

THE INTERNATIONAL POTATO CENTER (CIP)

## **Medium-Term Plan 2009-2011**

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of the  
Consultative Group for Agricultural Research (CGIAR)

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**Centro Internacional de la Papa  
Medium-Term Plan 2009-2011**

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# MTP OVERVIEW

## Introduction

This Medium Term Plan is presented following the Guidelines received from the Science Council with one exception: we report the Urban Harvest Systemwide Program as an MTP project. In their commentary on our 2007-2009 MTP the Science Council advised CIP that it did not recognize Urban Harvest as part of the System Priorities and requested that we shift the budgetary reporting to the non-agenda category. MTP preparation guidelines state that non-agenda items be presented only in the Overview chapter. However, given the interest of many investors and stakeholders in this program, we present a project narrative and logframe.

We continue implementation of the research program designed to respond to the CIP Vision of contributing to the Millennium Development Goals. Our research program is largely unchanged from that of the previous year. One significant development is with the Global Mountain Program. The uncertainties created by CG discussions on the future of the SWEPs caused several key donors to the GMP to suspend their support, leaving the program without funds for future years. As result, the GMP is filing a reduced MTP project. This is a change process year in the CGIAR. Should the Alliance decide to continue support for the GMP and donors provide financial support, we will seek to reactivate the program and file a complete project in our next MTP.

## CIP Research Program Context

During 2006 CIP published its new Strategic Plan for Research. Presented extensively in the 2007-2009 MTP, the Plan guides the implementation of the CIP Vision. The EPMR panel commented extensively on our strategic plan and in recommendation #2 asked that CIP develop a 'completed version' of the plan with various considerations including a narrowing of the MDGs we seek to address and a renewed concentration on our mandate crops. The panel goes on to clarify that it considers a business plan an integral part of the strategic plan. We accepted the recommendation and will be updating our strategic plan and writing corresponding business plans during 2008. As per the guidelines the full text of all the EPMR recommendations are found in the annex.

The EPMR panel also reviewed the structure of CIP research and in recommendation #1 suggested extensive changes in our program structure including the creation of regional programs and a new research division. CIP partially accepted recommendation #1. In 2004 CIP reorganized its research program structure creating research divisions that in 2005 became MTP Projects as well. In the past we had a separate regional research program managed independently from the main research program. After careful review we merged the two programs for improved coordination of headquarters and non-headquarters work. The panel recommended a new division to conduct research on partnerships. While we agree that understanding and using partnerships is a key element of success, we disagree that an entire division be funded to study the issue. Instead we added an output on research on partnerships to our MTP Project #1 and describe the change below. Our most significant change in this MTP is to de-couple the research divisions from MTP projects. We realized that divisions as projects tended to create disciplinary silos that discouraged collaboration. Thus starting with this MTP we have begun to rename divisions and MTP projects to emphasize more clearly their main characteristics and purpose. Divisional scientists now more easily allocate their research time across several MTP projects. These changes are introduced below in the project portfolio section.

In their comments on the research program we presented in the 2008-2010 MTP, the Science Council noted that: The MTP has a clear set of project goals... ; '...provides a clear indication ...of how CIP research contributes to IPGs...'; 'outputs and output targets...appear to be sufficiently ambitious and ... high value' and finally '...[CIP has an] extensive and appropriate range of partners and strategic alliances...'. The 2009-2011 MTP continues this level of planning, documenting implementation of our strategic plan and the continued alignment of the centers research agenda with system priorities. Implementation and alignment are step-wise processes. Our research agenda is almost entirely financed by research contracts. Like plant breeders seeking to shift the distribution of characteristics of their populations, CIP can shift the distribution of its research contract portfolio towards its objectives only as existing contracts expire and new contracts are won.

## Climate Change

Climate change can have profound effects on potato and sweetpotato production systems and the erosion of genetic resources in our priority countries. These changes can include greater variation in climate events, a general rise in temperatures, changing rainfall patterns, and more intense rainfall or drought. These factors affect traditional planning of cropping seasons and cropping patterns, intensity of pest and disease, potential for frost, drought or erosive rainfall or wind events and thus also the evolution of the native potatoes in Andean highlands.

The center has focused its research response on issues of adaptation. In the MTP Project 5 our work seeks to improve the utility of the climate change models. The current models predict outcomes on fifty square kilometer grids. With the great ecosystem variability found in tropical mountains this is not useful. Therefore, in Project 5 we are addressing the complex issue of linking climate data at different spatial and time scales with agriculture by downscaling climate change prediction from General Circulation Models and combine the results with process-based crop models to analyze alternative scenarios for germplasm adapted to stress-prone conditions. Coupled with this is work in the MTP Project 1 on integrated assessment that links economic analysis with cropping systems analysis to provide an ex-ante look at the responses of potato or sweetpotato farmers to possible climate changes. This research will analyze how those responses might be modified through technological interventions such as the ones described below and associated changes in policy.

Climate change also affects pest and disease cycles and in our MTP Project 4 through modeling we are taking a look to the future of how pest and disease pressure on cropping systems might change and what the needs for, and the effects of, new technologies would be, so that research could be planned properly in order to help farmers to be prepared for emerging scenarios. Finally and perhaps most importantly in MTP Projects 2 and 3 we are investing in the evaluation for drought and salt tolerance and the development of improved cultivars that resist abiotic stresses, in particular heat and drought.

## Implementation of the EPMR Recommendations

During 2007 CIP received the report of its Sixth External Program and Management Review. The review panel made 18 recommendations, 14 of which concerned the structure and content of the research program. Our responses and implementation of these recommendations are found in the designated table in the annex. We accepted most recommendations and have already implemented several of them; these are reflected in this MTP report. We did not accept or partially accepted several of the recommendations. These are discussed here.

The EPMR panel recommended that CIP end its relationship with the three SWEPs it hosts on behalf of the CGIAR. CIP did not accept the recommendation related to CONDESAN and partially accepted the recommendations related to Urban Harvest and Global Mountain Program. We argued these are not internal decisions of the center but ones that should be made by the system. CIP also only partially accepted a recommendation to add a project on research on partnerships (discussed above). We did not accept the recommendation to end our project on Agriculture and Human Health. CIP argued that the historic division between the health sciences and agriculture sciences is so marked that to be able to bridge the divide, a higher profile effort is needed to signal the seriousness of our intent to integrate the disciplines to better contribute to the MDGs.

## Highlights of Project Portfolio

There are several changes to report in the 2008 project portfolio: the most important is the re-naming of several projects. Internally, CIP's research program is arranged in Research Divisions and Partnership Programs. In last year's MTP we reported one MTP project for each division, using the division name for the project. As explained in the introductory section above, this year we begin to de-couple the divisions from the MTP projects. This is signaled to both internal and external stakeholders by selected name changes of both divisions and projects

Further changes are described below, project by project.

## ***Project 1. Partnerships, Markets and Policies for Pro-poor R&D***

Last year project 1 was named Impact Enhancement. The name change reflects more accurately the work done in the project and captures the spirit of the EPMR recommendation to engage in 'research on partnerships'. We have designated a new output 1 to house this research and shifted the remaining outputs respectively. The project remains a home for work designed to assist the center implement the research for development cycle described in the Strategic Plan. The project provides information on targeting, needs and opportunities assessment, policy related research and methods for impact analysis. There are output targets for baseline measurements for ex-ante impact assessment and new methods for ex-post impact analysis.

### ***New results or projects***

A new research contract jointly implemented with Montana State University, Wageningen Agriculture University and the Max Plank Institute utilizes integrated assessment to examine cropping systems impacts of different climate change scenarios in Ethiopia, Uganda and Kenya. This is reflected in new output targets in Output 2.

<b>Project 1. Partnerships, Markets and Policies for Pro-Poor R&amp;D</b>		
<b>Outputs 2008-2010</b>	<b>Outputs 2009-2011</b>	<b>Description of Change</b>
<b>Output 1.</b> Pro-poor R&D Cycle validated by 2010	<b>Output 1.</b> Principles for effective partnerships to reduce rural poverty and vulnerability (2012)	New output responding to CIPs partial acceptance of EPMR recommendation #1.
<b>Output 2.</b> Strategies for linking farmers with markets and post-harvest innovations tested and documented by 2011	<b>Output 2.</b> Information available for better targeting of research for development (2012)	The previous year's Output 1 but re-titled to accommodate ex-ante approaches for targeting.
<b>Output 3.</b> Pro-poor policies for institutional learning and change identified and documented by 2012	<b>Output 3.</b> Strategies for linking farmers with markets and post-harvest innovations tested and documented (2011)	The previous years Output 2 unchanged.
	<b>Output 4.</b> Pro-poor policies and strategies for institutional learning and change identified and documented (2012)	The previous year's Output 3 unchanged.

## ***Project 2. Sustaining Potato and Sweetpotato Biodiversity for Current and Future Generations***

The major change in this project is the establishment of more focused output targets. For example, Output 2 is totally concentrating on the confirming the genetic integrity of the accessions and the elimination of duplicates in the collections. EPMR recommendation #4 urged a greater focus on characterization of potato and sweetpotato. We responded by increasing our core budget investments in these tasks shifting those funds from several output targets related to Andean Roots and Tubers which were eliminated.

### ***New results or projects***

Phase 2 of the Global Public Goods project continues the contributions of CIP in genebank management and new output targets have been added. With access to new methods and tools, CIP is increasing its commitment to characterization of the holdings in the genebank, adding a new output that focuses on an expanded set of traits including nutritional characteristics.

<b>Project 2. Sustaining Potato and Sweetpotato Biodiversity for Current and Future Generations</b>		
<b>Outputs 2008-2010</b>	<b>Outputs 2009-2011</b>	<b>Description of Change</b>
<b>Output 1.</b> New wild and cultivated genetic resources of several crops (potato, sweetpotato and nine other root and tuber crops) are collected with their associated information, securely conserved and made available by 2010	<b>Output 1.</b> Wild and cultivated genetic resources of potato, sweetpotato and nine Andean root and tuber crops (ARTCs) are acquired with their associated information, securely conserved and made available by 2013	Change in wording for clarification.
<b>Output 2.</b> The genetic diversity of several crops (potato, sweetpotato and nine other root and tuber crops) is characterized and documented by 2010	<b>Output 2.</b> The genetic diversity of potato, sweetpotato and nine other Andean root and tuber crops is characterized and documented by 2013	<b>Output 2</b> will concentrate on characterization of germplasm collections to confirm genetic identity of each accession and to eliminate duplicates in the collections
<b>Output 3.</b> Selected gene pools of root and tuber crops are evaluated for useful breeders' traits of interest, and nutritional and health-related attributes by 2010	<b>Output 3.</b> Selected gene pools of root and tuber crops are evaluated for breeders' traits of interest, nutritional and health-related attributes by 2013	<b>Output 3</b> will focus on evaluation of breeder's traits of interest or nutritional and health-related attributes.

### ***Project 3. Genetic Enhancement and Crop Improvement***

The identification and characterization of new sources and strategies for developing pest and disease resistance, new knowledge of variability in micronutrient concentrations and insights into the responses of CIPs crops to abiotic stress has set the stage for new research that will blend conventional with biotechnological approaches to sweetpotato and potato improvement.

#### ***New results or projects***

New and pending projects will convene transnational expertise and new technologies in crop improvement to develop capacities and deliver new varieties that will help alleviate poverty through improved, productivity, nutrition and added value opportunities for income generation and development in Sub-Saharan Africa, Asia and Latin America.

Major emphases will be placed on research to enhance resistance to virus infection and weevils and increase the nutritional value of sweetpotato for Africa; and to combine resistances to major diseases and define physiological and genetic traits that confer drought tolerance in potato. Modeling will be applied to help set breeding objectives for water use efficiency and heat tolerance, in consideration of genetic parameters of CIPs improved populations, and in the light of agro ecological classification and climate change scenarios. A new Output will convene interdisciplinary efforts to develop and validate new methods and technologies for more effective characterization, and use of gene and trait diversity in germplasm including breeding materials

The consolidation of breeding networks and stakeholder groups including the private sector is expected to help target and accelerate the delivery of improved varieties and related technologies.



<b>Project 3. Genetic Enhancement and Crop Improvement</b>		
<b>Outputs 2008-2010</b>	<b>Outputs 2009-2011</b>	<b>Description of Change</b>
<b>Output 1.</b> Effective strategies for the identification and dissemination of high-yielding, resistant and nutritious potato and sweetpotato varieties available for each CIP region by 2012	<b>Output 1.</b> Effective strategies for the identification and dissemination of high-yielding, resistant and nutritious potato and sweetpotato varieties available for each CIP region by 2012	Seed production efforts related to variety dissemination to be developed in Output 1 of Project 4
<b>Output 2.</b> Potato populations, clones and true seed varieties with resistance, nutritional and market traits are developed for SSA, LAC, ESEAP and SWCA by 2012	<b>Output 2.</b> Potato populations, clones and true seed varieties with resistance, nutritional and market traits are developed for SSA, LAC, ESEAP and SWCA by 2012	No change.
<b>Output 3.</b> Sweetpotato populations and clones with superior agronomic, nutritional and end-use quality characteristics are developed for SSA, LAC, ESEAP and SWCA by 2012	<b>Output 3.</b> Sweetpotato populations and clones with superior agronomic, nutritional and end-use quality characteristics are developed for SSA, LAC, ESEAP and SWCA by 2012	No change.
<b>Output 4.</b> Transgenic potatoes and sweetpotatoes for resource-poor producers and consumers are developed and tested using good practices by 2012	<b>Output 4.</b> Transgenic potatoes and sweetpotatoes for resource-poor producers and consumers are developed and tested using good practices by 2012	No change.
	<b>Output 5.</b> Novel genotyping and phenotyping tools and screening strategies for efficient germplasm characterization and enhancement	New output addressing objectives formerly in crop-or discipline-oriented outputs of Projects 3 and 4

### ***Project 4. Crop Management for Sustainable Intensification of Potato and Sweetpotato Based Cropping Systems***

The project has changed its name to Crop management for sustainable intensification of potato and sweetpotato based cropping systems and will continue working towards developing international public goods. The focus will be on developing new types of knowledge about the main potato and sweetpotato constraints, particularly in light of emerging challenges, such as climate change, and also management components of wider application, which can contribute to the expression of the genetic potential of new varieties developed by the Center. We are reducing the emphasis on developing integrated solutions because we understand that integration occurs at farm level, which is highly influenced by local conditions that the Project cannot address sufficiently. However, we will continue our efforts to develop principles and methods to help NARS to conduct better integration of crop management components taking into consideration the need for developing alternatives for sustainable intensification and maximizing productivity of potato and sweetpotato cropping systems, paying particular attention to the needs of farmers and other members of the value chains through participatory methods.

#### ***New results and projects***

There have been some changes in the outputs of this project. Output number 1 will continue looking at alternatives for improving formal and farmer-based seed systems, but addressing the need to contribute efficient dissemination of CIP-derived varieties. This output will also include agronomic research which could support seed production. The output 2 in the 2008 project was related to developing strategies for technical integration of components. This output is not part of the 2009 MTP because of the reduced emphasis on

integrative research. The output targets of this output have been included in output 1 and in Project 5. Output 2 in the 2009 MTP (previously output 3) will continue addressing disease management, but giving emphasis to assessing the risk due to changes in pathogen population, climate and systems intensification. Output 3 (previously output 4) will continue developing management component for the main insect pests, but will also pay attention to developing methods for assessing pest risks under climate change and system intensification scenarios. Output 4 (previously output 5) will continue addressing methodological research on participatory methods, but will put more emphasis on capacity building oriented to NARS in both methodological and technical aspects.

<b>Project 4. Crop Management for Sustainable Intensification of Potato and Sweetpotato Based Cropping Systems</b>		
<b>Outputs 2008-2009</b>	<b>Outputs 2009-2011</b>	<b>Description of Change</b>
<b>Output 1.</b> Strategies for improving formal and farmer-based seed systems towards enhancing potato and sweetpotato production efficiency and competitiveness validated in at least three priority countries per region in LAC, SSA and Asia by 2012	<b>Output 1.</b> Strategies and technologies for improving seed systems, contribute to CIP's variety dissemination and improve agronomic management towards sustainable intensification of potato and sweetpotato cropping systems validated in at least three priority countries per region (LAC, SSA, Asia) by 2012.	Includes research on strategies for variety dissemination and some agronomic-related research for improving seed production and system intensification.
<b>Output 2.</b> Strategies and methods for technical integration of soil, seed, disease and insect management components for subsistence and semi-commercial potato and sweetpotato growers developed in at least three priority countries per region in LAC, SSA and Asia by 2012.		This output is not part of the Project 4 MTP in 2009.
<b>Output 3.</b> Components for integrated disease management against potato and sweetpotato diseases – late blight (LB), bacterial wilt (BW) and viruses – developed, tested and disseminated within ICM strategies in at least three priority countries per region LAC, SSA and Asian priority countries by 2012.	<b>Output 2.</b> Technologies for the management of LB, viruses and BW developed and capacities for assessing the risk due to changes in pathogen population, climate and systems intensification assessed in at least three priority countries per region by 2012.	More emphasis on component development for disease management and also on assessing risks due to changes in pathogens, climate and system intensification factors.
<b>Output 4.</b> Components and strategies for the integrated management of key potato and sweetpotato insect pests developed as part of ICM in at least three priority countries per region LAC, SSA and Asia priority countries by 2012.	<b>Output 3.</b> Components and strategies for the integrated management of potato and sweetpotato pests of global and regional importance and tools for assessing pest risks under climate change and system intensification developed and tested in at least three priority countries per region by 2012.	More emphasis on a holistic system approach to develop pest management strategies including assessments on risks for system sustainability due to system intensification and the prospects of climate change.

<b>Project 4. Crop Management for Sustainable Intensification of Potato and Sweetpotato Based Cropping Systems</b>		
<b>Outputs 2008-2009</b>	<b>Outputs 2009-2011</b>	<b>Description of Change</b>
<b>Output 5.</b> Participatory strategies and methods for socioeconomic integration of potato and sweetpotato ICM components developed and made available for improving potato and sweetpotato innovation systems in at least three priority countries per region LAC, SSA and Asia by 2012	<b>Output 4.</b> Participatory strategies and methods developed, and capacity building undertaken with an innovation systems approach for sustainable intensification of potato and sweetpotato cropping systems in at least three priority countries per region by 2012.	Emphasis will continue on methodological research, but will increase the importance of capacity building activities for NARS

### ***Project 5. Systems Approaches to Build Adaptive Capacity in Potato and Sweetpotato Based Systems***

This project was previously named Natural Resources Management. However, responding to center priorities, the project has focused more on potato and sweetpotato systems adaptive capacity and was renamed this year to reflect that focus. Among our stakeholders, the name NRM carries with it a popular image of integrated watershed management which is not the objective of research in the project. The names and number of MTP outputs have been modified to make them more coherent with the purpose of the project. In line with this focused work, the number of outputs in the 2009-2011 MTP has been reduced to just two, as shown in the logframe.

The MTP also aligns the work and output targets of the Project to the new challenges and opportunities of international agricultural research, as outlined in the Visioning Report to the ExCo of the CGIAR, submitted by the Working Group on Visioning and Development Challenges, established within the Change Management Process, initiated in early 2008. This document points out that the context of agricultural research has shifted dramatically in recent years and is dominated by climate change, high food prices and environmental and energy crises.

#### ***New results or outputs***

A new project for the analysis of vulnerability in potato-based systems in LAC has been awarded. The project is contributing to the development of analytical capacity in NARS to address the interaction climate-agriculture. Research on downscaling of climate forecasts and complex systems analysis continues in a new partnership with EMBRAPA. Advances in the use of remote sensing to detect potato pests and diseases and other stressing factors are being consolidated. The CIDA funded project (ALTAGRO) that seeks integrated solutions for poverty reduction in marginal Altiplano agro-ecosystems includes technical assistance activities that we classify as non-agenda.

<b>Project 5. Systems Approaches to Build Adaptive Capacity in Potato and Sweet Potato based Systems</b>		
<b>Outputs 2008-2010</b>	<b>Outputs 2009-2011</b>	<b>Description of Change</b>
<b>Output 1.</b> Geospatial methods and computer assisted tools for improved research targeting, crop assessments and Environmental Vulnerability Analyses, preparedness and mitigation in the Andes, SSA and SWCA developed by 2011	<b>Output 1.</b> Procedures, methods and computer-assisted decision support tools to improve research targeting, crop monitoring and the assessment of production systems vulnerability to environmental changes developed and tested by 2011	Better definition of output to fit new project title, thus responding to recommendations of external evaluations.

<b>Project 5. Systems Approaches to Build Adaptive Capacity in Potato and Sweet Potato based Systems</b>		
<b>Outputs 2008-2010</b>	<b>Outputs 2009-2011</b>	<b>Description of Change</b>
<b>Output 2.</b> Management recommendations and policy options to reduce environmental and economic vulnerability representative priority ecosystems in LAC, East Africa, India and Bangladesh documented by 2010		The output as described in the previous MTP has been moved to Project 1
<b>Output 3.</b> Strategies for increased resilience and adaptive capacity in agricultural systems in the Andes, SSA and Asia identified and validated by 2011	<b>Output 2.</b> Strategies for increased resilience and adaptive capacity in Potato systems in the high Andes and SP systems in Southern China and Vietnam identified and validated by 2011	Geographical targets better identified based on secured funding.

## ***Project 6. Agriculture and Human Health***

### ***New results or outputs***

In response to both CIP Board and EPMR panel feedback, existing outputs have been re-ordered to reflect the priority placed on nutrition and livelihood benefits associated with agricultural interventions. A new output (1) has been developed through project team discussions with CIP leadership which will more formally document the role of human health considerations in Pro-Poor cycle activities.

<b>Project 6. Agriculture and Human Health</b>		
<b>Outputs 2008-2010</b>	<b>Outputs 2009-2011</b>	<b>Description of Change(s)</b>
	<b>Output 1.</b> Human health and agriculture linkages that are sensitive to agricultural interventions for health mapped across learning sites (in close collaboration with Division1)	New project that reflects need to more consistently incorporated opportunities and impacts associated with human health as part of agricultural research for development.
<b>Output 2.</b> The value of orange fleshed sweetpotato as a component of food-based approaches to improved nutrition is demonstrated by 2010	<b>Output 2.</b> he value of orange fleshed sweet potato as a component of food-based approaches to dietary diversification and improved nutrition is demonstrated.	Moved up to reflect priority on emphasizing the positive. Incorporates potato work as well as OFSP. Envisages new regional SSA initiative.
<b>Output 1.</b> Integrated health and agriculture strategies to reduce pesticide exposure risk and promote healthy and sustainable agriculture among farm families in Ecuador, Peru and Bolivia designed and promoted by 2010	<b>Output 3.</b> Integrated health and agriculture strategies to reduce pesticide exposure risk and promote healthy and sustainable agriculture among farm families designed and promoted.	Reflects intention to extend metropolitan region approach to other geographic regions (SSA and SWEA).

## ***Project 7. CONDESAN***

CONDESAN concentrates on two major themes, sustainable water management in the Andes and fostering the establishment and functioning of innovative institutions that promote sustainable rural development.

### ***New results or projects***

During the year CIP, on behalf of CONDESAN, was awarded with a new project to support the activities of the Mountain Partnership Initiative in the Andes region and received World Bank support for the coordination unit again in 2008.

<b>Project 7. CONDESAN</b>		
<b>Outputs 2008-2010</b>	<b>Outputs 2009-2011</b>	<b>Description of Change</b>
<b>Output 1.</b> Policies and local, national and regional recommendations for improved integrated water resource management (IWRM) in Andean countries from Venezuela to Argentina scaled up and out by 2010	<b>Output 1.</b> Improved understanding of ecosystem, land use and climate dynamics with regard of water resource management in Andean basins (2013)	Better definition on the research topic.
<b>Output 2.</b> Institutional innovations, forms of organization and mechanisms for cooperation, training and dialogue are developed and promoted in the Andean agricultural systems to take advantage of the ecoregion's natural diversity by 2011	<b>Output 2.</b> Institutional innovations, forms of organization and mechanisms for cooperation, training and dialogue in the Andean agricultural system analyzed across the Andes (2013)	No change except more precision on the formulation.

## ***Project 8. Global Mountain Program***

The GMP concentrates on two major themes:(1) better CGIAR-based information for mountain communities and (2) improving benefits and efficiency of Rural Urban Linkages (RUL) and using RUL framework to provide a new collective action mechanism for the CGIAR and partners linking research and development in benchmark sites where MDG impacts can be measured. The program has also been active in climate change and policy.

### ***New results or projects***

In 2007 the GMP published the proceedings of the Rural Urban Linkage planning workshop held in Addis Ababa in 2006. It held a regional Andean mountain policy workshop in Lima and published a regional summary report, as well as the mountain policy report for Ecuador, The program also held a planning workshop to develop an Information and Innovation Marketplace for mountain groups together with community leaders, private industry, NARS and NGO representatives and invited specialists in Kathmandu. In addition, as part of a proactive move to coordinate better CGIAR climate change research in mountains the GMP organized with the Mountain Research Initiative the first Global Change Network in African Mountains Conference in Uganda. The proceeding proceedings were published in 2008.

Since July 2008 the program has faced frustrating difficulties which have hampered its progress and diverted much energy. As with the other CIP-hosted SWEPS the GMP was negatively affected by the CIP EPMR process and resulting report. The recommendation that CIP disengage from the GMP was only partially accepted by CIP. Then in early 2008 the SWEPS were exposed to a non consultative review by Science Council. In the case of the GMP one consequence has been the withdrawal of important program donors. The program awaits clarity, which it hopes will come through the new change of management process, in particular from proposals on the partnership mechanisms.

<b>Project 8. Global Mountain Program</b>		
<b>Outputs 2008-2010</b>	<b>Outputs 2009-2011</b>	<b>Description of Change</b>
<b>Output 1.</b> The principal research products of the CGIAR centers for mountains are available and accessible to mountain communities in the form of a supermarket or market place of innovations and opportunities.(with CIP and ILRI and the Mountain Forum (MF) (finished 2010)	<b>Output 1.</b> The principal research products of the CGIAR centers for mountains are available and accessible to mountain communities in the form of a marketplace for innovation and information. (finished 2017)	Extended time frame to 2017 to allow for time to collect information form 15 centers (one a year) and to develop the marketplace.
<b>Output 2.</b> Livelihood, land use & natural resources flow and policy analyses of Rural-Urban-Rural in Ethiopian benchmark are available. (2008-2010) With CIFOR, IWMI, IFPRI, SWIUPA, AHI and national partners).	<b>Output 2.</b> Livelihood, land use & natural resources flow and policy analyses of Rural-Urban-Rural in Ethiopian benchmark are available. (2008-2010) With CIFOR, IWMI, IFPRI, SWIUPA, AHI and national partners).	No change.

