



CRHIAM

CENTRO DE RECURSOS HÍDRICOS PARA LA AGRICULTURA Y LA MINERÍA

ANID/FONDAP/15130015

Water Research Center for Agriculture and Mining



Universidad de Concepción



Universidad de Concepción



UNIVERSIDAD
DE LA FRONTERA



Universidad del Desarrollo





Water Research Center for **Agriculture and Mining**





CRHIAM description

Chile is amid one of the longest droughts in history. This water shortage affects the country's population, ecosystems and economic development. Agriculture and mining are two of the most important industrial activities in the national economy. Both activities face the difficult challenge of finding alternatives for their sustainability, even as the quantity of available water continues to decrease.

In 2014 the Water Research Center for Agriculture and Mining (CRHIAM) was founded under the framework of ANID's fifth Fund for Research Centers in Priority Areas (FONDAP) competition.

CRHIAM is led by the Universidad de Concepción in association with the Universidad de La Frontera and the Universidad del Desarrollo.



Mission

To be a national authority on the creation of advanced scientific and technological knowledge on water resources for agriculture, mining, and communities and contribute to the achievement of sustainable development goals.



Vision

To be a worldwide authority as a water resources research center for the sustainable development of agriculture, mining and communities, in consideration of the principles of water security.



CRHIAM has four main goals:

Promote world-class research on water resources to create knowledge and develop technologies to contribute to the water security of ecosystems, communities, and production sectors.

1

Form undergraduate and especially graduate and postdoctoral human resources in order to create a critical mass that will support the development of abilities in the water resources field.

2

Create networks with the main domestic and international research institutions and the public and private sectors to benefit common interests regarding research, innovation, and development in water resources.

3

Contribute to better water management through communication and dissemination of scientific evidence that contributes to public policies and to the knowledge of society.

4

Strategic focuses



Water supply for communities that coexist with increasing agricultural and mining development through sustainable technologies and practices.



Ecosystem services as a key to reducing conflicts over water resources.



Strategic alignment with UN Sustainable Development Goals (SDGs) related to water access and sustainable consumption and production.



Research lines

CRHIAM seeks to foster spaces for interdisciplinary work and dissemination, implement actions with the participation of society, and contribute to the development of knowledge to achieve water security for ecosystems communities and production systems.

Research Line 1: Efficient use of water in agriculture and mining.

The main goals of this line of research are the optimization of water resources and the analysis of large amounts of data. Research in agriculture is consolidated in two fields connected to the efficient use of water and information technologies and data analysis applied to complex production systems. For mining, the focus is on improving water recovery in copper concentrators.

Research Line 2: New water sources for agriculture, mining and communities.

Three major forces drive this line: freeing freshwater for households and agriculture, anticipating the "not a single drop of freshwater for industrial processes" policy, and evaluating the use of low-quality metallurgical water, seawater, well water and recycled water to make mining activity more viable in extremely arid regions. Research work is organized around four projects: use of as-is or partially desalinated seawater in mineral processing; use of partially desalinated seawater in agriculture, development of cost-effective methods to improve water quality for agriculture and use of colloidal clay to clean large bodies of water and control the spread of harmful algae; development of a scientifically rigorous and quantitative methodology for the design of flotation, flocculation and anti-fouling reagents based on molecular modelling tools and exploration of a methodology that does not involve water for separating mineral particles under the dry or green mining framework.

Research Line 3:

Water availability and quality for agriculture and mining amid climate change.

This line of research aims to understand the impact of climate change on water availability and quality in the basins of central Chile. To this end, the development of modeling and monitoring tools that allow deeper study of hydrological processes that control water resources availability and the production and pollution transport processes that affect their quality is proposed.

Research Line 4:

Technology for water treatment and environmental remediation.

Some of the technologies addressed in this line of research are aimed at recovering wastewater, improving water retention capacity in degraded soils and, closing cycles, recovering valuable compounds, nutrients, energy and/or water, among other elements. Both intensive and extensive technologies, based on physical, chemical and/or biological processes, are studied. The interdisciplinary life-cycle assessment tool is integrated into evaluation of different scenarios of technology application and its connection with the environment. In addition, the influence of technology acceptance by society is investigated, mainly through studies on its adaptation for implementation in rural communities.

