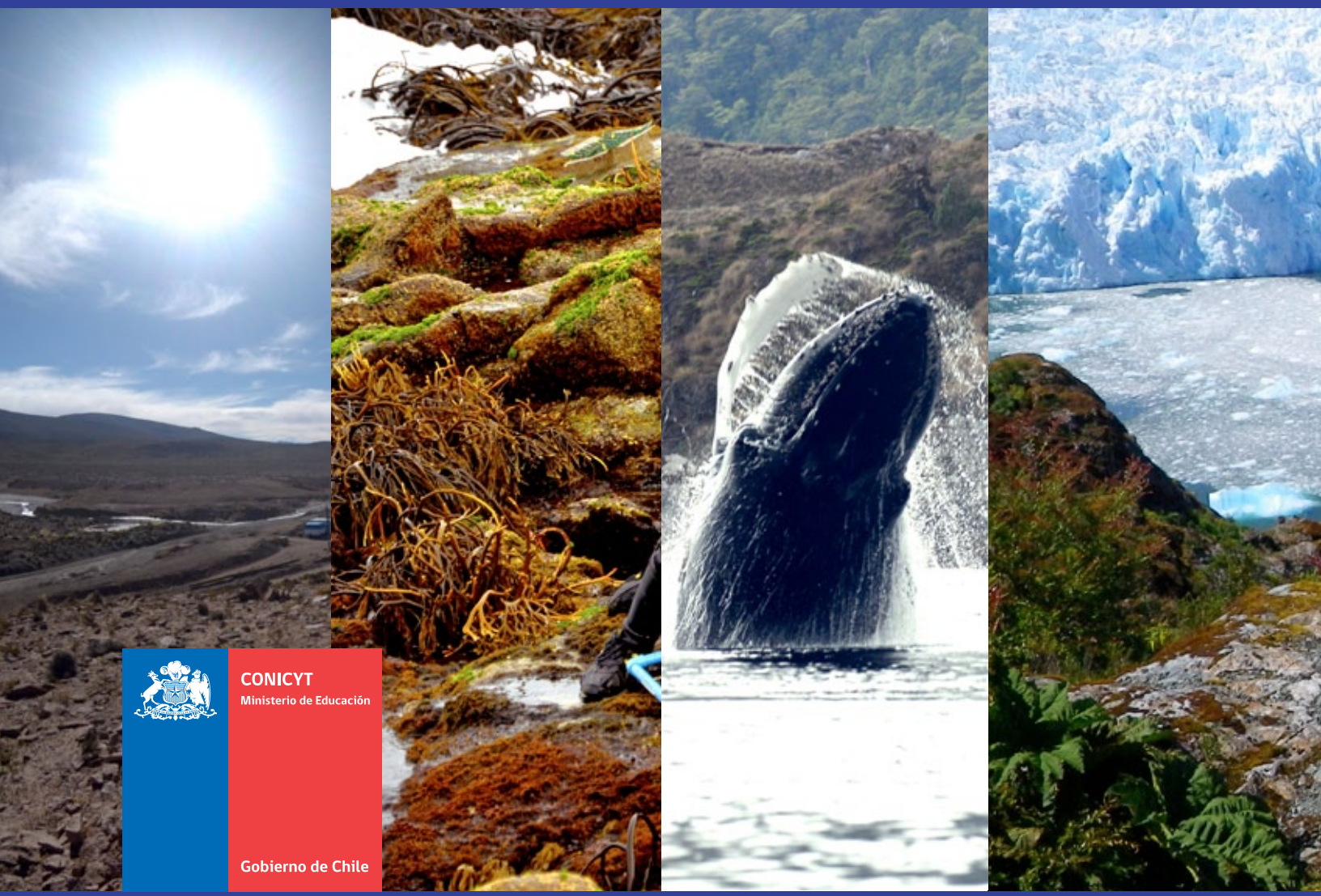
REGIONAL
Program
CONICYT

REGIONAL CENTERS FOR SCIENTIFIC AND TECHNOLOGICAL DEVELOPMENT

Decentralizing science to serve the regions

A joint initiative of CONICYT's Regional Program and the regional governments



CONICYT
Ministerio de Educación

Gobierno de Chile

REGIONAL Program

The National Commission for Scientific and Technological Research, CONICYT was created in 1967 as an advisory organization for the Presidency in matters of scientific development. It is an autonomous public institution under the Ministry of Education. It organizes its work under two main strategic pillars: strengthening Chile's scientific and technological base and promoting advanced human capital training.

In order to achieve these strategic goals CONICYT has a variety of programs guided by the principles of open tendering and excellency via open calls. The projects are evaluated through different stages until their awarding, based on evaluations that follow international practices.

Amongst our programs, the Regional Program for Scientific and Technological Research is of note. It began in 2000 thanks to an initiative by the Undersecretary of Regional Development and Administration. The instrument "Creation of regional centers for scientific and technological research" was co-funded by regional governments (GORE) with the aim of expanding and decentralizing the distribution of human, financial and material resources, from a geographic and institutional perspective. Thereby, the goal is to direct research towards the relevant subjects for the development of the regions where research institutions are located.

Also, we hope to stimulate the development of disciplines or specific areas throughout the country with the purpose of helping the regional centers to become national leaders in their specific fields.

On the other hand, this instrument also aims at promoting joint projects among universities, research institutes and the regional centers themselves. The goal is to achieve excellence levels in the midterm, as well as recruiting and retaining human resources able to lead research and development activities in the region.

Currently, the Regional Program has 13 scientific and technological regional centers throughout 11 Chilean regions. Each one of them was created within the framework of CONICYT's calls for the creation of regional centers of scientific and technological research and have had the opportunity to consolidate their work and keep functioning thanks to different instruments created by CONICYT for strengthening and supporting their continuity.

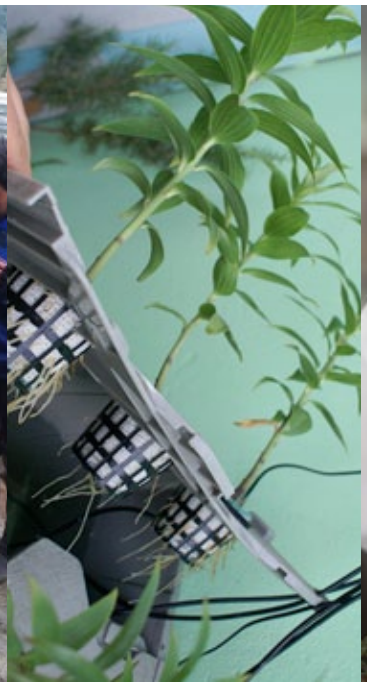
In the following pages, we present a panoramic view of the work done by the regional centers in different Chilean regions. To this end, each one of the institutions selected their main projects in terms of relevance or impact at the local level but also at a national or international scale.

With this publication we hope to contribute to the development of new research and scientific development initiatives in Chile, as well as establishing scientific capabilities that directly contribute to a balanced and decentralized scientific and technological development in our country.

Juan Paulo Vega
Director
CONICYT's Regional Program




REGIONAL CENTERS

ARICA AND PARINACOTA REGION

The Center for Research of the Man of the Desert, in the Arica and Parinacota region (CIHDE-CODECITE) is dedicated to the scientific-technological research and the transfer of knowledge with reference to heritage and natural resources. These are relevant issues for regional strategic development, considering the extreme arid conditions that characterize the landscape and life in Arica.

The Cultural Resources area performs interdisciplinary research about the biological and cultural history of the different people that have inhabited the desert ecosystems of the region. Whereas the Natural Resources area researches hydrological and morphological resources creating knowledge and innovative applications, enabling highly qualified human resources to contribute to the cultural development of human populations from a regional perspective.

CIHDE
CENTRO DE INVESTIGACIONES DEL HOMBRE EN EL DESIERTO

www.cihde.cl
Director: Elías Lafertte Montoya

Research areas

Archaeology and Anthropology: In this area, CIHDE conducts interdisciplinary scientific research in different fields: from archaeology and anthropology to environmental sciences, in collaboration with an expanding domestic and international network. Its aim is understanding and explaining the cultural and natural history of the Atacama Desert as part of the history of human populations. By doing so, it hopes to contribute to the understanding, conservation and dissemination of this cultural and natural legacy for the development of the present and future society.