## ***Project 9. Urban Harvest***

### ***New results or projects***

During the year the CIP EMPR was conducted and though not involving a review of Urban Harvest, recommended that CIP disengage from the SWEP. This recommendation was not accepted by CIP and CIPs decision was unanimously supported by the Executive Council of the CGIAR and at AGM. At the same time CIP agreed to review the strategy and achievements of this project and to seek ways for CIPs programmatic participation to be strengthened. Two peer-reviewed books of Urban Harvests work will be published during the reporting period and these will be contribute importantly to the assessment of results and to the review of strategy. A revised strategy has been requested by CIPs BOT for presentation during the year.

New project research with CIPs Division 6 on Agriculture and Human Health in the area of healthy and sustainable horticulture, including potatoes, in the Central Andes, is contributing to closer alignment with CIPs programmatic activities.

<b>Project 9. Urban Harvest</b>		
<b>Outputs 2008-20010</b>	<b>Outputs2009-2011</b>	<b>Description of Change</b>
<b>Output 1.</b> Innovativetechnologies and practices developed for increasing productivity and marketing of agricultural commodities produced in urban and peri-urban areas (ends2011)	<b>Output 1.</b> Innovativetechnologies and practices developed for strengthening livelihoods security and increasing productivity and marketing of agricultural commodities along the rural-to-urban continuum (2011)	Clarified statement of output to include continued work on HIV-AIDs affected household livelihoods in and around cities and to accommodate output statement to growing importance of rural-urban linkages.
<b>Output 2.</b> Methods developed to enhance the safety and sustainability of urban and peri-urban agriculture and the uptake of urban sources of nutrients for soils and feed (2011)	<b>Output 2.</b> Methods developed to enhance the safety and sustainability of agriculture along the rural-to-urban continuum and the uptake of urban sources of nutrients (2011)	Clarified statement of output to reflect increased importance of rural-urban linkages in Urban Harvest research work.
<b>Output 3.</b> Policy options and institutional and planning strategies to support safe and sustainable agricultural production in urban areas are developed (2011)	<b>Output 3.</b> Policy options and institutional and planning strategies to support safe and sustainable agricultural systems along the rural-to-urban continuum are developed(2012)	Clarified statement to reflect increased importance of rural-urban linkages. Change of ending date to reflect the slower time frame involved in developing policy options and institutional and planning strategies with local governments.

### ***Changes in collaborative arrangements***

In the previous MTPs we describe our participation in CGIAR and non-CG collaborative arrangements. As per guidelines we only document major changes in those relationships. The project highlights above also capture some of these changes as they result in new outputs or output targets.

#### ***Generation Challenge Program (GCP)***

No changes in Generation CP relations.

#### ***HarvestPlus Challenge Program***

No changes in HarvestPlus CP relations.

#### ***Water and Food Challenge Program***

CONDESAN continues as benchmark basin coordinator for the Andean system of basins.

#### ***Systemwide Genetic Resources Program (SGRP)***

No changes in CIP-SGRP relations.

#### ***Systemwide Livestock Program (SLP)***

No changes in CIP-SLP relations.

#### ***Systemwide Program on Integrated Pest Management (SP-IPM)***

No changes in CIP- SP-IPM relations.

***Participatory Research and Gender Analysis (PRGA)***

No changes in CIP-PRGA relations.

***Collective Action and Property Rights (CAPRI)***

No changes in CIP-CAPRI relations.

***EcoRegional Program for Sustainable Agriculture Development in CAC***

No changes to report.

***EcoRegional Program on AHI***

Collaboration continues, there are no changes to report.

***EcoRegional Program on Rice-Wheat Consortium for the Indo-Gangetic Plains***

CIP has had no activities funded by the consortium for several years.

***Other CGIAR Collective Action Initiatives***

***CGIAR Agriculture and Human Health Platform***

CIP participates in the Agriculture and Human Health Platform with the CIP representative to the platform serving as a member of the platform management committee.

***CIP-CIAT***

Arrangements for joint safety back-ups of the sweetpotato and cassava collections continue.

***Information and Communications Technology-Knowledge Management (ICT-KM) program***

No changes in the CIP-ICT-KM program.

***Future Harvest Consortium to Rebuild Agriculture in Afghanistan***

CIP contributes to an ICARDA-led research contract for potato seed provision.

***CIP-CIAT Project on Participatory Research for Development in the Uplands (PRDU) in Lao PDR, Vietnam and China***

The first phase of this research contract concluded and CIP has joined CIAT in negotiating a second phase.



## CENTER FINANCIAL INDICATORS

CIP attaches a high priority to maintaining a healthy financial position. Sound financial indicators reflect the Centers ability to cope with reasonable external shocks, ensure that research activities will continue in cases of unexpected minor funding shortfalls, and provide a sound base to support future growth. CIP will continue keeping strong financial indicators as a management priority.

**Short-term solvency (liquidity).** In 2007, the short-term solvency indicator increased to 104 days. CIP is forecasting a drop of the liquidity indicator for 2008 due to the increase on the research program, and is estimating that the ratio will grow back to 103 days by 2011 as a result of a growing surplus (Table 1).

**Long-term financial stability (adequacy of reserves).** The Centers long-term financial stability indicator reached 92 days in 2007. CIP will continue building up its long-term reserves indicator over the medium run.

<i>Table 1. Financial Position</i>	2007	2008	2009	2010	2011
Current assets and investments	19.9	20.2	20.8	21.5	21.8
Net fixed assets	3.7	3.7	3.8	3.8	3.9
<b>Total assets</b>	<b>23.6</b>	<b>23.9</b>	<b>24.6</b>	<b>25.3</b>	<b>25.7</b>
Liabilities	13.8	13.7	13.9	14.0	13.8
Net assets	9.8	10.2	10.7	11.3	11.9
<b>Total liabilities and net assets</b>	<b>23.6</b>	<b>23.9</b>	<b>24.6</b>	<b>25.3</b>	<b>25.7</b>
<b>Ratios / indicators</b>					
Working capital	6.9	7.3	7.8	8.4	9.1
Short term solvency (days)	104	98	94	97	103
Adequacy of reserves (days)	92	86	83	86	91

## Financial Results of 2007 Operations

The International Potato Center achieved a US\$0.6M surplus in 2007 (Table 2). The surplus resulted from an increase in restricted donations partially explained by the additional contribution received from EC to compensate the 2006 loss and due to careful management of expenditures.

**Table 2. CIP's 2007-2008 budget summary (US\$M)**

	<b>2007</b>	<b>2008</b>
	<b>Actual</b>	<b>Estimated</b>
<b>Income</b>		
Unrestricted	7.0	8.1
Restricted	16.6	18.4
Other	0.8	0.6
<b>Total</b>	<b>24.4</b>	<b>27.1</b>
Challenge Programs	1.4	1.7
<b>Grand Total</b>	<b>25.8</b>	<b>28.8</b>
<b>Expenses</b>		
Operations	24.1	<b>27.5</b>
Indirect Cost Recovery	(1.3)	(1.8)
Depreciation	1.0	1.1
<b>Total</b>	<b>23.8</b>	<b>26.8</b>
Challenge Programs	1.4	1.7
<b>Grand Total</b>	<b>25.2</b>	<b>28.5</b>
<b>Surplus</b>	<b>0.6</b>	<b>0.3</b>

With respect to the 2007 budget, total revenues increased by 9%, while total expenditures expanded by 6%. Unrestricted revenues dropped by US\$ 0.5M (or 6%), while restricted revenues increased by US\$ 2.4M, (15%), and other revenues jumped US\$ 0.1M (22%). Unrestricted revenues dropped due to lower than expected contributions from the World Bank and Denmark. In addition to the recovery from the EU, restricted revenues increased due to greater than predicted success in obtaining new research grants during the year. Other revenues increased sharply despite falling US Dollar interest rates during the second half as a result of improving yields on CIPs investments. The fall of the US Dollar and an increase in cost recovery from research contracts also positively influenced the results.

## Regional Funding Trends

CIP continues committed to poverty and hunger alleviation in Africa, Asia and Latin America. In 2007, CIP expanded its involvement in Africa and the Central Asia. These target regions, together with other poor countries of Asia will continue to see increased research and capacity strengthening activities.

Increased funding was available for Africa. In 2007, US\$ 6.7 million in new research contracts were secured for the SSA region. An important portion of the funding committed, 25%, will be used for continuing OFSP work in the region. Besides expanding work in Mozambique and Malawi, CIP is in the process of opening an office in Angola. Investments in Africa are growing rapidly and are expected to represent 42% of CIPs investments by 2011.

CIP has been expanding its involvement in Asia. The Center has increased its research activities in India and plans to increase its operations by relocating staff members to China. In both countries CIP is improving production of clean potato seed and in China CIP is also disseminating sweetpotato technologies. We also have important investments in Indonesia on both crops. New proposals submitted to donors to maintain CIPs work in the region will help maintain the share of Central and West Asia and expand work in East and South East Asia. The Center expects its investments share in the region to grow to 26% by 2011.

CIPs presence in the Andes and our focus on the poverty regions there make the center attractive to donors that continue with Latin American programs. New funding from Switzerland for the Papa Andina Phase 3 Project, from DFID for Alianza Cambio Andino and from INIA España for Red de Innovación, arrived during 2007 to

supplement existing resources for LAC. These projects will keep Latin America strong in the portfolio, but its share will drop to 32% in 2011.

Narrow interpretation of financial data can sometimes skew the interpretation of the regional emphasis of investments. Several of our LAC-based research activities are yielding knowledge and technologies that directly benefit Africa and Asia. Natural Resources Management tools, designed and tested in the LAC laboratory, have produced useful methods for vulnerability studies, allowing CIP and partners to refine its targeting in the African highlands. Likewise, the pro-poor Participatory Market Chain Approach (PMCA) that was developed and refined in three Andean countries has been adapted to the needs of the market chains in Uganda.

The investment in developing knowledge, analytical tools and training tools in the Andes was leveraged during 2007 for the improvement of livelihoods for East African potato and sweetpotato farmers.

Other examples of LAC-based research that continue to benefit producers in Africa and Asia include: the development of virus-free sweetpotato management techniques in Peru with a subsequent application in China that has generated hundreds of million dollars for resource-poor farmers and late blight resistant varieties developed in Peru that have been adopted by poor farmers in Africa and Asia, which are creating substantial economic benefits and reducing the use of pesticides.

## **Development of 2008 Operations**

The Center is forecasting a surplus budget by the end of the year 2008. Total revenues are expected to grow to US\$ 28.8M driven through increased restricted contributions. Unrestricted revenues and other income are also expected to grow. Restricted and earmarked donations, including Challenge Programs, are expected to account for 70% of total revenues.

Total expenses are projected to increase by US\$ 3.3M, or 13% during the fiscal year. Positive fund raising results obtained in 2007 and the first quarter of 2008 will support the planned expansion.

## **Financing Plan 2009 to 2011**

CIP's medium term financing plan has been constructed assuming current donors will maintain their unrestricted contributions, new sources will be identified during the period, projects already approved by donors will be implemented, and assuming that donors will approve the proposals already submitted and that we judge having a high probability of acceptance. This means that the data for 2009-2011 is based on the current structure of our portfolio of existing contracts and submitted proposals with high probability of success. Thus the data has a degree of variability due to the uncertainty associated with proposal approvals and it will be subject to future adjustments as new proposals are included in the pipeline and others are removed. We accepted the EPMR recommendation to write business plans. In next years report our financing plans will reflect our projected financial needs to implement the business plans.

The financial data shows an increasing trend in the activities of integrated crop management, impact enhancement and germplasm enhancement and crop improvement. Genetic resources conservation and characterization shows a declining trend in 2009-2010 then is then overturned in 2001. Urban harvest activities increase after a temporal drop in 2008, and agriculture and human health, natural resources management and CONDESAN remain fairly constant throughout the planning period.

CIP seeks to achieve a more balanced growth in integrated crop management, genetic resources conservation and characterization, and germplasm enhancement and crop improvement. Therefore, the Center will continue work towards that goal by emphasizing proposal preparation work for those projects.

Increasing productivity, protecting the environment and strengthening NARs will continue to absorb an important share of CIPs investments. Improving policies and saving biodiversity will also receive increasing attention.

## Budgeting and Financing

Medium-term financial forecasts take into account an appreciation of the US Dollar, which would have a negative impact on CIPs revenues, and a gradual increase in US Dollar interest rates. Program expansion relies heavily on new restricted funding, which means that expenditure growth will be dependant on success of restricted project funding.

During the years covered by this medium term plan CIP projects an 18% revenue growth. The Center is expecting that by the end of 2011, revenues will reach US\$ 34.1M (Table 3) and that 76% will come from restricted sources. These figures include revenues derived from Challenge Programs. The medium-term forecasts reflect new opportunities in a changing environment, and will demand increased attention to donor targeting and greater efficiency in proposal preparation and project implementation.

CIP will continue to emphasize its work on its mandate crops, linking research to activities that have a strong development impact potential and contribute to Millennium Development Targets. To that end, the Center plans to continue raising the share of its project portfolio in Africa, but the effects of a higher presence in that region will be more noticeable in 2010 and 2011. Increasing staff time is being allocated to work in Africa and Asia, as well as to fund-raising for projects in those priority regions.

<b>Income</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
Unrestricted	7.4	7.6	7.6
Restricted	24.0	25.4	25.8
Other	0.6	0.7	0.7
<b>Total</b>	<b>32.0</b>	<b>33.7</b>	<b>34.1</b>
<b>Expenses</b>			
Operations	32.7	34.3	34.7
Indirect cost recovery	(2.4)	(2.5)	(2.5)
Depreciation	1.2	1.3	1.3
<b>Total</b>	<b>31.5</b>	<b>33.1</b>	<b>33.5</b>
<b>Surplus</b>	<b>0.5</b>	<b>0.6</b>	<b>0.6</b>

A key element of CIPs Medium-Term Plan and future development is maintaining sound financial management and achieving sustainable growth. Controlling fixed costs growth and improving fund raising are both critical elements to achieve this.

Controlling fixed costs, in particular those costs that are paid by unrestricted funds, is essential for maintaining financial stability. Cost control requires reinforcing cost awareness and fiscal discipline, pursuing efficiency gains on a consistent basis and improving information systems. Looking for new ways of doing business by implementing user-friendly simple and effective procedures will help to reduce budgetary pressures and release additional resources for research. In addition, increased cost recovery by charging appropriate direct costs to projects will help improve control costs and reduce pressure on limited unrestricted resources.

Improving fund raising is crucial for achieving sustainable growth. Fund raising will continue to be a top priority and a challenge in the medium-term. Improved donor targeting, matching donor interests with CIPs program priorities, broadening and diversifying the donor base, and delivering high impact products are critical for continued fund raising success.

# PROJECT PORTFOLIO

## 1. Partnerships, Markets and Policies for Pro-poor R&D

### *Project Overview and Rationale*

The Project addresses the problem of where and how CIP should use its limited resources for agricultural research to maximize impact on potential beneficiaries and contribute to meeting the MDGs. The Pro-Poor R&D Cycle as the compass for CIPs program requires additional research to improve geographical targeting, and establish principles for effective partnerships. In addition, rapid growth of markets has created new opportunities for farmers to improve their incomes and research on new strategies for linking with markets and their outcomes is needed. Finally, the institutional environment for agricultural innovations has grown more complex. New ways of working with national innovation systems and influencing agricultural technology policies are necessary in order for CIP to achieve desired outcomes.

The title of this project has been changed from last year to reflect the greater attention to be given to partnerships in response to the 2007 CIP EPMR recommendation to create a new Division on Partnerships and Research on Partnerships.

### *Alignment to CGIAR Priorities*

This project brings together different types of research on policies and institutions which enhance the capacity of CIP and its partners to be more effective in contributing to poverty reduction within the center mandate. This is directly relevant to Priority area 5. The project is also home to a significant grant which examines the technology and cropping systems options for potato and sweetpotato systems in East Africa under climate change scenarios relevant to system priority 4A. The table indicates the particular contribution of each project output.

Outputs	CGIAR Priorities
<b>Output 1.</b> Principles for effective partnerships to reduce rural poverty and vulnerability (2012)	<b>5D.</b> Improved partnerships for research for development provide a crucial enabling environment for delivering outputs and increasing the probability that outputs become significant outcomes leading to impacts.
<b>Output 2.</b> Information available for better targeting of research for development (2012)	<b>5D.</b> Appropriate targeting of research by CIP and partners improves efficiency of resource use
<b>Output 3.</b> Strategies for linking farmers with markets and post-harvest innovations tested and documented (2011)	<b>5B.</b> As globalization occurs new opportunities for linking with markets have emerged which shape the opportunities for technology development and use. Research is proposed to develop strategies to bring farmers and other market chain actors together in a way which lead to favorable outcomes for the poor.
<b>Output 4.</b> Pro-poor policies and strategies for institutional learning and change identified and documented (2012)	<b>5A.</b> Policies understood in a broad sense play a key role in enabling outcomes and research is proposed to identify policy options that favor sustainable development with mandate crops. 4A specific goal 1: to develop analytical methods and tools for the management of multiple use landscapes with a focus on sustainable productivity enhancement.

## **Outputs Description**

### **Changes from previous MTP Outputs**

#### **Output 1. Principles for effective partnerships to reduce rural poverty and vulnerability (2012)**

This Output has been modified from Output 1 last year in response to the EPMR recommendation for research on partnerships.

#### **Output 2. Information available for better targeting of research for development (2012)**

This Output has been modified as the targets reported last year in Output 1 do not correspond to the reformulated Output focused on partnerships.

#### **Output 3. Strategies for linking farmers with markets and post-harvest innovations tested and documented (2011)**

No change.

#### **Output 4. Pro-poor policies and strategies for institutional learning and change identified and documented (2012)**

No change.

#### **Output 1. Principles for effective partnerships to reduce rural poverty and vulnerability (2012)**

Description. In the more complex institutional context facing NARS with the emergence of networks and new private sector actors the project will conduct research on partnerships and their management to improve R&D performance. This research will build on CIP's extensive experience with managing R&D networks and partnerships. It should improve the design, coordination and impact of these systems and increase the rate of uptake of CIP's physical and information outputs. The output will also assess the effectiveness of partnerships in contributing to the improvement of a range of delivery systems that are of global relevance, such as the use of orange fleshed sweetpotato. This output will develop partnership-based strategies and methodologies, e.g. research and development sectors, public and private sectors, to enhance the impact of CIP research that could be used by other CGIAR centers and by national agricultural research institutes. UPWARD and Papa Andina, CIP's partnership programs in Asia and the Andes, have initiated work to develop methodologies for evaluating partnerships; outputs from this and other preliminary efforts at CIP will provide conceptual and methodological tools for achieving Output 1.

Alignment to CGIAR Priorities. 5D: Improving research and development options to reduce rural poverty and vulnerability.

Countries of Planned Research. Bolivia; Colombia; Ecuador; India; Peru; Philippines.

#### **Output 2. Information available for better targeting of research for development (2012)**

Description. Improved methods for targeting and needs and opportunity assessment will help CIP and R&D partners and clients make better decisions about where and with whom to work, make better choices about technology design and understand how different technology options are likely to influence impacts of research on multifaceted dimensions of poverty. An improved geographical targeting approach will be developed using GIS tools which links the importance of potato and sweetpotato to a composite set of MDG indicators, and a more disaggregated model is being piloted in India. Where appropriate, more specific metrics will be used e.g. Disability Adjusted Life Years saved through the deployment of orange fleshed sweetpotato which contributes to improved Vitamin A availability and health status. Research will be conducted on global trends in sweetpotato, building on a similar output target in potato to be delivered in 2008. Research products will be made widely available for use by CIP and its partners through the Potato and Sweetpotato Atlases.

Alignment to CGIAR Priorities. 5D - Improving research and development options to reduce rural poverty and vulnerability.

Countries of Planned Research. India.

### ***Output 3. Strategies for linking farmers with markets and post-harvest innovations tested and documented (2011)***

Description. The Project can also enhance impact through research on ways of improving access of poor producers to markets, including post-harvest innovations, market chain analysis and marketing policy research. One of the principle products of previous research in the Andean region with CIP's Papa Andina partnership initiative is the Participatory Market Chain Approach (PMCA). The PMCA brings together farmers, other market chain actors and R&D organizations for market oriented innovation. This approach is being adapted and made available to NARS in Africa and Asia. Part of this research effort is to build synergy between PMCA and other pro-poor R&D approaches, e.g. farmer field school (FFS) and sustainable livelihood (SL).

Alignment to CGIAR Priorities: 5B - Making international and domestic markets work for the poor.

Countries of Planned Research. Indonesia; Mozambique; Philippines; Uganda.

### ***Output 4. Pro-poor policies and strategies for institutional learning and change identified and documented (2012)***

Description. One of the output targets is a strategy for influencing national agricultural innovation systems to make them more responsive to the needs of the poor. In the Andes, this work is being conducted jointly with CIAT, as part of the Andean Change Project. The development of the strategy will be based on evidence drawn from a series of impact studies on the dissemination of a suite of successful and appropriate participatory methods and approaches to strengthen the linking of suppliers of agricultural innovations with resource-poor producers in the Andean region. Evidence will be used for policy advocacy to improve the functioning and relevance for the poor of national agricultural innovation systems. Research will be carried out on the way in which policy advocacy using policy outcome mapping can achieve changes in policy. The output target on the strategy for formulating evidence-based technology innovation policy to achieve pro-poor impacts in potato growing areas of the Andes is being implemented by the Papa Andina partnership initiative in collaboration with national partners from Bolivia, Ecuador and Peru. It seeks to develop a 10 year strategic vision of the potato sector to guide policy makers in supporting technological innovation in each country and recognizing that potato can be a high value crop as well as a subsistence crop. The objective is to develop a methodological tool for influencing policy and strengthen the capacity of national partners for advocacy. The strategy will be based on surveys with farmers, other market chain actors, R&D organization stakeholders and policy makers and analysis of the competitiveness of the potato sector of each country. In Asia, UPWARD is working with the CGIAR Initiative for Learning and Change (ILAC) in piloting evaluation methodologies aimed at generating impact evidence for influencing policy change, i.e. the case of sweetpotato value chains in the Philippines. Meanwhile, the changing climate is exacerbating existing vulnerabilities of the poorest people who depend on semi-subsistence agriculture for their survival. Potatoes and sweetpotatoes are increasingly recognized as important cash and food security crops for poor farm households throughout the world, and are growing in importance in Sub-Saharan Africa (SSA). Potato and sweetpotato research is leading to promising innovations that could enhance the contribution of these crops to the resilience of agricultural systems and reduce the vulnerability of poor households. This project will utilize a new approach to ex ante research and policy impact assessment known as Tradeoff Analysis (TOA) that produces locally useful, site-specific results that can also be aggregated for regional policy analysis. TOA is designed to assess the economic and environmental sustainability of technologies and policies by linking stakeholders with research teams using quantitative impact assessment tools. TOA will be linked with participatory impact pathway analysis (PIPA) to increase the policy relevance and impact of the project.

Alignment to CGIAR Priorities. 5A - Improving science and technology policies and institutions, and 4A – Integrated land, water and forest management at landscape level.

Countries of Planned Research. Bolivia; Colombia; Ecuador; Ethiopia; Kenya; Peru; Philippines; Uganda.

## ***Impact Pathways by Output***

### **Output 1.** Principles for effective partnerships to reduce rural poverty and vulnerability (2012)

The impact pathway that is envisaged is that principles for effective partnerships will enable CIP to formulate more effective projects with a range of partners from public and private sectors. These projects will allow the inclusion of the perspectives of a broader range of stakeholders, to make research products more market-focused and user-driven. This will in turn lead to the development and eventual adaptation and adoption of more relevant technology for small farmers in potato and sweetpotato cropping systems and the production of more nutritious food for the poor who consume potato and sweetpotato.

The impact pathways resulting in reduced poverty, reduced hunger and improved nutrition that arise from the adoption of improved varieties or cropping practices is described in detail in Output 1 of Project 3 and are not repeated here.

### **Output 2.** Information available for better targeting of research for development (2012)

The impact pathway envisaged is that CIP and its partners will reassign resources by commodity and geographical region to increase the probability of impacts on the MDGs which have been prioritized by CIP in its Vision exercise. In addition, making targets more clearly defined and visible should make it possible to attract new resources to those areas where the payoff is highest. As more resources are available in the areas of greatest payoff, more and better research outputs will be achieved, eventually increasing the probability of positive outcomes and impacts on the poor.

The impact pathways resulting in reduced poverty, reduced hunger and improved nutrition that arise from the adoption of improved varieties or cropping practices is described in detail in Output 1 of Project 3 and are not repeated here.

### **Output 3.** Strategies for linking farmers with markets and post-harvest innovations tested and documented (2011)

The impact pathway which is envisaged is that a limited number of strategic partner organizations will acquire capacity in participatory market chain approach (PMCA) in each target country. They will work with a larger group of partners in capacity development (including training). This will lead to a series of iterations of the PMCA approach with CIPs target commodities and other economic activities that are relevant to the livelihoods of potato and sweet potato farmers. PMCA will build trust between market actors, stimulate market oriented innovations, create more profitable market opportunities, generating higher incomes for farmers linked to potato and sweetpotato market chains and help move farmers out of poverty.

The impact pathways resulting in reduced poverty, reduced hunger and improved nutrition that arise from the adoption of improved varieties or cropping practices is described in detail in Output 1 of Project 3 and are not repeated here.

### **Output 4.** Pro-poor policies and strategies for institutional learning and change identified and documented (2012)

The impact pathway envisaged operates at three levels of increasing specificity.

**Level 1.** The Output will seek to influence the formulation of national policy through the provision of evidence about the effects of current policy in favoring or otherwise the livelihoods of the poor in innovation systems. One of the principal policy obstacles is that the poor are excluded from having an effective voice in setting R&D agendas. This type of policy change can create an enabling environment for CIPs impact pathways and make it more likely that outputs become outcomes and impacts.

**Level 2.** At the level of NARS the Output will promote learning about innovation systems so that CIP, its partners and clients can more effectively engage in collective action towards common goals. Collective action is essential for resolving problems in complex systems where a number of different constraints have to be simultaneously addressed. For example, innovation in varietal use in a more market driven context needs to



simultaneously address constraints of seed production and input supply, on-farm agronomic and post-harvest issues and also quality criteria in final markets. This requires collective action among actors along the market chain and with service providers including NARS. Hence the impact pathway moves from the use of improved partnership arrangements, to social learning, to collective action for a shared goal and innovation in a complex system.

**Level 3.** At the level of individuals, teams and organizations the Output will enhance capacities to increase the overall ability to conduct scientific research (research capacity), manage technical change (technological capacity) and innovate in dynamic environments (innovation capacity). Based on a systems model of performance improvement this Project will research structured approaches to needs-based training that increase the motivation to improve performance and improve the organizational environment to facilitate the transfer of learning. For example, an analysis of individuals who participated in capacity strengthening in PMCA will help to understand the factors that motivate a person to improve work through learning and to apply the knowledge or skills in PMCA to work settings. At the same time this analysis will help to identify the capabilities needed by organizations or wider systems to understand the factors affecting transfer and so facilitate scaling-up of PMCA. This would also permit international comparisons of learning transfer systems in partner-organizations that operate under different cultural, political and social conditions..

Policies to promote pro-poor innovation, strategies for partnering and managing networks and structured systemic approaches to needs-based training are IPGs, which are potentially mutually reinforcing when promoted together.