Research Line 5:

Water governance, ecosystem services and sustainability.

This line seeks to develop research that will assure water quality and quantity from a perspective of respect for fundamental rights, alignment with Sustainable Development Goals proposed by the United Nations, and the conceptual and strategic perspective of water security. Work is also being done to improve protection of various bodies of water (lakes, wetlands, aquifers and glaciers, among others) and their associated ecosystem services through environmental conservation and land-use planning instruments. In addition, Efforts are being made to promote water governance that fosters more equitable, inclusive, fair and democratic decision-making, aimed at preventing and addressing water-related social conflicts and their judicialization.



CRHIAM is led by its directors and supported by administrative personnel.

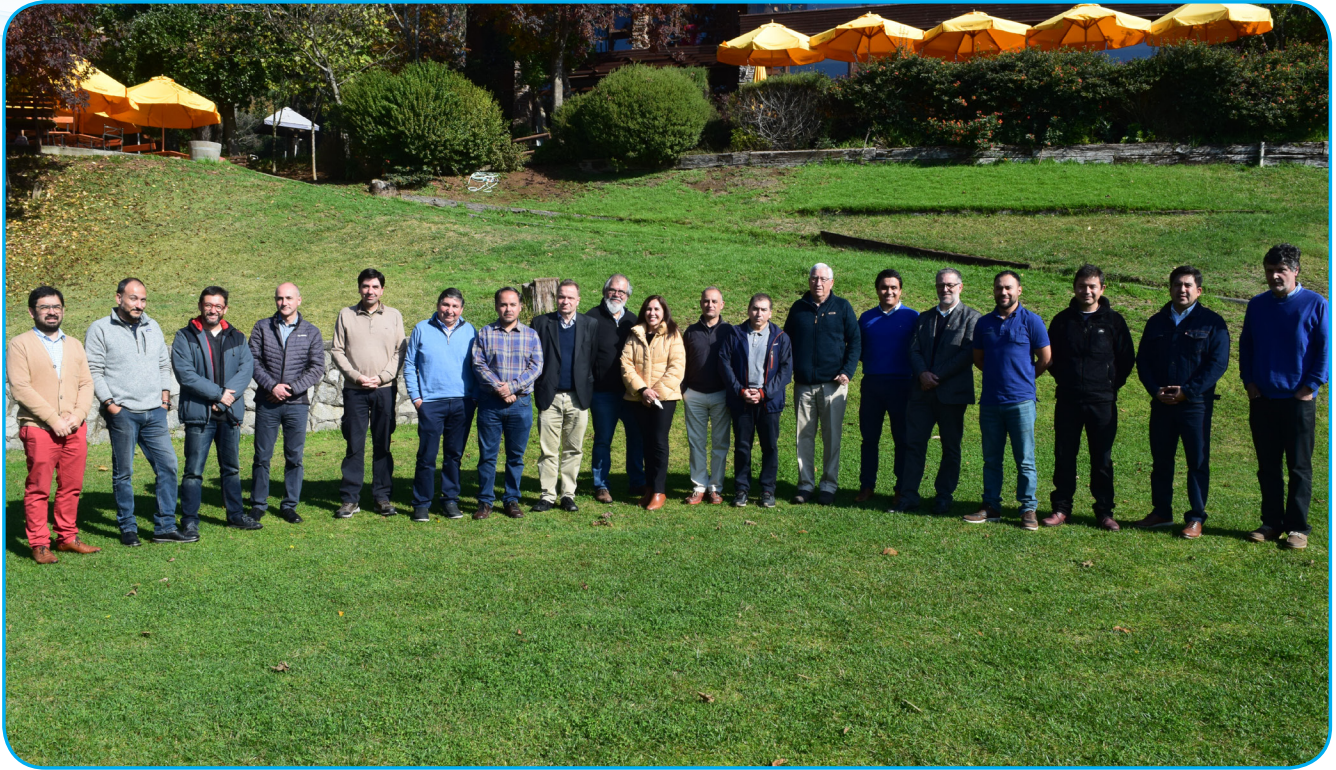
CRHIAM works with an Academic Council composed of eight principal researchers who lead four clusters: Resources, Demand, Technology and Water and Society. The groups are led by two principal researchers, associate researchers, and are supported by adjunct researchers, support personnel, postdoctoral fellows and undergraduate and graduate students. The work of the researchers of each cluster contributes to one or more of the center's five lines of research.