Genetics and Bioanthropology: It focuses on the genetic composition and pathological conditions of native people in order to identify determinants for the prevalence of certain diseases in the area. This is directly linked to the improvement of living conditions for the human population in the desert.

Year of creation : 2002.

Resources transferred*: CONICYT M CLP $1,856,424. GORE M CLP $785,195

Participating institutions: Universidad de Tarapaca

Employed researchers: 5 PhD + 1 PhD c

Associated researchers: 3 PhD

*Resources transferred up to December 2013 including additional strengthening projects awarded by the center.

Promotion of the Chinchorro culture as world heritage

Promoting the Chinchorro culture is a task that has arisen and linked local authorities and different sectors of the society because of the general interest around it, given the human and archaeological remains found in different areas of the region as well as the increasing chance of becoming a UNESCO World Heritage site. CIHDE, the Universidad de Tarapaca, the municipalities of Camarones and Arica, Arica Harbor Company (EPA) and the regional government of Arica and Parinacota have joined together under this mission.

The management of the Chinchorro application as a world heritage site is focused on Caleta Camarones, where they originated and grew. But there are also Chinchorro sites from the province of Ilo, in the South of Peru to Cobija in Antofagasta (Chile). Bajo Molle, Cerro Esmeralda and Caramucho are noted among the sites. Their well-documented remains are displayed in regional exhibition halls.

Building a solar map for the Arica and Parinacota region

This project characterizes and measures solar radiation using satellite images with the aim of fostering innovation and local development through the use of solar thermal energy in Chile. Its goal is to determine the actual radiation levels of this area at different heights.

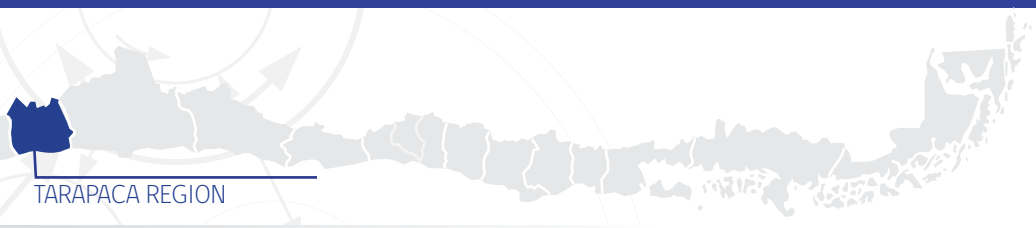
After coordinating with GEONICA, the setting up of field measurement equipment and the induction course for managing solar radiation measurement stations, on November 19th, 2012 the first station was installed in CIHDE, on the Velasquez Campus of the Universidad de Tarapaca. During December 2012 and January 2013 the Quiborax company and E-CL electric company stations were installed.

Currently, data from all three measurement stations are being collected.

Mobile treatment unit for decontaminating and disinfecting local natural springs on site

This is a research, development and efficient technology transfer project, with a suitable cost-benefit ratio. It looks to remove arsenic, boron and pathogenic microorganisms from natural springs destined for human consumption, with the aim of cleaning and analyzing the state of local springs.

A motor home was acquired to become the mobile treatment unit. A 3D model of the unit was developed and also the design for remodeling its furniture. In addition, a web site is being developed to report the progress and activities of the project.



The Center for Research and Development in Water Resources of the Tarapaca region (CIDERH) is dedicated to create and spread scientific knowledge regarding water resources in arid areas. Its main objective is helping the development and implementation of river basins management in such areas, and of applied innovative technologies to serve the community and local industries. This will allow a closer and true relationship with local small and medium sized companies (SMEs) and will also contribute to the creation of jobs and development opportunities into neighboring countries.

CIDERH
CENTRO DE INVESTIGACIÓN Y DESARROLLO EN RECURSOS HÍDRICOS

www.ciderh.cl
Director: Elisabeth Lictevout

Research areas

Integrated management of water resources: Mainly oriented to basic research of high-Andean, Pampa del Tamarugal and coastline river basins in the Tarapaca region. This research area aims at contributing to sustainable water development of the region, providing hydrological and hydrogeochemical data that accounts for the available volumes and their quality.

Technological innovation in aqueous systems: This line is oriented to developing technological innovation in aqueous processes that increase the removal of polluting agents and the recovery and reuse of water from urban and industrial wastewater, and obtaining water from natural sources.

Year of creation: 2009

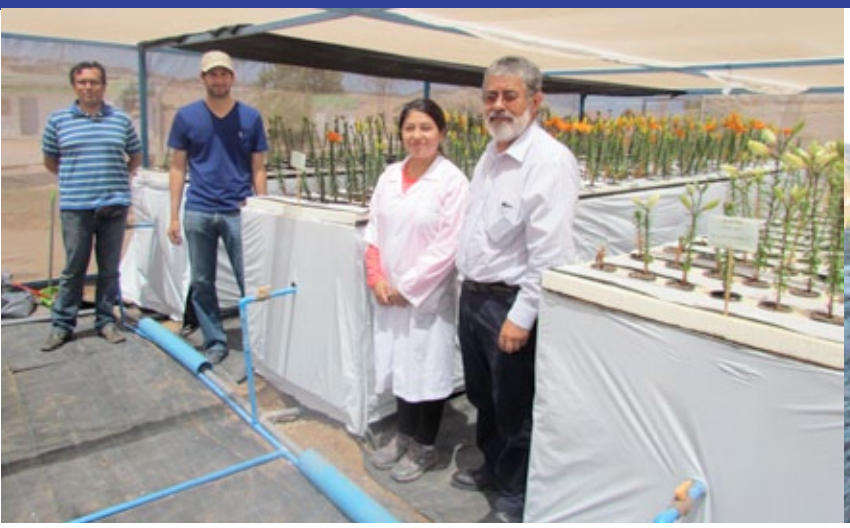
Resources transferred*: CONICYT M CLP $740,000. GORE M CLP $560,760

Participating institutions:
- Universidad Arturo Prat
- Doña Ines de Collahuasi mining company
- BHP-Billiton Cerro Colorado mining company
- CONADI (National Indigenous Development Corporation)

Employed researchers: 3 PhD + 3 M.S.

Associated researchers: 2 PhD + 2 M.S.

*Resources transferred up to December 2013 including additional strengthening projects awarded by the center.



Diagnosis and systematization of data on water resources of the Tarapaca region

This research constitutes the final report of the study "Diagnosis and systematization of data on water resources of the Tarapaca region" conducted in 2012 by CIDERH.

This study made it possible to identify major deficiencies in the generation of meteorological, pluviometric, well's level and water quality data on the different river basins. That is why it is important to rethink the monitoring networks of the region to characterize, quantify and correctly predict the quality and quantity of water in the basins and sub-basins, and to prevent a possible depletion of groundwater sources.

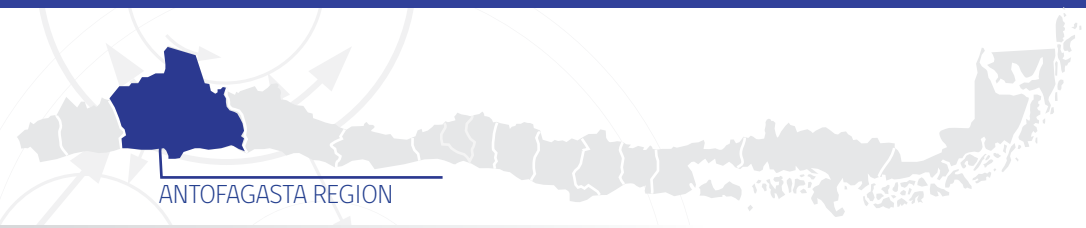
Water observatory

The Water observatory is a tool for managing and transferring relevant data to a documentation center specializing in water resources in the Tarapaca region and to a Geographic Information System Web (GIS web). The documentation center is an information unit that gathers and manages over 250 documents regarding local water resources that can be quickly and easily reviewed using an online catalog. The GIS web allows to display and query different layers of information on the origin, location, obtaining method, measurement time, duration and form of access to the data.

Implementation project of an aeroponic unit for producing flowers with disinfected urban wastewater

This project was developed to address the water shortage of the Tarapaca region. It consists of implementing an evaluation and commercial development process for Aeroponics, a growing system without the use of soil, where water recirculates several times generating a higher productive efficiency. Besides, it harnesses the aeroponic growing of cut flowers, such as Lilium.