## ***International Public Goods***

**Output 1.** Principles for effective partnerships to reduce rural poverty and vulnerability (2012). IPGs include:

- Knowledge about formulating effective partnerships for research on development
- Knowledge about how application of the Pro-Poor R&D Cycle contributes to improving the livelihoods of the poor
- Knowledge about scaling up models for promoting pro-Vitamin A sweetpotato

**Output 2.** Information available for better targeting of research for development (2012)

- Knowledge to identify target populations for whom potato and sweetpotato have (potential) key livelihood roles.
- Knowledge to target research investments with high potential for contributing to MDGs achievement.

**Output 3.** Strategies for linking farmers with markets and post-harvest innovations tested and documented (2011)

- Knowledge about engaging potato and sweetpotato farmers more effectively in markets and innovation processes to improve their livelihoods

**Output 4.** Pro-poor policies and strategies for institutional learning and change identified and documented (2012)

- Knowledge about approaches and tools to influence policy based on evidence
- Knowledge about the potential impact of climate change on cropping systems decisions and their capacity to adapt to those changes.

## ***Elaboration of Partners Roles***

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Australia	Dept of Agriculture and Food West Australia	Linking farmers with markets	1 (3)
Bolivia	PROINPA	Capacity building in linking farmers with markets. Contributes with human, financial support and logistic facilities for evaluating participatory and market chain interventions	1 (4)
Bolivia	Kurmi	Links with farmers' organizations, knowledge of local contexts and local logistical capacity	1 (4)
Bolivia	University of San Simon	Impact evaluation	1 (4)
Colombia	CIAT	Post-harvest innovations for upland agriculture in SE Asia, analysis of participatory interventions in Andes	1 (1, 4)
Colombia	CIAT - Santa Cruz	Developing participatory R&D methods and impact assessment	1 (4)
Ecuador	INIAP – Instituto Nacional Autónomo de Investigaciones Agropecuarias	Capacity building in linking farmers with markets	1 (1, 4)
Ecuador	Marco Foundation	Links with farmers' organizations, knowledge of local contexts and local logistical capacity	1 (4)
Ethiopia	Ethiopian Institute for Agricultural Research (EIAR)	Facilitate access for technology and policy evaluation with farmers and other stakeholders  Enhance capacity on bio-physical and Tradeoff Analysis modeling and climate downscaling	1 (4)
India	Central Potato Research Institute (CPRI)	Application of GIS tools for targeting potato research	1 (2)
India	Central Tuber Crops Research Institute (CTCRI)	Facilitates access to technology and links with development partners for promoting orange-fleshed sweetpotato	1 (1)
India	Micronutrient Initiative	Conducts nutritional studies to support promotion of orange-fleshed sweetpotato	1 (1)
Indonesia	Indonesian Vegetable Research Institute (IVEGRI)	Capacity building in linking farmers with markets, contributes to test market approaches in new contexts	1 (3)

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Indonesia	SwissContact	Capacity building in linking farmers with markets, contributes to test market approaches in new contexts	1 (3)
Kenya	Kenya Agr Res Inst (KARI)	Facilitate access for technology and policy evaluation with farmers and other stakeholders  Enhance capacity on bio-physical and Tradeoff Analysis modeling and climate downscaling	1 (4)
Peru	CONDESAN	Facilitate contacts with local institutions and provide framework for sharing knowledge of participatory interventions	1 (1)
Peru	Capac platform	Contributes to testing concepts of social responsibility in market chain and capacity building in linking farmers with markets	1 (1)
Peru	Mi Chacra	Links with farmers' organizations, knowledge of local contexts and local logistical capacity	1 (4)
Peru	PREVAL – Network of Evaluators	Developing impact evaluation methodology	1 (4)
Peru	ADERS	Links with farmers' organizations, knowledge of local contexts and local logistical capacity	1 (4)
Peru	Practical Solutions (ITDG)	Capacity building in linking farmers with markets, contributes to test market approaches in new contexts	1 (4)
Philippines	Philippine Rootcrops Research and Training Center (PhilRootcrops)	Capacity building for linking farmers to markets, impact evaluation for policy change	1 (3, 4)
Philippines	Philippine Council for Agriculture, Forestry and Natural Resources R&D (PCARRD)	Impact evaluation for policy change	1 (4)
Philippines	Tarlac College of Agriculture (TCA)	Evaluation of partnerships and capacity building, capacity building for linking farmers to markets	1 (1)
Uganda	Makerere University	Facilitate access for technology and policy evaluation with farmers and other stakeholders  Enhance capacity on econometric and Tradeoff Analysis modeling and climate downscaling	1 (4)
Uganda	National Agricultural Research Organization	Capacity building for linking farmers to markets	1 (3)

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Vietnam	National Institute of Animal Husbandry (NIAH)	Sweetpotato pigfeed utilization, linking farmers with markets	1 (1)
South East and South Asia	UPWARD	Adapting participatory market chain approach to Asia; collaboration to develop evaluation methodology for partnerships, capacity development, policy influence an livelihood impacts	1 (1, 3, 4)
World	Urban Harvest	Evaluating technical and policy research impacts in urban and peri-urban contexts and identifying the interdependencies and mutual impacts of rural-urban relations	1 (1)
Sub-Saharan Africa	Harvest Plus Challenge Program	Commodity biofortification for reducing malnutrition and assessment of impact in Africa	1 (1)
Latin America	Papa Andina Partnership Program	Strategic capacity in developing market chain approaches and promoting spillover in the Andes	1 (1)
Andean region	CONDESAN	Collaboration on the research about how to assess institutional capacity for innovation and on technology innovation policies in three Peruvian regions.	1 (1, 4)

## Logical Framework

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
<b>Output 1</b>	<b>Principles for effective partnerships to reduce rural poverty and vulnerability (2012)</b>		CIP Divisions, Partnership Programs, and Regional leaders, CGIAR Centers, Donors, ARI, Partners and clients in NARS and regional networks	Research is carried out with partners in ways that are more likely to achieve impacts on the poor	Improved livelihoods for farm households in target regions contributing to prioritized MDGs
2009	Methodology for assessing capacity development and institutional strengthening and their contributions to pro-poor research and development available (with UPWARD)	Other kinds of knowledge			
2010	Comparison of partnership approaches to scaling-up different models for promoting pro-vitamin A sweetpotato in Uganda and Mozambique documented	Other kinds of knowledge			
2010	Knowledge about contribution of Pro-Poor R&D Cycle to improving farmer livelihoods available	Other kinds of knowledge			
2010	Evidence available from at least 5 studies to document value added by partnerships	Other kinds of knowledge			
2011	Guidelines for managing partnerships for enabling outcomes and impact available	Other kinds of knowledge			
<b>Output 2</b>	<b>Information available for better targeting of research for development (2012)</b>		CIP Directors and Managers and Decision Makers in NARS	NARS which have the greatest potential for reaching the poor through CIP mandate crops are using CIP related technology more effectively	Improved livelihoods for potato and sweetpotato farmers and consumers
2009	Global trends in sweetpotato and options for poverty impacts analyzed and documented	Other kinds of knowledge			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2009	Method for targeting based on composite MDG indicators available	Other kinds of knowledge			
<b>Output 3</b>	<b>Strategies for linking farmers with markets and post-harvest innovations tested and documented (2011)</b>		Government officials, development professionals, researchers, farmers and other market chain actors	Stakeholders appreciate the value of organized market chains and new market opportunities and make better informed policy and investment decisions	Farm households and other poor market chain actors improve their incomes through access to new market opportunities and better organized market chains
2009	Status and new opportunities for SP utilization and marketing assessed in ESEAP and SWCA	Other kinds of knowledge			
2009	Participatory Market Chain Approach to enhance small farmers livelihoods in East Africa adapted and available to NARS	Other kinds of knowledge			
2010	Participatory Market Chain Approach to enhance small farmers livelihoods in Indonesia (potato) and Philippines (sweetpotato) adapted and available to NARS (with UPWARD).	Other kinds of knowledge			
<b>Output 4</b>	<b>Pro-poor policies and strategies for institutional learning and change identified and documented (2012)</b>		Policy makers in government, donors, CGIAR Centers and decision makers in NARS	Users designing policy and institutional arrangements to support agricultural research for development that improves the effectiveness of rural development and enhances poverty alleviation	Improvements in livelihoods of small farmers because of availability of more appropriate technology and an enabling environment for uptake
2009	Strategy for technology innovation policy to achieve pro-poor impacts developed (with Papa Andina and UPWARD)	Policy strategies			
2011	Regionally-specific technology and policy strategies to reduce vulnerability to climate change identified and evaluated with stakeholders	Policy strategies			

## **2. Sustaining potato and sweetpotato biodiversity for current and future generations**

### ***Project Overview and Rationale***

CIPs work in this project is focusing on acquisition, conservation, characterization, evaluation and documentation. The investment from the GPG 1 and GPG 2 projects has, to date, significantly improved the conservation and distribution of the in trust collections. A high-performance computing facility has been installed at CIP through our collaboration with the Generation Challenge Program. The implementation of information management to simplify tracking of germplasm through the use of barcode technology and more reliable data capture via PDAs has streamlined activities in the in vitro laboratory and disease testing. 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).

Currently, CIP is the leader in the CG genebank system in the maintenance of clonal collections, the use of barcode and wireless technology in genebank management and the safe movement of disease-indexed material on the world. In February 2008, it became the first genebank in the world to obtain an ISO 17025 accreditation for its in vitro collection and the safe movement of germplasm worldwide. With our long experience of working with True Potato Seed, CIP was one of the only genebanks representing clonally reproduced crops to be able to participate along with other CG seed genebanks in shipping 5,847 accessions of seed samples for backup in the international Svalbard genebank in Norway.

The two 2007 EPMR recommendations to Project 2 are: (1) accelerate the characterization of the remaining genotypes in the collections, and that this be completed for all key traits, and (2) produce a compendium based on passport, morphological and molecular data and characterization results for key biotic and abiotic stresses. Based these two recommendations, the outputs are designed to address the following areas relating to germplasm acquisition, conservation, characterization, evaluation and documentation.

### ***Alignment to CGIAR Priorities***

This Project is fully dedicated to sustaining biodiversity for current and future generations (SP1). Because of CIPs trusteeship mandate to potato, sweetpotato and other roots and tubers, major emphasis is placed on the conservation and characterization of these staple crops (SP1A).

### ***Outputs Description***

#### ***Changes from previous MTP Outputs***

In Output 1 we have added output targets for collection. In Output 2 we have increased the intensity of our effort and added or modified various output targets for establishing true identity of the holdings to increase our work on elimination of duplicates. We have also increased our efforts in characterization. In Output 3 we broaden our collaboration with breeders for evaluation especially for drought and nutrition related characteristics.

**Output 1.** Wild and cultivated genetic resources of potato, sweetpotato and nine Andean root and tuber crops (ARTCs) are acquired with their associated information, securely conserved and made available by 2013

Description. The international conventions on biodiversity and national legislations have prevented germplasm collection in recent years. In 2007, CIP submitted the first application for permit to collect since 1998 as the FAO International Treaty and its Standard Material Transfer Agreement provide an objective tool for the implementation of benefit sharing in the use of the germplasm. In view of the uncertainty of whether a permit will be granted the output target relating to germplasm collection has been removed in 2009.

The conservation of CIP collections are in the form of tuber (potato and some ARTCs), plant (sweet potato and some ARTCs), *in vitro* meristem culture, cryo-meristem, seed, DNA and herbarium specimen. The current CIP conservation strategy is the duplication of the tuber/plant collection in *in vitro* collection to safeguard the loss of accessions in the field. Seed collection is used to conserve duplicate accessions before they are being eliminated and the long-term goal is to put all the clonal accessions into cryo-bank. DNA bank and herbarium are additional safety. However, at the moment not all accessions in the field collections have been duplicated in the *in vitro* collections and not all accessions *in vitro* are being blackboxed at another site outside Lima. This is partly due to the fact that the safety duplication of a clonal collection is more demanding and costly than a seed collection. These are both important risk management issues that we have started to address in 2008. The 2009 MTP output 1 targets reflect the commitment to complete both tasks.

The distribution of potato and sweet potato germplasm as international public goods is flattening or slowing down comparing last decade with current decade. CIP is committed to the safe responsible distribution of germplasm to all researchers in the world. It is therefore important for us to find out the reasons of the trend so as able to take appropriate actions to correct issues that are in our control. In the 2009 MTP output 1 targets, we will conduct a survey amongst clients on satisfaction and areas of improvement and will continue to put emphasize on germplasm cleaning to increase the number of accessions available for distribution.

CIP will continue to use the Svalbard genebank to back up its seed collections which consist of all the wild relative of CIP crops and eliminated duplicate accessions of the cultivated forms. The seed regeneration standards will be improved and a seed regeneration plan has been put in place as indicated in the 2009 MTP output 1 targets. One of the goal is to extend the genebank ISO 17025 accreditation to cover also the seed component of the genebank.

Alignment to CGIAR Priorities. 1A - Promoting conservation and characterization of staple crops;

Countries of Planned Research: Argentina; Bolivia; Chile; Colombia; Colombia, CIAT HQ ; Ecuador; Peru; Peru, CIP HQ ; Venezuela.

**Output 2.** The genetic diversity of potato, sweetpotato and nine other Andean root and tuber crops is characterized and documented by 2013

Description. Characterization: The maintenance of potato and sweet potato clonal collection is more demanding on the issues of genetic identity and duplicate elimination than in seed collection. This is due to the fact that the field collection has to be replanted every year and the *in vitro* collection every year in sweet potato and every two years in potato. This means a potential increase in many folds the chance to make error and also the increase in maintenance cost.

The genetic identity of both the CIP potato and sweet potato collections have not been reconfirmed since they were collected 30-40 years ago. There are feedbacks from our clients that some percentages of the potato collection are not true to the original types. Similarly, the sweet potato collection is said to have this problem. In addition, none of the duplicates in the sweet potato collection have been eliminated despite the fact that up to 66% of the Peruvian collection are duplicates in CIP 1988 Annual Report.

The two targets of Output 2 in 2009-2011 are focusing on these two areas. Both morphological and DNA markers will be used. Chromosome study will be used also. The data generated will be put online immediately and these data will be used to study gene pool structure and attribute variation.

Alignment to CGIAR Priorities. 1A: Promoting conservation and characterization of staple crops.

Countries of Planned Research. Argentina; Bolivia; Chile; Colombia; Colombia, CIAT HQ ; Ecuador; Peru; Peru, CIP HQ ; Venezuela.

**Output 3.** Selected gene pools of root and tuber crops are evaluated for breeders' traits of interest, nutritional and health-related attributes by 2013

Description. The 2007 EPMR recommends the increase characterization (evaluation) of all key traits. The three targets of Output 3 reflect this. 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.

New and more useful sources of variation in resistance to priority biotic constraints such as PLRV virus in the potato collection will be explored. Drought tolerance, 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.

Alignment to CGIAR Priorities. 1A - Promoting conservation and characterization of staple crops.

Countries of Planned Research. Argentina; Bolivia; Chile; Colombia; Colombia, CIAT HQ ; Ecuador; Peru; Peru, CIP HQ ; Venezuela.

### ***Impact Pathways by Output***

**Output 1.** Wild and cultivated genetic resources of potato, sweetpotato and nine Andean root and tuber crops (ARTCs) are acquired with their associated information, securely conserved and made available by 2013.

Most of the projects contributions to MDGs come indirectly through other CIP MTP projects. The limited direct contributions are described below. The projects 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 Project 3 and 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.

**Output 2.** The genetic diversity of potato, sweetpotato and nine other Andean root and tuber crops is characterized and documented by 2013.

As for Output 1.

**Output 3:** Selected gene pools of root and tuber crops are evaluated for breeders' traits of interest, nutritional and health-related attributes by 2013

As for Output 1.

### ***International Public Goods***

This project houses our genebank work of collection, conservation and characterization. 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 our work to characterize the collection for traits with relevance to global agricultural issues, like food security, productivity and quality improvements, and knowledge, management practices, tools and information on genetic resources. Project 2 will evolve as a provider not only of clonal material and seeds for specific traits but also quantitative trait loci, alleles and DNA

samples. This new knowledge and new products are IPGs, the use of which will be governed by the mechanisms of benefit-sharing of the international treaty.

### ***Elaboration of Partners Roles***

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Argentina	Universidad Nacional de Tucuman	Contributes to the characterization of yacon	2 (3)
Argentina	Instituto Nacional de Tecnología Agropecuaria (INTA-Castellar)	Contributes storing the safety back up(blackbox) of potato in vitro collection	2 (1)
Belgium	Katholieke Universiteit Leuven	KUL Supervises a CIP Ph.D research thesis on potato cryopreservation	2 (1)
Belgium	Katholieke Universiteit Leuven	Genetic diversity of oca and mashua	2 (2)
Belgium	Agricultural University of Gembloux	Genetic diversity of ulluco	2 (2)
Belgium	Université Catholique de Louvain	Genetic diversity of Andean root and tuber crops	2 (2)
Colombia	CIAT	Provides technology and facilities in the genebank for conservation of CIP's sweetpotato blackbox collection	2 (1)
Italy	Global Crop Diversity Trust	Coordinate and support for developing and funding strategies for the Global Conservation of crops conserved by CGIAR centers	2 (1)
Italy	CGIAR System wide genetic resources program (SGRP)	Platform and coordination role for CGIAR Centers on upgrading and removal of backlogs for improving germplasm conservation	2 (1)
Mexico	Generation Challenge Program	Provides a platform for accessing methods and techniques for assessing/screening water stress	2 (3)
Peru	Instituto de Montaña	Collaboration in situ conservation in Páramo, Piura	2 (1)
Peru	Universidad Nacional Agraria La Molina	Morphological and molecular characterization of ARTC's.	2 (2)
		Assessment of pesticide impact on the reproductive ability of 15 accessions belonging to 8 wild potato species documented	2 (3)
		Inheritance of resistance to PLRV of 4 wild potato species from <i>Solanum</i> Section Petota determined and documented	2 (3)
Peru	Universidad Nacional Agraria La Molina	Secondary metabolites and antioxidant capacity of Andean roots and tubers	2 (3)
Peru	Centro de Investigaciones en Recursos Naturales y Medio Ambiente CIRNMA (Peru NGO)	Coordinate research on potato landraces of Altiplano communities	2 (2)

Peru	Consejo Nacional de Medio Ambiente (CONAM)	Provides coordination of World Bank sponsored project on research on occurrence and impact of gene flow in centers of origin as it relates to genetically engineered potato	2 (2)
Peru	Association for the sustainable development of nature (ANDES)	Provides the ethnobotanical knowledge and the link to the communities, and coordinates local activities	2 (1)
Peru	Universidad Nacional San Antonio Abad del Cusco (UNSAAC)	Morphological and molecular characterization of ARTC's	2 (2)
Peru	Universidad Nacional del Centro (UNC)	Morphological and molecular characterization of ARTC's	2 (2)
Peru	Universidad Nacional de San Cristobal de Huamanga (UNSCH)	Morphological and molecular characterization of ARTC's	2 (2)
Peru	Universidad Nacional Daniel Alcides Carrion (UNDAC)	Morphological and molecular characterization of ARTC's	2 (2)
Peru	Pontificia Universidad Católica del Perú	Determination of volatiles in mashua	2 (3)
Spain	Centro de Conservación de la Biodiversidad Agrícola de Tenerife (CCBAT)	Collaborative research on the movement of potato and sweetpotato germplasm between the Andes and the Canary Islands	2 (2)
Switzerland	Swiss Federal Institute of Technology Zurich (ETH)	Provides scientific and technological knowhow on biochemical-analytical technologies and support to MSc and PHD students	2 (3)
Switzerland	University Hospital Basel	Provides scientific knowledge to demonstrate health attributes of yacon	2 (3)
Tanzania	Dept. of Research and Training	Assessment and improvement of sweetpotato diversity for SSA; variety testing development and multiplication of the basic planting materials; Testing Bt toxicity to Weevils, developing & testing methodology for assessing weevil incidence	2 (2 & 3)
USA	Lincoln University Missouri, USA	Comparison of molecular techniques for potato genotyping	2 (2)
USA	Ohio State University	Screening for secondary metabolites in native potatoes	2 (2&3)
USA	University of Wisconsin/USDA	Provides scientific knowledge in potato modern taxonomy, phylogeny, wild species diversity, reproductive biology, and screening for drought and frost tolerance	2 (1, 2, 3)

## Logical Framework

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
<b>Output 1</b>	Wild and cultivated genetic resources of potato, sweetpotato and nine Andean root and tuber crops (ARTCs) are acquired with their associated information, securely conserved and made available by 2013		Center projects 2, 3, 4 and 5, and researchers at NARS, universities and ARIs, and farmers organizations/communities	Good quality germplasm collection with on-line database securely conserved and available for distribution as international public goods	Sustainable use of biodiversity according to FAO International Treaty, and improve farmers livelihoods through securing food availability
2009	Current passport, characterization and evaluation data of all germplasm collections standardized and all existing data updated in the online database	Other kinds of knowledge			
2009	In vitro potato, sweetpotato and ARTCs 100% back-up (blackbox) in another location outside Lima, Peru	Materials			
2009	ISO 17025 accreditation of the seed collections	Practices			
2009	Two percent of the cultivated potato (4640 accessions), 5% of wild potato (2448), 0.2% of sweet potato (6855), 1% of wild sweetpotato (1171), 100% of maca (35) regenerated for the seed collections	Materials			
2009	All accessions of cultivated potato, sweetpotato, oca, ulluco and mashua are duplicated in both field and in vitro collection	Materials			
2009	Virus elimination of potato (~2,000), sweetpotato (~3,300), ARTCs (~600) down to 1,600, 2,900, and 500 accessions, respectively	Materials			
2010	Ten wild potato species populations collected in Peru	Materials			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2010	ISO 17025 accreditation on genetic identity of the cultivated potato collection	Practices			
2010	Two percent of the remaining cultivated potato (4456 accessions), 5% of wild potato (2210), 0.2% of sweetpotato (6827), 1% of wild sweetpotato (1147), and 30% of ahipa (13) regenerated for the seed collection	Materials			
2010	Virus elimination of potato (~1,600), sweetpotato (~2,900), ARTCs (~500) up to 1,300, 2,600, and 400 accessions, respectively	Materials			
2011	Two percent of the remaining cultivated potato (4456 accessions), 5% of wild potato (2210), 1% of sweetpotato (6718), 5% of wild sweetpotato (1115), and 30% of ahipa (13) regenerated for the seed collections	Materials			
2011	Virus elimination of potato (~1,300), sweetpotato (~2,600), ARTCs (~400) up to 1,000, 2,300, and 300 accessions, respectively	Materials			
<b>Output 2</b>	The genetic diversity of potato, sweetpotato and nine other Andean root and tuber crops is characterized and documented by 2013		CIP, NAR, ARI and university researchers, NGOs, farmer communities	CIP, NAR and ARI researchers use information and selected germplasm for genetic enhancement and improvement, and other research	Genetic resources knowledge and material contribute to alleviate poverty, reduce temporal and chronic hunger, and improve access to nutritious food by supporting CIPs and CIP partners research on root and tuber crop improvement

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2009	Genetic identity confirmation: 80% of cultivated potato field collection (4,640) confirmed  200 accessions of cultivated potato in in vitro collection (4817) confirmed  200 accessions of cultivated sweetpotato confirmed	Materials			
2009	Duplicate identification and elimination: Characterization and identification duplicates of 200 accessions of cultivated potato in vitro collection  200 accessions of cultivated sweetpotato collection completed and 400 accessions by morphological characterization  109 accessions of mashua characterized	Materials			
2010	Genetic identity confirmation: Complete the whole cultivated potato field collection  200 accessions of cultivated potato in vitro collection (4817) confirmed  200 accessions of cultivated sweetpotato confirmed	Materials			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2010	Duplicate identification and elimination: Characterization and identification duplicates of 200 accessions of cultivated potato in vitro  400 accessions of the sweetpotato collection confirmed  335 accessions of olluco confirmed	Materials			
2011	Genetic identity confirmation: 200 accessions of cultivated potato in in vitro collection (4817)  200 accessions of cultivated sweetpotato	Materials			
2011	Duplicate identification and elimination: Characterization and identification duplicates of 200 accessions of cultivated potato in vitro collection  400 accessions by morphological characterization  Yacon, arracacha, achira and mauka collection completed	Materials			
<b>Output 3</b>	<b>Selected gene pools of root and tuber crops are evaluated for breeders' traits of interest, nutritional and health-related attributes by 2013</b>		CIP, NAR, ARI and university researchers, NGOs, farmer communities	CIP, NAR, university and ARI researchers use information and selected germplasm for genetic enhancement and other research	Genetic resources knowledge and material contribute to alleviate poverty, reduce temporal and chronic hunger, and improve access to nutritious food by supporting CIPs and CIP partners research on root and tuber crop improvement

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2009	Screening for biotic traits: At least 30 genotypes of wild potato accessions evaluated for PLRV	Materials			
2009	Screening for abiotic traits: In vitro screening methodology identified for evaluation of salinity tolerance in potato and sweetpotato  50 cultivated potato screening for response to calcium application in Andean farmer conditions	Materials			
2009	Screening for nutrition / health promoting metabolites:  Total carotenoids, beta-carotene, protein, starch and dry matter of 300 accessions of sweetpotato determined (4.8% of CIP-genebank)  Protein and dry matter of 300 accessions of potato determined (6.5% of CIP-genebank)  New methods developed for massive screening vitamin C in CIP potato genebank  Maca ecotypes with new feed uses (effect on animal fertility) identified  Sesquiterpeic lactones content in 15 yacon accessions determined  Infrared spectroscopic protocol for rapid and cost effective quantification of polyphenol content in potato identified	Materials			



Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
	Scope of using spectroscopic methods for rapid identification of samples determined and protocols standardized				
2010	Screening for abiotic traits: Ten accessions of potato and ten of sweetpotato selected for salinity tolerance  Other 50 cultivated potato screening for response to calcium application in Andean farmer conditions	Materials			
2010	Screening for nutrition / health promoting metabolites: Total carotenoids, beta-carotene, protein, starch and dry matter of 400 accessions of sweetpotato determined (6.4% of CIP-genebank)  Protein, Vitamin C, polyphenols and dry matter of 400 accessions of potato determined (8.6% of CIP-genebank)  New methods developed for massive screening of nutritional and health related compounds (fructooligosaccharides, glucosinolates, free sugars, starch and protein) in CIP root and tuber crops genebank (maca, yacon, mashua, arracacha)	Materials			
2011	Screening for abiotic traits: Twenty accessions of potato and 20 of sweetpotato selected for of salinity tolerance	Materials			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
	Other 50 cultivated potato screening for response to calcium application in Andean farmer conditions				
2011	<p>Screening for nutrition / health promoting metabolites: Total carotenoids, beta-carotene, protein, starch and dry matter of 500 accessions of sweetpotato determined (8% of CIP-genebank)</p> <p>Protein, Vitamin C, polyphenol and dry matter of 500 accessions of potato determined (10.8% of CIP-genebank)</p>	Materials			

### **3. Varieties with enhanced resilience, market and nutritional value**

#### ***Project Overview and Rationale***

##### ***Problem analysis***

Despite their outstanding potential for yield production per unit area, food value and income-generation, potato and sweetpotato often suffer low food quality and high losses in marginal environments. Small land holdings, year round pest pressures, climatic vagrancies and slow, prescribed processes of technology transfer, relegate developing country farmers to low returns. High production costs and seasonality, coupled with limited access to emerging markets, translate into frequent low crop value and lost opportunities. Due to their vegetative propagation, potato and sweetpotato exhibit relatively low rates of multiplication and are subject to high disease load in their bulky and perishable seed, making storage, transport and international exchange a special challenge in many environments and where infrastructure is poor.

