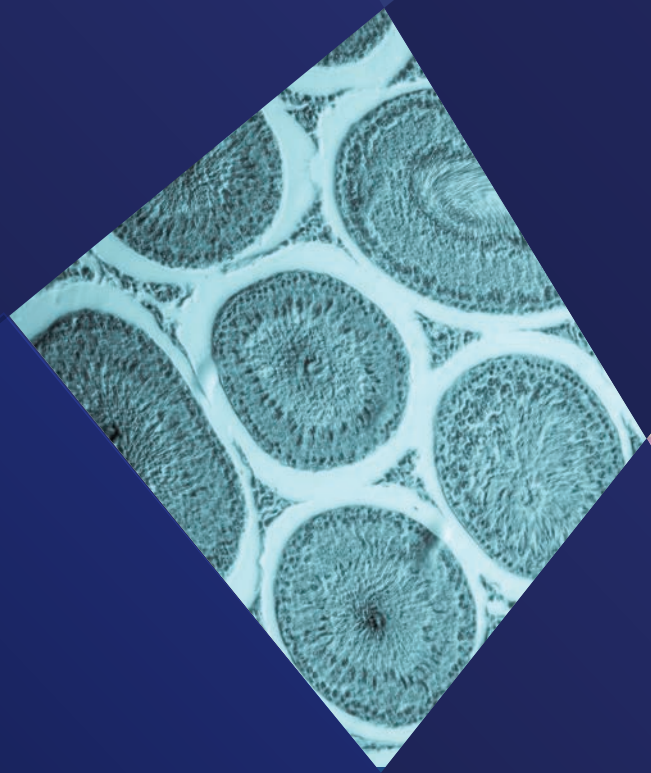
CONSEJO NACIONAL DE RECTORES

CeNAT
Centro Nacional de Alta Tecnología



Institutional Report

2020

CeNAT

Centro Nacional de Alta Tecnología

Table of Contents

Acronyms

CONARE	National Council of University Deans
CeNAT	Centro Nacional de Alta Tecnología
PRIAS	PRIAS Laboratory
LANOTEC	National Nanotechnology Laboratory
CNCA	National Advanced Computing Collaboratory
CENIBIOT	National Center for Biotechnological Innovations
CREATEC	Program for Creativity and Entrepreneurship in High Technology
TEC	Costa Rica Institute of Technology
UCR	University of Costa Rica
UNA	National University
UNED	Universidad Estatal a Distancia (State Distance Education University)
UTN	Universidad Técnica Nacional (National Technical University)
PLANES	National Higher Education Plan
Education-Roaming	Education Roaming
LCM	Costa Rican Metrology Laboratory (LACOMET)
AID	Agency for International Development
BCCR	Banco Central de Costa Rica (Central Bank of Costa Rica)
CCSS	Caja Costarricense de Seguro Social (Costa Rica Social Security Fund)
CONICIT	National Council for Scientific and Technological Research
ICE	Instituto Costarricense de Electricidad (Costa Rican Institute of Electricity)
INA	National Institute for Learning (INA)
INEC	Instituto Nacional de Estadística y Censos (National Institute of Statistics and Census)
MAG	Ministerio de Agricultura y Ganadería (Ministry of Agriculture and Livestock)
MICITT	Ministerio de Ciencia, Tecnología y Telecomunicaciones (Ministry of Science, Technology and Telecommunications)
MINAE	Ministerio de Ambiente y Energía (Ministry of Environment and Energy, MINAE)
RREE	Ministry of Foreign Affairs and Culture
FEES	Special Fund for Higher Education
SAF	Agroforestry Systems
PILA	La Amistad International Park
UdelaR	University of the Republic of Uruguay
CONICET	National Council for Scientific and Technical Research
UBA	University of Buenos Aires
CNEA	National Atomic Energy Commission
Univalle	Universidad del Valle, Colombia
UNI	National University of Engineering, Peru
CNRS	Centre National de la Recherche Scientifique, France
UGA	University of Grenoble Alpes, France
TGA	Thermogravimetry
FTIR	Fourier Transform Infrared
SEM	Scanning Electron Microscopy
TEM	Transmission Electron Microscopy
CANAPEP	National Chamber of Pineapple Producers and Exporters
IJSO	International Junior Science Olympiad
COLAEIQ	Latin American Congress of Students of Chemical Engineering and Related Majors
ACOMET	ACOMET Metales y Minerales S.L.
INS	National Insurance Institute
AFM	Atomic Force Microscopy
QUIMICAM	Chemistry Camp
ECMAR	National Marine-Coastal Science Station
ICHO	International Chemistry Olympiad
NAVAL	NAVAL United States Geological Survey
INALVE	Inalve Food Industries
FIFCO	Florida Ice and Farm Company
ULEAD	LEAD University

Acronyms

NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
USGS	United States Geological Survey
ESA	European Space AgencyEuropean Space Agency
DLR	German Space Agency
ILSI	Mesoamerica Association
STEAM	Science Technology Engineering Art Mathemathics
ALLBIOTECH	Latin American Network of Young Leaders in Biotechnology
DOS PINOS	Cooperativa de Productores de Leche Dos Pinos R.L.
PINN	Innovation and Human Capital Program for Competitiveness
CITA	National Center for Food Science and Technology
INTA	National Institute of Innovation and Transfer in Agricultural Technology
AECID	Spanish Agency for International Development Cooperation
TUHH	Hamburg University of Technology, Germany
CORBANA	National Banana Corporation
BIOTECH	Biotechnology
SEVRI	Pecific Institutional Risk Assessment System
PAO	Annual Operational Plan
CIPRONA	Natural Products Research Center
FIDA	International Fund for Agricultural Development
COOPETARRAZU	Cooperativa de Caficultores y Servicios Múltiples de Tarrazú R.L.
PRISLAB	Pattern Recognition and Intelligent Systems Laboratory
TIC	Information and Communications Technology
SUTEL	Superintendency of Telecommunications of Costa Rica
Zii	Wireless Internet Zones
MOCUPP	Change in Use of Productive Landscape Monitoring
GIZ	German Corporation for International Cooperation
CNFL	National Power and Light Company
SIMOCUTE	National Monitoring System for Land Cover and Use and Ecosystems
SFE	State Phytosanitary Service
MINAE	Ministry of Environment and Energy
IGN	National Geographic Institute
PEN	State of the Nation Program
MAG	Ministry of Agriculture and Livestock
IMN	National Meteorological Institute
FONAFIFO	National Forest Financing Fund
OECD	Organization for Cooperation and Development
GPSDD	Global Partnership for Sustainable Development Data
BM	World Bank
SICA	Central American Integration System
GEF	Global Environment Fund
USAIG	United States Aircraft Insurance Group
SERVIR	National Civil Service Authority
FAO	Food and Agriculture Organization of the United Nations
ECLAC	Economic Commission for Latin America and the Caribbean
PIACT	Interactive Platform for Tropical Climate Application
LAICA	Sugar Cane Chamber
CAPROSA	Guild of Health Professionals
CASAGRI	Farmers House
OEA	Organization of American States
ANAGAN	National Association of Cattle Breeders
MEP	Ministry of Public Education
UNESCO	United Nations Educational, Scientific and Cultural Organization

Eduardo Sibaja Arias

Director
Centro Nacional de Alta Tecnología

Presentation

Science and technology constitute a fundamental pillar for cultural, social, and economic development and for life in modern society. The Centro Nacional de Alta Tecnología, in its twenty-two years of existence, has developed its strategic vision and work planning with this slogan, "Transforming knowledge into development".

It is a phrase that encompasses an enormous mission, which is backed by specialized human capital with high-tech equipment and the support of the academic sector, as a program that belongs to the Consejo Nacional de Rectores.

CeNAT's activities, projects, and initiatives focus on promoting scientific and technological development, as driving forces for change and progress, by linking the academic, governmental, and private sectors, and fostering collaboration spaces to generate and facilitate the transmission of knowledge and development of socio-productive projects, among other areas of work.

In this process that integrates decision-making, planning, and execution of CeNAT's dependencies, it is essential to establish accountability mechanisms to favor management transparency. Consistent with the above, we present this Institutional Annual Report, in which the data, information, and results of the actions carried out are synthesized to promote reflection and analysis of the research, scientific, educational, and administrative work carried out.

This Report includes the work of the areas, laboratories, programs, and the Centro de Alta Tecnología Foundation (FunCeNAT) and collects what has been done in 2020, a period marked by the health crisis of COVID-19 that has affected the different latitudes of our planet. This situation has led to making decisions and taking measures that guarantee the safety of the personnel and the fulfillment of the institutional objectives, including establishing capacity limits in the laboratories, development of teleworking activities, implementation of preventive health measures, the definition of protocols, and the use of technological tools for the execution of the work, among other actions.

Against this background, it is important to highlight the work of the personnel who maintained their commitment to quality and compliance with the different processes, while generating knowledge about science and technology at the service of the country.

This Report is a compendium of the multidisciplinary management of the entity, whose scientific research focuses on science and engineering of materials, biotechnology, advanced computing, environmental management, and in the areas of science, culture, and society.

It is also a fundamental input for institutional evaluation and decision-making.

Devoted to our mission and convinced that what has been achieved makes us see the present with satisfaction and the future with optimism, aware of the institutional commitment to the country, we commit to continue setting goals focused on supporting the development of Costa Rica and strengthening the well-being of the population.

Background of CeNAT

The Government of the Republic, during the Figueres Olsen administration, raised the initiative for the creation of a National High Technology Center in Costa Rica, with the backing of state universities to attract investment in high technology; taking as reference countries such as Korea, Singapore, and Israel, the latter with the Technion or Israeli Technological Institute, located in Haifa. This reaffirms the role of public universities as the main generators of research in Costa Rica.

In October 1997, the Government of the Republic presented to the Consejo Nacional de Rectores (CONARE) an initiative to use the formerly used building by the US Agency for International Development (AID) for the establishment of a national center in high technology, through which the academia would be linked with the Government and the productive sector, in areas of high impact linked to the attraction of foreign investment, for the benefit of national development.

This initiative would later become normative, when the Legislative Assembly promulgated Law 7806, on May 25, 1998, authorizing the transfer of the building to CONARE to create the Centro Nacional de Alta Tecnología and call it after Dr. Franklin Chang Díaz.

Furthermore, article 3 of this law would provide for the creation of the Centro Nacional de Alta Tecnología Foundation (FunCeNAT), in order to fulfill the legal duty to manage the resources required for the execution of the projects developed through CeNAT.

CONARE was then made up of Dr. Gabriel Macaya Trejos, Chancellor at the University of Costa Rica, Alejandro Cruz Molina, Eng., Chancellor at the Costa Rica Institute of Technology, Dr. Celedonio Ramírez Ramírez, Chancellor at the State University for Distance Education, and Dr. Jorge Mora Alfaro, Chancellor at the National University, who supported the proposal to create a center for scientific and technological development, which would enhance the research efforts of the universities. The first administrative board of FunCeNAT was formed by them and by Marielos Aldí Villalobos, as representative of the Municipality of San José.

As part of the conformation process, the Consejo Nacional de Rectores, under the umbrella of the Coordination Agreement of State Higher Education, at session number 5-99, of March 2, 1999, of the Consejo Nacional de Rectores (CONARE), created the Centro Nacional de Alta Tecnología.

CeNAT is an inter-university encountering instance for the academy, the Government, and the productive sectors of the country, in different high technology fields, which join forces to enhance the possibilities of the country and to take advantage of the opportunities that technological development offers to countries that, like Costa Rica, have invested significantly in the education of their population at all levels.

During the years after its inception, it has consolidated a work platform based on the high technical-professional capacity of the personnel in its areas and laboratories, its equipment and facilities, thus allowing it to promote various research and knowledge transfer projects, focused on the vision to transform knowledge into development.

Strategic Planning

One of CeNAT's essential characteristics is its continuous improvement and reinvention capacity amidst the new contexts and challenges that society has faced throughout its 21 years of existence. The year 2020 has been one of the most difficult to face in recent history, not only in Costa Rica but also worldwide, given the multiple economic and social challenges resulting from the health crisis generated by the COVID-19 pandemic.

Facing this scenario, the different operational units of CeNAT and FunCeNAT carried out a process of re-formulation and definition of new operational actions, taking advantage of the capacity and ability of their personnel for innovation, in addition to the strength of the physical, instrumental, computational and telematic infrastructure with which it counts.

New lines of virtual and face-to-face work were adopted, while ensuring the safety and efficiency of both its collaborators and their research work. Fieldwork processes were generated, which were defined as virtual tours. Training sessions, talks, workshops, and virtual seminars were developed, as well as webinars, television, and radio information capsules, based on different platforms of great scope and impact, oriented to the different levels of society and productive sectors.

All this has ensured not only the operational continuity of the Center, but has also promoted new lines and modern and innovative tactics for the development of institutional strategic objectives, while supporting social development, which is necessary for the current situation.

In addition, in 2020, CeNAT had updated the philosophical framework of its Strategic Plan and the Strategic Plans of its laboratories, with a mission, vision, and development objective that guide the course of the 2019-2023 five-year period, aligned with the National Plan of Higher education.

Mission of CeNAT

"We are an inter-university coordination body that facilitates and promotes the proper functioning and systemic development of scientific research in higher education, in various areas of high scientific-technological content, oriented to research, linkage, environmental development, and extension, within an innovation framework with the government, civil society, and the private sector" (as inspired by the constitutive deed of CeNAT).

Vision of CeNAT

"To be a leading innovative Center that generates high-technology knowledge, products and services for the promotion of high-impact scientific-technological collaboration, promoting learning spaces, strengthening competitive development, and knowledge exchange at the highest level, while enhancing the mechanisms that support inter-university and institutional coordination of excellence both at national and international levels".

In addition to its mission and vision statements, CeNAT incorporates the development goal into its philosophical framework, as a contribution by the Center to the development of the country.

Development
Goal

To conduct research activities that provide the country with science, technology, innovation, and strategic entrepreneurship for competitiveness and economic, social, and environmental development (based on the constitutive deed of CeNAT).

Objectives of
CeNAT

The objectives come from the constitutive deed of CeNAT, which guides the work of the institution, its contribution, and work scope.

Main Objective

To conduct training and research activities that would provide the country with the necessary, relevant, and strategic technology for the competitive development of the different sectors of society in the economic, social, and environmental areas.

Specific Objectives

The specific objectives describe the major categories that come from the constitutive deed towards their orientation to collaborate to the scientific development of the country.

Regarding Science Promotion

To promote the development of research activities to provide the country with the necessary, relevant, and strategic technology, for the competitive development of the different sectors of society in the economic, social, and environmental areas.

To carry out everything that represents social, cultural, and scientific wellbeing, according either to the work of the institution or pursuant to Article One of the Law on Foundations.

Regarding Information and Training

To promote the creation and to provide contributions to support thinking spaces, as well as to coordinate actions that support scientific and technological development and conformation of multidisciplinary teams of researchers with a high level of training and experience (high level of critical mass), especially at the graduate level.

To promote technology extension, through exhibitions, conferences, seminars, technology markets, and training courses, among others.

Regarding Contribution to Postgraduate Specializations

To promote and support the implementation of academic research programs at the graduate level in coordination with state higher education university institutions.

Regarding Inter-Sectoral Articulation

To promote the coordination of public and private sectors involved in generation, training, transfer, and application of high technology.

To encourage and promote the generation of businesses with high technological content and high added value for the country.

Regarding Contribution to the Country's

To conduct -with research purposes- activities for development, licensing, utilization of resources (know-how), donation or purchase of patents, inventions, industrial or utility models.

To publicize and sell publications arising from research; to assign, sell, transfer and grant licenses for use of its patents, industrial or utility models, as well as any other assets that belong to its intellectual property.

Values and Principles Enforced **at CeNAT**

The values that are listed are those defined in the CONARE Ethical Principles Manual, followed by the values and principles enforced at CeNAT.

Institutional Values of **CONARE**

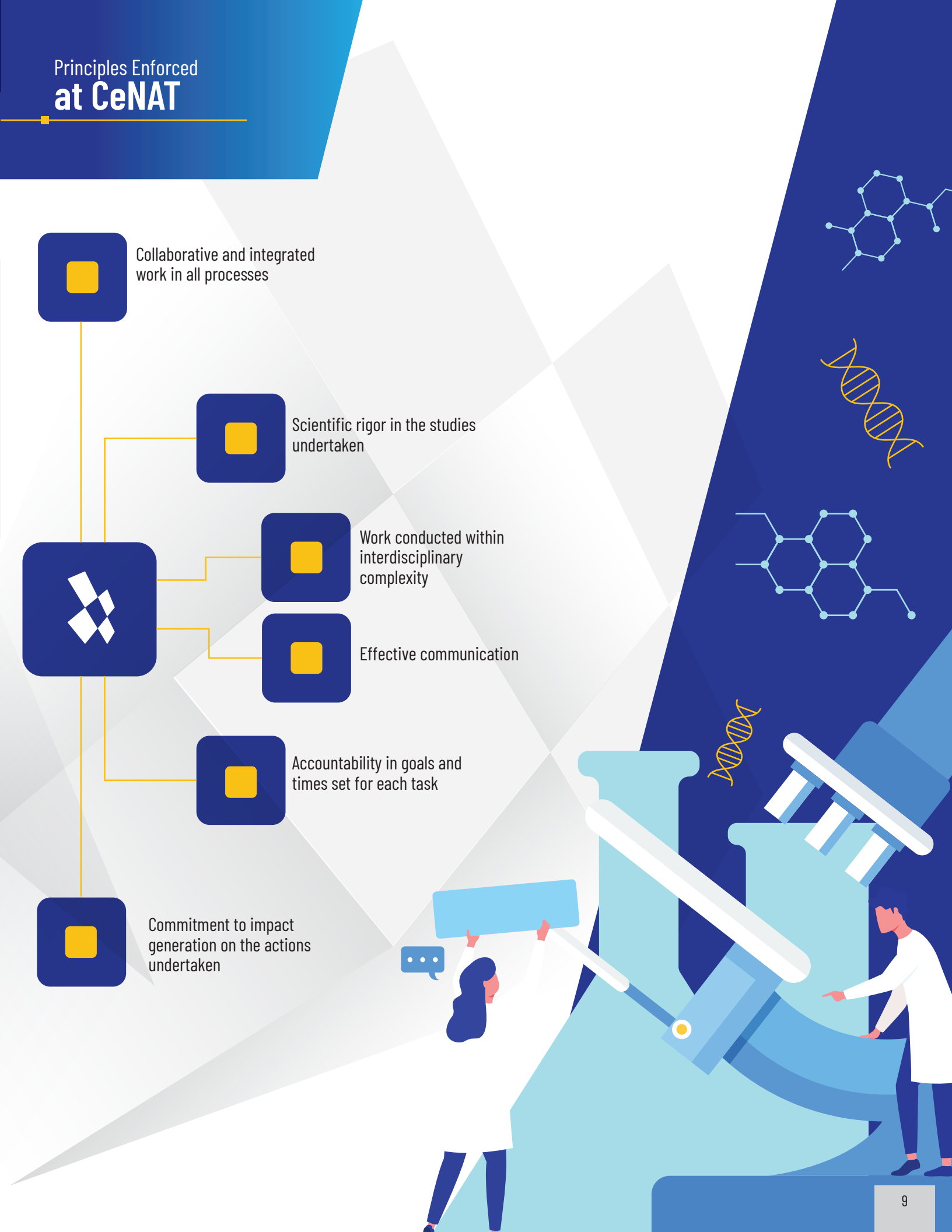
- Teamwork
- Discipline
- Respect
- Communication
- Responsibility
- Tolerance
- Honesty and Loyalty
- Commitment

Values Enforced at **CeNAT**

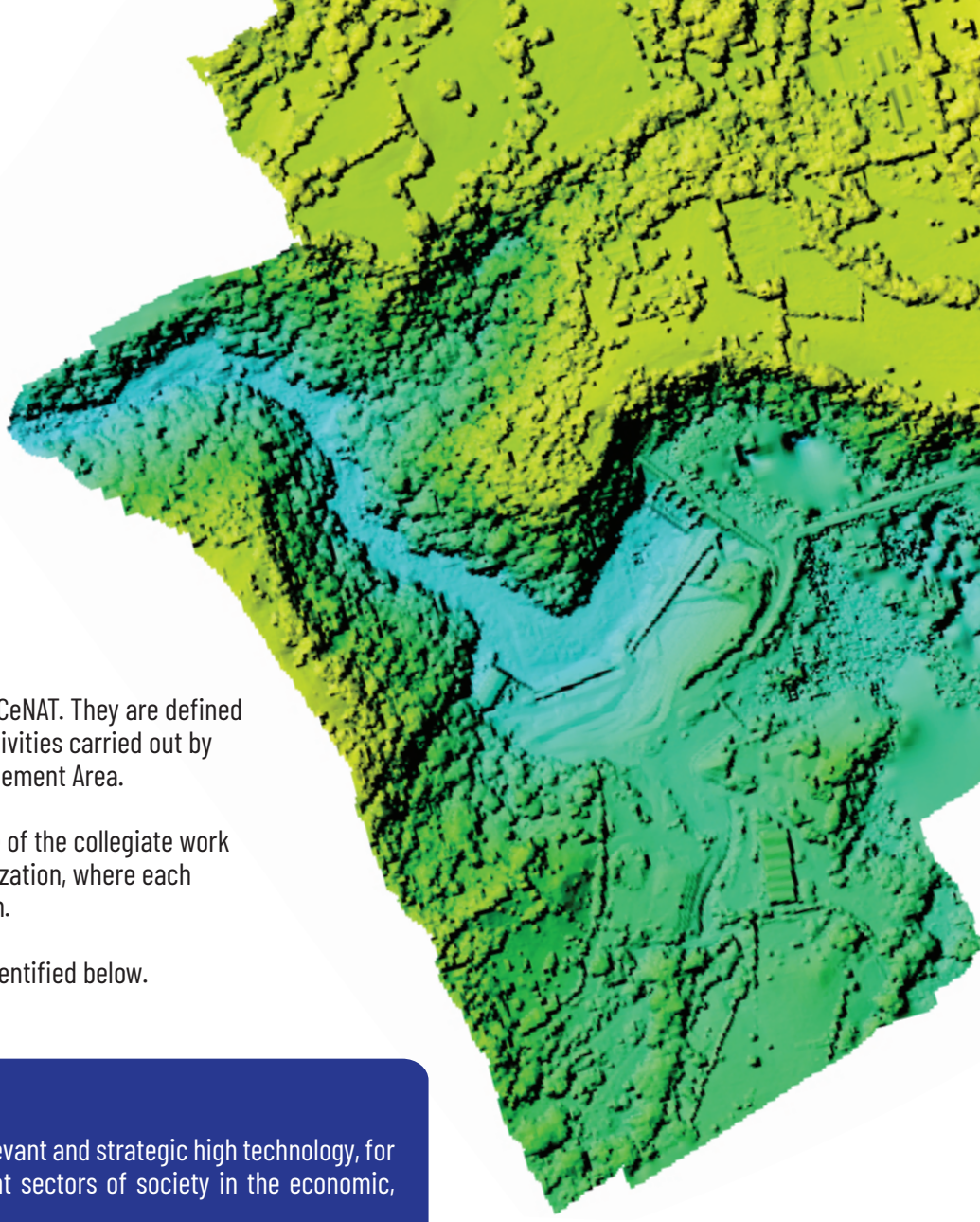
- Willingness to excellence in the work that is undertaken
- Transparency in the exercise of research
- Tolerance and flexibility in the processes that are developed
- Ongoing learning attitude
- Critical and self-critical position to address improvements in all research processes
- Continuous personal improvement attitude at the scientific level

Principles Enforced
at CeNAT

- Collaborative and integrated work in all processes
- Scientific rigor in the studies undertaken
- Work conducted within interdisciplinary complexity
- Effective communication
- Accountability in goals and times set for each task
- Commitment to impact generation on the actions undertaken



CeNAT
Strategic Lines



The strategic lines are present in the work of CeNAT. They are defined as cross-sectional lines of the substantive activities carried out by the laboratories and the Environmental Management Area.

These strategic lines highlight the importance of the collegiate work of each dependency that makes up the organization, where each action contributes to efficiency and projection.

The strategic lines and their definitions are identified below.

Knowledge Generation:

It provides the country with knowledge on relevant and strategic high technology, for the competitive development of the different sectors of society in the economic, social, and environmental scopes.

Learning Transfer:

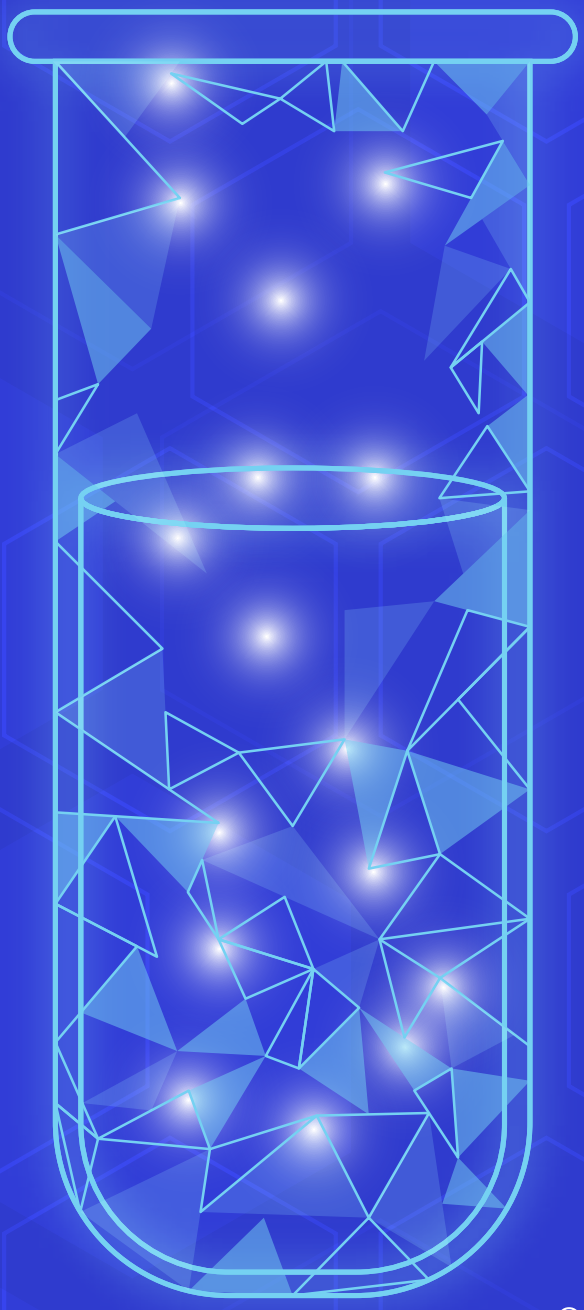
It supports learning spaces from interuniversity coordination to articulate actions that support scientific and technological development and the formation of multidisciplinary groups of researchers with high scientific rigor.