One of the main advantages of Aeroponics is the increase of the efficiency of the use of water up to 30% and a reduction up to 40% in the cost of fertilizers compared to conventional growing systems. In addition, it offers greater oxygen availability for the roots and the reduction or elimination of the diseases caused by phytopathogens. The proposal of this business model intends to lead the region towards sustainable agriculture, with greater added value, which will allow it to consolidate as a model in this type of technology, with the use of new water sources for cultivating cut flowers. This area has shown a considerable growth in domestic consumption and has positive exporting projections for the next decade.



The mission of the Scientific and Technological Research Center for Mining of the Antofagasta region (CICITEM) is to support innovation, development and sustainability of the mining industry and its associated productive sectors, both regional and national, by conducting high level scientific and technological research. Their researchers actively develop technological projects with the productive sector, either through co-financed projects (Fondef, Corfo, Fondecyt, among other public funds) or direct financing.

In addition, CICITEM provides consultancy, research projects design and technology transfer, working with Chilean productive sectors, both private and public.

CICITEM

www.cicitem.cl
Director: Luis Rojas Araya

Research areas

Processes

Process engineering: It consists of the design and improvement of mining processes to increase efficiency and reduce their environmental impact. Leaching, crystallization, phase balance and thickening are some of the phenomena being studied under this line.
Modeling and optimization: Developing computing models and tools to improve operation and design of plants and their associated phenomena.

Biomining
Bioleaching: Biological systems offer significant environmental and economic advantages over conventional processing technologies. Mining companies, increasingly aware of this fact, use this technology to recover base metals such as cobalt and precious metals like gold from low grade ores. Chile is the largest producer of copper by bioleaching. Copper is listed first among the metals recovered using this technology.

Bioenergy and environmental sustainability
Biofuels: Production of clean, renewable energy using biological organisms such as bacteria, plants, microalgae, seeds, etc.
Bioremediation: Reduction of pollution of an environment using living organisms and their derivatives.

Year of creation: 2005

Resources transferred*: CONICYT M CLP $2,243,940. GORE M CLP $1,588,108.
Participating institutions:

- Universidad Catolica del Norte
- Universidad de Antofagasta

Employed researchers: 5 PhD + 3 PhD c + 1 M.S.
Associated researchers: 12 PhD + 2 PhD c

*Resources transferred up to December 2013 considering additional strengthening projects awarded by the center.

Patent CL 2389-2011. Invention called 'Integrated system for mitigating water loss and automated measurement of evaporation rates in pools or ponds of mining use'

The creators of this project (CICITEM, Universidad de Antofagasta and Xstrata Lomas Bayas mining company) are working on the patent application and in adding solar heating systems. To do this, they are working with companies based in Puerto Montt that will adapt technologies used in salmon aquaculture, together with the researchers from CICITEM and the Universidad de Antofagasta. They applied to a local innovation fund in the Los Lagos region (FIC-R fund) and they also expect to offer an improved and adapted solution to mining companies.

Technology upgrades for using water resources in Toconce

The results of this project aim to identify groups of marking genes in different metabolic aspects from microbial communities present in bioleaching processes on piles of low grade copper sulfides. A routine analysis of molecular biology will allow bioleaching plant operators to know when it is necessary to add key nutrients, such as ammonium or phosphate, that will help maintaining the microbial population active during the process. In addition to CICITEM, the Center of Biotechnology of the Universidad Catolica del Norte, the Ciencia y Vida Foundation and Minera Escondida were part of the project.

Development of specialized DNA adjustments for monitoring industrial bioleaching transcriptomes

This initiative -co-funded by Codelco's Radomiro Tomic division- consists of the development of a technology for removing arsenic from water in order to provide this resource to Toconce. This town, located 80 kilometers away from Calama and 3,200 meters above sea level, has suffered water contamination with this element for years.

Thanks to this project, it was possible to restore the provision of drinking water, incorporating technologies for recovery, reuse, treatment and sustainable exploitation of existing water resources in the area. It also allowed the training of community members in the use of water treatment technologies. Currently, the residents of Toconce have drinking water, an essential resource for their social and productive development.

The Center for Advanced Studies in Arid Areas (CEAZA) of the Coquimbo region is dedicated to promote scientific and technological development through high level research aimed at understanding the effects of oceanographic/climate oscillations on the hydrological cycle and biological productivity (natural and grown) in the arid and marine areas of northern-central Chile. It also collaborates in human capital training in science and technology, local productivity, environmental protection and education. Thus, CEAZA seeks to contribute to progress and people's quality of life.

CENTRO DE ESTUDIOS AVANZADOS EN ZONAS ÁRIDAS
CEAZA

www.ceaza.cl
Director: Bernardo Broitman Rojas

Research areas

Hydrology and models (water resources): This line analyzes the dynamics of the different components of water balance and their interactions as well as aspects related to the management of water resources. It studies water, solid and liquid, its origin, composition and dynamics on the river basins in order to understand its history, its present and future, in a scenario of climate change in arid zones.

Ecology and preservation (marine and terrestrial biology) :Through this line CEAZA attempts to understand the biological resources that belong to Chile's wealth, in order to reveal their qualities, understanding how they interact with the environment and learn how to take care of them to ensure their sustainability.

Genetic diversity of crops (agriculture and climate – aquaculture and oceanography): This line analyzes new methods for production and cultivation of crops, as well as its genetic improvement so as to enhance the benefits provided by nature.

Biotechnology: Using scientific tools, CEAZA assists in the adaptation of species to difficulties such as lack of water, excessive soil salinity, as well as nutrition and pathologies of marine organisms, and other aspects that may impact production.

Integrated forecasting system (SIP): The center has developed an integrated forecasting system that links atmospheric and oceanographic components, as well as their interaction with productive factors related to local agriculture and aquaculture. It has a significant capacity for monitoring and atmospheric and oceanographic modeling, allowing for understanding and predicting the behavior of these environmental elements which have great impact on the life and production in the area.

Year of creation year: 2003

Resources transferred*: CONICYT M CLP $2,938,756. GORE M CLP $3,091,448.

Participating institutions:
- Universidad de La Serena
- Universidad Catolica del Norte
- Agricultural Research Institute

Employed researchers: 21 PhD + 7 M.S.
Associated researchers: 21 PhD + 2 M. S.

*Resources transferred up to December 2013 considering additional strengthening projects awarded by the center.

DGA, CAZALAC, CEAZA project: Characterization and monitoring of rocky glaciers on the Elqui river basin and mass balance of the Tapado glacier

This is the first initiative that provides data on the contribution of a glacier to the water resources of the Coquimbo region and the Elqui river valley in specific. These data are especially relevant in a period of declining precipitation allowing drought and other effects of climate change to impact the entire area.

In this context, there were numerous expeditions to the Tapado glacier in the province of Elqui to study the body of ice and snow from different scientific perspectives. It will allow assessment of its contribution to the Elqui valley.

CORFO project: Integrated oceanographic forecast system (SIPO) Chile Coastline (www.sipocostachile.cl)

The aim of this research is to create a system for assessing the impact of coastal environmental fluctuations on species of commercial and ecological interest in the Coquimbo region. Therefore, the project is aimed at implementing a coastline observation system (ocean-atmosphere) and to initiate, calibrate and validate a forecasting coastal oceanic model, an operational bioeconomic forecasting model for the local scallop aquaculture industry and a biological forecasting model of the larval stages of species of commercial interest. This supports the management of productive and public sectors of the Atacama and Coquimbo regions.

CEAZAMET network and data integration for decision making

The monitoring network CEAZAMET (www.ceazamet.cl) was created in 2004 with the aim of improving the accuracy of meteorological data in diverse areas of the Coquimbo region. Until then, these were unknown due to the lack of appropriate tools as well as to the orographic complexities of the area.

On an hourly basis, the stations collect data on temperature at different levels, humidity, wind speed and solar radiation among other variables. Currently, there are stations alongside Elqui and Limari, and the Huasco river valleys.

The Regional Center for Studies in Food and Health of the Valparaiso region (CREAS) is a scientific and technological research center that develops R&D&I in nutrition and its effects on health.

