



Annual Report

2022



Contents

Presentation	4
Section 1. Our milestones 2022.....	6
Section 2. CATIE in numbers	21
Section 3. Research for Inclusive Green Development.....	26
Section 4. CATIE as a regional scientific platform.....	67
Section 5. IICA-CATIE cooperation.....	75
Section 6. CATIE in the region	86
Section 7. CATIE in the global agenda.....	106
Section 8. Our finances and human capital	109
Section 9. Next steps.....	112
Acronyms	114



Presentation



I am pleased to present the Annual Report for CATIE (Tropical Agricultural Research and Higher Education Center) for 2022, a report with important milestones, advances and results that will help generate positive and tangible impacts for the Latin American and Caribbean region, in pursuit of Inclusive Green Development.

This 2022 was a year that brought many challenges for the institution, considering the footprint left by COVID-19 and the conflict between Russia and Ukraine, which is having an impact on the economies of the countries. From CATIE we have implemented measures to manage these risks, which resulted in the generation of tangible results that drive the economic development of communities and countries through the training of leaders.

This year, the Directorate of Education, through its Graduate School, graduated 45 students, including 25 women and 20 men, in topics related to agroforestry and sustainable agriculture, management and conservation of tropical forests, sustainable tourism, environmental economics and climate change, watershed management, as well as agribusiness and sustainable markets. Two new master's degrees in sustainable intensification of animal production and regenerative coffee farming were also developed, which seeks to promote topics that contribute to the current

needs that must be met by the countries of the region.

For its part, from its different units, the Directorate of Research for Inclusive Green Development (DIDVI, for its acronym in Spanish) executed multiple research and development projects. The work focused on generating evidence to support decision-making, promote adaptation and mitigation of climate change, agriculture, sustainable livestock intensification, and sustainable forest management, for which innovative technological tools were integrated in silvopastoral systems, agroforestry, coffee and cocoa that support, in turn, the development of climate-smart agriculture.

Likewise, the scalability of the initiatives was a main objective of CATIE's work and that is why the governments of the region were accompanied in the implementation of science-based policies that guarantee a real transformation of the agricultural and environmental sector.

The Center's Commercial Management continues to grow with the development of high quality products, such as chocolate "La Lola" and coffee from CATIE (winner of the Cup of Excellence in Costa Rica), both produced from improved varieties, resilient to diseases and climate change. In addition, cooperation with Verto Education was strengthened through the signing of a new contract that allows hundreds of students to complete their first university semester on the CATIE campus.

The Directorate of Alliances and Green Business, Resource Mobilization and Strategic Alliances presented encouraging data this 2022, after having coordinated the elaboration of 36 proposals in collaboration with the research units of the DIDVI and different partners. Ten of them were approved for USD \$74 million.

From the General Directorate we implemented a strategy of healthy management of CATIE's finances, considering the present risks, which was reflected in the institution's financial reports, leaving a positive balance. In general, in all departments and offices, income closed positively, which will allow the organization to navigate in the framework of its 50th anniversary with an air of security and growth.



Muhammad Ibrahim, Ph.D.
Director General of CATIE



Section 1.

Our milestones 2022

CATIE's work in 2022 focused on its three pillars of action: research, education, and external projection, and sought through them to generate solutions based on science and innovations that seek Inclusive Green Development (DVI, for its acronym in Spanish) of the countries of Latin America and the Caribbean.

Below, a look at CATIE's main milestones during 2022 is provided.



Swedish cooperation returns to Central America in partnership with CATIE

In May 2022, a cooperation agreement was signed between the Swedish International Development Cooperation Agency (SIDA) and CATIE, to implement the regional project ESCALAR. This four-year initiative aims to increase resilience to the negative effects of climate change in high-priority areas of El Trifinio Dry Corridor.

This objective will be achieved by scaling up agricultural innovations for adaptation, using attractive business opportunities for rural youth as a mechanism, as well as ensuring an enabling environment through capacity-building, governance and financing facilities to employ large-scale innovations.

In 2022, the preparatory phase of the project was successfully carried out, through which the final beneficiaries and their adaptation needs, work sites, implementation partners, governance platforms and possible sources of financing were identified.

Through this project, CATIE reactivated its presence in El Trifinio and is using the lessons learned from 20 years of work in this region.

In 2022, the preparatory phase of the project was successfully carried out



Costa Rica has a Map of Mangrove Ecosystems

Thanks to a coordinated work between the National System of Conservation Areas (SINAC, for its acronym in Spanish) and CATIE 's Climate Action Unit (CAU, for its acronym in Spanish), Costa Rica has a Map of the Mangrove Ecosystems, thus fulfilling a key slope to achieve its national restoration goals, in accordance with its National Wetlands Policy.

This map is a technical tool for long-term planning for the restoration of national wetland systems and their responsible use, which will contribute to improving the quality of life of communities. In addition, it offers a detailed and accurate description of the country's mangrove ecosystems by 2021 and represents a consistent baseline that will allow monitoring future changes of the mangrove ecosystem in Costa Rica.

The development of the 2021 Mangrove Ecosystem Map was possible thanks to the State contribution of the SINAC, in conjunction with Conservation International (CI) Costa Rica, the support of The Pew Charitable Truts and the technical contribution of CATIE.



Green infrastructure for the well-being of the Costa Rican coastal population

Restoring sites, rehabilitating degraded soils, preventing erosion and water contamination, as well as promoting forest cover and promoting structural, biological, and functional connectivity are part of the benefits mentioned by Cinthia Barrantes, SINAC official, as results that stand out from the project Diagnosis on the Possibilities for Developing Infrastructure in the Caribbean and Pacific Coasts of Costa Rica, which is executed by CATIE's Environmental Economics and Sustainable Agribusiness Unit (UEAAS/EfD, for its acronym in Spanish), together with other organizations.

Guanacaste is a region where severe droughts affect the population. Therefore, the project through the construction of green infrastructures contributes directly to reducing the impact of droughts on the environment and the population.

In this project, tools were generated for the selection and prioritization of nature-based solutions by municipalities vulnerable to climate variability and change, as well as the implementation of a pilot for the restoration of sensitive ecosystems in the riparian zone of the Potrero Caimital Biological Corridor, a space where wildlife areas are protected and part of the water resources of the North Pacific of Costa Rica are managed.

Guanacaste is a region where severe droughts affect the population



Rural companies strengthened through the Activa-CATIE laboratory

The Activa-CATIE laboratory, created within the framework of the project known as Secondary Forests, has been dedicated to supporting emerging rural companies in collaboration with the Development Bank System (SBD).

During 2022, the first generation of 23 rural companies graduated and received non-reimbursable seed capital. The financing was provided by the SBD through a first agreement with CATIE for an amount of USD \$250,000. During the same year, the agreement was renewed, which allowed to support with non-reimbursable seed capital to 30 rural companies linked to decarbonization goals. In total, 53 rural enterprises have been supported and USD \$570,000 in seed capital mobilized.



During 2022, the first generation of 23 rural companies



Constitution of a network of 98 plots of participatory research for coffee and cocoa

There are 52 cocoa plots and 46 coffee plots where research is carried out, in which producing families, technical staff, the student community and researchers participate. These plots constitute a network made up of 10 countries in Latin America and the Caribbean: Bolivia, Peru, Colombia, Panama, Costa Rica, Nicaragua, Honduras, El Salvador, Guatemala, and the Dominican Republic.

This network is important in the medium and long term, both for the projects that finance it (KoLFACI projects) and for CATIE, since based on field measurements and analysis of results, it contributes to identifying the best varieties and practices to increase yields in coffee and cocoa crops, as well as improve the provision of ecosystem services.

This network is important in the medium and long term



Characterization and mapping of more than 100 regenerative food businesses in the Central American Dry Corridor and the Amazon

One of the first products developed by CATIE, in the Regenerative Food Business (NAR) project, was the identification, characterization and mapping of approximately 180 regenerative food businesses and their more than 460 associated actors in the Central American Dry Corridor and the Amazon.

The analysis made it possible to select 15 pilot businesses that will be incubated by the NAR project. In addition, the mapping will be the starting point for the activation and dynamization of the Latin American learning community on the regenerative approach during 2023.



The analysis made it possible to select 15 pilot businesses that will be incubated by the NAR project

Agroforestry systems adapted to the Central American Dry Corridor

Through the Adapted Agroforestry Systems for the Central American Dry Corridor (AGROINNOVA, for its acronym in Spanish) project, 93 demonstration agroforestry plots have been implemented to strengthen public-private capacities for agricultural research, transfer, and extension on multistratum agroforestry systems in Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama.

The design and management of these plots incorporates agricultural and silvopastoral technological innovations adapted to each area, including agroecological technologies for the management of soil, water, nutrients, agricultural and forestry crops, under an integrated model that combines sustainable production with greater resilience to climate change and the generation of environmental benefits.

The innovations promote greater use of bioinputs, both biofertilizers and biocontrollers, to reduce dependence on synthetic agricultural inputs. Simultaneously, environmental, economic and social benefits are generated by reducing production costs and improving household income and food security through the promotion of circular economy processes.



Cattle ranching families in the Ecuadorian Amazon with knowledge for the transition to sustainable production systems

Through the Integral Amazonian Program for Forest Conservation and Sustainable Production (PROAmazonía), CATIE's Livestock and Environmental Management Unit (GAMMA, for its acronym in Spanish) developed a series of livestock Field Schools (ECAs) to strengthen the knowledge and skills of livestock producing families, and thus achieve a transition from traditional systems to sustainable production systems in the provinces that make up the Special Territorial Amazonian Circumscription (CTEA, for its acronym in Spanish).

In 2022, the objective of strengthening the capacities of 3500 livestock farmers (45% women) was met and 1830 non-monetary incentives were delivered, which were defined with the participants of the ECA, based on the elaboration of participatory plans of livestock farms.

In addition, 18 demonstration farms were implemented with good livestock practices enhanced through investment and that are guided by the Ministry of Environment, Water and Ecological Transition (MAATE, for its acronym in Spanish) and the Ministry of Agriculture and Livestock (MAG, for its acronym in Spanish) of Ecuador, in order to comply with the indicators of the program and serve as a center of learning and replication at the national level.



Letter of intent signed to facilitate dialogue on the Pedernales river basin

In 2022, the signing of the letter of intent between the Dominican Republic and Haiti was achieved for the collaborative and joint work between the committees and basin council of the Dominican and Haitian side of the binational basin of the Pedernales River. This is a significant advance in achieving the objectives of the Binational Cooperation in Favor of Dominican-Haitian Relations.

In this process, through its Watershed, Water Security and Soils Unit (UCSHS, for its acronym in Spanish), CATIE has provided technical advice on the cooperation actions of GIZ and the European Union. From a local approach, it is intended to increase the operability of the implementation of basin co-management plans towards a governance process that will allow immediate actions to be achieved as a complement to the existing high-level border cooperation mechanisms at national levels.

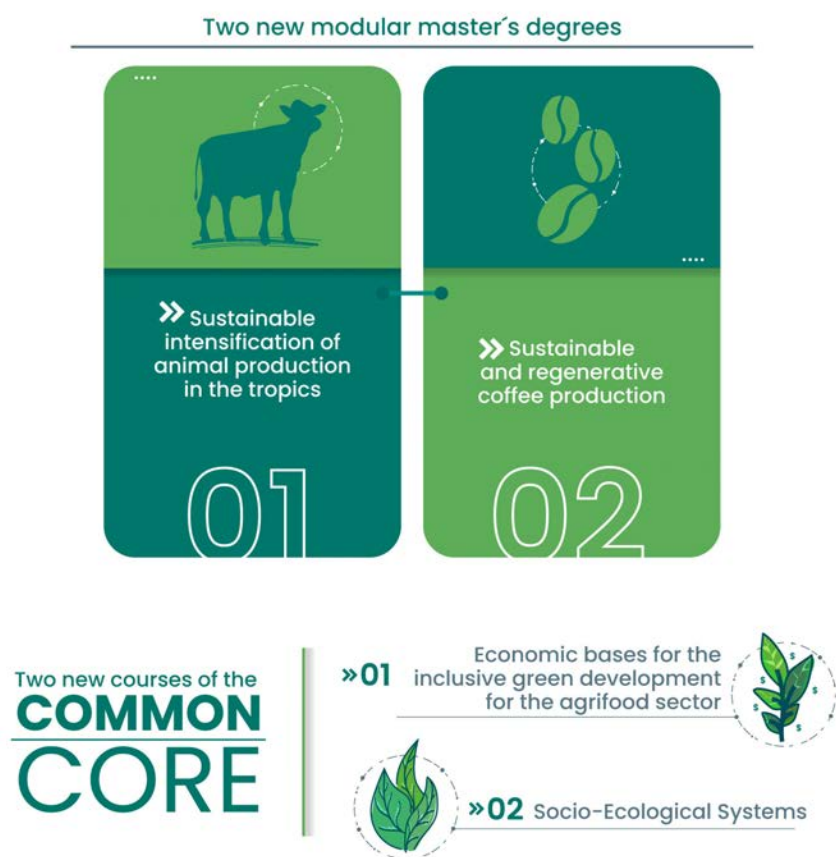


CATIE has provided technical advice on the cooperation actions of GIZ and the European Union

New master's programs and postgraduate courses for professionals in the region

An elevated percentage of potential students – 89% of 302 people surveyed in the region – consider it important to have the flexibility to organize and develop master's courses in a modular way so that it does not interfere with their work. In response, CATIE initiated the formulation of two modular master's degrees, through three independent diplomas plus a final graduation project. There is the flexibility to take only diplomas, obtain a specialty or complete a master's degree.

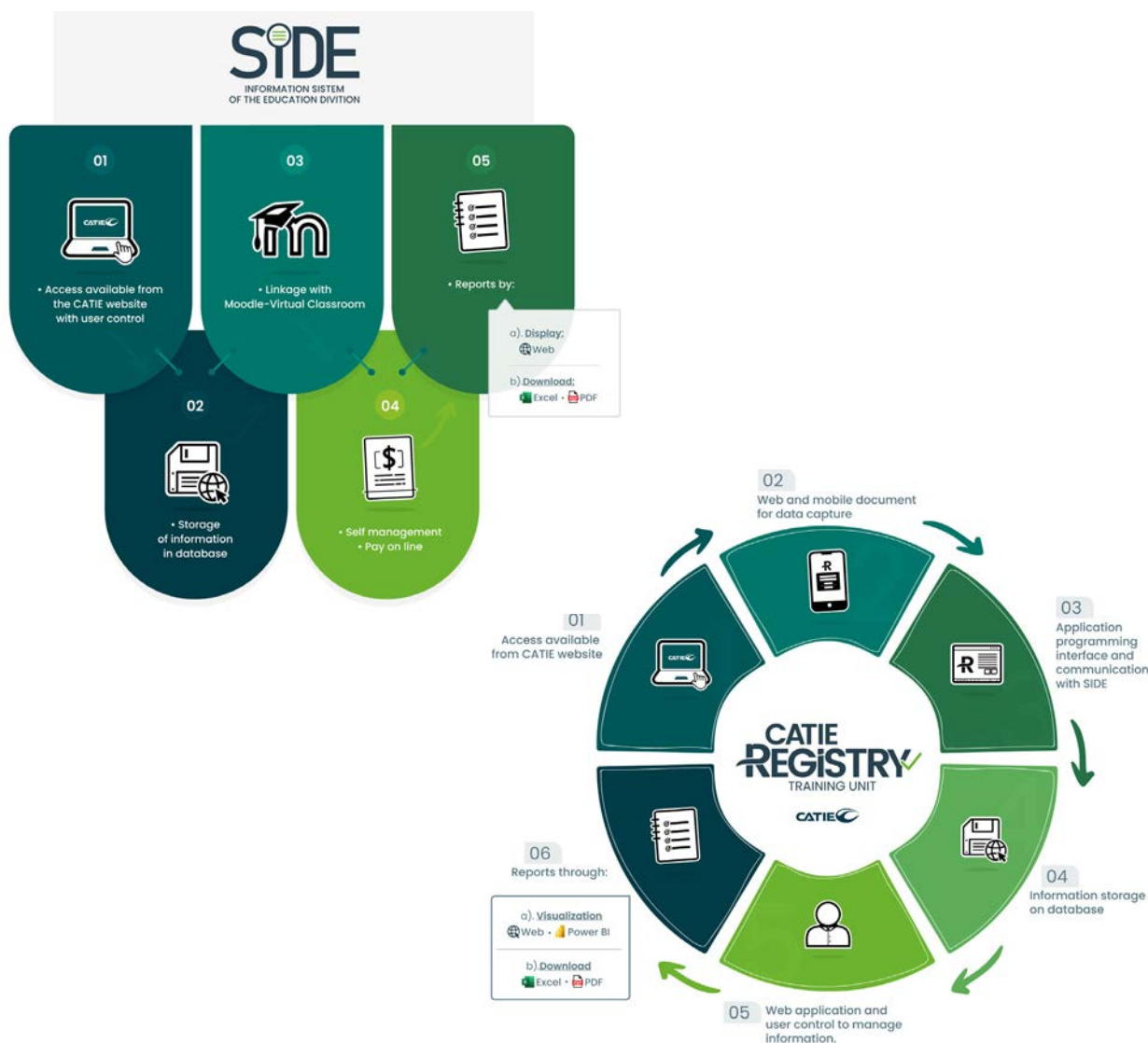
The two new master's degrees developed are: 1) Sustainable intensification of animal production in the tropics and 2) Regenerative sustainable coffee farming. In addition, two new courses of the common core were designed, which summarize the work of CATIE in 50 years of promoting the DVI: 1) Economic bases for the DVI of the agri-food sector and 2) Socioecological systems. Both the master's programs and the new common core courses will be taught from 2023.



Enhanced technology platforms

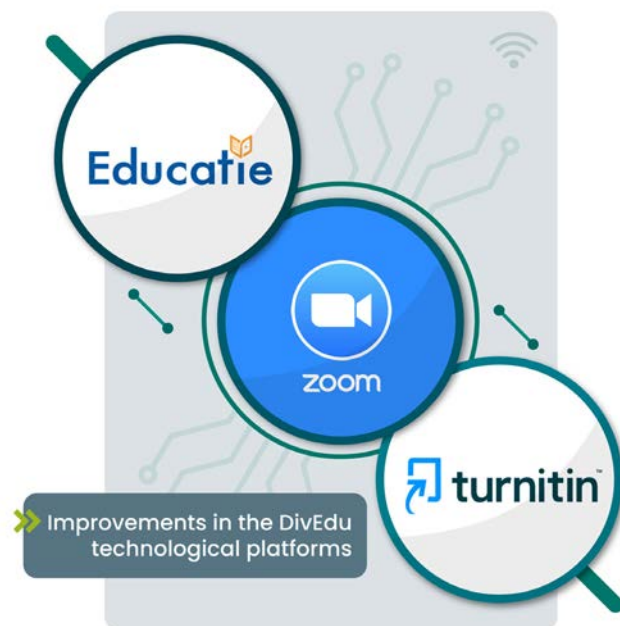
CATIE is expanding its face-to-face postgraduate model to offer virtual and bimodal options. This transformation was reinforced with the development of an information system (SIDE, for its acronym in Spanish) that facilitates access to data and the creation of automated reports for all users. In addition, new virtual classrooms were created thinking about the level of familiarization of teachers and students with virtual learning environments and according to the programs of each course, as well as the methodology that is proposed.

In addition, the Center now has an app – web and mobile application – that will facilitate obtaining information about training events in real time. The application will be linked to the new SIDE system and will make it easier to record data and information from CATIE training events held in different countries, as well as to monitor the results and potential impacts of capacity building.



From remote face-to-face learning to virtual learning environments

The challenges to formalize virtual education in the CATIE, from the remote face-to-face adopted in the pandemic, included the updating of teachers, orientations, regulations, and academic guides for the design of educational proposals, as well as resources and materials.



"CATIE has been a great ally in this digital transition. From the operational and logistical coordination, to the delivery of classes with dynamism and a lot of focus on the academic satisfaction of the students. From the Graduate School, we are very happy to be able to count on CATIE as an academic partner", Mercedes Gómez, professor at the Peruvian University of Applied Sciences (UPC) of Peru.

Agreements to grant postgraduate studies

CATIE seeks to establish and maintain relationships with donors that grant funding or scholarships for postgraduate studies, therefore, in 2022 it signed agreements with the Institute for the Training and Use of Human Resources (IFARHU, for its acronym in Spanish) of Panama, the Ministry of Higher Education, Science and Technology (MESCYT, for its acronym in Spanish) of the Dominican Republic, as well as an extension until 2024 of the scholarship agreement with the German Academic Exchange Service (DAAD). Likewise, the procedures for the extension of the agreement with the National Council of Science and Technology of the United Mexican States (CONACYT, for its acronym in Spanish) of Mexico were initiated.



New revenue and project fund management

Two major proposals for sustainable livestock intensification and carbon footprint reduction, one with the NAMA Facility and the other with the International Climate Initiative (IKI), were approved in 2022. Together, these two initiatives add up to nearly USD \$35 million to be implemented over the next seven years. The most relevant fact that stands out from these efforts is the technical capacity of the teams that lead the initiatives and the demonstrated institutional capacity.

For this process, CATIE was subjected to an intense due diligence process by external auditors of both donors, to collect and verify relevant information about the Center and validate the capacity and solvency in the management of projects of this dimension, which allows the applicant to decide based on solid information.

Both processes were successfully overcome, and this represents not only the confirmation of the approved funds, but also the possibility for CATIE to position itself in the region and open options for it to apply in the future to new similar financing opportunities.

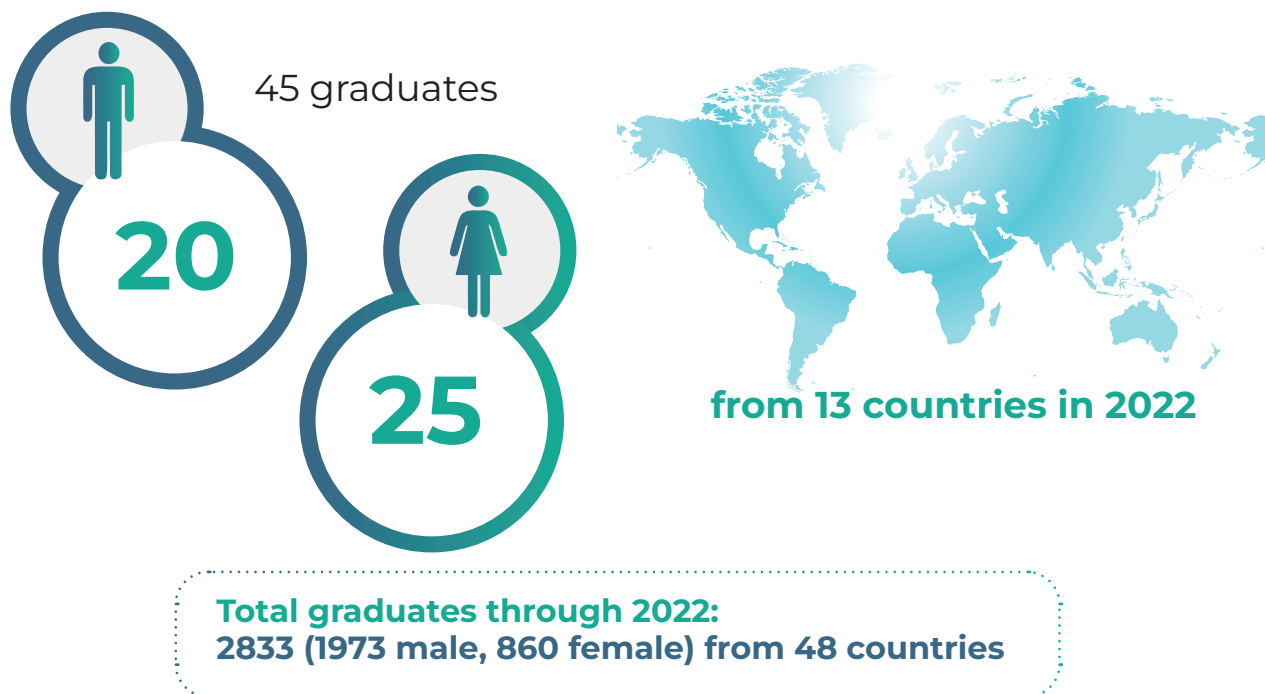
On the other hand, commercial activities, especially the sale of coffee hybrids, forest seeds and educational trips – among which the CATIE-Verto Education alliance stands out – experienced a clear growth.



