The Arequipa Nexus Institute
for Food, Energy, Water, and the Environment

INTRODUCTION

Urbanization, agricultural intensification, and the mining of metal ores brought many economic and social benefits to the Arequipa region of Peru, and to the country in general. These activities have also contributed to the degradation of the region's air, soil, and water resources. Landscape-level changes in the form of desertification, soil erosion and rapidly melting glaciers further impact local livelihoods, economies, infrastructure, and ecosystems. Additionally, the region's changing and ambiguous natural resources ownership and use rights, inequitable development and high rates of poverty have resulted in increased food insecurity, overall socio-ecological vulnerability, and in some cases, social conflict.

These social, environmental, and economic challenges are interconnected in complex ways, making the solutions landscape difficult to navigate, especially in the context of meeting the United Nations Sustainable Development Goals (SDGs). Increasingly, the world's universities are playing a central role in creating, translating, and promoting sustainable solutions. To accelerate the transition to sustainability in the Arequipa region of Peru, the ***Universidad Nacional de San Agustín*** (UNSA) and Purdue University have partnered to create the **Arequipa Nexus Institute — a large scale research, education, and innovation institute in support of a sustainable future.**

CAPACITY & CAPABILITY BUILDING

Through strategic resource investments, the Institute has strengthened education programs, jump started research at the food-energy-water-environment nexus, and helped position UNSA as a leader of sustainable development in Peru.

LONG-TERM SCIENCE COLLABORATIONS

Institute faculty has designed and implemented collaborative projects that are shaping UNSA's long-term agenda for leadership in research, innovation, and technology transfer supported by strong outreach and engagement programs.

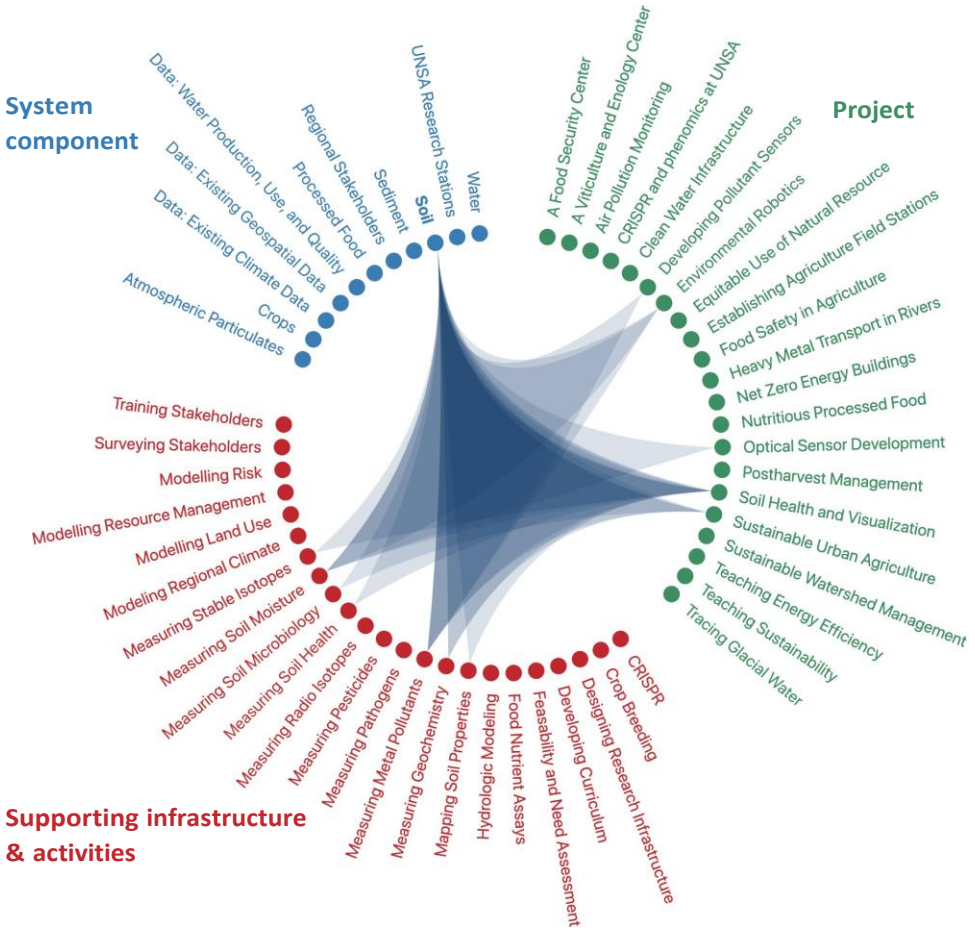
SOLUTIONS FOR A SUSTAINABLE PERU

Using the SDGs as a guide, the Institute engages in solutions-oriented research for sustainable use of natural resources with minimal tradeoff to the environment and in partnership with local experts and stakeholder communities.

