



CONACYT

CAMPUS III

INECOL



INSTITUTO DE ECOLOGÍA, A.C.
INECOL

Project for Extension and Modernization
of the Scientific and Technological Infraestructure

What is the Institute of Ecology A.C.

The Institute of Ecology AC (INECOL) is one of 27 Public Research Centers run by the Mexican Council of Science and Technology (CONACYT). Since our inception in 1975, our mission has been to generate major advances in scientific understanding in ecology, biodiversity, and the management of natural resources, including agricultural pests and vectors of diseases, in order to conserve our natural heritage and promote the social and economic development of Mexico.

Our main objectives:

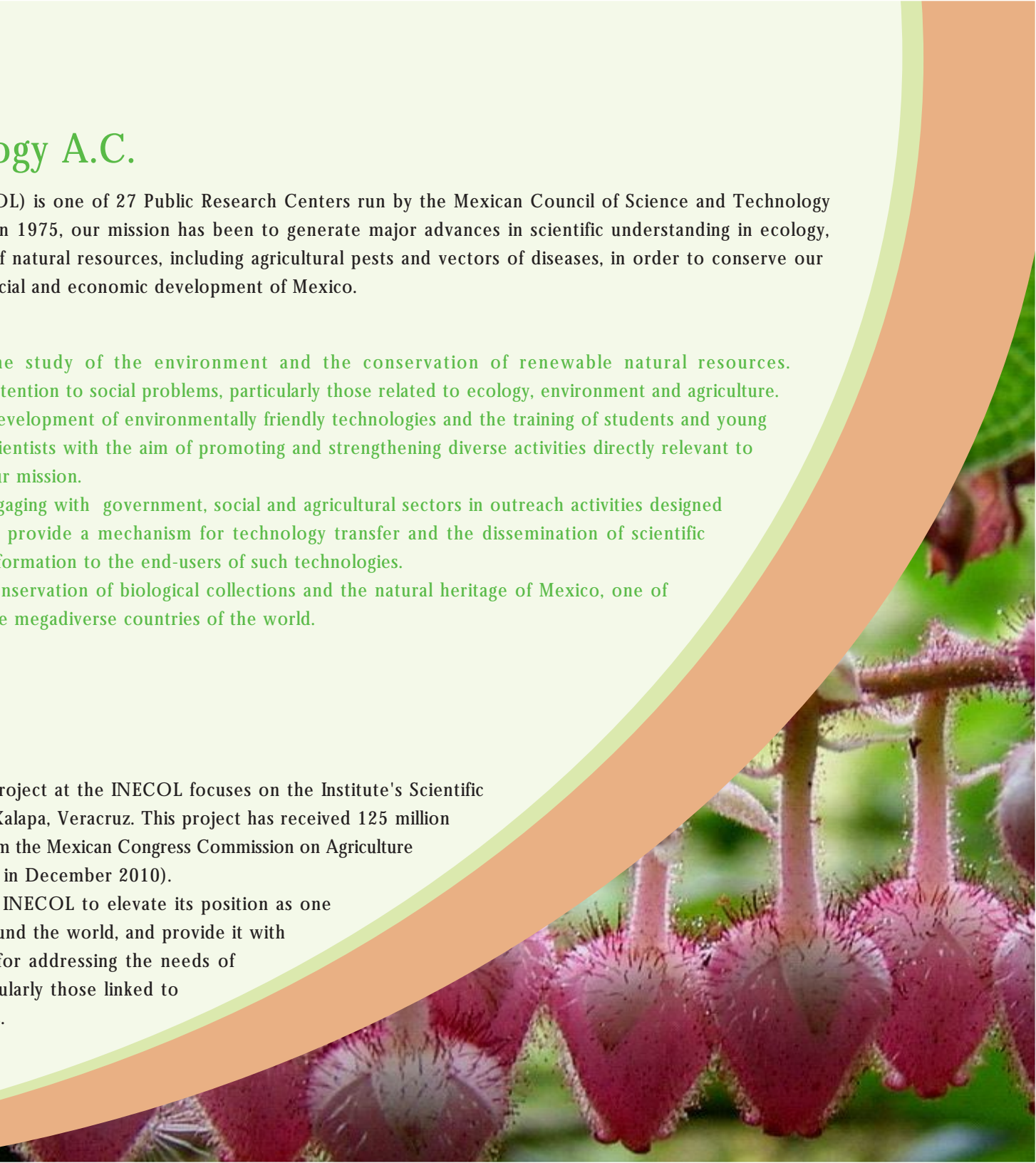
- The study of the environment and the conservation of renewable natural resources.
- Attention to social problems, particularly those related to ecology, environment and agriculture.
- Development of environmentally friendly technologies and the training of students and young scientists with the aim of promoting and strengthening diverse activities directly relevant to our mission.
- Engaging with government, social and agricultural sectors in outreach activities designed to provide a mechanism for technology transfer and the dissemination of scientific information to the end-users of such technologies.
- Conservation of biological collections and the natural heritage of Mexico, one of the megadiverse countries of the world.