Internationalization:

It strengthens knowledge exchange at the highest national and international levels, both in the public and private sectors.

Institutional Management:

It strengthens organizational management through mechanisms that support the sustainability of CeNAT promoting efficient and transparent accountability and the development of scientific relevance.



OUR AREAS, LABORATORIES, AND PROGRAMS

Areas and Divisions of CeNAT

Areas

- Materials Science and Engineering
- Biotechnology
- Advanced Computing
- Manufacture
- Environmental Management
- Science, Culture and Society

Laboratories

- National Nanotechnology Laboratory (LANOTEC)
- CENIBIOT Laboratory
- National Collaboratory of Advanced Computing (CNCA)
- PRIAS Laboratory

Programs

- Climate Observatory
- Agromatics
- CREATEC
- CeNAT - CONARE Scholarships
- CeNAT Teaching

Creation of **Divisions**

Following agreement 5-99 of the Consejo Nacional de Rectores, CeNAT is comprised of the following areas:

I.

New Materials Area:
It was constituted in 2004, by the National Nanotechnology Laboratory (LANOTEC).

II.

Biotechnology Area:
Since 2013, the CENIBiot Laboratory integrates this operational area.

III.

Advanced Computing Area:
The National Advanced Computing Collaboratory (CNCA) is part of it since 2009.

IV.

Manufacturing Area:
There is no operating unit attached to it.

V.

Science, Culture, and Society Area:
This is a cross-sectional area that is managed directly by the Directorate of CeNAT. It encompasses the CeNAT Teaching, CREATEC, and CeNAT-CONARE Scholarship programs.

VI.

Environmental Management Area (AGA):
This area includes one laboratory and two programs:

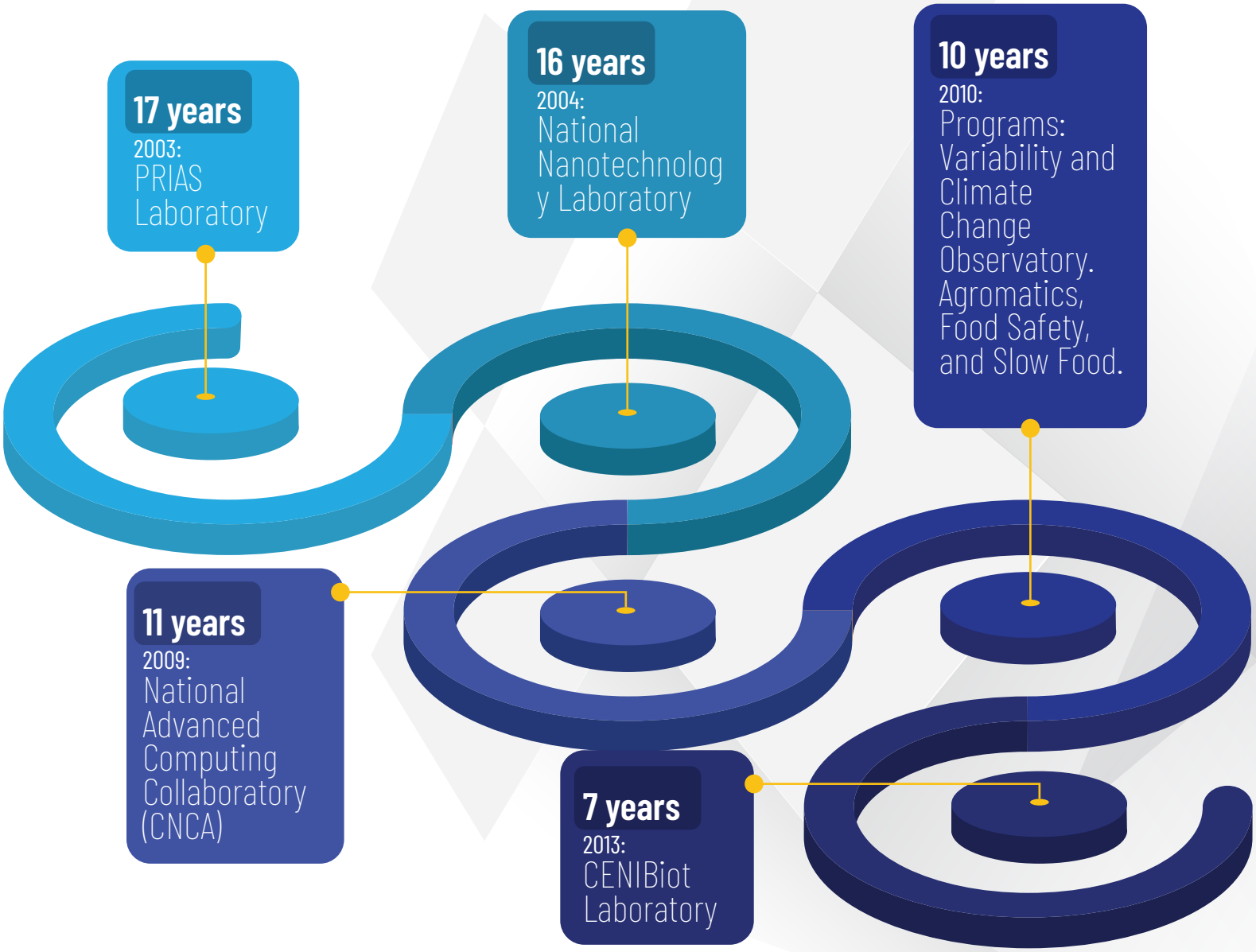
PRIAS Laboratory: It started in 2003.

Programs:

Variability and Climate Change Observatory, which started in the year 2010.

Agromatics, Food Safety, and Slow Food, which started in 2010.

CeNAT
2020


17 years
2003:
PRIAS Laboratory
16 years
2004:
National Nanotechnology Laboratory
10 years
2010:
Programs: Variability and Climate Change Observatory. Agromatics, Food Safety, and Slow Food.
11 years
2009:
National Advanced Computing Collaboratory (CNCA)
7 years
2013:
CENIBiot Laboratory

Consejo Nacional de Rectores

Scientific Council comprised by CONARE Vice-Chancellors for Research

Director General of CeNAT

Science and Engineering of Materials

LANOTEC

- Knowledge Generation
- Knowledge transfer
- Internationalization
- Sustainability

Biotechnology

CENIBiot

- Knowledge Generation
- Knowledge Transfer
- Internationalization
- Sustainability

Advanced Computing

CNCA

- Knowledge Generation
- Knowledge Transfer
- Internationalization
- Sustainability

Environmental Management

PRIAS

- Knowledge Generation
- Knowledge Transfer
- Internationalization
- Sustainability

Agromatic Climate Change

- Knowledge Generation
- Knowledge Transfer
- Internationalization
- Sustainability

Science, Culture, and Society

- Knowledge Transfer
- Internationalization
- Sustainability

Directorate of CeNAT

The year 2020 was an atypical year worldwide, leading all organizations to a complete reorganization in managing processes, both in operational and project development activities.

The managing actions of CeNAT's Directorate, as defined in the constitution deed of the Centro Nacional de Alta Tecnología are:

> It seeks the correct performance of CeNAT, following the guidelines dictated by CONARE and the strategic lines defined by the Scientific Council.

From the directorate, the strategic themes of the Center are overseen, including:

- Monitoring and execution of agreements and conventions of CeNAT.
- Establishment of the operational tactics and goals to be developed by the organization.
- Supervision of the Science, Culture, and Society area, which integrates the programs: CeNAT Teaching, CREATEC, and CeNAT-CONARE Scholarships.
- Continuous follow-up to the actions carried out by each area and program attached to CeNAT.

Stock Photo, 2019

CeNAT
Teaching

Knowledge transfer activities are fundamental axes of the Centro Nacional de Alta Tecnología. CeNAT Teaching holds lectures, workshops, and conferences aimed at different sectors of society, government, and academia, taught by global leading national and international experts, linked to activities and/or projects of CeNAT, in scientific and technological subjects.

In 2020, CeNAT Teaching was not operational.

Relevant Talks:

In 2020 there was participation in relevant talks, which are listed below:

1. **Importance of Metrology in scientific research and innovation: Nanotechnology in Costa Rica,** World Metrology Day, organized by ASOMET, May 2020, taught by Dr. José Vega Baudrit, with national reach.

2. **Development of nanotechnology in the region,** organized by CONICIT, on the Facebook platform, Costa Rica, October 2020, taught by Dr. José Vega Baudrit, with both national and international reaches.

3. **Biomedical problems: need to solve them and application examples.** Opening Conference, Organizing Committee: The Biomedical Engineering Club and the EMBS Chapter of the Yachay University, Ecuador, First Contest of Biomedical Devices (CBD 2021), December 2020. International reach. Taught by Dr. José Vega Baudrit.

4. **Impact of LANOTEC's research on the Costa Rican health sector.** Conference taught in the Month of Science, coordinated by MICITT, CONICIT, virtual platform, with national reach, August 2020. Taught by Dr. José Vega Baudrit.

5.

Latin America in the face of the COVID-19 pandemic: Nanotechnological solutions. Conference organized by the Copa Tecnociencias International Fair in Paraguay. Virtual-Online modality, 2020. National and regional reach, Paraguay, December 2020. Taught by Dr. José Vega Baudrit.

6.

Impact of management systems in nanotechnology laboratories on public health: the case of LANOTEC. Cycle of Virtual Conferences, June 2020, Organized by PROCAME, National University, with national impact, taught by Melissa Camacho Elizondo, M.Sc.

7.

Nanotechnology and Medicine: LANOTEC before COVID-19. Organized by CUCEI at the University of Guadalajara, Mexico, on a regional platform, taught by Dr. José Vega Baudrit, October 2020.

8.

Nanotechnology in Costa Rica. April 2020, national reach, organized by Universidad Latina de Costa Rica. Taught by Dr. José Vega Baudrit.

9.

Innovation processes at research centers: success stories at LANOTEC, CeNAT-CONARE,"Dialogue in bioeconomy: the UNA at the service of national development" Workshop, Vice-Chancellorship for Research, National University, taught by Dr. José Vega Baudrit, national impact, November 2020.

10.

Latin America in the face of the COVID-19 pandemic: Nanotechnological solutions, within the framework of the 2020 Nanoandes Network, Colombia, December 2020, taught by Dr. José Vega Baudrit, regional impact.

11.

Biorefinery processes of pineapple by-products to obtain materials in Costa Rica, Nanoandes 2020 Event, Peru, International Nanoscience Workshop for the environment and health, Nanoandes Network 2020, November 2020, taught by Dr. José Vega Baudrit, with regional impact.

12.

Nanomaterials in Costa Rica. Nanomaterials Workshop in Bolivia and Latin America, La Paz, Bolivia, December 2020, taught by Dr. José Vega Baudrit, with regional impact.

13.

Nanotechnology in Costa Rica. ACS event, Student Chapters of the American Chemistry Society in Costa Rica, National University (UNA), University of Costa Rica (UCR), and Costa Rica Institute of Technology (TEC), 1 ACS-CR Interuniversity Congress on Green Chemistry and Clean Technologies, taught by Dr. José Vega Baudrit, Costa Rica, regional impact, November 2020.

14.

Nanocellulose obtaining and applications: Biorefinery processes of pineapple by-products. Lecture taught as part the Biorefinery and circular economy in the industrialization of agro-industrial production chains course. Valuation in bioactives and materials, Montevideo, Uruguay, BIORRECER CYTED Network, Ibero-American regional reach, taught by Dr. José Vega Baudrit, November 2020.

15.

Morphological and mechanical properties of astrocytes treated with immunoglobulins from healthy and sick patients. II Conference on Clinical Bioinformatics: Innovations and Achievements in Human Health, October 2020, on an international platform, taught by Dr. Yendry Corrales, Costa Rica.

16.

The biorefinery of biomass pineapple waste as a case for a sustainable bioeconomy and environmental impact in Costa Rica, II Virtual Seminar in Support of the National Bioeconomy Strategy, ILSI Mesoamerica, Taught by Melissa Camacho, M.Sc., Costa Rica, regional impact, November 2020.

17.

Development of advanced metrological tools for the characterization of nanomaterials: application to the sonochemical synthesis of silver nanoparticles. Speakers: Dr. José Vega Baudrit, director of LANOTEC, and Bryan Calderón Jiménez, Head of the Department of Chemical Metrology LCM, organized by LCM and LANOTEC, with national reach, August 2020.

18.

Extracellular nanostructures as inspiration for designing novel materials. Taught by Dr. Yendry Corrales Ureña. Webinar organized by the CYTED Nanocelia Network, Argentina, with Latin American reach, July 2020.

19.

Nanotechnology and biorefinery in Costa Rica. Presented by Melissa Camacho Elizondo, M.Sc. Webinar organized by the CYTED Nanocelia Network, Argentina, with Latin American reach, June 2020.

20.

Webinar: The Role of the Innovation Agency in Local Economic Development. Exposition: **Centro Nacional de Alta Tecnología as a success story in innovation.** Organized by the Government of Mendoza, Argentina, Thursday, November 5, 2020. Taught by Allan Campos Gallo, MBA. Eng.

21.

Lecture: Research in times of crisis. Organized by the Antioquia High Technology Center (CTA), Thursday, November 12, 2020. Taught by Dr. Randall Loaiza Montoya, Ph.D.

22.

Central American Aerospace Symposium. Aerospace Technology collaborating with the new normal. Lecture: Research in Earth Observation from the PRIAS Laboratory, organized by the Central American Aeronautics and Space Association (ACAE)-CeNAT, on a virtual platform, November 2020, taught by Cornelia Miller, Eng., with a regional reach.

23.

Satellite Technology Course: Use of Geographic Information Systems (GIS) software, Python programming, and basic knowledge of remote perception. Organized by the Nicaraguan Council of Science and Technology of Nicaragua (CONYCIT), on a virtual platform, October 2020, taught by Esteban Castillo, Iván Ávila, and José Hernández, with international impact.

CeNAT-CONARE

Scholarship Program

On the initiative of the Deans of CONARE's member universities, in 2013, the scholarship program started, which is aimed to encourage students enrolled in the state universities to develop final graduation or research works, linked to the areas of CeNAT.

The objectives and topics of these research works and theses should be directly linked to the competence topics of LANOTEC, CNCA, CENIBiot, PRIAS, and Environmental Management, according to specific contests that are held at public universities, which are disseminated by the institutional media and by the Vice-Chancellorships for Research at each university.

The scholarship process begins in September of each year, to allocate the selected scholarships in March of the following year, but due to the pandemic, the scholarships began in June 2020 and are projected to conclude in March 2021.

The 2021 scholarship process began in November 2020, to begin execution in June 2021.

Stock Photo, 2020

Table 1. **Assigned Scholarships from 2017 to 2020**

2019 CENAT-CONARE SCHOLARSHIPS BY UNIVERSITY AND LABORATORY

UNIVERSITY	LANOTEC				CENIBIOT				ENVIRONMENTAL MANAGEMENT				CNCA				PRIAS				TOTAL / UNIVERSITY			
	2017	2018	2019	2020	2017	2018	2019	2020	2017	2018	2019	2020	2017	2018	2019	2020	2017	2018	2019	2020	2017	2018	2019	2020
UCR	1	3	1	5	4	5	4	4	-	1	1	-	2	1	5	2	-	-	1	-	7	10	12	11
UNA	1	2	-	1	-	1	-	-	1	1	1	-	-	-	-	1	2	2	1	-	4	6	2	2
UNED	-	-	-	-	-	-	-	-	1	-	2	1	-	-	-	-	2	-	1	-	3	-	3	1
TEC	2	1	2	2	2	1	-	1	-	-	-	1	-	3	1	-	-	1	2	1	4	6	5	5
UTN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL / LABORATORY	4	6	3	8	6	7	4	5	2	2	4	2	2	4	6	3	2	3	5	1	18	22	22	19

Source: Information on the year 2020 provided by the Laboratories and Area of CeNAT.

Table 2. **Individualization of the Assigned Scholarships**

N°	Student	Proposal	University	Area / Laboratory
1	Joseph Ibrahim Cabraca Vargas	Development of a stable anti-fungal formulation by extraction and purification of peptaibols produced by Trichoderma asperellum.	Universidad de Costa Rica (University of Costa Rica, UCR)	CENIBiot
2	Samara López Ramírez	Optimization of Methods for Determination of the Transfection Efficiency and Cytotoxicity of Murine T Lymphocytes Transfected with LGAPEI Nanoparticles.	Costa Rica Institute of Technology (Instituto Tecnológico de Costa Rica, TEC)	CENIBiot
3	Luis Diego Arias Chavarría	Evaluation of the viability of conidia of Trichoderma spp. microencapsulated as a strategy to prolong the useful life of the fungus as a biological control agent.	National University (Universidad Nacional, UNA)	LANOTEC
4	Adriana Fallas Cosío	Radiometric and hyperspectral characterization of agroforestry plantations as indicators of physiological development and nutritional status.	Costa Rica Institute of Technology (Instituto Tecnológico de Costa Rica, TEC)	PRIAS
5	Krissia Johanna Wilhelm Romero	Nanotechnology applied to the improvement of the biological activity of curcumin and Bis-demethoxycurcumin: preparation of nanostructured materials.	Universidad de Costa Rica (University of Costa Rica, UCR)	LANOTEC
6	Silvia Fernández	Effect of lactic acid bacteria (LAB) on the growth of Salmonella enterica Thyphimu rium LT2 applied to MD-2 hybrid pre-cut pineapples (ananas comosus).	Universidad de Costa Rica (University of Costa Rica, UCR)	CENIBiot
7	Juan Miguel Zúñiga Umaña	Morphological characterization of the diversity of coffee rust (Hemileia vastatrix Berkeley & Broome), based on uredinia and uredospores: an approach to its genetic diversity.	Universidad de Costa Rica (University of Costa Rica, UCR)	LANOTEC

N°	Student	Proposal	University	Area / Laboratory
8	Manuel Zumbado Corrales	Description and characterization of seismic-volcanic signals using signal processing techniques based on Deep Learning.	National University (Universidad Nacional, UNA)	CNCA
9	Carlos Víquez	Teraphoside spiders as possible vectors of vesicular stomatitis.	National Distance Education University (Universidad Estatal a Distancia, UNED)	Environmental Management
10	María Isabel Quirós Fallas	Crystal Engineering applied to the formation of Saquinavir and Piperine co-crystals.	University of Costa Rica (UCR)	LANOTEC
11	Esteban José Rodríguez	Study on the association between the candidate disc1 gene and psychosis in the Costa Rican population.	University of Costa Rica (UCR)	CNCA
12	María Fernanda Francis Cartín	Identification of rare copy number variants in a family with a high prevalence of psychosis.	University of Costa Rica (UCR)	CNCA
13	Marcel Jiménez Fallas	Production of enzymes with cellulase activity by a filamentous fungus for the use of lignocellulosic biomass available in Costa Rica, as an inducer of enzymatic activity.	University of Costa Rica (UCR)	CENIBiot
14	Rodrigo Alberto Muñoz Arrieta	Study of the metabolomic profiles associated with the consumption of a cas (Psidium friedrichsthalianum) extract in urinary excreta of Wistar rats.	University of Costa Rica (UCR)	CENIBiot
15	Deilin Tatiana Ureña Portuguez	Evaluation of an alternative adsorbent material to activated carbon from the biomass generated in the preparation of the coffee drink.	Costa Rica Institute of Technology (TEC)	LANOTEC
16	Miguel Benavides	Genetic, genomic, and histological characterization of a sexual mutation in Carica papaya (Caricaceae).	University of Costa Rica (UCR)	LANOTEC
17	Adrián Villalobos Cano	Design of a system for automatic acquisition of samples in a bioreactor.	Costa Rica Institute of Technology (TEC)	LANOTEC
18	Josué Isaac Cordero Guerrero	Printed monolayers in Nanometric Patterns: A green Chemistry approach to achieving Hydrophobicity and its potential application as a Bacteria repellent.	Universidad de Costa Rica (University of Costa Rica, UCR)	LANOTEC
19	Fiorella Calderón Jiménez	Design of a Mobile Research Center powered by clean energies	Costa Rica Institute of Technology (TEC)	Environmental Management

Source: Information on the year 2020 provided by the Laboratories and Area of CeNAT.

CREATEC

OpenLAb:
Program for Creativity and Entrepreneurship in High Technology

In March 2020, a very successful stage in the history of CREATEC culminated with the execution of the contract for the technological entrepreneurship incubation program called Costa Rica Open Future Program for Creativity and Entrepreneurship in High Technology (CREATEC).

The organizers and partners of this program were CeNAT, Telefónica de Costa Rica, the Ministry of Science and Technology, and the Ministry of Economy, Industry, and Commerce.

During the 6 years of the program, more than 70 projects were incubated and more than 600 applications were received, thus marking a positive impact on the entrepreneurial ecosystem of Costa Rica.

Upon completion of this program in 2020, a re-planning of an incubation project was undertaken by the Coordination, with improvements in the support program for entrepreneurs and the search for allies to make it a reality.

In November 2020, the company Philip Morris Costa Rica agreed to be part of the program, thus obtaining financing to resume the operation of the project in 2021, named OpenLab this time, and still being part of the Program for Creativity and Entrepreneurship in High Technology (CREATEC).


LANOTEC
Laboratorio Nacional de Nanotecnología

LANOTEC Annual Operational Plan

(CeNAT-CONARE) 2020

Scientific publications – Dissemination **26**

81 Knowledge transfer activities

Research Projects **13**

2 National / International Agreements

Attention to Students **42**

Background

The National Nanotechnology Laboratory (LANOTEC) is attached to the Centro Nacional de Alta Tecnología (CeNAT). On October 18, 2004, it started conducting research with the goal of being a technological leader in the Central American and the Caribbean region, with cutting-edge engineering on the study of advanced materials for research, design, and training in technologies associated with microtechnology, nanotechnology, and materials science.

In addition, it allowed to expand knowledge development and to collaborate with human capital formation, scientific research, and to contribute to developing specific applications for the productive sector in different types of industries, such as materials, polymers, microbiology, medicine, geophysics, and space exploration, among others.

LANOTEC currently has three established areas on which focuses its work, which are scientific research, innovation-entrepreneurship, and certification under the ISO 17025 Standard, as well as teaching and extension programs.

Since the COVID-19 pandemic began, LANOTEC -as well as the other CeNAT laboratories- undertook the task of enforcing the necessary indications of the protocol to avoid contagion. This protocol was established and coordinated by the respective authorities of FunCeNAT, CeNAT, and CONARE, with the support of the researchers and the coordination of LANOTEC. It was not an easy task. LANOTEC did not close completely, so many of its tasks such as the Service Provision Unit and some research projects continued during this period, thanks in part to the commitment of LANOTEC collaborators. Communication processes with companies continued. There was a substantial increase in collaborations and projects instead; likewise, publications in indexed journals almost doubled, through various government and autonomous bodies.

In the context of the pandemic, an attempt was made to collaborate with some medical devices for protection and sample-taking in the fight against COVID-19. Some initiatives were presented before national and international bodies, and some of them are in execution. The most important thing about this first pandemic year was the degree of collaboration of all LANOTEC researchers, who always said "present" when required. Difficult times always show what people are made of and the LANOTEC team is made of bravery, courage, and love for their work and the institution they represent.

Philosophical
Framework

LANOTEC Development Objective

To generate scientific value from nanobiotechnology to process and product innovation initiatives that impact economic development and the Sustainable Development Goals of Costa Rica.

Mission Statement

We are a research laboratory for the use of nanobiotechnology that has specialized professionals who carry out studies with the highest scientific standards in the framework of innovation and development for the public, private, and social sectors of the Region.

Vision Statement

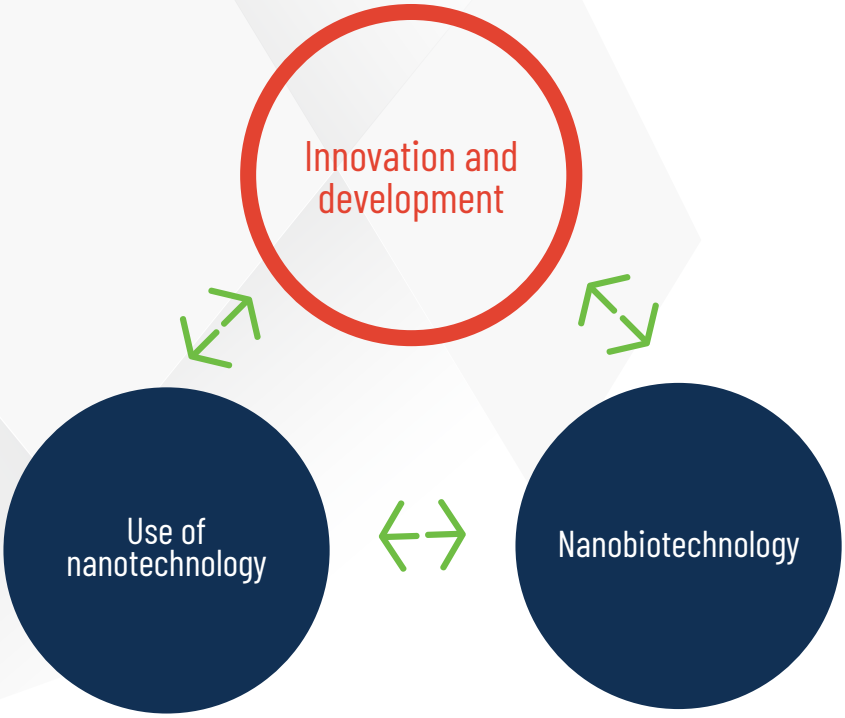
At LANOTEC, respect for Human Rights is enforced, especially the right to life, liberty and security of every person. Likewise, there is awareness about the environment and it is expected that the designed products and developments avoid pollution and preserve the environment.