##### ***Identification of specific problems to be tackled with research***

Access to technologies and market opportunities are interrelated. Lack of adaptation and low standards for attributes needed for trade and processing can exclude farmers from emerging markets. In the case of potato, reliance on pesticides to maintain productivity in tropical and subtropical ecologies has negative effects on environmental and human health. On the other hand, limited water and fertility, and increased pressure of abiotic factors such as salinity, drought, acidity and extreme temperatures, can further limit the potential of potato- and sweetpotato-based cropping systems.

The relatively long crop duration of some well-established potato and sweetpotato varieties impedes their use in potentially profitable production systems including the double-cropping areas of Asia, and winter seasons of the subtropical lowlands that are under mixed cropping systems. Susceptibility, perishability, and bulk of vegetative seed lead to chronic shortages of healthy planting material. Virus-resistant potato and sweetpotato varieties can provide a partial solution to the lack of quality seed, in effect, underwriting farmer-based seed systems and enabling more reliable health quality where certification is not reliable.

Inconsistent attention to dissemination and scarce information on available germplasm and seed limits the development and diffusion of improved varieties. This situation is aggravated by high turnover and limited opportunities for innovation in national agricultural research systems. At the household level, dietary uniformity and insufficient intake of micronutrients contribute to malnutrition.. The need is pressing for late blight-resistant potatoes and nutrient rich, virus- and weevil-resistant sweetpotatoes that meet traditional and market preferences and the demands of commercial handlers and processors. Potential solutions, including orange flesh sweet potato (OFSP), True Potato Seed (TPS), or even transgenic varieties, are slow to be adequately assessed due to the fragility of socio-cultural and bio-physical environments of developing countries and researchers and policy makers reticence.

A significant obstacle to the development of varieties that can help farmers respond to evolving constraints and market demands is the lack of single genes with consistent large effects on potato and sweetpotato attributes. New potato and sweetpotato varieties are exceptionally cumbersome to develop. Both crops are polyploid and yield best as highly heterozygous hybrids, their complex genetics and sensitivity to inbreeding precluding simple trait amendment to achieve rapid gains toward breeding objectives. Furthermore, in the case of potato, photoperiod sensitivity for tuber formation limits the adaptation of most diversity to short day environments or seasons, and limited understanding of the phenomena and its impact on required traits thwarts efficient germplasm enhancement and exchange across latitudes.

These characteristics, combined with strong type preferences that constrain the acceptance of new varieties, make them especially attractive for transgenic approaches. However, transgenic technology has been essentially developed by the private sector and best practices to manage these new crops remain to be tailored to developing country agriculture and regulatory systems. Coupling population improvement methods with Current knowledge of the structure and function of genetic and genomic diversity, and comparative

mapping/association studies will allow the exploration of alternative or complementary breeding strategies to succeed in amalgamating multiple demands into a single product

### ***Objectives***

Project 3 aims at the efficient development, identification and dissemination of diverse new potato and sweetpotato varieties with critical productivity traits, suitable nutrient concentrations and the resistance needed to help improve food security, and incomes while reducing environmental, health and economic risk. The project develops and strategically exploits uniquely broad-based advanced potato and sweetpotato populations as international public goods, while efforts are increased to conserve, appreciate and enhance landraces in primary and secondary centers of diversity, improve competitiveness and contribute to the development of capacities and policies that enhance the adoption of new technologies. New breeding strategies and methods for clonally propagated crops which allow higher selection efficiencies are investigated. Molecular methods to more efficiently access and monitor gene and trait diversity in breeding are integrated and transgenic technologies are applied where they provide advantages. Gene networks are explored to help improve sweetpotato and potato productivity, quality and nutritional and market value; and TPS varieties are developed as an alternative production system suited to remote regions with poor access to infrastructure for reliable supplies of tuber seed. Likewise, networks involve in capacity building, information exchange and the selection and promotion of new varieties will provide platforms to better account for farmers preferences and tackle reluctance for variety change

### ***Specific objectives***

These are: (a) To enhance strategies, capacities and communication for the more efficient and innovative identification, dissemination and adoption) of new cultivars and breeding materials from public breeding programs; (b) To develop new potato cultivars more resistant to late blight and viral diseases, tolerant to warm conditions and reduced water availability, with improved levels of bio available micronutrients, and market value with yield stability for reliable productivity under low-input conditions and marginal environments; (c) To develop new sweetpotato cultivars with enhanced dry matter yield, -carotene, Fe and Zn content, with resistance to weevils and viruses and adaptable to subsistence farming systems and industrial uses; d) To develop and share more efficient evaluation protocols and selection methodologies for identifying products by accessing and incorporating the timely application of correlated screens such as Near Infrared Reflectance Spectroscopy, molecular markers and in vitro methods. (e) To develop and transfer transgenic potatoes and sweetpotatoes to researchers and extension officers while also improving consumer confidence in genetically engineered crops and products through utilizing and communicating a range of best practices and convening or contributing to specific outreach activities.

### ***Targeted ecoregions***

The project addresses a wide range of ecoregions with its commodities, the nature of which largely dictate the characteristics of adaptation, resistance, architecture and response to environment that must be built into successful varieties.

### ***Potato ecoregions***

(1) The highland tropics of Sub-Saharan Africa, Southeast Asia and the Andes in South America are characterized by a short day lengths with rainfall patterns that allow 1-3 potato crops per year; late blight, viruses and bacterial wilt are the most important biotic constraints and require resistant potato cultivars. Early maturing cultivars are often required in Southeast Asia and Central and East Africa. Frost and drought constitute significant abiotic limitations to optimal production in parts of the Andes and Sub-Saharan Africa; and short dormancy is often requested in Central Africa. (2) Subtropical lowlands of Southwest Asia and Southeast Asia where potato is mainly a short-day winter irrigated crop, with late blight, virus diseases and post-harvest problems, require resistant potato cultivars with early bulking for diversified cropping systems. In the Hindu Kush region (Himalayas) potato is a spring,rainfed long day crop; bacterial wilt and late blight are the major biotic constraints and require resistant potato varieties. (3) Subtropical highlands of East Asia typically with one or two potato crops per year, depending on the altitude with the second crop grown in warmer low lands; rain-fed, with late blight, viruses and bacterial wilt as important production constraints, require resistant potato cultivars with medium maturity. . (4) Temperate region of East Asia and the Caucasus characterized by long day length with one to two potato crops per year (in the lowlands), often rain-fed, and where viruses, late blight and drought are main biotic and abiotic constraints to potato production. (5) Continental semiarid region of Central Asia

characterized by long day length, where viruses, limited water, soil salinity and high temperatures are major constraints and resistant potato cultivars with early maturity are needed. In this ecoregion only one crop per year can be produced in the 120-130 day growing season as in the highlands, but very early varieties needed in lowland areas of double cropping where 140-160 frost-free days are shared by two crops or in rotations in which potatoes are inserted between two cereal crops, as rice-rice or wheat-wheat. Dormancy and storage ability are also important in systems and situations where farmers save their own seed.

### ***Sweetpotato ecoregions***

(1) Tropical lowlands and mid-elevations of Sub-Saharan Africa (SSA), Southeast Asia, Central and South America and the Caribbean where sweetpotato is often grown year round. Viruses and weevils are important production constraints and require resistant cultivars usually with medium to high dry matter and mostly for fresh consumption. (2) Subtropical lowlands of East, Southeast Asia and South Asia, where sweetpotato is a winter crop in a rice dominated cropping system. Low temperature and viruses are production constraints. Fresh consumption, animal alimentation (often pig feed systems) and production for food industries are of equal importance. (3) Subtropical lowlands and mid-elevations of SSA where sweetpotato is grown for a short period but a major staple in processed form when it is a lean season for other staples. Drought and weevils are production constraints. (4) Subtropical mid-higher elevations of SSA where sweetpotato is grown as one of the staples in a maize-dominated cropping system. Frost and fungal diseases (*Alternaria*) are production constraints. Climatic conditions from rain all year round; to two marked wet seasons; one major cropping season; and cooler, mid-altitude situations, as well as the range of cropping systems sweetpotato is grown in, dictate the resistance and phenological characters that are needed in improved varieties.

### ***Strengthening NARS***

The Projects strategy to strengthen NARS and help build synergies among research and development programs is based on 1) networking with potato and sweetpotato breeders and researchers in allied disciplines from genomics to economics, behavior and policy; 2) training to enhance local capacity to solve breeding problems; 3) on scientific research, breeding and diffusion of varieties advisory roles to NARS (backstopping) for funding bodies supporting NARS; and 4) exchange of information, documentation and publication. The Project hosts the Vitamin A for Africa (VITAA) partnership and collaborates with regional networks in Africa (PRAPACE; SARRNET), Latin America (Papa Andina) and Asia (UPWARD), providing improved potato or sweetpotato materials, practices and related scientific support. This collaboration strengthens the capacity of national breeding programs to acquire, evaluate, develop and release varieties.

The Project also participates in new networks for capacity building, learning and institutional innovation such as the Global Initiative for Plant Breeding Capacity Building hosted by FAO and the recently funded Latin American Potato Breeding Innovation Network. Collaboration with non-traditional (private) partners such as seed companies and processing industry with a clear production-chain perspective and the active involvement of national public centers provides new incentives for the exchange of regional expertise toward specific market driven opportunities.

The VITAA partnership is a food-based initiative that attacks the consequences of vitamin A deficiency through complementary efforts of national agricultural research institutes, health and nutrition departments, non-government organizations, community-based organizations and private sector agencies. It links with networks such as PRAPACE (ASARECA) and SARRNET (SACCAR) already working in Sub-Saharan Africa. VITAA consists of a coordinated set of activities building upon the experiences of successful pilot projects and promotes wider scale production and use of extreme provitamin A rich orange flesh sweetpotatoes (OFSP) along with other micronutrient-rich foods. Activities include participatory testing of varieties for adaptation and acceptability, community-based multiplication of planting materials, nutrition education, post-harvest processing for market and for home consumption, promotion through social marketing, monitoring of impact on nutrition and health and capacity building. The partnership targets young children and their mothers, who are the most vulnerable to vitamin A deficiency. Initiatives by VITAA link well with the HarvestPlus Challenge Program, which is working to fortify major developing country staples through crop improvement. The overall objective of VITAA is to make OFSP available on a large-scale in SSA demonstrating the potential of crop-based approaches in alleviating micro-nutrient deficiencies, especially vitamin A deficiency.

## ***Alignment to CGIAR Priorities***

Project 3 Outputs contribute to System Priorities 2A, 2B and 2C. Output 1 represents the more downstream efforts of potato and sweetpotato working with advanced material and seeking to design strategies for improved germplasm to move more rapidly through the national evaluation and release processes. Output 2 builds potato populations with improved productivity, biotic and abiotic stress tolerance and nutritional and end-use quality. Output 3 covers a similar range of activities for sweetpotato. Outputs 2 and 3 contribute to SP 2A, 2B and 2C and Output 4 where we focus on utilizing biotechnology for crop improvement contributes to SP 2A by working on biotic stresses which are difficult to combat by conventional breeding. Output 5 will develop, test and document new phenotyping and genotyping procedures that will improve the efficiency or quality of the evaluation of potato and sweetpotato germplasm including breeding materials.

## ***Outputs Description***

### ***Changes from previous MTP Outputs***

A number of changes in project emphasis and approaches are incorporated in response to developments in science, institutional capacities and availability of resources.

As whole genome analysis is becoming available for both crops, we will integrate the tools of genomics into on-going breeding and selection programs. Gene discovery assisted by gene and marker-trait associations, data mining, or bulk sequencing [m1] is more accessible to CIP researchers as gene chip technology and high throughput sequencing are becoming available from a wide range of providers. Recognizing national programs as key partners in product development and adoption, our alliances with NARS will evolve towards innovative system approaches implying greater upstream participation as well as longer term commitments to communication and cooperation in technology development as well as delivery.

We will exploit opportunities for public-private sector collaboration especially but not exclusively for variety development; to improve targeting and expedite and enhance the conceptualization, development, identification and dissemination of new products.

Following the recommendation of the 6<sup>th</sup> EPMP to increase attention to regional breeding, we envisage staff increases or transfers to regions, identification and contribution to the enhancement of NARS capacities, setting up program structure and procedures for shuttle breeding, improved communication of attributes and breeding value of program products, and incorporation of end-user and innovations perspectives.

Specifically, we will help NARS to establish Germplasm Management & Exchange Networks in each region as fora for information sharing and distribution of valuable germplasm. The objective of such Networks will be to facilitate the movement of varieties and other germplasm across borders, and to improve communications toward strategic evaluation, and information, materials and capacity exchange. Contributions will be made to helping Quarantine Services to upgrade equipment and update staff competence to prevent imports and distribution of germplasm materials of doubtful quality.

Anticipating climate change impact and in light of the 6<sup>th</sup> EPMP, we will increase attention to breeding for tolerance to abiotic stresses for both CIP crops. Special project and ear-marked donations are already dedicated to drought and heat tolerance, and significant collateral outcomes are also expected from reduced crop duration (earliness) and virus resistance

**Output 1.** Effective strategies for the identification and dissemination of high-yielding, resistant and nutritious potato and sweetpotato varieties available for each CIP region.

Participatory research, documentation, , real time communication, assessment of models of variety development, ,promotion schemes and attention to seed systems are complementary means to improve and convene capacities for making new varieties with pro-poor traits available to farmers in a timely fashion. Particular attention is paid to the problems of variety development that stem from vegetative propagation of CIPs crops. For example, efficient variety identification and diffusion is highly dependent on the availability of clean seed stocks. Public-private partnerships may result in more successful seed systems that take advantage of new technologies such as aeroponics for increasing new varieties for evaluation with farmers. Specific

seed-production related elements of variety dissemination developed in Output 1 of Project 4 (Strategies and technologies for improving formal and farmer based seed systems&) will contribute to the efficient diffusion of breeding products.

**Output 2.** Potato populations, progenitors, clones and true seed varieties with superior resistance, nutritional and end-use quality characteristics are developed for SSA, LAC, ESEAP and SWCA.

In order to enhance product attractiveness and impact, and in light of gains accomplished through population improvement focusing on resistance to biotic stress, we will increase our attention to market quality and to the combination of resistances to major diseases of potato. A global breeding strategy that addresses sets of disease and stress complexes and end-use preferences will address the combination of new traits with existing ones considering that previous gains in major traits are to be maintained or even enhanced at the same time. Interdisciplinary efforts will be increased to define physiological traits and understand G X E interactions for adaptation to stressful environments while genetic research undertakes to elucidate the basis of photoperiod insensitivity.

CIP has taken the decision not to invest Core resources in breeding for production from True Potato Seed (TPS) in the foreseeable future. In light of the potential of this technology for resource-poor farmers in subsistence or semi-subsistence conditions in the highlands of Central Asia and North-eastern India we will seek restricted funding to analyze and communicate accomplishments, secure best progenitors and seek to identify and engage partners in the best opportunities for realizing impact from TPS technology.

**Output 3.** Sweetpotato populations and clones with superior agronomic, nutritional and end-use quality characteristics are developed for SSA, LAC, ESEAP and SWCA and breeding methods tools, information and capacities are enhanced.

New breeding schemes to optimize the intercrossing of advanced breeding populations and incorporate new diversity from other gene pools will be implemented. Likewise knowledge on G x E, heterosis prediction and developing of propagation schemes will expedite the selection of promising materials from CIPs advanced populations of sweetpotato.

New phenotyping schemes will be developed and implemented with Output 5 to facilitate breeding and Marker-assisted selection of SPVD resistant germplasm and breeding materials

**Output 4.** Transgenic potatoes and sweetpotatoes for resource-poor producers and consumers are developed and tested using good practices

After emphasis on avoidance of R genes as a risk to durable resistance to late blight, new prospects for pyramiding major genes and emerging knowledge about their role in partial resistance have made their come-back into potato breeding through biotechnology. We will invest in and collaborate with a range of institutes in research on pyramiding major genes for resistance to late blight, coupled with research in pathology into the likelihood of durability of particular single or combined sets of R genes in tropical and subtropical agroecologies

After a decade of deployment of transgenic varieties by commercial companies, we will focus on product development of CIP transgenic technology. Solving global production constraints remain the primary objective of the transgenic project but new opportunities and needs (abiotic stress, post-harvest traits) will also be considered as restricted funding allows and in accord with CIPs comparative advantages in this field.

**Output 5.** Novel genotyping and phenotyping tools and screening strategies for efficient germplasm characterization and enhancement

This new output will convene interdisciplinary efforts to develop, adapt and validate new methods and technologies for more effective characterization, and use of gene and trait diversity in potato and sweetpotato germplasm including breeding materials. Improving efficiency and efficacy (reducing potential for artifacts and increasing sensitivity) will enhance the capacity of CIP to identify, define and combine important genes and traits for target areas, including resistances to major biotic constraints such as late blight, bacterial wilt and several of the major viruses affecting these crops. More robust and standardized phenotyping will also improve

comparability of data across locations or over time enhancing its utility for documentation and breeding purposes.

**Output 1.** Effective strategies for the identification and dissemination of high-yielding, resistant and nutritious potato and sweetpotato varieties available for each CIP region (3-5 years)

Description. Output 1 aims to enhance efficiency and support decision-making and logistics of the identification, dissemination and uptake of new varieties from public breeding programs through improved communication and research on varietal characteristics, demands, preferences and end-user perceptions, and the generation, collection and synthetic analysis of trial data, production sites and marketplaces. Participatory research, documentation of variety characteristics and seed availability, real time communication and feedback between developers and users, systematization of successful models of variety development, promotion schemes and attention to seed systems are complementary means to improve and convene capacities for making new varieties with pro-poor traits available to farmers in a timely fashion. Capacity strengthening is important in this project. Examples of work included in the project are: Documentation of varietal demand, use and uptake pathways in selected countries Improvement of procedures for the feedback, analysis, interpretation and communication of global trial data Dissemination of communication tools (including potato variety catalogue), site characterization parameters, variety descriptions and promotional tools Conduct standard evaluation trials to document the performance of candidate varieties Networking for the introduction, demonstration, testing , documentation, exchange, and participatory selection of new varieties Establishment of new varieties in seed systems through partnerships

Alignment to CGIAR Priorities. 2A -Maintaining and enhancing yields and yield potential of food staples; 2B: Improving tolerance to selected abiotic stresses; 2C: Enhancing nutritional quality and safety.

Countries of Planned Research. Angola; Argentina; Armenia; Bangladesh; Bolivia; Brazil; Burkina Faso; Burundi; Cameroon; Chile; China; Colombia; Congo, The Democratic Republic of the; Costa Rica; Cuba; Ecuador; Ethiopia; Ghana; Indonesia; Kazakhstan; Kenya; Korea, Democratic People's Republic of; Madagascar; Malawi; Mozambique; Nepal; Netherlands; Nigeria; Pakistan; Papua New Guinea; Peru; Rwanda; Spain; Sudan; Tajikistan; Tanzania; Uganda; United States of America; Uruguay; Uzbekistan; Venezuela; Viet Nam;

***Output 2. Potato populations, clones and true seed varieties with resistance, nutritional and market traits are developed for SSA, LAC, ESEAP and SWCA***

Description. Output 2 builds potato populations with improved productivity, biotic and abiotic stress tolerance and nutritional and end-use quality. This project aims at improving food security, health and income generation while reducing environmental and economic risks encountered by small holders in developing countries through the development and adoption of new potato varieties with enhanced resistance and market value that produce reliable yields under low-input conditions in marginal environments. Examples of work in the project include:

- Development and adaptation of stocks, tools and strategies for broadening the genetic base of potato and overcoming major biotic constraints to sustainable production.
- Characterization and enhancement of new sources of resistance, quality and nutritional traits
- Breeding for late blight resistance, quality and adaptation to cool humid tropical and subtropical environments for reduced crop losses and dependence on pesticides
- Breeding for virus resistance, quality and adaptation to warm dry and humid tropical and subtropical environments for reduced crop losses and dependence on expensive inputs such as imported seed and pesticides
- Improvement of potatoes adaptation to long day, warm and dry environments while maintaining the high levels of disease resistance already achieved in CIPs advanced germplasm

Alignment to CGIAR Priorities. 2A - Maintaining and enhancing yields and yield potential of food staples; 2B: Improving tolerance to selected abiotic stresses; 2C: Enhancing nutritional quality and safety.

Countries of Planned Research. Afghanistan; Argentina; Azerbaijan; Bangladesh; Bhutan; Bolivia; Brazil; Cameroon; Chile; China; Colombia; Costa Rica; Dominican Republic; Ethiopia; Georgia; India; Indonesia; Kenya;



Korea, Democratic People's Republic of; Malawi; Mongolia; Mozambique; Myanmar; Nepal; Nigeria; Pakistan; Panama; Papua New Guinea; Peru; Philippines; Rwanda; South Africa; Tajikistan; Turkey; Uganda; Uruguay; Uzbekistan; Viet Nam.

**Output 3.** Sweetpotato populations and clones with superior agronomic, nutritional and end-use quality characteristics are developed for SSA, LAC, ESEAP and SWCA and breeding methods tools, information and capacities are enhanced (3 5 years)

Description. Output 3 builds sweetpotato populations with improved productivity, biotic and abiotic stress tolerance and nutritional and end-use quality. It aims at improving human health and income generation through the development and adoption of new sweetpotato varieties and germplasm with enhanced dry matter yield, beta-carotene content, and other desirable post-harvest characteristics adaptable to low-input subsistence farming systems. New breeding schemes to optimize the intercrossing of advanced breeding populations and incorporate new diversity from other gene pools will be implemented. Likewise knowledge on G x E, heterosis prediction and developing of propagation schemes will expedite the selection of promising materials from CIPs advanced populations of sweetpotato. Examples of work include:

- Breeding for productivity, resistance & post-harvest use in E. Asia
- Breeding & varietal dissemination for nutritional quality & adaptation to SSA
- Breeding & biotechnology for high dry matter yield & adaptation

Alignment to CGIAR Priorities. 2A - Maintaining and enhancing yields and yield potential of food staples; 2B: Improving tolerance to selected abiotic stresses; 2C: Enhancing nutritional quality and safety.

Countries of Planned Research. Australia; Austria; Brazil; Congo, The Democratic Republic of the; Ghana; India; Indonesia; Madagascar; Mozambique; Nigeria; Rwanda; South Africa; Sri Lanka; Tanzania; Uganda; United States of America; Viet Nam; Zambia.

**Output 4.** Transgenic potatoes and sweetpotatoes for resource-poor producers and consumers are developed and tested using good practices (3-5 years)

Description. Output 4 uses the potential of direct gene transfer into existing varieties lacking important traits which may be added by single (or few) gene transfer. Both crops, amenable to genetic transformation, have severe production constraints affecting both income generation and food security that can be mitigated by adding new genes. The emphasis is both on using proven technologies for which safety record exists and target countries where an appropriate and workable biosafety regulation is in place or at least under development. Technology development as well as deployment are achieved in partnership with the national programs of target countries and advanced research institutes. Capacity strengthening is important in this output. Examples of work included in the project are:

- PLRV, tuber moth, Colorado potato beetle technology development
- Late blight resistance technology using R genes from wild species that appear to provide resistance to broad spectrum of *Phytophthora infestans* strains and testing durability by field exposure of transgenic varieties in developing countries selected for future deployment
- Virus and weevil resistance technology and transformation of susceptible varieties of the sweetpotato crop for selected African countries
- Developing biosafety research and capacity in LAC and African countries by testing environmental impacts of transgenic varieties.

Alignment to CGIAR Priorities. 2A - Maintaining and enhancing yields and yield potential of food staples.

Countries of Planned Research. Belgium; Burundi; China; Colombia; Congo, The Democratic Republic of the; Finland; Indonesia; Kenya; Peru; Rwanda; South Africa; Uganda; United States of America.

**Output 5.** Novel genotyping and phenotyping tools and screening strategies for efficient potato and sweetpotato germplasm characterization and enhancement.

Description. Output 5 will develop, test and document new phenotyping and genotyping procedures that will improve the efficiency or quality of the evaluation of potato and sweetpotato germplasm including breeding materials. In the output we will convene interdisciplinary efforts to develop, adapt and validate new methods and technologies for more effective characterization and use of gene and trait diversity in potato and sweetpotato germplasm including breeding materials. Improving efficiency and efficacy (reducing potential for artifacts and increasing sensitivity) will enhance the capacity of CIP to identify, define and combine important genes and traits for target areas, including resistances to major biotic constraints such as late blight, bacterial wilt and several of the major viruses affecting these crops. More robust and standardized phenotyping will also improve comparability of data across locations or over time enhancing its utility for documentation and breeding purposes..

Alignment to CGIAR Priorities. 2A - Maintaining and enhancing yields and yield potential of food staples; 2B: Improving tolerance to selected abiotic stresses; 2C: Enhancing nutritional quality and safety.

## ***Impact Pathways by Output***

**Output 1.** Effective strategies for the identification and dissemination of high-yielding, resistant and nutritious potato and sweetpotato varieties available for each CIP region (3-5 years).

Output 1 provides intermediate products useful in identifying and disseminating potato and sweetpotato varieties of high-yield, resistant and nutritious for each CIP region. These products include documents on local systems of variety dissemination and uptake; improved breeding materials evaluated and selected locally with the purpose of variety release; information on CIP breeding materials such as on-line potato catalogues of varieties and breeding materials for NARS; protocols for breeding, germplasm and clonal evaluation; tools and databases for managing breeding data and; country and regional level strategies aiming at the enhanced diffusion of advanced clones. The intended users of these intermediate products include NARS and Center researchers, extension and development agents, private sector, seed producers, and variety release agencies. Output 1 aims at developing and implementing efficient strategies that will help at the introduction and the diffusion of new CIP breeding materials, their evaluation for adaptation jointly with NARS, the release of new varieties locally and the interaction with stakeholder in key processes of the uptake of varieties to ensure that the varieties are available to intended users. Output 1 also considers platforms of strategic partners such as NARIs and the private sector for joint collaboration on common research problems related to the introduction, evaluation and uptake of varieties, including enhanced flow of breeding materials among NARS. Output 1 also collaborates closely with Outputs 2 and 3, CIPs research service units such as the Health Quarantine Unit, the In vitro Unit and the Acquisition and Distribution Unit for the development and timely introduction of improved breeding materials, and with Output 4 on seed research as a tool for variety dissemination. Output 1 products including new schemes and strategies to evaluate and assess elite clones with variety potential, will be used by researchers, extension agents, seed growers and the private sector actors. Capacity strengthening is an important component of this output. Expected impact includes farmers access and adoption of diverse new varieties in shorter timeframes; enhanced livelihoods of low income farmers, seed growers and rural and urban consumers, due to increased productivity and nutritional and market value of farm.