The center has a Scientific Committee composed of leading scholars from foreign universities that ensures that the research carried out at the center is first class.

In addition, CRHIAM has an Advisory Council composed of leading professionals from institutions related to water management in agriculture and mining, this council guarantees that the work done at the center is directly related to important issues for the country.



First CRHIAM student and postdoctoral researcher gathering in April 2019



2022 researcher gathering



CRHIAM researchers and Scientific Committee on field visit to Lolol in 2019



CRHIAM Outreach Products

CRHIAM has a wide range of outreach products available to the community in different formats. They collect the scientific evidence gathered by the center's researchers.

CRHIAM Communication Series

With an interdisciplinary perspective and simple language, these texts present the research work of CRHIAM on various topics. They are an opportunity for collective collaboration among various researchers linked to CRHIAM and a means of reporting and transmitting research evidence related to water management to decision-makers in the public and private spheres and society in general.

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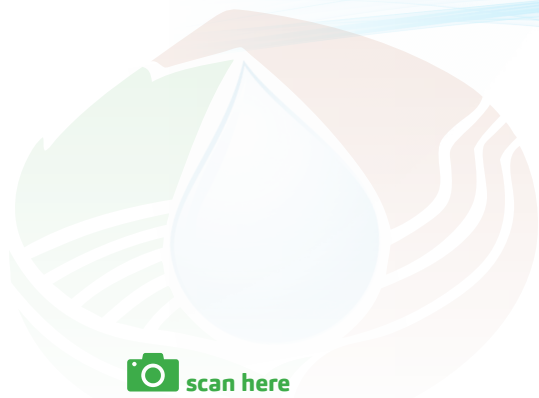
Books

More than ten books have been written by the CRHIAM team, together with other researchers. These texts cover various topics, in accordance with the work area of each of the five research lines.



Podcast: "Water has its science"

Through informative capsules and interviews with researchers, students and members of the center, as well as representatives of the public and private spheres, CRHIAM aims to periodically present different aspects related to water, agriculture, and mining. The episodes are available on Spotify.



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Audiovisual material

Our lecture cycles, book launches, international webinar, interviews, explanatory videos and other material are available on our YouTube channel.



Infographics

If you would like to easily learn more about a concept or topic, you can find downloadable infographics on our web site. They are designed to be used as support material by professors, students, or anyone who wants to know more about water resources.



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CRHIAM student and postdoctoral researcher gathering books

Compilation of works presented at the CRHIAM student and postdoctoral researcher gathering, held each year since 2019.

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Outreach Activities in Agriculture

Since its beginnings, CRHIAM has offered lectures, courses, and workshops focused on presenting topics related to the work of the country's agricultural sector to support the development of professionals trained in water resources.

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Diploma in Water Resources for Sustainable Development



This program has been developed by CRHIAM amid the need to increase specialized human resources abilities related to the updated and interdisciplinary vision of water resources.

It began in 2019 as an in-person course jointly developed by CRHIAM and the Universidad de Concepción School of Engineering, School of Environmental Engineering and School of Environmental Sciences.

Since 2020 it has been delivered online, reaching professionals throughout the country.



End of 2021 CRHIAM diploma course



Schools linked to **CRHIAM**





International collaboration

Canada

- University of Alberta
- University of British Columbia
- University of New Brunswick
- University of Waterloo
- Université Laval
- Water Security Agency
- Canada Center for Inland Water (CCIW)
- University of Calgary
- Ministry of the Environment and Climate Change
- McGill University

Mexico

- Universidad Autónoma de San Luis Potosí
- Universidad Autónoma del Estado de Hidalgo
- Instituto Potosino de Investigación Científica y Tecnológica
- Universidad Autónoma de Yucatán

Germany

- Heinrich-Heine Universität Düsseldorf
- Universität Stuttgart
- Leibniz Universität Hannover
- Die Hochschule Magdeburg-Stendal
- Karlsruher Institut für Technologie
- Institut für Lebensmittelchemie
- Friedrich-Alexander-Universität Erlangen-Nürnberg
- Deutsches Zentrum für Luft und Raumfahrt
- Universität zu Köln