Project Presentation

The Extension and Modernization project at the INECOL focuses on the Institute's Scientific and Technological Infrastructure in Xalapa, Veracruz. This project has received 125 million Mexican pesos (ca. US\$10 million) from the Mexican Congress Commission on Agriculture and Livestock Production (approved in December 2010).

This strategic project will allow the INECOL to elevate its position as one of the leading scientific centers around the world, and provide it with the capacity to generate solutions for addressing the needs of different sectors of Veracruz, particularly those linked to environmental and agricultural issues.



Opportunity

The Extension and Modernization project of the INECOL will be established on a plot of land of 4-75-53 hectares next to the Botanic Garden, formerly devoted to agricultural and livestock production. A new building for scientific facilities (laboratories, classrooms, videoconferences rooms) uses will be constructed, but also the idea is to restore the former cloud forest, to expand the Botanic Garden, and to protect the natural occurring springs found on the site.

The INECOL will acquire this land so it can establish a natural protected area and ensure the continuity of the local cloud forest. At the present time, the INECOL is surrounded by few properties where this forest is established, like the Cloud Forest Sanctuary, the Francisco Javier Clavijero Botanic Garden, the Centre of Education for Environmental Conservation (run by the government of Veracruz) and other private lands.

Architectural Programme

- Main Building

Research laboratories:

Teaching Laboratory for the “Scientific Career among Children and Young” program
Biological Collections
Natural History Museum
New Classrooms and Teaching Laboratories for the Graduate School
Auditorium
Offices for researchers
Videoconferences Rooms
Unit of Liasion and Technology Transfer (UVTC).

- Pilot Plants (Pilot research facilities)

Parasitoid Breeding
Plant Tissue Culture
Cultivation of Edible Mushrooms
Biological Pest Control

- Greenhouses
- Parking
- Departments for Visiting Professors / Researchers
- Wastewater Treatment Plant linked to an Algae Bio-Factory
- Expansion of the Botanic Garden



Concept & Components

The Extension and Modernization project will create the Campus III of INECOL, located next to its headquarters in Xalapa, Veracruz.

What does this project consist of?

The initial stage of the Campus III of INECOL, consists of the acquisition of a land of 4-75-53 hectares next to the Botanic Garden. On this land, a new and intelligent (sustainably built?) building will be constructed. Schemes of exploitation of solar power, energy saving, and low impact on the natural environment will be applied. The project has a high strategic value for the country, and is divided into the following groups:

Infrastructure for Scientific and Technological Research

- Institutional laboratories of high technology in terms of phytosanity (bio-rational management of pests and vectors), molecular biology, chemical ecology, environmental nanotechnology and agro-nanotechnology.
- Spaces to house valuable Institutional Collections, among which, the collection of the Herbarium XAL stands out and whose current collection of more than 300,000 plant and mushrooms specimens is a potential source of information for the bio-prospection of new materials and agents of biological control, among others. Other collections are the Entomologic Collection and the Wood Samples Collection.
- Cubicles and common work areas for researchers and academic technicians.
- Five small apartments for accommodation and longer visits for visiting researchers, professors and special guests.

Infrastructure for the formation of new scientific teams:

- Educational classrooms, teaching laboratories and a video-conference room with capacity for the increasing number of students of the INECOL's Graduate School.
- Educational Laboratory for Children and Young, as part of the institutional Program for promotion of the scientific career for children and young. This Program is unique in the country and in the world in general, and will serve as a new model for science education in Mexico.
- A Natural History Museum linked to the Institutional Collections and the Educational Laboratory for Children and Young. It will put the knowledge of Mexico's biological richness within reach of the public, whose generation is the substantive activity of INECOL. modern auditorium with capacity for 120 people, to provide science forums and discussions, as well as being extremely useful for our institutional graduate courses.