Values Enforced at **LANOTEC**

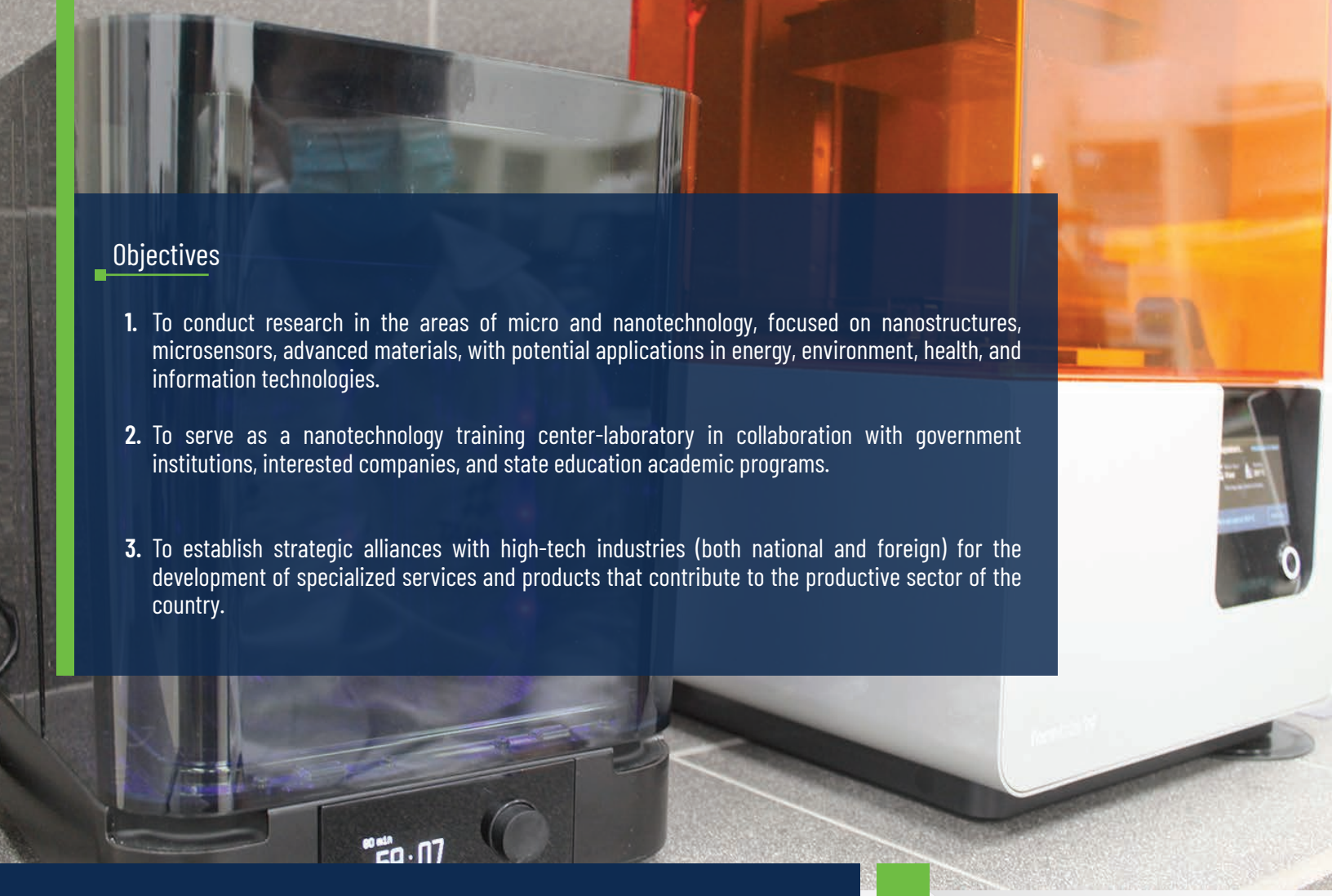
- Collaborative management in the projects that are undertaken
- Socialization of scientific information
- Responsible project management
- Commitment to the processes and products that are undertaken

Principles Enforced at **LANOTEC**

- Efficient use of time
- Efficient use of technological infrastructure
- Accountable administrative management of research projects
- Generation of ideas for process improvements



Operational Structure of
LANOTEC



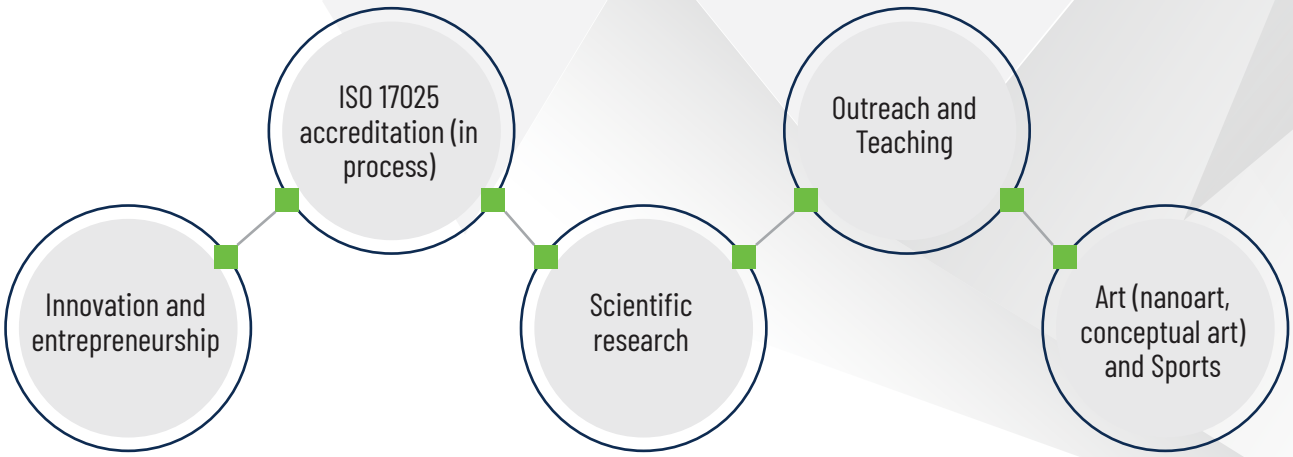
Objectives

1. To conduct research in the areas of micro and nanotechnology, focused on nanostructures, microsensors, advanced materials, with potential applications in energy, environment, health, and information technologies.

2. To serve as a nanotechnology training center-laboratory in collaboration with government institutions, interested companies, and state education academic programs.

3. To establish strategic alliances with high-tech industries (both national and foreign) for the development of specialized services and products that contribute to the productive sector of the country.

Strategic **Nodes**



Impact Indicators

Publications

Indexed:

26

Knowledge Transfer

6
Participations at national workshops

42
Participations at national courses / symposia / conferences

12
Participations at international courses / symposia / conferences

16
Courses, symposia, congresses, and talks taught at the national level

4
Courses, symposia, congresses, and talks taught at the international level

1
Internship for collaborators at the international level

350
People benefited from knowledge transfer

Research Projects

6
projects with the private sector:

- Obtaining starch from cassava by-products for the generation of biobased polymeric films
- Biodegradable plastic bottle analysis and characterization, FIFCO.
- Project with Stein Laboratories
- PINN: Generation of agro-industrial capacities and creation of a comprehensive unit (physical-chemical, organoleptic, and microbiological characterization) to improve the production process of Turrialba cheese with Designation of Origin.
- Production and characterization of bacteria-repellent microcontact printed substrates and bactericidal nanostructured surfaces.
- HORIZONTE 2020, H2020: Automated functional screening of IgGs for diagnostics of neurodegenerative diseases (AUTOIgG).

2
internal projects:

- Nanostructures with bactericidal potential.
- Synthesis and applications of quantum dots of graphene.

3 FEES Projects:

Name	Subject	Product
Molecular bases for interaction and degradation of the vascular basement membrane by hemorrhagic metalloproteinases of snake venoms.	Mechanisms of action of venom hemorrhagic toxins (SVMPs).	• Scientific dissemination
Emerging technologies applied to improving the anti-inflammatory effect of bioactive substances: new nanomaterials of curcumin and proanthocyanidins.	Selective and enriched obtaining of curcuminoids from Curcuma longa, the largest source of curcumin, as well as extracts rich in proanthocyanidins from U. tomentosa, a proven source for its in-vitro antioxidant and anticancer activities.	• Talks and conferences • Scientific Paper
Creation of biocompatible scaffolds using 3D printing, for their implementation in studies of cellular biophysics and bone tissue engineering.	An alternative to treat congenital craniofacial malformation.	• A scientific publication. • Final graduation thesis. • A specialized international conference or symposium. • Nationwide lectures

2 Scientific vocation projects

Name	Subject	Product
Eureka - FIFCO - ISEF Workshop	Approaching students to scientific process and development of research projects with the aim to train future scientists for Costa Rica.	• The project was not able to develop as planned, since due to the health crisis all events had to be canceled
Nanoprofessor -MEP, MIDEPLAN, ANII, Uruguay-: Conceptualization and dissemination of nanotechnology to promote scientific vocations in elementary school boys and girls in Costa Rica.	Approaching elementary school teachers to the scientific process and nanotechnology, with the aim of promoting scientific vocations at an early age.	• Training • Support material on nanotechnology • Work guides

2 Project proposals under negotiation:

1. Optimization of solid lipid nanosystems and in silico and in vitro studies of inhibitor candidates of the SARS-CoV2 virus.

2. Evaluation of the degradation of plastic samples after aging through home composting.

1 Private Sector

1. Study of materials (no further information can be provided due to the Confidentiality Agreement).

Attention to Students:

42 students at the lab:

- 12 CeNAT-CONARE Fellowship students
- 9 accompaniments in graduation or thesis projects
- 11 interns
- 3 volunteers
- 7 supervised professional practices

Articulations:

Academic sector:

- Articulations with the five public universities, through research projects and FEES projects, including scientific vocation projects and preparation of students for the representation of Costa Rica at the International Chemistry Olympics editions, UDELAR University, Uruguay.
- Catholic University of Nicaragua
- Universidad Latina
- University of Belgrade, Serbia
- University of Friborg, Switzerland
- Bar-Ilan University, Israel

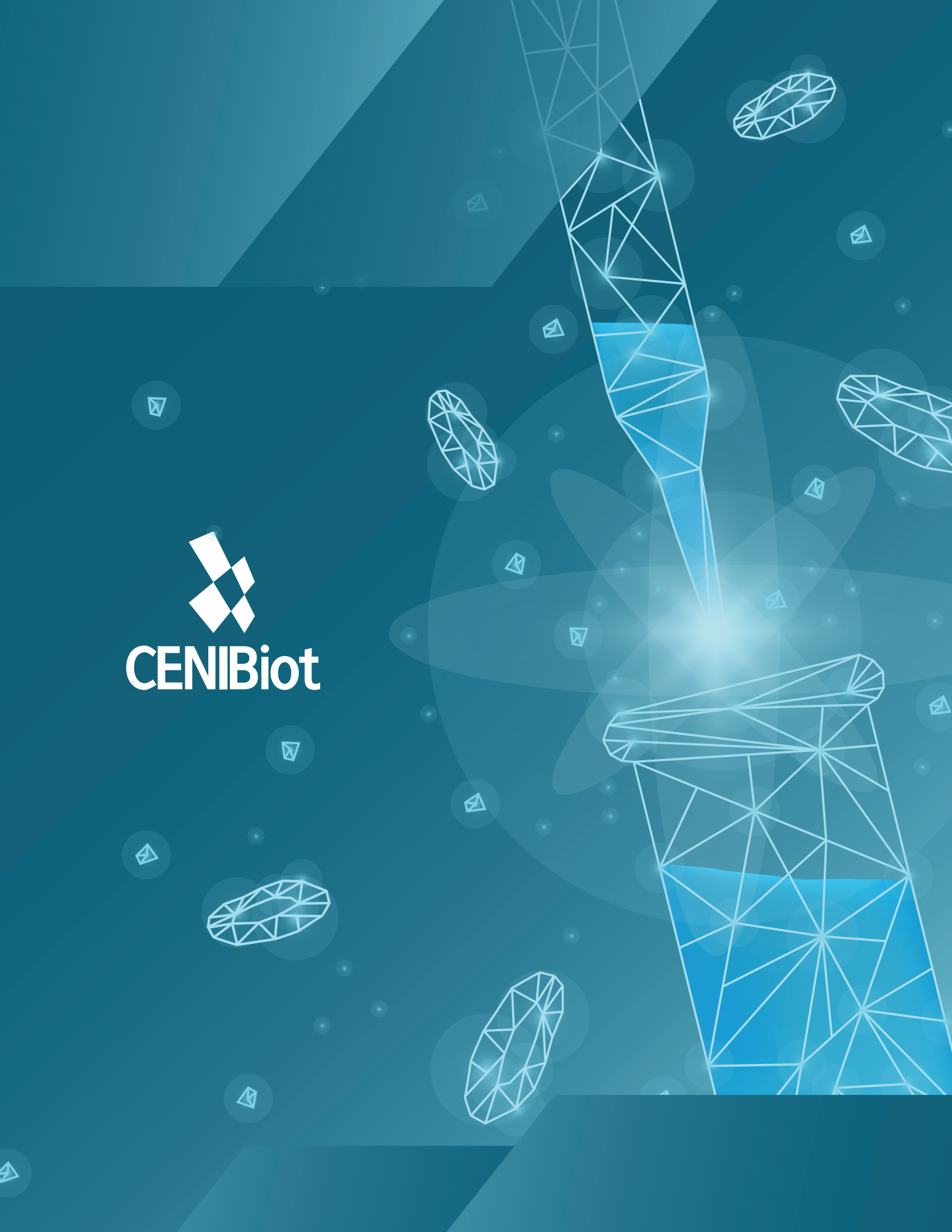
Partnership with international and national companies:

- PROQUINAL, STEIN
- Phillips Morris through scientific projects
- INTECO, through several work commissions
- Strengthening relationships with FIFCO through scientific projects and scientific vocations.
- Biomedical Companies (Establishment Labs., Smith & Nephew, Allergan, Boston, Hologic, among others)
- Cooperativa de Quesos Turrialba, through a PINN project.
- Ecoinsumos, through a PINN project.
- Naval Research Office, through fundraising for a research project through Grants. Gov.
- European Union, through H2020 funds.

Agreements

National Museum of Costa Rica

National Institute for Learning (INA)


CENIBiot

CENIBiot Annual Operating Plan

(CeNAT-CONARE) 2020

Scientific Publications **10**

15 Knowledge transfer activities

Research Projects **44**

2 Agreements

Attention to Students **61**

Background

The National Center for Biotechnological Innovations (CENIBiot) is an interuniversity Laboratory for research, development, innovation, and scaling up in biotechnology, attached to Centro Nacional de Alta Tecnología (CeNAT), with the financial support of Consejo Nacional de Rectores (CONARE).

It contributes to the generation of innovative biotechnological solutions and strategic partnerships between the academic, business, and government sectors, by supporting entrepreneurship with sound scientific and technological content of high added value, technology transfer, and university-business linkage. This way it will achieve its vision of being a "World-class interuniversity center in biotechnological innovation".

As an overall goal, CENIBiot aims to generate the most impact in each activity in which it participates. To achieve this, specialization in areas of knowledge and focus on strategic issues that have been identified as country needs are sought, by taking advantage of the installed capacity and supplemented by the strengths of the partners inside and outside CONARE.

CENIBiot seeks to lead efforts to do more research, in collaboration with state universities and the private sector, but above all to develop innovative products that can be marketed, thus generating a significant increase in getting resources, and thus, contributing to its sustainability.

For CENIBiot, the year 2020 led it to prioritize projects that directly addressed the pandemic, such as the development of extraction protocols for the detection of the SARS-CoV-2 virus and projects with companies whose results would allow them to continue operating, such as the services provided to Thrive Care.

Virtuality was taken over for data analysis, research proposals, reports, and scientific article writing. To promote safety, maximum capacity quotas per work area were established in order to allow the entry of as many researchers as it was safe to host simultaneously.

Frequent discussions were also held to promote personal responsibility as the safest mechanism to prevent contagions within the laboratory, which served to generate a fluid and harm-free communication through which a vigilant attitude and the rapid identification of people at risk of possible contagion have been executed. The measures taken allowed the laboratory's productivity not to decrease in 2020 and significant progress was made in the flagship collaboration projects with organizations such as CoopeTarrazú/UCR, CoopeAtenas/UTN, and AgroSpheres of the United States.

Philosophical
Framework

CENIBiot Development Objective

To generate biotechnological research that contributes to the Sustainable Development Goals for Costa Rica, through scientific projects and impact innovation that contribute to society in the economic, social, and environmental fields, through the exchange of knowledge, services in science, and alliances with the business sector.

Mission Statement

We seek to be a biotechnological research and development laboratory that works with high scientific standards and where higher education in Costa Rica, public and private sectors converge to accelerate scientific and technological innovation.

Vision Statement

We are a self-sustaining laboratory with high scientific, economic, and social impact at the national and international level that strengthens competitive development through scientific rigor and intersectoral articulation.

Values Enforced at **CENIBiot**

- Human team care
- Ongoing learning attitude
- An attitude of amazement at the findings and achievements obtained
- Collaborative management in the projects that are undertaken

Principles Enforced at **CENIBiot**

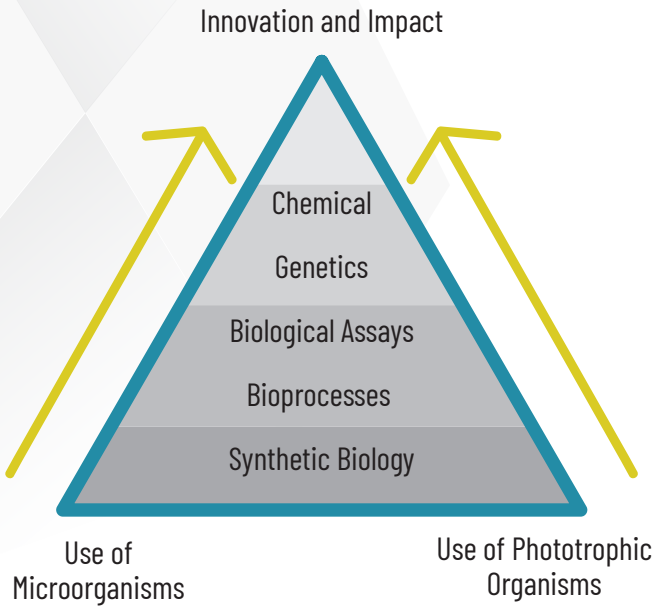
- Supportive and efficient use of scientific equipment
- Accountable administrative management of research projects
- Willingness for constant improvement of the projects that are undertaken

Operating Structure of **CENIBiot**

The organizational structure of CENIBiot (CeNAT-CONARE) comprises five research groups. This way, the general strategic activities of CENIBiot are obtained from the specific actions developed by five research leaders, who lead, supervise, and collaborate in the development of personnel who are in the training stage with less experience in research, in coordination with the director. The groups overseen by the project coordinators are dynamic and are made up of members with different academic profiles.

In addition, projects in association with the CONARE Universities and the country's productive sector are promoted.

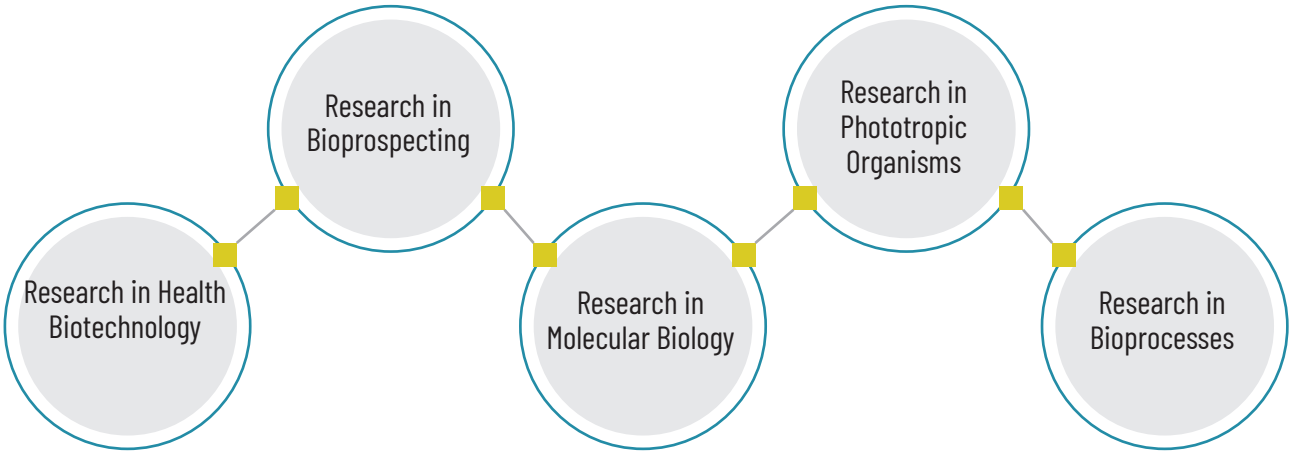
The illustration below details the current distribution of the areas of orientation of the CENIBiot (CeNAT-CONARE) research groups, describing the general action subjects of each one, which are competent to their role of service and support for biotechnological development of the country and the region.



Strategic **Objectives**

1. To achieve an effective consolidation of links and strategic alliances with the academia, the business sector and the government.
2. To position CENIBiot as a specialized center in industrial bioprocesses, for both scientific and business development.
3. To have a structured and optimized quality management system.
4. To improve the professional development of the human capital of CENIBiot.

Strategic **Nodes**



CENIBIOT
indicators

Publications

Indexed : **10**

Articles in review for publication **23**

Knowledge Transfer

14	1	42
Participation at national courses/symposia/conferences	Participation at international	Participation at international courses/symposia/conferences

Projects

3
FEES Projects

23
Internal Projects

3
Linking Projects

10
Projects with other funds

5
Vice-Chancellorships for Research

9
Proposals in negotiation

3
linking projects:

- Easy and accessible SARS-COV-2 detection protocol for screening of large populations in Latin America.
- Co-production of metabolites and value-added compounds in lactic acid bacteria (DFG).
- Nanoencapsulation of Bacillus for the control of Radopholus similis (pathogenic nematodes of banana) – CORBANA.

10
projects funded by MICITT:

- Application of nanobiotechnology for the development of carrier-in-a-carrier transport systems for nucleic acid transfection, FI-215B-17(CONICIT).
- Bioprospecting for new extremozymes in Costa Rican volcanic environments, FI-255B-17 (MICITT).
- Biotechnological production of terpenes from endemic species of Costa Rica, for the control of Fusarium oxysporum f.sp. cubense, a causal agent of Panama disease in banana plantations (Musa spp.), FI-254B-17(MICITT).
- Use of agro-industrial waste through the development of bioprocesses to produce common and fine chemical products (MICITT).
- Design of collagen-based medical devices for tissue regeneration, from the use of by-products from the aquaculture industry (GTR).
- Formulation of a peptide-based biofungicide extracted from Trichoderma asperellum and evaluation of its ecotoxicity and safety, FI-048B-19 (MICITT).
- Bioles as a source of inspiration for the generation of new native microbial biostimulants for Costa Rican agricultural innovation, FI-041B-19 (MICITT).
- Study of the physicochemical and microbiological defense mechanisms of the eggs of Costa Rican forest birds - SIPPRES.
- Search for antimicrobial-producing bacteria in the fur of sloths of the Choloepus and Bradypus genera from Costa Rica.
- Microorganisms associated with solar panels and their potential for the production of natural pigments: A pilot study of the University of Costa Rica - SIPPRES.

5
Projects with Research Vice-Chancellorships:

- Profiling and validation of the downstream molecular pathophysiology of the hyperstimulation of NRG1-ErB4 relevant to schizophrenia (VIE).
- Bioprospecting of hydrocarbon degrading microorganisms from oil exploration wells in Costa Rica. Code 809-B8-518 (SIPPRES 2019).
- Characterization of the microbiota associated with the biodegradation of historical documents of Costa Rica VI-4921-2019 (SIPPRES 2019).
- Genomic and postgenomic analysis of the biosynthetic pathways of antibiotic production in Streptomyces sp M54. -4953-2019 (2019).
- Research of the downstream neuronal path of Neuregulin-2. (VIE).

23 internal projects:

- Anatomical description and in vitro culture of Hamelia xerocarpa.
- Anatomical description and in vitro culture of Spachea correare.
- Genotyping of the Costa Rican cas.
- Production and characterization of peptides with antifungal activity from Trichoderma asperellum (peptaibols).
- Evaluation of the efficacy of an experimental treatment for Chagas disease using purified fractions from plants of the Hamelia genus, collected in Sarapiquí and the Osa Peninsula.
- Role of sorption in lymphocyte in-vitro proliferation .
- Construction of a vector based on Tellurite genes for the genetic manipulation of multi-resistant bacteria.
- Biodegradation of fungicides with endophytic strains of trichoderma.
- Microbiota associated with the biodeterioration of the works of art of the National Theater of Costa Rica.
- Production of lipotechoic acid (LTA) in Lactobacillus rhamnosus.
- Development of a method for quantification of pesticides in food matrices.
- Development of a method for extraction and quantification of alkaloids from the root of Ipecacuana.
- Mechanism of Cardiac Dysfunction induced by circulating histones.
- Safe Work Procedure (PST-CENIBiot).
- Development of methods for the sequencing and analysis by mass spectrometry of proteins, focused on the analysis of biosimilars.
- Preparation of protocols for handling equipment and training in analysis techniques-Bioprospecting.
- Extraction of lignin from different lignocellulosic biomasses to evaluate its use in the production of materials.
- Analysis of insecticidal components in plants and formulations-Coopetarrazú.
- Process of domestication of Coyol (Acrocomia aculeata) as a bioenergetic alternative in Costa Rica - fatty coyol fruits with edible and biofuel potential applications.
- Analysis on the consumption of nutrients in in-vitro models of sugar cane (Saccharum officinarum) using temporary immersion systems.
- Melina's genetic footprint.
- CENIBiot Operation
- Effects of endophytic fungi from plant isolates of the Rubiaceae family on the morphology and physiology of coffee plants.

3
FEES Projects:

- Production of bioactive compounds from isolates of the Ganoderma sp fungi for commercialization in the nutraceutical industry (FEES).
- Effects of endophytic fungi on the health and resilience of coffee plants - Trichoderma (FEES).
- Development of a food product from microalgal biomass of Arthrospira maxima with high nutritional value (FEES).

9
project proposals under negotiation:

- Proposal writing: Network of family agroecological productive systems in Latin America and the Caribbean (LAC), for the sustainable use of soils - FONTAGRO.
- Proposal writing: Preparation of recommendations for agroecological management of coffee cultivation and its impact on mitigating climate change.
- Design of an experimental laboratory for the production of anthuriums.
- Drafting of a proposal to MICITT: Increasing the production volume of Dracaena varieties through the use of in vitro culture: scaling with temporary immersion systems.
- Submitted proposal: Discovery of novel antivirals against SARS-CoV-2 derived from a collection of actinomycetes isolated from neotropical insects.
- Submitted proposal: Energy-and COst-effective water treatment technology to remove neonicotiNOID insecticides from agriculture wastewater (ECONOID).
- Submitted proposal: International Course on Applied Biodiversity.
- Submitted proposal: Formulation of a biofungicide based on peptides extracted from Trichoderma asperellum and evaluation of its ecotoxicity and safety.
- Submitted proposal: Multi-product lactic-acid bacteria process.

Attention to Students:

61
students at the lab:

- 9 CeNAT-CONARE Fellowship students
- 15 accompaniments in graduation or thesis projects
- 36 national interns
- 1 supervised professional practice

Articulations:

Academic sector of the country:

- Articulation with the five public universities through research projects, FEES projects, and projects with MICITT funds. In addition, with the attention of students provided during the year.