Section 2.

CATIE in numbers





Notable graduates:

M.Sc. Héctor Francisco Espinoza García:

Guatemala, class of 2014
Vice Minister of Natural Resources and Climate Change, Ministry of Environment and Natural Resources of Guatemala, November 2022.



Dr. Manuel Otero:

Argentina, class of 1976
Honorary doctorate for his constant work in transformative actions for the Inclusive Green Development of the Americas, in particular in quality education and training actions for young rural leaders, with the commitment to turn them into agents of change, capable of creating a more sustainable and resilient world, awarded by CATIE and delivered during the 77th Graduation Ceremony of the Master's Program, October 2022.

M.Sc. Lorena San Román Johanning:

Costa Rica, class of 1975

Honorary doctorate for her significant contribution to society in the educational, cultural and economic fields, awarded by the International Educational Consortium Warden, A.C., San Nicolás de la Garza, Mexico, July 2022.

**36 052 people**

reached through continuing education during 2022

**4472 professionals**

from 18 countries updated their knowledge

**36 proposals**

developed in collaboration with various partners. Ten were approved for a total of USD \$74 million; of which, USD \$29.3 million are implemented by CATIE

**More than 60 global**

regional, and local alliances were established with partner organizations, with the purpose of strengthening CATIE's impact in the region

**49 news published**

in media from 13 countries and 2 international agencies

CATIE Social Networks add more followers:



Facebook: 63 404 (+3577 new followers)



Instagram: 9101 (+1169 new followers)



LinkedIn: 7437 (+2370 new followers)

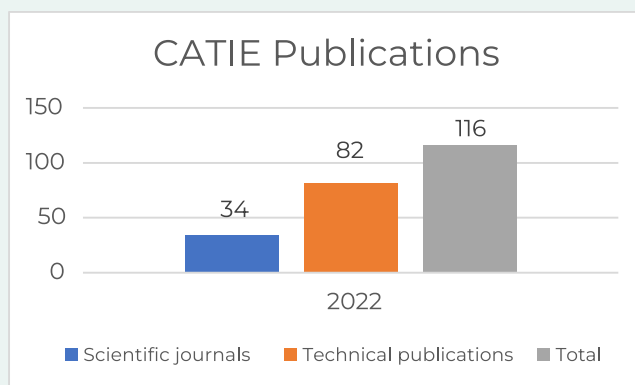


Twitter: 4138 (+268 new followers)

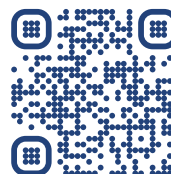
116

• **publications** were produced in 2022

82 of them correspond to technical publications, which include theses and CATIE seal publications, while the remaining 34 are articles published in scientific journals in which researchers from the Center participate.



Access the institutional repository by entering
<https://repositorio.catie.ac.cr/>





Section 3.

Research for Inclusive Green Development

CATIE's research aims to turn the findings into significant and measurable impacts that contribute to the advancement of the SDGs in the Latin American and Caribbean region. Likewise, the transdisciplinary and participatory approach of its research allows to interact directly with external actors to create and apply knowledge collaboratively and develop innovative solutions that respond to the needs and priorities of society.

Learn in this section about the work that CATIE carried out in 2022 from the Directorate of Research for Inclusive Green Development (DIDVI, for its acronym in Spanish), which was carried out in an articulated manner among the eight research units that make up the DIDVI, for which a gender and equity approach was applied, and modern and high-quality biostatistical methodologies were used.



Research for Inclusive Green Development

Investment in scientific research is essential to achieve economic and social advances to address global challenges. For this reason, in 2022 CATIE created a competitive research fund. The purpose is to promote the development of research that contributes to positioning the Center not only in the scientific field, but also in the face of international cooperation, by generating knowledge and identifying strategic areas of work to comply with the first objective of CATIE's Strategic Plan: to generate scientific and technical knowledge, through research for Inclusive Green Development.

Seven proposals were received and evaluated by 15 external reviewers, experts in those thematic areas. As a result, four investigations are being carried out that include the assessment of biodiversity, ecosystem services and their contribution to human well-being in the Trifinio-Central American Dry Corridor, as well as the determination of the productive and socioeconomic impact of the dispersion and arrival of moniliasis to producing countries in the Caribbean. In 2023, the second call will be launched, and additional funding is being managed through external sources.

Climate Action

CATIE faces the challenge of climate action in a transversal manner, by generating and disseminating knowledge, promoting research and experimentation and the development of technologies and tools that integrate mitigation and adaptation responses to climate change. The work carried out considers the demands of multiple audiences and integrates a wide range of natural and productive ecosystems, from coastal marine to high mountain.

Under this approach, two projects led CATIE's actions in this area during 2022.

Mangroves for Development - Securing Livelihoods and Climate Resilience in the Caribbean (2019-2022, funded by CBF and BMU-IKI).

The actions developed within the framework of this project have allowed to date that the participation of partners and local actors makes it possible to map and describe the impact of agricultural activities on mangroves, disseminate sustainable livestock practices to 67 producers and restore the hydrological flow for the recovery of 709 hectares of mangroves. which combines scientific research results and local expert knowledge.

At the same time, this project has developed a conceptual framework for the biophysical and social design and monitoring of restoration as an Ecosystem-based Adaptation (EbA) strategy, and the assessment of mangrove environmental services for adaptation. In this sense, the project contributes to the efforts of other coastal ecosystem restoration projects in Central America.

In addition, it has aimed to strengthen the social, ecological, and economic resilience of the marine-coastal landscapes and the adjacent terrestrial matrix in the province of Monte Cristi, in the

Dominican Republic. Specifically, the design of the project envisages: a) increasing the awareness of local communities about mangroves and their environmental services, b) developing sustainable livestock practices that reduce pressure on mangroves, c) restoring ecosystems and d) developing a financial strategy to support the scalability and sustainability of EbA actions in the landscape.



Assessment of the Climate Resilience of Agriculture and its Relationship with Food Insecurity and Migration in the Northern Triangle of Central America. (2021-2022, funded by USDA).

In 2022, a study was developed with the objective of systematizing the existing knowledge and perceptions of technicians and farmers on the impacts of climate change and the vulnerability of the agricultural sector in El Salvador, Guatemala, and Honduras, to support the United States Department of Agriculture (USDA) to identify contributions to the United States Strategy to respond to the causes of migration in Central America.

The livelihoods approach was used to analyse agricultural vulnerability, food security and migration, with an emphasis on the spatial granularity of the analysis. In parallel, the results of the analysis were linked to existing practices on the ground and concrete proposals for intervention in this region were offered.

More than 200 participants, including farmers, representatives of cooperatives and farmers' associations, contributed to provide the primary data for this study, which were collected through participatory workshops in 14 regions and through 20 field visits.

This study is an example of the participatory mapping methodology developed by CATIE's Climate Action Unit (UAC, for its acronym in Spanish), which has been shared in other geographical spaces as a South-South collaboration, inside and outside Latin America.



In 2023, UAC will initiate a new project that seeks to strengthen the climate resilience of communities and ecosystems in the coastal Atlantic region of Belize, Guatemala, and Honduras, which will use nature-based solutions. This five-year project will be financed by the Central American Bank for Economic Integration (CABEI) and the World Resources Institute (WRI) and involves three components:

- Incorporation of restoration as a key nature-based adaptation measure at national and local levels, as well as regulatory frameworks and land-use planning processes to increase resilience to the intensification of extreme weather events, with emphasis on minority groups and women's participation.
- Implementation of adaptation measures in selected landscapes of the Atlantic forests.
- Capacity building, dissemination of knowledge and information at local, national, and regional levels.

Tools and methodologies implemented

The UAC developed a participatory methodology to analyze vulnerability to climate change at the level of rural livelihoods and value chains, with national coverage. This is based on a participatory process with experts in rural areas and agriculture, convened through regional workshops, covering the different agroecologies of a country.

The methodology allows the mapping and characterization of rural livelihoods, production systems and their agricultural calendars, and incorporates climate risks and impacts. The methodology also includes the identification of the main response measures and the requirements necessary to adopt and scale them, both at the level of production systems and in the different links of the value chain, as well as the current level of adoption. It also identifies the impact of the measures in terms of effectiveness, environmental benefits, and gender inclusion.

The methodology has been applied in multiple countries and the results indicate that it is possible to identify financing strategies for climate risk management based on an analysis of rural livelihoods and their demands.



Another innovative methodology developed was multitemporal visual assessment to rapidly quantify land-use change in mangrove ecosystems and surrounding areas. This type of analysis is the basis for the development of reference levels of greenhouse gas (GHG) emissions.

This methodology made it easier to estimate the reference levels by using information from a set of mangrove plots with measurements from 2013 to 2021, as well as the so-called emission factors, which – when combined with activity data (change of use) – allowed to know the gas balance within mangrove ecosystems. The tool was developed within the framework of the Blue Carbon project, International Mechanisms and National Commitments of Costa Rica before the United Nations Framework Convention on Climate Change (UNFCCC).

Within the framework of the Technical and Methodological Support to Public Institutions of Costa Rica project, in accompaniment of the National Decarbonization Plan, four training courses were held for officials of government institutions and universities in Costa Rica on topics related to scientific programming and remote sensing.



In addition, as part of the project Survey of the Baseline of the Integrated Monitoring System of Mangrove Ecosystems in the Gulf of Nicoya, training was carried out for officials of SINAC (Costa Rica) on the installation of permanent sampling plots and field data collection in mangroves, to improve the representativeness of the mangrove in the National Forest Inventory and develop capacities for continuous monitoring.

Environmental Economics and Sustainable Agribusiness

CATIE uses environmental economics and the promotion of sustainable agribusiness management as means to promote the achievement of sustainable development goals in Latin America and the Caribbean. To this end, scientific evidence is generated for the design, implementation and evaluation of public policies, knowledge is transferred, and the capacities of various stakeholders are strengthened to use the economic perspective to solve the most urgent environmental problems in the region.

Likewise, it contributes to the insertion and phasing of micro, small and medium-sized enterprises (MSMEs) in sustainable agricultural, forestry, aquaculture, fisheries and beekeeping value chains, being also the institution that hosts EfD Central America (EfD-CA).

In this theme, four projects implemented in 2022 stand out for their impact and relevance for the region.

Feasibility for a Water Fund in the Trinational Lempa River Basin: El Salvador, Guatemala, and Honduras (2022-2023, financed by IDB).

This project aims to determine if a Water Fund can be an ideal financial mechanism to contribute positively to water security in the action area of the Trinational Basin of the Lempa River, which is located between El Salvador, Guatemala and Honduras, which allows leaving as main results that there is sufficient evidence to recommend that we proceed with the design phase to establish a Transboundary Water Fund for the Lempa River Basin (FdAT, for its acronym in Spanish).

To achieve its international character, the creation of the FdAT will have to be anchored to the Trifinio Plan Transborder Treaty. The leadership would be under the Trinational Executive Secretariat of the Trifinio Plan and will have as potential results to generate water benefits such as maintaining the supply of drinking water to the municipalities of the three countries of the Trifinio Region, increasing the domestic water security of San Salvador, given that at least 22% is supplied by the Lempa River and protecting the water supply for agriculture and industry located in the basin. Finally, it will contribute to maintaining the supply of water for hydroelectric generation, mainly for the Guajoyo dam in El Salvador.

To achieve its result, a hydrological, legal, and institutional analysis was carried out, based on secondary information, modeling exercises and inputs from a highly participatory process with key actors.

Scaling Up Ecosystem-Based Adaptation Measures in Latin America (EbA LAC) (2020-2025, funded by BMU-IKI).

The aim of the project is to increase the climate change resilience of vulnerable communities and ecosystems in rural areas of Ecuador, Guatemala, and Costa Rica. In 2022, efforts focused on identifying promising governance structures that will be the multi-stakeholder and multi-level communication channel for mainstreaming the EbA approach at landscape and national levels.

Environmental and sectoral policies that would serve as an entry point for integrating the EbA approach into public policies were also identified. In addition, there is a list of EbA measures and practices for sustainable landscape management and increasing the resilience of communities and their livelihoods to climate change.

This project aims to incorporate the EbA approach into policies at the national and landscape levels and provide practical evidence on the cost-effectiveness of implementing EbA measures at the farm and landscape level, as well as create business models to leverage approaches that consider ecosystem services and biodiversity for climate risk management.

**Fair Trade Bananas Peru and Dominican Republic (2021-2024, led by CLAC, funded by AFD).**

Within the framework of this project, through the UEASS/EfD, CATIE has been responsible for the management strengthening process of 11 small producers' organizations (SPOs), which in total bring together 10,000 producers. The objective is for SPOs to properly manage the resources of small producers, in the case of bananas. There is great potential to replicate this process in at least 1000 SPOs of the Latin American and Caribbean Coordination of Fair-Trade Small Producers and Workers (CLAC), in Latin America and the Caribbean.



Integrate Project (2021-2022, led by DOLE).

Integrate Project (2021-2022, led by DOLE). The cooperation between the private company DOLE and CATIE allowed 17 women between the ages of 22 and 55 to acquire new skills to achieve economic empowerment that facilitates them to obtain greater income through their ventures. The women entrepreneurs come from vulnerable families in La Estrella Valley, in Limón, Costa Rica.

They participated in a training and advisory process given by CATIE's expert agribusiness staff, which has helped improve the projection of their ventures. Thanks to the use of the *Design Thinking methodology and Model Business Canvas*, the participants developed a business idea or reformulated the one they had, so that currently 17 projects have a profile to access funds from different sources of financing.



On the other hand, three new initiatives were managed by the UEASS/EfD in 2022.

1. **Research Program on Sustainable Consumption and Production (SCOPE).** This program seeks to contribute to the achievement of SDG 12 of ensuring responsible consumption and production through applied research from an economic perspective, with a comprehensive approach towards the design of changes in lifestyles, food consumption, waste management and circularity.

SCOPE will identify policy leverage points and incentives to transform food systems. These changes can lead to more sustainable agriculture through improvements in supply chain management, circularity principles, resource efficiency along the value chain, product life cycle and eco-labelling, among other commercial and non-commercial alternatives.

In turn, given the collaborative nature of SCOPE, these interventions are expected to be sensitive to diverse sociocultural contexts. SCOPE is funded by the EfD Initiative and will be coordinated until 2026 by CATIE, as the headquarters of EfD Central America. Its strategic partners are EfD centers in Chile, Vietnam, China, South Africa, India, and Nigeria.

2. **TRANSPATH Project.** It looks for opportunities to pursue climate neutrality and protect biodiversity, while strengthening local communities. TRANSPATH will focus its work on Eastern and Western Europe, Africa and Latin America and identify points of influence and interventions to trigger transformative changes at the level of consumers, producers, and organizations.

In Latin America, the coffee sector has been identified as a priority for TRANSPATH's work, where it is expected to generate positive changes. TRANSPATH is funded by the European Commission, through the Horizon Europe Programme and has a duration of four years (2022-2026). It is also led by Wageningen University & Research and involves – in addition to CATIE – eight research centers in Europe and Africa.

3. **Capacity building of 750 rural MSMEs linked to agricultural activities in seven countries of the region: Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, and the Dominican Republic.** This project is coordinated by the Regional Center for the Promotion of MSMEs (CENPROMYPE, for its acronym in Spanish) together with the entities of SMEs in each country.

The strengthening process is based on face-to-face and virtual training activities, which will address issues that have been prioritized by each country and that are aligned with the development of sustainable and nutrition-sensitive value chains, as part of the efforts in the transformation of the productive systems of the Central American Integration System (SICA, for its acronym in Spanish) region. This is CATIE's first approach to CENPROMYPE as a potential ally in the generation of synergies for rural development, focused on agricultural SMEs.

Tools and methodologies implemented

The UEASS/EfD team applied spatially explicit models to map ecosystem service flows and changes because of climate change, land-use changes and the implementation of green infrastructure in coastal areas. The InVEST tool (Stanford University) was applied to analyze the potential for ecosystem service provision of coastal protection, erosion reduction and sediment deposition, as

well as climate regulation (carbon sequestration and blue carbon) provided by mangroves, marsh wetlands, gallery forests and other green infrastructure.

This work allowed prioritizing areas for the implementation and restoration of green infrastructures based on their contribution to the provision of ecosystem services under climate change and land use scenarios, which will serve as a guide to channel local and national efforts on adaptation. This work had the contribution of Costa Rican technicians and researchers with experience in green infrastructures and the support of SINAC, IUCN and the Costa Rica Forever Association.

Advocacy

On the other hand, through the DESCUBRE program, of the Foreign Trade Promoter of Costa Rica (Procomer), specialists from the UEAAS/EfD developed a diagnosis of products and exporting companies, with which product chains, such as shrimp and papaya, were analyzed. The results obtained served as a basis for Procomer to make the decision to prioritize the papaya chain and thus promote the consolidation at the national level of the exportable supply of this fruit. Among the purposes that would be achieved is that an excellent quality of the product is delivered to exporting companies and, in this manner, more countries can have access to it. In addition, as part of the support provided by Procomer, economic support was given to producers as seed capital.

Capacity building

Within the framework of the Peru and Dominican Republic Fair Trade Bananas project, CATIE taught four Territorial Business Training Schools (EFET, for its acronym in Spanish) in both countries, the first on governance, the second on strategic planning, the third on operational planning and the fourth on process efficiency. Technical assistance on these issues was also provided to 11 organizations of small producers (six in the Dominican Republic and five in Peru). Sixty-seven (67) persons (45% women and 30% youth) were trained in management schools and technical assistance was provided to 75 persons (40% women).

The capacities of the members of the Federations, Leagues, and Unions of ASADAS (FLU) were strengthened in the use of tools to improve community water management, and the transfer of knowledge and skills between communal aqueducts was promoted, this within the actions of the project Improvement of Water Services in Vulnerable Communities of Costa Rica, funded by the U.S. Embassy in Costa Rica, through the Central American Regional Security Initiative (CARSI).

As a result, community managers improved their customer service capabilities, business model development, communication, accountability, as well as soft skills that included transparency and leadership skills, among others.

The workshop applied a social entrepreneurship perspective and a train-the-trainer approach. Additionally, face-to-face, and virtual training sessions were held on the use of the ASADAS+ application to prepare water managers and users in the use of this tool, which seeks to improve communication and water resource management in the community.

Agroforestry, Coffee, and Cocoa

CATIE is considered a pioneer in the concept and model of agroforestry in Latin America and the Caribbean. In addition, it is recognized for the work it carries out, from genetic improvement, to promote coffee and cocoa crops in the region. The Agroforestry and Genetic Improvement of Coffee and Cocoa Unit (UAMCC, for its acronym in Spanish) of the Center works to contribute to the design and management of diversified and sustainable agroforestry systems for the provision of ecosystem services for the benefit of families and their farms, the landscape and territories, which especially involves the optimal management of trees and their interactions with coffee and cocoa crops.

In addition to this, it generates promising materials (hybrids-clones) of coffee and cocoa for the use and socioeconomic benefit of rural families and other actors in the chain (academics and industry), for which the genetic wealth preserved in CATIE's international coffee and cocoa germplasm collections is used.

This work in 2022 focused on two important projects:

Chocolate4All Project (2019-2022, financed by IDB-LAB).

This project, executed by Heifer International, CATIE and the National University of Agriculture of Catacamas (UNAG, for its acronym in Spanish), worked with cocoa farming communities in Olancho, Honduras. Thanks to this, more than 1000 producing families acquired knowledge and skills on agronomic and agroforestry management, as well as cocoa quality through the Field Schools (ECA).

The teaching process through the ECA was reinforced with the development of audiovisual materials that included manuals and digital animations, which functioned as a guide for the application of good practices in cocoa, taught in these schools. As a result, yields in cocoa production increased by at least 20%.



Other actions of the project included the installation of eight clonal cocoa gardens and the rehabilitation of two existing ones. The 10 gardens will serve as demonstration sites and source of improved variety material. Likewise, 30 UNAG professors and technicians were trained in various areas of cocoa crop management, who will serve as trainers for other technicians and producers.

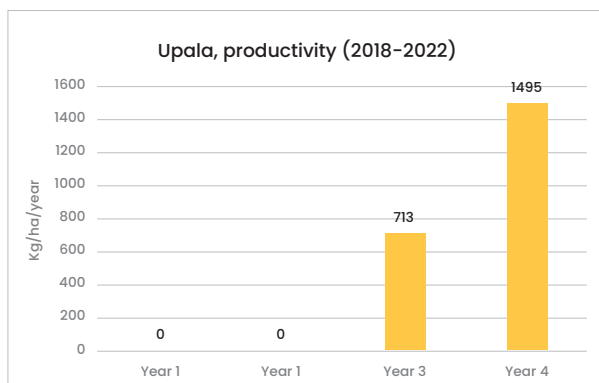
KoLFACI Cocoa and Coffee Projects (2017-2023, funded by RDA-KoLFACI).

It is a participatory research and training initiative for researchers from government institutions in eight countries in Latin America and the Caribbean. The project aims to apply good practices, ranging from the use of improved varieties to agroforestry management techniques. En relación con el cacao, se cuenta con 29 parcelas mejoradas con clones de cacao y 23 parcelas rehabilitadas.

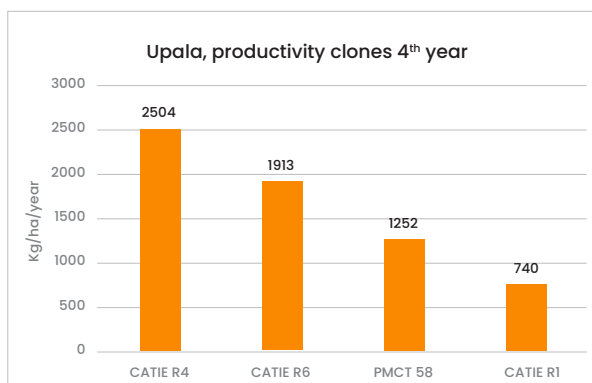


In relation to cocoa, there are 29 plots improved with cocoa clones and 23 rehabilitated plots. At the moment, two important results are visualized: the precocity in production, since the clones begin to produce from the second year, as well as the increase in yields. For example, improved plots already produce up to three times more compared to national averages.

Good agroforestry management of clonal cocoa plantations is revealing the potential for improved materials to increase yields. In addition, the average in the Latin American region is around 300 kg dry cocoa/ha/year. Likewise, the improved cocoa plots already produce from the second or third year of establishment and by the fourth year their potential is much higher, and it is also possible to differentiate which are the most promising clones, as shown in the figure below (example of Costa Rica).



A traditional non-technified cacao farm begins to produce only in the 4th year. The national average is 271 kg/ha/year. The incidence of diseases was 1%



The clones with the greatest potential are CAITE R4 and CATIE R6. However, all exceed the national average in the fourth year.