One of the reasons in founding this center was the national and regional strategy for developing healthy and functional foods that aims at positioning Chile as an agro-food power. CREAS looks to add value to the supply chain by developing functional ingredients and formulating healthy foods with positive effects on human health. This will also contribute to the local and national development.

CREAS
Centro Regional de Estudios en Alimentos Saludables

www.creas.cl
Directora: María Elvira Zúñiga Hansen

Research areas

Technology development for a sustainable agriculture in obtaining healthy foods: This research area aims at developing agronomic management technologies to obtain safe products with healthy properties in vegetable species of agricultural interest. It also seeks to develop new agricultural technologies associated with environmental protection and human health.

Development of sustainable products and processes for obtaining bioactives and healthy foods: Developing the use of enzyme technologies, fermentation processes, recovery technologies, food preservation processes and bioactives, as well as products with healthy properties.

Evaluation of healthy and functional properties of foods and products: This line seeks to determine bioactivity in vitro and in vivo.

Year of creation: 2007

Resources transferred*: CONICYT M CLP $1,510,000. GORE M CLP $1,265,404

Participating institutions:
- Pontificia Universidad Catolica de Valparaiso
- Universidad de Valparaiso
- Universidad Tecnica Federico Santa Maria
- Agricultural Research Institute – INIA

Employed researchers: 5 PhD
Associated researchers: 13 PhD + 3 M.S.

* Resources transferred up to December 2013 considering additional strengthening projects awarded by the center.

Development of a functional ingredient from residues of the banana industry

A physicochemical process was developed for obtaining flour from residues of the local banana processing company. This product is rich in vitamins, minerals and dietary fiber. Its use mixed with wheat flour for making bread may be vital for the continuity of the industry and the health of consumers.

Currently, bakers interested in innovating wish to include this and other functional ingredients in the baking process.

Extracts of sugar beet pectines and defatted byproducts of rapeseed flour with antiproliferative activity on cell lines of breast and colon cancer

Although the primary technological use of pectines is as a thickener in the formulation of food, new uses are being developed. They range from flour with added vitamins to a treatment for cancer. In that sense, CREAS works with pectic extract of depleted beet pulp discarded by sugar producers. It is tested in cell lines of cancerous tissues cultures. It was compared with tamoxifen, a chemical used for chemotherapy. It turned out to be more anticarcinogenic or antiproliferative reducing proliferation of cancer cells by up to 80%, whereas tamoxifen reduces it by up to 50 or 60%.

The research is at an experimental phase. They also need to verify if the results with pectines repeat in new cell lines. They are also expected to determine if extracts of other vegetable residues have similar reactions and whether their benefits also apply in other types of cancer.

Development of packaging technologies to improve the conditions of blueberry exports to Asia, the United States and the European Union

This is a challenge set by researchers at CREAS and the Universidad Tecnica Federico Santa Maria to develop packaging technologies that will improve the conditions in which Chile's exports of fresh blueberries arrive to the markets in Asia, the United States and Europe. They took part in a project led by Fundacion Chile funded by CORFO's Innova Program.

The initiative seeks to assess and develop prototypes of packaging technologies for these berries that do not exist at pre-commercial or commercial level. Their goal is to delay and reduce fruit softening, increasing its life, slowing ripening and aging and diminishing the action of fungi such as Botrytis cinerea, Colletotrichum and Alternariaalternata. This would assure the best arrival condition of the fruit to the destination country and its marketing network.

The Center for Horticultural Innovation of Valparaiso Region (CERES) is an interdisciplinary research center with high local contacts that seeks to strengthen primary produce development in the Valparaiso region, make it globally competitive and sustainable in the long term, through a set of R&D activities. It works with different agricultural sectors, building scientific and innovation alliances in the region with domestic and international groups, working also with all horticultural production stakeholders.

ceres
Centro Regional de Innovación Hortofrutícola de Valparaíso

www.ceres-cr.org

Director: Eduardo Gratacos Naranjo

Research areas

Horticultural systems: This area seeks to generate scientific and technological products that lead to developing competitive and sustainable production models in the local horticulture.

Territorial systems: This research field seeks to develop scientific products and technologies that lead to harmonizing interactions between the vulnerability of the territory, the different types of horticulture and the conditions of the resulting cultural landscape.

Regional system for horticulture innovation: It aims to create and validate an innovation management model for horticulture in the Valparaiso region based on complexity science.

Year of creation: 2011

Resources transferred*: CONICYT M CLP $103,722. GORE M CLP $545,454

Participating institutions:

- Pontificia Universidad Catolica de Valparaiso
- Agricola Brown Ltda.
- Agricola Pihue Ltda.

Employed researchers: 3 PhD + 3 M.S.

Associated researchers: 1 PhD + 2 M.S.

* Resources transferred up to December 2013 considering additional strengthening projects awarded by the center.

Laboratory of soil chromatography to determine its biological quality

Soil chromatography on circular paper or "chroma profile" is a qualitative technique that provides an overview of the biological activity and direction of soil or compost. It can be done anywhere easily and at low cost. The implementation of a laboratory of soil chromatography aims at validating this method in the soils of the region determining their biological quality based on this technique. Then, it will be transferred to farmers to foster increased knowledge on soil biological quality and restoration.

Demonstration module on agroecological techniques

Currently, agroecological technologies are available at domestic and international level. They can be incorporated or integrated into the regional agricultural situation. This aims at fostering agriculture sustainability and its added value in a context of sustainable innovation. Techniques such as polyculture, using different organic fertilizers, maintaining ground covers, etc., help preserving healthy agroecosystems and the productivity of the crops. It also allows reducing dependence on external inputs.

Implementing a demonstration module of agroecological techniques will allow transferring and disseminating these techniques to the agricultural community. It will provide small farmers with tools for self-sufficiency and selling of quality products.

Innovative methodologies validation unit for producing ultra-early quality cherries

Chile is the main exporter of cherries in the southern hemisphere and the third globally. This context provides an opportunity to extend the supply period of this fresh fruit, which is currently concentrated in November and December, as of week 46. This project seeks to develop a unit for validating innovative methodologies for producing ultra-early cherries from weeks 41 to 44. During that period no cherries are available in the world market, improving local competitiveness in the exporting sector.

Territorial monitoring platform for greenhouse whitefly

Over the last 20 years, greenhouse whitefly (Trialeurodes vaporariorum) has become a supra-farm pest. Since the whitefly is polyphagous, it can be found on wild vegetation outside farmland facilitating its spreading. The pest puts increasing pressure on agriculture in the Quillota and Limache valleys, causing indirect damage by sucking the sap of the plants and consequently weakening them. It also affects the quality of the fruits since it favors the development of fumagina fungus, reducing its commercial value and increasing the price of post-harvest tasks.

The project will launch a web platform for territorial monitoring of the greenhouse whitefly in the Quillota valley. It will have eight points of systematic monitoring to provide data on the behavior of the pest over time. This behavior will be linked to climatic and territorial features around the monitoring points providing the basis to develop intervention strategies and predictive models that will allow farmers to prevent damage and optimize resources.

Research Center in Tourism and Heritage of the Valparaiso region (CITYP). Its goal is to support competitive and sustainable development of local territories. This is done through an integrated set of programs, projects and studies that promote research, innovation and technology transfer regarding heritage and special interest tourism. The center seeks to innovate and create benefits in the system and the knowledge creation value chain, looking to provide a higher level of competitiveness in the tourism sector.

CENTRO DE INVESTIGACIÓN
TURISMO Y PATRIMONIO

www.cityp.cl

Director: Jorge Negrete Sepúlveda

Research areas

Heritage: The aim of this research area is to understand, keep, preserve, emphasize and manage archaeological, historical, cultural and natural heritage based on case studies and models.

Special Interest Tourism: It seeks to understand the territorial model and the existing tourist model identifying its determinants and to propose, develop and implement a sustainable model for tourism development. The research is developed through three key areas: sustainability, destination management and new technologies.