Articulation with international universities and institutes:

- University of Wisconsin, Madison
- Hamburg University of Technology (TUHH), Germany
- Leibniz Institute of Agricultural Engineering and Bioeconomy (ATB), Germany
- EARTH University

Partnership with international and national companies:

- Speratum
- Puro Verde Paraíso Forestal
- Marine Essence Biosciences
- Thrive Natural Care
- BIOTECH
- Coopetarrazú
- Del Monte Foods
- Brewers Association
- AgroSpheres
- Stein Corp.
- National Banana Corporation (Corbana)
- Inolasa
- Bio CR S.A.

Agreements

Specific Agreement between CeNAT/CENIBiot-UCR/CITA

INCIENSA-FUNIN Framework Cooperation Agreement

CNCA

Colaboratorio Nacional de
Computación Avanzada

CNCA Annual Operating Plan

(CeNAT-CONARE) 2020

Scientific Publications **7**

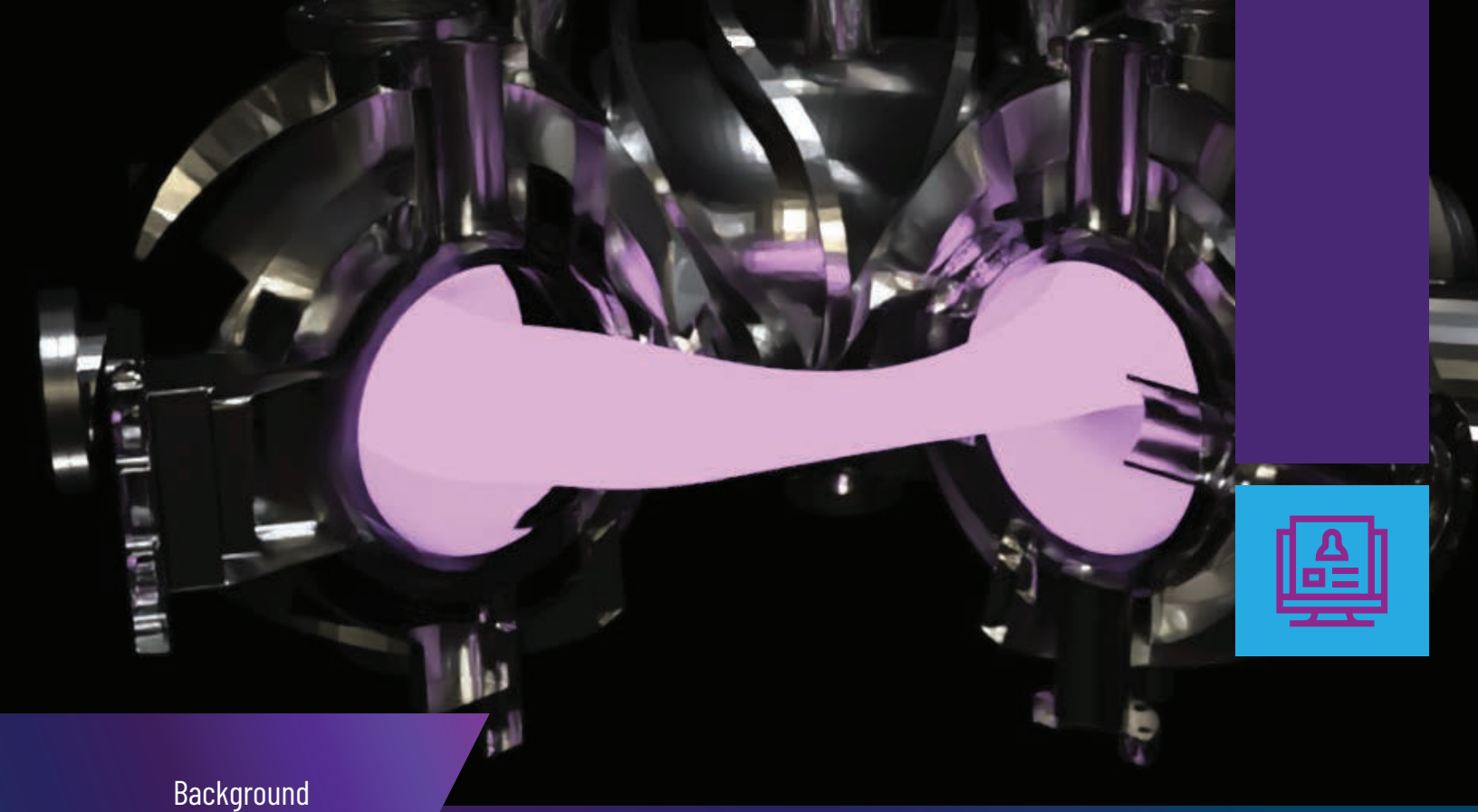
Research Projects **12**

Agreements **2**

39 Knowledge transfer activities

303 Cluster operation

8 Attention to Students



Background

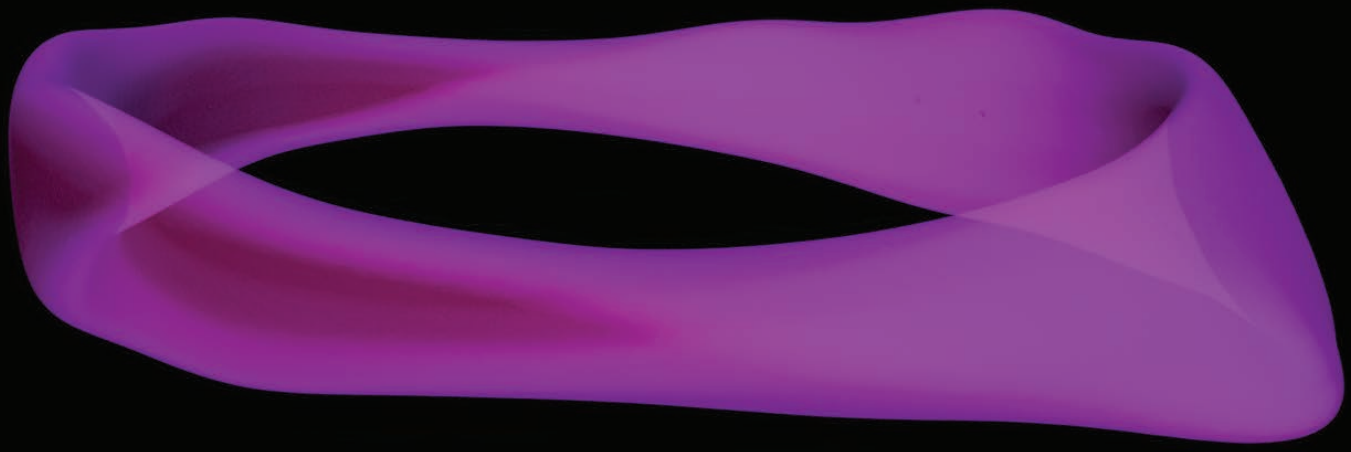
The National Advanced Computing Collaboratory (CNCA) is a multidisciplinary space where scientific discovery and technological innovation are accelerated, through the use of advanced computing infrastructure. This infrastructure includes not only specialized and updated hardware but also a set of efficient applications and trained personnel to take advantage of all that technology. This allows CNCA to work on the core dimensions of the development of research projects, training, and service delivery.

The CNCA aims to provide two pillars of scientific development to the Costa Rican community. In addition to theory and experimentation, simulation and analysis of data constitute fundamental pieces in the exploration of the knowledge frontier. To achieve this aspiration, computer hardware and software tools are essential. The work of CNCA members then deals with the computer cluster and the applications installed in it.

The CNCA must provide a computer infrastructure of excellence for the development of projects and services that allow the creation of high-impact solutions for society.

CeNAT's National Collaboratory for Advanced Computing (CNCA) carried out the following work method actions to deal with the health situation caused by COVID-19: i) Use of teleworking. The CNCA's activities are almost entirely teleworkable. With few exceptions, such as certain administrative tasks and work on the computational infrastructure, the work can be done remotely. This meant that few CNCA workers had to attend CeNAT sporadically to complete their assignments. ii) Virtual meetings. In order not to affect the interaction in the work teams in the different research projects, various platforms were used to hold periodic work meetings, including the weekly meeting of all CNCA plant members. iii) Virtual training sessions. A strategy was designed to move the entire portfolio of training workshops to a synchronous virtual format. Through online teaching platforms, it was possible to transform all training into a virtual modality, while maintaining the quality of these efforts.

Philosophical
Framework



Development Objective of the **CNCA**

To encourage the use of advanced computing in research with complex information that boosts development and innovation, contributing to the achievement of the Sustainable Development Goals in Costa Rica.

Mission Statement

We are a research laboratory that promotes the management of complex information, with professionals specialized in advanced computing who carry out studies with the highest scientific standards, innovating in technological development and articulating studies at a national and international levels.

Vision Statement

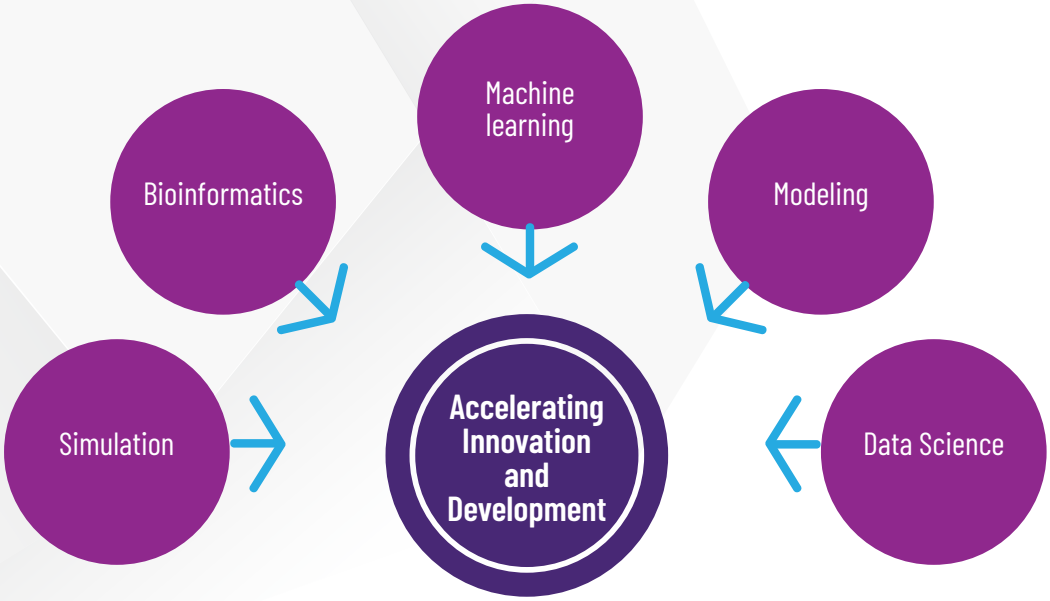
We aim to be a self-sustaining advanced computing laboratory with the highest technological infrastructure, impacting on both national and international innovation and development.

Values Enforced at **CNCA**

- Willingness to good human relationships
- Willingness to continuous learning
- Collaborative innovation at the laboratory work

Principles Enforced at **CNCA**

- Collaborative management in the projects that are undertaken
- Creativity in knowledge transfer
- Permanent communication within the work team
- Efficient use of resources



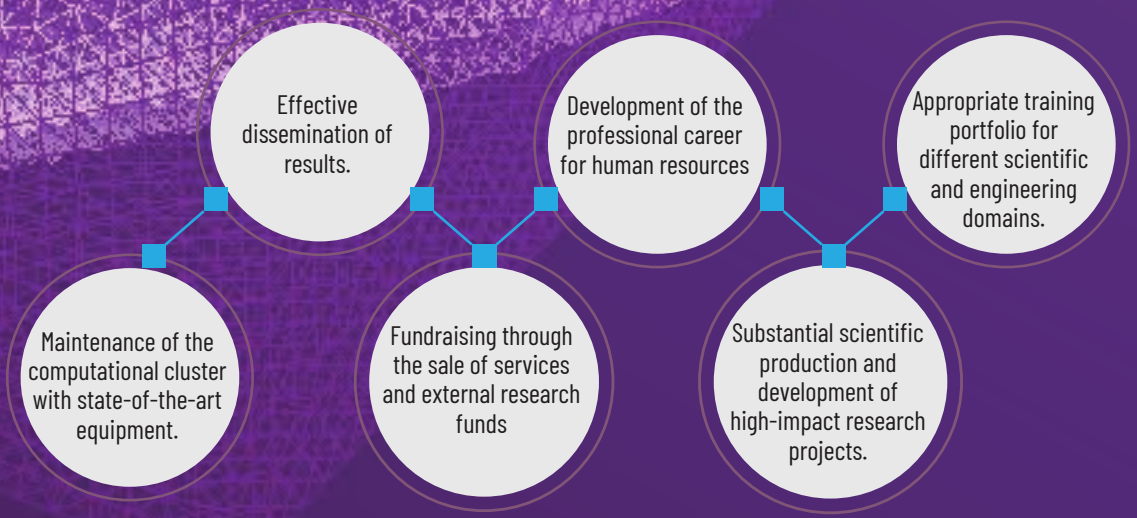
Operational Structure

CNCA

Objectives

1. To provide advanced computing infrastructure under constant improvement, update and use for scientific research.
2. To communicate effectively the results and activities of the collaboratory.
3. To create mechanisms to attract external funds.
4. To guarantee the professional growth of the members of the collaboratory.
5. To enhance the scientific production of the collaboratory.
6. To strengthen the training offer of the collaboratory.

Strategic **Nodes**



Indicators of the
CNCA

Publications

Papers
7

Indexed:
7
on SCOPUS

Knowledge Transfer

5 programming workshops on introduction to programming, scientific computing, and machine learning with Python language for different scientific domains.

6 Programming workshops on introduction to programming, statistical analysis, and data visualization with r language for different scientific domains.

2 Workshops on bioinformatic processing of genomic and metagenomic data.

3 Workshops on the use of the kabré cluster.

11 Advanced computing seminars were held, where an expert in the application of high-performance computing in a particular scientific domain presented their results.

2 Programming schools in advanced computing topics: high-performance computing and big data. Hpc school in face-to-face mode and costa rica big data school in virtual mode.

Total **39** knowledge transfers.

Total **718** people benefited from knowledge transfers.

Participations:

- 3 Participations at national courses/symposia/conferences
- 1 poster at academic congresses, meetings, or international forums
- 1 internship for the staff at an international level
- 5 certifications of laboratory staff

Research Projects

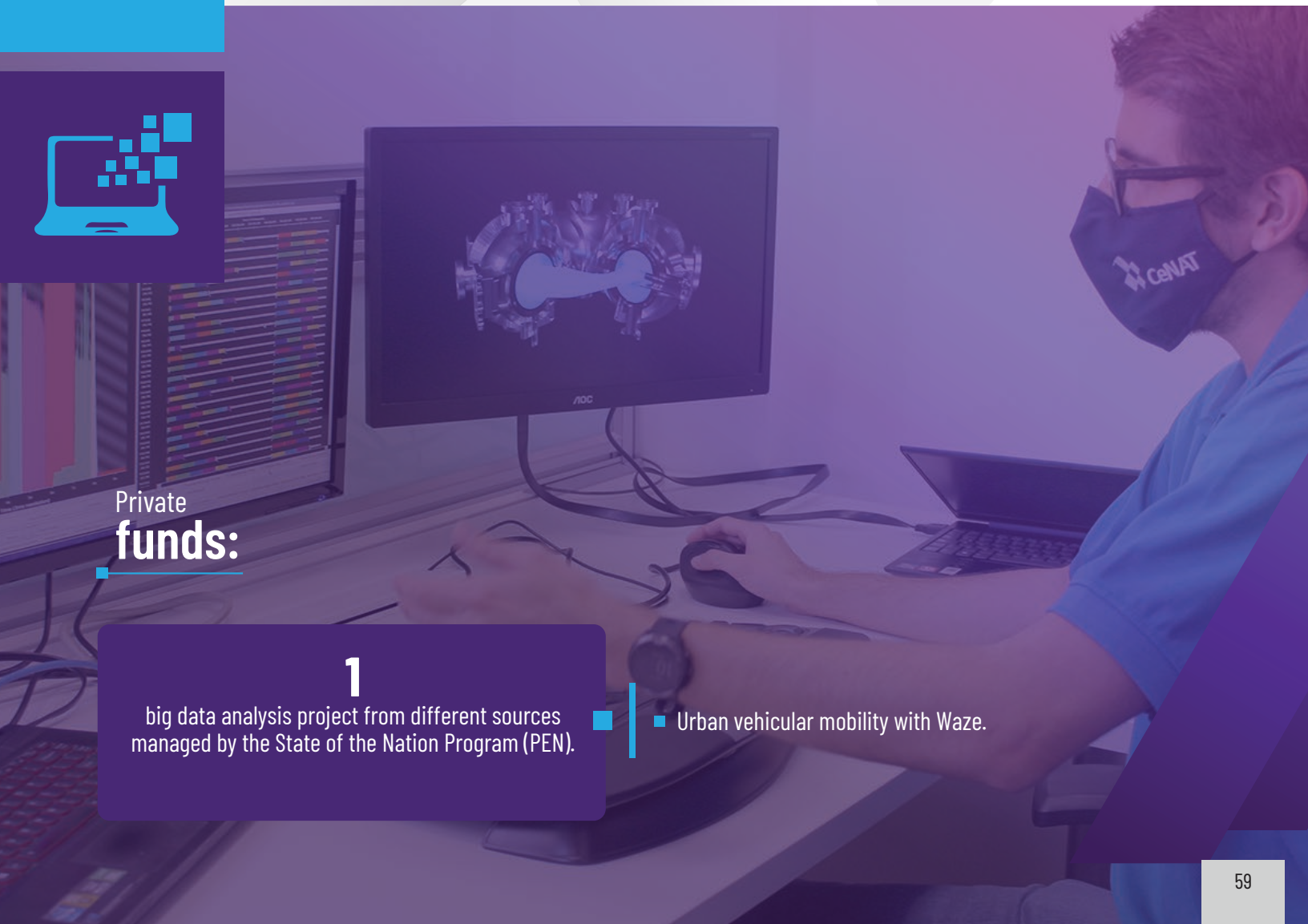
Public funds:

5 Research Projects in:

- 2 Simulation and modeling
- 2 Artificial Intelligence
- 1 Bioinformatics

6
awarded FEES projects:

- Transportation of atmospheric pollutants in the Western Central Valley: identification of atmospheric pollution sinks and their impact on metallic materials.
- Functional genomic analysis of cancer cells by interference RNA for the identification of regulatory networks associated with proliferation and death in response to genotoxic chemotherapy.
- Search for new antimicrobials in honey, the genome, and the microbiota associated with stingless bees (Meliponini, Apidae): use of omic techniques at the service of the Costa Rican meliponiculture.
- Implementation of a real-time automatic monitoring system for active volcanoes in Costa Rica.
- Fakenews: An interdisciplinary investigation on the spread of fake news in Costa Rica.
- Genomic diversity of Salmonella enterica and antimicrobial resistance genes in human, animal, and food populations in Costa Rica.



Private
funds:

1
big data analysis project from different sources managed by the State of the Nation Program (PEN).

- Urban vehicular mobility with Waze.

Computational Infrastructure:

303
days a year of operation of computer services that resulted in:

- 478 accounts with access to computing infrastructure services.
- 36,000 science hours in simulations and data processing.
- 394 cluster users.

Attention to Students:

5
students at the lab:

- 4 CeNAT-CONARE Fellowship students.
- 1 graduate intern.

Student support:

- 3 support in graduation or thesis projects

Articulations:

Academic sector:

- Articulation with the five public universities, through research projects and FEES projects.

Partnership with international and national companies:

- Costa Rica Institute of Technology (TEC)
- UTN researchers
- PRISLAB
- LANOTEC
- National Accreditation System for Higher Education (SINAES)
- National Seismological Network (RSN)
- Space Research Center (CINESPA)
- PIET- UNA
- State of the Nation Program (PEN)
- National Animal Health Service (SENASA)
- Applied Mathematics & Computer Simulation Group
- MIO-CIMAR UCR
- Research Center in Hematology and Related Disorders (CIHATA)
- eScience Program
- OVSICORI-UNA
- INCIENSA
- Laboratory for Research and Technological Innovation
- PlasmaTEC
- CENIBiot
- ParmaGroup
- DCILab
- PRIAS
- Ibero-American High-Performance Computing Network (RICAP)
- Advanced Computing System for Latin America and the Caribbean (SCALAC)
- Costa Rican Chamber of Information and Communication Technologies (CAMTIC)

RED CONARE

One of the services of RedCONARE and the ICT departments of the universities is Eduroam, which has the following indicators:

- Access to approximately 120,795 students and teachers.
- 106 participating countries in the Eduroam network.
- Operation in the 5 public universities of the Eduroam network (Costa Rica).
- Operation in the research centers located in each university and CeNAT of the Eduroam network.
- Through the agreement signed by the Consejo Nacional de Rectores (CONARE) and the Superintendency of Telecommunications (SUTEL), the Eduroam service joins the Connected Public Spaces program, through which the population is offered free Internet access in 515 Wireless Internet Zones (Zii).
- To date, there are 301 Wireless Internet Zones (Zii) of the 515 included in the project.

Agreements

Advanced Computing System for Latin America and the Caribbean (SCALAC)

Costa Rican Chamber of Information and Communication Technologies (CAMTIC)

PRIAS

PRIAS Annual Operating Plan

(CeNAT-CONARE) 2020

Scientific Publications **7**

70 Knowledge transfers

Research Projects **7**

2 Attention to Students

PRIAS is comprised by a multidisciplinary work team. The laboratory maintains a close relation with institutions of the public and private academic sector, both nationally and internationally, for the promotion of scientific research and transfer of knowledge, through the acquisition, treatment, storage, analysis, representation, and dissemination of information in the areas of Photogrammetry, Remote Sensing, Geographic Information Systems, Global Positioning System, Spatial Data Infrastructure, Geodesy, and Computer Science, which constitute the discipline of Geomatics.

Attached to the Centro Nacional de Alta Tecnología (CeNAT) and with the financial support of the Consejo Nacional de Rectores (CONARE), the promotion and development of scientific research activities in various application fields have been achieved.

The PRIAS Laboratory work team harmonized its performance within the framework of the pandemic due to the SARS-COV-2 virus, with great curiosity, creativity, open mind, courage, and commitment that resulted in innovative development solutions to meet the laboratory's objectives, in accordance with the new conditions of uncertainty presented by the reality that was experienced in 2020. Institutional values were the basis for consolidating teamwork at distance and the mission and vision of the Laboratory, as well as CeNAT's slogan, "Transforming Knowledge into Development", embodied in the heart of each human being. All these elements were poured into the crucible to develop a compass that guided the entire team through the challenges and uncertainties of a global reality, to continue to provide development and innovation from technology to society.

Philosophical

Framework

Development Objective of **PRIAS**

To develop geospatial research that contributes to the knowledge of the Costa Rican territory and the achievement of the Sustainable Development Goals, thus enabling a contribution in decision-making, through specialized scientific-technical assistance projects that empower improvement in the academic, socioeconomic, and environmental areas in the region.

Mission Statement

We are a geospatial research laboratory made up of a specialized team of professionals who work with the highest scientific standards in earth observation, articulated with higher education in Costa Rica and international cooperation, within the framework of innovation with the public, private, and social sectors.

Vision Statement

We aim to be a self-sustaining scientific research laboratory with a high impact on decision-making both nationally and internationally to strengthen geospatial innovation, by transferring technical and scientific knowledge at the academic, socioeconomic, and environmental levels.