In the case of coffee, 46 farms have been established, each with an improved variety trial in combination with different types of pruning. Preliminary results are already available with data from the first two harvests after the strongest pruning and important findings are expected in 2023. Both projects have aroused the interest of researchers, technicians and farming families in more productive systems and the use of better agroforestry practices.

To continue its work, through the UAMCC, CATIE got involved in two new projects in 2022.

1. INNOVEA, led by World Coffee Research (WCR). It is a global coffee breeding network and brings together nine countries (Costa Rica, India, Indonesia, Kenya, Mexico, Peru, Rwanda, Uganda, and the United States) to transform coffee breeding worldwide and accelerate the pace of genetic improvement.

The focus of the network is the development of genetically diverse breeding populations, which are distributed to network participants every six years so that they can continuously replenish national breeding programmes with superior breeding material. The participating countries will oversee the development and launch of finished varieties adapted to local conditions and niche market demand.

The development of improved varieties is a long-term effort. Depending on the breeding approach and material yield, some countries could launch new varieties by 2033. Most will take several more years. After that, new varieties can be launched in a country with a frequency of three to five years

The network will use genomic selection with centralized recombination in the WCR breeding factory, located at CATIE, to create improved populations as quickly as possible. Each new population cycle will recombine individuals with the highest genetic values in all traits. Phenotyping is carried out by partners at globally distributed sites. These approaches allow breeders to address multiple issues simultaneously (such as yield, disease resistance, cup quality, and climate resilience) and thus accelerate breeding.

The INNOVEA initiative strengthened the partnership between CATIE and WCR and incorporated a senior breeding expert as an associate staff member of both institutions, with an office at CATIE headquarters.



2. **ClearLeaf.** It began in mid-2022, is financed by the Barry Callebaut industry and CATIE is its main executor. It aims to evaluate the efficacy of ClearLeaf's GotaBlanca® product in the management of several cocoa diseases, including moniliasis, black cob and other secondary pathogens such as Rosellinia pepo and Ceratocystis cacaofunesta.

This product, made from colloidal silver, has fungicidal and bactericidal effects already proven in various pathogens of several agricultural crops and its use is allowed in organic agriculture. The idea is to offer farming families a pathogen and disease control strategy that is effective, accessible and environmentally friendly. The project includes laboratory experiments, nurseries and field trials that seek to measure the effectiveness of the product, both on CATIE farms and in producers of the three main cocoa-producing regions in Costa Rica. This, in turn, will improve cocoa productivity in the country and then in the region.

Currently, preliminary laboratory tests have been carried out and formal trials in the laboratory and the greenhouse are about to begin, as well as controlled trials on CATIE farms. For the field trials, the selection of the farms that will be evaluated has already been carried out and we are waiting for the start of the next peak of cocoa production to mount the trials.



In 2022, several results of the UAMCC's work stood out. For example, the coffee agroforestry trial maintained its long-term studies, in collaboration with the scientific platform AGROFORESTA. Likewise, with the University of Greenwich, England, a study was initiated on soil carbon of the different systems under study.

Also, the study agenda with bioinputs was continued in collaboration with Coopetarrazú and Ecom, which provided promising results regarding the possibility of validating biological and natural products of efficiency and quality. In addition, the collaboration with EARTH University, an institution that conducts a similar trial in the lower zone with the Esperanza hybrid, is maintained. With EARTH, an application has been developed to support researchers and visitors for spatial location within the complex of study plots and subplots.

Tools and methodologies implemented

The device that combines drone images with www.shademotion.net, software, developed within the framework of the Chocolate4All project, is a technological innovation that has allowed the diagnosis of the tree structure of agroforestry systems. With it, it is possible to capture tree data in agricultural systems more quickly and derive it to software for diagnostic, design or redesign exercises of agroforestry systems. A technical publication has been produced with the methods of this tool and the intention is to continue working to improve the techniques for analyzing and determining the dimensions of trees.

In the context of climate change, another outstanding innovation has been the mechanization of the management of service trees (legumes) in the design of plantations with high tree densities and dynamic control of light entry, regulation of microclimate, contributions of nutrients to the biomass by pruning and the fixation of nitrogen to the soil. The innovation was validated in a systems trial in its third year and has demonstrated very high potential. As of 2022, it entered the list of innovations to be strengthened in the NAMA Café Costa Rica and in the six countries of the Global Agroforestry Program in Coffee Farms.

Regarding coffee cultivation, innovation was made to achieve commercial mass production of F1 coffee hybrids. The use of a new culture medium in the regeneration phase was vital to obtain a greater number of embryos of better morphological quality that developed into acclimatible seedlings in a short time, which achieved an excellent conversion into plants. This innovation was vital to achieve during 2022 the highest production of coffee plants derived by somatic embryogenesis in the history of CATIE's Biotechnology Laboratory.

From April to November, around 37,000 plants were delivered to CATIE's Forest Seed Bank and placed in hydroponic beds for commercial propagation by rooting cuttings. The Biotechnology Laboratory can reach a production of 50,000 plants per year, which would generate funds for the operation of the laboratory itself and provide resources for the maintenance of the Center's International Coffee Collection, which is the source of materials for the genetic improvement program.

Capacity building

In the Dominican Republic, UAMCC specialists conducted two training courses in cocoa and two in coffee. A total of 93 technicians participated (49 in cocoa and 44 in coffee). Fourteen (14) technical guides were developed on priority topics of both crops, as well as materials that included flipcharts (banners with photographs, diagrams and other visual elements) that helped to review the most relevant topics of the training. Sixty (60) ECA sessions were also implemented in three pilot areas, involving 395 farming families. ECA generated positive reactions among families and has great potential to be replicated in other areas of the country.



On the other hand, with the KoLFACI Cocoa and Coffee Projects, 30 technicians from government institutions in 10 countries of the region were trained. The training focused on general aspects of database management, recommendations for data management and statistical analysis with InfoStat software.



Finally, for the Global Program of Agroforestry in Coffee Farms CATIE-VOLCAFE, virtual and face-to-face training events were held with the participation of 100 technicians from six countries (Costa Rica, Peru, Colombia, Honduras, Guatemala, and Brazil), on the topics of diagnosis of coffee farms with agroforestry systems, agroforestry and regenerative agriculture, design, and management of agroforestry systems with coffee, forest exploitation in coffee farms, as well as assessment of the vulnerability and adaptive capacity of coffee farms to climate change.

Forests and Biodiversity in Productive Landscapes

Tropical forests are the most diverse terrestrial ecosystems on the planet, they constitute the main source of biodiversity in a landscape and radiate it to other land uses, contributing to its sustainability. Likewise, biodiversity is the engine that generates the services that ecosystems provide, an essential element for food security, human health, the supply of air and drinking water, the subsistence of peoples and their economic and cultural development. CATIE works on this issue aware of its importance and in that sense, in 2022, it executed a project.

Sustainable Management Models of Secondary Forests and their Link with Private Financing (2017-2022, funded by IKI).

The project promoted changes in regulatory, technical, and commercial aspects for the sustainable forest management of secondary forests in four countries of Mesoamerica (Costa Rica, Honduras, Guatemala, and El Salvador). The elimination and reduction of transaction costs related to legal regimes were addressed and national and international investment in this sector was promoted. In addition, with the aim of strengthening long-term research, 10 demonstration plots were established, covering 580 hectares of surface.

It should be noted that secondary forests are ecosystems frequently found in agricultural landscapes, highly vulnerable to factors such as land use change, because they are mostly outside private or public protected areas, and the scarce knowledge and / or appreciation of their contributions to human well-being.

However, these forests, in any of their stages of regeneration, are used for the direct obtaining of ecosystem goods and services, which include wood, fodder, firewood, honey, ornamental plants, as well as the provision of microclimate regulation services, biological pest control and pollination. These ecosystems are critical to maintaining and restoring connectivity in agricultural landscapes, contributing to the conservation of plant communities, and providing habitat for wildlife.

To present the results of the project, in June 2022, workshops were held in the four implementing countries, which included the participation of government actors related to the management and sustainable management of forest resources, academics, individual and community owners of secondary forests, among others. They shared the methods, results, and experiences of the project.



It is important to mention that from this project an innovation and entrepreneurship laboratory called Activa-CATIE was created. This laboratory supports emerging rural companies through three main actions: mentoring and business training for the proper development of their business models, development of business roundtables and financial support through the non-reimbursable seed capital mechanism.

Activa-CATIE has successfully established collaboration with the SBD of Costa Rica. In the first stage it managed USD \$162,000 and later, in 2022, USD \$411,000 to be executed over a period of two years.

To date, the Activa-CATIE laboratory has supported a total of 45 emerging companies (30 in its third call in 2022). These companies work in forestry, sustainable agriculture, rural tourism, digital technologies and agribusiness. The results include the generation of direct jobs (86 jobs - 34% women and 21% youth), as well as the contribution to decarbonization and biodiversity conservation goals in the country, since they have a direct impact on at least 100 hectares made up of forests, agroforestry systems, silvopastoral systems and regenerative agriculture, with the implementation of different nature-based solutions.

In May, Activa-CATIE organized a business event at the headquarters of the Center, in which the Minister of Agriculture and Livestock of Costa Rica, the General Director of CATIE, members of the Board of Directors of CATIE, the coordinator of access to financing of Procomer and the coordinator of innovation and entrepreneurship of SBD participated. With this event, representatives of Costa Rican enterprises connected with new opportunities for innovation, sustainable development projects and investments.

Within the framework of the Activa-CATIE platform, the presentation of proposals by women and the creation of jobs for women and youths were dynamically encouraged. To this end, support was requested from Activa-CATIE allies to promote the call among women and other groups traditionally excluded from funding processes and strategic support was given in the initial application phase to



several projects presented by women, in an attempt to improve their quality. As a result, of a total of 785 applicants, 54% were women and of the total number of ventures selected (30) in the third call, 43% are led by women.

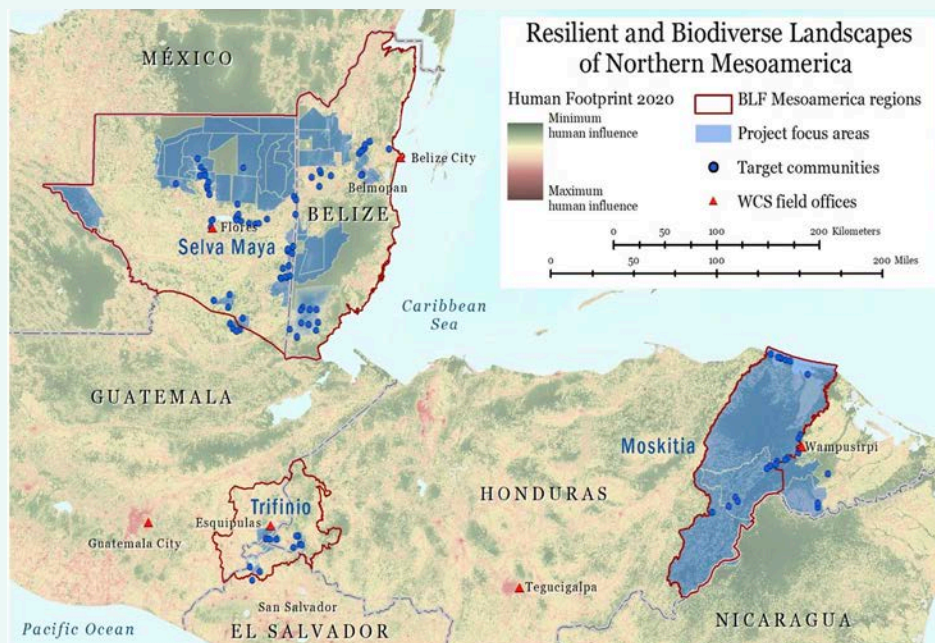
On the other hand, from its Forests and Biodiversity in Productive Landscapes Unit (UBBPP, for its acronym in Spanish), CATIE managed two new projects:

1. **Resilient and Biodiverse Landscapes of Northern Mesoamerica.** In response to a call from the Biodiverse Landscapes Fund Programme of the Department for Environment, Food & Rural Affairs (DEFRA) of the British government. The consortium for this project is made up of the Wildlife Conservation Society (WCS), together with the Balam Association, the Association of Forest Communities of Petén (ACOFOP), Belize Maya Forest Trust (BMFT), Friends for Conservation and Development (CDF) and CATIE. The proposal, approved in December 2022, has a total of £12.3 million of funding; of which, CATIE will execute £1 501 498 in the region of El Trifinio.

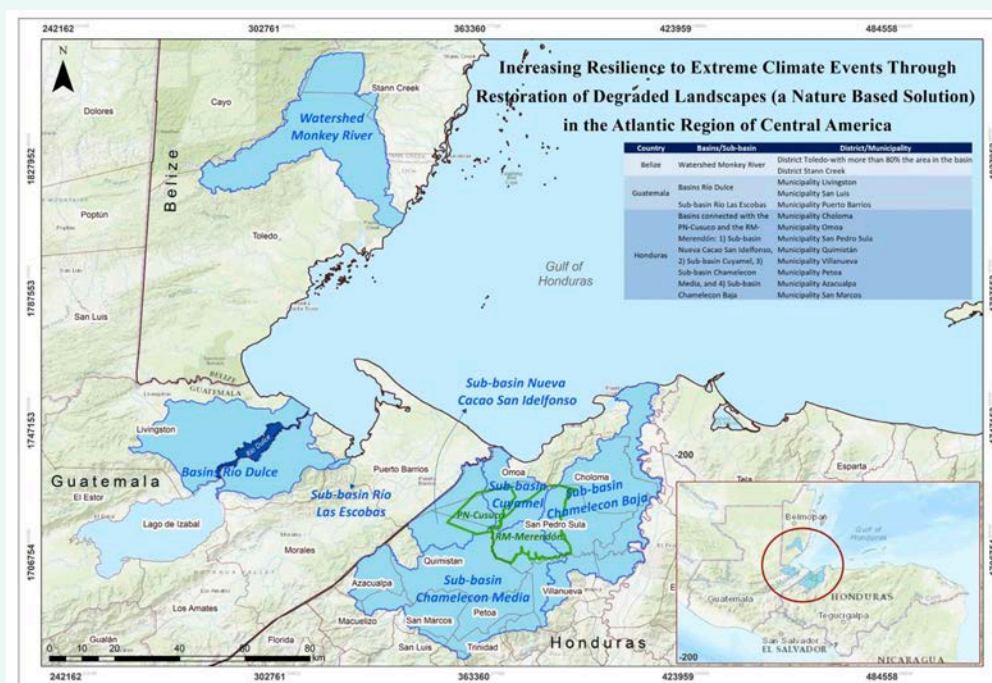
The development of the proposal also had the participation of the UAC and the UEAAS/ EfD of CATIE. The project will begin in 2023 and will last seven years. Its objective is to reduce poverty and promote the sustainable development of communities that live and depend on forest ecosystems in the prioritized regions, through the lasting protection, sustainable management, and restoration of forest ecosystems, which protect biodiversity and maintain or improve the quality of these ecosystems.

2. **Use of Nature-based Solutions to Increase Resilience to Extreme Climate Events in the Atlantic Region of Central America.** This project was managed jointly by the UBBPP and the UAC of CATIE, in consortium with the WRI. Its execution period will be from 2023 to 2025, with financing from the Adaptation Fund in the amount of USD \$2,905,575.

Its objective is to strengthen the climate resilience of communities and ecosystems in the Caribbean coastal region of Belize (Monkey River basin), Guatemala (Cerro San Gil) and Honduras (Cusuco National Park and buffer zone of the Merendón municipal reserve).



The project has a strong emphasis on improving climate change adaptation of vulnerable sectors of coastal communities (women, youth and indigenous people) and will work on three components: 1) integration of restoration as a key EbA measure into national and local regulatory frameworks and land use planning process; 2) implementation adaptation measures in selected landscapes of the Atlantic Forest and 3) capacity building, dissemination of knowledge and information at local, national and regional levels.



Long-term research

CATIE continued its work in forest and biodiversity management and conservation through its long-term research in permanent plots. In this sense, the fifteenth measurement was carried out at the Los Laureles de Corinto demonstration site, established in 1991. In this lowland tropical rainforest, a second use of wood was carried out in 2021 and in 2022, the impact of this intervention on plant diversity and accumulated carbon was measured.

In addition to this, the recording of climate information continued at weather stations located near demonstration sites of natural forest in the Barbilla-Villa Mills altitudinal gradient. These stations provide information since 2012 and the purpose is to relate climate variability with forest dynamics and determine the potential impacts of climate change on biodiversity and ecosystem services.



Advocacy

The project Models of Sustainable Management of Secondary Forests and its Link with Private Finance was able to identify the barriers and enabling conditions to promote and encourage the sustainable management of secondary forests, which determined that there are legal and political challenges regarding the definition of secondary forest and its incorporation into national strategies for sustainable forest management. In the specific case of Costa Rica, an important contribution was made by developing a forest policy proposal 2022-2052.

Capacity buildings

The teaching actions carried out by the UBBPP team resulted in the advice of seven master's students from CATIE's Graduate School, who successfully completed their program in 2022. The topics covered in these theses included bee communities in contrasting environments, resilience of mangroves in the Dominican Republic, characterization of natural tree regeneration from forest to paramo in Talamanca, Costa Rica, evaluation of structure, functional diversity and removal rates by coprophagous beetles, impacts of forest management on natural regeneration and carbon content in aerial biomass; gross profits from timber extraction at farm level in Ecuador and design of a business model for the denomination of origin of Loja coffee, in Ecuador.

Additionally, four courses were taught in CATIE's master's programs (academic and virtual) and the collaboration initiated in 2020 with the Regional Cooperative Program for the Technological Development and Modernization of Coffee Farming (PROMECAFE) for the dictation of the Diploma of Innovative Coffee Farming of PROMECAFE was continued.

Livestock and Environmental Management

Currently, livestock is at a crossroads in which different regional and global challenges converge (climate change, rural poverty, health, food security and sovereignty, emigration of the young population and others), which affect socioeconomic indicators and the livelihoods of livestock families. In this sense, CATIE's research goes beyond the traditional limits of animal production sciences, which takes into consideration other key factors to achieve resilient, productive, competitive systems with minimal impact on human health.

With this objective, CATIE's Livestock and Environmental Management Unit (GAMMA) worked on four projects in 2022.

Biodiversity and Sustainable Agrosilvopastoral Livestock Landscapes - BioPaSOS (2018-2022, funded by BMU-IKI).

This project implemented in territories of Jalisco, Chiapas, and Campeche (Mexico) and which closed in 2022 promoted climate-smart and biodiversity-friendly agrosilvopastoral approaches. Through the ECA methodology, BioPaSOS managed to strengthen the capacities of 1232 producers (78% men and 22% women).

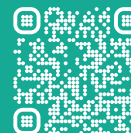
A total of 68 ECAs were developed in the three Mexican states. In addition, 35,000 hectares of the three pilot areas were transformed, where good livestock practices were established. Also, more than 140 demonstration plots were established and in 80 cattle ranches the carbon footprint was monitored, which was possible to reduce with sustainable practices, such as agrosilvopastoral systems.

Moreover, the BioPaSOS project successfully generated scientific technical information for knowledge management, as more than 10,000 people from 63 countries participated in its regional knowledge platform. Also, evidence was generated to adjust the institutional and political framework. Specifically for the states of Chiapas and Campeche, guidelines for the development of sustainable livestock at the state level were built.

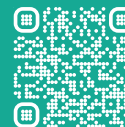


It should be noted that in Chiapas, in collaboration with the Livestock Development Bureau of the Congress of the State of Chiapas, a proposal was prepared to include the sustainable livestock approach and the promotion of agrosilvopastoral systems in the Law of Livestock Development and Health. In addition, at the level of the three states, a joint declaration was signed by the Secretariats of Agriculture to promote sustainable livestock.

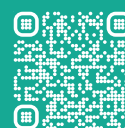
BioPaSOS was implemented by CATIE with the support of the Inter-American Institute for Cooperation on Agriculture (IICA), in coordination with the National Commission for the Knowledge and Use of Biodiversity (CONABIO, for its acronym in Spanish) and the Secretariat of Agriculture and Rural Development (AGRICULTURA, for its acronym in Spanish), with funding from IKI and together with multiple local partners in their territories of intervention. Part of the results of the project were compiled in the following videos:



[Results of the BioPaSOS project in Campeche](#)



[Results of the BioPaSOS project in Chiapas](#)



[Results of the BioPaSOS project in Jalisco](#)

Integral Amazonian Program for Forest Conservation and Sustainable Production - PROAmazonía (2020-2023, funded by GCF and GEF).

CATIE was responsible for the capacity building component through the ECA methodology. In 2002, livestock ECA were developed to strengthen the knowledge and skills of producers and thus make a transition from traditional systems to sustainable production systems in the provinces that make up the Special Amazonian Territorial Circumscription (CTEA).

This process included a training of five modules, aimed at 3500 livestock farmers (45% women) in two cycles (2021 and 2022). A total of 245 ECAs were conducted. The modules taught were farm plans, forage banks, rotational grazing, ecosystem services, productive records, nutritional blocks, animal health and manure management.

Simultaneously, the delivery of non-monetary inputs (NMI) was carried out, which were defined with the participants of the ECA based on their needs, after the elaboration of livestock farm plans. The following were areas for improvement: establishment and management of improved pastures, division of paddocks and establishment of live fences and implementation of woody and grass forage banks.

Similarly, 18 demonstration farms were established, which have been enhanced through investment and are aimed at meeting the indicators of the program and serving as a learning center.

The goal of PROAmazonía is that there is 15% female participation in its activities. During 2022 this goal was increased, since a total of 1232 women participated. This participation was achieved by scheduling work and training sessions at times when women ranchers could be part of the construction of learning modules, the definition of investment lines and the selection of non-monetary incentives. In addition, 50% of the technical team (training promoters) was made up of women.



Sustainable Productive Landscapes in the Peruvian Amazon (PPS) (2020-2023, funded by UNDP).

This project is implemented in prioritized areas of the departments of Huánuco (districts of Codo del Pozuzo, Yuyapichis and Puerto Inca) and Ucayali (districts of Curimaná, Neshuya and A. von Humboldt), in Peru. Through an agreement with UNDP-Peru, CATIE is responsible for the livestock component, which has the impact of improving productivity and ecosystem services through the sustainable intensification of livestock activity, which promotes greater competitiveness and better incomes for families, as well as increasing resilience to climate change.

The main results obtained have been the validation of information about the characterization of livestock and the analysis of its meat and milk value chain, a management document for technical recommendations for the promotion of sustainable livestock in the Peruvian Amazon, as well as the strengthening of capacities to 250 people related to livestock, organized in 14 ECAs.

In these schools, 94 learning sessions and field days have been developed, covering topics such as farm planning, live fences and tree planting of pastures, sanitary calendar, community nurseries, establishment and management of pastures, genetics, drinking troughs in paddocks, weight gain and milk production. In addition, technologies and good practices were implemented in 14 prototype farms that will serve as a model and scale.

Of the total participants in ECAs, 48 were women, representing 20%. Several of these women even led some ECAs by choice of the group and formed support groups, which allowed them to

demonstrate their important role in activities that were historically reserved for men. Additionally, two women were chosen by their ECA group to be the promoters. Also, the participation of women in the farm characterization study was contemplated where, of the 292 participants, 42 (14%) were women. Training on topics that promote economic development and opportunities for women is scheduled for next year.

As part of the PSS project, in the search to address the problems of livestock activity in the Peruvian Amazon, a proposal was generated for a management instrument for the livestock sector to articulate the local level with the national level, based on a process of participatory co-designs for decision-making.

For its construction, virtual and face-to-face workshops were held with more than 100 participants, including livestock producers, researchers, officials, and academics from the Peruvian Amazon, grouped to address three main axes of identified problems: 1) governance and institutionality, 2) sustainable production and innovation, and 3) business and commercial management.