United States

- University of California
- Georgia State University
- Arizona State University
- Oakland University
- Brown University
- University of Nebraska
- University at Albany
- University of Colorado Boulder
- University of Wyoming
- University of Idaho
- University of Pittsburgh
- University of Arizona
- University of Delaware
- Columbia University
- National Institutes of Health, Bethesda
- North Carolina State University
- Colorado Water Science Center
- United States Geological Survey

Colombia

- Universidad Mariana
- Universidad Nacional de Colombia
- Universidad de Antioquia

Brazil

- Universidade Estadual de Campinas
- Instituto de Botânica
- Universidade de São Paulo
- Universidade Federal de Alfenas
- Universidade Federal de Campina Grande
- Universidade Tecnológica Federal do Paraná
- Empresa Brasileira de Pesquisa Agropecuária (Embrapa)
- Instituto Nacional de Pesquisas Espaciais, São José dos Campos
- Universidade Estadual do Oeste do Paraná
- Universidade Federal do ABC (UFABC)
- Universidade Federal de Santa Maria

Honduras

- Universidad Nacional Autónoma de Honduras

Costa Rica

- Tecnológico de Costa Rica
- Universidad de Costa Rica

Ecuador

- Universidad de las Fuerzas Armadas-ESPE
- Universidad Nacional de Loja
- Universidad Central del Ecuador

Chile

CRHIAM

Cuba

- Universidad Central "Marta Abreu" de Las Villas

Peru

- Universidad de Ingeniería y Tecnología (UTEC)

Argentina

- Universidad Nacional de La Plata
- Universidad Nacional de Mar del Plata
- INIBIOMA, Universidad Nacional del Comahue - CONICET
- Universidad Nacional de Cuyo
- Universidad Nacional de San Luis

Spain

- Universidad Politécnica de Madrid
- Universidad Politécnica de Cataluña
- Universidad de Valencia
- Universidad Pablo de Olavide
- Universidad de Santiago de Compostela
- Universidad de Valladolid
- Universidad de Málaga
- Universidad de Alcalá
- Universidad de Huelva
- Instituto de Diagnóstico Ambiental y Estudios del Agua (IDAEA-CSIC)
- Universidad Complutense de Madrid
- Universidad del País Vasco
- Universidad de Sevilla
- Estación Experimental del Zaidín (EEZ-CSIC)
- Universidad Rey Juan Carlos
- Empresa Aqualia
- Instituto de Recursos Naturales y Agrobiología de Sevilla (IRNAS-CSIC)

England

- University of Bristol
- University of Oxford
- Cranfield University
- Loughborough University
- Northumbria University

Portugal

- Universidade de Coimbra
- Universidade do Minho

Sweden

- Lund University
- Swedish Institute of Agricultural and Environmental Engineering
- Swedish Agricultural Sciences University Uppsala

Denmark

- Technical University of Denmark

Finland

- Aalto University School of Science
- University of Oulu

Russia

- Institute for Problems of Mechanical Engineering

Belgium

- Université de Liège
- Vrije Universiteit Amsterdam
- Universiteit Gent
- Vlaamse Instelling voor Technologisch Onderzoek (VITO)

Poland

- AGH University of Science and Technology

Saudi Arabia

- Imam Abdulrahman Bin Faisal University

China

- University of Science and Technology Beijing

India

- University of Allahabad

Thailand

- Chulalongkorn University

France

- Université Paris-Saclay
- Université de Bordeaux
- Université de Versailles Saint-Quentin-en-Yvelines
- Université Blaise-Pascal
- Université de Strasbourg
- Centre National de la Recherche Scientifique (CNRS)

Italy

- Università di Siena
- Università degli studi Roma Tre
- Università degli Studi della Basilicata
- Università degli Studi della Basilicata

Switzerland

- Université de Lausanne
- University of Basel

Greece

- University of Thessaly
- Aristotle University of Thessaloniki
- University of the Aegean

Czech Republic

- Masaryck University
- University of Chemistry and Technology, Prague
- Institute of Chemical Technology, Prague

Austria

- Universität Innsbruck

Australia

- The University of Queensland
- The University of Melbourne
- Griffith University
- James Cook University
- University of South Australia
- Commonwealth Scientific and Industrial Research Organisation (CSIRO)



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