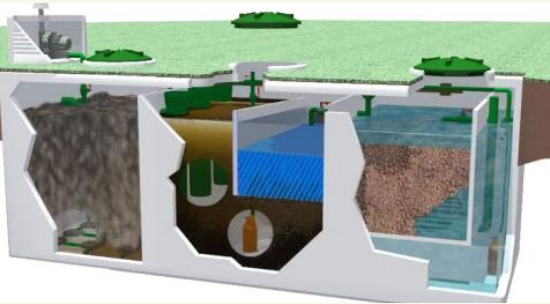
Productive infrastructure linked to research

- Pilot plants and greenhouses with capacity for meeting, on an intermediate scale, the demands of the main users from natural enemies of fruit flies, edible mushrooms and native plants with commercial, educational and conservation purposes.
- The office of the Unit of Liaison and Technology Transfer (UVTC), will serve as a link between INECOL, investors and stakeholders in the creation of science and technology-based enterprises.

Other facilities

On the land which will be acquired, other actions and facilities with high scientific value that are notoriously linked with society will be developed:

- Establishment of the National Laurel Collection (Lauraceae) eg. Avocados; Citrus (Rutaceae) guava (Myrtaceae) and mangoes and tropical plums (Anacardiaceae), as germplasm banks for obtaining varieties and cultivars with a high market value.
- A restoration project of the native cloud forest, through human intervention and by natural succession. It will be a practical contribution to the effort of conservation of the original vegetation.
- The Water Educational Center, a vanguard project that will take advantage of the existence of a natural spring on the land to be acquired and which will educate visitors about the proper management of this vital resource and the importance of preserving the forests as “water factories”.
- A waste water treatment plant linked to an algae or biodiesel bio-factory, as a clear example of a practical solution to the serious local problem of water pollution.



Justification

The INECOL is a scientific centre, dedicated for 35 years to the study of environmental issues, the management and conservation of renewable natural resources, and management of agricultural pests and disease vectors. This institute forms high level professionals and responds to the problems in society with competitiveness, through the generation and application of knowledge about biodiversity, animal behavior, including insect pests such as fruit flies, the development of technology and by providing highly specialized services. The Institute made of 9 academic networks, addresses vanguard topics oriented to study a wide range of aspects concerning the structure, evolution and current problematic areas of ecological systems, including agro-ecosystems, which are the fundamental support of the regional and national economy.





The INECOL is working to generate high level scientific knowledge applied to the establishment of practical solutions to the conservation, restoration and sustainable management of natural resources and the agricultural pests and disease vectors, all this in benefit of Mexican society.

The institution is recognized for having played a fundamental role in the opening of the American market for the Hass avocado, produced in Michoacán. This important action has generated an economic flow of more than \$2,000 million dollars to the country as well as permitting the creation of more than 25,000 jobs. Presently the necessity for generating an integral modernization process of the institution is clearly visible. The institution indispensably requires having access to high levels of scientific research in the world, and

for that it must have a new highly specialized scientific infrastructure, which permits the incorporation of new and high qualified academic staff, greater efficiency in the development of its substantive activity, and at the same time promoting a better mechanism of linkage with society through the generation of cutting-edge solutions to environmental and agricultural problems that are equally serious.

Since 2010 an enormous internal effort has been made to strengthen the institution, but if the same institution wants to transform itself into a highly competitive entity, generating patents and other innovative processes, and contributing to the solution of pressing environmental problems including agricultural pests, particularly in fruit culture that affects the State of Veracruz and the country in general, then it is necessary to create a new cutting-edge infrastructure associated and conducive to working with advanced equipment.

Objective of the project

The fundamental objective is to provide the institution with cutting edge infrastructure and scientific and technological installations with proper capacities for high level research, technological development and knowledge transfer applied to solutions for some of the serious environmental and agricultural problems that affect diverse sectors of society.

Benefits

For INECOL

- Providing the institution with a major and more efficient capacity to generate solutions to environmental and agricultural problems, among which the sustainable use of water stands out. Also, the conservation, restoration and management of cloud forest patches, and overall those



related to pests and disease vectors, problems that, due to their magnitude, negatively influence the regional and national economy and of course the quality of life of Mexicans.

- Strengthening the institutional capacity of genuine linkages for participation in environmental education, according to the Strategy of Environmental Education for the Sustainability of Mexico. It will also provide an opportunity to expand the living and preserved plant collections, located in the Institute's Botanic Garden and Herbarium and to contribute with concrete facts in the maintenance, restoration and conservation of the cloud forest.