The impact pathway would flow the adoption of strategies that accelerate the identification and dissemination of varieties. Slow varietal release is a persistent and systematic bottleneck for dissemination of new improved materials. Knowledge products combined with capacity strengthening and pilot testing will speed the screening, release and multiplication of new varieties. The accelerated release of the varieties, their effective promotion and distribution through functional seed programs, farmer adoption and farmer-to-farmer dissemination are steps to increased distribution. With adoption, we expect either yield increases, loss reduction, yield stability, and finally reduction in costs of inputs, particularly pesticide sprays. Any combination of these factors should lead to increased revenues from potato and sweetpotato production. Increased revenues could lead to increased profits which could lead to increased farm income. Increased farm income could help the farm family escape poverty. A second pathway resulting from adoption would be reduced risk of crop loss and therefore greater food security for the household. Greater food security from potatoes or sweetpotatoes could lead to reduced hunger and improved family nutrition.

**Output 2.** Potato populations, clones and true seed varieties with resistance, nutritional and market traits are developed for SSA, LAC, ESEAP and SWCA

Output 2 covers our main potato breeding programs and offers a diverse set of intermediate and final products, including: a.) value-added and new genetic resources for pre-breeding and crop improvement, b.) pest and disease resistant, nutritious, drought tolerant, high yielding, superior table and/or processing quality candidate potato varieties, c.) genomic resources and validated markers for breeding, d.) new tools and methodologies for germplasm screening, crop improvement and variety selection, and e.) training materials and publications. Immediate users of these products are NARS, ARI and CIP researchers and the intended end users are resource poor farmers and consumers at risk of malnutrition. Research linkages and delivery strategies help assure that project outputs will reach the next level of users, who will in turn be able to produce sets of products, in the value chain linking germplasm to varieties, farmers fields, market places and consumers diets.

'Users using outputs' is our basic definition of an outcome. Anticipated outcomes include reduced timeframes and increased probability of success for researchers to develop varieties with needed traits, as global public goods, and the use by farmers of resistant, nutritious varieties for increased productivity, reduced loss and enhanced nutrition.

Interdisciplinary collaborative efforts are needed to orient crop improvement and appropriately target investments and outputs. Impact assessment prioritizes the constraints and opportunities to be addressed in the Centers program and subject knowledge assesses which are most amenable to genetic solutions. Targeting of populations considers demographics of poverty, hunger, malnutrition, farming practices and consumption patterns, and specific objectives as well as methods for genetic enhancement are developed according to information on available trait diversity and ability to select on it.

Output 2 focuses on breeding for enhanced yield stability, resistance, marketability, nutrition and resource utilization and the adaptation and dissemination of new technologies that can impact on income, hunger, mortality and the natural resource base. Materials, practices, information and capacities of students and researchers are developed to help strengthen national programs for base-broadening breeding, biotechnology, germplasm and information management, and variety selection. Stakeholders (seed producers, extension workers, industry, consumers, and release agencies) are engaged in conceptualization and variety evaluation to help assure the fit and efficient uptake of breeding products. Communication of deliverable research products in accordance with end-user characteristics, using tools such as scientific publications, user manuals (protocols, training guides), and catalogues help to assure the relevance of outputs to users and provide valuable feedback for future modification.

The impact pathway resulting from accelerated release of improved genetic materials is describe at length for Output 1. We pay attention to improving the chances for our products to successfully follow that pathway by: a.) demand based research with early involvement of value chain actors for breeding product development and delivery, b.) pro-poor research with specific targeting of regions and users where value adding, cost reduction, income generation and food security are of key importance, c.) participatory and horizontal research with defined feedback links for product validation and the accommodation of preference traits, regional needs and priorities, d.) innovation system perspectives to create and enable environments for technology development and delivery.

Specific partnerships (e.g. Challenge Programs, and Networks) enable inter-agency cooperation to access, develop and deliver technology and information,. In collaboration with partners Output 2 works to create an enabling environment for participatory technology development, help assure equitable access to technology and markets, and promote food safety under intensification principally by way of the pro-poor traits accumulated in improved varieties.

**Output 3.** Sweetpotato populations and clones with superior agronomic, nutritional and end-use quality characteristics are developed for SSA, LAC, ESEAP and SWCA and breeding methods tools, information and capacities are enhanced (3 5 years)

Output 3 covers our main sweetpotato breeding programs and is structured similarly to Output 2. Compared to Output 2, Output 3 offers a similar range of intermediate and final products for a similar set of users. The conditions for those users whether potato or sweetpotato are similar, researchers in developing country research institutes that are frequently not crop specialists and with limited budgets and small holder farmers that farm in resource constrained conditions. Our description of an impact pathway would be largely similar to that of Output 2 and so we will not repeat it here.

This is CIPs key output for the development of improved sweetpotato breeding materials and strategic sweetpotato genetic information required to advance the breeding populations. The research is conducted both in headquarters and in the regions, recognizing the secondary areas of genetic diversity of sweetpotato, long traditional use of sweetpotato as staple food, and opportunities for the crop in food security and nutrition in Africa, and Southeast Asia and the Pacific. Output 3 also hosts the VITAA (Vitamin A for Africa) Partnership, a global network of elite demonstration trials of orange-fleshed sweetpotato linked to communication strategies involving the public health, education, science and development communities. Output 3 has close interaction with Harvestplus in the development of improved breeding methods and tools for nutrient research. Sweetpotato breeding materials are used by researchers of NARS, ARI to CIP, and poor resource farmers. Extensionists, educators in rural communities, agricultural development staff also participate in the evaluation and / or diffusion of these sweetpotato materials. Output 3 also strengthens the capacity of collaborating NARS by training NARS researchers on specific aspects of sweetpotato breeding and use of improved breeding methods so the materials are evaluated and utilized more efficiently with modern techniques.

**Output 4.** Transgenic potatoes and sweetpotatoes for resource-poor producers and consumers are developed and tested using good practices (3-5 years)

Increased food security and new income generation by reducing production costs and offering new products to the processing industry can be achieved by delivering genetically engineered or transgenic potato and sweetpotato varieties to farmers in developing countries.

Acceptance of biotech crops, once depicted as the obstacle to product deployment, continues to increase in developing countries. Target countries for CIP transgenic varieties are in Africa and Asia. In Africa, Kenya, Uganda, DR Congo, Rwanda, and Burundi are priorities for utilization of the virus and weevil resistant sweetpotato varieties under development. Each country has biosafety and biotechnology frameworks under development with the Uganda being most advanced. Through research partnerships for product development with the NARS, we contribute modestly to regulation development by organizing biosafety and biotechnology workshops and training African scientists. Towards the end of 2008 and during 2009, Uganda and Kenya will initiate product development in local universities and NARS in partnership with CIP. From then on, product development will follow the standard pathway for biotech varieties with potential commercial event selection based on molecular description and field performance, risk assessment on human health and the environment. In Asia, Indonesia, China, the Philippines, and Vietnam are target countries for the aforementioned technologies. Each country has a biosafety framework although at different stage of development. However, in the short term only Indonesia will see joint activities and technology transfer from CIP to develop late blight resistant potato. Already experienced with handling GMO materials, the national program will test the new CIP-developed late blight resistant Granola in 2009. Because the technology is based on un-modified gene from the own crop germplasm, many of the biosafety issue are expected to be waived.

The most challenging step of the impact pathway for delivering transgenic potato and sweetpotato varieties to resource-poor farmers in developing countries is material delivery to farmers. CIP and the local public sector, especially in African countries, have little experience in biotech crop commercial release. Formal release is also intertwined with issues of biosafety, biotech seed distribution systems, farmer behavior, targets for markets, regional trade issues, and all the complex components required for an effective and responsible strategy for development and deployment of biotech varieties. Fortunately, CIP is a partner of two biotech crop commercialization initiatives supported by USAID, one with Bt potato in South Africa and the other with late blight potato in Indonesia. We expect to overcome this critical step of material delivery by developing a licensing strategy with entrepreneurial seed grower(s).

**Output 5.** Novel genotyping and phenotyping tools and screening strategies for efficient potato and sweetpotato germplasm characterization and enhancement

Interdisciplinary collaborative efforts are needed to orient crop improvement and appropriately target investments and outputs. Project 3 will engage in each of the seven themes described in CIPs MTP overview, through breeding for enhanced yield stability, marketability, nutrition and resource utilization and the adaptation and dissemination of new technologies in the regions that can impact on income, hunger, mortality and the natural resource base. Project 3 will help build capacity in national programs for base-broadening breeding, biotechnology, germplasm and information management, and variety selection methods. Additional stakeholders (seed producers, extension workers, industry, consumers, and release agencies) are engaged in variety evaluation to help assure the fit and efficient uptake of breeding products. Specific partnerships (e.g.

VITAA, Challenge Programs, and Networks) enable inter-agency cooperation to access, develop and deliver technology and information with nutrition institutes, health clinics, schools, etc. In collaboration with partners Project 3 will work with an innovations systems perspective to create an enabling environment for participatory technology development, help assure equitable access to technology and markets, and promote food safety under intensification principally by way of the pro-poor traits accumulated in improved varieties.

Project 3 delivery strategies help assure that project outputs reach the next level of users, who will in turn be able to produce sets of products, in the value chain linking germplasm to varieties, farmers fields, market places and consumers diets.

Project 3 offers a diverse set of products, including: a.) value-added and new genetic resources for pre-breeding and crop improvement, b.) pest and disease resistant, nutritious drought tolerant, high yielding, superior table and/or processing quality candidate potato and sweetpotato varieties, c.) genomic resources and validated markers for breeding, d.) new tools and methodologies for germplasm screening, crop improvement and variety selection, e.) training materials and publications.

### ***International Public Goods***

Project 3 develops a wide range of global public goods in the categories of materials, practices, capacities and other kinds of information. Project 3 also invests in capacity strengthening of a variety of users.

Potato and sweetpotato populations, clones and progenitors with new sources of resistance, quality, productivity and nutritional traits are the primary public good produced in this project. These are accompanied by IP-free information documenting their phenotypic, biochemical, agronomic and genetic characteristics. New practices are developed and shared with NARS in the form of manuals and protocols for the assessment of potato and sweetpotato germplasm and breeding materials in laboratory and field experiments. IP-free and openly accessible databases and analytical procedures and packages are developed to facilitate research and collaboration in crop improvement. Students, researchers, extensionists and farmers capacities in selection, production, biology, genetics, breeding, biotechnology and biosafety are built through practical training, workshops, publications, conferences and field days. Value is added to genetic resources of potato and sweetpotato through characterization and evaluation and documentation of traits of interest to crop improvement. Technology development as well as deployment are achieved in partnership with national programs of target countries and advanced research institutes.

### ***Elaboration of Partners Roles***

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Angola	IIA-Instituto de Investigación Agromonica	Research on variety selection and promotion in target environments	3 (1 & 2)
Argentina	INTA: Instituto Nacional de Tecnología Agropecuaria	Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1)
Armenia	Armenian Science Center of Agricultural and Plant Protection	Testing of elite clones with varietal potential under target production conditions	3 (1)
Australia	University of Adelaide	Micronutrient content analysis, linking farmers with markets	3 (2 & 3)

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Austria	Austrian Research Centers Seibersdorf	Functional genomics capacity	3 (2 & 3)
Australia	Diversity Array Technologies (DART P/L)	Genotyping tool development	3 (2)
Bangladesh	Tuber Crops Research Center, Joydebpur	Multiplication and testing of advanced elite clones with varietal potential under target production agro-ecologies; Testing True Potato Seed (TPS) hybrids	3 (2)
Bangladesh	Bangladesh Rural Advancement Committee (BRAC)	Multiplication and testing of advanced elite clones with varietal potential under target production agro-ecologies	3 (2)
Belgium	Universiteit Gent	Capacity building in Biosafety issues & management to African partners	3 (4)
Bolivia	PROINPA	Testing of elite clones and molecular technologies. Assessment of new sources of resistance for late blight	3 (2)
		Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1)
Brazil	EMBRAPA - Empresa Brasileira de Pesquisa Agropecuária	Post harvest evaluation for improved utilization of sweetpotato; training and scientific exchange	3 (3)
		Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1)
Burkina Faso	Helen Keller International	Assessment and promotion of orange-fleshed sweetpotato varieties in West Africa using integrated nutrition-agriculture approaches	3 (1)
Burundi	University of Burundi	Socioeconomic impact of virus and weevil of sweetpotato production in East Africa. Contribute to develop capacity in production of sweetpotato planting material and other biotechnology applications	3(4)
Cameroon	Inst of Agricultural Research for Development	Research on variety selection and dissemination in target environments	3 (1 & 2)

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Canada	Agriculture and Agri-Food	Expertise and capacity building on genomics and bioinformatics	3 (2)
Canada	Refractions.net (Canadian software consultancy)	Contracted for consultancies on modern Java development techniques in support of activities under Generation CP	3 (2)
Chile	Instituto de Investigaciones Agropecuarias (INIA)	Provides support and environments for assessment of germplasm and disease reactions under long day conditions	3 (2)
		Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1)
China	Chinese Academy of Agricultural Sciences (CAAS)	Contributes to potato breeding technology development and dissemination	3 (2)
China	Northeast Agricultural University	Strategic testing of advanced breeding materials in long day environments	3 (2)
China	Hesheng Seed Potato Industry	Variety introduction and quality control of seed potato production	3 (1)
Colombia	CIAT	Contribute to the development of biosafety capacities in LAC countries	3(4)
Colombia	Universidad Nacional de Colombia	Testing of elite clones and molecular technologies. Assessment of new sources of resistance for late blight	3 (2)
		Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1 & 2)
Colombia	CORPOICA - Corporación Colombiana de Investigación Agropecuaria	Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1 & 2)
Colombia	Alianza Cambio Andino / Corporación PBA	Research on Participatory Varietal Selection (PVS) in Peru and Colombia, exchange of expertise in participatory research with the LatinPapa network.	3 (1)
Colombia	CONGELAGRO (McCain)	Testing and evaluation of advanced clones with varietal potential; active coordination with the LatinPapa Network.	3 (1)

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Costa Rica	Ministerio de Agricultura y Ganadería INTA Instituto de Innovación y Transferencia de Tecnología Agropecuaria	Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1 & 2)
Cuba	Instituto Nacional de Ciencias Agrícolas	Testing True Potato Seed (TPS) hybrids and their utilization in urban agriculture	3 (1)
D.R. Congo	INERA	Socioeconomic impact of virus and weevil of sweetpotato production in East Africa	3(4, 5)
		Research on variety selection and dissemination in target environments	3 (3)
Denmark	Royal Veterinary and Agricultural University	Discovery of genes with antifungal properties	3 (2)
Ecuador	INIAP Instituto Nacional Autónomo de Investigaciones Agropecuarias	Testing of elite clones and molecular technologies. Assessment of new sources of resistance for late blight	3 (2)
		Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1 & 2)
Ethiopia	Ethiopian Agricultural Research Organization	Research on variety selection and dissemination in target environments	3 (1 & 2)
Finland	University of Helsinki	Facilities and expertise regarding understanding of and engineering virus resistance to SPVD	3 (4)
France	CIRAD - Centre de coopération internationale en recherche agronomique pour le développement	Cross-species genomics of drought tolerance genes Tools for haplotype analysis in geographical context (GCP)	3 (2)
Georgia	Crop Husbandry Institute	Multiplication and testing of advanced elite clones with LB resistance under target production agro-ecologies	3 (1 & 2)
Germany	Max Planck Inst	Capacity building and research in genomics	3 (2)
Germany	Julius Kuehn Institut, BFI fuer Kulturpflanzen	Drought resistance research on potato	3 (2)



<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Ghana	Crops Research Institute	Assessment and improvement of sweetpotato diversity for SSA; variety testing development and multiplication of the basic planting materials	3 (1 & 3)
India	All India Coordinated Potato Improvement Project (AICPIP), Shimla	Testing of elite clones in different agro-ecologies at AICPIP centers	3 (2)
India	Central Potato Research Institute Shimla	Multiplication and testing of advanced elite clones with varietal potential under target production agro-ecologies; Testing of TPS families with potential characteristics under target production zones	3 (1 & 2)
India	CTCRI - Central Tuber Crops Research Institute	Cropping systems research on sweetpotato	3 (3)
India	ICRISAT - International Crops Research Institute for the Semi-Arid Tropics	Intercropping sweetpotato and legumes	3 (3)
Indonesia	IVEGRI - Indonesian Vegetable Research Institute	Evaluation of elite LB resistant potato clones in West and Central Java	3 (2)
Indonesia	ILETRI - Indonesian Legume and Tuber Crops Research Institute	Evaluation of Sweetpotato Clones in Papua-Indonesia	3 (3)
Israel	Hebrew University of Jerusalem	Develop tools for potato functional genomics	3 (2)
Italy	Bioversity International	Sharing bioinformatics techniques and tool development under the Generation CP	3 (2)
Kazakhstan	Research Institute Potato and Vegetable Farming	Testing of elite clones with varietal potential under target production conditions	3 (1)
Kenya	University of Nairobi	Research on variety selection and promotion in target environments	3 (1 & 2)
Kenya	Kenya Agr Res Inst (KARI)	Research on variety selection and dissemination in target environments	3 (1, 2 & 3)
Kenya	Kenyatta University	Genetic transformation of sweetpotato for weevil resistance	3 (4)

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Korea	Rural Development Administration	Provides support and environments for assessment of germplasm and disease reactions under long day conditions; Provides expertise for capacity building	3 (2)
Kyrgyzstan	Aga Khan Foundation	Tests on TPS and clones issued from the Regional Clonal Selection conducted in Tajikistan	3 (2)
Luxembourg	Centre de Recherche Public Gabriel Lippmann	Biochemical analysis of selected potato landraces	3 (2)
Madagascar	FIFAMANOR	Assessment and improvement of sweetpotato diversity for SSA; variety testing development and multiplication of the basic planting materials; Testing Bt toxicity to Weevils, developing & testing methodology for assessing weevil incidence	3 (1, 2 & 3)
Malawi	SARNET - Southern Africa Root Crops Research Network	Convenes agencies from 13 countries in Southern Africa region to extend and adapt technologies derived from potato and sweetpotato research in the region	3 (1)
Malawi	Dept of Agricultural Research Services of the Ministry of Agriculture	Research on variety selection and promotion in target environments	3 (1 & 2)
Mexico	CIMMYT International Maize and Wheat Improvement Center	Sharing bioinformatics techniques and tool development under the Generation CP; collaboration towards a common database for managing field and lab data (CIPPEX/ICIS)	3 (2)
Mexico	Generation Challenge Program	Expertise and capacity building on population genetics, genomics and bioinformatics	3 (2 & 3)
Mozambique	IIAM - Instituto Nacional de Investigação Agrária de Mocambique	Research on variety selection and promotion in target environments	3 (1, 2 & 3)
Mozambique	Eduardo Mondlane University	Development of genetic resources for sweetpotato	3 (2)
Myanmar	Yezin Agricultural University	Evaluation of advanced potato clones in target environments	3 (2)
Netherlands	Wageningen Agricultural University	Socioeconomic research toward understanding processes of diffusion and adoption of potato varieties; Potato genomics (gene expression) facilities and expertise	3 (1 & 2)

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Nigeria	National Root Crops Research Insitutive (Umudike)	Research on variety selection and promotion in target environments	3 ( 3)
Nigeria	University of Ibadan	Research on variety selection and promotion in target environments	3 (1 & 3)
Pakistan	National Potato Program, Pakistan Agricultural Research Council, Islamabad, Pakistan	Multiplication and testing of advanced elite clones with varietal potential under target production agro-ecologies.	3(2)
Pakistan	Ayub,Aqri. Res. Inst., Faisalabad;; Potato and Veg seed Inst., Quetta; Hazara Agri.Res. Inst, Peshawar; Sindh Horti.Research Institute.	Testing of elite clones in different agro-ecologies at Research Institutes and farmer fields.	3 (2)
Papua New Guinea	NARI	Introduction and testing of Potato Clones in Papua New Guinea	3 (2)
Peru	Instituto Nacional de Innovación Agraria (INIA)	Implementing innovative participatory variety evaluation scheme	3(1)
		Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network. Collaborates on potato genomics within STC project	3 (1 & 2)
Peru	PRA Huanuco (Economic Corridors)	Testing and evaluation of advanced clones with varietal potential; active coordination with the LatinPapa Network.	3 (1)
Peru	HOPE foundation	Testing and evaluation of advanced clones with varietal potential; active coordination with the LatinPapa Network.	3 (1)
Peru	Instituto de Investigación Nutricional (IIN)	Determination of role of potato in the diets of populations at risk of malnutrition; research and training in human nutrition	3 (2)
Peru	Universidad Nacional Agraria La Molina	Testing of elite clones and molecular technologies. Assessment of new sources of resistance for late blight	3 (2)
Peru	Universidad de Desarrollo Andino (UDEA, Huancavelica)	Testing and evaluation of advanced clones with varietal potential; active coordination with the LatinPapa Network.	3 (1)

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Peru	Universidad Nacional Jorge Basadre Grahmann de Tacna (UNJBG)	Testing and evaluation of advanced clones with varietal potential	3(2)
Peru	Universidad Nacional Cayetano Herrera	Collaborates on Potato Genomics (STC project)	3(2)
Philippines	IRRI International Rice Research Institute	Sharing bioinformatics techniques and tool development under the Generation CP; collaboration towards a common database for managing field and lab data (CIPPEX/ICIS)	3 (2)
South Africa	Agricultural Research Council	Assessment and improvement of sweetpotato diversity for SSA; variety testing development and multiplication of the basic planting materials; Testing Bt toxicity to Weevils, developing & testing methodology for assessing weevil incidence	3 (3)
Rwanda	ISAR	Socioeconomic impact of virus and weevil of sweetpotato production in East Africa. Contribute to develop capacity in production sweetpotato planting material and other biotechnology applications	3(3 & 4)
South Africa	Agricultural Research Center Roodeplaat	Develop commercialization of GM potato in South Africa	3 (4)
Spain	NEIKER - Instituto Vasco de Investigación y Desarrollo Agrario	Provides scientific and technological knowhow for genetic and molecular analysis	3(2)
		Coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1 & 2)
Spain	CCBAT Centro de Conservación de la Biodiversidad Agrícola de Tenerife	Active coordination with the LatinPapa Network.	3 (1 & 2)
Sri Lanka	Horticultural Research and Development Institute(HORDI)	Testing of CIP clones in different ago-ecologies	3(2)
		Enhancement and testing of new sweetpotato germplasm for adaptation and utilization	3(3)
Tajikistan	Inst. of Plant Physiology and Genetics; NGO Tukhmiparvar, Dushanbe	Testing of elite clones and TPS families with varietal potential under target production conditions	3 (1)

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Tajikistan	Horticultural Inst Bogparvar, Academy of Agricultural Sciences, Inst of Plant Phys and Genet, FAO: OSRO/TAJ/401/CAN	Testing of elite clones and TPS families with varietal potential under target production conditions	3 (1)
Tanzania	Dept. of Research and Training	Assessment and improvement of sweetpotato diversity for SSA; variety testing development and multiplication of the basic planting materials; Testing Bt toxicity to Weevils, developing & testing methodology for assessing weevil incidence	3 (2 & 3)
Tanzania	Tanzania Food and Nutrition Center	Nutrient quality analysis	3 (3)
Uganda	PRAPACE - Regional Potato and Sweetpotato Improvement Network in Eastern and Central Africa	Convenes agencies from 10 countries in East and Central Africa to extend and adapt technologies derived from potato and sweetpotato research in the region	3 (1)
Uganda	National Agricultural Research Organization	Research on variety selection and dissemination in target environments	3 (1, 2 & 3)
		Assessment and improvement of sweetpotato diversity for SSA; variety testing development and multiplication of the basic planting materials; Testing Bt toxicity to Weevils, developing & testing methodology for assessing weevil incidence	3 (3 & 4)
Uganda	Makerere University	Socioeconomic impact of virus and weevil of sweetpotato production in East Africa	3(4, 5)
USA	HarvestPlus Challenge Program	Expertise and facilities for micronutrient determinations, human nutrition, communication and impact	3 (1, 2 & 3)
USA	Cornell University	Capacity building in population genetics, genomics and bioinformatics	3 (2)
USA	NCGR - National Center for Genome Resources	Sharing bioinformatics techniques and tool development under the Generation CP	3 (2)
USA	Virginia Polytechnic Institute and State University	Expertise and facility for analyzing molecular genetics of response to abiotic stress	3 (2)
USA	Louisiana State University	Nutrient quality analysis and variety evaluations	3 (3)

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
USA	Michigan State University	Develop commercialization of GM potato in South Africa	3 (4)
USA	University of Wisconsin/USDA	Provides scientific and technological knowhow on taxonomic and molecular analysis	3 (2)
USA	Boyce Thompson Institute for Plant Research	Experimentation in genetic manipulation of carotenoid pathway, under umbrella of HarvestPlus Challenge Program	3 (2), 3 (4)
USA	USDA Plant Soil and Nutrituion Lab	Provides expertise and research outputs regarding micronutirient bioavailability	3 (2), 3 (3)
Uruguay	INIA - Instituto Nacional de Investigación Agropecuaria	Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1 & 2)
Uzbekistan	Institute of Vegetables, Melons and Potato	Testing of elite clones with varietal potential under target production conditions; Testing TPS families for adaptation to long day conditions	3 (1)
Venezuela	Instituto Nacional de Investigaciones Agrícolas (INIA)	Evaluation of True Potato Seed hybrids and diffusion among low-income small-land holdings potato farmers	3 (1,2)
		Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1 & 2)
Vietnam	Food Crops Research Institute of VAAS	Evaluation of Potato Clones resistant to Late Blight and Viruses in Red River Delta	3 (1 & 2)
Vietnam	Food Crops Research Institute of VAAS	Enhancement and testing of new sweetpotato germplasm for adaptation and utilization	3 (3)
Zambia	Ministry of Agriculture-Research Program	Research on variety selection and promotion in target environments	3 (3)
Vietnam	Vietnam Agricultural Science Institute (VASI) of VAAS	Evaluation of potato clones and True Potato Seed hybrids	3 (1, 2)
Angola	IIA-Instituto de Investigaçao Agromonica	Research on variety selection and promotion in target environments	3 (1 & 2)