Year of creation: 2011

Resources transferred: GORE M CLP $ $363,636

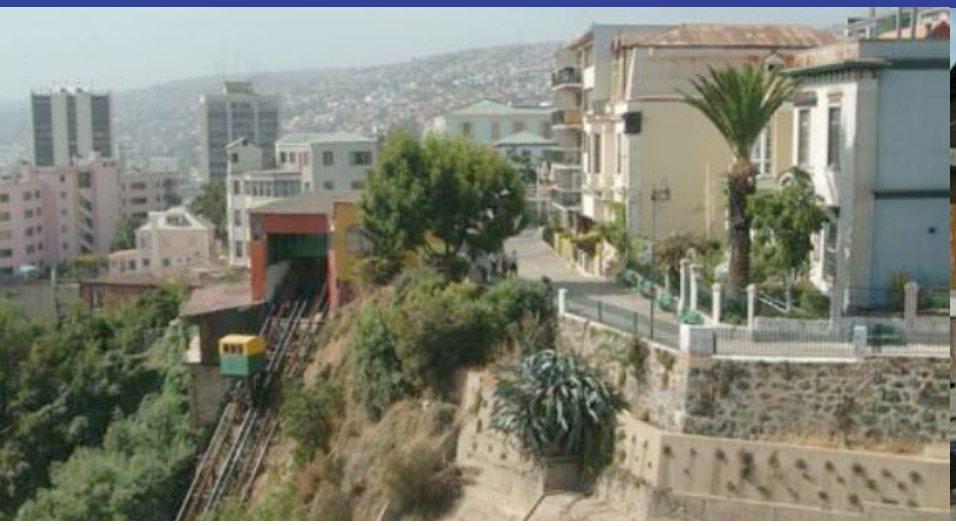
Participating institutions:

- Pro Aconcagua Development Corporation
- Pontificia Universidad Catolica de Valparaiso
- Universidad de Valparaiso

Employed researchers: 3 PhD + 5 M.S.

Associated researchers: 5 PhD + 3 M.S.

* Resources transferred up to December 2013 considering additional strengthening projects awarded by the center.



Give a hand to heritage: Restoring house facades with heritage value using crude earth in the Centenario sector of Los Andes

This project aims to recover and highlight constructions built with crude earth in the Centenario neighborhood of the city of Los Andes.

The recognition of a territorial identity of the Aconcagua river valley, associated to crude earth constructions (sun-dried brick and other techniques) is a first attempt to preserve an everyday life and housing heritage in one part of the city, involving the residents of the selected houses. This project received funding from the Cultural Fund 2012.

Aconcagua valley. Tourism 2020: Strategic plan for planning and promoting tourism in the Aconcagua valley

This project intends to develop tourism on the valley based on innovation and sustainability, with zoning and promotion, and the creation of a destination management organization. To that end, several supply and demand field studies are being held, along with workshops for entrepreneurs and city officials involving international experts. This project was financed by CORFO's Innova program.

Cultural heritage demonstrations and their relationship with the territory in order to formulate a model of exhibition story of the history of the city of Valparaiso

This project is set around cultural heritage, the features of the territory and the recognition of the relevance of the Contemporary Arts Museum as a space that concentrates the knowledge about a place, establishes a binding relationship with its residents and promotes its protection.

From this initiative, a new research project was formulated to identify the context that defines the conception of an exhibition story model that facilitates communicating the history of the city of Valparaiso and articulates access for understanding cultural heritage. Mainly, the model must consider applying a systems approach that recognizes the changes in paradigms that occurred in the field of museology and museography. The purpose of the project is helping to build the cultural memory of the city of Valparaiso. This project was financed by a research fund of the Universidad de Valparaiso (DIUV 14/2011).

The Center of Advanced Studies in Fruit Growing of the O'Higgins region (CEAF) was created to find solutions and new possibilities for developing the local fruit industry. Its activities include strengthening state of the art research, training specialists, publishing scientific papers and developing technological products for the efficient use of water and nitrogen in fruit growing. Particular attention is given to stone fruits by integrating new disciplines such as functional and physiological genomics.

CENTRO DE ESTUDIOS AVANZADOS EN FRUTICULTURA

www.ceaf.cl

Director: Manuel Pinto Contreras

Research areas

Genetic improvement: On this field, CEAF aims to solve problems that cannot be addressed solely by importing varieties. Chile has problems such as high soil alkalinity, large populations of nematodes, presence of bacterial and fungal diseases, low or very high water retention and excessive vigor, that affect many of the existing varieties of prunus.

Functional Genomics: Globally, environmental stresses known as "abiotic stresses" are the main cause of productivity loss. They are becoming a growing problem for Chilean fruit production. CEAF seeks to understand the molecular basis of adaptive responses of fruit trees to environmental stresses such as root asphyxia, drought and salinity.

Physiology of stress: Plants are subjected to unfavorable conditions for their growth and development. On this context, CEAF proposed to study the critical physiological and biochemical parameters associated with tolerance to abiotic stresses such as root hypoxia, drought and salinity in prunus rootstocks.

Agronomy: The region has a high share of fine-textured soils (clay and clay loam) which create a complex situation for local producers regarding water management of the fruit tree, among other problems: an error in the rate or frequency of irrigation might cause hypoxia in the root zone. This makes it necessary to characterize the agro-topoclimatic conditions of the region, distinguishing areas suitable for growing stone fruit trees from those that could present hypoxia problems.

Year of creation: 2009

Resources transferred*: CONICYT M CLP $1,006,170. GORE M CLP $1,000,000

Participating institutions:
- Agricultural Research Institute - INIA
- Universidad de Chile
- ASPROEX (producers and exporters association)

Employed researchers: 5 PhD + 5 PhD c + 2 M.S.

Associated researchers: 10 PhD + 2 M.S.

* Resources transferred up to December 2013 considering additional strengthening projects awarded by the center.

Molecular characterization of Meloidogyne sp. species and study of their parasitism on stone fruit trees´ rootstocks, prunus sp. grown in the central area of Chile

Phytoparasitic nematodes are responsible for 10% of losses in global agriculture resulting in amounts close to 160 billion dollars. Almost every agricultural and forest species are susceptible to the attack of one or more phytoparasite. Some studies indicate they can cause a 16% reduction in the size of the fruits and in its commercial yield.

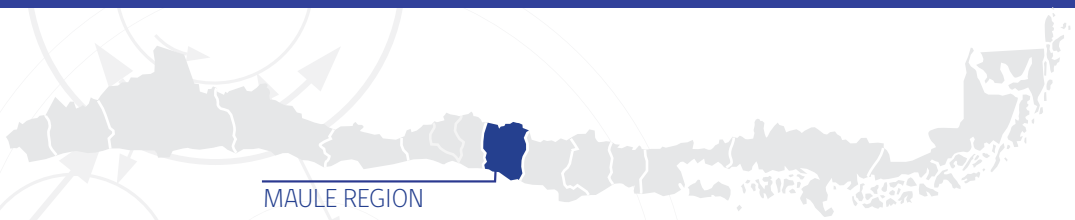
This project aims to identify Meloidogyne sp. species, one of the most relevant phytoparasite types for agriculture, associated to the growing of stone fruit trees in the central part of the country. Once the identification and classification is done, the main stone fruit trees rootstocks grown in Chile will be inoculated and parasitism will be assessed aiming at finding resistance and/or tolerance. To do this, reproductive indexes relating final versus initial population will be measured, as well as root galling index and parameters of plant vigor (root weight and growth of aerial phytomass).

CEAF's Knowledge Transfer Network (CEAF Network)

The project consists of creating and providing knowledge and capacities to a network of knowledge transfer agents of the fruit sector. It will carry out a methodology and a process of specialized knowledge transfer that results in detecting technological and knowledge transfer needs of the local fruit sector companies.

The idea is to insert a professional with competencies in capture, management and knowledge transfer, train them and the researchers of the project's participant institutions in using modern transfer tools and techniques for innovation. In addition, an annual technology transfer plan will be outlined, considering the sector's needs and situation, as well as a management and communication procedure of the knowledge transfer network.

REGIONAL Program



The Center for Studies in Processed Foods of the Maule region (CEAP) is a research and development center of applications that add value to the companies related to agroindustrial product processing.

Using R&D&I it is expected to increase local horticultural agroindustry competitiveness at domestic and international levels through the creation of new agroindustrial products for end consumers, optimization of agroindustrial processes in the main horticultural sectors, increase of the environmental sustainability of local agroindustry, and creation of technological businesses with an impact in the region by means of developing technologies, products, processes and services with application in the horticultural processed foods industry.

ceap
Centro de Estudios en Alimentos Procesados

www.ceap.cl

Director: Ricardo Díaz Cárcamo

Research areas

Process improvement program by providing technology solutions addressed from different areas: process optimizing, process technology, mechanization/automation, an ERP type information system, and raw material supply logistics.

