATIE's support in the formulation of joint master's degrees with Dominican universities, prioritizing the areas of sustainable agribusiness, watershed and water resources management, and sustainable low-emission livestock farming.

In addition, agreements were established with private universities, such as the National Evangelical University (UNEV, by its acronym in Spanish) and the Technological Catholic University of Cibao (UCATECI, by its acronym in Spanish). With the latter, the formalization of a joint master's degree in sustainable agribusiness is being completed.

Regarding research, several initiatives have been developed. Among them, there are Technological-Financial Alternatives for the Renovation, Rehabilitation, and Promotion of Coffee Plantations, and Training in the Design and Agroforestry Management of



Coffee Plantations to Increase Yield and Ecosystem Services, both in collaboration with the Dominican Coffee Institute (INDOCAFE, by its acronym in Spanish). The projects Evaluation of the Behavior of Eight Cocoa Clones Developed in the Experimental Cocoa Farm in Mata Larga, in collaboration with the National Cocoa Commission; Measurement of Biomass and CO₂ in Non-forested Plantations in the Dominican Republic; and Use of Geographic Information Systems to Monitor Agroforestry Systems and their Contribution to Reducing GHG Emissions were developed in coordination with the Climate Change Directorate of the Ministry of the Environment..

Acronyms

AFD	(French Agency for Development)
AGRICULTURA	(Secretariat of Agriculture and Rural Development)
ANAGAN	(National Association of Cattlemen of Panama)
IDB	(Inter-American Development Bank)
IDB-MIF	(Multilateral Investment Fund of the Inter-American Development Bank)
Bioversity-CIAT	(Bioversity Alliance and International Center for Tropical Agriculture)
CAF	(Development Bank of Latin America)
CARSI	(Central American Initiative for Regional Security)
CATIE	(Tropical Agricultural Research and Teaching Center)
CENIGA	(National Center for Geoenvironmental Information)
CGIAR	(Consultative Group on International Agricultural Research)
CIFOR	(Center for International Forestry Research)
CIRAD	(Center for International Cooperation in Agronomic Research for Development)
CONABIO	(National Commission for the Knowledge and Use of Biodiversity)
CONAP	(National Council of Protected Areas of Guatemala)
CTCN	(Office of Climate Change and Climate Technology Center)
CUSO	(Canadian University Service Overseas)
DICTA	(Directorate of Agricultural Science and Technology of Honduras)
EfD	(Environment for Development)
EU	(European Union)
FAO	(Food and Agriculture Organization of the United Nations)
FCA	(Fund for the Conservation of Tropical Forests of Guatemala)
FONAFIFO	(National Forest Financing Fund)
FONTAGRO	(Regional Fund for Agricultural Technology)
GIZ	(German Society for International Cooperation)
GEF	(Global Environment Fund)
ICF	(Forest Conservation Institute of Honduras)
IICA	(Inter-American Institute for Cooperation on Agriculture)
IKI	(International Climate Initiative)
INAB	(National Forest Institute of Guatemala)
INAF	(National Institute of Agricultural and Forestry Research)
INDOCAFE	(Dominican Coffee Institute)
INGUAT	(Guatemalan Tourism Institute)
INIA	(National Institute of Agricultural Research of Uruguay)
INIA	(National Institute of Agrarian Innovation of Peru)
IPCC	(Intergovernmental Panel on Climate Change)

IUCN	(International Union for Conservation of Nature)
KOICA	(Korea International Cooperation Agency)
KoLFACI	(Korean Cooperation for Food and Agriculture in Latin America)
MAGFOR	(Ministry of Agriculture and Forestry of Nicaragua)
MiAmbiente	(Ministry of the Environment of Panama)
MiAmbiente	(Ministry of the Environment of Honduras)
MICITT	(Ministry of Science and Technology of Costa Rica)
MIDA	(Ministry of Agricultural Development of Panama)
MESCYT	(Ministry of Higher Education, Science and Technology of the Dominican Republic)
MMAyA	(Ministry of Environment and Water)
PCP	(Scientific Collaboration Platform)
PNIA/INIA	(National Agrarian Innovation Program of the National Institute of Agrarian Research of Peru)
PROMECAFE	(Regional Cooperative Program for Technological Development and Modernization of Coffee Growing)
SAG	(Secretariat of Agriculture and Livestock of Honduras)
SESAN	(Secretariat of Food and Nutrition Security of the Presidency of the Republic)
SINAES	(National Accreditation System for Higher Education of Costa Rica)
SIMOCUTE	(National Monitoring System for Land Cover and Use and Ecosystems)
SIMSAN	(Municipal Information System on Food and Nutritional Security)
SINASAN	(National Food and Nutrition Security System)
SINAC	(National System of Conservation Areas of Costa Rica)
SDC	(Swiss Development Cooperation)
SDG	(Sustainable Development Goals)
UCATECI	(Technological Catholic University of Cibao of the Dominican Republic)
UAGRM	(Gabriel René Moreno Autonomous University)
UNAG	(National University of Agriculture of Catacamas of Honduras)
UNAH	(National Autonomous University of Honduras)
UNEP	(United Nations Environment Program)
UNEV	(National Evangelical University of the Dominican Republic)
UNDP	(United Nations Development Program)
UNFCCC	(United Nations Framework Convention on Climate Change)
USAID/ASHA	(American Schools and Hospitals Abroad de USAID)
USDA	(United States Department of Agriculture)
VRHR	(Vice Ministry of Water Resources and Irrigation of Bolivia)
WCR	(World Coffee Research)
WHO	(World Health Organization)



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