Likewise, a report on the characterization of livestock was generated, in which surveys were conducted to a random sample of 292 farmers, interviews with key informants and focus groups. The information allowed an update regarding the socioeconomics of the producer, the herd (composition, purpose, reproduction and health), pastures and the livestock feeding system, situation of the environmental component (water, biodiversity and silvopastoral systems), as well as the analysis of the value chain. The results of the reports were validated by actors in the meat and milk chain.

Contribution of the Sustainable Intensification of Livestock in the Reduction of Methane in Livestock Farms (2022-2024, financed by CCAC).

The Climate and Clean Air Coalition (CCAC) has relied on CATIE to contribute its experience in the issue of livestock and climate change in the region, and specifically, to identify those good practices that improve competitiveness and reduce emissions in livestock activity in Panama and the Dominican Republic.



The project involves key regional partners, such as the Secretariat of the Central American Agricultural Council (SECAC, for its acronym in Spanish), whose role is to strengthen the regional platform on sustainable livestock in the countries of the Central American Integration System (SICA) and global partners, such as the World Meteorological Organization (WMO), which will carry out a study to know the technical and economic feasibility for the use of satellite technology to estimate GHG emissions at the atmospheric and its relationship with productive activities on land.

These actions are of great relevance, because within the framework of the project, CATIE will provide technical inputs so that SICA countries can move forward more effectively with the fulfillment of their country commitments, mainly Nationally Determined Contributions (NDC) and SDGs. It is hoped that the experiences of this project will be scaled to other countries, where both the CCAC and the WMO have global actions.

Another relevant action of CATIE about livestock and environmental management during 2022 was the formulation of new projects.

1. TRANSFORMA-INNOVA (2023-2026), funded by IKI and the European Union, and executed by GIZ.

CATIE oversees implementing the livestock component through which silvopastoral systems and good livestock practices will be promoted among producing families through the ECA and the development of materials and training events for technicians, as well as the socioeconomic systematization of the pilot farms of the NAMA livestock. With the results of the implementation, it is expected to support the fulfillment of the climate commitments of the livestock sector in the NDC and the National Decarbonization Plan, which are international commitments of Costa Rica.

2. Transformation of the Honduran Livestock Sector into a Low Carbon Economy, financed by NAMA Facility and led by the Ministry of Energy, Natural Resources, Environment and Mines (MiAmbiente) and the Ministry of Agriculture and Livestock (SAG), with support from CATIE.

Its formulation was finalized in December 2022 and is ready to be implemented during the first quarter of 2023. It seeks to overcome the barriers that currently limit the development of a Honduran livestock sector, address the challenges of the sector, align national extension and advisory programs, markets, and industry to promote innovations that improve productivity, profitability and climate resilience while reducing GHG emissions and maximizing carbon sequestration at the farm level.

This program includes a climate finance component that will be implemented through the operation of a financial mechanism, which will foster articulation (triangulation) between farmers, industry, and the financial sector to mobilize public and private funds for low-carbon transformation. It will directly support 1200 families, for which a gender-inclusive approach will be followed and will benefit 13 500 people including farmers, employees, relatives, extension workers and credit officers (24% women).

The process will seek investments from the public and private sector, as well as the direct mitigation of 762 ktCO₂e during its implementation and 5.3 ktCO₂e 10 years later. The program will be monitored and evaluated through a digital platform that will generate performance indicators for decision-making, create a continuous learning cycle and provide metrics to contribute to the country NDCs.

3. Integrating Climate-Compatible Livestock Systems into the National Commitments of Central America and the Caribbean, known as INTEGRA.

Its execution period will be from 2023 to 2027, with funding from IKI and will be implemented in Costa Rica, Dominican Republic, Guatemala, and Panama, under the leadership of CATIE, in partnership with the Regional Committee of Hydraulic Resources (CRRH, for its acronym in Spanish) and the Zamorano University of Honduras.

The objective is to promote the transition of the traditional livestock sector towards climate-compatible production pathways (highly productive, climate resilient and low carbon) to support the long-term fulfilment of climate and biodiversity conservation commitments throughout the Central American region.

Tools and methodologies implemented

There were two important advances in the development of tools. The first one had to do with the programming of a livestock modeling tool that will allow the financial evaluation of low-carbon interventions on farms, which takes into account the projection and dynamics of the herd, the balance of supply and demand of dry matter, energy and protein. This tool will facilitate the development of robust assessments on livestock farms.

In addition to this, we worked on the adaptation of the methodology of social network analysis and polycentric governance in landscapes dominated by livestock systems. The adaptation of this tool allows us to better understand the decision-making and governance processes of the meat and milk production chains, as well as the interactions that exist around the governance of the livestock sector in the region.

Advocacy

In Mexico, it was supported by the review and preparation of a proposal to reform the Law on Livestock Development and Livestock Health for the State of Chiapas, which was delivered in December 2022 to the Congress of the State of Chiapas.



Likewise, in the Dominican Republic, a strategy was formulated to strengthen the capacities of the extension system of that country, so that extension workers promote climate-smart livestock and silvopastoral systems, thus contributing to the decarbonization of the livestock sector. The strategy was prioritized in the NDC action plan.

Capacity building

Through the BioPaSOS project, GAMMA conducted face-to-face, virtual, and bimodal training workshops on financial education on livestock farms, training for ECA facilitators and links, as well as potential synergies for the scalability of sustainable livestock in three states of Mexico (Chiapas, Jalisco, and Campeche); 807 people participated (38% women). From the PROAmazonía project, face-to-face and virtual training workshops were carried out in the Amazon region of Ecuador, for a total of 2713 participants, of which 45% were women. The target groups were producers, technicians, and decision makers.

Finally, in Peru, through the PPS, training workshops were held in two departments (Ucayali and Huánuco), in which 1834 people participated, of whom 24.1% were women.

The gender perspective and the recognition of the work carried out by women in livestock activities were key aspects of GAMMA's actions in 2022. In this sense, in addition to the aforementioned trainings, in which women actively participated, through the Territorial Economic Inclusive Development Program (DEIT) and ABC Honduras, it was sought to include 30% of women in the training and pilot farms. With DEIT in the southern zone, the goal was reached and exceeded. However, Olancho must continue working on the issue. Simultaneously, in the Dominican Republic, all the technicians of the livestock extension program of the Ministry of Agriculture were trained in the active principles of gender incorporation to achieve more inclusive extension programs.



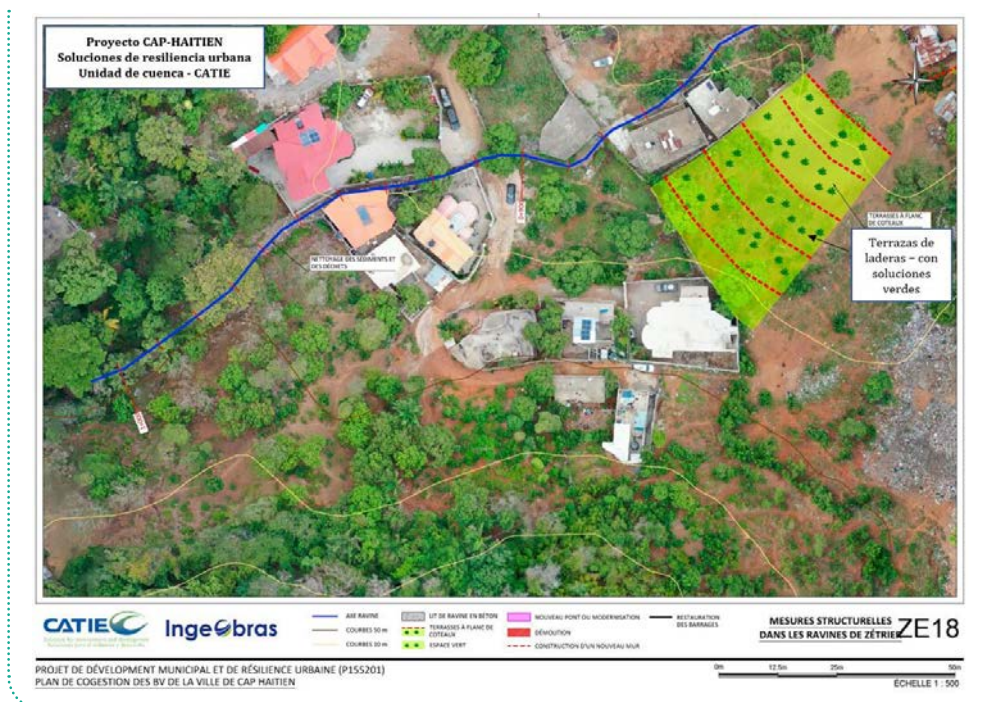
Watersheds, Water Security and Soils

Proper management of water and soil resources is essential to maintain terrestrial ecosystem functions and services. Therefore, a socio-ecological approach is needed to identify and understand natural systems, territorial dynamics, social systems and the impact of climatic anomalies on the livelihoods of communities and the conservation of ecosystem services. CATIE works on the issue of watersheds, water security and soils from a comprehensive and systemic approach, for which biophysical, social, economic and environmental aspects are considered. Under this perspective, in 2022, CATIE's Watershed, Water Security and Soils Unit (UCSHS) focused on the execution of three projects.

Implementation of Non-Structural Measures to Reduce Erosion and Mitigate Flood Risks in the Zétrier and BelleHôtesse Sub-Basins, Cap-Haitien (2022-2023, financed by the World Bank).

This project seeks to increase resilience to flooding in urban areas. It involves land-use planning and non-structural nature-based interventions that reduce erosion and sedimentation in the Belle Hôtesse and Zétrier sub-basins in Haiti.

To achieve sustainable management of risk reduction interventions, efforts are being made to strengthen community-level organization, strengthen capacities and change the behaviour of stakeholders in watershed management. Among the expected results are the quantification of the benefits generated by Nature-based Solutions (NbS), designed within the framework of an urban watershed co-management plan, the generation of learning in the implementation of NbS in the field, such as restoration and reforestation in urban spaces, and in the processes of training and awareness to key actors, including civil society.



Planning, Information, and Institutional Strengthening for the Management of the Pedernales Binational Basin (2020-2022, funded by GIZ).

The actions were implemented within the framework of the project Governance of Groundwater Resources in Transboundary Aquifers (GGRETA), in support of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and in conjunction with IHE-Delft. CATIE developed a roadmap to guide the binational management of the Ocotepeque-Citalá Transboundary Aquifer (ATOC), shared by El Salvador and Honduras, and covering a large part of the Lempa Alto sub-basin, which overlaps with the Trifinio-Fraternidad Biosphere Reserve.

Through participatory activities with key actors for the management of the shared aquifer, three strategic lines of action were defined, namely: transboundary cooperation at the binational level, coordinated with the regional and subnational levels; generation, dissemination and use of hydrogeological knowledge for the participatory management of the ATOC and consolidation of legal and governance frameworks at national and subnational scales, with a basin approach in the management of the ATOC, as well as steps and bases for the governance mechanism of the ATOC, being of special interest the Trifinio Plan.



Roadmap towards Coordinated Management, with a Basin Approach of the Transboundary Aquifer Ocotepeque-Citalá (ATOC) (2022, funded by IHE-Delft of UNESCO).

Within the framework of the first component of the program Scaling Up Ecosystem-Based Adaptation Measures in Rural Areas of Latin America (EbA LAC), the strengthening of multilevel governance was sought to scale up Ecosystem-based Adaptation (EbA). In addition, it contributed to the strengthening of governance and planning processes at the landscape scale.

The results to date include the identification, mapping, and baseline of governance mechanisms at the landscape level in Costa Rica, Guatemala, and Ecuador, as well as the prioritization of those most promising mechanisms with which the strengthening process will be directly continued. In Costa

Rica, the Commission for the Sustainable Development of the Sarapiquí River Basin (CODESOSA, for its acronym in Spanish) stands out, in the figure of the promoters for the implementation of the Law for the Safeguarding of the Sarapiquí River Basin, the local committees of biological corridors (San Juan La Selva and Paso de las Nubes) and the Regional Development Agencies (AREDE, for its acronym in Spanish) in Huetar Norte and the Caribbean.

In Ecuador, the Portoviejo River Basin Council stands out and in Guatemala the focus will be on the indigenous mayors of San José Poaquil, San Andrés Sacbaja, Rabinal and San Miguel Chicaj. The capacity-building strategy with a regional approach and country chapters is in the proposal and validation stage. The regional EbA-LAC programme has a duration of four years.



Another work carried out in 2022 was an analysis to know the contribution that planning processes in watersheds have had in the fulfillment of the SDGs. To this end, a sample of CATIE's experience in the development of watershed management, management and co-management plans was studied, understanding that the development of a plan of this type goes through a large part of the watershed management cycle, which enhances the impacts of the plans beyond their preparation.

Twenty-one (21) watershed management plans that were prepared or advised by CATIE in Central America and the Caribbean were analyzed, for which the approach of each one was compared with the 17 SDGs. In this exercise, for each plan, its indicators or elements that would respond to each SDG were identified and it was pointed out to which of the specific goals and indicators proposed by the United Nations (UN) these plans would contribute. It was found that all the plans analyzed address SDGs 1, 2, 6, 9, 11, 12, 13 and 15. The reflections based on these findings allow us to propose enabling conditions to achieve a better contribution of watershed management and management plans to the fulfillment of the SDGs.



The UCSHS will contribute in 2023 to the execution and monitoring of the project Adaptation of Agriculture to Climate Change through Water Harvesting in Nicaragua to achieve the consolidation and scalability of water harvesting technology, the economic benefits generated by its use and the massification of the knowledge created by the project. which will help producers in the dry zone of Nicaragua to have more economic income and therefore, improve their quality of life by transforming their production systems to be more diversified and resilient to climate change.

Tools and methodologies implemented

Within the actions of the project Adaptation of Agriculture to Climate Change through Water Harvesting in Nicaragua, runoff water harvesting systems were established, which include the construction of more than 600 water harvesting works. Based on this experience and the statistical and geospatial analysis of data, a geospatial tool was developed to identify and select potential sites on farms for the establishment of water harvesting works by runoff, which consider topographic variables of the terrain.

To facilitate the use of the tool, a technical manual was developed that provides a detailed description of the biophysical variables for the identification and prioritization of zones and sites, as well as the statistical analyses and weighted spatial overlap that support the analyses. Also, the manual includes a section for the user in the QGIS platform, and contemplates the scope, limitations, and general recommendations.

Advocacy

It contributed to the process of reform and development of the policy framework of the water sector of the Dominican Republic, particularly in the definition of the areas of incidence of the sub-basin committees, which contributes to the analysis, improvement and implementation of the resolution of the Ministry of Environment, which approves the procedure for the formation of the micro-basin committee, sub-basin authority and river basin councils in that country. In addition to this, Haiti and the Dominican Republic contributed to the completion of the compliance report

of indicator 6.5.2 on transboundary basin management, corresponding to SDG 6. CATIE's action made it possible for countries to comply on time with this voluntary commitment made within the framework of the SDGs.

Capacity building

From the project Adaptation of Agriculture to Climate Change through Water Harvesting in Nicaragua, the UCSHS designed and coordinated a diploma in this subject, in which 24 students participated with technical profiles, both from the Water Harvest project and from the National Institute of Innovation and Transfer in Agricultural Technology (INTA, for its acronym in Spanish), as well as Nicaraguan national universities.

Some of the topics covered in this diploma course were connection of scientific research with participatory action research; water harvesting systems, process of identification and definition of potential sites for the establishment of water harvesting works by runoff; criteria, variables, weights, statistical analysis, characteristics of spatial inputs, and use and management of the geospatial tool (complement for QGis), aimed at identifying optimal areas for the establishment of water harvesting works by runoff.

Agrobiodiversity and Food Security

Food security is one of the main challenges of this century at a global level. By 2050 the world will require increased food production to meet the needs of a growing population and this must still be achieved in the face of the challenges of new consumption patterns, the impact of climate change and limited access to resources such as water and soil. Given this context, CATIE executed three research and development projects in 2022, in order to add to global efforts in response to this challenge. These projects were led by the Agrobiodiversity and Food Security Unit (UASA, for its acronym in Spanish).



Kafé Makaya Project (Haiti). Towards an Inclusive Productive Economy Adapted to Climate Change (2019-2024, funded by GAC, Canada).

This project, implemented in the Haitian communities of Beaumont, Pestel, Jérémie, Roseaux (department of Grand'Anse) and Camp Perrin (department of the South) aims to positively impact the economic well-being and reduce the socioeconomic vulnerability of the country's rural population. To this end, work is being done to strengthen the coffee production chain, for which cross-cutting issues for its sustainability are addressed. It is expected to directly benefit around 13,000 people, including 60% women and 40% men, and at least 10 coffee associations.

CATIE conducted training for more than 50 technical partners of the project. Among the topics discussed are the design of farm plans, the implementation of new designs, the agroecological management of farms and pilot coffee reproduction centers.

Within the framework of this project, six model farms of multilayer agroforestry systems with coffee were established, implemented with designs adapted to the need for crop diversification for the food security of families. Half of the model farms are led by women and half of the technicians for scaling are women. In addition, greater participation of beneficiaries in direct training actions and financing implemented by Kafé Makaya's partners was encouraged.

**Regenerative Food Business (NAR, for its acronym in Spanish) Project (2022-2024, funded by IDRC, Canada).**

The project tries to promote the knowledge and action of companies and investors oriented towards a regenerative approach to the agricultural sector and more inclusive and resilient food systems, so in 2022 it was possible to make a first mapping of existing regenerative cases, as well as make the state of the art with respect to environmental attributes, social and economic.

The information obtained and the steps taken represent the foundation for the strengthening and scaling of this innovative approach in the future stages of the project, which is led by Fundación Avina and implemented by a consortium composed of CATIE and seven other organizations, whose actions within the project expect to connect more than 50 public and private entities, to conserve more than 5000 hectares of threatened forest and incubate at least 15 food businesses, as a basis for future strengthening and scaling of regenerative approaches.

In 2022, the NAR project was able to map 180 successful women-led businesses that have a regenerative approach. The focus territories of the project are the Central American Dry Corridor (Panama, Nicaragua, Costa Rica, Honduras, Guatemala, and El Salvador) and the Amazon (Peru, Brazil, Bolivia, Colombia, and Ecuador).

In addition, the year 2022 brought with it the beginning of two important initiatives, led by CATIE's UASA:

1. Transformative Low Carbon and Climate Resilient Routes of Costa Rica, known as TRANSFORMA-INNOVA. This program will run until 2026, with funding from IKI and the European Union. Within it, CATIE leads the support for the transformation of the agricultural sectors and contributes transversally with other objectives of the program.

TRANSFORMA-INNOVA supports Costa Rica in achieving its NDCs, as well as in the implementation of its sectoral strategies by: 1) strengthening the coherence of national policies and the governance of low-carbon pathways; 2) the development and promotion of low-carbon, biodiversity-conserving and resilient agricultural production and processing practices in three NAMAs (coffee, livestock and musaceae); (3) improving the livelihoods of coastal communities; 4) facilitating access to climate finance, and 5) raising awareness of low-carbon and resilient development pathways.

As a result, coffee, meat, milk, and banana producers, as well as coastal communities, will directly benefit from the transition to low-carbon, biodiversity-conserving, and climate-resilient value chains. The results of TRANSFORMA-INNOVA will contribute to climate resilience, ecological sustainability, and biodiversity conservation, thus contributing to Costa Rica's National Decarbonization Plan.

2. Biodiversity, New Diseases and Sanitary and Phytosanitary Risk Management (BIO2DIV). This is an interregional project that will end in 2023 and has funding from the European Union and Interreg Caribbean. Its objective is to strengthen the monitoring and management of sanitary and phytosanitary risks in neighboring Caribbean countries. CATIE provides technical and logistical support to develop a simulation model on the dynamics of the incidence of black banana Sigatoka, to identify the crucial points to prevent or reduce the incidence of this disease.

Tools and methodologies implemented

Within the framework of the Technical Assistance Services to Support the Implementation and Establishment of Low Carbon Agri-Food Systems in Costa Rica (funded by EUROCLIMA and FIIAPP), CATIE technicians applied a participatory and inclusive methodology to collect agricultural information on Bribri and Cabécar indigenous communities in Talamanca, Costa Rica, in order to propose criteria for a potential financial recognition of environmental benefits in their farms, as well as in other organic farms in the country.

The use of the ODK software package facilitated the collection and analysis of data, as well as the submission of results. In addition, the project trained the survey staff of the Indigenous Development Associations (IDA) to carry out participatory diagnoses on organic production and agroecological practices applied to more than 10 crops, as well as the incidence and management of pests and diseases in musaceae and cocoa. It is highlighted within the actions of this project that the space was opened for indigenous people to work in the collection of information and data.

In turn, the NAR project is developing a methodology to identify and assess the degree of regeneration of regenerative food businesses in Latin America. The parameters used are based on an ecocentric perspective, where the dynamics of nature and the restoration of its processes are central to the success of the business. Additionally, aspects of social justice and economic prosperity are also evaluated.

The dissemination of these concepts and instruments will be linked to a knowledge and tools center, whose construction is being coordinated by CATIE. This center will strengthen and connect hundreds of Latin American businesses and actors interested in this approach, with the aim of orienting their actions towards regenerative and transformative socio-ecological systems.

Capacity building

UASA supported two subprograms of the Program for Technological Innovation in Agriculture and Agroforestry (PITAG), in Haiti, with didactic materials, trainings and technical sessions on improved coffee and cocoa agroforestry systems, as well as on composting practices and agroecological concepts for sustainable soil management. All these contributions make it possible to increase agricultural productivity, while contributing to the conservation of natural resources.

On the other hand, for knowledge management, the AGROINNOVA project implements different strategies and processes appropriate to achieve impact at the local and regional level in Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama, countries of the Central American Dry Corridor. One of these strategies is the reintegration of rural youth into agriculture through innovation and digital technology. It promotes theoretical and practical spaces for co-creation and promotion of innovative ventures, models of resilient agriculture and concepts of digital agriculture, as factors of change. One example is 208 young people in Honduras who complemented the curriculum through field training on Multilayer Agroforestry Systems (SAFM, for its acronym in Spanish).

Also, in Costa Rica, seven theoretical-practical modules of goat agrosilvopastoral ECA were developed to strengthen the capacities of young people, producers and technicians on the management and innovation of goat production, SAFM, sustainable intensification and the

transformation of agricultural products to generate employment and added value. In this process, 20 leading goat producers from the Pacific of Costa Rica, eight technicians from the Ministry of Agriculture and Livestock (MAG), and 26 young people from the Professional Technical College of La Suiza, Turrialba, Costa Rica, were trained, where a goat module was also built as a demonstration showcase for the area.

Biostatistics

The Biostatistics Unit (BU) assists CATIE's research units in the design, planning and analysis of the information on the projects they carry out. This ensures reliable and robust results that can later be used for decision making. Likewise, it collaborates with the development of algorithms and the adjustment of methodologies that facilitate the capture, processing, and presentation of data, which seeks to maximize the knowledge generated.

The BU also provides support in the training of students of the CATIE Graduate School, as well as students and interns from other educational institutions at national and international level, in the use of modern tools for the filtering, analysis and interpretation of data, and supports them in the analysis of the information collected during the field phase of their degree work. In this sense, this unit is responsible for organizing and guarding the databases generated by the research of the students at the CATIE Graduate School.

Among its main research results developed in 2022 is a study on [tree diversity in an agricultural-tropical forest mosaic landscape in Honduras](#). The decline of biodiversity in the tropics requires an integral management of the productive landscape in which agricultural systems are a key element for the conservation of biodiversity. This study evaluated the potential for the conservation of taxonomic biodiversity within an intensive livestock-agricultural-forestry landscape in Catacamas, Honduras.