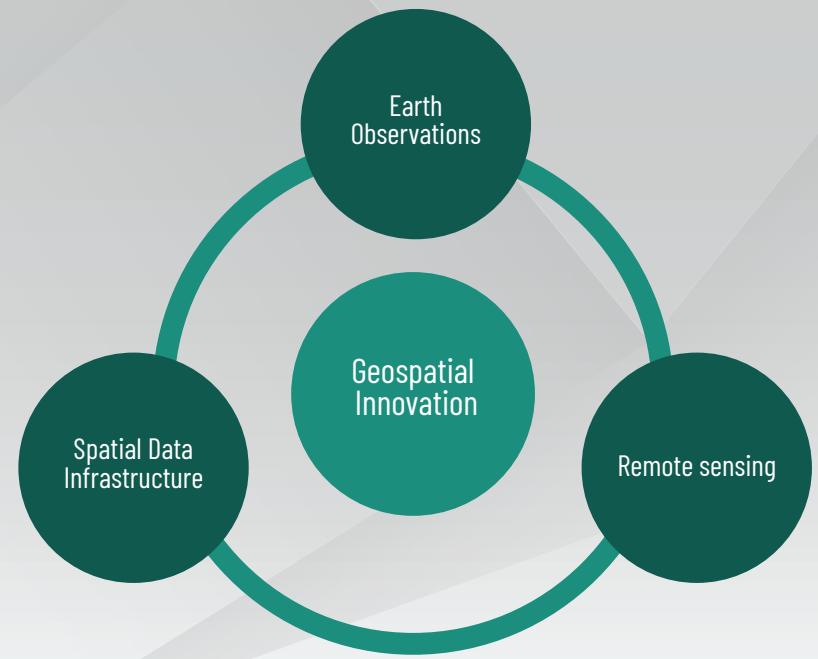
Values Enforced at **PRIAS**

- Empathy in collaborative work
- Willingness to multidisciplinary learning
- Creativity to face improvements
- Commitment to the goals set in each project

Principles Enforced at **PRIAS**

- Efficient use of technological infrastructure
- Interdisciplinary collaborative work
- Knowledge transfer adapted to populations
- Willingness for constant improvement of the projects that are undertaken

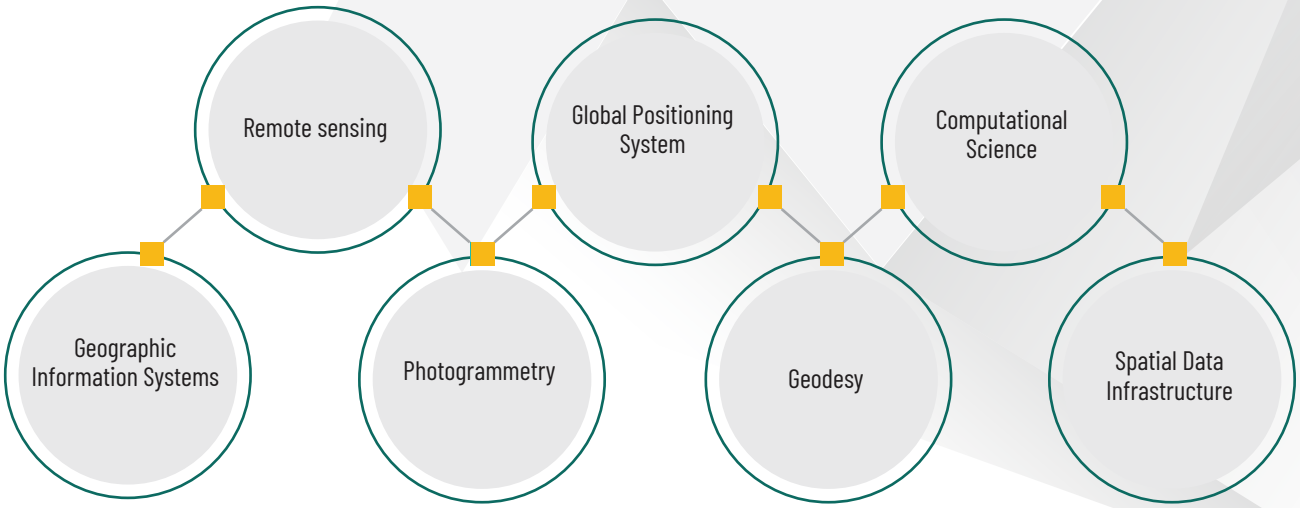
Operational Structure of **PRIAS**

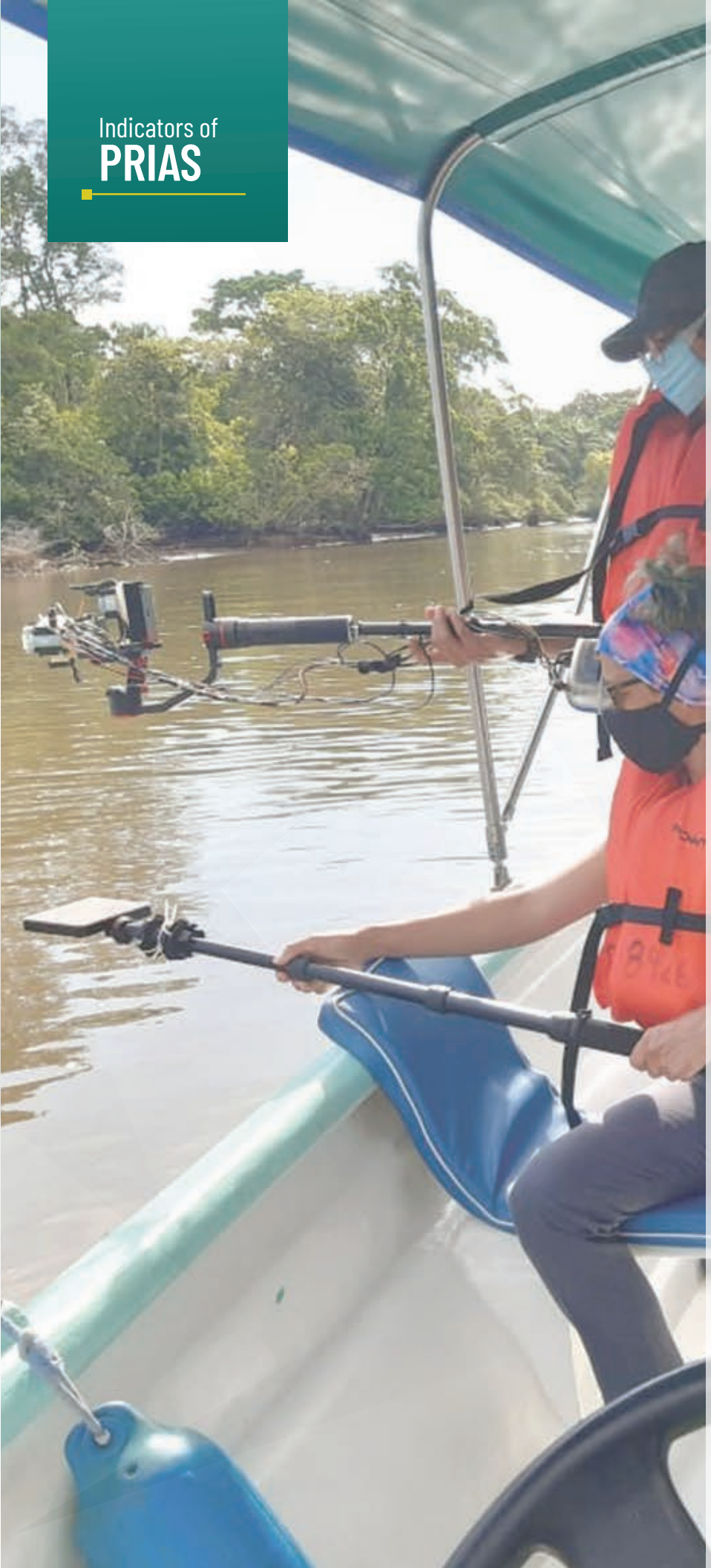


Objectives

1. To position the image of the laboratory through the establishment of strategic alliances that allow for services and scientific-technological exchange.
2. To attract additional resources for the development of research and innovation at PRIAS Laboratory.
3. To improve the internal processes of the PRIAS Laboratory on geospatial data management.
4. To increase the operational capacities at the PRIAS Laboratory, for the maintenance of a culture of continuous improvement.

Strategic **Nodes**





Indicators of PRIAS

Publications

Indexed:

2

Specialized:

5

Articles in review for publication:

12

Knowledge Transfer

5
national workshops taught

29
participations at national courses / symposia / conferences

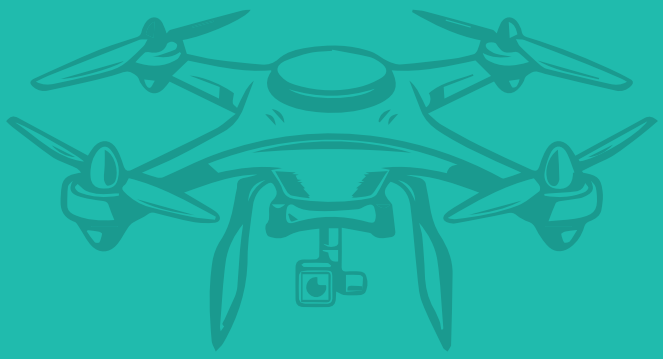
36
participations at international courses /symposia / conferences

325
people benefited from knowledge transfer

Research
Projects

3
internal projects

- Cantonal Historical Geospatial Representation of Costa Rica for the 1905-2014 period
- Library of Spectral Signatures
- Implementation of distributed storage in a data center



1
Vice chancellorship of Research

- Indirect derivation of the spatial distribution and development status of secondary forests in Costa Rica, using satellite images of medium spatial resolution.

3
private projects

- Conserving Biodiversity through Sustainable Management of Productive Landscapes and Pastures in Costa Rica-MOCUPP.
- Applicability of Sentinel-2, DESIS, and Landsat 8 satellite imagery data for water quality studies, on water bodies related to crop coverage surroundings of the National Térraba-Sierpe Wetland (MONEO-WET).
- Pilot digital system for monitoring illegal logging in the Golfo Dulce Forestry Reserve and a study area on the Pacific side of La Amistad National Park. FAO-SEPAL.

5
project proposals under negotiation:

- Establishment of the coffee baseline and surrounding registered tree cover in 2019.
- Update of the productive landscape of pastures in 2020, with their respective loss, gain, or no change in the surrounding and registered tree cover.
- Establishment of the Musaceae baseline for 2020, with their respective loss, gain, or no change in the surrounding and registered tree cover.
- Central American Mobility and Logistics Plan Project (SIECA-JICA).
- Antillean Manatee_Trichechus manatus in Costa Rica Project Proposal.

Attention to Students:

2 students at the lab:

- 1 CeNAT-CONARE Fellowship student
- 1 national internship

Articulations:

Academic sector:

- Costa Rica Institute of Technology
- University of Costa Rica

Partnership with government entities and international and national companies:

35 National:

- Ministry of the Presidency
- National Center for Geoenvironmental Information (CENIGA)
- Tropical Agricultural Research and Higher Education Center (CATIE)
- Central Bank of Costa Rica (BCCR)
- National Monitoring System for Land Cover and Use and Ecosystems (SIMOCUTE)
- State Phytosanitary Service (SFE)
- Municipality of San José
- National Institute of Statistics and Census (INEC)
- Consejo Nacional de Rectores (CONARE)
- Ministry of Environment and Energy, Costa Rica (MINAE)
- National Geographic Institute (IGN)
- State of the Nation Program (PEN)
- Ministry of Agriculture and Livestock (MAG)
- Costa Rican Institute of Electricity (ICE)
- National Meteorological Institute (IMN)
- National Forest Financing Fund (FONAFIFO)
- National Institute of Innovation and Transfer in Agricultural Technology (INTA)
- Ministry of Science, Technology, and Telecommunications of Costa Rica (MICITT)
- National Emergency Commission (CNE)
- National Learning Institute (INA)
- National Institute of Housing and Urbanism (INVU)
- National Chamber of Pineapple Producers and Exporters (CANAPEP)
- Pineapple Development Corporation-Del Monte (PINDECO)
- Secretariat of Environmental Sector Planning (SEPLASA)
- Livestock Corporation (CORFOGA)
- National REDD+ Secretariat
- Environmental Quality Management Directorate (DIGECA)

35 National:

- Ministry of Economy, Industry, and Commerce of Costa Rica (MEIC)
- Ministry of Housing and Human Settlements (MIVAH)
- Administrative Environmental Court
- National Commission for Biodiversity Management (CONAGEBIO)
- PALMATICA
- Inter-American Institute for Cooperation on Agriculture (IICA)
- National Council for Scientific and Technological Research (CONICIT)
- Municipality of Garabito
- GEOINN

46 International:

- Organization for Economic Cooperation and Development (OECD)
- Central American Integration System (SICA)
- World Bank
- Geocentric Reference System for the Americas (SIRGAS)
- National Aeronautics and Space Administration (NASA)
- Global Environment Facility (GEF)
- German Cooperation Agency (DLR)
- German Development Cooperation Agency (GIZ)
- United Nations Development Programs (UNDP)
- United States Agency for International Development (USAID)
- Regional Visualization and Monitoring System (SERVIR)
- Silvacarbon
- Food and Agriculture Organization of the United Nations (FAO)
- System for Earth Observation Data Access, Processing, and Analysis for Land Monitoring (SEPAL)
- European Comission
- Land Trend
- Google Earth Engine
- EO Data Science
- Nicaraguan Council of Science and Technology (CONICYT)
- Natural Capital Project
- National Autonomous University of Managua
- Autonomous University of León
- Catholic University of the Dry Tropics
- Nicaraguan Institute for Territorial Studies
- Central American Aeronautics and Space Association (ACAE)
- Boston University
- United States Geological Survey (USGS)
- Pacific Scientific Institute
- Stanford University
- Fairbanks University
- Secretariat of the Group on Earth Observations (GEO)
- Community of Latin American and Caribbean States (CELAC)
- International Union for Conservation of Nature (IUCN)
- University of British Columbia
- Georgia University
- UNDP Biodiversity Lab
- United Nations (UN)
- National Geographic
- Gordon and Betty Foundation
- Inter-American Development Bank (IDB)
- United States Forest Service (USFS)
- Secretariat for Central American Economic Integration (SIECA)
- Japan International Cooperation Agency (JICA)
- Waitt Foundation
- Government of Ecuador

Environmental Management

Environmental Management Area Annual Operating Plan

(CeNAT-CONARE) 2020

Publications **1**

31 Knowledge transfer activities

Research Projects **4**

6 Attention to Students

Background

The Environmental Management Area (AGA) is one of the six constituent areas of the Centro Nacional de Alta Tecnología (CeNAT) of the Consejo Nacional de Rectores (CONARE), according to Agreement 5-99 of March 2, 1999.

This Area links and articulates environmental actions with the universities linked to CONARE, state institutions, and the business sector, on topics such as advisory and search for sustainable alternatives in productive processes, natural resources, best practices, academic and specialized training activities, research, and applications of new environmentally-friendly technologies. This area is supported by "environmental management" representatives from UNED, UNA, ITCR, UTN, and UCR, which make up the Academic Advisory Committee.

Its main objectives include support, coordination, and projection in the areas of Environmental Management of the universities, development of environmental projects and interdisciplinary activities with the other areas of CeNAT, management and conservation of natural resources, climate, and food safety, and support in improving the country's environmental policies.

The Environmental Management Area has been characterized by its great flexibility and ability to take advantage of the situations that arise in different areas, as principles of opportunity. The year 2020, so atypical and difficult, was taken as such by the Area's programs to reinvent themselves in the light of new technologies while taking advantage of the strengths of CeNAT's physical, network, and telematics infrastructure. This led to the migration to Webinars, news bulletins, workshops and virtual training sessions, and all kinds of activities that enhanced and increased the regional, national, and international impacts of both Agromatics and the Climate Observatory.

Philosophical
Framework

Development Objective of the **Environmental Management Area**

To disseminate and empower society from the Sustainable Development Goals, in the economic, social, and environmental fields on climate change, productive chains, and added value of products, by developing technical assistance processes that territorially impact innovation projects, technology, and entrepreneurship for the productive development of Costa Rica.

Mission Statement

We are a research area with national and international linkages, which supports the public, private, and civil society sectors in technical assistance for decision-making in the face of risks of weather events and in productive development, through a team of specialized professionals who carry out studies with the highest scientific standards, within the framework of innovation and development of higher education in Costa Rica.

Vision Statement

We aim to be a self-sustaining research area with high economic and social impact at the national and international levels, which contributes to knowledge generation on climate change, production chains, and product added value, being a leader in strengthening competitive development and technical assistance from the intersectoral articulation.

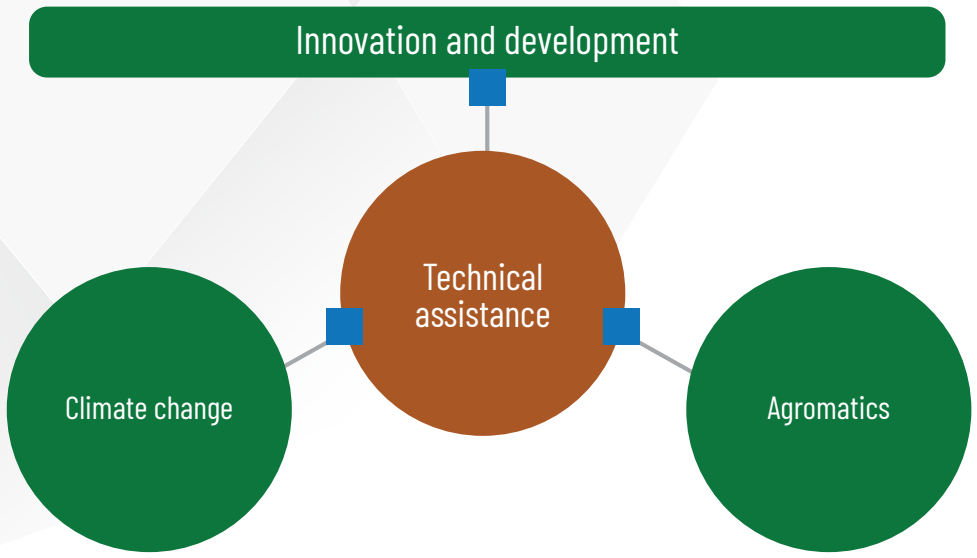
Values enforced at the **Environmental Management Area**

- Human team care
- Gastronomic and productive support under constant improvement
- Collaborative management in the projects that are undertaken
- Socialization of scientific information to society

Principles Enforced at the **Environmental Management Area**

- Efficient use of time
- Accountable administrative management of research projects
- Willingness for constant improvement of the projects that are undertaken
- Knowledge and skills empowerment

Operational Structure of the **Environmental Management Area**



General strategic **objective:**

To consolidate the Environmental Management area as support and linkage instance for public-academic-private initiatives for the social development of communities, through high-tech tools in remote sensing, climate variability and change, and Agromatics.

Environmental Management

Programs

General Coordination:

The Coordination of the area supports and aligns the strategic actions of the different programs that make up the area, such as the Agromatics and Climate Observatory and coordinates the annual CeNAT-CONARE Scholarship Program, focusing on undergraduate and postgraduate students from public universities, so that they can carry out their graduate or research projects at CeNAT laboratories and/or programs.

In addition, it contributes to managing the projects developed by the PRIAS Laboratory and promotes business innovation actions and projects with European and American linkage projects, focusing on SMEs and high-tech ventures. This is done in association with the Ministry of Science, Technology and Telecommunications (MICITT) and the Ministry of Economy, Industry and Commerce (MEIC).

Climate Observatory

The Climate Observatory Program of the Environmental Management Area responds to the need to strengthen the capacity to adapt to the variability and climate change that extreme variations in weather and climate generate on the productivity of the agricultural sector.

It is a Program dedicated to researching past and current situations, as well as climate perspectives with the purpose of social benefit facing climatic adversities.

The Observatory continuously and innovatively provides services to the agricultural sector in research and training, with personalized assistance from a technological platform on issues related to adaptation and resilience to variability and climate change to agricultural communities, in order to sustain productivity and increase the yield of crops and livestock; thus helping in decision-making and planning of activities.

Agromatics

The Agromatics program is dedicated to working with the support of alliances and high technologies (with universities, institutions, ministries, companies, regulatory bodies, and CeNAT's own laboratories), in publicizing local resources and products.

Products and their gene expression are typified to detect genes for adaptation to the environment and resistance to diseases and pests, which are linked to quality and hardness, according to the variability of the existing species. Typification is done through the knowledge of the organoleptic and culinary quality of local products, many of which are little known.

In addition, morpho-agronomic, physicochemical, organoleptic, and biochemical characterizations are carried out to allow knowing and evaluating both nutritional and anti-nutritional contents of products and, through high technologies, the technical specifications that may indicate that a product deserves a distinctive sign of quality are endorsed. The aim is to determine the origins and uses of the different products and the good use of agro-industrial by-products. These comprehensive studies make it possible to address natural disasters, climate variability and change, deforestation, and loss of harvests that cause higher prices of products and food insecurity.

Through the alliance with Slow Food, activities are developed to promote quality, clean products (innocuous and with clean technologies that minimize damage to human, animal, and environmental health), and fair pricing, by reducing intermediation chains in a way that not only producers and their families win, but also co-producers, who are conscious consumers and understand the problems of producers and their families and consider the great effort they make to provide more sustainable and healthy products.

Objectives

1. To manage effective links with different stakeholders of civil society, both nationally and internationally.
2. To implement technology tools for both access and dissemination of information.
3. To increase knowledge in communities on environmental management matters.
4. To strive to the financial sustainability of Environmental Management.

Strategic **Nodes**

Development of joint projects to support communities and environmental impact studies with national and international organizations.

Development of computer platforms and information access tools for decision-makers, producers, and communities, on population, spatial, environmental, climate and agrifood matters.

Promotion of knowledge and added value of products through agronomic strategies attached to national, regional, and global initiatives, such as the SAN-CELAC plans, Slow Food, denominations of origin, Mother Earth fairs, and related.

Indicators of the

Environmental Management Area

Publications

Specialized

1

Article in review for publication

1

Knowledge transfer

17
workshops or national lectures taught

1
workshop or international lecture taught

12
Participation at national courses, symposia / conferences

1
Participation at international courses, symposia / conferences

More than **4.000**
people benefited from the different knowledge transfers carried out.

Other collaborative activities

- 4 participations in technical events and/or strategic projects
- 1 collaboration in Antarctica project
- 51 participation in disclosed specialized information, such as WhatsApp chat, news bulletins, radio or television interviews, Facebook live on climate perspectives, collaboration in events, and collaboration in proposals with other laboratories or institutions, among others.
- 1 agreement submitted

Research Projects

1 project executed internally

- Operational Environmental Management Project

3 external projects:

- Approval of project, "Creation of the Comprehensive Quality Unit of the Turrialba Cheese Designation of Origin" PINN-MICITT.
- OAS Project "Interactive Platform for Application of Tropical Climate (PIACT)" TRIFINIO Region and Costa Rica, Stage III.
- Fundecooperación project

4 project proposals under negotiation:

- Design of a Pilot Innovation Center for Costa Rica (Desamparados)
- Proposal to Central American Networks-SICA Project
- Early Warning and Climate System
- Elaboration of calendar

Attention to Students:

6 students at the lab:

- 2 CeNAT-CONARE Fellowship students
- 2 Assistant students
- 2 Volunteer students

Articulations:

Academic sector:

- Articulations with 5 public universities, through research projects.

Partnership with international and national institutions or companies:

9 National:

- Ministry of Agriculture and Livestock
- Repretel Channel 6
- Columbia Radio Station
- La Teja Newspaper
- Sugar Cane Chamber (LAICA)
- National Institute of Innovation and Transfer in Agricultural Technology (INTA)
- CACPROSA
- La Casa del Agricultor (CASAGRI)
- Livestock Corporation (CORFOGA)

6 International:

- ISEF Science Fair event in conjunction with the European Union
- UNA University in Nicaragua
- Organization of American States (OAS)
- National Association of Cattle Breeders (ANAGAN)
- Walmart Central America
- TRIFINIO Plan: organization of members of the borders of Honduras, Guatemala, and El Salvador.

INSTITUTIONAL RESULTS

Support in Knowledge
Transfer:

At LANOTEC, the work carried out by the Extension and Teaching Area is essential, since it is crucial to promote scientific vocations at an early age and to achieve alliances or collaborations with academic institutions to fulfill this purpose.

The Costa Rican Chemistry and Sciences Olympics have the goal to involve high-school students and more recently it has been possible to incorporate elementary-school students into the areas of Sciences, seeking to encourage scientific vocations. Both processes have two main stages: one national and one international.

The activities carried out by the organizing committees for the national competition are enrollment, distribution of information, locations of the eliminatory test, distribution of people who oversee tests, final test venue, closure, and certificates. In 2020 due to the health crisis, the annual Chemistry and Sciences camp had to be held virtually.

The scientific committees are in charge of preparing the examinations of the three national stages: Eliminatory, Final, and Laboratory. For international participation, theoretical/practical training is provided prior to the competition, where students are deepened about the subjects. Then, a student selection test is made and the international competition is attended. This year, the international events were canceled because of the pandemic:

- Iberoamerican Chemistry Olympics
- XIII Central American and XII Caribbean Chemistry Olympics
- International Youth Science Olympics

The International Chemistry Olympics were held in person despite the pandemic; however, the Costa Rican Organizing Committee made the decision not to participate and not compromise the security of the delegation that would represent our country at the event.

Participation at
Chemistry Olympics

National Olympics 2020

Costa Rican Chemistry Olympics (OLCOQUIM)

CATEGORY	AWARD	FINALISTS
INTERMEDIATE	Honorable mention	Marianela Quesada Quesada Matías José Portillo Fuentes Melisa Zhen Liang Arturo Chaves Cortés Esteban Rolando Calvo Ortega
	Bronze Medal	Diego Alonso Espinoza Rojas Anthony José Arguedas Rodríguez Arella Navarro Sandoval Olivia Sojourner Dixon
	Silver Medal	Diego Granados Retana Fanny Mariana Solís González Danny Steven Solórzano Mayorga
	Gold Medal	Ignacio Herrera Gamboa Mateo Samuel Heinz Brenes Daniel Granados Retana (best grades)

CATEGORY	AWARD	FINALISTS
ADVANCED	Honorable mention	Lucía Vargas Paniagua Francisco Antonio Leiva Gómez Emilia María Víquez Mora Nicole Vílchez Mejías Daniel Esteban Rojas Pérez
	Bronze Medal	Daniel Solano Miranda Jostin Gerardo Cordero Madrigal Andrés Josué Esquivel Guadamuz Alejandro Reyes Chi Daniel Alvarado Navarrete
	Silver Medal	Jorge Luis Alvarez Araya Pedro Alberto Muñoz Pérez Jeremy Soto Castillo
	Gold Medal	Mariangel Rojas Barrantes Jefferson Daniel Delgado Quesada (best grade)

Source: Information from the year 2020 provided by LANOTEC of CeNAT.

Foto de archivo

Participation at
Science Olympics

Costa Rican Science Olympics (OLCOCI)

BEST GRADE

LEVEL	STUDENT	ACADEMIC INSTITUTION
Elementary	Felipe Antonio Villalobos Ruiz	Garmonales School
Seventh grade	Miranda Herrera Venegas	Yurusti School
Eighth grade	Alexander Sancho Dive	Yurusti School

AWARD	STUDENT	ACADEMIC INSTITUTION
Honorable mention	Juan Pablo Nolasco Meléndez Fiorella Benavides Mendives Lucía Matamoros Gutiérrez Marianela Blanco Villalobos Ana Laura Blanco Villalobos Jason Brenes Vásquez	Yurusti Nuestra Señora de Sión School Yurusti Carmen Lyra Educational Center Carmen Lyra Educational Center Nuestra Señora de Sión School
Bronze Medal	José David Alvarado Bolaños Felipe Ulate Rodríguez Sofia Fallas Bolaños Mariana Valverde Ortiz	Yurusti Yurusti Yurusti Yurusti
Silver Medal	Dayana Murillo Guzmán Miranda Herrera Venegas Felipe Antonio Villalobos Ruiz	Carmen Lyra Educational Center Yurusti Gamonales School
Gold Medal	Alexander Sancho Dive Maria Fernanda Corrales Villegas	Yurusti Yurusti

Source: Information from the year 2020 provided by LANOTEC of CeNAT.

Stock Photo

Events canceled due to the pandemic:

- Iberoamerican Chemistry Olympics
- XIII Central American and XII Caribbean Chemistry Olympics
- International Youth Science Olympics

Stock Photo

Participation at
Scientific Fairs

Eureka Science Fair:

This fair, formerly known as the Costa Rica ISEF Challenge, involved seven science and technology student projects, of whom only two projects were selected.

The winners would represent Costa Rica at the International Science and Engineering Fair ISEF 2020, but given the pandemic that we began to experience in 2020, the organizing committee chose not to participate in order not to compromise the health of the entire delegation.

The selected projects were:

Project	Students	Tutor	School
Integrated Bees Internet System	Melanie Espinoza Hernández Nicole Gamboa Mena	Patricia Vargas Robles	CTP Puriscal
Endophytic fungi as an alternative for the biocontrol of the Phytophthora oomycete on Costa Rican pineapple	Yareny Alfaro Campos Angie Herrera Aguilar Patricia Ruiz López	Melania Hernández Campos	San Carlos Scientific College

Source: Information from the year 2020 provided by LANOTEC of CeNAT.