Regional / national impact

- A total investment of more than \$250 million pesos, with the consequent and important economic flow through to the region.
- Modernization of a research centre to international standards, thereby substantially increasing the scientific potential of the INECOL.
- The possibility to carry out cutting edge research in ecology and management of pests and agricultural diseases, it will be a fundamental step to position Veracruz as a protagonist of the scientific and technological development of the country.
- Strengthening the culture of environmental protection, by encouraging interest in the

Scientific Careers for Children and the Young in the region as an alternative life option (as an alternative career option?).

- Partnering with the three levels of government, businesses (private sector), and civic organizations in a new project that breaks paradigms and will bring great benefits to society.

The Project of Extension and Modernization of Scientific and Technological Infrastructure of INECOL will have a highly positive impact on the indicators of knowledge generation, strengthening competitiveness, and high-level human resources training. It will contribute at the same time in the field of patent generation and other technological innovations.

Goals of the project

To provide space and facilities commensurate with future projects and current needs with a surface of 13,400 m².

Estimated cost of the construction \$155, 650,000 Mexican pesos (NOTE: At present, \$125 million is assured).



Building

Module A

Laboratories and classrooms for Graduate School, Natural History Museum, Educational Laboratory to promote the Scientific Careers among Children and the Young, Auditorium, Collections, UVTC offices.

Module B

Laboratories of Chemical Ecology and Molecular Biology; Phytosanitary Laboratories.

Module C

Laboratories of Agro-nanotechnology and Environmental Nanotechnology in partnership with the Research Center on Advanced Materials (in Spanish Centro de Investigación en Materiales Avanzados -CIMAV), Biological Collections (Herbarium, Entomological, and Wood Tissues).

Each module covers 1500 m². All the electric facilities, gases, data network, etc., installed on one side to facilitate their future maintenance.

New research projects

The new facilities will permit the increase of INECOL's workforce. It is expected to add 25 researchers and 25 academic technicians (10 researchers and 8 academic technicians will be new personnel), as well as at least 50 students of the Graduate School, 50 undergraduate and social service students.

Some examples of specific research projects to be implemented in whole or in part in the new facilities of Campus III are:

- Application of nanotechnology in solving environmental pollution problems and the improvement of productive processes in the camp.
- Identification and creation of new nano-biomaterials.
- Application of nanotechnology in industrial processes.
- Development of a natural repellent (patented by the INECOL) against fruit fly species (this research is truly urgent due to the Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food who will soon prohibit the use of the pesticide, Malathion, in fruit orchards).
- Comprehension and identification of defense mechanisms used by fruits when attacked by fruit flies with the purpose of developing resistant varieties.

- Research of genomics of plant species from the families of Lauraceae, Rutaceae, Myrtaceae and Anacardiaceae aimed at the creation of cultivars/varieties of avocado, citrus, guavas and mangoes resistant to pests and diseases.
- Biological control of the golden nematode (*Globodera rostochiensis*), one of the phytosanitary problems with major negative impact on potato crops all over the country.
- Consolidation of the project for identifying pathogens that cause massive death of bees (in partnership with the Department of Defense of the United States and other international agencies).
- Mass propagation of native timber trees and other useful plants (eg. medicinal plants) through tissue culture.
- Cultivation and commercialization of native strains of hybridized mushrooms
- Research about the comprehension of evolutionary and ecosystem restoration processes. (Phylogeography).
- Development of practical and viable schemes for the restoration of a cloud forest by testing different species assemblages.
- Establishment of schemes for the recovery of wetlands and springs in medium-altitude areas.
- Technological development for treating wastewater using algae.

Expected products

- Patents and technological innovations.
- Creation of new nano-biomaterials and their application in the processes of industrial manufacture and solving environmental problems.
- Cutting-edge scientific articles.
- Formation of high level human resources and to promote interest in the Scientific Careers among Children and the Young.



- Formulas/schemes to control some agricultural pests and vectors of diseases for example: fruit flies, the golden nematode and several defoliator worms.
- Articles of dissemination of Science.



Credits

All photographs showed in this document were taken in:

The Cloud Forest Sanctuary
Clavijero Botanic Garden of the INECOL

Presented by

Martín R. Aluja Schuneman Hofer, PhD.,
Director of the Institute of Ecology

Technical Secretariat
Clavijero Botanic Garden
Liaison Office

Photographs © Instituto de Ecología, A.C.
Xalapa, Veracruz, México 2011
www.inecol.mx