Participation in this type of work makes visible the skills that the BU has for data modeling that can later be used as evidence for decision making. In this case, it was shown that practices that integrate the knowledge of local producers and technicians can improve tree diversity in agricultural landscapes by prioritizing a combination of induced and native (multi-use) tree species. This study was developed in collaboration with CATIE's UBBPP and UAMCC, as well as CIRAD and the University of Montpellier.

Another outstanding research result was the study on the [structure, diversity and conservation value of tropical dry forests in highly fragmented landscapes](#). Tropical dry forests are the most degraded and fragmented in the world. However, there is still a poor understanding of their basic ecological character and conservation status, particularly in the Neotropics.

This study assessed the diversity, composition, structure, and conservation value of tropical dry forests in a highly fragmented landscape in Nicaragua, where plots and transects were established in and along river corridors, secondary forests, living fences and grassland-forests. Each forest type was found to have a distinct composition, demonstrating the importance of conserving different types of natural cover in fragmented landscapes. The study was developed in collaboration with the

Estelí Regional Multidisciplinary Faculty of the National Autonomous University of Nicaragua and the Autonomous University of Barcelona.

Finally, research on [timber growth, cocoa yields and financial income in a long-term experiment of cocoa agroforestry systems in northern Honduras](#) had important findings. Cacao in Honduras is grown under traditional shade tree species, as well as under fruit and timber species planted deliberately or selected and managed from natural regeneration.

The study evaluated three components of shade in cocoa, including banana (*Musa x paradisiaca*) and wood (*Gliricidia sepium*), which were used as temporary shade, as well as timber species that were selected as permanent shade. Data on growth of timber species, cocoa yield by plant and the main diseases (Monilia and Black Cob) were analyzed.

In addition, the income of each component of agroforestry systems was evaluated and it was found that 5 of the 12 timber cocoa plantations accumulated more than USD \$95,000 of combined income, equivalent to income of USD \$3775 per hectare, per year. The study found that timber cocoa plantations are a promising alternative for agricultural diversification in northern Honduras.

This research was developed in collaboration with the Honduran Agricultural Research Foundation (FHIA, for its acronym in Spanish), the Cocoa and Agroforestry Program, La Másica, Atlántida, Honduras, Corus International, the MOCCA project of Nicaragua and the Research Group on Agroecosystems and Conservation in Amazonian Forests (GAIA, for its acronym in Spanish) of the University of the Amazon, Florence, Colombia.

Capacity building

Historically, the BU has strengthened the capacities of the students of the Graduate School through the dictation of the course Statistical Tools for Research in Agriculture and Natural Resource Management, through which, during 2022, it contributed to strengthening the statistical knowledge of 20 CATIE master's students.

At the same time, given the large number of data that is recorded and analyzed, as well as the fact that analysis techniques have evolved and with them the training needs of students and technicians, in 2022 it was possible to expand the offer of courses, and the course Advanced methods of data analysis and programming in R was offered, in which 12 students of the different master's degrees of the Center participated.

Featured publications



Ecosystem services by birds and bees to coffee in a changing climate: a review of coffee berry borer control and pollination.

This scientific publication demonstrates that coffee systems are capable of hosting useful biodiversity, which not only contributes to conservation, but also contributes to yields. Without the intervention of birds that can prey on pests and bees that contribute to pollination, yields can be reduced by more than 20%. These are important findings to disseminate in conservation and development projects, to promote sustainable agroforestry systems.



Shade tree traits and microclimate modifications: implications for pathogen management in biodiverse coffee agroforests.

This article was certified by the scientific journal *WILEY-BIOTROPICA* as the most cited during 2021-2022, based on a collaborative study between the University of Toronto, CIRAD and CATIE, in the trial of agroforestry systems with long-term coffee that is located at CATIE headquarters. The article points out that agroforestry systems with coffee modify microclimatic conditions compared to monocultures, which affects the success of important plant pathogens, such as *Hemileia vastatrix*, which causes coffee rust.



The existence value of the Antillean manatee in the unprotected Hondo River (México) as a fundamental component for its conservation.

This scientific article, published by Nature Conservation, states that the Hondo River is the natural border between Mexico and Belize, and is part of the distribution area of the endangered West Indian manatee. Using qualitative research methods, the social perception and local knowledge of riparian communities was documented to assess the conservation status and trends of manatees in the area. This study provides evidence of relevant local knowledge about the ecology of the manatee and its habitat, fundamental for the construction of binational conservation strategies for the species.



Market opportunities and impacts of COVID-19 on short chains of agroforestry products in Costa Rica.

This research was conducted to identify market opportunities and impacts of COVID-19 in short chains of products of agroforestry systems (SAF), in two cantons of Costa Rica. The methodology consisted of three stages: i) supply analysis with 20 SAF owners and demand analysis with 40 businesses located a maximum of 50 km around the farms; ii) analysis of national consumption trends with a sample of 1579 people; iii) identification of impacts due to COVID-19 at the level of producers and businesses.



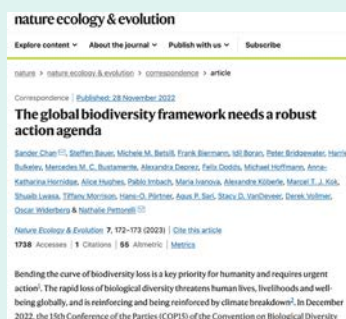
Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Contributed to chapter 12 of this book, which focuses on Central and South America. To this end, literature was reviewed and scientific evidence systematized, for which the guidelines and standards of the Intergovernmental Panel on Climate Change (IPCC) were followed. The review focused on the impacts of climate change on agriculture in Central America, as well as adaptation measures implemented by the public, private and community sectors to reduce the effects of climate-related disasters in Central and South America.



Guidelines for the promotion of sustainable livestock in Chiapas. This document consolidated the experience derived from efforts that contribute to mitigate the negative cycle of traditional extensive livestock practices in biodiversity conservation, in Chiapas, Mexico. The lessons learned and intervention actions to be taken into consideration by the different actors linked to livestock activity and the state government to continue advancing towards sustainable livestock are addressed. The document was constructed between the Ministry of Agriculture, Livestock and Fisheries (SAGyP), the Ministry of Environment and Natural History (SEMAHN) and CATIE, through the BioPaSOS project.



Tree diversity in a tropical agricultural-forest mosaic landscape in Honduras. This study evaluated the conservation potential of taxonomic biodiversity within an intensive livestock, agricultural and forestry landscape in Catcamas, Honduras. The results indicate a high degree of tree species diversity. The biodiversity indices of agroforestry coffee were equivalent to those of the natural secondary forests of the Catcamas landscape. It was determined that combining biodiversity conservation and agricultural production is possible in tropical landscapes under human pressure by maintaining tree cover, and that enrichment practices that combine local producers and know-how can improve tree diversity in agricultural landscapes.



The global biodiversity framework needs a robust action agenda. This article, published in *Nature Ecology & Evolution*, suggests that an action agenda on biodiversity be included that mobilizes society-wide nature recovery actions as a complement to government efforts. If governments can agree on a solid framework, an action agenda can create productive linkages between multilateral and transnational actions. However, if governments fail to agree on an ambitious framework, the action agenda can help sustain action and build momentum. The article argues that the action agenda must be complementary, catalytic, collaborative, comprehensive and credible to generate enthusiasm from a diverse set of actors when taking action on biodiversity.

Section 4.

CATIE as a regional scientific platform



From the DIDVI, CATIE managed and maintained during 2022 important alliances and partners, which give a boost to its research and results. In total, 12 new alliances are reported during the year, in which countries of the Central American region are involved, as well as Haiti, England and Switzerland. In addition, four of the 12 alliances are international in nature. These partnerships cover issues related to environmental economics and agribusiness, climate action, genetic improvement of coffee and cocoa, forest and biodiversity management, watershed management and agrobiodiversity and food security.

In terms of research partners, the institution managed to form a network of 173 partners, from 29 countries around the world, as well as regional partners (Central and Latin America) and global partners. These include non-governmental organizations, donors, financial institutions, government institutions, cooperatives, associations, private companies, and academic institutions.

In 2022, the alliance between CATIE and CIRAD was expanded, and efforts were maintained with the actions of AGROFORESTA. Four new institutions joined this platform: the Colombian Agricultural Research Corporation (AGROSAVIA, for its acronym in Spanish) of Colombia; the College of the Southern Border (ECOSUR, for its acronym in Spanish) of Mexico; the Nicafrance Foundation of Nicaragua; and the National Institute of Agricultural Research (INIAP, for its acronym in Spanish) of Ecuador. In total, there are now nine members of the platform. Also, within the framework of this alliance, the arrival of two new CIRAD researchers (in the areas of cocoa and coffee) was prepared for their assignment at CATIE starting in 2023. In addition, a significant number of AGROFORESTA researchers participated in the 5th World Agroforestry Congress held in Quebec, Canada (with the organization of a side event), as well as in the International Cocoa Research Symposium held in Montpellier, France. As a result of this cooperation, 42 scientific articles were published in 2022, 18 of them in journals with an impact factor; nine oral communications and three posters were presented at congresses; three master's theses and three bachelor's theses were presented. Seven seminars were organized on AGROFORESTA's research.



Alliances

Partner Name	Country	Objective	Associated research topics
National Confederation of Federations, Leagues and Unions of Asadas (CONAFLU)	Costa Rica	Support the associativity of water management associations in Costa Rica.	Environmental economics and agribusiness
Regional Centre for the Promotion of MSMEs (CENPROMYPE)	SICA Region	Seek joint funds for the strengthening of rural MSMEs in the SICA region.	Environmental economics and agribusiness
Global Convening Programme of the British Academy of Sciences	England	Integrate a multidisciplinary team under the leadership of the University of Oxford to contribute CATIE's experience in climate change and natural resource management in the rural environment of the global south.	Climate Action
World Coffee Research	International	Develop the INNOVEA project in coffee genetic improvement.	Agroforestry, coffee, and cocoa
Barry Callebaut	International	Develop the ClearLeaf project, for the management of several cocoa diseases.	Agroforestry, coffee, and cocoa
Panthera Corporation	International	Develop and initiate the implementation of work and cooperation actions in research, training, and development of programs and / or projects related to the management of natural resources, with emphasis on actions of management and conservation of biodiversity (forests and wildlife).	Forests and biodiversity in productive landscapes
Swiss Foundation for Technical Cooperation (SWISSCONTACT)	Switzerland	Establish and implement work and cooperation actions in research, training and development of programs and projects related to the management of natural ecosystems.	Forests and biodiversity in productive landscapes
Osa Conservation Association	Costa Rica	Establish and implement work and cooperation actions in research, training and development of programs and projects related to the management of natural ecosystems with emphasis on forestry, agroforestry, forest restoration and livestock landscapes.	Forests and biodiversity in productive landscapes
Development Bank System (SBD)	International	Promote and strengthen rural enterprises, especially, but not exclusively, in the forestry and agricultural sectors of Costa Rica, so that they become innovative and profitable companies that build a more sustainable development in the future.	Forests and biodiversity in productive landscapes
United Nations Development Programme (UNDP)	Haiti	Carry out capacity building for technicians and key actors in water issues and basin management, as well as jointly manage international cooperation projects.	Watersheds, water security and soils

Partner Name	Country	Objective	Associated research topics
Commission for the Management of the Reventazón River Basin (COMCURE)	Costa Rica	Elaborate, execute, and control a management project for the Reventazón river basin, with emphasis on water conservation and protection, define and execute a training project for the community in watershed planning and management, and train officials of the institutions and community leaders involved in the project in specific matters that support the plan.	Watersheds, water security and soils
Fondation Nouvelle Grand'Anse (FNGA) and Ayitika	Haiti	Strengthen research and development actions in Haiti, through the development of projects and impact intervention strategies.	Agrobiodiversity and food security

Partners

Country	Project or institution
Germany	Global Crop Diversity Trust
	International Climate Initiative (IKI)
	German Society for International Cooperation (GIZ)
Argentina	National University of Córdoba
	Avina Foundation
Belize	MAFFESDI
Bolivia	Latin American and Caribbean Coordinator of Small Producers and Fair Trade Workers (CLAC)
	National Institute of Agricultural and Forestry Innovation (INIAF)
Brazil	Executive Committee of the Cocoa Plan (CEPLAC)
	World Transforming Technologies (WTT)
	NESsT Investments
	System B
Brazil, Colombia, Costa Rica, Honduras, Guatemala and Peru	VOLCAFE
Central America	Regional Cooperative Program for the Technological Development and Modernization of Coffee Farming (PROMECAFE)
Colombia	Colombian Agricultural Research Corporation (AGROSAVIA)
	Social Enterprise Knowledge Network (SEKN)
Korea	Korean Cooperation for Food and Agriculture in Latin America (KoLFACI)
	Rural Development Administration (RDA)

Country	Project or institution
Costa Rica	National Forestry Financing Fund (FONAFIFO)
	Secretariat of Sectoral Planning of Environment (SEPLASA)
	National System of Conservation Areas (SINAC)-MINAE
	Development Bank System (SBD)
	Foreign Trade Promoter of Costa Rica (Procomer)
	Conservation International (CI)
	DOLE Costa Rica
	Costa Rica Association Forever
	Directorate of Agricultural Science and Technology (DICTA)
	National Banana Corporation (CORBANA)
	Ministry of Agriculture and Livestock (MAG)
	Ministry of Environment and Energy (MINAE)
	Coffee Institute of Costa Rica (ICAFE)
	BARRY CALLEBAUT
	ClearLeaf
	Nestlé
	CRA
	ECOM-FJ ORLICH
	San Francisco Bay Coffee
	Nespresso
	National University (UNA)
	Mesoamerican Center for Sustainable Development of the Dry Tropics (CEMEDE-UNA)
	Regional Agricultural Milk Cooperative (Coopeleche)
	CONAC-4S
	National Chamber of Milk Producers (CPNL)
	Inter-American Institute for Cooperation on Agriculture (IICA)
Ecuador	Latin American and Caribbean Network of Fair Trade Small Producers and Workers (CLAC)
	National Institute of Agricultural Innovation (INIA)
	Ministry of Agriculture and Livestock (MAG)
Guatemala, Honduras and El Salvador	Plan Trifinio
Guatemala	National Institute of Forests (INAB)
	Rural Development Bank (BANRURAL)
	FUNDAECO
	Institute of Agricultural Science and Technology (ICTA)
	Rafael Landívar University (URL)
	Ministry of Agriculture, Livestock and Food (MAGA)
El Salvador	National Center for Agricultural and Forestry Technology “Enrique Álvarez Córdova” (CENTA)
Spain	EUROCLIMA Programme

Country	Project or institution
United States	Inter-American Development Bank (IDB)
	University of Montana
	Duke University
	Wildlife Conservation Society (WCS)
	World Resources Institute (WRI)
	American Bird Conservancy (ABC)
	Mars Incorporated
	University of Florida
	United States Department of Agriculture (USDA)
France	Centre for International Cooperation in Agricultural Research for Development (CIRAD)
Haiti	Agronomes & Vétérinaires Sans Frontières (AVSF)
	OXFAM Canada
	Nouvelle Grand'Anse Foundation (FNGA)
	REBO coffee
Holland	Institute for Water Education (IHE DELFT)
Honduras	Honduran Association of Milk Processors (APROLECHE)
	Central American Bank for Economic Integration (CABEI)
	Honduran Chamber of Milk (CAHLE)
	National Federation of Farmers and Ranchers of Honduras (FENAGH)
	Federation of Cattlemen of the South (FEGASUR)
	Chamber of Livestock Development of Honduras (CAFOGAH)
	Agroindustrias Del Corral, Leche y Productos Derivados S.A. (LEYDE)
	Lácteos de Honduras S.A. (LACTHOSA)
	Honduran Bank for Production and Housing (BANHPROVI)
	Ministry of Agriculture and Livestock (SAG)
	Secretariat of Natural Resources and Environment (MiAmbiente)
	Directorate of Agricultural Science and Technology (DICTA)
	National Institute of Conservation and Forest Development Protected Areas and Wild-life (ICF)
	Regional University Center of the Atlantic Coast (UNAH)
	National University of Agriculture
	Directorate of Agricultural Science and Technology (DICTA)
	Heifer International
	Program for Inclusive Territorial Economic Development (DEIT) South
	Directorate-General for Biodiversity (DIBio)
	Secretariat of Natural Resources and Environment (SERNA)
	National Platform for Sustainable Livestock (PNGS)
	National University of Agriculture (UNAG)
	Zamorano University
	Association of Producers of Agroforestry Systems with Organic Cocoa-Olancho (APRO-SACAO)
	Honduran Coffee Institute (IHCAFE)
	National Institute of Vocational Training (INFOP)
Indonesia	Center for International Forestry Research (CIFOR)

Country	Project or institution
Kenya	World Agroforestry Centre (ICRAF)
Nicaragua	Directorate of Agricultural Science and Technology (DICTA)
	Nicaraguan Institute of Agricultural Technology (INTA)
Mexico	National Institute of Forestry, Agricultural and Livestock Research (INIFAP)
	Ministry of Rural Development (SDR), Campeche
	Secretariat of Environment, Biodiversity and Climate Change (SEMABICE), Campeche
	Secretariat of Social and Human Development (SEDESYH), Campeche
	Ministry of Environment and Territorial Development (SEMADET), Jalisco
	Ministry of Agriculture and Rural Development (SADER), Jalisco
	Junta Intermunicipal de Medio Ambiente de la Costa Sur (JICOSUR), Jalisco
	Intermunicipal Board of Environment for the Integral Management of the Lower Basin of the Ayuquila River (JIRA), Jalisco
	Secretariat of Agriculture, Livestock and Fisheries (SAGyP), Chiapas
	Secretariat of Environment and Natural History (SEMAHN), Chiapas
	Secretariat for Gender Equality (SEIGEN), Chiapas
	National Forestry Commission (CONAFOR)
	National Commission of Natural Protected Areas (CONANP)
	La Sepultura Biosphere Reserve (REBISE)
	Ecology, Innovation and Sustainability (ESI, A.C.)
	Technological Institute of Chiná (ITA)
	University of Guadalajara
	University Center of the South Coast (CUCSUR), Jalisco
	Autonomous University of Chiapas (UNACH), Faculty of Agronomic Sciences and Faculty of Veterinary Medicine and Zootechnics
	University of Sciences and Arts of Chiapas (UNICACH)
	Institute of Biological Sciences
	Instituto Tecnológico Superior de Cintalapa (ITSC)
	Intercultural University of Chiapas (UNICH)
	Juarez Autonomous University of Tabasco (UJAT)
	College of the Southern Border (ECOSUR)
	ProNatura of Mexico
	State Council for Scientific Research and Technological Development of Campeche (COESICYDET)
	Produce Foundation
	The Nature Conservancy (TNC)
	El Triunfo Conservation Fund (FONCET)
	Calakmul Biosphere Reserve
	Sierra de Manantlán Biosphere Reserve
	SVX Mexico
	GRADE
Italy	Food and Agriculture Organization of the United Nations (FAO)
Finland	Finnish Forestry Association

Country	Project or institution
Panama	Institute of Agricultural Innovation of Panama (IDIAP)
	Nestlé
	Ministry of Agricultural Development (MIDA)
	Faculty of Agricultural Sciences, University of Panama
Peru	National Institute of Agricultural Innovation (INIA)
	Ministry of Agrarian Development and Irrigation (MIDAGRI)
	Technical Table of livestock of Ucayali
	National Agrarian Health Service of Peru (SENASA)
Peru, Ecuador, and Guatemala	United Nations Development Programme (UNDP)
Puerto Rico	University of Mayagüez
Dominican Republic	Ministry of Environment and Natural Resources (MIMARENA)
	Ministry of Agriculture
	AgroFrontera
	Dominican Institute of Agricultural and Forestry Research (IDIAF)
	National Council for the Regulation and Promotion of the Dairy Industry (CO-NALECHE)
	General Directorate of Livestock (DIGEGA)
	MEGAMILK
	Agricultural Bank
	Federation of Cattlemen of Central and Northeast Cibao (FEGACIBAO)
	International Trade Centre (ITC)
Sweden	Environment for Development (EfD)
	Swedish International Development Cooperation Agency (SIDA)
Switzerland	Lindt & Sprüngli
Latin America	Economic Commission for Latin America and the Caribbean (ECLAC)
Global	Bioversity & CIAT Alliance
	Nordic Climate Facility (NCF)
	Green Climate Fund (GCF)
	Global Environment Facility (GEF)
	Tropical Agriculture Platform (FAO-TAP)
	Rainforest Alliance
	World Coffee Research (WCR)
	INCOCOA GROUPS
	World Bank
	Intergovernmental Hydrological Programme (IHP)

Section 5.

IICA-CATIE cooperation

In 2022, the Inter-American Institute for Cooperation on Agriculture (IICA) and CATIE signed an agreement with which they seek to strengthen and amplify the support they provide to their member states on issues of sustainable development in the agricultural, livestock and forestry sectors.



Initially, joint efforts focus on actions to strengthen productive innovation processes, sustainable agribusiness, research and technology transfer in tropical agriculture, and sustainable agri-food systems. In addition, it includes work in biodiversity conservation, watershed management, water resources and soil integral management, as well as synergies between the adaptation and mitigation of agriculture to climate change and in areas such as coffee, cocoa, other tropical crops, sustainable livestock and agroforestry, and silvopastoral systems.

Another focus of cooperation is associated with strengthening the capacities of the public sector, agricultural producers and their families, and private sector organizations that contribute to strengthening agriculture competitiveness and sustainability, adaptation to climate change and, food and nutrition security. The agreement also establishes actions to contribute to the development of sectoral policies, public-private institutional frameworks, projects, and activities for the sustainable management of rural territories.

These are the main actions carried out within the framework of this institutional cooperation.

Project Adapted Agroforestry Systems for the Central American Dry Corridor (AGROINNOVA)

This project, implemented jointly by IICA, CATIE (from UASA) and 20 other partner institutions, aims to improve the climate resilience and food security of at least 3,000 smallholder producers of basic grains in the six countries that make up the Central American Dry Corridor (Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama).

To achieve its objective, the implementation of adapted Multilayer Agroforestry Systems (SAFM) models has been encouraged, which promote innovations to increase yields, protect water sources, improve soil, promote biodiversity and generate additional income. In 2022, the establishment of 93 demonstration agroforestry plots was completed to strengthen public-private capacities for agricultural research, transfer, and extension on SAFM.

The design and management of these plots incorporates agricultural and silvopastoral technological innovations adapted to each area, and include agroecological technologies for the management of soil, water, nutrients, agricultural and forestry crops, under an integrated model that combines sustainable production with greater resilience to climate change and the generation of environmental benefits.

It should be noted that AGROINNOVA incorporates the gender perspective, through the goat ECA for women of the Costa Rican Pacific, where 25 women were trained to become knowledge multipliers on issues related to the management and innovation of goat production, agrosilvopastoral systems, strategies for sustainable intensification and added value. Likewise, the rural youth strategy for agriculture has been promoted through the training of young people from agricultural technical colleges, where goat agrosilvopastoral ECAs were also developed with eight technicians from

the Ministry of Agriculture and Livestock (MAG) of Costa Rica, and 26 young people from the 27 de Abril Professional Technical College. In these ECAs, seven theoretical-practical training modules were given, and a goat module was built and enabled as a demonstrative showcase for the Guanacaste area.

The ECA was developed with several approaches, including education with a gender focus, providing equal opportunities to women and men of all ages, from different parts of the Costa Rican Pacific.