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Argentina	INTA: Instituto Nacional de Tecnología Agropecuaria	Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1)
Armenia	Armenian Science Center of Agricultural and Plant Protection	Testing of elite clones with varietal potential under target production conditions	3 (1)
Australia	University of Adelaide	Micronutrient content analysis, linking farmers with markets	3 (2 & 3), 1(2)
Austria	Austrian Research Centers Seibersdorf	Functional genomics capacity	3 (2 & 3)
Bangladesh	Tuber Crops Research Center, Joydebpur	Multiplication and testing of advanced elite clones with varietal potential under target production agro-ecologies; Testing True Potato Seed (TPS) hybrids	3 (2)
Belgium	Universiteit Gent	Capacity building in Biosafety issues & management to African partners	3 (4)
Bolivia	PROINPA	Testing of elite clones and molecular technologies. Assessment of new sources of resistance for late blight	3 (2)
		Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1)
Brazil	EMBRAPA - Empresa Brasileira de Pesquisa Agropecuária	Post harvest evaluation for improved utilization of sweetpotato; training and scientific exchange	3 (3)
		Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1)
Burkina Faso	Helen Keller International	Assessment and promotion of orange-fleshed sweetpotato varieties in West Africa using integrated nutrition-agriculture approaches	3 (1)
Burundi	University of Burundi	Socioeconomic impact of virus and weevil of sweetpotato production in East Africa. Contribute to develop capacity in production of sweetpotato planting material and other biotechnology applications	3(4)

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Cameroon	Inst of Agricultural Research for Development	Research on variety selection and dissemination in target environments	3 (1 & 2)
Canada	Agriculture and Agri-Food	Expertise and capacity building on genomics and bioinformatics	3 (2)
Canada	Refractions.net (Canadian software consultancy)	Contracted for consultancies on modern Java development techniques in support of activities under Generation CP	3 (2)
Chile	Instituto de Investigaciones Agropecuarias (INIA)	Provides support and environments for assessment of germplasm and disease reactions under long day conditions	3 (2)
		Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1)
China	Chinese Academy of Agricultural Sciences (CAAS)	Contributes to potato breeding technology development and dissemination	3 (2)
China	Northeast Agricultural University	Strategic testing of advanced breeding materials in long day environments	3 (2)
China	Hesheng Seed Potato Industry	Variety introduction and quality control of seed potato production	3 (1)
Colombia	CIAT	Contribute to the development of biosafety capacities in LAC countries	3(4)
Colombia	Universidad Nacional de Colombia	Testing of elite clones and molecular technologies. Assessment of new sources of resistance for late blight	3 (2)
		Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1 & 2)
Colombia	CORPOICA - Corporación Colombiana de Investigación Agropecuaria	Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1 & 2)
Colombia	Alianza Cambio Andino / Corporación PBA	Research on Participatory Varietal Selection (PVS) in Peru and Colombia, exchange of expertise in participatory research with the LatinPapa network.	3 (1)



<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Colombia	CONGELAGRO (McCain)	Testing and evaluation of advanced clones with varietal potential; active coordination with the LatinPapa Network.	3 (1)
Costa Rica	Ministerio de Agricultura y Ganadería INTA Instituto de Innovación y Transferencia de Tecnología Agropecuaria	Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1 & 2)
Cuba	Instituto Nacional de Ciencias Agrícolas	Testing True Potato Seed (TPS) hybrids and their utilization in urban agriculture	3 (1)
D.R. Congo	INERA	Socioeconomic impact of virus and weevil of sweetpotato production in East Africa	3(4, 5)
		Research on variety selection and dissemination in target environments	3 (3)
Denmark	Royal Veterinary and Agricultural University	Discovery of genes with antifungal properties	3 (2)
Ecuador	INIAP Instituto Nacional Autónomo de Investigaciones Agropecuarias	Testing of elite clones and molecular technologies. Assessment of new sources of resistance for late blight	3 (2)
		Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1 & 2)
Ethiopia	Ethiopian Agricultural Research Organization	Research on variety selection and dissemination in target environments	3 (1 & 2)
Finland	University of Helsinki	Facilities and expertise regarding understanding of and engineering virus resistance to SPVD	3 (4)
France	CIRAD - Centre de coopération internationale en recherche agronomique pour le développement	Cross-species genomics of drought tolerance genes Tools for haplotype analysis in geographical context (GCP)	3 (2)
Georgia	Crop Husbandry Institute	Multiplication and testing of advanced elite clones with LB resistance under target production agro-ecologies	3 (2)
Germany	Max Planck Inst	Capacity building and research in genomics	3 (2)

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Ghana	Crops Research Institute	Assessment and improvement of sweetpotato diversity for SSA; variety testing development and multiplication of the basic planting materials	3 (1 & 3)
India	All India Coordinated Potato Improvement Project (AICPIP), Shimla	Testing of elite clones in different agro-ecologies at AICPIP centers	3 (2)
India	Central Potato Research Institute Shimla	Multiplication and testing of advanced elite clones with varietal potential under target production agro-ecologies; Testing of TPS families with potential characteristics under target production zones	3 (2)
India	CTCRI - Central Tuber Crops Research Institute	Cropping systems research on sweetpotato	3 (3)
India	ICRISAT - International Crops Research Institute for the Semi-Arid Tropics	Intercropping sweetpotato and legumes	3 (3)
Indonesia	IVEGRI - Indonesian Vegetable Research Institute	Evaluation of elite LB resistant potato clones in West and Central Java	3 (2)
Indonesia	ILETRI - Indonesian Legume and Tuber Crops Research Institute	Evaluation of Sweetpotato Clones in Papua-Indonesia	3 (3)
Israel	Hebrew University of Jerusalem	Develop tools for potato functional genomics	3 (2)
Italy	Bioversity International	Sharing bioinformatics techniques and tool development under the Generation CP	3 (2)
Kazakhstan	Research Institute Potato and Vegetable Farming	Testing of elite clones with varietal potential under target production conditions	3 (1)
Kenya	University of Nairobi	Research on variety selection and promotion in target environments	3 (1 & 2)
		Research on variety selection and dissemination in target environments	3 (1, 2 & 3)
Kenya	Kenyatta University	Genetic transformation of sweetpotato for weevil resistance	3 (4)

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Korea	Rural Development Administration	Provides support and environments for assessment of germplasm and disease reactions under long day conditions; Provides expertise for capacity building	3 (2)
Kyrgyzstan	Aga Khan Foundation	Tests on TPS and clones issued from the Regional Clonal Selection conducted in Tajikistan	3 (2)
Luxembourg	Centre de Recherche Public Gabriel Lippmann	Biochemical analysis of selected potato landraces	3 (2)
Madagascar	FIFAMANOR	Assessment and improvement of sweetpotato diversity for SSA; variety testing development and multiplication of the basic planting materials; Testing Bt toxicity to Weevils, developing & testing methodology for assessing weevil incidence	3 (1, 2 & 3)
Malawi	SARRNET - Southern Africa Root Crops Research Network	Convenes agencies from 13 countries in Southern Africa region to extend and adapt technologies derived from potato and sweetpotato research in the region	3 (1)
Malawi	Dept of Agricultural Research Services of the Ministry of Agriculture	Research on variety selection and promotion in target environments	3 (1 & 2)
Mexico	CIMMYT International Maize and Wheat Improvement Center	Sharing bioinformatics techniques and tool development under the Generation CP; collaboration towards a common database for managing field and lab data (CIPPEX/ICIS)	3 (2)
Mexico	Generation Challenge Program	Expertise and capacity building on population genetics, genomics and bioinformatics	3 (2 & 3)
Mozambique	IIAM - Instituto Nacional de Investigação Agrária de Mocambique	Research on variety selection and promotion in target environments	3 (1, 2 & 3)
Myanmar	Yezin Agricultural University	Evaluation of advanced potato clones in target environments	3 (2)
Netherlands	Wageningen Agricultural University	Socioeconomic research toward understanding processes of diffusion and adoption of potato varieties; Potato genomics (gene expression) facilities and expertise	3 (1 & 2)
Nigeria	National Root Crops Research Insitutite (Umudike)	Research on variety selection and promotion in target environments	3 (3)

Country	Major Partner	Strategic Role and Complementary Capability	Project (Output)
Nigeria	University of Ibadan	Research on variety selection and promotion in target environments	3 (1 & 3)
Pakistan	National Potato Program, Pakistan Agricultural Research Council, Islamabad, Pakistan	Multiplication and testing of advanced elite clones with varietal potential under target production agro-ecologies.	3(2)
Pakistan	Ayub, Agri. Res. Inst., Faisalabad.; Potato and Veg seed Inst., Quetta; Hazara Agri. Res. Inst, Peshawar; Sindh Horti. Research Institute.	Testing of elite clones in different agro-ecologies at Research Institutes and farmer fields.	3 (2)
Papua New Guinea	NARI	Introduction and testing of Potato Clones in Papua New Guinea	3 (2)
Peru	Instituto Nacional de Innovación Agraria (INIA)	Implementing innovative participatory variety evaluation scheme	3(1)
		Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network. Collaborates on potato genomics within STC project	3 (1 & 2)
Peru	PRA Huanuco (Economic Corridors)	Testing and evaluation of advanced clones with varietal potential; active coordination with the LatinPapa Network.	3 (1)
Peru	HOPE foundation	Testing and evaluation of advanced clones with varietal potential; active coordination with the LatinPapa Network.	3 (1)
Peru	Instituto de Investigación Nutricional (IIN)	Determination of role of potato in the diets of populations at risk of malnutrition; research and training in human nutrition	3 (2)
Peru	Universidad Nacional Agraria La Molina	Testing of elite clones and molecular technologies. Assessment of new sources of resistance for late blight	3 (2)
Peru	Universidad de Desarrollo Andino (UDEA, Huancavelica)	Testing and evaluation of advanced clones with varietal potential; active coordination with the LatinPapa Network.	3 (1)

Country	Major Partner	Strategic Role and Complementary Capability	Project (Output)
Peru	Universidad Nacional Jorge Basadre Grahmann de Tacna (UNJBG)	Testing and evaluation of advanced clones with varietal potential	3(2)
Peru	Universidad Nacional Cayetano Herrera	Collaborates on Potato Genomics (STC project)	3(2)
Philippines	IRRI International Rice Research Institute	Sharing bioinformatics techniques and tool development under the Generation CP; collaboration towards a common database for managing field and lab data (CIPPEX/ICIS)	3 (2)
South Africa	Agricultural Research Council	Assessment and improvement of sweetpotato diversity for SSA; variety testing development and multiplication of the basic planting materials; Testing Bt toxicity to Weevils, developing & testing methodology for assessing weevil incidence	3 (3)
Rwanda	ISAR	Socioeconomic impact of virus and weevil of sweetpotato production in East Africa. Contribute to develop capacity in production sweetpotato planting material and other biotechnology applications	3(3 & 4)
South Africa	Agricultural Research Center Roodeplaat	Develop commercialization of GM potato in South Africa	3 (4)
Spain	NEIKER - Instituto Vasco de Investigación y Desarrollo Agrario	Provides scientific and technological knowhow for genetic and molecular analysis	3(2)
		Coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1 & 2)
Spain	CCBAT Centro de Conservación de la Biodiversidad Agrícola de Tenerife	Active coordination with the LatinPapa Network.	3 (1 & 2)
Sri Lanka	Horticultural Research and Development Institute(HORDI)	Testing of CIP clones in different ago-ecologies	3(2)
		Enhancement and testing of new sweetpotato germplasm for adaptation and utilization	3(3)
Tajikistan	Inst. of Plant Physiology and Genetics; NGO Tukhmiparvar, Dushanbe	Testing of elite clones and TPS families with varietal potential under target production conditions	3 (1)

Country	Major Partner	Strategic Role and Complementary Capability	Project (Output)
Tajikistan	Horticultural Inst Bogparvar, Academy of Agricultural Sciences, Inst of Plant Phys and Genet, FAO: OSRO/TAJ/401/CAN	Testing of elite clones and TPS families with varietal potential under target production conditions	3 (1)
Tanzania	Dept. of Research and Training	Assessment and improvement of sweetpotato diversity for SSA; variety testing development and multiplication of the basic planting materials; Testing Bt toxicity to Weevils, developing & testing methodology for assessing weevil incidence	3 (2 & 3)
Tanzania	Tanzania Food and Nutrition Center	Nutrient quality analysis	3 (3)
Uganda	PRAPACE - Regional Potato and Sweetpotato Improvement Network in Eastern and Central Africa	Convenes agencies from 10 countries in East and Central Africa to extend and adapt technologies derived from potato and sweetpotato research in the region	3 (1)
Uganda	National Agricultural Research Organization	Research on variety selection and dissemination in target environments	3 (1, 2 & 3)
		Assessment and improvement of sweetpotato diversity for SSA; variety testing development and multiplication of the basic planting materials; Testing Bt toxicity to Weevils, developing & testing methodology for assessing weevil incidence	3 (3 & 4)
Uganda	Makerere University	Socioeconomic impact of virus and weevil of sweetpotato production in East Africa	3(4, 5)
USA	HarvestPlus Challenge Program	Expertise and facilities for micronutrient determinations, human nutrition, communication and impact	3 (1, 2 & 3)
USA	Cornell University	Capacity building in population genetics, genomics and bioinformatics	3 (2)
USA	NCGR - National Center for Genome Resources	Sharing bioinformatics techniques and tool development under the Generation CP	3 (2)
USA	Virginia Polytechnic Institute and State University	Expertise and facility for analyzing molecular genetics of response to abiotic stress	3 (2)
USA	Louisiana State University	Nutrient quality analysis and variety evaluations	3 (3)

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
USA	Michigan State University	Develop commercialization of GM potato in South Africa	3 (4)
USA	University of Wisconsin/USDA	Provides scientific and technological knowhow on taxonomic and molecular analysis	3 (2)
USA	Boyce Thompson Institute for Plant Research	Experimentation in genetic manipulation of carotenoid pathway, under umbrella of HarvestPlus Challenge Program	3 (2), 3 (4)
USA	USDA Plant Soil and Nutituiion Lab	Provides expertise and research outputs regarding micronutirient bioavailability	3 (2), 3 (3)
Uruguay	INIA - Instituto Nacional de Investigación Agropecuaria	Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1 & 2)
Uzbekistan	Institute of Vegetables, Melons and Potato	Testing of elite clones with varietal potential under target production conditions; Testing TPS families for adaptation to long day conditions	3 (1)
Venezuela	Instituto Nacional de Investigaciones Agrícolas (INIA)	Evaluation of True Potato Seed hybrids and diffusion among low-income small-land holdings potato farmers	3 (1,2)
		Research on breeding, varietal development and dissemination; coordination of the national innovation network; active coordination with the LatinPapa Network.	3 (1 & 2)
Vietnam	Food Crops Research Institute of VAAS	Evaluation of Potato Clones resistant to Late Blight and Viruses in Red River Delta	3 (2)
Vietnam	Food Crops Research Institute of VAAS	Enhancement and testing of new sweetpotato germplasm for adaptation and utilization	3 (3)
Zambia	Ministry of Agriculture-Research Program	Research on variety selection and promotion in target environments	3 (3)
Vietnam	Vietnam Agricultural Science Institute (VASI) of VAAS	Evaluation of potato clones and True Potato Seed hybrids	3 (1, 2)

## Logical Framework

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
Output 1	Effective strategies for the identification and dissemination of high-yielding, resistant and nutritious potato and sweetpotato varieties available for each CIP region (3-5 years)		NARS and Center researchers, extension and development agents, Private sector, Seed producers, release agencies	Researchers, extension agents, seed growers and the private sector use new schemes and strategies to evaluate and assess elite clones with variety potential	Farmers access and adopt diverse new varieties in shorter timeframes; Livelihoods of poor farmers, seed growers and rural and urban consumers are enhanced due to increased productivity and nutritional and market value of farm produce with less dependence on external inputs
2009	Late blight resistant potato clones selected in multilocation trials in Vietnam, Myanmar and Indonesia	Materials			
2009	Protocols for characterizing tuber bulking and dormancy developed and implemented for documentation and enhanced potato breeding capacity	Practices			
2009	New early maturing, late blight / virus resistant potato clones evaluated and selected in SWA countries	Materials			



Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2009	Network of potato breeders in LAC, for the exchange of capacities in crop improvement and selection & promotion of new varieties with market and sustainability traits, is established	Capacity			
2009	Utility of participatory breeding trials in variety release procedures demonstrated in Peru	Materials			
2009	Potato clones with tuber quality for table consumption identified for local use in North China	Materials			
2010	Ten TPS families for long day conditions of CAC highlands documented	Materials			
2010	Three new candidate potato varieties appropriate for Uzbekistan and Tajikistan identified	Materials			
2010	Candidate potato varieties from population A and B with resistance to late blight and cooking/processing qualities identified in Malawi and Mozambique	Materials			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2010	A strategy for the diffusion of candidate potato varieties including private-public partnerships and massive production of clean seeds developed in Kenya	Other kinds of knowledge			
2010	New LB resistant variety releases in 3 countries of SSA are documented	Materials			
2010	Training of NARS on local potato breeding and population selection is conducted in SWCA countries	Capacity			
2010	Elite sweet potato clones identified in multi-location trials for variety release in SWCA	Materials			
2010	Document on successful and replicable potato variety promotion schemes, links with informal seed systems and private sector in LAC systematized and key lessons is published	Other kinds of knowledge			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2010	New database that integrates data of participatory trials and environment (via GIS databases and methods) in LAC, for routine analysis of trends and recommendations available for variety deployment	Other kinds of knowledge			
2010	Elite clones identified in China are made available for introduction to neighboring countries (DPRK)	Materials			
2010	New potato clones are made available for provincial testing and release in North China	Materials			
2010	Outstanding potato clones with drought tolerance are identified and proposed for provincial trials in China	Materials			
2011	Candidate potato variety selected for tolerance to abiotic stress in SWCA countries	Materials			
2011	Three candidate virus resistant potato varieties are identified for low altitude hillsides in Indonesia.	Materials			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2011	Marketing and promotion systems for candidate varieties operative in four LAC countries	Other kinds of knowledge			
<b>Output 2</b>	Potato populations, clones and true seed varieties with resistance, nutritional and market traits are developed for SSA, LAC, ESEAP and SWCA		Resource poor farmers; NARS, ARI and CIP Researchers	Researchers use new germplasm, tools, practices and information to enhance breeding progress, and communicate benefits of available materials. NARS, farmers and consumers select adopt and consume elite clones and TPS as improved varieties	Higher productivity, less use of pesticides, increase farmers net income, improved food security. Farmers harvest reliable yields with reduced use of external inputs, and increase their incomes from value-added markets. Rural and urban families consume more nutritious diets. Breeding progress is enhanced and the genetic base of breeding populations and farming systems is increased.
2009	Ten elite late blight resistant clones with heat tolerance and good table quality available	Materials			
2009	Variability of CIPs advanced virus resistant, potato population for heat tolerance documented	Materials			
2009	Heterosis between two independently improved LB resistant population groups assessed and documented	Other kinds of knowledge			
2009	Six 4x families with late blight resistance from diploid wild Solanum Piurana crossed to cultivated potato available	Materials			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2009	Chromosome regions associated with carotenoids identified and gene expression studies for enzymes involved in carotenoid synthesis documented	Materials			
2009	Physiological traits associated with drought tolerance in tetraploid potatoes are described	Other kinds of knowledge			
2009	40 selected true seed families combining resistance to late blight and viruses and required end- use quality available to NARS in ESEAP	Materials			
2009	Genetic parameters for drought tolerance determined in native potato cultivars	Materials			
2009	Ry gene locus in neo-tuberosum and S. stoloniferum germplasm is characterized and compared	Other kinds of knowledge			
2010	Genetic gains in micronutrient content determined in diploid cultivated potatoes (with HarvestPlus)	Other kinds of knowledge			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2010	Genetic loci and alleles conferring drought tolerance from Andean potatoes identified and documented	Other kinds of knowledge			
2010	Screening methods for photoperiod response useful for identification of day neutral potato clones are documented and available	Practices			
2010	Stability of the levels of micronutrient accumulation of four elite potato clones is documented in CAC (with HarvestPlus)	Other kinds of knowledge			
2010	The role of two plant processes in variability for micronutrient concentration of potato tubers is understood (with HarvestPlus)	Other kinds of knowledge			
2010	Ten clones combining virus and late blight resistance, with probable adaptation to long days, are cleaned up and available for distribution to ESEAP and SWCA	Materials			
2010	Tuber bulking behavior of twenty LB resistant clones assessed and documented under contrasting agro-ecologies of central and south China	Materials			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2010	10 new elite potato clones for processing combining resistance to viruses and late blight are available for distribution to NARS	Materials			
2010	4x potato clones with late blight resistance from Solanum Piurana and favorable agronomic features available	Materials			
2010	Quantitative Trait Loci for micronutrient content in native potato identified and documented (with HarvestPlus)	Other kinds of knowledge			
2010	Utility of NIRS method for rapid analysis of glycoalkaloids in potato documented	Practices			
2011	Resistant allele of the Ry gene from PVY resistant potato cloned and available	Materials			
2011	Genetic control of potatoes response to photoperiod elucidated	Other kinds of knowledge			
2011	Biochemical basis of Fe bioavailability in pigmented potato understood	Other kinds of knowledge			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2011	20 new heat tolerant, early-maturing lines with resistance to potato viruses and good table quality developed and available for SWCA	Materials			
2011	Genetic parameters for drought tolerance of CIPs LTVR population determined and documented	Other kinds of knowledge			
2011	Phenotyping for drought tolerance of 1,000 potato genotypes completed and available	Materials			
<b>Output 3</b>	Sweetpotato populations and clones with superior agronomic, nutritional and end-use quality characteristics are developed for SSA, LAC, ESEAP and SWCA and breeding methods tools, information and capacities are enhanced (3 5 years)		Resource poor farmers NARS, ARI and CIP Researchers	NARS and farmers use selected sweetpotato clones to release varieties; Researchers use more efficient methods for enhancement of sweetpotato diversity; National programs enjoy reduced costs and / or increased capacity in sweetpotato breeding	Farmers adopt varieties with agronomic and clearly improved nutritional value Increased rates of breeding progress for sweetpotato yield & stability and new tools for development of varieties with improved nutritional value
2009	4-6 new drought tolerant higher beta-carotene, high dry matter, medium iron and zinc elite VA-1x clones available and disseminated by interregional elite demonstration & GxE trials in all CIP regions (with HarvestPlus, VITAA)	Materials			



Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2009	25 35 elite demonstration clones including new OFSP elite VA-1x clones and pathogen free S1 and S2 clone established and under multiplication in 20 countries (with HarvestPlus, VITAA)	Materials			
2009	(VA-2x x VA-2) hybrid generation comprising 300 seed families with improved high beta-carotene, medium iron & zinc and high dry matter available and tested for SSA and LAC (with HarvestPlus)	Materials			
2009	200 promising drought tolerant clones with medium to high dry matter, beta carotene, Fe and Zn content identified in VA-2 breeding population by CIP-HQ for LAC & SSA	Materials			
2009	VA-E2 generation comprising 8 x 2000 elite seed crossings with drought tolerance and high dry matter, high beta-carotene, medium iron & zinc populations available for all CIP regions (with HarvestPlus)	Materials			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2009	VA-2x generation comprising 80 seed families segregating for resistance to clorotic stunt virus (SPCSV) with improved high beta-carotene, medium iron & zinc and high dry matter available and tested for SSA and LAC (with HarvestPlus)	Materials			
2009	Rapid NIRS screening methods for protein quality (amino acid composition) in sweetpotato tested and established (with HarvestPlus)	Practices			
2009	Rapid NIRS screening methods for water use efficiency (WUE) in sweetpotato tested and established (with HarvestPlus)	Practices			
2009	EST libraries from drought-challenged sweetpotato clones established and sequenced (with GCP)	Materials			
2009	A DArT genotyping tool for sweetpotato (with GCP)	Practices			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2010	Breeding progress and change of genetic parameters for dry matter, pro-vitamin A, Fe and Zn after two recurrent selection cycles for population ZapSPK VA-3 determined (with Harvest Plus)	Materials			
2010	60 promising and nutrient efficient ZapSPK VA-3 clones with health status 2 are ready for distribution to LAC, ESEAP, SWCA and SSA (with HarvestPlus)	Materials			
2010	Determination of the mid-parent mid-off-spring heterosis in sweetpotato	Materials			
2010	Manual and Training program for PT, AT sweetpotato designs and their analysis	Capacity			
2010	GXE pattern of sweetpotato in East- and Southern Africa determined	Other kinds of knowledge			
2010	Heritabilities for vine survival (survival of planting material until the next planting season) determined	Materials			
2010	OFSP germplasm evaluated and documented in SWCA	Materials			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2010	Hexaploid mapping population with QTLs for SPVD resistance developed at CIP and made available for sweetpotato scientists (with GCP)	Materials			
2010	Proof of concept for estimation of provitamins A, iron and zinc across major food crops (potato, sweetpotato, cassava, maize, wheat, rice, beans, bar pearl millet) by NIRS (with Harvest Plus)	Practices			
2010	A diploid reference map for sweetpotato established (with GCP)	Materials			
2010	The CIP core collection genotyped (with GCP)	Materials			
2011	Optimum ratio between number of crosses and size of families in sweetpotato crossing blocks determined	Other kinds of knowledge			
2011	Accelerated population improvement schemes established at centers of excellence (Mozambique, Uganda, Ghana, Peru) replacing temporal with spatial variation of test environments	Practices			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2011	At least 5 new OFSP varieties adapted to drought prone conditions identified in Southern Africa and used for massive dissemination by the public and private sector	Materials			
2011	Establishment of crossing blocks on basis of controlled crosses in SWCA	Practices			
2011	MAS established at centers of excellence (Mozambique, Uganda, Ghana, Peru) to facilitate screening for SPVD resistance	Materials			
2011	Diploid mapping population of Ipomoea trifida made available by CIP for sweetpotato scientists (with GCP)	Materials			
2011	Yield, dry matter, protein, starch, minerals and processing quality of Yam bean germplasm documented in SSA and LAC	Materials			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2011	NIRS technology established to determine protein, starch, sugars, provitamins A, Ca, Mg, Fe and Zn in sweetpotato storage roots at three centers of excellence in SSA (Ghana, Mozambique, Uganda) (with Harvest Plus)	Practices			
<b>Output 4</b>	Transgenic potatoes and sweetpotatoes for resource-poor producers and consumers are developed and tested using good practices (3-5 years)		Farmers in Africa and Asia; Researchers at CIP and NARS regulators and decisionmakers	Farmers in developing countries use resistant and industrial varieties; Regulatory agencies, policy-makers and researchers use available technologies and more accurate knowledge of environmental impact of transgenic variety deployment	Increased food security and new income generation by reducing production costs and offering new products to the processing industry
2009	Sweetpotato transformation intragenic vector is available for researchers worldwide	Materials			
2009	Field resistance of transgenic potato with programmed hypersensitive resistance to LB is assessed in the US	Other kinds of knowledge			
2009	Spectrum of resistance to LB in selected events of transgenic potato with the $R_{pi-blb1}$ gene is tested in biosafety greenhouse in Peru	Other kinds of knowledge			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2009	Sweetpotato events with new SPCSV resistance constructs tested for virus resistance in greenhouse	Materials			
2009	Socio-economic impact study of virus and weevil of sweetpotato in DR Congo (Kivu province), Burundi, Rwanda, and Uganda is available	Other kinds of knowledge			
2010	Proof-of-concept of the sweetpotato intragenic vector is achieved	Other kinds of knowledge			
2010	Proof-of-concept of gene flow prevention systems are tested in sweetpotato	Other kinds of knowledge			
2010	Level of resistance to LB in selected events of transgenic potato with the $R_{pi-blb1}$ gene is tested in confined field trials in Indonesia	Materials			
2010	Transformed events of cv. Jewel with Bt genes are available for testing sweetpotato weevil resistance in the greenhouse in the US and / or Africa	Materials			
2010	Effectiveness of Bt sweetpotato events are demonstrated in field trials in one SSA country	Materials			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2011	Impact of glucosinolate content of transgenic potato against pests and pathogens is assessed	Other kinds of knowledge			
2011	Field trials of transgenic Desiree plants resistant to PLRV are conducted in Uzbekistan	Materials			
2011	Construct combining Bt genes and SPVD resistance is available	Materials			
2011	Regulatory file for one Bt sweetpotato event in one SSA country is produced.	Other kinds of knowledge			
2011	Resistance of transgenic events to SPFMV, SPCSV and SPVD is determined in greenhouse/field in Africa	Materials			
<b>Output 5</b>	Novel genotyping and phenotyping tools and screening strategies for efficient potato and sweetpotato germplasm characterization and enhancement		CIP, NARS and commercial variety development programs	Breeding programs more accurately identify durable resistance a lower cost and in more timely fasion	Farmers livelihoods improved by more timely and appropriate germplasm
2009	A new modeling tool that integrates genetic, genomic and environmental data is available for use in breeding	Practices			



Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2009	One scale for quantifying late blight resistance developed and available globally	Practices			
2009	Real time PCR method for rapid screening of sweetpotato germplasm for SPVD resistance developed	Practices			
2009	Real time PCR method for quantifying R. solanacearum colonization of potato plants developed and available	Practices			
2009	New rapid multiplex assays for Ry marker detection in potato are developed and available	Practices			
2010	High-throughput low cost MAS system for Ry introgression in potato developed	Practices			
2010	Robust screening technique for identifying resistance to R. solanacearum in potato germplasm developed and available	Practices			
2010	Utility of SPVD screening method demonstrated on a panel of putative sweetpotato germplasm with varying degrees of resistance	Practices			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2010	Potential for measuring the resistance phenotype of late blight resistance trans genes in the greenhouse in Lima as model system determined	Practices			
2010	In vitro tests for salinity, drought and heat tolerance in potato validated and available	Practices			
2010	Sequence-based allele mining and gene discovery technologies to identify and characterize new sources of resistance to potato late blight developed and available	Practices			
2010	Scale for late blight resistance assessment validated in breeding trials	Practices			
2010	Molecular markers to assist and expedite selection for high levels of resistance to PLRV available	Practices			
2010	Utility of conserved orthologous set (COS) gene markers for mapping and diversity assessment in potato and sweetpotato demonstrated	Practices			
2011	New high throughput spectroscopic method for biological identification of varieties evaluated	Practices			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2011	Selected potato germplasm characterized for resistance to R. solanacearum.	Materials			
2011	Molecular markers available to assist and expedite selection for extreme resistance to SPVD	Practices			

## 4. Crop management for sustainable intensification of potato and sweetpotato based cropping systems

### *Project Overview and Rationale*

**Problem analysis.** Potato and sweetpotato farmers in developing countries face several biotic and abiotic constraints that reduce crop productivity. These constraints have the risk of becoming more serious treats because of climate change. The main constraints of global importance that affect the potato crop are the diseases late blight, bacterial wilt and a number of viruses, and insect pests of global and regional importance including the potato tuber moth complex, potato Colorado beetle, leaf miner fly and the Andean potato weevil. The main biotic constraints to sweetpotato production include viruses, sweetpotato weevil and white fly. The lack of high quality planting material is a common problem for both crops in developing countries where commercial seed production systems are virtually non-existent, and were more frequent extreme climatic events limit severely farmers possibilities of keeping seed from one season to the other. In addition, soil fertility is declining in many developing countries, affecting the present and future productivity of these crops, which are planted to a large extent in marginal areas. The incidence of different constraints depends on regions and countries; however, often several constraints affect crop productivity, which consequently reduces farmer competitiveness, income and food security. The latter has become a serious problem because of the increase in food prices in recent years. Biotic constraints also lead to the use of highly toxic pesticides that pose a serious risk to human health and environment. In addition, NARS scientists in developing countries have limited access to suitable information, technologies and methods, which influence their capacity to develop and deliver sustainable technologies. Due to increasing temperature globally, pathogens and insect species are expected to increase their range, but the risk of expanding pest distribution, especially in developing countries, has still not been sufficiently addressed.

**Identification of specific problems to be tackled with research.** The lack of quality planting material for potato and sweetpotato in developing countries is addressed through research to improve formal and farmer-based (self-supply) seed systems, which in turn becomes a key vehicle for the dissemination of new improved varieties. Agronomic management plays an important role for the production of both seed and ware potatoes and sweetpotatoes. Increasing the efficiency of scarce resources for crop production and safe-guarding the environment of possible negative effects of agricultural activity is one of the main objectives for the project. The project also focus on the development of control components for diseases and insects respectively; for this purpose basic research to understand the biophysical principles of pests is conducted at a preliminary stage, to transform this knowledge into tools and management components in a later stage. The agro-ecology team applies and tests ecological concepts and principles for this purpose. An additional area of research is directed at developing participatory methods and strategies for assessing management components in response to specific needs and socio-economic conditions of farmers. The project focuses on the development of general principles and methods for crop management and looks at scaling-up and out strategies giving priority to provide training to NARS scientists. Thus, the partner institutions in developing countries will use such principles and methods to fine tune components, integrate them and scale-up and out specific crop management technologies according to their priorities.

**Objectives.** The goal of the ICM Project is to reduce poverty and hunger and contribute to sustainable intensification of potato and sweetpotato based systems towards maximizing productivity by developing and disseminating new and adapted crop management technologies. The fundamental entry point for integrated management is through varieties, where available, with improved characteristics for addressing biotic and abiotic stress, and also assessing risks from emerging challenges, such as climatic change.

### *Alignment to CGIAR Priorities*

The outputs of this project are related to different system priorities, and most of them to several priorities at the same time. However, here we describe the priorities with which the outputs are more related. Output 1 of the project, related to potato and sweetpotato seed systems, is linked to priorities 4A and 5D. Output 2 dealing with disease management is linked to priority 2A. Output 3 on integrated insect pest management is linked to priority 4D. Output 4 about participatory research and capacity building is linked to priority 5C.

## ***Outputs Description***

### ***Changes from previous MTP Outputs***

The project has changed its name from "Integrated Crop Management" to "Crop Management for Sustainable Intensification of Potato and Sweetpotato based Cropping Systems". The reason for the change is for increasing the emphasis on the development of international public goods (knowledge, information, principles, methods and technologies) for solving problems caused by the main potato and sweetpotato constraints, particularly in light of potential changes, such as climate and system intensification, and for contributing to the expression of the genetic potential of new varieties developed by the Center. There is a reduced emphasis on developing integrated solutions, because the integration of crop management components is highly influenced by site-specific conditions. The Project aims at enhancing NARS capacities to integrate management components and develop site-specific solutions based on the international public goods developed through research.

There have been some changes in the outputs of this project. Output number 1 will continue working on the development of technological, methodological and institutional strategies for improving seed systems, but emphasizing research to contribute to the efficient dissemination of CIP-derived varieties. This output will also include a minor component on agronomic research in order to support seed production.

Output 2 in the 2008 MTP was related to developing strategies for technical integration of management components. Because of the reduced emphasis on integrative research described above, this output is not part of the 2009 MTP. Relevant output targets have been included in Output 1 or in Project 5.

The previous Output 3 in the 2008 MTP, about integrated disease management, will be now Output 2 in the 2009 MTP. It will continue looking at disease management, but giving emphasis to assessing the risk of changes in pathogen population, migration, severity and intensity, due to changes in climate or system intensification.

The previous Output 4 in the 2008 MTP, about integrated insect-pest management, will be now Output 3 in the 2009 MTP and will continue working on developing knowledge and technologies for integrated pest control based on agroecological principles, but will also pay attention to developing methods for assessing pest risk under climate change and system intensification scenarios.

The previous Output 5 in the 2008 MTP will be now Output 4 in the 2009 MTP, and will continue addressing methodological research on participatory methods for crop management, but will put more emphasis on capacity building oriented to NARS so that they can plan, design, develop, assess and disseminate more appropriate technologies to respond to the needs of the poor.

**Output 1.** Strategies and technologies for improving seed systems, contribute to CIPs variety dissemination and improve agronomic management towards sustainable intensification of potato and sweetpotato cropping systems validated in at least three priority countries per region (LAC, SSA, Asia) by 2012

Description. This output is oriented to develop technologies for the improvement of potato and sweetpotato seed systems. Research and capacity building are oriented to improve both formal and farmer-based seed systems, and also to define strategies for more efficient dissemination of improved varieties, accompanied by appropriate agronomic management. The improvement of seed quality will contribute to enhance crop productivity, farmer efficiency and competitiveness. The output contributes to priorities 4A and 5D in particular to improve the quality of the context where the poor use their assets and to reduce risks (production, climate and market) affecting livelihoods of smallholders.

Alignment to CGIAR Priorities. 4A - Promoting integrated land, water and forest management at landscape level; 5D: Improving research and development options to reduce rural poverty and vulnerability.

Countries of Planned Research. Bangladesh; Bhutan; Bolivia; China; Ecuador; Ethiopia; Georgia; India; Kenya; Kyrgyzstan; Malawi; Mozambique; Nepal; Papua New Guinea; Peru; Sri Lanka; Tajikistan; Tanzania; Uganda; Uzbekistan.

**Output 2.** Technologies for the management of LB, viruses and BW developed and capacities for assessing the risk due to changes in pathogen population, climate and systems intensification assessed in at least three priority countries per region by 2012.

Description. Developing environmentally friendly components for the management of diseases, particularly to control late blight and viruses, uses improved varieties as their fundamental building block, and will contribute to improved breeding targeting through understanding host-pest interactions, pest evolution and the initiation and development of epidemics. Reducing the impact of these yield-reducing constraints improves the capacity of sustainable gains in productivity through genetic improvement and enhances competitiveness of potato and sweetpotato-based systems. This output is linked to priority 2A.

Alignment to CGIAR Priorities. 2A - Maintaining and enhancing yields and yield potential of food staples.

Countries of Planned Research. Burundi; Congo; Ecuador; India; Indonesia; Kenya, ILRI HQ ; Malawi; Mozambique; Papua New Guinea; Rwanda; Tajikistan; Uganda; Uzbekistan.

**Output 3.** Components and strategies for the integrated management of potato and sweetpotato pests of global and regional importance and tools for assessing pest risks under climate change and system intensification developed and tested in at least three priority countries per region by 2012.

Description. Developing environmentally friendly insect-pest management alternatives is based on understanding ecological concepts and principles and assessing herbivore/natural enemy (predators, parasitoids and entomopathogens) and plant interactions and inter-relationships taking into consideration the effects of landscape fragmentation and complexity in agro-ecosystems and its vulnerability to climate change. This understanding allows the design of strategies for conservation and enhancement of natural enemies to stabilize agro-ecosystems and counteract a wide range of potato and sweetpotato insect pests. For key pests, biocontrol-based integrated pest management strategies will be developed and applied aiming at reducing the use of highly toxic pesticides. Global Warming will affect pest abundance and severity in agricultural and horticultural crops and will most likely increase the yield and quality losses caused by pests. Climate change can also dissociate predator or parasitoid-prey relationships because higher trophic levels appear to be more sensitive to climatic variability or have different temperature optima compared to pests. Modeling tools will be developed and tested to predict climate change effects on potato and sweetpotato pests and related parasitoids for preparing adaptive strategies. This output is related to priority 4D, particularly to the specific goal 6.

Alignment to CGIAR Priorities. 4D - Promoting sustainable agro-ecological intensification in low- and high-potential areas.

Countries of Planned Research. Bangladesh; Bhutan; Bolivia; China; Ecuador; Kenya; Nepal; Peru; Philippines; Uganda.

**Output 4.** Participatory strategies and methods developed, and capacity building undertaken with an innovation systems approach for sustainable intensification of potato and sweetpotato cropping systems in at least three priority countries per region by 2012.

Description. The output focuses on methodological research for developing technologies with the participation of farmers and other components of the potato innovation system in order to identify entry points and scaling-up and out strategies for new approaches and technologies. The output is also looking at strategies for more efficient capacity building on crop management oriented to NARS. Developing participatory methods and strategies to help NARS and CIP to be more responsible to the needs of the poor is linked to the system priority 5C, particularly to the specific goal 1 of this priority.

Alignment to CGIAR Priorities. 5C - Improving rural institutions and their governance.

Countries of Planned Research. Bolivia; China; Ecuador; Ethiopia; Georgia; India; Indonesia; Kenya; Malawi; Mozambique; Papua New Guinea; Peru; Philippines; Solomon Islands; Uganda; Uzbekistan.

## ***Impact Pathways by Output***

**Output 1.** Strategies and technologies for improving seed systems, contribute to CIPs variety dissemination and improve agronomic management towards sustainable intensification of potato and sweetpotato cropping systems validated in at least three priority countries per region (LAC, SSA, Asia) by 2012.

The products from this output include strategies for improving the formal and farmer-based seed systems and capacity strengthening to NARS and extension organizations. Strengthening seed systems will also contribute to the dissemination of new improved varieties. Users are researchers, development professionals and seed growers and farmers.

The impact pathway of improvements in seed systems and agronomic management, and more efficient variety dissemination will be reflected in productivity and income increase, poverty and hunger reduction, more efficient use of resources, decrease in the risk to abiotic stresses (i.e. drought), and better access to nutritious food for farmers. In regions such as Africa or Asia this is particularly important for farmers who produce potato as a high value crop and need to improve their competitiveness for taking advantage of emerging market opportunities. In the Andean region this strategy would help subsistence farmers to achieve food security, but also to initiate interactions with niche markets, for example, for marketing native potatoes. The relative strength of NARS has a direct influence on the possible development of formal seed systems and the improvement of agronomic management. CIP will play a primary role in identifying bottlenecks that limit the improvement of seed systems and agronomic management, and conduct research to solve some of the constraints. CIP will not only play a catalytic role linking institutions from the public and private sector to address technological challenges but also strengthen their capacities to advance this process. Intermediate users of the technology (NARS, including universities, NGOs and farmer organizations) will play an important role for adjusting and scaling-up technologies and strategies according to local conditions.

The impact pathway for the adoption of new improved varieties was described in detail in Project 3 and will not be repeated here.

**Output 2.** Technologies for the management of LB, viruses and BW developed and capacities for assessing the risk due to changes in pathogen population, climate and systems intensification assessed in at least three priority countries per region by 2012.

The products of this output include extending the understanding of the evolution of diseases, the intricacies of disease-host interactions and the initiation and growth of epidemics. As appropriate for investments in SP 2A, this will improve the efficiency and effectiveness of the development of stable, broadly adapted varieties, and the development of suitable disease control technologies. Close collaboration among crop protection and crop improvement specialists enhances the development and delivery of varieties as the cornerstone of integrated disease management practices.

The impact pathway of improved varieties flows through scenarios of improved productivity and sustainable intensification of the potato and sweetpotato. This contributes to income generation, poverty and hunger reduction, improving access to safe food, and to help farmer to link with the markets more competitively. In addition, disease management will help reduce dependence on pesticides with the consequent positive impact on the environment and human health. CIP will play a facilitating role for supporting access of NARS to scientific knowledge and technologies and enabling institutions to develop, apply and make available disease management for the final users of the technology (farmers).

**Output 3.** Components and strategies for the integrated management of potato and sweetpotato pests of global and regional importance and tools for assessing pest risks under climate change and system intensification developed and tested in at least three priority countries per region by 2012.

The development of insect control technologies will allow farmers to benefit from new varieties for longer periods, or to manage their own varieties when no sources of resistance are available. This has implications for improved productivity, quality (reflected in better prices), and production costs towards sustainable intensification of potato and sweetpotato systems. Improved pest management will contribute to income generation, poverty and hunger reduction, and to help farmer to link with the markets more competitively. In addition, integrated insect management will help reduce dependence on pesticides with the consequent positive impact on the environment and human health. CIP will play a facilitating role for supporting access of

NARS to scientific knowledge and technologies and enabling institutions to develop, apply and make available insect management information and technologies for the final users (farmers).

**Output 4.** Participatory strategies and methods developed, and capacity building undertaken with an innovation systems approach for sustainable intensification of potato and sweetpotato cropping systems in at least three priority countries per region by 2012.

The output will include the assessment of participatory research strategies and methods in order to support the development and dissemination of potato and sweetpotato crop management technologies according to local needs and socioeconomic conditions of farmers. The output also includes characterizing potato innovation systems, extracting lessons and guidelines about scaling-up from several cases. This output is related to institutional learning, aiming at contributing to improve the efficiency of the potato and sweetpotato innovation systems in terms of responding more efficiently to the needs of the poor, including looking at potential new scenarios, such as climate change, and ways to support farmers' preparedness. Methods change or adjustment will depend on the existence of institutional environments, which enable innovation and such environments vary from country to country. CIP will play a primary and secondary role for research, according to the strength of the NARS, will take advantage of experiences developed by other research and development organizations, and will play a catalytic and facilitation role towards capacity building for NARS, in coordination with local or regional universities.

### ***International Public Goods***

The project has a strong focus on IPG through the development of knowledge of biophysical principles related to the main potato and sweetpotato constraints and their changes and risks due to emerging conditions (market, climate, and intensification). The project also generates IPGs that include management components, principles, strategies and methods to support NARS in their work of fine tuning technologies to local conditions. Outputs 2 and 3 will involve the development of technically oriented IPGs where CIP has a comparative advantage built on its extensive knowledge about potato and sweetpotato constraints in developing countries and its long standing expertise in linking NARS and ARIs. CIP has the global mandate to continuously monitor risks inherent in pest and disease threats. Output 1 IPGs will include technologies and methods for improving seed systems, and Output 4 IPGs will include knowledge, principles and participatory methods, an area in which CIP has long experience.

### ***Elaboration of Partners Roles***

Country	Major Partner	Strategic Role and Complementary Capability	Project (Output)
Australia	Department of Primary Industries, Victoria	Participates in R&D project in Papua New Guinea	4 (2)
Australia	University of Queensland	Participates in R&D project in Papua New Guinea	4 (2)
Australia	IPM Technologies Pty Ltd.	Exchange of beneficial insects for potato tuber moth control and large scale field testing of CIPs technologies (attract-and-kill)	4 (3)
Bangladesh	Bangladesh Agriculture Research Institute/ Tuber Crop Research Centre	True Potato Seed (TPS) to improve farmer-based seed systems.	4 (1)
Bolivia	PROINPA	Contributes with human, financial support and logistic facilities for conducting ICM-related research	4 (1, 2, 3,4)
Burundi	ISABU	Contributes with human resources and facilitates technology evaluation with farmers	4 (2)
Bhutan	Bhutan Potato Development Program	Human resources, for the validation and dissemination of seed production models	4 (1)



Country	Major Partner	Strategic Role and Complementary Capability	Project (Output)
		Contributes with human, financial support and logistic facilities for conducting IPM-related research and dissemination	4 (3)
Cameroon	Inst. of Agricultural Research for Development	Contributes with human resources and facilitates technology evaluation with farmers	4 (2)
Canada	Agriculture and Agri- Food	Coordination and development of network in GILB	4 (2)
China	Northeast Agricultural University	Facilitates technology evaluation with farmers	4 (2)
		Contributes with funding for students and facilitates linkages with research teams in developed countries in Europe	4 (3)
Congo	Institut National Pour l'Etude et la Recherche Agronomiques -INERA	Collaboration for virus related research	4 (2)
Ecuador	World Neighbors	Cultivar diffusion strategies	4 (2,4)
Ecuador	Instituto Nacional Autónomo de Investigaciones Agropecuarias - INIAP	Contributes with human, financial support and logistic facilities for conducting IPM-related research and dissemination	4 (4)
		Contributes with human and financial resources for conducting IPM research	4 (3)
Ecuador	Escuela Politécnica de Chimborazo (ESPOCH)	Supervision of Master students involved in potato and horticulture IPM research	4 (2,3)
		Contribute to validate farmer-based seed technologies with the Seed Growers' Associations assisted by the NGO	4 (1)
Ethiopia	HZPC	Collaboration for seed related research	4 (1)
Ethiopia	Ethiopian Institute of Agricultural Research (EIAR)	Contribute with human resources for seed, participatory research and training	4 (1,4)
Ethiopia	Ministry of Agriculture and Rural Development (MoARD)	Collaboration for virology research and training	4 (2,4)
Ethiopia	Solagrow	Collaboration for seed production and training	4 (2,4)
Georgia	NGO IAAD, Tbilisi; Crop Husbandry Institute, Mtsketa-Tserovani	Contribute to validate farmer-based seed technologies with the Seed Growers' Associations assisted by the NGO; contribute with virus detection techniques to establish a seed quality control system	4 (1)
Germany	Institute of Biological Control, BBA	Contributes with expertise on biological control, particularly for baculovirus-related research	4 (3)
Germany	University of Hohenheim	Contribute with students to conduct research as part of Master and PhD programs	4 (3)
Germany	University of Kiel	Contributes with expertise on entomopathogenic nematode research and taxonomic identification and with students to conduct research as part of Master programs.	4 (3)
Guatemala	Instituto de Ciencia y Tecnología Agrícolas ICTA	Contributes with human resources and expertise to identify parasitoids for <i>Tecia solanivora</i>	4 (3)

Country	Major Partner	Strategic Role and Complementary Capability	Project (Output)
India	Department of Agriculture Nagaland and University of Nagaland	Contributes with human resources for the validation and dissemination of positive and negative selection of clonal seed and True Potato Seed (TPS) to improve farmer-based seed systems.	4 (1)
India	Departments of Agriculture/Horticulture, Arunachal Pradesh, Meghalaya, Mizoram, Nagaland and Sikkim	Contributes with human resources to facilitate aphid and virus monitoring and sampling and GPS handling for data collection to identify suitable regions for quality seed production	4 (2)
India	CPRI	Contribute with human resources for virology related research	4 (2)
India	Indian Council of Agriculture Research/Central Potato Research Station	Contributes with human resources and laboratory facilities to aphid/virus monitoring and sampling and GPS handling for data collection to identify quality seed production sites	4 (2)
India	MI-Micronutrient Initiative	International Development Organisation- Consumption studies on OFSPs in Orissa, Bihar and Uttar Pradesh states in India	4 (1)
Italy	Food and Agriculture Organization	Collaboration for seed related research	4 (1)
Kenya	University of Nairobi	Facilitate access to lab facilities and technology evaluation with farmers. It leads the ASARECA-funded project on seed and BW management.	4 (1, 2, 3, 4)
Kenya	The International Centre of Insect Physiology and Ecology (ICIPE)	Contributes with human and financial resources and facilities to conduct IPM research	4 (3)
Kenya	Kenya Agricultural Research Institute (KARI)	Contributes with human and financial resources and facilities to conduct IPM research	4 (3,4)
Kenya	Ministry of Agriculture	Collaboration for capacity building on seed production	4 (4)
Kyrgyzstan	Aga Khan Foundation, MSDSP Project, Osh	Contribute to validate farmer-based seed technologies, including TPS technology, with the Seed Growers' Associations assisted by the NGO	4 (1)
Nepal	Potato Development Section / Potato Research Program of NARC	Potato research including testing of True Potato Seed (TPS) hybrids	4 (1)
Nepal	Nepal Agricultural Research Council (NARC)	Contributes with human resources and facilities to conduct IPM research	4 (3)
Papua New Guinea	National Agricultural Research Institute (NARI)	Introduction and testing of Potato Clones in Papua New Guinea	4 (2)
		Contributes to the evaluation of the productivity of sweetpotato mould systems	4 (3)
Papua New Guinea	Fresh Produce Development Agency (FPDA)	Collaboration for late blight related research	4 (2)
Peru	Instituto Nacional de Innovación Agraria (INIA)	Contributes with human resources for conducting research related to IPM, soil and seed management	4 (1, 2, 3)

Country	Major Partner	Strategic Role and Complementary Capability	Project (Output)
Peru	SENASA	Contributes with human and financial resources for virology related research	4 (2)
Peru	Universidad Nacional Agraria La Molina	Contributes with expertise for taxonomy of insects and research related to disease control	4 (3)
Peru	Centro de Investigaciones en Recursos Naturales y Medio Ambiente CIRNMA (Peru NGO)	Contributes to test crop management technologies, particularly on soil fertility management	4 (1)
Peru	Universidad Nacional del Centro (UNC)	Contributes with students to conduct research as part of Master programs as well as with human resources for taxonomy studies of plants	4 (3)
Peru	Valle Grande	Contributes with human resources and facilities to potato IPM research	4 (3)
Philippines	Tarlac College of Agriculture	Production of sweetpotato clean planting materials, linking farmers with markets	4 (1,4)
Philippines	Philippine Rootcrops Research and Training Center	Production of sweetpotato clean planting materials, linking farmers with markets	4 (1,4)
		IPM for sweetpotato weevils	4 (3)
Philippines	University of the Philippines Los Baños	Production of sweetpotato clean planting materials, linking farmers with markets	4 (1,4)
Philippines	DA-NOMIARC	Facilitates technology evaluation with farmers.	4 (2)
Philippines	UPWARD	Facilitates contacts with research and development institutions in Asia for conducting participatory research related to ICM	4 (1, 2, 4)
		Contributes with expertise for research related to LB epidemiology	4 (2)
Rwanda	Institut des Sciences Agronomiques du Rwanda (ISAR)	Collaboration for virology related research	4 (2)
Sweden	Swedish University of Agricultural Sciences	Contributes with human and financial resources to conduct research as part of Master and Postdoc programs	4 (3)
Switzerland	Swiss Federal Institute of Technology Zurich (ETH)	Provides scientific and technological knowhow on biochemical-analytical technologies and support to MSc and PHD students	4 (2)
Tajikistan	NGO Tukhmiparvar, Dushanbe	Contribute to validate farmer-based seed technologies with the Seed Growers assisted by the NGO; introduce TPS technology as an alternative seed production technique in marginal areas	4 (1)
Tajikistan	Institute of Plant Physiology and Genetics, Academy of Sciences, Dushanbe	Contributes with expertise and facilities in establishing a system for production of diagnostic antisera, laboratory and field diagnostic kits for potato plant viruses	4 (2)
Tanzania	Department of Research and Development (DRD)	Collaboration for seed related research and training	4 (1)
Uganda	National Agricultural Research Organization	Facilitates access to lab facilities and the evaluation of technology and participatory research methods with farmers	4 (1, 2, 4)