Sustainability program to support qualitative and quantitative improvement of environmental sustainability of horticultural agroindustry by improving waste and mud management, liquid waste treatment, energy generation from waste, associative waste management, energy efficiency, carbon and water footprint, reduction in the use of processes, pesticides waste and NCRE.

Product generation program to support the horticultural agroindustry in generating new and better products to improve the industry's competitiveness. The lines of work of this program are: new products, waste recovery, product differentiation, and quality and quantity of raw material.

Year of creation: 2009.

Resources transferred*: CONICYT M CLP $735,838. GORE M CLP $735,160

Participating institutions:

- Agricultural Research Institute – INIA
- Universidad de Talca
- Universidad Catolica del Maule
- Aconcagua Foods S.A.
- Agroindustrial Surfrut Ltda.

Employed researchers: 3 PhD + 6 M.S.

Associated researchers: 27 PhD + 6 M.S.

* Resources transferred up to December 2013 considering additional strengthening projects awarded by the center.

Pioneering study in Chile determined that the by-product of tomato has properties that reduce cardiovascular disease

The Maule region accounts for about 66% of Chile's industrial tomato production and near 600,000 tons of processed tomato every season. This major industry throws near 18,000 tons of waste known as tomasa. Specifically, it is the skin and seed of the processed pulp. Today, it is sold at very low prices or given away for animal consumption. But the picture could change for this byproduct, since the results of a scientific study from CEAP and the Universidad de Talca revealed that tomasa has properties that reduce the chances of developing cardiovascular disease.

Today, following the positive results of this study, the project is moving towards incorporating this waste in different processed foods matrices (cookies, yoghurt, flour, pasta, etc.) gradually contributing, through food, to decrease the incidence of heart disease in Chile.

Cookies with tomasa

In order to add more value to tomasa, CEAP's line of food evaluation is testing its incorporation into food matrices.

First, preliminary tests were conducted on baked products incorporating tomasa, cookies specifically. They were subject to sensory evaluation by an untrained panel in order to assess the acceptability of its organoleptic features: appearance, color, smell and taste.

A subjective response test was used for these evaluations. Each participant was given a sample of the cookies in order to evaluate them.
By analyzing the results of the test, the experts determined that the acceptability degree of the products was positive and they identified the maximum percentage of tomasa that can be added without causing rejection.

Process improvement: The key to optimizing efficiency in agroindustry

Given the need for companies to be more competitive, analyzing and improving processes within the organization is not optional, but essential. In this context, CEAP's Process improvement program seeks to develop improvements in internal logistics, material management, plants layout, production planning and inventory, and storage management in agroindustrial plants of the Maule region.

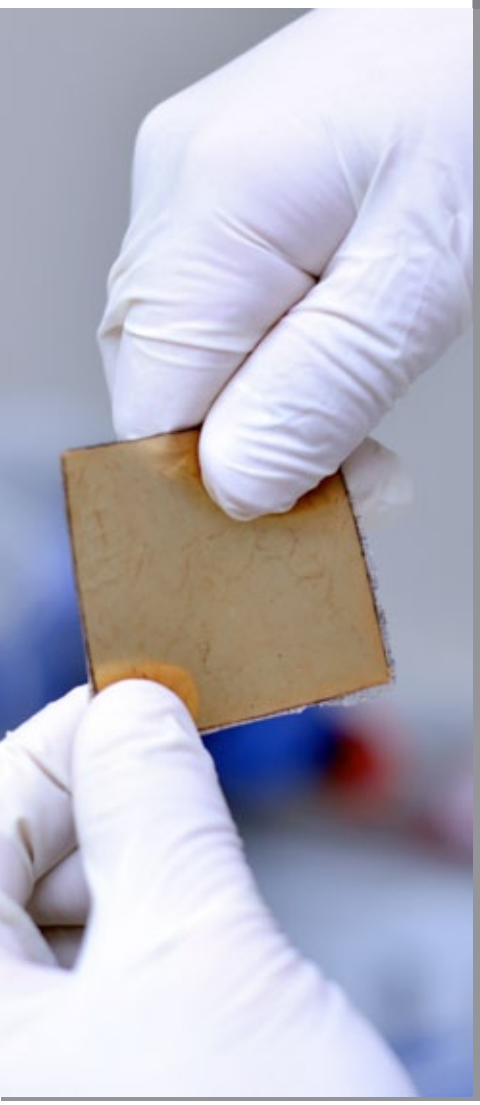
A computing tool was developed as part of a project for technology transfer and dissemination that benefited numerous storage centers and frozen raspberry plants. It integrates all stages of the production process, which provides real-time data and allows identification of management control indicators which help improve traceability of the developed products.

The Center for Advanced Polymer Research of the Biobio region (CIPA Chile) is a center whose main purpose is contributing to the development and competitiveness of the regional and national polymer sector by generating and transferring frontier scientific and technological knowledge. Its activities are focused on human capital training, technical assistance to the public and private sectors, and development of excellence scientific research.

CIPA
Centro de Investigación de Polímeros Avanzados

www.cipachile.cl
Director: Claudio Toro Aedo

Research areas



Functional polymer area: Their research is oriented towards new materials, mainly by exploring new ways for polymer synthesis and incorporation of active ingredients. The goal is to obtain polymers with improved properties to be applied in removing pollutants or toxic species, developing packaging, treating wastewater and developing pharmaceutical products, among other uses. This area works under two research lines: obtaining polymeric materials for environmental applications and polymer development with medical, agricultural and energy applications.

Thermoplastic materials area: The work of this area focuses on developing new materials with improved properties from mixing or adding fillings such as fibers, nanoparticles, inorganic molecules, etc. to synthetic and/or natural polymers. Also, it performs studies, tests and technical recommendations for operating and processing polymers. This area works under two research lines: thermoplastic biomaterials and thermoplastic composed materials.

Adhesives and recycling area: Scientific and applied research is carried out in two main fields: synthesis, application and characterization of new polymers with adhesive properties; and evaluation of recycled polymeric materials for its potential reuse and/or development of new materials. This area works in two research lines: synthesis and characterization of adhesives for wood, which has a high impact in the Biobio region given the specific needs of the forestry/wood sector; and polymer recycling.

Year of creation: 2003

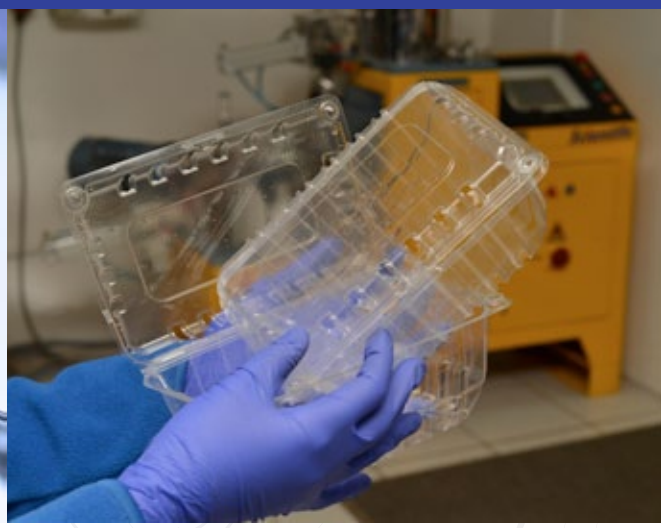
Resources transferred*: CONICYT M CLP $1,950,107. GORE M CLP $1,485,193

Participating institutions:
- Universidad de Concepcion
- Universidad del Biobio

Employed researchers: 7 PhD + 5 M.S.

Associated researchers: 10 PhD + 1 M.S.

*Resources transferred up to December 2013 considering additional strengthening projects awarded by the center.



Innovation in developing medicated feeds for salmons: Development of new formulations that enhance solubility, absorption and bioavailability of the active principles under study

This project, funded by the INNOVA Biobio program, allowed the development of an innovation in an emacetin and florfenicol based product that enhances absorption, solubility and bioavailability of these active principles in medicated feeds for salmons. In addition, they were able to reduce the dosage of the active principle compared with the substitutes available on the market.