Feasibility study for the dairy sector in Guyana

The IICA Office in Guyana invited CATIE as a partner in the preparation of a report on the Evaluation of the Milk Value Chain, from production to consumption, centralized in regions 2, 3, 4, 5, 6 and 10, to support the Ministry of Agriculture of Guyana in planning the development of the dairy sector. The study covered primary and secondary activities in the dairy value chain, and described the marketing of imported milk and dairy, and identified countries of origin and import trends over the years. The study also tracked local production of raw milk and some value addition by producing paneer and fresh cheese. The data analyzed showed that the consumption of milk and dairy products has been increasing, so investment in the local dairy industry would be a profitable venture.

Likewise, the study revealed that the sector is dominated by men and the population of dairy farmers tends to be older people. One of the key factors for the development of the value chain is the availability of land for pasture, as there are conflicts for its use in rice production and urbanization.

As part of the study, a SWOT analysis of the processing plants was included and the characteristics of primary production, related to feed and genetics, milk handling, hygiene and waste management were defined. In terms of marketing, negotiations between actors and price variations between regions were identified, and that most producers prefer retail sales. As expected, price was a key element for the producer and in all regions the most frequent price of raw milk was G\$100 (USD \$0.45).

The study recommended various actions to improve the milk value chain, including policy actions, legal strategies aimed at private and public sector participants, strengthening the capacities of the different actors in the chain, improving communications between them and supporting activities with a strong emphasis on organizational structure, as well as the role and responsibilities of each actor. Finally, the study incorporated recommendations for priority actions to improve dairy value chain models.

Technical evaluation of coffee and cocoa in Guyana

IICA and CATIE worked together to develop a rapid assessment of coffee and cocoa cultivation in Guyana to formulate recommendations and present to the Guyanese Ministry of Agriculture possible approaches to revitalize both crops, considered priority products for the country.

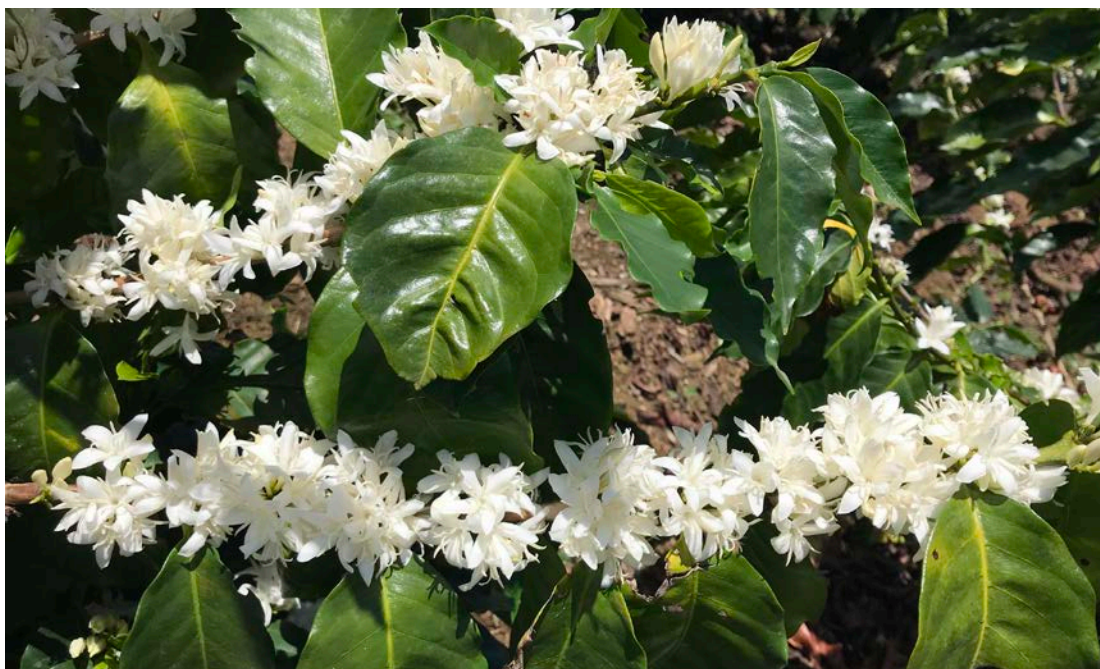
Within the framework of this cooperation, it was agreed that IICA and CATIE will support Guyana with the introduction of proven genetics, the necessary infrastructure to realize the benefits of improved techniques, the development of capacities of technicians and farmers through various agroforestry models, transfer of laboratory and propagation techniques, and conservation and management of germplasm.

After the evaluation, it was found that the regions visited demonstrated important efforts and initiatives that are being carried out by producing families to improve their production systems. It is highly necessary to design, consolidate and implement an initiative aimed at strengthening the agri-food systems of these regions, mainly aimed at crops such as cocoa and coffee, which have important opportunities to generate income for families.

The IICA and CATIE team recommended to the Ministry of Agriculture the introduction of new varieties of coffee, as well as other varieties of Liberian coffee in regions 1, 2 and 10, based on the environmental conditions of those areas. The establishment of Arabica varieties was recommended mainly for evaluation purposes, since in the regions mentioned the general altitude and soil conditions for a good agronomic response of this coffee species are not met.

In addition, new high-yielding cocoa varieties were recommended for genetic diversity and increased production. Identification of existing cocoa plants through molecular marker testing is imperative to determine what is currently available locally and what is being propagated and distributed to farmers.

Finally, genetic diversity, the cultivation of different species for specialized markets, the reduction of diseases and pest pressures, the possibilities of intercropping with other high-value crops and the use of the country's numerous microclimates were identified as factors supporting investment in the coffee and cocoa industries in Guyana.



Diagnosis of the tissue culture laboratory of the Salvadoran Coffee Institute

Jointly, IICA and CATIE carried out a technical cooperation mission requested by the Salvadoran Coffee Institute (ISC, for its acronym in Spanish), with the objective of making a diagnosis of the current capacities and existing needs for the reactivation of operations and services of the ISC's tissue culture laboratory, as well as a proposal for the implementation of new areas of interest to the institution.

In the past this laboratory provided vegetative reproduction services for coffee plants. It had specific projects: a) in vitro reproduction of the parents of the Nemaya variety (*Coffea canephora*) and b) in vitro reproduction of hybrid varieties F1 (*Coffea arabica*).

With the diagnosis it was found that there are laminar flow chambers, scales, autoclaves, magnetic stirrers, growth rooms and sufficient glassware in general. With the exception of autoclaves, which must be checked for operation, most of the equipment has already completed its useful life, so it was suggested to acquire new equipment. Spaces should be redesigned to offer greater staff safety and efficient workflow between laboratory areas. There is a greenhouse that can be used for the acclimatization of plants produced in the laboratory, which must be remodeled.

Finally, the diagnosis advised that the in vitro culture laboratory be only for research because the physical area of the ISC would not allow future expansions to increase its capacity. Agreements would have to be established with other institutions, such as the National Center for Agricultural and Forestry Technology (CENTA, for its acronym in Spanish) and / or the National School of Agriculture (ENA, for its acronym in Spanish) that do have enough space to establish new areas, both for laboratories and greenhouses for commercial production of coffee plants.

Sustainable Agrosilvopastoral Livestock and Biodiversity and Landscapes Project, known as BioPaSOS

After four years of implementation, the BioPaSOS project laid the foundations for the Mexican states of Chiapas, Jalisco, and Campeche to continue promoting sustainable livestock. This project, which ended in December 2022 and was financed by IKI, was implemented by CATIE with the support of IICA, in coordination with CONABIO and AGRICULTURA, together with multiple local partners in their territories of intervention.

The project promoted climate-smart and biodiversity-friendly agrosilvopastoral approaches and sought sustainable management and long-term conservation of biodiversity through the promotion of agrosilvopastoral technologies and other livestock practices.

Among its main results is the implementation of an intervention model with participatory methodologies, such as ECA, which takes into account the analysis of local problems and the construction of participatory solutions for the promotion of silvopastoral systems and good livestock practices, in order to reduce GHG emissions, impact on biodiversity, climate change impacts and support informed and timely decision-making, as well as building alliances with actors from the public, private sector, academia, and other partners.

Other important results are:

- Through 68 ECAs, in the three states, the capacities of 1232 livestock producers were strengthened (78% and 22%, respectively), which impacted 20 municipalities.
- 35 000 hectares of the three pilot areas were transformed.
- More than 140 demonstration plots and more than 80 cattle ranches, where the carbon footprint was monitored, which was possible to reduce with sustainable practices, such as agrosilvopastoral systems.
- Scientific technical information for knowledge management was successfully generated, more than 10,000 people, distributed in 63 countries, participated in the regional knowledge platform.
- It generated evidence for the adjustment of the institutional and political framework for the states of Chiapas and Campeche.
- In Chiapas and Campeche, guidelines for the development of sustainable livestock at the state level were drafted.
- In Chiapas, a proposal was made for the inclusion of the sustainable livestock approach and the promotion of agrosilvopastoral systems in 2022, in collaboration with the Livestock Development Table of the Honorable Congress of the State of Chiapas.
- The joint declaration was signed by the Secretariats of Agriculture for the promotion of sustainable livestock between the states of Chiapas, Jalisco, and Campeche.

Public-private partnerships were another pillar. For example, in Campeche, the creation of the Working Group Sustainable Livestock Agroecosystems of the State of Campeche (AGS-CAM, for its acronym in Spanish) and a Network of Youth and Women Monitors of Biodiversity in Agricultural Landscapes of the State of Campeche (Bio-Cam) were promoted, in conjunction with the iNaturalist platform.

As part of the outstanding work of CATIE and IICA in the BioPaSOS project, the knowledge management component achieved encouraging results, including:

- 10,248 people, from 63 countries, trained through a virtual course on agrosilvopastoral systems.
- Development of 13 virtual forums in which 1560 people, from 23 countries, were trained on issues of sustainable livestock and biodiversity conservation.
- Development of tools such as the virtual app BioPaSOS, the geographic information viewer GeoWeb BioPaSOS, the publication Toolbox to Promote the Development of Sustainable Livestock and the Regional Platform for Sustainable Livestock, all available on the www.biopasos.com website.
- Repository of information on relevant livestock issues in the region.

Proposal for the Landscape of the Condor Kutuku Corridor of the Amazon of Peru and Ecuador

This proposal was made in response to a call from the Biodiverse Landscapes Fund (BLF) Programme of the Department for Environment, Food & Rural Affairs (DEFRA) of the British government, with the participation of IICA as leader of the proposal and CATIE, Disclosure Insight Action (CDP, for its acronym in Spanish), the Peruvian Association for Nature Conservation and the National Cooperative Business Association Clusa Internacional (NCBA CLUSA) as partners.

The project aims to reduce poverty and create economically sustainable opportunities in the communities living in the landscape of the Kutuku Condor Corridor, through the protection, sustainable management and restoration of the landscape, which will safeguard biodiversity and maintain and manage the quality of ecosystems. It will work with women and marginalized groups, which do not have equal recognition in agricultural management, use and production. In addition, the lack of value towards the natural capital of local communities by the market has limited their development. The challenge is to overcome these limitations through the development of profitable production models that can be scalable and also friendly to the environment.

IICA-CATIE Investment Fund

To strengthen CATIE's finances, the Directors General of both institutions agreed to create an investment fund to promote innovations in green businesses that are aligned with the mission of IICA and CATIE.

Hybrid propagation module and improved coffee varieties

In accordance with the investment proposals submitted to expand the propagation capacities of hybrids and improved coffee varieties. It details the progress of the execution of these investments and the recovery as of December 31, 2022; it also includes a projection of the projected sales to date for 2023.

The coffee plant propagation module was inaugurated by the Directors General of IICA and CATIE in October 2022, projecting the production of 1,000,000 plants when it reaches its maximum production level in May 2024.



State. The scaling up project for the coffee nursery and the clonal garden is in the operational phase and in the recovery of the investment capital of the IICA-CATIE Fund and some additional investments with resources from CATIE.

Currently, a marketing plan is being managed with the Communication and Marketing Office aimed at potentiating the demand for coffee plants in new market niches. In addition, the growth in the installed capacity for the production of plants has also considered the strengthening of seed sources (Breeding factory), where CATIE can already offer seeds and plants of 10 varieties of coffee considered of high cup quality, as well as offer the possibility of production of coffee plants grafted on Nemaya, thus a seedbed lot of this material has been established that is required by producers with special soil conditions.



Formalized sales. In the 2021-2022 period, the sale of 111,300 plants was formalized with an income of USD \$89,040. The sales registered for 2023 to date (April) represent an income of USD \$81,295, by the end of 2023 an additional income of USD \$95,000 is prospected, which represents a production of 220,000 plants, which would be recovering the investment corresponding to the main sources of the IICA-CATIE Investment Fund and CATIE resources.

Energy efficiency investment project

The energy efficiency investment project was designed with the aim of generating a rationale on investment in saving electricity consumption costs, and not necessarily in generating profits. For this, EcoSolutions was hired to design the preliminary project and its implementation.

The project has three stages:

- **Lower CATIE's electricity bill through the efficiency of electricity consumption.** This will be achieved with the change of A/C equipment, using state-of-the-art technology, improving, and monitoring consumption to improve its efficiency.
- **Design and implementation of a photovoltaic self-consumption system.** This generation will be delivered to the Costa Rican Electricity Institute (ICE, for its acronym in Spanish) for its respective debit to the total CATIE bill. Migration of luminaires to LED technology.
- **Design of a photovoltaic system for cogeneration with ICE.** This stage will serve to generate profits with the sale of the generated to third parties.

In turn, the first stage has been subdivided into stages, concentrating first on the Henry A. Wallace Building and the Gilberto Pérez Building.

To date, the investment is USD \$95,370.00, projecting an annual saving of USD \$18,088 and reaching the recovery of the investment in 6.2 years.

The implementation of the remaining investments of the first and consequent cover will depend on the income of resources to the IICA-CATIE Investment Fund.

Productive improvement of the milk and meat herd

The investments were directed to the effective development of dairy and fattening cattle, which allows CATIE to improve the livestock production system that is carried out in the Commercial Farm, focused mainly on improving infrastructure, pasture renewal, security and livestock purchase.

With the investments made, the breeding capacity has been increased with greater animal welfare, the pens are improved for ease of operations, and a sidewalk has been built to reduce the frequency of injuries in animals and the biodigester has been reactivated. Also, 15 ha of pastures were renovated that add to the possibilities of increasing the productivity of the commercial dairy and fattening cattle project.

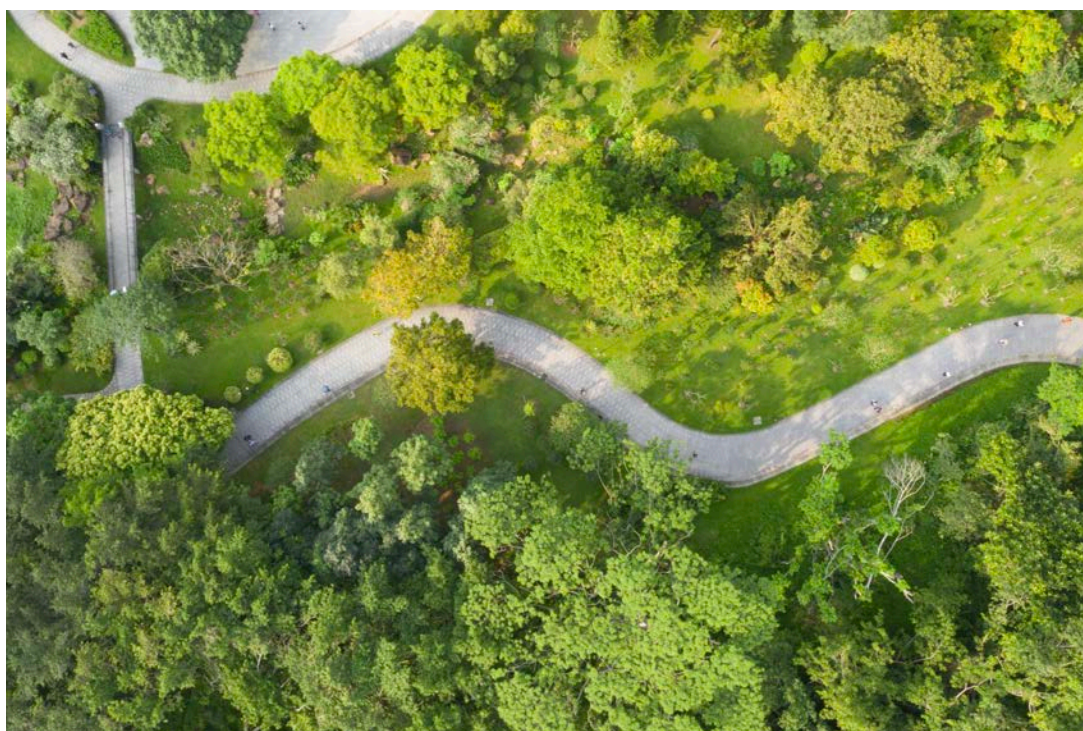
As of December 31, 2022, USD \$118,994 was executed against the approved investment plan; In addition, USD \$22,778 were invested, which are not reflected in the following budget, because it corresponds to the investment in two cowboy houses and a monitoring system with surveillance cameras.

Regarding the return on investment, in the case of the production of milk obtained from the animals purchased, the economy in the use of fertilizers and electricity is quantified in Table 2. It's more complete to show the result of other investments such as the renewal of pastures and infrastructure. In addition to this, the project as such requires other complementary investments.

Also, it should be noted that the use of the material produced in the dairy farm for the cultivation of sugarcane as fertilizer is not contemplated.

Forest of the Americas IICA-CATIE

During 2022, IICA and CATIE advanced in the technical and landscape implementation of the IICA-CATIE Forest of the Americas. This forest is an initiative that contributes to preserving biodiversity by restoring ecosystems and the natural habitat of the area, allows access to biodiverse tree spaces and generates greater awareness about the importance of trees and ecosystem services for sustainability and the fight against climate change. The Forest of the Americas is located in Vásquez de Coronado and Turrialba, Costa Rica, and has four components: arborization of space, a level of agrobiodiversity, pollinator gardens, environmental education and community projection.



Section 6.

CATIE in the region

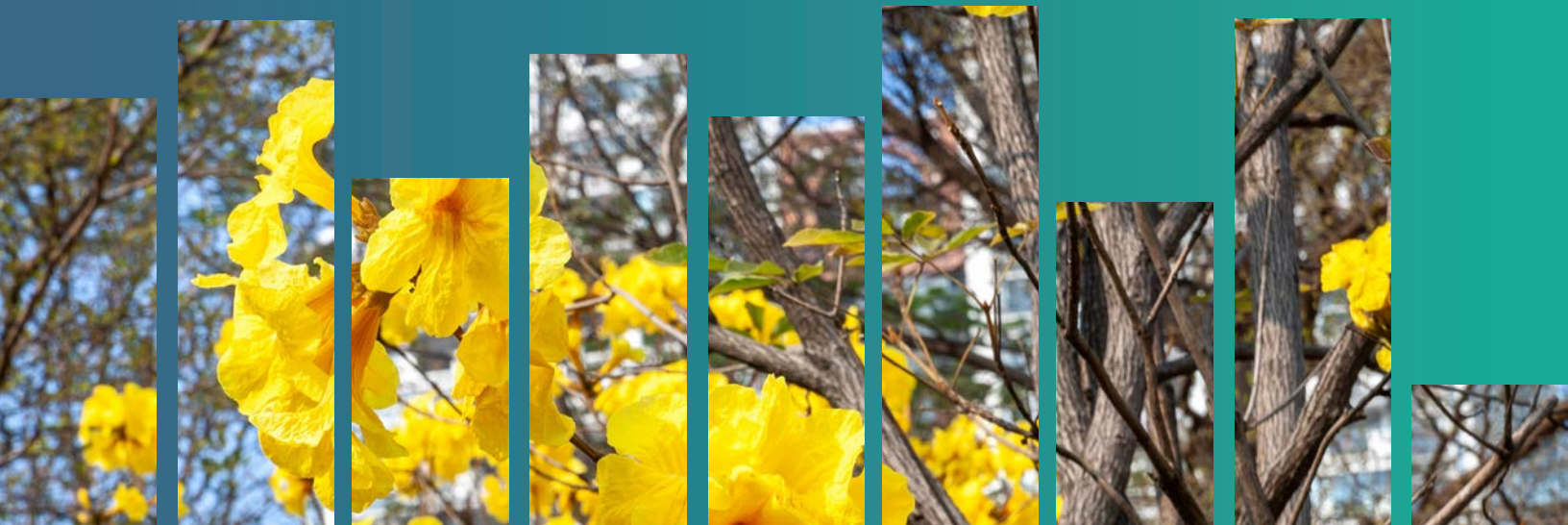
CATIE supports the countries of the region to achieve sustainable and inclusive management of agriculture and natural resources. In 2022, the institution worked, with the support of partners and donors, through research and development projects and capacity building on key issues to respond to the demands of the area.

In Central America, CATIE represents a strategic ally of great value for the government of the United States of America and the Alliance for Central America program. In this sense, during 2022 alliances were strengthened with the United States Agency for International Development (USAID) and USDA, as well as with several North American companies and organizations to identify and implement concrete actions that promote economic prosperity in the region, especially in the Northern Triangle, in the fields of sustainable agriculture and livestock and the implementation of nature-based solutions, the restoration of degraded landscapes and the strengthening of local capacities, with emphasis on youth, women and indigenous populations.

CATIE also promoted and reactivated the strategic interest of the Swedish state through SIDA to implement development projects in Central America. In addition, the Center seeks to reactivate the international cooperation of the Scandinavian countries in Central America.

Finally, CATIE has worked to strengthen its impact and management in the region of the islands and countries of the Caribbean, for which it has strengthened alliances with CARICOM, which allow channeling the necessary financial resources for its islands and countries to implement development and adaptation and mitigation projects to climate change.

A summary of the actions by country is shown here.





MEXICO

CATIE's actions in Mexico during 2022 include activities related to project implementation, training, research, public policy management and alliances between partners in the country. In this sense, the actions of the project Strengthening the Methodology on the Use of a Local Emission Factor for Enteric Fermentation and Manure Management in Bovine Livestock in Mexico were initiated, with funding from USDA. The project seeks to identify and strengthen Mexico's experiences in methodologies and tools on GHG emission factors to promote the low-emission livestock sector in the Mexican states of Nuevo León, Coahuila, Chihuahua, and Durango.

On the other hand, in response to invitations from the Secretariat of the Countryside, Protector of Forests of the State of Mexico, the UAC of CATIE participated in two webinars in which it presented about the restoration of forest landscapes in Latin America and forest management as a development and conservation strategy in Guatemala and Costa Rica.

In 2022, within the framework of the BioPaSOS project, a workshop was held to generate links and synergies with representatives of private sector organizations and developing initiatives with an interest in promoting sustainable livestock and that can use, adopt and / or adapt the various products, strategies and lessons learned from BioPaSOS.

In the state of Campeche, BioPaSOS organized the Agricultural Green Credit Fair with the participation of six financial institutions, which was attended by more than 200 people; of these, 35% were women, from more than 30 communities. In Chiapas, the technical team of BioPaSOS participated in the Livestock Development table of the Honorable State Congress, which allowed to review the «Law of Promotion and Livestock Health for the State of Chiapas», for which a document with recommendations for this law was delivered in December 2022 before the deputies and deputies members of the Livestock Development Table of the congress.



GUATEMALA

CATIE's initiatives in Guatemala promote integration with units, programs, institutional projects and, at the same time, seek strategic alignment with policies and instances of the public sector and international cooperation. In the case of integration and alignment with public instruments, initiatives directly related to at least 10 national policies and six international agreements have been developed. Similarly, integration and alignment with public bodies and their actions has been promoted, so that the contribution in the different areas of action is direct and allows better interaction and feedback in both directions.

