

Project 2. Genetic Resources Conservation and Characterization

Problem analysis

CIP's location in the center of domestication and diversity of potato and other less-used roots and tubers, the increasing importance of potato and sweetpotato to global food security and the potential offered by the other Andean roots and tubers, place CIP project 2 central to center's research program. CIP's mandate as custodian of these international public goods, and provider of associated knowledge related to them makes this project our long-term commitment to their protection and worldwide availability.

Through safeguarding and distribution of well-characterized germplasm, this project contributes to CIP's and CIP partners' research efforts to increase productivity, reduce farmers' reliance on agrochemicals, save threatened genetic resources and produce more nutritious and healthy food. The project also aims to sustain poor farmers' livelihood in securing food and conserving agrobiodiversity.

Wild relatives have demonstrated value as new sources of variation to improve potato and sweetpotato. However, short and long term natural events including climate change and human interventions increasingly threaten the biodiversity of potato, sweetpotato and other roots and tubers in their Andean center of diversity. The CIP genebank holds 151 of the 188 recognized wild potato species. Of these, 83 species are endemic to Peru and at least 20 are facing imminent risk of loss. Despite these holdings, recent work in CIP shows that a number of wild species are under represented, in terms of diversity, in CIP genebank.

Increasing knowledge of the genetic and functional characteristics of the collections and promoting their diffusion and use are two areas where we seek increased investment in order to add value to the conservation efforts.

Identification of specific problems to be tackled with research

CIP's work in this project is summarized in the three 'C's': collection, conservation and characterization. The international conventions on biodiversity and Peruvian legislation have limited collection in recent years. The GPG 1 project was a major investment in improved conservation. Activities on characterization have grown and are further emphasized in the new 2008-10 MTP. The targets of Output 2 and the new Output 3 signal greater efforts dedicated to diversity assessment, characterization and evaluation of collections' sub-sets to generate information on gene pool structure, priority traits and attributes variation.

Through research, a range of genetic resources problems can be approached using modern genetic and information tools and precise and extensive phenotyping for characterization of morphological, physiological, pathological and biochemical traits. To do this more efficiently, the use of high-throughput phenotyping and genotyping capacities are in the pipeline of future capital investment to support research activities in this project.

A high-performance computing facility is installed at CIP through our collaboration with the Generation Challenge Program. We will continue to improve information management to support simplified tracking of germplasm through the use of bar-codes and more reliable data capture via PDAs. The analysis of high volume data is being addressed in the areas of statistical quality control, more formal and transparent documentation and certification of standard operating procedures and the use of the latest tools in high throughput reporting (data warehouses) and reproducible research (automated analysis pipelines).

These investments will allow us to: conduct accurate measurement of diversity, determine the limits and gaps of collections, and assess geneflow and erosion risk and discover allelic variation

of new sources of traits of interest to breeders. The project will also carry out and convene research on new conservation methods, including cryopreservation, genetic and genomic stocks and DNA banking. Targeted collecting missions will focus on areas with high levels of endemism and risk of erosion. We will partner with local organizations to ensure community-based conservation of cultivated potatoes, sweetpotato and other roots and tubers. We will also invest in documentation and communication activities.

New and more useful sources of variation in resistance to priority biotic constraints such as PVY and PLRV virus in the potato collection and nematode and virus disease resistance in the sweetpotato collection will be explored. Drought tolerance, micronutrient content and health-enhancing attributes will also be explored in the potato, sweetpotato and ARTC collections. CIP can contribute towards collaborative studies involving local partners on issues of genetic resources access and mechanisms for benefit sharing under the International Treaty.

Objectives

To enhance the efficiency and effectiveness of CIP's role in collection, conservation and characterization of potato, sweetpotato and other root and tuber genetic resources and associated information as International Public Goods. In addressing the understanding of the collections recommendations for best practices and new knowledge will be generated to ensure that the value of these resources is enhanced and made available for contributing to achieving the MDGs.

As stated in the Overview chapter, a new output (Output 3) has been established to collect in a single reporting location the germplasm evaluation activities which were previously distributed among other outputs. This output will add value to the collections. Output 1 continues to focus on the generation of new methods for germplasm conservation and conservation, as well as collect and make available genetic resources that are conserved ex situ, in situ and on-farm; Output 2 will provide essential knowledge on the diversity of root and tuber crop genetic resources. All three Outputs include now documentation/information and capacity building roles.

Alignment with CGIAR System Priorities

This Project is fully dedicated to sustaining biodiversity for current and future generations (SP1). Because of CIP's trusteeship mandate to potato, sweetpotato and other roots and tubers, major emphasis is placed on the conservation and characterization of these staple crops (SP1A). Starting in 2010, we assign proposed collaborative work on selected promising under-utilized crops of the Solanaceae group to SP1B.

Description of impact pathways

Most of the project's contributions to MDGs come indirectly through other CIP MTP projects. The limited direct contributions are described below. The Project's main deliverables include knowledge, material, expertise, best practices, documentation and analysis tools, and facilities. The pathway from these materials and knowledge outputs to Outcomes and Potential Impact will mostly proceed through linkages with CIP research Projects Germplasm Enhancement and Crop Improvement (Project 3) and Impact Enhancement (Project 1). Through these projects outputs from this project will be felt through research on key themes such as the reduction of temporal and chronic hunger in vulnerable communities, improving access to safe and nutritious food, but especially to the sustainable use of biodiversity.

Project 2 outputs also contribute directly to the sustainable use of biodiversity through supporting efforts to sustain local crop productivity, food availability and restoring crop diversity. Adoption of conservation and characterization methodologies by NARS and local biodiversity organizations, farmers' use of disease-free local germplasm, and use of well characterized and documented germplasm by NARS and local researchers are important Outcomes of Project 2. Potential Impact will derive from restoring crop diversity in farming communities and contributing to increasing food security and income generation.

Research approach to develop International Public Goods (IPGs)

The genetic resources collections managed in this project constitute one of the main core assets of the CGIAR and CIP, which are conserved, characterized and disseminated as International Public Goods. The three Project Outputs comprise research activities with deliverables that are public goods, including knowledge, management practices, tools and information on genetic resources, and traits with relevance to global agricultural issues, like food security, productivity and quality improvements. Project 2 will evolve as a provider not only of seeds and clonal material for specific traits but also quantitative trait loci, alleles and DNA samples. This new knowledge and new products will remain IPGs, the use of which will be governed by the mechanisms of benefit-sharing of the international treaty.