Other collaborative activities:

Development of nanotechnology in the region, CONICIT, October 15

Lecture on Nanotechnology for the University of Costa Rica, October 19

Stock Photo

Innovation

Entrepreneurship:
Support to Companies of Applied Scientific Research

COMPANY	LABORATORY	RESEARCH
INALVE	LANOTEC	Obtaining starch from cassava by-products for generation of biobased polymeric films.
ASOPROA Santa Cruz	LANOTEC and Environmental Management	PINN: Generation of agro-industrial capacities and creation of a comprehensive unit (physical-chemical, organoleptic, and microbiological characterization) to improve the production process of Turrialba cheese with Designation of Origin.
Stein Laboratories	LANOTEC	New Product Generation - Confidential Status.
FIFCO	LANOTEC	Plastic bottle characterization analysis.
Purdy Group	LANOTEC	Purdy Motor Challenge.
Proquinal	LANOTEC	"Evaluation of the antimicrobial activity of vinyl fabrics produced by the Proquinal Proyecto Argento company".
H2020 - EU - University of Belgrade	LANOTEC	Automated functional screening of IgGs for diagnostics of neurodegenerative diseases (AUTOIgG).
UNESCO	LANOTEC	Nanoprofessor: Conceptualization and dissemination of nanotechnology to promote scientific vocations in elementary school boys and girls in Costa Rica.
ISEF	LANOTEC	Eureka - ISEF Workshop.
Naval Research Office, Boston, MA, USA	LANOTEC	Production and characterization of bacteria-repellent microcontact printed substrates and bactericidal nanostructured surfaces.
FONTAGRO	CENIBiot	Proposal writing: Network of family agroecological productive systems in Latin America and the Caribbean (LAC), for the sustainable use of soils.
SPERATUM	CENIBiot	Implementation Unit.
Puro Verde Paraíso Tropical	CENIBiot	Implementation Unit.
CORBANA	CENIBiot	Molecular identification (DNA barcoding) of living organisms.
Coopetarrazú	CENIBiot	Preparation, quantification, characterization, and extract development method of material of plant origin.
Thrive	CENIBiot	Hydroalcoholic extraction of 25 kg of Fridericia chica.

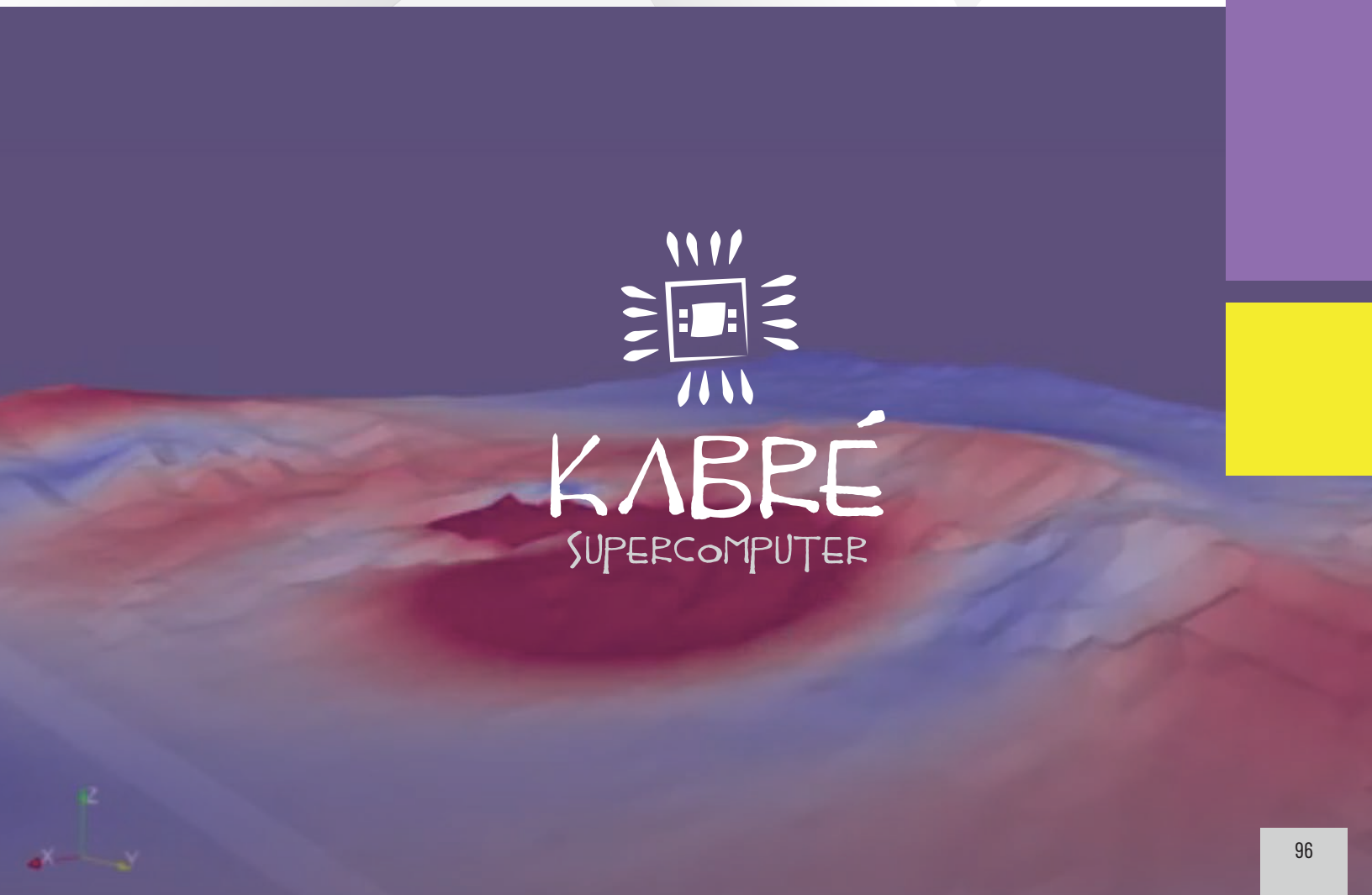
COMPANY	LABORATORY	RESEARCH
Stein	CENIBiot	Analysis of potency and impurities for lactulose solution according to the monograph of the United States Pharmacopeia (USP) for six duplicate batches, with refractive index HPLC method.
Coopeatenas	CENIBiot	Qualitative analysis of microbial diversity in soil and biole samples using the T-RFLP (Terminal Restriction Fragment Length Polymophisms) technique.
AgroSpheres	CENIBiot	Tech Transfer for three strains.
Standart Fruit Company DOLE	CENIBiot	Various laboratory services for storage of samples of plant origin.
Gutis	CENIBiot	Molecular identification (DNA barcoding) of living organisms.
BioTech	CENIBiot	Molecular identification (DNA barcoding) of living organisms.
Belén Poultry Supply	CENIBiot	Optimization of biological processes for the production of microorganisms or metabolites of interest.
Bio CR	CENIBiot	Development and validation of quantification and identification methods by HPLC and mass spectrometry techniques.
INOLASA	CENIBiot	Determination of the equilibrium of the vapor pressure of a plant matrix or solid food product, on the surface, between the vapor pressure of surrounding pure water in the atmosphere.
FUNIN	CENIBiot	"Support and exchange in chemical, biological, and genetic analysis of biotechnological products that are developed either jointly or by each party. among others."

Support to applied scientific research organizations or institutions

ORGANIZATION	LABORATORY	PROJECT
MINAE, SEPLASA, IGN, FAO, SilvaCarbo	PRIAS	National "Tackling deforestation and forest degradation in Costa Rica using Google Earth Engine" project: Improving the methodologies available worldwide to detect deforestation and forest degradation using satellite images and different technological tools.
Group on Earth Observations (GEO), UN Habitat, MIVAH, SEPLASA, UNDP, INEC, Municipality of Garabito	PRIAS	National Proposal —Earth Observations for Sustainable Cities and Communities Toolkit: Developing a customizable and continuously updated set of tools for integrating Earth observations and geospatial information into urban monitoring and reporting processes on SDG targets and indicators based on input from Member States and cities of the United Nations. In this particular case, work is being done on SDG 11.
Group on Earth Observations (GEO), UN Habitat, MIVAH, SEPLASA, UNDP, INEC, Municipality of Garabito	PRIAS	National Proposal —Earth Observations for Sustainable Cities and Communities Toolkit: Developing a customizable and continuously updated set of tools for integrating Earth observations and geospatial information into urban monitoring and reporting processes on SDG targets and indicators based on input from Member States and cities of the United Nations. In this particular case, work is being done on SDG 11.
NASA, MINAE, U of Stanford	PRIAS	Natural Capital Project: Improved linkages between Earth observations and ecosystem service models with essential biodiversity variables.
UNDP, MINAE, U of British Columbia	PRIAS	The Great Enchilada: Mapping nature for people and the planet: Identification and prioritization of essential areas for life, where nature-based solutions can be implemented to meet conservation and sustainable development needs.
CONARE-PEN	PRIAS	Cantonal Historical Geospatial Representation of Costa Rica for the 1905-2014 period Constructing the spatial representation in the form of geographic information layers that enable reproduction of the Territorial Administrative Division of Costa Rica for the periods 1905, 1950, 1963, 1973, 1984 and 2014.
Nicaraguan Council of Science and Technology (CONYCIT), National Autonomous University of Managua, Autonomous University of León, Catholic University of the Dry Tropics, Nicaraguan Institute of Territorial Studies	PRIAS	GIS Introduction Workshop: Training of at least 25 researchers from different research centers of the Nicaraguan government.

ORGANIZATION	LABORATORY	PROJECT
TEC	PRIAS	Indirect derivation of the spatial distribution and development status of secondary forests in Costa Rica, using satellite images of medium spatial resolution.
FAO	PRIAS	FAO-SEPAL Project: Pilot digital system for monitoring illegal logging in the Golfo Dulce Forestry Reserve and a study area on the Pacific side of La Amistad National Park.
NASA, MINAE, SICA, MINAE, U of Georgia	PRIAS	Mesoamerica Corridor Project - Determination of land change in protected areas in Costa Rica and Panama for the management of targeted resources. Analysis of changes in land use in protected areas of the Mesoamerican Corridor, in the southern regions of Costa Rica and northern Panama.
UNDP, MAG, MINAE	PRIAS	MOCUPP Project: Conserving Biodiversity through Sustainable Management of Productive Landscapes in Costa Rica.
CONICIT	PRIAS	MONEO-WET Project Applicability of Sentinel-2, DESIS, and Landsat 8 satellite imagery data for water quality studies, on water bodies related to crop coverage surroundings of the National Térraba-Sierpe Wetland (MONEO-WET).
Restaurateurs, chefs, and cooks	Environmental Management	Ecogastronomy and Slow Food Course.
Professional Association of Journalists	Environmental Management	What is Slow Food.
Slow food	Environmental Management	Support to producers, cooks, and artisans for the sale of products to the contact base of slow food students and affiliates, to compensate for the fact that fairs are not being held.

ORGANIZATION	LABORATORY	PROJECT
5,300 Producers using the platform in CR and Central America	Environmental Management	Management of PIACT and Mercado de la Tierra Facebook page.
530 Agricultural producers	Environmental Management	Central American Climate Chat update.
PIT/AUGE	Environmental Management	Project for promoting differentiated products and markets: Development of prototypes for Turrialba cheese and Tucurrique pejibaye. A video was made.
ASOPROA - SANTA CLAUS	Environmental Management	PINN Project. Creation of the Comprehensive Quality Unit for Turrialba cheese with Denominations of Origin.
FUNDECOOPERACIÓN	Environmental Management	Support to adaptation of the agricultural sector through the dissemination of meteorological information - Phase II.
OEA	Environmental Management	Project "Interactive Platform for Application of Tropical Climate (PIACT)" TRIFINIO Region and Costa Rica, Stage III.
Academic and similar national and international networks	CNCA	Access to CeNAT's Kabré computational platform for data processing.



CeNAT in the face of

COVID-19

The pandemic generated by COVID-19 had an impact on all areas of human society, both nationally and internationally, turning 2020 into a challenging year, which was seen by CeNAT as an opportunity to reinvent and innovate, according to its mandate.

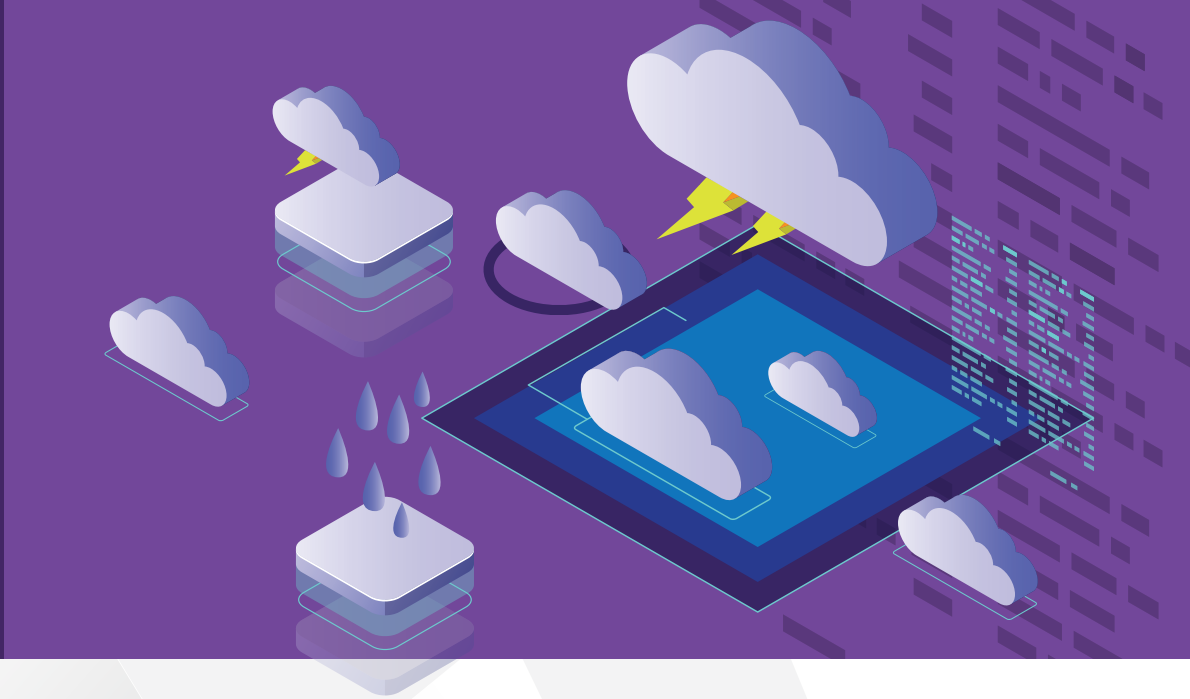
Firstly, the different laboratories and programs adopted immediate measures, based on their infrastructure and collaborator strengths, which allowed them not only to maintain their operational capacity but to innovate in new methodologies and ways of operating that empowered us to reach new and greater target audiences.

On the other hand, the LANOTEC and CENIBiot laboratories developed projects specifically to address and combat the pandemic, focused on supporting university and national efforts to detect, address, and manage this disease.

Below is a detail of the main actions carried out during 2020:

AREA / LABORATORY	CATEGORY	NAME OF THE ACTIVITY
LANOTEC	Virtual workshop	SciDipTalks (SCITECH DIPLOHUB - Barcelona Science and Technology Diplomacy Hub) - Scientific Diplomacy Against the Pandemic: Iberoamerica faced with the COVID-19 Crisis.
	Webex	Webex, with the BIOECONOMY and COVID-19 group.
	Virtual event	"COVID-19 in Costa Rica: what we are learning and what we are forgetting."
	Submitted project	Nano-phytopharmaceuticals for the prevention and treatment of COVID-19: Optimization of solid lipid nanosystems and in-silico and in-vitro studies of inhibitor candidates of the SARS-CoV2 virus.
	Submitted project	Optimization of solid lipid nanosystems and in-silico and in-vitro studies of inhibitor candidates of the SARS-CoV2 virus.
	Submitted article	CRISPR-Cas9 system as an alternative cancer treatment and its application for COVID-19 assessment.
	Collaboration activity	Support in the manufacture of respirators for the CCSS.
	Collaboration activity	Proposal: "Development of a transport solution for samples from patients suspected of carrying the SAR-CoV-2 virus, in a safe way for health and laboratory personnel and with locally available materials.
	Collaboration activity	Proposal: "Network for Research and Scientific Diplomacy in Nano-biotechnology and Advanced Materials to respond to challenges generated by SARS CoV-2 and other crises in the Central American region and the Dominican Republic", which will be presented in the call for "presentation of project proposals to organize Central American networks of exchange and scientific collaboration", opened by the Central American Integration System (SICA).
	Collaboration activity	Donation of 320 swabs to the National Children's Hospital.

AREA / LABORATORY	CATEGORY	NAME OF THE ACTIVITY
ENVIRONMENTAL MANAGEMENT AREA	Virtual workshop	Application of meteorological variables for decision making in Agriculture and Livestock. Taught by Irina Katchan.
	Webinar	08-14-2020 Weather outlook for the second half of August and update of the climate outlook for September-November 2020. Irina Katchan.
	Webinar	09-01-2020: Climate Outlook from September to November 2020 for Costa Rica and Central America. Irina Katchan.
	Webinar	09-17-2020: Update of the climate outlook for Costa Rica and Central America in the second half of September and the following months of 2020. Irina Katchan.
	Virtual Lecture	"Variation and Climate Change" to students of UTN.
	Virtual Lecture	Climate Outlook in December 2020-2021 and 1st quarter 2022. Walmart Cartago.
	Virtual Lecture	Climate Outlook in December 2020-2021 and 1st quarter 2022. Sumitomo Chemical Chile S.A. Southern Area.
	Virtual Lecture	Climate Outlook in December 2020-2021 and 1st quarter 2022. Sumitomo Chemical Chile S.A. Atlantic and Northern Areas.
	Webinar	12-01-2020 Climate Outlook for December 2020 and 2021. Irina Katchan.
	Virtual Workshop	Introduction to Denomination of Origin. PINN-ASOPROA.
	Webinar	Climate Outlook for Costa Rica and Central America for the Second Semester 2020. Fundecooperación Project.
	News Bulletin	Interview on TV Channel 42 - Climate Observatory and PIACT.
	News Bulletin	Interview on Santa Clara Radio on Climate Change.
	News Bulletin	Interview on TV Channel 42 - Climate Observatory and PIACT.
	News Bulletin	Interview on Santa Clara Radio on Climate Change.
	News Bulletin	Interview on Santa ClaraRadio - Perspectives of atmospheric weather.
	News Bulletin	Informative Link Interview-TELERED AND TELESYSTEMS / REPRETEL / MULTIMEDIOS.

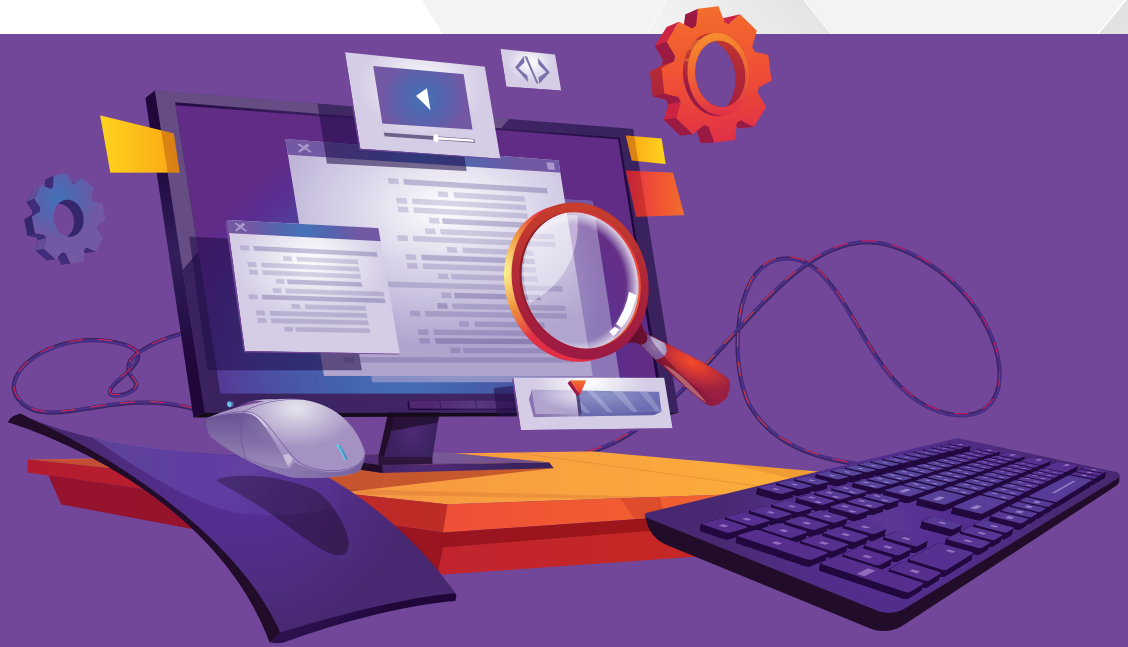


AREA / LABORATORY	CATEGORY	NAME OF THE ACTIVITY
ENVIRONMENTAL MANAGEMENT AREA	News Bulletin	Huella Tica interview.
	News Bulletin	Interview on Honduras Radio.
	News Bulletin	Radio program at UCR "An hour with Public Health".
	News Bulletin	Interview on Santa Clara Radio on Climate Change.
	News Bulletin	Interview on National Radio in Honduras.
	News Bulletin	TV interview - Channel 6 Repretel.
	News Bulletin	TV interview - Channel 6 Repretel.
	News Bulletin	Informative link interview - TELERED AND TELESYSTEMS.
	News Bulletin	TV interview - Channel 10 and Channel 14 Nicaragua.
	News Bulletin	Informative link interview - TELERED AND TELESYSTEMS.
	News Bulletin	Informative link interview - TELERED AND TELESYSTEMS.
	News Bulletin	Interview on National Radio in Honduras.
	News Bulletin	TV interview - Channel 6 Repretel.
	Facebook Live	Climate Perspectives I quarter.
	Facebook Live	Climate Perspectives II quarter.

AREA / LABORATORY	CATEGORY	NAME OF THE ACTIVITY
PRIAS	Operational Management	Task Force to ensure: Support protocol, remote connectivity, virtual recruitment systems, orientation and training, remote data management, and storage.
	Virtual tours	Methodology for visual evaluation of LULC sampling points in productive landscapes. MOCUPP-CR project: 7 virtual tours and 2,800 sampling points in 5 categories of use.
	Virtual tours	Work protocol: Visual interpretation of sampling points to determine the LULC in productive landscapes of the MOCUPP.

AREA / LABORATORY	CATEGORY	NAME OF THE ACTIVITY
CNCA	Virtual Workshop	Introduction to the Kabré Supercomputer, June 9.
	Virtual Workshop	Introduction to Programming with Python, June 15-26.
	Virtual Workshop	Introduction to Programming with R, June 22-July 3.
	Virtual Workshop	Introduction to the Kabré Supercomputer, August 4.
	Virtual Workshop	Data visualization with R, August 3-14.
	Virtual Workshop	Scientific Computing with Python, August 10-21.
	Virtual Workshop	Introductory Workshop on Genomic and Metagenomic Data Processing, September 7-18.
	Virtual Workshop	Introduction to the Kabré Supercomputer, October 6.
	Virtual Workshop	Data visualization with R, October 26 - November 6.
	Virtual Workshop	Introduction to Programming with R, September 21 - October 2.
	Virtual Workshop	Introduction to Programming with Python, September 21 - October 2.
	Virtual Workshop	Scientific Computing with Python, November 2 - 13.
	Virtual Workshop	Statistical Analysis with R. November 16-27.
	Virtual Workshop	Big Data School 2020. December 7 - 10.
	Virtual Workshop	Introduction to Bacterial Genomic Analysis, November 16-27.
	Virtual Workshop	Machine Learning with Python, November 23 - December 2.
	Scientific computing virtual seminar	Tips to execute and document the research process, 5/25/2020.
	Scientific computing virtual seminar	Considerations for the prediction in biological processes of the agricultural field with limited data. 6/29/2020.

AREA / LABORATORY	CATEGORY	NAME OF THE ACTIVITY
CNCA	Scientific computing virtual seminar	Modeling and simulation of distributed energy resources and flexible loads. 7/13/2020.
	Scientific computing virtual seminar	Reduction of evaluations to expensive functions in multi-objective optimization strategies. 7/20/2020.
	Scientific computing virtual seminar	Using augmented reality for medical telementorship. 8/10/2020.
	Scientific computing virtual seminar	Sexism and its impact on academic performance. 8/31/2020.
	Scientific computing virtual seminar	Observable characteristics and automatic classification of the poverty level in households in Costa Rica. 9/7/2020.
	Scientific computing virtual seminar	Latent variables modeling for dimension reduction. 10/5/2020.
	Scientific computing virtual seminar	Scientific programming with Python: Applications in complex systems and plasma physics. 10/27/2020.
	Scientific computing virtual seminar	Spinning experimental problems and weaving computer solutions. 11/15/2020. Continuous remote monitoring for evaluation of nitrate levels that affect water quality. 12/3/2020.
	Projects	Writing of proposals for research projects and collaboration networks on computational epidemiology subjects.
	Projects	Coordination of research activities through the Zoom platform.

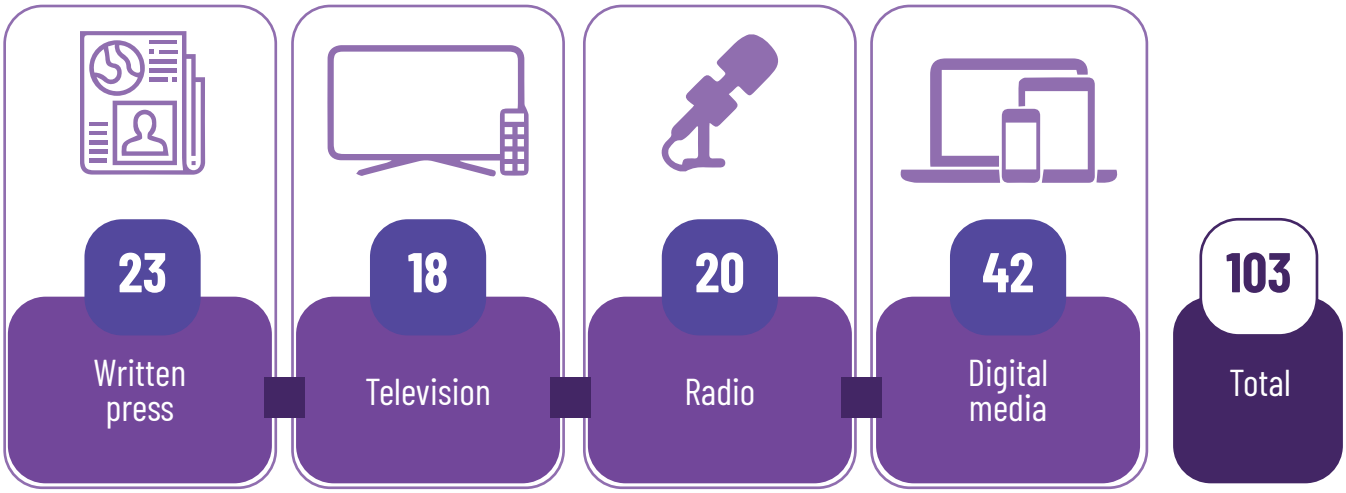


AREA / LABORATORY	CATEGORY	NAME OF THE ACTIVITY
CENIBiot	Virtual lab	Lab Meeting, Bioprospecting-Chemistry Projects.
	Project	Development of detection tests for the SARS-CoV-2 virus. Includes the invention of two extraction protocols for parallel processing of 96 samples. Methods already in the validation stage, within the framework of a clinical trial, for the health registry.