During 2022, CATIE has actively participated in efforts to contribute to the implementation of public policies and their instruments related to integral rural development, family farming, peasant economy, agroecology, food and nutrition security, biodiversity conservation and sustainable management of natural resources. From this account, the main achievements are the cooperation with public sector bodies, such as the National Institute of Forests (INAB, for its acronym in Spanish), the National Council of Protected Areas (CONAP, for its acronym in Spanish), the Secretariat of Food and Nutritional Security (SESAN, for its acronym in Spanish), the Ministry of Agriculture, Livestock and Food (MAGA, for its acronym in Spanish), the Ministry of Environment and Natural Resources (MARN, for its acronym in Spanish), the Ministry of Public Health and Social Assistance (MSPAS, for its acronym in Spanish), the Ministry of Development (MIDES, for its acronym in Spanish) and the Ministry of Education (MINEDUC, for its acronym in Spanish).

As for local authorities, we worked with more than 15 municipalities and one commonwealth. In addition, it coordinated with cooperators such as the European Union, SIDA, the United Nations Environment Programme (UNEP), UNDP, the Food and Agriculture Organization of the United Nations (FAO), the United Nations Children's Fund (UNICEF), Capacity for Nutrition (C4N), CIRAD, IUCN, GIZ, KfW Bank, the Credit Institute for Reconstruction or the Credit Bank for Reconstruction and the Trifinio Plan Commission.

In 2022, CATIE implemented and collaborated in eight projects and initiatives, both at the national level and in specific geographical areas, which represent eight departments, in coordination with government authorities and local authorities and actors, as well as communities and producer organizations.

Through knowledge management processes, the capacities of 2820 people were strengthened, through the ECA methodology and courses on topics such as agroforestry and silvopastoral systems, business strengthening, statistics, use and interpretation of data, analysis of data on nutrition, analysis of anthropometric data, use of water and sanitation data, malnutrition and food security, ecosystem-based adaptation, risk management, ECA methodology, farm planning, soil diagnostics, soil and water conservation and agroecological production.

In addition, in Guatemala, CATIE led or participated in communities of practice that address key issues for the country, such as the Working Group on Sustainable Bovine Livestock, the Alliance for Soil Conservation, the Table of Adaptation and Vulnerability to Climate Change of the Guatemalan System of Climate Change Sciences (SGCCC, for its acronym in Spanish), and the National Board of Forest Landscape Restoration.

The main initiatives executed by CATIE in Guatemalan territory during 2022 were:

National Nutrition Information Platform (PiNN) Project - Phase II

- 584 people (285 women and 299 men) trained in topics related to data management and information on food and nutrition security.
- 9 Departmental Food and Nutrition Security Commissions have endorsed the implementation of the Departmental Food and Nutrition Security Information System (SIDESAN, for its acronym in Spanish) in their department, with the commitment to manage and analyze data that contribute to improving decision-making on food and nutrition security.
- Web and mobile applications were developed for SESAN for the capture and processing of institutional information.
- The use of information by the Directorate of the Health Area of Totonicapán through the automation and analysis of data from programs of the public health network was improved.

Landscape Connectivity and Livelihoods Project in Four Municipalities of Region 3

- Presentation and validation of the project in 15 communities of the territory.
- Formation and participation of 10 ECA groups in seven communities.
- Generation of farm plans to guide the technical assistance of the project and the empowerment of 135 families.
- Direct dialogue with municipal authorities in San Pedro Yepocapa, Chimaltenango, for field evaluations and cost-benefit analysis of the financial sustainability of the Joya Grande Municipal Regional Park.
- Through training processes, knowledge has been shared and capacities of 31 people (20 women and 11 men) have been strengthened in the methodology of ECA and farm plans.

Project Economic Development and Sustainable Territorial Governance in the Adjacency Zone of the Sarstún River in Guatemala

- A total of 11 ECAs (73 workshops on eight different topics) were formed, which were integrated by a total of 255 families from eight communities.
- With the 195 families of 10 agricultural ECAs, 199 hectares of agroforestry systems were established with timber species, service species, musaceae and agricultural cultivation.

- A total of 18,780 service plants, 37 965 timber plants, 4000 musaceae (Curare banana corms) and 10,350 agricultural crop plants (cardamom and black pepper) were provided in agricultural ECAs.
- 12 bags of 20 kg each of ICTA B7 seed were provided for the establishment of experimental plots to improve distancing and obtain better productive yields of maize.
- A total of 89 farm plans were generated. This information was recorded in a database to carry out different analyses and, primarily, to identify the main productive constraints that must be addressed.
- A toolkit was delivered to 95 families (a hoe, a pickax and a machete), with the aim that families learn and implement soil conservation works on their farms and incorporate organic matter through agroforestry systems and organic fertilizers.
- A livestock ECA was implemented, made up of 60 producing families.
- Through a Territorial Business Training School (EFET) and business technical assistance, the business and organizational capacities of 40 members of the Boards of Directors of four local organizations were strengthened.

Consulting Services for the Development of an Irrigation Promotion Policy 2023-2032

- Guatemala's irrigation potential was updated and analyzed, and an investment plan (2022-2032) was developed.

Technical Assistance to the Project Adaptation to Climate Change in the Dry Corridor of Guatemala

- Climate change adaptation measures were strengthened among extension workers and beneficiaries, and support was provided to MAGA to improve post-intervention operations.





BELIZE

CATIE has given fundamental support in different areas of work to Belize and in the last year efforts have been made in knowledge management, human resources training, rural development, extension, family farming, agroecology, cocoa and coffee agroforestry systems, sustainable intensification of livestock production, forest management, adaptation, and mitigation to climate change. Water balance and security and information platforms for holistic territorial analysis, among others.

Since April 2022, under the project called Improving Productivity and Climate Resilience in Belize, CATIE and IICA joined the Belize Livestock Producers Association (BLPA) to prepare a proposal, which was presented to the Inter-American Development Bank (IDB), aimed at promoting climate-smart technologies to reduce the vulnerability of the livestock sector to climate change and contribute to reducing GHG emissions in Belize. CATIE was responsible for providing technical support to promote the adoption of climate-resilient practices, aimed at increasing livestock production with excellent results.

For example, this project established model farms with silvopastoral interventions to scale up improved technologies and trained 25 technicians and 65 producers. In addition, 10 silvopastoral innovations were tested in at least one of the 10 model farms identified by BLPA in three districts. At the same time, there was a methodology for the Participatory Design of Climate-Smart Livestock Production Systems based on the reference information of the farms.

To continue the performance of the project, a report was prepared on lessons learned from best practices to increase resilience in livestock farms in Belize and, finally, a report was generated on potential opportunities for climate-smart livestock intensification through public-private cooperation in Belize.

Another program implemented from August 2021 to April 2022 was the so-called Training of Trainers, Training in Climate Smart Agriculture. This program aimed to strengthen the capacities of staff from the Ministry of Agriculture, Food Security and Enterprise (MoAFSE), the Belize Rural Resilient Program (RRB), as well as climate-smart agriculture extension officers and technical staff.

They were trained to use the ECA methodology for farming families to transfer the knowledge gained from the training to medium and small producers in the designated areas of Belize. In addition, the long-term goal is to increase the resilience of Belize's agricultural sector to the negative effects of climate change.

During this program, completed in 2022, 38 participants received training in climate-smart agriculture, ECA for producers, integrated soil and water management, optimization of vegetable production (crop management) and beekeeping.

CATIE also participated in the Value Chain and Market Assessment for a Resilient Rural Belize. In this area, through the RRB Program, with funds from the International Fund for Agricultural Development and the GCF, the Government of Belize aims to minimize the impact of climatic and financial phenomena on smallholder farmers, while supporting a sustainable market for their products.

Finally, together with entities such as WRI, CATIE will participate in the execution of the project called Use of Nature-based Solutions to Increase Resilience to Extreme Weather events in the Atlantic Region of Central America. This regional project, which focuses on Disaster Risk Reduction and Early Warning Systems, will be implemented in Belize, as well as Honduras and Guatemala. The Adaptation Fund approved an amount of USD \$13,248,121, where CATIE will support the general coordinator of all project activities and provide technical advice and guidance to the management team.



DOMINICAN REPUBLIC



CATIE has developed actions and initiatives in the Dominican Republic to provide a timely, coherent, and innovative response to the demands and needs of the country at different levels of the agricultural and environmental sector.

- With the Directorate of Climate Change of the Ministry of the Environment, biomass and carbon dioxide have been measured in non-forest plantations, in which areas of coffee, cocoa, pastures and coconut groves were incorporated.
- For the Ministry of Agriculture, the in vitro production system of seedlings of different crops has been improved through the strengthening of the capacities of the In Vitro Seedling Propagation Laboratory (BioVega).
- In coordination with INDOCAFE, training was provided in the design and agroforestry management of coffee plantations to increase yields and ecosystem services.
- Linked to the actions to reduce emissions in the Dominican Republic, in coordination with the Directorate of Climate Change of the Ministry of the Environment, the use and adoption of Geographic Information Systems for the monitoring of agroforestry systems and their contribution to the reduction of GHG emissions has been promoted.
- With the Dominican Institute of Agricultural and Forestry Research (IDIAF, for its acronym in Spanish), eight cocoa clones developed at the Experimental Cocoa Farm in Mata Larga were incorporated into the International Cocoa Collection of CATIE, in Costa Rica, to evaluate their behavior. This was carried out under an agreement with the National Cocoa Commission of the Dominican Republic.
- Using the ECA approach, a capacity building program for coffee and cocoa management is implemented in three pilot sites, in conjunction with INDOCAFE, the Department of Cocoa and the National Cocoa Commission of the Dominican Republic.

- In coordination with the Vice Ministry of Coastal and Marine Affairs, plus two private sector partners, it works with mangroves to strengthen livelihoods and climate resilience in the province of Monte Cristi. This initiative is known as the Mangroves for Development (MPD, for its acronym in Spanish) project.

On the other hand, during 2022 CATIE was involved in management and negotiation processes for new projects in the Dominican Republic. These include the project Integration of Climate-Compatible Livestock in National Commitments of Central America and the Caribbean, known as INTEGRA, the NAMA Facility project, concept notes for the reordering of the Higuamo River basin and the management of the binational basin of the Pedernales River, a study to know the socioeconomic impact of a potential entry of cocoa moniliasis (*Moniliophthora roreri*) to the Dominican Republic and a proposal to strengthen the extension programme of the National Council for the Regulation and Promotion of the Dairy Industry (CONALECHE, for its acronym in Spanish).

CATIE's actions in the Dominican Republic are enhanced thanks to coordinated work with strategic partners from the public, academic, private, and international cooperation sectors. In the last three years, 15 agreements have been signed with partner institutions.

Aiming at the formation of human capital in the country, CATIE gave two trainings in 2022, a forest restoration course to 15 technicians from the Ministry of the Environment, as well as a sustainable livestock workshop for extensionists from the General Directorate of Livestock and the FAO Ghana-Climate project.

Finally, at the level of technical assistance, he highlighted the support provided to the Livestock Extension Service of the Dominican Republic, within the framework of the Gana-Clima project, to which CATIE livestock specialists carried out a SWOT analysis, which compiled key information that allowed the presentation of the first draft of the country's Strategic Livestock Extension Plan.





HONDURAS

An issue of great importance for CATIE in Honduras has been to support the transfer of methodologies applied to sustainable production systems that contribute to the NDCs, among which is contemplated the forest restoration of 1.3 million hectares of forest, reducing emissions from energy generation by 16% and reducing firewood consumption by 39%.

At the technical assistance level, through the DEIT SUR, Chocolate4All and Árboles en Finca projects, the institution managed to distribute cocoa trees, 13 species of timber trees and genetic material from grass adapted to the dry tropics.

As relevant milestones of CATIE in Honduras is the promotion of the modernization of the coffee subsector, which continues under processes of continuous improvement through the efforts that the Center makes to develop new varieties of coffee with a focus on adaptation to climate change and with the challenge of preserving the characteristics of quality of rate and acceptable levels of production.

In this regard, follow-up has been given to the work carried out by the Central American Program for the Integrated Management of Coffee Rust (PROCAGICA), which introduced two new varieties of coffee to strengthen the genetics of the crop to deal with new strains of rust that affected the plots of the producing families, because of climate change.

CATIE is committed to strengthening the coffee subsector due to its significant contribution of almost 30% to the national agricultural Gross Domestic Product (GDP) and 3% to the country's general GDP. In addition, being an agroforestry system, it is one of the most important to meet the goal of 1.3 million hectares, since this sector has a total of 250,000 hectares cultivated nationwide.

CATIE also supported the cocoa subsector. With the Chocolate4All project, a total of 1166 producers were served in the department of Olancho; of these, 30% are women and 40% are young people. A total of eight local organizations were beneficiaries of the project: two cocoa producers' associations, three rural savings banks and three cooperatives. One of them is the Association of Producers of Organic Cocoa Agroforestry Systems (APROSACAO).

In terms of sustainable livestock, through an inter-institutional agreement with the DEIT Sur program of the Swiss Agency for

Development and Cooperation (SDC), CATIE's intervention in the program was completed and the low-emission sustainable livestock component was implemented, within the framework of which two ECA were taught. Ten (10) demonstration plots were installed and the distribution of genetic material from pastures adapted to the climatic conditions of the Gulf of Fonseca will continue.

In addition, work was carried out directly with the 21 associations of the Federation of Cattlemen of the South (FEGASUR, for its acronym in Spanish), with which it was possible to introduce improved grass with adaptation to the conditions of high temperatures and drought in the area. Technical assistance was also provided in the design of the business model for dairy products. Especially, during the pandemic, short commercial chains were developed, for which it was considered how difficult mobilization was, which allowed opening 50 jobs for young people, who were responsible for distributing the product in their localities, in order to consolidate a portfolio of customers and supply them continuously.

On the other hand, the implementation of the Sustainable Farm model allowed the development of farm plans for some 450 livestock producers. This model incorporated the tree component on the farm, with timber and fruit trees, and thus give added value to family income and provide environmental stability in degraded micro-watersheds. It is worth mentioning that the producing families have positively received the management practices in which the burning of pastures is eliminated, as well as the use of solar energy to electrify pastures and the protection of micro-basins to improve water collection in the winter.

To complement the work done in sustainable livestock, CATIE also conducted a study of the business climate of the livestock chain, which will allow a better insertion into the market. Likewise, the first measurement of the carbon footprint in livestock production in the region was carried out, being one of the first studies in this subject, which will allow monitoring, registration and verification (MRV) of the impacts on livestock emissions, which is part of the country's commitment. The livestock chain can make a great contribution to the restored areas, since in the country there are 650 000 hectares dedicated to this item.

CATIE also promoted the formation of the Sustainable Livestock Platform, in which state institutions participate, such as the Ministry of Agriculture and Livestock (SAG, for its acronym in Spanish), the Ministry of Energy, Natural Resources, Environment and Mines (MiAmbiente, for its acronym in Spanish), the Forest Conservation Institute (ICF, for its acronym in Spanish), private companies and the National Federation of Farmers and Ranchers of Honduras (FENAGH, for its acronym in Spanish), among others.

In the research project Trees on Farm, in the department of Olancho, 25 producers were selected, with an average of 50 hectares each, which makes a total of 1250 hectares in which the planting of 22 000 trees was promoted. As part of this project, a field study was also carried out to know the baseline of the current state of the tree component in the area, with a taxonomic characterization of the species used and a platform was developed to detect tree cover in agricultural landscapes, especially living fences, for which satellite images and radar images were used. The tool used was installed in the Forest Monitoring System (SIGMOF, for its acronym in Spanish) of the ICF, which will be very useful in the implementation of the Livestock NAMA.

On the topic of watershed management and territorial planning, CATIE and INNOVATERRA formed a consortium for the preparation of the Municipal Land Use Plan (PMOT, for its acronym in Spanish) and the Urban Development Master Plan (PMDU, for its acronym in Spanish), with a focus on adaptation to climate change and comprehensive disaster risk management for the municipality of the central district of Honduras. This is a contribution to the centers with the largest population that require guidance for the proper use of land and thus reduce the risk and vulnerability to climate change of the population of the capital, which has 1.7 million inhabitants.

In this sense, three project proposals were presented that will be of great support to the populations of the cities of Siguatepeque and the capital city, Tegucigalpa. These proposals will be worked with the Directorate of Territorial Planning, which manages the priority basins of the capital. CATIE will provide technical support to improve the conditions of water production for the populations.





ECUADOR

In close coordination with MAATE and in conjunction with GIZ and IUCN, CATIE implemented the regional program Scaling Ecosystem-Based Adaptation Measures (EbA) in Rural Latin America. In Ecuador, the program contemplates two geographical areas, one focused on consolidating EbA measures in the parishes of Honorato Vásquez (Santa Ana) and Membrillal (Jipijapa), based on the experience of a previous EbA project (2016-2018, also financed by IKI-BMU) and two scaling in San Plácido and Chirijos (Portoviejo), Quiroga (Bolívar), the east of the Junín canton, Bachillero and Ángel Pedro Giler (Tosagua) and the west of Santa Rita (Chone).

In 2022, progress was made in strengthening the capacities of 274 multipliers in the province of Manabí, in which women represented 43% of the participants. The methodology applied in these events was competency-based learning and design thinking methodology, which took advantage of tools such as theoretical-practical presentations, group work, discussions, and conclusions in plenary, as well as reflections on experiences in the region.

Through the project Design and Implementation of a Training and Technical Assistance Program for Sustainable Livestock Production in the Provinces that Make Up the Special Territorial Amazonian Circumscription (CTEA), CATIE put into operation a methodology adapted from the Field Schools, with which it strengthened the capacities of 5100 producers in issues related to sustainable livestock, which included a delivery of non-monetary inputs.

This project is led by MAG, MAATE, UNDP and PROAmazonía. It incorporates actions that are in line with the REDD+ Action Plan, a public policy to mitigate climate change that promotes the transition from conventional production to sustainable and deforestation-free production systems, linked to the conservation of natural resources, improvement of livelihoods and generation of additional resources to family economies, through the conservation approach.

Another relevant action of CATIE in Ecuador, during 2022, was the development of blue carbon projects, mainly in the Gulf of Guayaquil, as well as the analysis of the institutional process of the National Forest Assessment of Ecuador, through which suggestions were presented for the establishment of the MAATE Forest Monitoring Unit.

In addition, technical assistance was provided in carbon measurements and monitoring in the Ecuadorian Amazon and an approach has been maintained with the universities of the Ecuadorian coast and Loja to carry out blue carbon actions. Technical assistance was also provided in the implementation of an agroforestry systems project, led by the INIAP in the Ecuadorian Amazon.

COLOMBIA

In 2022, CATIE collaborated with a wide variety of Colombian institutions and gave a timely, coherent, and innovative response to the demands and needs of the country at different levels and thematic areas. Some of the outstanding initiatives of the Center in Colombia were to evaluate the impact of silvopastoral systems on the adaptation and mitigation of climate change, as well as to propose guidelines for their replication in a large majority of the national territory.

Specialized technical advice was also provided in the formulation activities of the Action Plan for Climate Change, which will reflect the adaptation and mitigation strategies of the department of Huila, Regional Autonomous Corporation of Alto de Magdalena.

In addition to this, CATIE participated in the Sustainable Forest Management in the Andean Region and in the program Diets for the Implementation of the Participatory Territorial Management Internship Based on the Approaches of the New Territories of Peace.

At the regional project level, the following were affected:

- Improving cocoa production using improved germplasm and climate-smart agriculture practices (funded by KoLFACI).
- Potential impacts of climate change on forest ecosystems in Latin American mountain ranges and tools for management adaptation in Costa Rica, Colombia, Honduras, and Mexico (financed by IDB-ClimiForad).
- Initiative 20x20, a country-led effort to restore 20 million hectares of degraded lands in Latin America and the Caribbean, including Colombia, Peru, Mexico, Costa Rica, Chile, and Guatemala (funded by WRI).
- Multifunctional productive landscapes supporting resilient forest communities in Costa Rica, Colombia, and Ecuador (funded by Natural Resources Canada – NRC).

- Joint UNEP-UNIDO programme to host and manage the Climate Technology Centre and Network in Costa Rica, Colombia, and Chile (funded by the United Nations Environment Programme – UNEP).

CATIE was also in charge of developing a non-formal training in Colombia, known as the workshop on uses and sources of sustainable livestock, which was attended by 60 people involved in the livestock sector. In addition, the institution has contributed to the talks on Sustainable Livestock, with approximately 2000 registered.

PERU

In 2022, new projects and consultancies were developed. For example, consulting for the strengthening of technical, organizational, business, and commercial capacities for sustainable businesses within the framework of the Forest Investment Program (FIP), financed by the World Bank, a contract awarded by the National Forest Conservation Program for the Mitigation of Climate Change (PNCBMCC, for its acronym in Spanish) of the Ministry of Environment of Peru.

The consultancy was executed by CATIE and the Center for the Development of the Amazonian Indigen (CEDIA, for its acronym in Spanish), to provide specialized services to strengthen the capacities of native communities and small forest users in Atalaya, Ucayali region, which allows them to formulate, in a participatory manner, 50 ideas and sustainable business plans and initiate the implementation of said business plans. To date, 15 ideas and business plans have been developed with 15 native communities. It is estimated that 190 families will benefit directly and 2300 indirectly.

In addition, it is estimated that some 500 families in Ucayali and Huánuco will benefit from the Sustainable Productive Landscapes (PPS, for its acronym in Spanish) project, which CATIE executes with the Ministry of Environment (MINAM, for its acronym in Spanish), the Ministry of Agrarian Development and Irrigation (MIDAGRI, for its acronym in Spanish) and UNDP.

On the other hand, in Peru, CATIE held seven events with 243 participants on issues of agricultural innovation, environmental management and sustainability, organized with the National Agrarian University La Molina (UNALM, for its acronym in Spanish), the Peruvian University of Applied Sciences (UPC, for its acronym in Spanish), the University of the Pacific, the National University of San Marcos and the University of Caldas of Colombia, among others. In addition, three events were organized in the country with more than 100 participants on model forest issues, 94 training events and six field-internship days with 1410 participants (20% women) on topics related to silvopastoral systems in the PPS project.

Likewise, technologies and methodologies were implemented in the establishment of 13 ECAs in two regions of the country (Ucayali and Huánuco). The CANVAS method was used for the development of ideas and business plans in agroforestry systems and tourism in Atalaya, Ucayali.

Finally, a final platform where CATIE leads or participates in communities of practice is the Latin American Model Forest Network, with four model forests in Peru: Pichanaki, Villa Rica, Río Abiseo Huambisa and Abancay.

BOLIVIA

Actions in this country focused on capacity building. For example, the institution developed the course entitled Climate Action and Water Security in Practice, an online self-learning program that expects to reach about 500 people in its first phase. Its objective is the strengthening of capacities in the framework of climate action and water security, focused on the application of tools for the development of investment programs and projects at the subnational level.

Also, in conjunction with the Bioversity & CIAT Alliance, CATIE provided training on governance in water security and climate change with 49 professional participants. In addition, 40 professionals, academics and representatives of rural communities were trained as watershed managers in Bolivia.

In turn, the training provided 26 professional participants, researchers, and managers with tools for the management of protected areas in Bolivia. Additionally, 20 public servants were trained in the management of socio-environmental conflicts and 59 participants in water resources management, hydrological models, and hydraulic models.

Twenty (20) public servants were trained in spatial hydrology and integrated water resources management. On the other hand, 78 researchers and professors from the main universities of the country received the International Diploma in Biostatistics from CATIE and the Universidad Mayor de San Andrés (UMSA). Meanwhile, the International Diploma in Integrated Watershed Management and Climate Change trained 21 technical professionals from governmental and non-governmental entities on the subject.