The new formulations had a direct impact on the aquaculture industry, ensuring the success of the treatment given the bioavailability certification of the dosage, increased solubility and absorption.

This improvement resulted in a decrease in the use and dosage of antibiotics and antiparasitics and a reduction in industry losses in the short and medium term. Also, this project resulted in a close relationship with food companies and numerous services contracted by CIPA.

Diagnostic and strategies for integral management of plastic waste in Chile

This project was funded by CORFO's Innova Program with the main objective of providing a diagnostic of the current management of plastic waste in Chile in order to increase its reduction, recycling, reuse and recovery rates with emphasis on generating reuse alternatives with high added value.

This information will be relevant for the domestic industry since it promotes investing in recycling. Nowadays much of the waste materials used in productive companies in Chile are imported.

Development of antimicrobial polymeric materials with core-shell nanostructures (copper-silver) as an active agent for preventing nosocomial infections

The challenge of this project, funded by CONICYT's Fondef Program, is designing an antibacterial polymeric material of sustained release that avoids and/or reduces biofilm formation on its surface and can be transformed using standard techniques of thermoplastic processing. The base polymer material will be PVC incorporating core-shell nanoparticles. The copper nanostructures will be silver coated. The development of this innovative project will strengthen the concept of preventive microbiology associated with the design of specific target antibacterial polymeric materials.

REGIÓN DE LA ARAUCANÍA

The Center for Agroaquaculture Nutritional Genomics of the Araucania region (CGNA) is a research center aimed at developing basic and strategic research to add value to raw vegetable materials using biotechnology. Their purpose is to generate products and processes of high economic potential for human and animal consumption contributing to the development of the agrifood chain and each of its components.
CGNA has become a domestic model in nutritional genomics of conventional crops like lupin, rape canola and flax.

CGNA
Centro de Genómica Nutricional Agroacuícola
INNOVANDO DESDE LA ARAUCANÍA

www.cgna.cl
Director: Haroldo Salvo Garrido

Research areas

Crop Genomics: The Genomics and Bioinformatics unit seeks to foster the production of "premium" raw vegetable materials, those with an outstanding protein quality and quantity, fatty acids, soluble fibers and antioxidants with low proportion of antinutrients and environmentally friendly.

CGNA develops a set of valuable genetic resources, genomic and bioinformatic tools, proteomic applications and genetic engineering in order to achieve the improvement of protein crops such as yellow lupin, and oilseeds such as rape canola and flax.

Technology and processes: The aim of this unit is to develop technologies for producing functional ingredients, developing nutritional supplements, identifying and characterizing bioactive and techno-functional compounds, and improving nutritional properties of raw vegetable materials for their use in the food industry.

Nutrition and adaptation to industrial use: This line fosters co-research with companies from intermediate processing industries and final producing industries of nutritional components demanded by animal producers and their derivatives. Their aim is to research the possible substitution of current raw material inputs for products with higher nutritional and economic added value designed by CGNA.

Year of creation: 2005

Resources transferred*: CONICYT M CLP $2,308,080. GORE M CLP $1,880,000

Participating institutions:
- Agricultural Research Institute - INIA
- Universidad de la Frontera
- BASF Chile S.A.
- Sociedad Agrosearch Ltda.
- FEDERCOOP (Regional Federation of Farming Cooperatives)
- BIOMAR Chile S.A.
- Agrocomercial del Sur Ltda.

Employed researchers: 7 PhD + 1 M.S.
Associated researchers: 5 PhD

*Resources transferred up to December 2013 considering additional strengthening projects awarded by the center.

Producing a biofertilizer by using genomics and microencapsulation to contribute to the competitive and sustainable development of high protein lupin crops in family farming in southern Chile

The growing global demand for vegetable protein offers a unique opportunity for Chilean agriculture, especially for family farming (AFC). That is why CGNA developed a yellow lupin with 60% protein on the shelled grain adapted to the conditions of the Araucania region. However, the success of this alternative depends on the use of technologies to ensure grain yield, protein content and low production cost, especially for AFC.

That is why the center proposed to develop a specific biofertilizer for yellow lupin from selected nitrogen-fixing bacteria strains, at low cost, using microencapsulation as an alternative to nitrogen fertilization without losing yield or protein per hectare, causing a positive effect on costs and the environment.

Postdoctoral training

Three postdoctoral Fondecyt projects are being carried out in CGNA, adding top researchers to develop basic research with high value application in the area of strategic product development for the food sector.

The research projects are: "Microencapsulation of astaxanthin in oleosomes to enhance its oxidation stability" (2012) by Dr. Francisca Acevedo Canala-Echevarria; "Designing a sweet lupin from its genes: fine mapping of genes or genetic factors associated with alkaloid content in leaves and seeds" (2013) by Dr. Claudia Osorio Ulloa; and "Encapsulating aromas: assessment of multilayer microemulsions with ionic biopolymers under spray drying" (2013) by Dr. Cesar Burgos Diaz. They are sponsored by CGNA thus contributing to advanced human capital training.

Registration and certification of a technological product: AluProt-CGNA commercial variety with high protein content in grain

AluProt-CGNA was created with the aim to grow grain with the highest amount of existing grain protein using modern genetic improvement strategies that include genomics, proteomics and bioinformatics to satisfy the demand of the food industry in aquaculture, poultry, pigs, pets, ruminants and even humans.

The new variety of yellow lupin developed by CGNA has 60% of shelled grain protein, even higher than the imported soy cake (byproduct obtained from soy after extracting the oil, used in the food industry), which has only 46-48% of protein.

It's an early, semi-dwarf variety, efficient regarding carbon footprint. Therefore, it is adapted to the climate change scenario generating minimum waste management and becoming environmentally friendly.

The Center for Research in Ecosystems of Patagonia from the Aysen region (CIEP) was created with the aim of consolidating basic research into aquatic and terrestrial ecosystems, in particular to determine the impact of climate change on regional ecosystems. By conducting specific actions it seeks to promote the development of sustainable productive activities, in particular in aquaculture, tourism and artisan fishing; to intensify applied research; and to promote scientific knowledge transfer to the local community. It also aims at extending international scientific networks to multiply the research conducted in the region and to improve the quality of knowledge of its ecosystems.

CIEP

www.ciep.cl

Director: Giovanni Daneri Hermosilla

Research areas and linkage

Aquatic ecosystems: This area aims to achieve excellence in basic and applied knowledge on process monitoring for productivity, conservation state and variability of regional aquatic resources at different space and time scales.

Terrestrial ecosystems: aims to obtain excellence in basic and applied knowledge on the processes that monitor conservation state and dynamics of regional terrestrial natural resources. Building strategic alliances with local institutions involved in planning and production and studying special patterns and processes affecting terrestrial resources of regional relevance.

Artisan fishing: Generation of fisheries and social related knowledge to promote productive diversification and sustainable development of the local artisan fishing sector.

Sustainable tourism: Sustainability in tourist development through scientific research, social and economic studies, and support for pilot projects.

Aquaculture: Production of scientific knowledge to support the sustainable management of local aquaculture, raising efficiency levels, linkages and competitiveness.

Year of creation: 2005

Resources transferred*: CONICYT M CLP $2,466,120. GORE M CLP $1,699,836

Participating institutions:
- Universidad Austral de Chile
- Universidad de Concepcion
- University of Montana
- Universita di Siena
- Universidad de Cordoba
- Agricultural Research Institute – INIA

Employed researchers: 7 PhD + 3 M.S.
Associated researchers: 2 PhD + 1 M.S.

*Resources transferred up to December 2013 considering additional strengthening projects awarded by the center.

Growth of secondary forests after Aysen's wildfire: occurrence of multi-stem trees in Lenga beech

Between the 1920s and the 1960s, catastrophic fires caused by man destroyed nearly three million hectares of woods in the Aysen region, mainly of Lenga beech, Nothofagus pumilio. Unlike most of the species of this family, it has not been documented that Lenga beech sprouts again. Nevertheless, the occurrence of multi-stem trees on the edges of secondary forests post fire prevails.

These trees, grown from the fusion of Lenga seedlings joined after weathering stressing factors like wind, show a higher survival rate than trees growing from a single stem. It suggests that natural selection is not occurring at an individual level, but rather at groups of individuals.