Socialization of **Science**

Part of the work carried out by the Centro Nacional de Alta Tecnología is the dissemination of the institutional work of CeNAT and attention to inquiries from the media, in order to maintain a rapprochement of the Center's work with the general population.

Work of CeNAT on **Media**



Source: Information from the year 2020.

Social
Media

Currently, the presence in social networks is fundamental within the dissemination strategy, as a permanent communication channel, which has the advantage of the immediacy of the information to the audiences of the institution. CeNAT has a YouTube channel, Soundcloud profile, Facebook page, and website, which represent the institutional channels that provide information to the different segments.

In the second half of 2020, the new website was published, with the aim of modernizing and making the page more user-friendly and interactive.

Furthermore, the Facebook page is constantly growing in followers and the audience is stratified by 53% women and 47% men. The publications made are announcements of virtual courses or workshops, news of the work carried out by the dependencies, and CeNAT-CONARE scholarships, among other topics. Additionally, two digital campaigns were developed:

Awaken your scientific vocation: aimed at awakening scientific vocations in young people through testimonials from researchers from different laboratories.

CeNAT 21st Anniversary: Publications referring to the anniversary and others were designed with the Center's management indicators.

CeNAT
on Facebook

12,570	12,312	462,898	38,575 personas	47
Number of followers	Number of Likes of the page	Annual reach of posts	Average monthly reach of posts	Number of countries that follow the page

Source: Information from the year 2020.

* The number of followers has been generated organically, without resorting to paid social media advertising. As of December 31, 2018

Countries that Follow CeNAT on Activities Socialized on Facebook

America	Europa	Asia	Africa	Oceania
Costa Rica	Spain	China	South Africa	Australia
U.S	Czech Republic	South Korea		New Zealand
Peru	France	Israel		
Mexico	Portugal	Japan		
Colombia	Germany	Egypt		
Guatemala	UK	Philippines		
Dominican Republic	Belgium			
Ecuador	Italy			
Nicaragua	Norway			
Honduras	Denmark			
El Salvador	Finland			
Chile	Sweden			
Cuba	Austria			
Brazil	Turkey			
Panama	Switzerland			
Bolivia	Netherlands			
Canada				
Venezuela				
Paraguay				
Uruguay				
Argentina				
Puerto Rico				

Source: Information from the year 2020.

Below, the main data of information on reach, achievements, and impacts evidenced by each of the Laboratories of CeNAT in the year 2020 are presented.

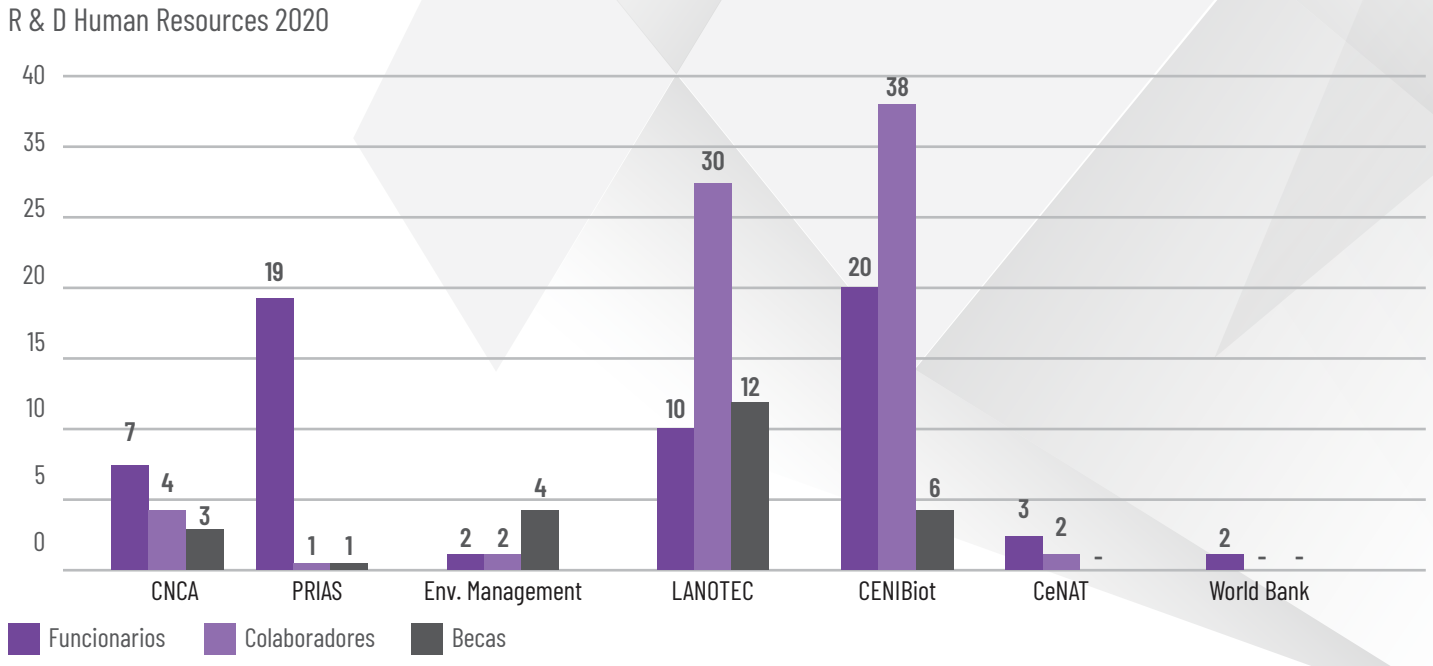
Human Resources at CeNAT

CeNAT
R & D Human Resources 2020

Laboratory	Officers	Collaborators	Scholarships	Total
CNCA	7	4	3	14
PRIAS	19	1	1	21
Env. Management	2	2	4	8
LANOTEC	10	30	12	52
CENIBIOT	20	38	6	64
CeNAT	3	2	0	5
World Bank	2	0	0	2
TOTAL	63	77	26	166

Source: Information from the year 2020 provided by the Laboratories and Areas of CeNAT.

Participation Percentage of R & D Human Resources in 2020, according to Officers, Collaborators and Scholarships present at CeNAT



Source: Information from the year 2020 provided by the Laboratories and Areas of CeNAT.

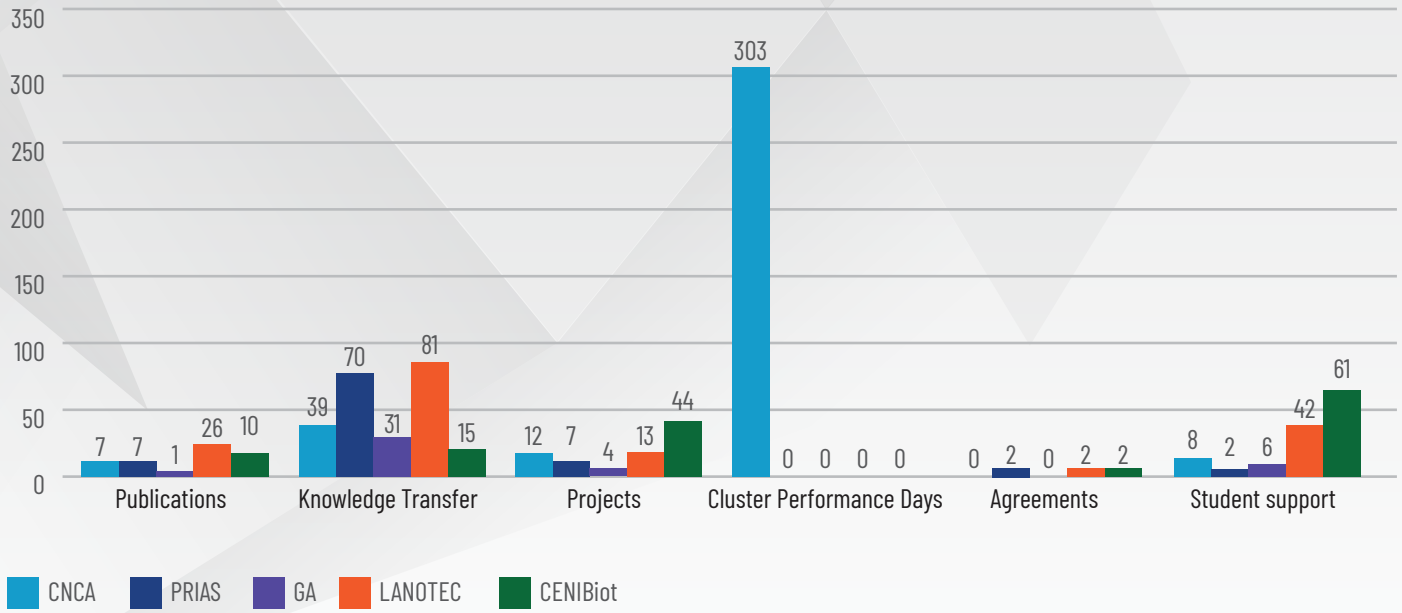
2020 Indicators,
according to CeNAT Laboratories and Areas

CeNAT
R & D Human Resources 2020

Indicator	CNCA	PRIAS	GA	LANOTEC	CENIBIOT	Total
Publications	7	7	1	26	10	51
Knowledge transfer	39	70	31	81	15	236
Projects	12	7	4	13	44	80
Cluster Performance Days	303	0	0	0	0	303
Agreements	2	0	0	2	2	6
Student support	8	2	6	42	61	119
Total	371	86	42	164	132	795

Source: Information for the year 2020 provided by the Laboratories and Areas of CeNAT.

Public and private indicators



Source: Information from the year 2020 provided by the Laboratories and Areas of CeNAT.

Strategic Sectors of

Society Linked with CeNAT

Identification of sectors related to CeNAT as of November 2020

- Education 2018
- Social 2018
- Health 2018
- Energy 2018
- Agriculture 2018
- Local-Municipalities 2018
- Aerospace 2018
- Tourism 2018
- Environmental 2018
- Food 2018
- Technology 2018
- National Security 2018
- Medical Physics 2018
- Biodiversity 2018
- Drug development 2018
- Biorefinery/Bioeconomy 2018
- Medical Devices 2018
- Aeronautics 2018
- Accreditation 2019
- Art and Culture 2019
- Sports 2019
- Textile 2019
- Transportation 2020

Sectors that are

linked to CeNAT

CONSEJO NACIONAL DE RECTORES

CeNAT
Centro Nacional de Alta Tecnología

Source: Information from the year 2020 provided by the Laboratories and Areas of CeNAT.

Baseline as of November 2018 of the description of the measurement tool of the strategic sectors related to CeNAT for subsequent years

	LANOTEC			CNCA			CENIBiot			PRIAS			Environmental Management		
	18	19	20	18	19	20	18	19	20	18	19	20	18	19	20
Energy	X	X	X	X	X	X				X	X	X	X	X	X
Social				X	X	X				X	X	X	X	X	X
Health	X	X	X	X	X	X	X	X	X	X	X		X	X	X
Education	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Agriculture							X	X	X	X	X	X	X	X	X
Local-Municipalities										X		X	X	X	X
Aerospace	X	X	X	X	X					X	X	X	X	X	X
Tourism													X	X	X
Environmental	X	X	X	X	X		X	X	X	X	X	X	X	X	X
Food	X	X	X				X	X	X	X	X	X	X	X	X
Technology	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
National Security										X	X	X			
Medical/Computational Physics				X	X										
Biodiversity	X	X	X	X	X	X	X	X	X			X	X	X	
Drug development	X	X	X				X	X	X						
Biorefinery/Bioeconomy	X	X	X					X	X				X	X	X
Medical Devices	X	X	X					X	X						
Aeronautics										X	X	X			
Quality/Accreditation	X	X	X		X			X	X						X
Art and Culture	X	X	X						X		X			X	
Sports	X	X													
Textile		X	X												
Transportation		X	X			X					X				

Source: Information from the year 2020 provided by the Laboratories and Areas of CeNAT.

Linkage of CeNAT
with Institutions

Institutions that ceased to have a relationship with CeNAT in 2020

Incorporated in 2020 Incorporated in 2019 Present in 2018

Source: Information from the year 2020 provided by the Laboratories and Areas of CeNAT

Institutional Relations

# of CeNAT in 2020

Incorporated in 2020 | Incorporated in 2019 | Present in 2018 | The relationship has ended

Source: Information from the year 2020 provided by the Laboratories and Areas of CeNAT.

Institutions that are related

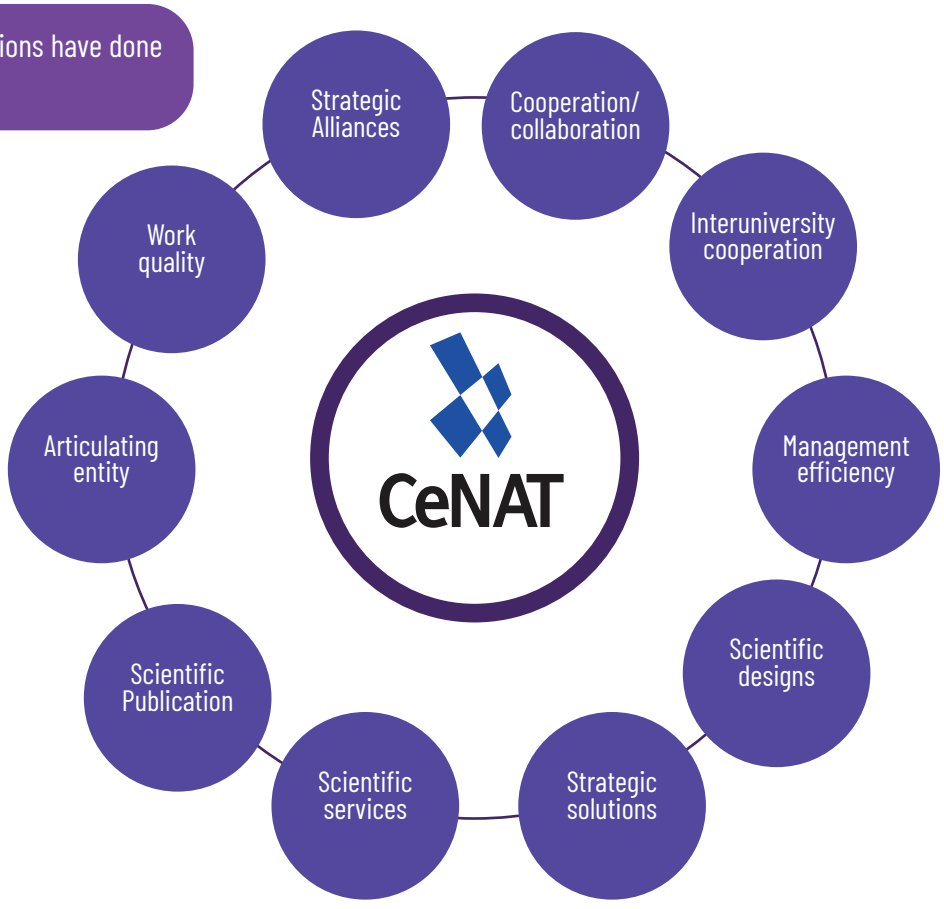
to CeNAT

	LANOTEC			CNCA			CENIBiot			PRIAS			Gestión Ambiental		
	18	19	20	18	19	20	18	19	20	18	19	20	18	19	20
MICITT-CONICIT	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MEIC										X	X	X	X	X	X
MINAE	X	X								X	X	X	X	X	X
MAG				X	X	X	X	X	X	X	X	X	X	X	X
Ministry of Health	X	X	X	X	X	X	X	X	X	X	X		X	X	X
ICE					X					X	X	X			
Public Universities	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Min. of the Presidency										X	X	X	X	X	X
Civil Aviation										X	X	X			
Min. of Public Security										X					
Min. of Foreign Affairs - Chancellery.		X	X							X	X	X	X	X	X
INA	X	X	X										X	X	X
ECA-LACOMET	X	X	X											X	X
INEC										X	X	X			
BCCR										X	X	X			
Work Unions	X														
CCSS			X				X	X	X						
Ministry of Justice										X	X	X		X	X
MEP	X	X	X									X			
Professional Guilds					X										X
CONAVI											X				
MOPT					X										
ICT camera					X	X									
LANAMNE		X	X							X	X	X			
US Navy			X												
Lawrence Livermore National						X									
Laboratory						X									
SCALAC						X									
BSC						X									
CSUCA															

There is no relationship

Source: Information from the year 2020 provided by the Laboratories and Areas of CeNAT.

Perception of what the institutions have done with CeNAT



Source: Information from the year 2020 provided by the Laboratories and Areas of CeNAT.

Expectation of CeNAT institutions in the next five years

CeNAT at the forefront of research

CeNAT in institutional relation strengthening

CeNAT

CeNAT as an ally to meet institutional objectives

CeNAT as an innovative institution

CeNAT supports country goals

CeNAT conducting joint research

CeNAT supports reliability of the data

CeNAT is closer to the academy

CeNAT in joint publications

CeNAT in the development of joint projects

CeNAT as organizer of scientific events

CeNAT in solutions to global problems

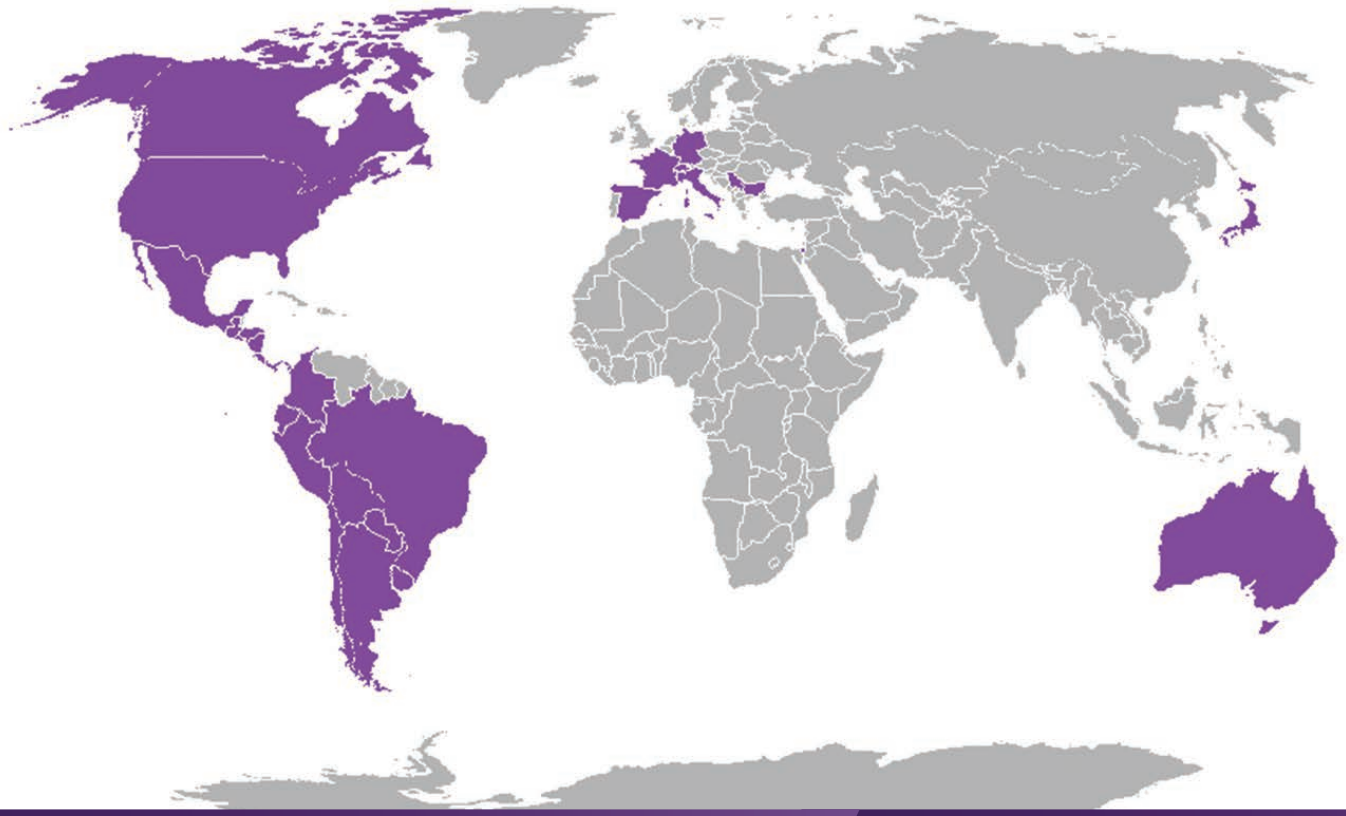
CeNAT in scientific training

CeNAT in participation in international projects

CeNAT socializes the use of information

Source: Information from the year 2020 provided by the Laboratories and Areas of CeNAT.

Countries where
CeNAT has ties



- Germany
- Argentina
- Australia
- Bolivia
- Brazil
- Bulgaria
- Canada
- Chile
- Colombia
- El Salvador
- Spain
- U.S
- France
- Guatemala
- Honduras
- England
- Israel
- Italy
- Mexico
- Nicaragua
- Panama
- Paraguay
- Peru
- Serbia
- Switzerland
- Uruguay

Source: Information from the year 2020 provided by the Laboratories and Areas of CeNAT.

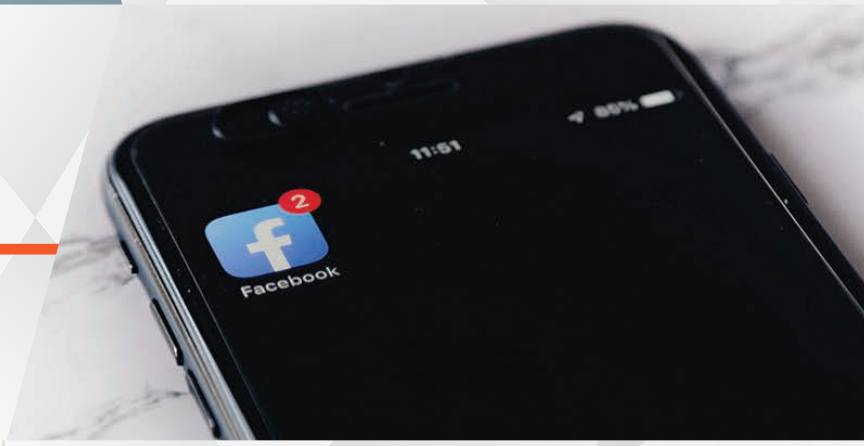
INDICATORS OF INSTITUTIONAL WORK

Impact Reached in
2020 at CeNAT

12,570 Facebook Followers

38,575 Average monthly reach of Facebook posts

47 Nationalities of Facebook followers



Stock Photo, 2019

103 Media presence

Impact Reached in
2020 at CeNAT

3 Registered patents

7 Registration processes

2 Researchers in the United States Invention Registration

236 Knowledge Transfer

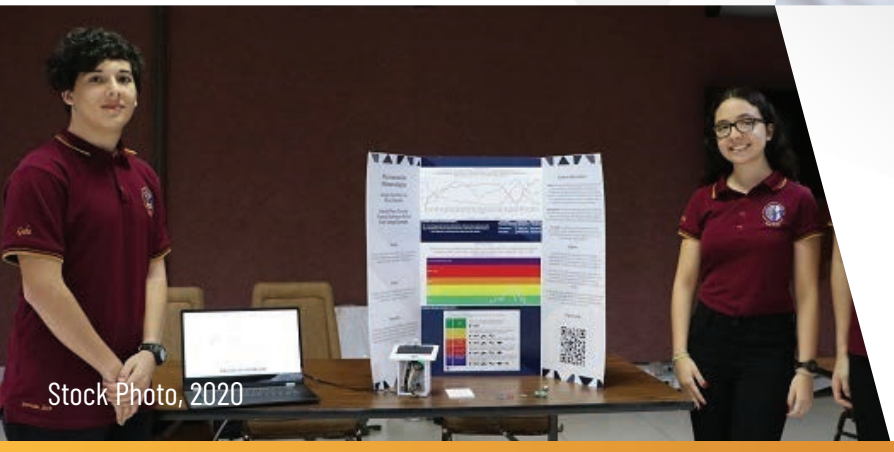
1493 People benefited by knowledge transfer from the laboratories

Impact Reached in
2020 at CeNAT

51 Scientific Publications

119 Students and interns with research projects

19 CeNAT-CONARE Scholarships

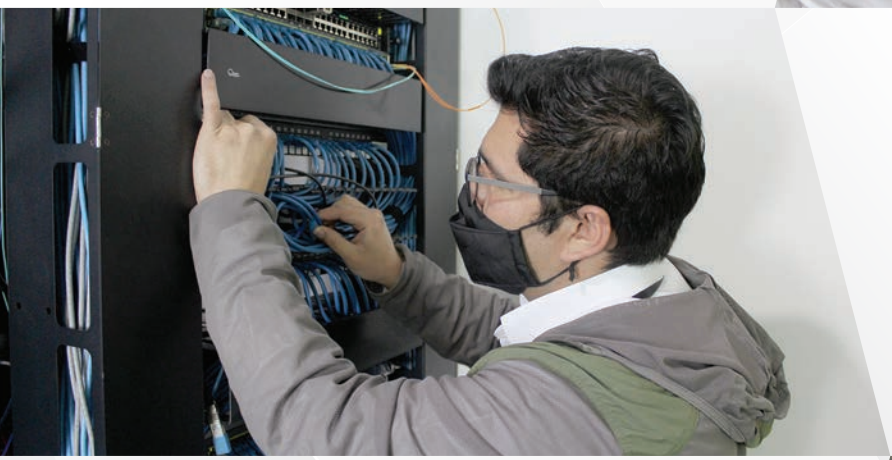


Stock Photo, 2020

3 Olympics and Fairs supported by CeNAT

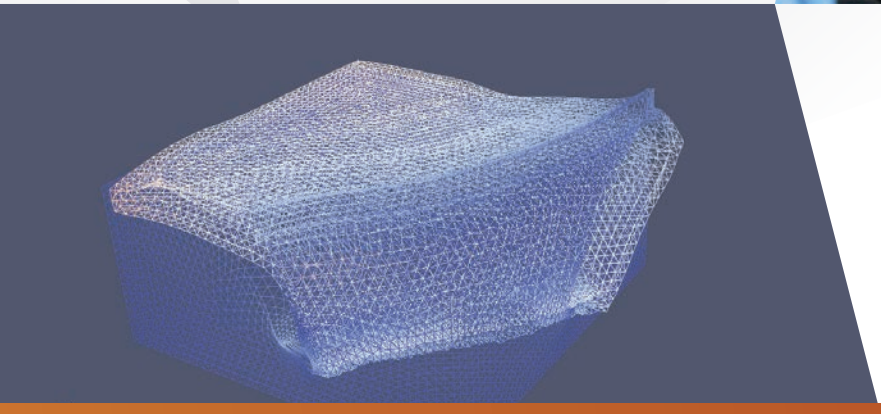
Impact Reached in
2020 at CeNAT

80 Projects developed within the triple-helix framework: Academic, Government, and Private Sector.



394 Users using simulation cluster

478 accounts with access to computing infrastructure services



36,000 science hours in simulations and data processing

Impact Reached in
2020 at CeNAT

120,795 Students and professors of public universities with access to the Edu-Roam network

106 participating countries in the Eduroam network

4,000 Technical assistance to producers in Variability and Climate Change

Source: Information from the year 2020 provided by the Laboratories and Areas of CeNAT.