Finally, the International Course on Modern Cocoa Culture trained 29 technical professionals from municipal entities, cocoa producers, and technicians from non-governmental organizations.



PANAMA

For Panama, CATIE develops work related to capacity building, as well as research and development projects related to the environmental and agricultural sector. In October 2022, the Center began the consultancy Maintenance of the System Implemented in Riparian Reforestation and Agroforestry with Coffee Systems and Soil Conservation in the sub-basin of the Caisán River, in Chiriquí.

This resulted in the inspection and diagnosis of the state or condition of 45 farms, 25 of them started with coffee varieties tolerant to climatic conditions, 19 with lots of coffee hybrids acquired at CATIE and 5 with forest restoration actions. Of the 49 farms, 16 are attended by women (36%) and 4 of them (with hybrid lots) are served by the Institute of Agricultural Innovation of Panama (IDIAP, for its acronym in Spanish). In addition, technical assistance was provided to the 45 farms and inputs (fertilizers and pest control) were provided to farms working with coffee crops (40).

Coffee with climate change adaptation measures

Coffee crops with climate change adaptation measures in Panama transform the productive landscape and coffee hybrids produced at CATIE contribute to the initiative.

David Pitty was mainly engaged in raising cattle and planting some plots of coffee and basic beans. Currently, he and his family transformed two hectares of pastures into coffee crops with climate change adaptation measures and are transforming another four hectares with coffee crops. He is one of the 25 producers of a forest restoration and coffee crop project with climate change adaptation measures financed by the Adaptation Fund, implemented by NATURA, executed by the Ministry of Agricultural Development (MIDA, for its acronym in Spanish) and developed by CATIE and the Association of Renaissance Producers (APRE, for its acronym in Spanish).

Experts in agroforestry systems with coffee from CATIE participated in the training activities, which included technical staff from MIDA and APRE, as well as Producer families.

This Project directly impacted 50 hectares on 25 farms, 14 of them run by women. Among the adaptation measures implemented is the planting of six types of coffee hybrids (about 17,000 seedlings) produced at CATIE.



NICARAGUA

In Nicaragua, CATIE has worked hand in hand with government institutions, mainly the Ministry of Agriculture, the Nicaraguan Institute of Agricultural Technology (INTA, for its acronym in Spanish) and other members of the National System of Production, Consumption and Trade.

The project Adapting Agriculture to Climate Change through Water Harvesting in Nicaragua was implemented in its second phase and financed by the SDC. With it, 2500 families, in 10 municipalities of the Dry Corridor of Nicaragua, received attention, since its objective has been to contribute to families of small and medium producers in the north central zone of Nicaragua to improve their food and nutritional security through the establishment of productive systems more resilient to climate change.

The outstanding achievements of this project are the construction of water harvesting works linked to agroforestry and silvopastoral systems that integrate about 700 surface runoff works, 530 Zamorano-type tanks and more than 70 water collection works from natural springs.

The actions of the project are coordinated with INTA and in its second phase it has developed consolidation actions, mainly in scaling, sustainability, and knowledge management, for which it has worked together with the livestock guild and other actors. Actions in the consolidation phase include 10 new municipalities in Nicaragua's Dry Corridor.

CATIE also influenced the Nicaragua-Honduras Sentinel Landscape project, which is a transect of more than 300 km long that represents a gradient of intensive agriculture, pastures, agroforestry systems and forests. In turn, this landscape contains one of the largest forest areas in Central America and CATIE has the responsibility of coordinating research activities, seeking to establish monitoring areas to determine the impact of policies on the management and conservation of natural resources. The project includes the mapping of institutions and drivers of land use change, as well as the role of various agroforestry systems and the integration of adaptation and mitigation into climate change and land use policies, among others.

A fourth project that was developed in Nicaragua, in the years 2021 and 2022, was called Nature as a Safeguard of the Human Right to Water in the Context of COVID-19. For this project, all the technical and methodological efforts aimed at actively promoting

the participation of the protagonists were facilitated from the identification, participatory analysis of their problems around water resources and the prioritization of actions aimed at improving their water supply conditions, from the approaches of nature-based solutions and the human right to water.

As part of this project, actions were carried out in the water recharge zone of water sources, which included water planting works, in an articulated manner to promote water quality and availability. In addition, the capacities of at least 208 people (93 women and 115 men) in the subject were strengthened, who will be integrated throughout this process. Additionally, local authorities, technicians, students, and the general population of 17 water recharge areas participated in the training.

On the other hand, CATIE carried out collaborative research with BROOKE 2022 that was called Contribution of Working Equines in the Integral Management of Disaster Risk with a Focus on Community Resilience. The research documented the perception of producing families regarding the situation of working equines and their contribution to events that put their communities at risk.

The study was developed in the departments of Somoto, Totogalpa and Palacagüina. With an information collection of 201 surveys, 31 interviews, six focus groups and the application of 249 observation tools. The main results showed that there are emergency plans by local authorities in which families are integrated and aware of risks and vulnerability.

Another collaborative research that CATIE carried out was with AGROFORESTA, in the project entitled Agronomic Performance and Productive Potential of CATIE's Cocoa Clones in Five Agroecological Zones of Nicaragua, in alliance with other partners. This study required to know the performance of the cocoa clones produced at CATIE that were introduced to the country within the framework of the Central American Cocoa Program (2008-2012), how their behavior has been and their status.

During the study, 10 clonal gardens (10 ha) of cocoa that had been established were visited and 25 producers (35 ha) in five agro-ecological zones of Nicaragua were interviewed, to document the agronomic and productive performance of the cocoa clones released by CATIE in 2010. Cacao plantations are planted at a density of 3x3 m, have an age of 6 to 10 years.

In terms of yield, the best clones were CATIE-R4 (901.2 kg/ha), PMCT-58 (802.4 kg/ha), CATIE-R6 (499.5 kg/ha) and CATIE-R1 (260.5 kg/ha). The level of incidence of monilia and black cob varied between 24-35% depending on the area and agronomic management provided by the producer. The 10 clonal gardens were established from 100 to 750 m altitude. Seven of the 10 clonal gardens visited are not well managed or offer planting material.

75% of the clonal gardens are owned by cooperatives or producer associations and the remaining 25% are privately owned. Only half of the clonal gardens are functional and registered-certified with the relevant authorities. In this sense, it is key to develop a business plan and strategy at the territorial level for the promotion and marketing of quality planting material.

Another area to highlight of CATIE's work in Nicaragua during 2022 are the 330 training and dissemination events that were carried out to strengthen the capacities of producing families, technical staff, and students. Among them stand out 218 workshops that had an impact on at

least 3750 people, 4 specialized courses and 45 events of days of field demonstrations of innovative techniques and practices.

The main topics addressed were water harvesting, drip irrigation systems, management of water recharge areas, application of nature-based solutions, bioinputs, climate-smart livestock practices, crop diversification, food security and sovereignty and cost-benefit ratio of productive units, among other issues of relevance to be applied in the Nicaraguan Dry Corridor.

Similarly, there was a presence on local radio stations, with the dissemination of messages alluding to the implementation of nature-based solutions for the appropriate management of natural resources, water, soil conservation and agroforestry management.



EL SALVADOR

CATIE's work in El Salvador was focused on the development of projects such as the Plan for Attention to Food Insecurity in the Río Lempa Trinational Border Commonwealth, caused by the COVID-19 pandemic within the framework of the Central American Program for the Integral Management of Coffee Rust (PROCAGICA) and the AGROINNOVA project.

Among the most outstanding results is the construction of galvanized greenhouses, the acquisition of seeds, poultry, and inputs for the support plan for the trinational border commonwealth of the Lempa River, as well as the purchase of coffee plants, fertilizers, and minor equipment (spray pumps, wheelbarrows, and others).

Also, two initiatives are being implemented in the country called Guidelines for a regional public policy against climate change from the perspective of small fair-trade producers and Training of small producers in climate change and leadership. These two initiatives are worked with CLAC as a partner, where CATIE's role is the preparation of the study, formulation, and execution of the training plan.

Section 7.

CATIE in the global agenda

In 2022, CATIE attended different international events in which it positioned its research topics on the global agenda, shared experiences and knowledge, and presented its science-based solutions to the multiple challenges facing the Latin American and Caribbean region. CATIE's research staff attended these events mainly as exhibitors, speakers, guests and panelists, among others, in their respective areas of *expertise*.



Below, the details of the events in which CATIE participated.



Events in which CATIE participated

1 Countries of Central America and the Caribbean

- Regional Meeting of IKI Projects

2 Mexico

- Inter-American Congress on Water, Soil and Agrobiodiversity, Sonora
- 2nd. Congress of Mangroves of America, Merida, Yucatan
- 2nd. Chiapas de Corazón
- International Coffee Festival 2022
- 2nd. Mangrove Congress of America
- International Forum on Sustainable Livestock

3 Canada

- World Congress of Agroforestry

4 France

- International Symposium of Cocoa Research
- Initiative on Agroecological Control of Pests and Diseases

5 Egypt

- Conference of the Parties (COP)

6 United States

- 2022 AAEE Annual Meeting
- International Greenhouse Gas & Animal Agriculture Conference (GGAA)

7 Spain

- Course on Biodiversity, Ecosystem Services and Climate Change in Spain, Latin America and the Caribbean

8 Ecuador

- International Seminar on Agroecology and Sustainable Development

9 Costa Rica

- Challenges and success factors of the edible insect production chain in Costa Rica
- Conference of the International Association for Society and Natural Resources (IASNR)
- Restoration Monitoring Accelerator
- Fire Governance: Effective social participation in the management of Forest and Landscape Fires
- Talk about the importance of bees
- Atlas Ecosystem Services of the GAM
- SINTERCAFE
- XXVII International Seminar on Natural Sciences for Development
- Festival Rivers and Forest Alliance, United by the Pacuare River
- 50 years CORBANA

10 Colombia

- International Environmental Fair (FIMA)
- Second International Fair of Agricultural Innovation – El Campo Innova
- Sustainable Landscape Governance: the Challenges of the XXI Century

11 Cuba

- Convention on Animal Production and Agrodevelopment

12 Honduras

- Latin American Coffee Summit
- Training on Conjunctive Water Management and Participatory RBOs Design

13 Peru

- Seminar on Sustainable Livestock in the Peruvian Tropics
- International Forum Problems and Improvement of Cattle in the Province of Oxapampa
- Seminar Initiatives for Sustainable Production in the Peruvian Tropics, Huánuco – Ucayali Corridor

14 Venezuela

- II International Forum Integrated Water Management: Ecosystem Restoration
- The Urban Tree: ornament, environment and quality of life

15 Dominican Republic

- First National Meeting on Watershed Management in the Dominican Republic

16 South Korea

- XV FAO World Forestry Congress
- World Forestry Congress

17 Italy

- Annual Conference of the European Association of Environmental and Resource Economists (EAERE)

18 South Africa

- RGlobal meeting of leaders of FAO's forest communicators networks

19 Uganda

- 16th Annual Meeting of the EfD



Virtual

- Alliance for Green and Inclusive Development in Latin America
- Society for Benefit-Cost Analysis Annual Conference
- Sustainable MSMEs CENPROMYPE
- Youth Training Program, Latin American Model Forest Network

- Alliance for Responsible Forest Management (ARFM)
- World Water Week 2022: The Forest - Water Nexus in Latin America
- International Forum on Water Harvesting
- Executive Committee Tropical Agriculture Platform (TAP-FAO)

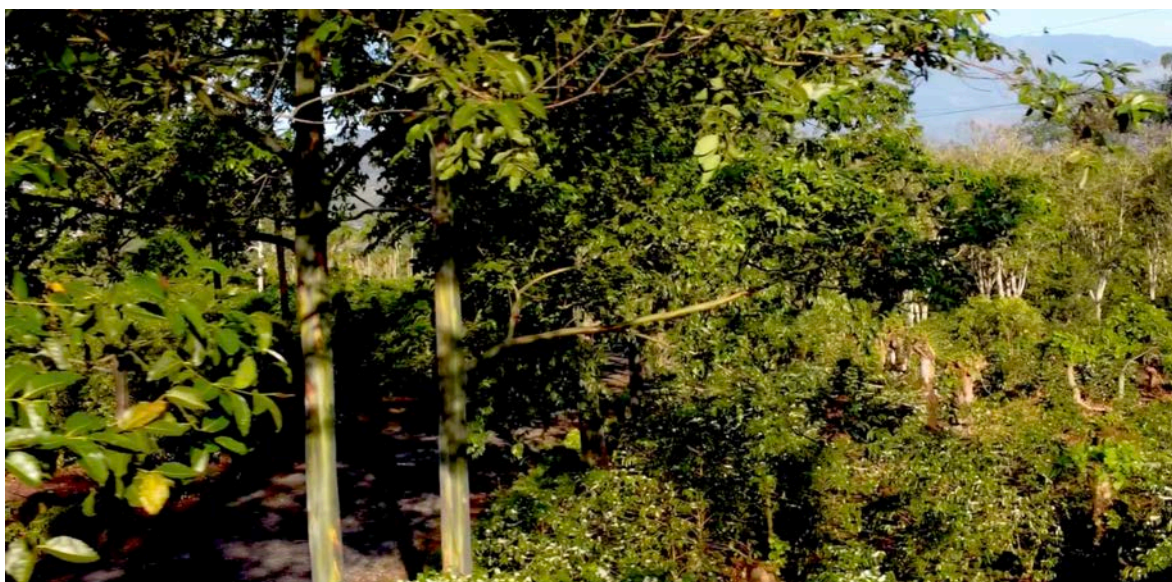
CATIE at the COP

Within the framework of the COP, CATIE managed to establish high-level meetings with important climate finance actors such as GCF, GEF, Adaptation Fund, IKI, NAMA Facility, European Union with the Euroclima program, alliances and private sector networks such as One Planet Business for Biodiversity and World Business Council for Sustainable Development.

In addition, the institution explored strategic alliances with investment funds, such as Pegasus, which seek to invest financial resources in the coffee and cocoa value chains in the region. CATIE represents an investment de-risking Tool thanks to its technology, germplasm, knowledge and production methodologies of these crops resilient to climate change.

CATIE at the World Congress of Agroforestry

At this world congress, CATIE experts presented, as first authors, eight research advances in three scientific sessions of the congress; in addition, two of them moderated four scientific sessions. Also, CATIE partners presented at least five research papers co-authored by CATIE researchers. The AGROFORESTA side-event was also co-organized with colleagues from CIRAD. This session was attended by about 50 people from partner institutions of the platform and other institutions working with agroforestry. It was useful to present 15 years of the platform's trajectory in the prioritized research topics, examples of projects and research, and to motivate more people to share information and join the projects.



Section 8.

Our finances and human capital



At the financial level, 2022 was a year of positive results, which reached budgetary levels such as those in 2014 and 2015 in the management of the assets, liabilities and equity of the institution.

The success in the budget increase is due to the work carried out by the entire institutional team for the achievement and approval of proposals made to donors, such as SIDA, GIZ, UNDP, IKI, USAID, European Union and SDC, among others, which has led the institution again to achieve the objectives set.

It should also be noted that CATIE is working on adjusting the education model, for which it has established a common core that increases the contributions of the Education Division to the sustainability of the Center.

In turn, the research area is making efforts to resume presence in the regions of Trifinio, Petén and develop a scaling plan for important projects in Central America, such as Water Harvesting in Nicaragua and the Information Platform (PIIN) in Guatemala, as well as the recently approved NAMA Facility, which operates mainly in Honduras.

The pandemic brought limitations that were overcome during 2021, resulting in a successful return to scientific, research, education and work activities. However, CATIE was directly affected by the increase in the prices of agricultural inputs, necessary for dairy production and the commercialization of sugarcane, so the commercial area took actions such as the use of alternative fertilizers and making production processes more efficient to reduce the impact of the increase in prices.



Each year for CATIE is a new challenge, this because of the nature of its constitution and the form of its financing, in which a strict control of income and disbursements must be carried out at the level of the basic budget and the execution of the awarded projects depends on the collection of country fees. For which it must show a consolidated solvency in the execution of the projects, the maximization of the income of its productive activities, as well as an adequate austerity of the execution of its expenses. CATIE must continue to be a leading institution in the management of regional projects for different donors.

For its sustainability, the Center must continue to seek resources to strengthen its trust, currently managed by Fundatrópicos and with the support of The Tropic Foundation, as well as continue to participate in proposals for project management. In the short term, it is expected to have a new and modern computer and reporting system that allows generating efficient and timely information for decision making.

For its part, for the benefit of institutional human capital, the Department of Human Development (HD) worked in 2022 on the definition and establishment of three regulations: salary payment policy in dollars, occupational health policy and new practices to reduce risks of occupational accidents, gender policy and telework policy.

In addition, the entire financial information system used from HD to the new institutional platform Softland was migrated. Also, improvements were implemented in the personnel induction process, an evaluation of soft skills was included in staff recruitment interviews and an agreement was signed with the Ministry of Foreign Affairs to allow spouses of CATIE's international staff to work.



Section 9.

Next steps



Thanks to CATIE's 50th Anniversary, 2023 represents a great opportunity to strengthen strategic alliances with its main partners, both national, regional and global.

The challenges of the region are as numerous as they are diverse and complex, and without a doubt, it is only with the cooperation of partner organizations that CATIE will be able to promote its development agenda, based on science and strategically promote education and the strengthening of the capacities of the inhabitants of the region. especially women, youth and indigenous people.

In this sense, the Graduate School and the Directorate of Education play a transcendental role in training and capacity building, and for this CATIE will continue to work together with universities and study centers. In addition, it will seek to strengthen its scholarship program with the support of existing and new sources of funding.

In addition to this, the Directorate of Education will review its business model, will open two modular master's degrees in coffee and cocoa, and will reengineer the master's degrees in watershed management to offer a master's degree in science in virtual mode.

The external projection of the institution will continue to be the main tool to bring research and knowledge to the communities of the region. On the other hand, strategic alliances represent the most efficient way to influence the final beneficiaries.

Finally, revenues generated by business activities will continue to grow. Alliances with coffee and cocoa producers and companies will allow them to continue improving their value chains, their impact on resilience and economic development and, therefore, on CATIE's financial income.

On the other hand, the strategic alliance between CATIE and Verto Education will allow more undergraduate students from North American universities to study at least one semester in Turrialba and live the CATIE experience, which will represent an important income for the Center to keep its infrastructure and equipment current and updated.

During 2023, CATIE will celebrate its 50th anniversary, strengthening its long-term financial sustainability.



Acronyms

AbE	Adaptation based on Ecosystems
ACOFOP	Association of Forest Communities of Petén
ADI	Indigenous Development Associations
AFD	French Agency for Development
AGRICULTURE	Secretariat of Agriculture and Rural Development
AGROINNOVA	Adapted Agroforestry Systems for the Central American Dry Corridor
AREDE	Regional Development Agencies
ASDI	Sweden Agency for International Development
ATOC	Ocotepeque-Citalá Transboundary Aquifer
BioPaSOS	Biodiversity and Sustainable Agrosilvopastoral Livestock Landscape
BIO2DIV	Biodiversity, New Diseases and Sanitary and Phytosanitary Risk Management
BLPA	Belize Livestock Producers Association
BMFT	Belize Maya Forest Trust
BU	Biostatistics Unit
CARICOM	The Caribbean Community
CARSI	Central American Regional Security Initiative
CCAC	Climate and Clean Air Coalition
CEDIA	Center for the Development of the Amazonian Indigen
CENPROMYPE	Regional MSME Promotion Centre
CODESOSA	Commission for the Sustainable Development of the Sarapiquí River Basin
COMCURE	Commission for the Management of the Reventazón River Basin
CONABIO	National Commission for the Knowledge and Use of Biodiversity
CONACYT	National Council of Science and Technology of the United Mexican States
CONAFLU	Confederation of Federations, Leagues and Unions of Asadas
CONAP	National Council of Protected Areas of Guatemala
SDC	Swiss Agency for Development and Cooperation
UNFCCC	United Nations Framework Convention on Climate Change

CRRH	Regional Committee of Hydraulic Resources
CTAF	Regional Committee of Technicians
CTEA	Special Territorial Amazonian Circumscription
DAAD	German Academic Exchange Service
DIDVI	Directorate of Research for Inclusive Green Development
DEFRA	Department for Environment, Food & Rural Affairs
DVI	Inclusive Green Development
EbA LAC	Program Scaling Ecosystem-Based Adaptation Measures in Latin America
ECA	Field School
EfD-CA	EfD Central America
EFET	Territorial Business Training School
FCD	Friends for Conservation and Development
FHIAF	Honduran Agricultural Research Foundation - Cocoa and Agroforestry Program
FdAT	Transboundary Water Fund for the Lempa River Basin
FLU	Federations, Leagues, and Unions of ASADAS
GAIA	Research Group on Agroecosystems and Conservation in Amazonian Forests
GAMMA	Livestock and Environmental Management Unit
GGRETA	Governance of Groundwater Resources in Transboundary Aquifers
INDOCAFE	Dominican Coffee Institute
IFARHU	Institute for the Training and Use of Human Resources of Panama
INIAP	National Institute of Agricultural Research of Ecuador
IPCC	Intergovernmental Panel of Experts on Climate Change or Intergovernmental Panel on Climate Change
MAATE	Ministry of Environment, Water and Ecological Transition of Ecuador
MARN	Ministry of Environment and Natural Resources of Guatemala
MESCYT	Ministry of Higher Education, Science and Technology of the Dominican Republic
MIDES	Ministry of Development of Guatemala
MINAM	Ministry of Environment
MINEDUC	Ministry of Education of Guatemala
MSME	Micro, small and medium-sized enterprises
MoAFSE	Ministry of Agriculture, Food Safety and Business
MPD	Mangroves for Development
MSPAS	Ministry of Public Health and Social Assistance
NAR	Regenerative Food Policies
NDC	Contributions Nationally Determined
NRC	Natural Resources Canada

ODS	Objectives of Sustainable Development
WMO	World Meteorological Organization
UN	Organization of the United Nations
OPP	Organizations of small farmers
PITAG	Technological Innovation in Agriculture and Agroforestry
PROAmazonía	Integral Amazonian Program for Forest Conservation and Sustainable Production
PROCAGICA	Central American Program for the Integrated Management of Coffee Rust
PPS	Sustainable Productive Landscapes in the Peruvian Amazon
UNEP	Environment Programme
PSA	Pagos for Environmental Services
RRB	Resilient Rural Belize
SAF	Agroforestry systems
SAFMS	Multilayer agroforestry systems
NbS	Nature-based solutions
SCOPE	Research Program on Sustainable Consumption and Production
SECAC	Secretariat of the Central American Agricultural Council
SESAN	Secretariat of Food and Nutritional Security of Guatemala
SICA	Central American Integration System
SIDESAN	Departmental Food and Nutrition Security Information Systems
SWISSCONTACT	SWISS Foundation for Technical Cooperation
UAC	Climate Action Unit
UAMCC	Agroforestry and Genetic Improvement of Coffee and Cocoa Unit
UASA	Agrobiodiversity and Food Security Unit
UBBPP	Forests and Biodiversity in Productive Landscapes Unit
UCSHS	Watershed, Water Security and Soils Unit
UEAAS/EfD	Environmental Economics and Sustainable Agribusiness Unit
IUCN	International Union for the Conservation of Nature
UMSA	Universidad Mayor de San Andrés de Bolivia
UNALM	Universidad Nacional Agraria La Molina
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
UPC	Peruvian University of Applied Science
USAID	United States Agency for International Development



Annual Report

2022