A SYSTEMS APPROACH

The UNSA-Purdue partnership was initiated with a network of 21 interrelated, interdisciplinary research projects designed to identify regional interdependencies among food, water, and energy systems, and explore tradeoffs between land use and the environment. Supporting research infrastructure and activities were co-developed to leverage synergies among the projects.

The projects were developed either as a pilot study to gauge interest and capabilities, or as a short-term exploratory effort in preparation of a full-scale, long-term research program. Embedded within both tracks is analysis of different models for local and regional capacity building and information dissemination.



OUTPUTS AND OUTCOMES

Science Collaborations

160 faculty and staff researchers from Purdue (63) and UNSA (97) from 6 Purdue colleges and 10 UNSA colleges

Projects integrate 35 postdoctoral scholars, and train 30 undergraduate students from Purdue and UNSA

21 collaborative, interdisciplinary research projects.

A network of 24 distinct field study locations throughout the Arequipa region

Emphasis on career development through peer-reviewed research publications—currently 47 papers published and 13 in prep

Capacity Building

4 thematic centers at UNSA support the Institute

Annual technical workshops and symposia at Purdue attended by 150 UNSA faculty and students

On-line training in the Soil and Water Assessment Tool for 50 researchers

116 conference presentations at regional and international scientific society meetings

Design and implementation of scientific instrumentation and laboratory capability unique to the region

Co-development of new curricula in energy sustainability

New programs in environmental monitoring and sampling

Creation of 3 citizen science networks for environmental monitoring (soil, water, and air)

Design of new agricultural and environmental research and demonstration stations

Sustainable Solutions

Design of UNSA campus net zero energy building

22 active partner institutions (national and regional; government and NGO)

59 interviews and stories in the media (television, print, digital, radio) across Peru and the U.S.

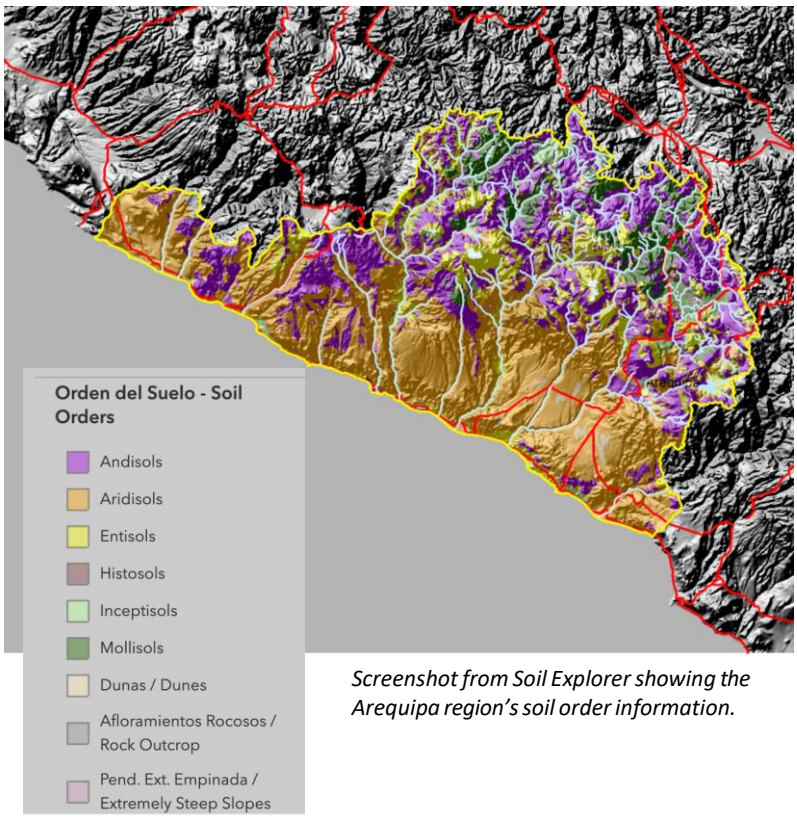
PROJECT AT A GLANCE

Arequipa Soil Explorer

Sustainable agriculture and regional food security require healthy soil and clean water. Team members from the "Soil Health and Visualization" research project are providing a baseline assessment of the health, vulnerability, and contamination of soils within the areas supporting Arequipa's evolving, and highly stressed, agricultural economy.

The team began their collaboration by adapting the on-line Soil Explorer mapping platform developed at Purdue (**https://SoilExplorer.net**) for the Arequipa region. This tool provides practical, location-specific information about Arequipa soils, geology, and detailed agricultural land use maps accessible via the web, tablet or smart phone-based devices in English and Spanish.

The platform currently provides information about soil orders, soil moisture, pedogenic features, elevation, and hill shade. The next addition to the Arequipa Soil Explorer will include information on soil health and metal contamination collected through a citizen science network of regional farmers and UNSA undergraduate students. Other Institute project teams will incorporate hydrologic and climate data to the platform.



Screenshot from Soil Explorer showing the Arequipa region's soil order information.

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Updated: May 2022

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