FunCeNAT and FINANCIAL RESULTS

FunCeNAT and

Financial Results

FunCeNAT was established in November of 1997, under the Law of Foundations No. 5338 with the name of Fundación Centro de Alta Tecnología.

The Foundation has the mission of managing public and private resources, as well as providing support in the organizational management of each of the divisions that make up CeNAT, as promulgated by Law N° 7806.

Law No. 7806 of May 25, 1998, expressly recognized FunCeNAT as the entity that would hold the legal duty to administer the resources required for the execution of the projects developed through CeNAT. Article 3 of this law provided:

"Article 3°- The State and its institutions are hereby authorized to transfer resources to the Centro Nacional de Alta Tecnología, whose administration and management will be handled by the Fundación Centro Alta Tecnología, with legal identification N° 3-006-213777. The public funds that the Foundation administers by virtue of this law will be kept under the supervision of the Office of the Comptroller General of the Republic".

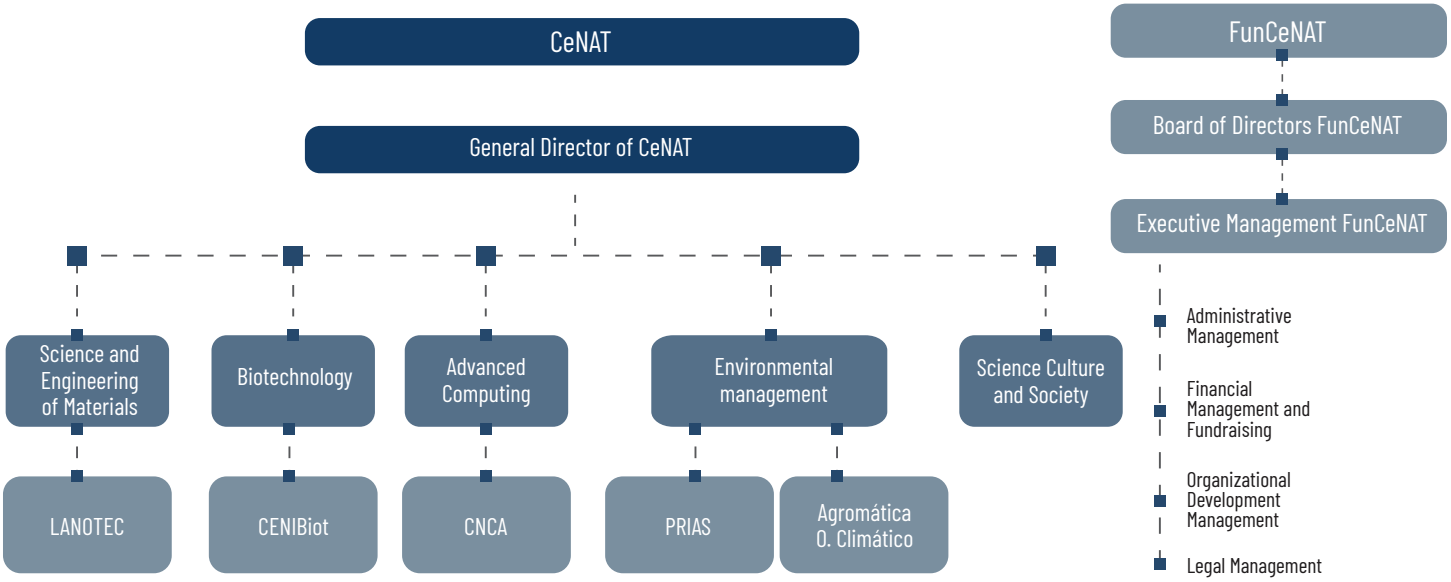
The Foundation acts as a service platform that meets the needs of CeNAT, as well as the public and private projects it manages. For this reason, FunCeNAT actively collaborates in the work of the areas, laboratories, programs, and projects, providing support in administrative management in an efficient and transparent way, in sound financial management, in the organizational development at national and international levels, as well as legal support in the actions that the Laboratories, Programs, and Projects undertake. Through its work, it strengthens the link with CONARE, in addition to supporting communication and inter-sectoral articulation.

It always aligns all its activities with the guidelines issued by CONARE, its Board of Directors, the Comptroller General of the Republic, and the audit of CONARE, as well as the External Audit, so that its activities and actions comply with all the applicable laws and regulations.

FunCeNAT is the foundation that provides permanent support to CeNAT laboratories and programs in four pillars for organizational development, namely:

- Administrative Management
- Legal Management
- Human Talent Management.
- Financial Management and Fundraising

The operational structure of CeNAT is presented below.



PRENDAS, VARGAS Y CÓRDOBA

DESPACHO DE CONSULTORES Y ASESORES
CONTADORES PÚBLICOS AUTORIZADOS Y PRIVADOS
Sociedad de Responsabilidad Limitada Cédula Jurídica: 3-102-272831

Independent Audit Report

To the Managing Board of Fundación
Centro de Alta Tecnología

We have carried out the audit of the attached balance sheet of Fundación Centro de Alta Tecnología (FunCeNAT) as of Thursday, December 31, 2020 and 2019 of the related statements of comprehensive activities, of changes in net assets and of cash flows that are relative to the twelve-month period ended on those dates.

Management's accountability for the financial statements:

FunCeNAT's Management is responsible for the preparation and reasonable presentation of the financial statements, in accordance with the International Financial Reporting Standards and for the internal control it deems necessary to allow the preparation of financial statements to be free of material errors, both fraud and mistakes.

Auditor's accountability:

Our responsibility is to issue an opinion on such financial statements, based on our audit. We perform our audit in accordance with International Standards on Auditing. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves the execution of procedures to obtain audit evidence supporting the amounts and disclosures in the financial statements of FunCeNAT. The selected procedures depend on the judgment of the auditor, including their risk assessment for significant error, whether caused by fraud or error. In conducting these risk assessments, the auditor takes the internal controls of the Organization relevant to the reasonable preparation and presentation of the financial statements into consideration, in order to design audit procedures that are appropriate to the circumstances. An audit also includes an assessment of the accounting policies used and the reasonableness of the accounting estimates made by the Administration, as well as the general assessment of the presentation of the financial statements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a reasonable basis for our opinion.

Opinion:

In our opinion, the Balance Sheet of the Fundación Centro de Alta Tecnología (FunCeNAT) as of Thursday, December 31, 2020 and 2019, the related statements of income, changes in net assets and cash flows that are relative to the twelve-month period ended on those dates, reasonably present, in all their important aspects, the financial situation in accordance with the International Financial Reporting Standards.

Tel.: 2253-2410
Fax: 2281-2971
www.prendasvargas.com
Apdo Postal 168-2120
San José, Costa Rica

Matters that do not affect opinion:

1- Our audit was conducted with the purpose of presenting an opinion on the financial statements of FunCeNAT as of December 31, 2020 and 2019 and for the twelve-month period ended on those dates. The supplementary financial information for the periods ended December 31, 2020 and 2019 shown in the Annex is presented for additional analysis purposes and is not required as part of the basic financial statements. This supplementary information was subject to the same audit procedures applied to the audit of the financial statements as of December 31, 2020 and 2019 and for the twelve-month period ended on those dates and, in our opinion, it was reasonably presented in all significant respects when considered in relation to the financial statements, taken as a whole.

2- In relation to the pandemic caused by the virus known as COVID-19, as of the date of the opinion of the external auditors on the financial statements of FunCeNAT as of December 31, 2020, the Administration of the organization was unable to reasonably estimate the duration and the severity of this pandemic, so it is unaware of the future effects it may have on the financial situation of FunCeNAT and the projects it manages and, although it estimates that its effect has been slight and will remain that way in the short term, it carries out the respective analyzes to determine any situation that may affect it, adopting measures to mitigate the possible effects, so the attached financial statements should be read considering the effects mentioned in Note 10 - Contingency due to COVID-19 pandemic, where mention is made of the national emergency situation throughout the territory of the Republic of Costa Rica caused by the COVID-19 pandemic.

Prendas, Vargas y Córdoba, Ltda.

Marcelo Prendas González
Certified Public Accountant, card No. 822

Loyalty Policy No. 0116 FIG 7, expiring on September 30, 2021. Stamp of Law Nº 6663.

San Jose, March 26, 2021.

FUNDACIÓN CENTRO DE ALTA TECNOLOGÍA
(Nonprofit Organization)

BALANCE SHEET
As of December 31, 2020 and 2019
(Amounts shown in colones)

ASSETS		2020	2019
Current assets:			
Cash and cash equivalents	Note 3	¢101,853,482	¢52,484,956
Transitory investments	Note 4	1,151,242,614	1,012,829,494
Accounts receivable	Note 5	43,051,701	93,966,314
Total current assets		1,296,147,797	1,159,280,764
Long-term investments	Note 6	1,313,366,516	1,236,434,984
Furniture and equipment, net amounts		2,782,100	1,029,676
TOTAL ASSETS		¢2,612,296,413	¢2,396,745,424
NET LIABILITIES AND ASSETS			
Liabilities			
Current liabilities			
Accounts payable and accumulated expenses	Note 7	¢186,842,411	¢319,474,843
Restricted funds for public-funded projects	Note 8	1,500,554,117	1,349,367,121
Restricted funds for private-funded projects	Note 8	715,094,015	532,254,736
Total current liabilities		2,402,490,543	2,201,096,700
NET ASSETS			
Accumulated surplus	Note 10	209,805,870	195,648,724
Total equity		209,805,870	195,648,724
TOTAL LIABILITIES AND NET ASSETS		¢2,612,296,413	¢2,396,745,424

The attached notes are an integral part of these financial statements.

FUNDACIÓN CENTRO DE ALTA TECNOLOGÍA
(Nonprofit Organization)

INCOME STATEMENT - INTEGRATED
FOR THE TWELVE-MONTH PERIOD ENDED DECEMBER 31, 2020 AND 2019
(Amounts shown in colones)

	2020	2019
REVENUE:		
Fund Revenue	¢97,380,278	¢94,820,151
Project Management Revenue	55,026,506	39,029,225
Other Revenue	3,509,805	13,446,129
Total Revenue	155,916,589	147,295,505
EXPENSES:		
Remunerations	123,016,680	112,239,215
Services	6,373,108	6,554,820
Materials and Supplies	1,591,476	369,842
Depreciation expense	1,002,557	726,830
Benefits	5,067,552	8,655,502
Training and protocol	4,256,904	2,278,075
Other minor expenses	451,166	877,896
Total Expenses	141,759,443	131,702,180
SURPLUS OF THE PERIOD	¢14,157,146	¢15,593,325

The attached notes are an integral part of these financial statements.

INSTITUTIONAL
LEADERSHIP

Institutional Leadership

Consejo Nacional de Rectores (National Council of Deans)

Carlos Araya Leandro, Dr.,
Chancellor, University of Costa Rica.

Luis Paulino Méndez Badilla, Eng.,
Chancellor, Costa Rica Institute of Technology.

MBA. Francisco González Alvarado,
Chancellor, National University.

Rodrigo Arias Camacho, MBA,
State University for Distance Education.

Emmanuel González Alvarado, Dr.,
National Technical University.

Scientific Council

Fernando García Santamaría, Dr.,
Vice-Chancellor of Research, University of Costa Rica.

Máster Jorge Alfredo Chaves Arce,
Vice-Chancellor of Research, Costa Rica Institute of Technology.

Daniel Rueda Araya, M.Sc.,
Vice-Chancellor of Research, National University.

Rosibel Viquez Abarca, Dr.,
Vice-Chancellor of Research, State University for Distance Education.

Francisco Romero Royo, Dr.,
Vice-Chancellor of Research, National Technical University.

Strategic Allies

- University of Costa Rica
- Costa Rica Institute of Technology
- National University
- Universidad Estatal a Distancia (State Distance Education University)
- Universidad Técnica Nacional (National Technical University)
- CONICIT
- MICITT

Directorate of CeNAT

Eduardo Sibaja Arias, Eng. ,
Director, CeNAT

Karol Palma Odio,
Direction Administrative Assistant

Laboratory Directors

José Vega Baudrid, Ph.D., Director, National Nanotechnology Laboratory

Randall Loaiza Montoya, Ph.D., Director, National Center for Biotechnological Innovations.

Esteban Meneses Rojas, Ph.D., Director, National Collaboratory of Advanced Computing.

Allan Campos Gallo, MBA, Director, Environmental Management Area.

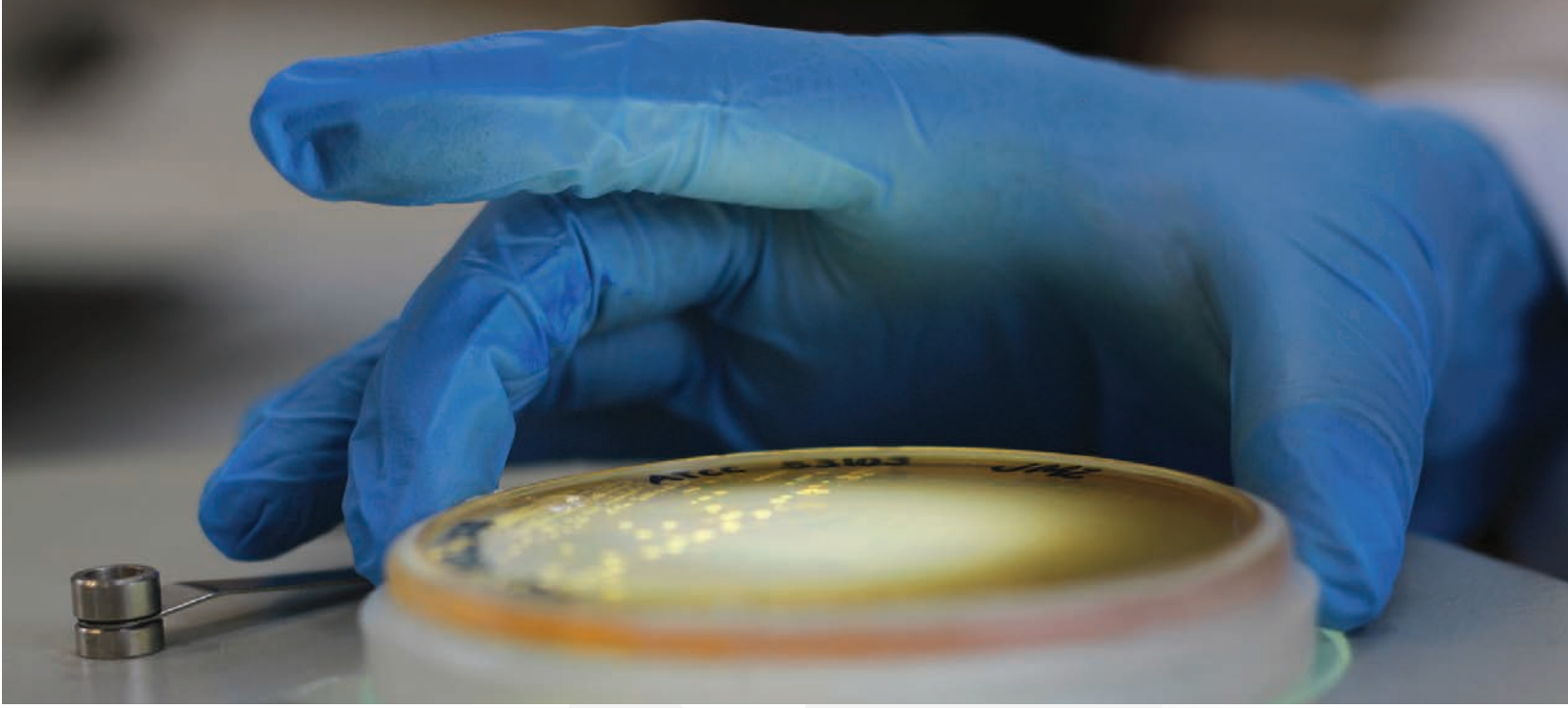
Cornelia Miller Granados, Eng., PRIAS Laboratory Director.

Officers

Sánchez Calderón Kimberly	CeNAT
Padilla Hernández Rubén	CeNAT
Rivera Obando Sugey	CeNAT
Hidalgo Díaz Billy Alexander	Coordinating Unit of the World Bank Project
Rojas Esquivel Armando	Coordinating Unit of the World Bank Project
Montes de Oca Vásquez Gabriela	LANOTEC
Camacho Elizondo Melissa	LANOTEC
Flores Sequeira Flor	LANOTEC
Pereira Reyes Reynaldo	LANOTEC
Paniagua Barrantes Sergio	LANOTEC
Araya Sibaja Andrea Mariela	LANOTEC
Morales Cerdas Carolina	LANOTEC
Bastista Menezes Diego	LANOTEC
Mora Bolaños Rodrigo	LANOTEC
Corrales Ureña Yendry	LANOTEC
Calderón Castillo Karla	CNCA
Castro Castro Jorge Mario	CNCA
Jiménez Vargas Diego	CNCA
Umaña Jiménez Jean Carlo	CNCA
Abdalah Hernández Mariela	CNCA
Gamboa Venegas Carlos	CONARE Network
Montero Vargas Maripaz	CNCA-CENIBiot

Officers

Ortega Rivera Marilyn	PRIAS
Aguilar Arias Heileen	PRIAS
Vargas Bolaños Christian	PRIAS
Ávila Pérez Iván	PRIAS
Castillo Gamboa Jonny Esteban	PRIAS
Hernandez Castro José Enrique	PRIAS
Arguedas González Catalina	PRIAS-MOCUPP
Blanco Arias Brandon	PRIAS-MOCUPP
Calvo Elizondo Yorleny María	PRIAS-MOCUPP
Vargas Solano Yerlin Dayana	PRIAS-MOCUPP
Vargas Céspedes Armando Antonio	PRIAS-MOCUPP
Romero Badilla David Alonso	PRIAS-MOCUPP
Jiménez Rodríguez Milagro	PRIAS-MOCUPP
Hernández Hernández Sofía	PRIAS-MOCUPP
Manrow Villalobos Marilyn	PRIAS-MOCUPP
Fallas Montero Ezequiel	PRIAS-MOCUPP
Acuña López Sofía	PRIAS-MOCUPP
Fernández Garro Jennifer María	PRIAS-MOCUPP
Corrales Garro Francini	PRIAS-MOCUPP
Montero Castro Karla Vanessa	CENIBiot
Muñoz Arrieta Rodrigo	CENIBiot
Arias Salazar Wendoly	CENIBiot
Rojas Gómez Mónica	CENIBiot
Montero Zamora Jessica	CENIBiot
Chavarria Vargas Max	CENIBiot
Araya Mattey Jorge Alberto	CENIBiot
Araya Valverde Emanuel	CENIBiot
Baizan Rojas Monica	CENIBiot
Alvarado Villalobos Daniel Andrés	CENIBiot
Chaves Phillips Melissa María	CENIBiot
Mora Villalobos Anibal	CENIBiot
Rojas Carrillo Oscar	CENIBiot
Tonon Baschirrotto Priscila	CENIBiot
Charpentier Alfaro Camila	CENIBiot
Orozco Ortiz Cristofer	CENIBiot
González Fernández Yosimar	CENIBiot
Alfaro Vargas Pamela	CENIBiot
Vásquez Castro Manuel Felipe	CENIBiot
Rivera Mora Vanessa María	CeNAT-CENIBiot
Obando Rodríguez Kenneth	State of the Nation



Program Coordinators

Sánchez Trejos Patricia	Agromatics, Food Safety And Slow Food
Katchan Katchan Irina	Variability and Climate Change Observatory

Managing Board of Fundación Centro de Alta Tecnología

- **Carlos Araya Leandro,** President
- **Luis Paulino Méndez Badilla,** Secretary
- **Francisco González Alvarado,** Treasurer
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- **Rosemarie Ruiz Bravo,** Member 1
- **Rodrigo Arias Camacho,** First Comptroller
- **Emmanuel González Alvarado,** First Comptroller
- **Eduardo Sibaja Arias,** Director, CeNAT
- **Gastón Baudrit Ruiz,** Legal Advisor OPES-CONARE

Administrative Management FunCenat

Cynthia Cordero Solís, Administrative Director	FunCeNAT
Mauricio Segura Chacón	FunCeNAT
Jeannette Vargas Arce	FunCeNAT
Yakelyn Bejarano López	FunCeNAT
Margarita Quan Zepeda	FunCeNAT
María Fernanda Hernández Jiménez	FunCeNAT

Scholarships

Joseph Cabraca Vargas	University of Costa Rica (UCR)	CENIBiot
Samara López Ramírez	Costa Rica Institute of Technology (TEC)	CENIBiot
Silvia Fernández Ferández	University of Costa Rica (UCR)	CENIBiot
Marcel Jiménez Fallas	University of Costa Rica (UCR)	CENIBiot
Rodrigo Muñoz Arrieta	University of Costa Rica (UCR)	CENIBiot
Adrián Villalobos Cano	Costa Rica Institute of Technology (TEC)	CENIBiot
María Fernanda Francis Cartín	University of Costa Rica (UCR)	CNCA
Esteban José Rodríguez Rodríguez	University of Costa Rica (UCR)	CNCA
Manuel Zumbado Corrales	Costa Rica Institute of Technology (TEC)	CNCA
Carlos Víquez Núñez	National University for Distance Education (UNED)	GA
Fiorella Calderón Jiménez	Costa Rica Institute of Technology (TEC)	GA
Josue Cordero Guerrero	University of Costa Rica (UCR)	LANOTEC
Karime Ramírez Jiménez	Costa Rica Institute of Technology (TEC)	LANOTEC
Maria Isabel Quirós Fallas	University of Costa Rica (UCR)	LANOTEC
Krissia Wilhelm Romero	University of Costa Rica (UCR)	LANOTEC
Deiling Ureña Portuguez	Costa Rica Institute of Technology (TEC)	LANOTEC
Luis Diego Arias Chavarría	Universidad Nacional de Costa Rica (National University of Costa Rica, UNA)	LANOTEC
Andrea Chacón Calderón	University of Costa Rica (UCR)	LANOTEC
Miguel Benavides Acevedo	University of Costa Rica (UCR)	LANOTEC
Juan Miguel Zuñiga Umaña	University of Costa Rica (UCR)	LANOTEC
Gabriela Montes de Oca Vásquez	Universidad Nacional de Costa Rica (National University of Costa Rica, UNA)	LANOTEC
Brian Calderón Jiménez	Costa Rica Institute of Technology (TEC)	LANOTEC
Rodrigo Mora Bolaños	Costa Rica Institute of Technology (TEC)	LANOTEC
Adriana Fallas Cosío	Costa Rica Institute of Technology (TEC)	PRIAS

Team Members

Roger Mora González	CeNAT
Farid Marín Granados	CeNAT
Daniela Blanch Bermúdez	CENIBiot
Ana Carolina Cerdas	CENIBiot
David Valverde	CENIBiot
Nadia Solano Mora	CENIBiot
Ivania Guillén Pérez	CENIBiot
Ana Victoria Elizondo Masis	CENIBiot
Kevin Alvarado Barrantes	CENIBiot
Maria Paz Vieto Cárdenas	CENIBiot
Andrés Montoya Ruíz	CENIBiot
Isaac Vargas Solórzano	CENIBiot
Diego Rojas Gatjens	CENIBiot
Pamela Alfaro Vargas	CENIBiot
Rafael Montenegro Marín	CENIBiot
Raquel Gutiérrez Solano	CENIBiot
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Carolina Gamboa Chaverri	CENIBiot
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Daniela María Zamora Barrantes	CENIBiot
Daniela Vásquez Vásquez	CENIBiot
Juan Sebastián Hernández Cifuentes	CENIBiot
Marco Porras López	CENIBiot
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María Alejandra Vallejo Salas	CENIBiot
Katherine Valverde Madrigal	CENIBiot
José Gabriel Vargas Jiménez	CENIBiot
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Mariana González Campos	CENIBiot
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Erika Méndez Rodríguez	CENIBiot
Gabriel Morales Artavia	CENIBiot
Adeliza Vargas Chavarría	CENIBiot
Isabella Gómez Díaz	CENIBiot

Team Members

Victor Manuel Yeom Song	CNCA
Luis Campos Duarte	CNCA
Leonardo van der Laat Muñoz	CNCA
Elvis Rojas Ramirez	CNCA
Andrés Bolívar Retana	GA
Martha Montero Vindas	GA
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Daniel Serrano Delgado	GA
Ariadna Hidalgo Gatgens	LANOTEC
José Pablo Morales Víquez	LANOTEC
Luis Castillo Henriquez	LANOTEC
Nathalia Vargas Valverde	LANOTEC
Josué Cordero Guerrero (Ligado al proyecto privado)	LANOTEC
Diego Fumero Martinez	LANOTEC
Daniel Serrano Delgado	LANOTEC
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Brandon Rodriguez Quesada	LANOTEC
Alejandro Sánchez Esquivel	LANOTEC
Gabriel Jiménez Thuel	LANOTEC
Sofía Rojas Vargas	LANOTEC
Ariadna Hidalgo Gatgens	LANOTEC
Daniela Masís Vega	LANOTEC
Angélica Astorga Pérez	LANOTEC
Reyner Vargas Gamboa	LANOTEC
Maribel Cordero Pereira	LANOTEC
Daniela Brenes Gutiérrez	LANOTEC
Hellen Cordero Robles	LANOTEC
Yariela Rodríguez Arias	LANOTEC
Valeria Mata Medaglia	LANOTEC
Adriana Caseres Rojas	LANOTEC
Luis Carballo Loría	LANOTEC
Bladimir Ceron Guerra	LANOTEC
Andrea Rivera Álvarez	LANOTEC
Luis Murillo Espinoza	LANOTEC
Laura Bolaños Chaves	LANOTEC
Ana María Guevara Camargo	LANOTEC
Luis Diego Arias Chavarría	LANOTEC
Joshua Corrales Castillo	LANOTEC
Mariana Jiménez Venegas	PRIAS

CONSEJO NACIONAL DE RECTORES

CeNAT
Centro Nacional de Alta Tecnología

(506) 2519-5835 | Fax: (506) 2232-0423 /centro.nacional.de.alta.tecnologia

cenat@cenat.ac.cr www.cenat.ac.cr

1,3 km north of the US Embassy. National Center of High Technology building. San José, Costa Rica.