Thanks to this project the discovered ecological features and requirements of the Lenga should be considered when planning reforesting with native species the vast surface of Aysen's landscape affected by these catastrophic wildfires.

Oceanographic information system for aquaculture sustainability in the Aysen region

This project consists of an oceanographic information system to measure marine variables such as temperature, salinity and dissolved oxygen, in addition to meteorological variables like speed and wind direction, solar radiation, rainfall, etc. This data are routed in real time to an open access online platform (www.ciep.cl/sio). These data have special relevance. For example, oxygen is one of the variables constantly being monitored by salmon farming companies. As for atmospheric and marine variables, they allow the obtaining of a comprehensive map of oceanographic conditions in the Puyuhuapi and Jacaf canals. This is relevant because most of the regional salmon farming centers are located here. It's worth noting that this information is not exclusive for farming centers, but could also be useful for future scientific research, artisan fishermen and the general public.

Sciences for Aysen's tourist development: creating a Patagonian Center for Scientific Tourism

This project developed a model for valuing scientific research for the benefit of Aysen's sustainable tourism. Scientific tourism allows innovating and strengthening a differentiating tourist development. With this research, it was possible to understand how research on this territory promotes tourism and how it can, in turn, support scientific work.

Some explorations in Aysen open the door for academic research and ecovolunteering programs that allow sustaining processes over time and creating a cultural and educational tourism offer based on scientific interpretation.

The work methodology of this initiative was based on the development of pilot projects of scientific tourism, generated in stages with diverse topics specific to each territory.

The Center for Studies of the Quaternary of the Magallanes region, Fire Patagonia and Antarctica (CEQUA) studies the environment. On the one hand, by means of paleoclimatic and glaciological reconstructions of the past for understanding the present and modeling the future. On the other, by contributing to knowledge, valuation, care, protection, management and proper use of the privileged ecosystems and natural resources of a region considered a "natural laboratory".

CEQUA
CENTRO DE ESTUDIOS
DEL CUATERNARIO
FUEGO • PATAGONIA
Y ANTÁRTICA

www.cequa.cl

Director: Paola Acuña Gómez

Research areas

Ecology of marine ecosystems area: This area works in strengthening local capacities in scientific research oriented to application and social and economic contacts of the region, in environmental issues that imply knowledge, valuation, care, management and proper use of the ecosystems and natural resources of the southernmost region of Chile. It develops research in oceanography, ecology, molecular genetics, genomics, physiology, top predators, geographic information system and teledetection. These areas study the particular ecosystems of fjords and canals characteristic of the region, oceanic convergence ecosystems and the different sub-antarctic and antarctic environments that define the territory.

Paleoecology and glaciology area: This area seeks to strengthen local capacities on scientific research in geoscience understanding of how Austral landscape, climate and ecosystems evolved since the end of the last glaciation. A multidisciplinary approach is used including palynology, geomorphology and glacial geology; dendrochronology, glaciology, stratigraphy, tephrochronology, biogeography and history of fire, considering different temporary and space scales.

These different approaches allow comparing the phenomena of the current accelerated change with the reconstruction of past environmental scenarios in order to anticipate the expected changes in the short, medium and long term. This information is crucial to sustain the management of natural resources and the development of the areas with greater potential, such as energy, fishing and tourism.

Year of creation: 2002

Resources transferred*: CONICYT M CLP $2,273,066. GORE M CLP $1,633,370

Participating institutions:
- Universidad de Magallanes
- Fisheries Promotion Institute (IFOP)
- Chilean Antarctic Institute (INACH)

Employed researchers: 7 PhD + 1 PhD c + 2 M.S.

*Resources transferred up to December 2013 considering additional strengthening projects awarded by the center.

Digital cartography of the Torres del Paine National Park at local scale

When managing natural resources there's a permanent need for cartographic updates since external factors such as wildfires, floods and earthquakes modify or fragment the land covers and the landscape. In this case, an anthropic event caused a natural disaster that needed to be assessed and at the same time provide a new "resources audit" to learn its current condition. That's the reason behind this initiative, based on the use of satellite technology and ecological botanical knowledge, to obtain results that reveal this behavior and contribute to the proper territorial management of one of Chile's most relevant national parks.

Combined study of genetic and morphological variability of spider crab (Lithodes santolla) in the Magallanes and Chilean Antarctic region: tool for management, sustainability and commercial added value of the resource

Artisan fishing is one of the main productive activities of the region. Nevertheless, given the disconnection of the area with the rest of the country, commercialization of marine products to the domestic market is not competitive and exports have little added value.

This research aims at determining local population stocks of Lithodes santolla to favor fishing management and resource sustainability measures to increase the efficiency of the catching and add commercialization value by applying genetic markers and geometric morphology.

Magallanes without didymo control: monitoring rivers and lakes

Man has become the main spreading agent of this algae, expanding its distribution area. It adheres to any equipment of recreational or sport fishing that involuntarily acts as a vector scattering it to other water bodies forming new colonies in places where it was not found before.

This project aims at establishing a sampling, detection and control system to identify Didymosphenia geminata diatomea in local rivers used for sport and recreational fishing, and providing training activities to instruct users and the population on contingency and biosafety measures. It is expected to establish a regular prospecting system which provides information assuring that the region remains free of didymo, and to raise awareness among the community and waterways users on preventive measures to contain the pest.

REGIONAL GOVERNMENTS

ARICA Y PARINACOTA
GOBIERNO REGIONAL

Región de Tarapacá
Somos el Norte del Desarrollo

Gobierno Regional
Región de Antofagasta
Gobierno de Chile

GOBIERNO REGIONAL
REGION DE COQUIMBO

Gobierno Regional
Región de Valparaíso

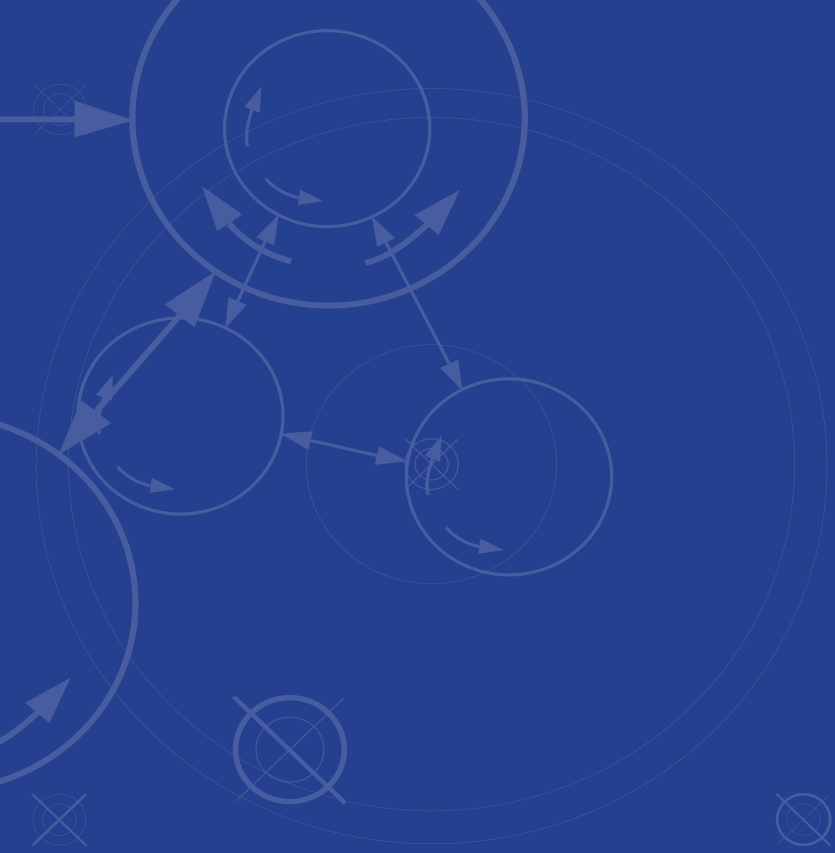
REGION DE O'HIGGINS
GOBIERNO REGIONAL

Gobierno Regional
maule

GOBIERNO REGIONAL
REGION DEL BIOBIO

GOBIERNO REGIONAL
DE LA ARAUCANIA

GOBIERNO REGIONAL Y SU CONSEJO
PATAGONIA AYSEN



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