Country	Major Partner	Strategic Role and Complementary Capability	Project (Output)
United Kingdom	Natural Resources Institute	Provides access to human resources for work related to participatory research and training methods in SSA	4 (4)
USA	Cornell University	Contributes with top expertise on modeling work for LB-related research	4 (2)
USA	University of California	Contributes with expertise for taxonomy and biocontrol-related work	4 (3)
USA	USDA-ARS	Access to expertise on biocontrol and PTM management in other environments and cropping systems	4 (3)
Uzbekistan	Laboratory of Virology of the Institute of Genetics and Plant Experimental Biology, Tashkent	Contribute with virus detection (DAS-ELISA) for initiating clean seed production; virus survey in Uzbekistan	4 (1,2)
Uzbekistan	Dept. of Entomology of Tashkent State Agrarian University	Contribute to potato pest identification and aphid monitoring	4 (3)
Uzbekistan	National University of Uzbekistan	Contribute with tissue culture facilities and other infrastructure for initiating clean seed production	4 (1,3)
Central Asia and Caucasus	Collaborative Research Program for Sustainable Agricultural Development in Central Asia and the Caucasus	Facilitates contacts with research institutions in Central Asia and the Caucasus for conducting research related to seed management.	4 (1,3)
Latin America	Papa Andina	Development of late blight management capacity	4 (2)

## Logical Framework

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
<b>Output 1</b>	Strategies and technologies for improving seed systems, contribute to CIPs variety dissemination and improve agronomic management towards sustainable intensification of potato and sweetpotato cropping systems validated in at least three priority countries per region (LAC, SSA, Asia) by 2012		NARS, NGOs, potato and sweetpotato growers, certification agencies, seed growers associations and cooperatives.	Quality seed available for farmers, contributing to improving productivity and competitiveness, to disseminating new breeding materials, and reducing the spread of potato and sweetpotato diseases.	Enhanced livelihoods of poor potato and sweetpotato farmers due to increased potato and sweetpotato productivity.
2009	Strategy for improving farmer-based seed potato systems developed and validated for Peru (for native cultivars), Tajikistan and Kyrgyzstan.	Other kinds of knowledge			
2009	Comparative analysis of potato seed systems in subtropical highlands, lowlands and temperate regions of China and South East Asia carried out.	Other kinds of knowledge			
2009	Feasibility of using aeroponics for the production of pre-basic potato minitubers as a replacement for methyl bromide sterilized substrate assessed in Peru and China.	Practices			
2009	Technical options for low-input (organic) potato production evaluated in Peru, and implications for regional application analyzed (with Papa Andina).	Practices			
2009	Seed supply system, access to varieties, and information about how sweetpotato production/seed systems relate to farmer overall agricultural livelihoods documented in selected highland and lowland regions of Papua New Guinea.	Capacity			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2009	Develop Quality Declared Seed protocols for sweetpotato, ARTCs and potato in collaboration with FAO and appropriate NARS and capacity building provided to key stakeholders	Other kinds of knowledge			
2010	Role of positive and negative selection combined with disease-detection techniques evaluated and documented for its contribution to improve formal and farmer-based potato seed systems in Peru, Mozambique, Malawi and Georgia.	Other kinds of knowledge			
2010	<b>Output Target</b> <b>2010:</b> A strategy for promotion and diffusion of candidate potato varieties implemented in at least two CAC countries	Other kinds of knowledge			
2010	Strategies for improving farmer-based sweetpotato seed systems developed for subtropical lowland systems in Bangladesh, India and Sri Lanka.	Other kinds of knowledge			
2010	Factors influencing potato seed degeneration in high altitudes determined in Peru.	Other kinds of knowledge			
2010	Genotype by environment interactions in the production of pre-basic potato minitubers by aeroponics studied in a range of latitudes and altitudes in Malawi, Kenya and the Peruvian Andes	Other kinds of knowledge			
2010	Model for estimating and predicting potato seed degeneration developed in Peru.	Other kinds of knowledge			
2010	One country-specific network of public and private institutions established and assessed, and capacity building provided	Other kinds of knowledge			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
	to key stakeholders, for multiplication and dissemination of good-quality potato seed in Peru, Ecuador, Uganda, Kenya, Ethiopia, Malawi, Kyrgyzstan and Tajikistan.				
2010	True potato seed (TPS), as an alternative seed potato production technology, tested and documented in Northeast India, Nepal, Uzbekistan, Tajikistan and China.	Practices			
2010	Strategies for improving formal and farmer-based seed systems developed and documented, and NARS capacity strengthened in three countries of in South West and Central Asia.	Other kinds of knowledge			
2010	Role of National potato seed policies and regulations on the sustainability and effectiveness of seed systems in SSA (Eastern and Central Africa) and Peru evaluated.	Policy strategies			
2010	Appropriate integrated crop management technologies for potato-seed production in stress environments identified and documented in Malawi and Mozambique with potential application to other SSA regions.	Practices			
2010	Strategies for the year-round supply of sweetpotato planting material for the Lake Victoria zone of East Africa developed, and training provided to key stakeholders.	Other kinds of knowledge			
2010	Technologies developed for use of plant growth promoting rhizobacteria (PGPR) in intensive cropping systems (potato seed production and urban agriculture) in Peru	Practices			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
	(with Papa Andina and Urban Harvest).				
2010	Integrated management for the potato crop for main improved potato varieties validated for subsistence and market-oriented systems in China.	Practices			
2011	Strategies for improving farmer-based sweetpotato seed systems developed for Solomon Islands with application for other areas of the Pacific region.	Other kinds of knowledge			
2011	Feasibility and appropriateness of using aeroponic technology for the production of pre-basic potato minitubers in the highland tropics of Africa and South America evaluated.	Other kinds of knowledge			
2011	Extrapolation of likely potato seed production sites from degeneration trial data from selected sites in NE India validated.	Other kinds of knowledge			
2011	Strategies for scaling out seed-related interventions for improving formal and farmer-based sectors assessed and documented in Kenya, Uganda Ethiopia, Malawi, Tanzania and Mozambique and potential for replication in other SSA countries analyzed.	Other kinds of knowledge			
2011	Role of the private sector on improving seed systems and disseminating CIP varieties documented in Ethiopia	Other kinds of knowledge			
2011	The quality declared seed approach assessed for potato and sweetpotato in Peru, Uganda and Ethiopia.	Other kinds of knowledge			
2011	Minumum tillage system for potato production in China evaluated and its potential for out-scaling assessed.	Practices			



Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2011	Seed-system model, linking biological and socio-economic aspects, developed for the potato crop in highland agriculture in Peru.	Other kinds of knowledge			
2011	Assessment of suitable seed production sites in NE India through GIS extrapolated aphid monitoring exercises and validation through ground-truthed degeneration studies.	Other kinds of knowledge			
<b>Output 2</b>	Technologies for the management of LB, viruses and BW developed and capacities for assessing the risk due to changes in pathogen population, climate and systems intensification assessed in at least three priority countries per region by 2012.		NARS, NGOs, resource-poor farmers.	Potato and sweetpotato farmers adopt improved disease management components, contributing to reduce crop losses and use of fungicides.	Enhanced livelihoods of poor potato and sweetpotato farmers due to increase in potato and sweetpotato productivity, and reduced negative impact of fungicides in the environment.
2009	GIS modeling tool for assessing effects of climate change on LB disease developed	Other kinds of knowledge			
2009	Efficacy of phosphonate for LB control tested in Peru, Ecuador and Papua New Guinea.	Other kinds of knowledge			
2009	Spore dispersal dynamics of <i>Phytophthora infestans</i> (LB) quantified by field trials in highland tropical conditions in Ecuador.	Other kinds of knowledge			
2009	Predictions of likely spread of Potato yellow vein virus in the Andes by ground truthing surveys validated and model improved as appropriate.	Other kinds of knowledge			
2009	Potato virus distribution in different agro-ecological conditions of Uzbekistan determined.	Other kinds of knowledge			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2009	System for production of diagnostic antisera, laboratory and field diagnostic kits for potato plant viruses established by a previous FAO project assessed in Tajikistan to serve regional purposes (CAC)	Other kinds of knowledge			
2009	The importance and incidence of major viruses affecting sweetpotato determined in Rwanda, Burundi, D.R. Congo (Kivu districts only) and Uganda.	Other kinds of knowledge			
2010	Map and database of <i>Phytophthora infestans</i> diversity from five target countries, elaborated with Eucablight software, available	Other kinds of knowledge			
2010	Generic model for spore dispersal and mobility of <i>Phytophthora infestans</i> available.	Other kinds of knowledge			
2010	Ex ante assessment of R gene durability and comparison of deployment strategies for LB available	Other kinds of knowledge			
2010	Risk assessment of increased LB severity due to climate change completed.	Other kinds of knowledge			
2010	Durability of resistance gene to LB from <i>S. bulbocastanum</i> tested in Ecuador, Peru and Indonesia.	Other kinds of knowledge			
2010	Usefulness of BW-tolerant potato clones in integrated management of BW tested with farmers and the two best clones with stable resistance selected by NARS in Kenya and Uganda.	Materials			
2010	Importance of BW in potato production determined in Malawi and Mozambique.	Other kinds of knowledge			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2010	Effects of soil fertility management on plant and soil health evaluated in potato based cropping systems in at least two priority countries in Africa and Asia.	Other kinds of knowledge			
2010	Integrated soil and disease management strategies to control potato BW and other major soil-borne diseases while enhancing plant nutrition and soil health developed with farmers in Kenya, Uganda and Burundi by combining host resistance, soil fertility, and rotational management practices.	Other kinds of knowledge			
2010	One generic laboratory diagnostic method for all quarantine viruses and other pathogens of potato and sweetpotato developed and validated	Practices			
2010	Web based tools to communicate risk to interested parties of emerging potato and sweetpotato viruses and phytoplasmas developed	Other kinds of knowledge			
2010	Feasibility of regional capacity for the production of diagnostic antisera, laboratory and field diagnostic kits for plant viruses and bacteria of potato and sweetpotato assessed in at least two key countries in SSA, and in China.	Other kinds of knowledge			
2010	Global risk management tool to map emerging disease threats to potato and sweetpotato developed and implemented.	Other kinds of knowledge			
2010	Potato integrated disease management research outputs for Eastern Africa documented and published	Other kinds of knowledge			
2011	LB simulation model using new dispersion model developed	Other kinds of knowledge			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2011	Complete risk assessment for recombinant Potato virus Y strain in developing countries and communicate global risk to interested parties as a model system for communicating risk surrounding emerging virus diseases	Other kinds of knowledge			
2011	Capacity building activities conducted to train extension workers on integrated disease management in at least two main potato production provinces in China	Capacity			
<b>Output 3</b>	Components and strategies for the integrated management of potato and sweetpotato pests of global and regional importance and tools for assessing pest risks under climate change and system intensification developed and tested in at least three priority countries per region by 2012.		NARS, NGOs, resource-poor farmers, Universities, advanced labs, and private sector.	Potato and sweetpotato farmers adopt improved components for the integrated management of potato and sweetpotato insect pests, which contribute to reduce crop losses and the use of insecticides.	Enhanced livelihoods of poor potato and sweetpotato farmers due to increased crop productivity and reduced negative impacts of insecticides on human health and the environment.
2009	Potential strategies for natural enemy conservation to support self-regulation of potato pests in potato cropping systems of Peru (Andean highlands, coast) evaluated and documented.	Other kinds of knowledge			
2009	The efficacy and potential integration of entomopathogenic fungi in pest management strategies for LMF assessed in Peru.	Other kinds of knowledge			
2009	Insect life cycle modeling software (ILCYM) developed and validated for insect species of different orders and families.	Other kinds of knowledge			
2009	Phenology models for <i>L. huidobrensis</i> developed and potential distribution assessed globally by GIS.	Other kinds of knowledge			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2009	Biological control options (biopesticides and/or parasitoids) appropriate for resource-poor potato farmers in Nepal, Bhutan, Bangladesh verified and capacity building for local production of the agents provided.	Other kinds of knowledge			
2009	Feasibility study of introducing the parasitoid <i>Endovum puttleri</i> conducted and dossiers prepared according to the FAO Code of Conduct for its introduction to CAC.	Other kinds of knowledge			
2010	The efficacy and potential of entomopathogenic nematodes for pest management in the Andean Region (Peru, Ecuador and Bolivia) assessed and documented.	Other kinds of knowledge			
2010	IPM strategies for the potato crop in lowland (coast) and highland production systems of Peru assessed and documented.	Practices			
2010	Molecular tools for identifying LMF species and related principal parasitoids for the Andean region developed.	Other kinds of knowledge			
2010	Potato IPM technologies promoted through suitable training activities, and institutionalized by national programs in Nepal, Bhutan, Bangladesh.	Practices			
2010	Potato and sweetpotato pest problems and post harvest practices of potato and sweetpotato farmers in China understood and biological control options appropriate for resource-poor farmers identified; IPM technology interventions developed with application in other Asian countries.	Other kinds of knowledge			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2010	Risk of establishment and changes in the distribution of three potato tuber moth species in response to climate change forecasted through spatial phenology modeling.	Other kinds of knowledge			
2011	Potato IPM technologies for lowland (coast) and highland production systems of Peru validated in action research with farmers and capacity building provided to research and development organizations.	Practices			
2011	Promotion and institutionalization of new potato IPM technologies (through national programs) assessed in Peru, Ecuador and Bolivia.	Other kinds of knowledge			
2011	Strategies for the integrated management of the sweetpotato weevil assessed in three priority countries in Africa and Asia.	Other kinds of knowledge			
2011	Effect of climate change on the phenology and potential efficacy of parasitoids of main potato pests assessed through modeling for adaptation planning.	Other kinds of knowledge			
2011	Biology and ecology of the bud midge, an emerging potato pest at the coast of Peru, assessed and phenology models developed to understand its future impact on agriculture under Climate Change.	Other kinds of knowledge			
2011	IPM technologies including biological control for the bud midge developed and tested in potato and other horticultural crops at the coast of Peru.	Practices			
<b>Output 4</b>	Participatory strategies and methods developed, and capacity building undertaken with an innovation systems		NARS researchers, extension workers, research and development	Research and development-oriented institutions use participatory strategies and methods for	Improved capacities of NARS to design evaluate and implement more efficient

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
	approach for sustainable intensification of potato and sweetpotato cropping systems in at least three priority countries per region by 2012.		institutions.	socioeconomic integration of potato and sweetpotato ICM to adapt, adjust and fine tuning technologies according to local or regional conditions.	ICM-related interventions to contribute to improved farmer livelihoods.
2009	Extension capacity enhanced for the dissemination of improved sweetpotato production practices to improve cost-effectiveness of pig production in Papua New Guinea and lessons extracted for other countries in the Pacific Region.	Capacity			
2009	Farmers perceptions about climate change, causes, consequences and solutions documented through participatory methods in Peru.	Other kinds of knowledge			
2009	Guidelines for training NARS and extension personnel about how to characterize potato innovation systems available	Capacity			
2009	Facilitators guide for LB management validated in Philippines and Indonesia	Capacity			
2010	Facilitators guide for farmer learning potato ICM available in Ecuador and Peru	Capacity			
2010	Manual on methodologies for participatory learning and research on BW adapted for farmer training in Kenya, Uganda, Philippines and China.	Capacity			
2011	Appropriate ICM technologies for improving sweetpotato production in small Island agro-ecologies evaluated in technical and socioeconomic terms through participatory methods in Solomon Islands.	Other kinds of knowledge			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2011	Comparative analysis of effectiveness of participatory methods to enable farmers to improve their response to market demand, through appropriate potato ICM technologies, evaluated in Bolivia, Ecuador, Peru, Uganda, Kenya and Ethiopia	Other kinds of knowledge			
2011	Role of social and human capital for the formation and effectiveness of inter-organizational platforms to respond to farmer needs for potato ICM assessed in case studies in Peru, Uganda, Kenya , Ethiopia, India and Georgia.	Other kinds of knowledge			
2011	Innovation system related to participatory research for potato ICM, characterized in Mozambique Malawi, , Uzbekistan and Georgia and China, and a user-friendly method for this purpose developed	Other kinds of knowledge			
2011	In Ethiopia, Kenya and Uganda at least 180 qualified trainers, and 3,600 ware potato farmers will be trained on seed potato quality management by 2011	Capacity			
2011	Participatory methods adapted to gather, analyze and respond to farmers perceptions regarding climate change causes, effects and solution alternatives.	Other kinds of knowledge			



## **5. Systems approaches to build adaptive capacity in potato-and sweet potato-based systems**

### ***Project Overview and Rationale***

#### ***Problem analysis***

Sustainable agricultural development is at the core of the CGIAR mission statement. Nonetheless, the research programs of the centers have historically emphasized its contribution to this objective through increased crop yields. This approach had a tremendous impact in increasing food supplies and a reduction in the rate of expansion of the agricultural frontier, especially in Asia and to some extent in Latin America. However, focusing only on increasing food supply might produce a negative impact in the long run. This is particularly true when resources from a past era or from distant places subsidize the increment. An important issue is then whether agricultural growth can be compatible with conservation of the natural resource base. The biggest problem seems to be land and water degradation, which decreases crop yields and increase food costs, pushing many into poverty. Climate change, high food prices, energy crisis and growing societal demand for environmental services and other public goods is changing the picture of how agricultural technologies and policies are shaped. There is an increasing pressure for shifts in agricultural policy from subsidy and trade policies to conservation and environmental aspects of agriculture. That is why it is not surprising that agriculture has been incorporated into the General Agreement on Tariffs and Trade. A major challenge is then to find technologies, policies and institutions to make the three goals agricultural growth, poverty alleviation and sustainable natural resource use more compatible.

These changes in paradigm require CGIAR centers to focus on understanding how agricultural growth interacts with the environment in a dynamic scenario of climate change and increasing vulnerability as well as how poverty interacts with the environment. That is, the research focus should be on understanding the complexity of the social-ecological systems where their mandate crops are established. These paradigms have been incorporated in the new systems priorities, particularly priority 4: poverty alleviation and sustainable management of water, land and forest resources.

The challenge faced by the project is to facilitate the conversion of potato and sweet potato based systems into resilient agro-ecosystems; that is systems with the capacity to absorb shocks and adapt to change while maintaining function. It requires in-depth study of the dynamics of complex systems, a paradigm that is just evolving. Therefore, new methods and approaches must be developed and tested without further delaying the most needed solutions for poor farmers depending on CIPs mandate crops for their subsistence.

#### ***Identification of specific problems to be tackled with research***

During the period covered by the present MTP the Project will tackle the following issues:

- Application of optical and radar remote sensing imagery and radiometric measurements to improve the reliability of root and tuber crops statistics in areas with high concentration of resource-poor farmers
- Improvement of the ability to forecast potato and sweet potato yields under variable environmental and management conditions
- Refinement of methods to assess the environmental and economic vulnerability of potato and sweet potato systems
- Methods for supporting the scaling up of technology from plots to watersheds to regions
- Methods and tools to assess the potential effect of climate change on food systems productivity, vulnerability and resilience
- Methods and tools to support the development of resilient and productive potato and sweet potato productions systems with new technology and management options to foster adaptive capacity.

- Geospatial, modeling and growing chamber methods and tools focused on environmental and plant and crop physiological data to support the work on potato and sweet potato germplasm oriented to specific target areas.

## **Objectives**

The overall objective of this project is to augment the understanding of the behavior of complex human-natural systems where producing potato and/or sweet potato constitute key livelihood strategies and to enhance their sustainability both directly through technology and management improvements and indirectly through the improvement of human and social capitals as factors that affect sustainable development. During the period included in the present MTP the specific objectives are:

- To develop methods for improved impact targeting and environmental vulnerability assessment. The methods are based on tools being used in the new interdisciplinary science called complex systems<sup>1</sup>
- Contribute to the development of technologies and practices, and the integration of production systems to cope with environmental and economic vulnerability
- Integrate principles and approaches in specific case studies where the pro-poor R&D cycle is implemented, aiming at enhancing adaptive capacity.

## **Changes from the last MTP**

Utilizing the feedback from the CCER and the EPMR report, we changed the project name to ***Systems approaches to build adaptive capacity in potato and sweet potato-based systems***. The MTP will align the work and output targets of the project to the new challenges and opportunities of the world of international agricultural research, as outlined in the Visioning Report to the Executive Council of the CGIAR, submitted by the Working Group on Visioning and Development Challenges established within the CGIAR Change Management Process, initiated in early 2008. This document points out that the context of agricultural research has shifted dramatically in recent years and is dominated by climate change, high food prices and environmental and energy crises.

## **Alignment with CGIAR Systems priorities**

The MTP Project (Systems approaches to build adaptive capacity in potato and sweet potato-based systems) conducted by CIP's Division 5 falls within the priority area 4: Promoting poverty alleviation and sustainable management of water, land and forest resources. The table below links the outputs of the project with the specific goals of the priority area 4.

<b>Outputs</b>	<b>Specific goal in the SP4</b>
<b>Output 1.</b> Procedures, methods and computer-assisted decision support tools to improve research targeting, crop monitoring and the assessment of production systems vulnerability to	<b>Priority 4A</b> <b>Specific goal 1:</b> To develop analytical methods and tools for the management of multiple use landscapes with a focus on sustainable productivity enhancement
	<b>Priority 4D</b> <b>Specific goal 1:</b> To improve understanding of degradation thresholds and

<sup>1</sup> The term complex system usually refers to a system of many parts, which are coupled in a non-linear fashion. In practical terms a non-linear relationship means that a small perturbation may cause a large effect, a proportional effect, or even no effect at all whereas in linear systems, effect is always directly proportional to cause. Complex systems are open, contain feedback loops and their history change over time and prior states may have influence on present states (adapted from Wikipedia).

Outputs	Specific goal in the SP4
environmental changes developed and tested (By 2011).	<p>irreversibility and the conditions necessary for success in low productivity areas</p> <p><b>Specific goal 4:</b> Evaluate the production potential of high productivity systems and their constraints and trends</p> <p><b>Specific goal 7:</b> To optimize productivity at high input use (e.g. labor, nutrients, pest control practices, water, seed and feed) through understanding and managing spatial and temporal variation</p>
<p><b>Output 2.</b> Strategies for increased resilience and adaptive capacity in Potato systems in the high Andes and SP systems in Southern China and Vietnam identified and validated (By 2011)</p>	<p><b>Priority 4A</b></p> <p><b>Specific goal 2:</b> To enhance the management of landscapes through changing stakeholder awareness and capacity for social-ecological planning at landscape and farm levels</p> <p><b>Priority 4D</b></p> <p><b>Specific goal 3:</b> To identify domains of potential adoption and improvement of technologies for improving soil productivity, preventing degradation and for rehabilitating degraded lands</p> <p><b>Specific goal 5:</b> To improve soil quality to sustain increases in productivity, stability and environmental services through greater understanding of processes that govern soil quality and trends in soil quality in intensive systems</p> <p><b>Specific goal 8:</b> Identify social, economic, policy and institutional factors that determine decision-making about managing natural resources in intensive production systems and target interventions accordingly</p>

## ***Outputs Description***

### ***Changes from previous MTP Outputs***

The names and number of MTP outputs have been modified to make them more coherent with CIP's new strategic plan. Also, output targets have been more clearly defined.

In line with this focused work, the number of outputs has been reduced to just two:

**Output 1:** Procedures, methods and computer-assisted decision support tools to improve research targeting, crop monitoring and the assessment of production systems vulnerability to environmental changes developed and tested.

**Output 2:** Strategies for increased resilience and adaptive capacity in Potato systems in the high Andes and SP systems in Southern China and Vietnam identified and validated.

Output 1. Procedures, methods and computer-assisted decision support tools to improve research targeting, crop monitoring and the assessment of production systems vulnerability to environmental changes developed and tested (By 2011).

**Description.** This output is related to the development of tools and methods for the analysis of complex systems, including climate and farming systems; methods for improved potato and sweet potato statistics; computer assisted simulation models for the analysis of crop growth and soil-plant-water relations under climate change environmental conditions; mathematical tools for the downscaling and interpolation of climate data; tools and methods for studying plant responses to abiotic stresses; screening methods for ideotyping plant and root abiotic stress tolerance, as a decision support system for potato and sweet potato breeding; methods for

root growth analysis; and, remote sensing - process-based models procedures for yield prediction and monitoring of crop growth and health as affected by biotic and abiotic stresses.

**Alignment to CGIAR Priorities.** 4A - Promoting integrated land, water and forest management at landscape level; 4D: Promoting sustainable agro-ecological intensification in low- and high-potential areas.

Countries of Planned Research. Brazil; China; Costa Rica; Ecuador; Mexico; Peru.

**Output 2.** Strategies for increased resilience and adaptive capacity in Potato systems in the high Andes and SP systems in Southern China and Vietnam identified and validated by 2011.

**Description.** This output involves the development of integrated, resilient, sustainable and productive potato- and sweet potato-based production systems that effectively contribute to food security, the strengthening of human capital and environmental health.

**Alignment to CGIAR Priorities.** 4A - Promoting integrated land, water and forest management at landscape level; 4D: Promoting sustainable agro-ecological intensification in low- and high-potential areas.

Countries of Planned Research. Bolivia; China; Peru; Thailand; Viet Nam.

### ***Impact Pathways by Output***

**Output 1.** Procedures, methods and computer-assisted decision support tools to improve research targeting, crop monitoring and the assessment of production systems vulnerability to environmental changes developed and tested (By 2011).

The two outputs of the project have the same impact pathway which has the following major steps:

a) Targeting: Production Systems and their environment provides a context for germplasm or commodity research. Any potato or sweet potato variety develops best in a particular environment with a characteristic set of environmental growing conditions in terms of water, temperature and radiation regimes. A recent CCER report distinguishes two relevant aspects which Project 5 performs: (i) a check is possible as to whether a given variety is likely to thrive in a given environment by comparing environmental data with plant-specific data. This is relevant when new varieties are to be introduced, or (ii) input of environmental data of a given area is provided to breeders to breed varieties that are likely to thrive in that area. This is relevant when development of a given area is the objective and when existing varieties appear to be unsuited. It is important to point out that the targeting performed by Project 5 goes beyond the analysis of environmental data and includes other indicators such as poverty, land use and vulnerability. Therefore, Project 5 adds an important element to targeting by not only considering biotic and abiotic factors but also more broadly, environmental, economic and social conditions of the area being considered. To this end, Project 5 has a unique set of techniques to quantify such conditions in a landscape setting, even in data-poor areas, as noted by the CCER panel. It is relevant to notice that many of the analytical tools and methods have been developed by Project 5, as public goods.

b) Technology and management recommendations to reduce environmental and economic vulnerability on targeted ecosystems: this step follows targeting in a logic way in the impact pathway and is basically performed through the analysis of land use and farming systems for the targeted ecosystems. This step strongly integrates the work and outputs of other CIP Projects into the work of Project 5 in an iterative manner. This integration focuses on CIPs specific mandate for potato and sweet potato production systems. So every scenario tested centers on our mandate commodities, without missing the fact that these commodities frequently interact with other components of the farming systems. It is this interaction that will be tested by calculating its environmental, economic and social consequences and recommendations and policy options will follow in the impact pathway.

c) Strategies for increased resilience and adaptive capacity in agricultural systems: this step is concerned with the field test and validation of production systems. Again, it integrates the contribution of other CIPs Projects and partnership programs and brings the outputs near the ambit of the Impact Enhancement Project. It is important to stress that the impact pathway of Project 5 is not isolated from the CIPs impact pathway but should

be integrated into it. In other words, the production systems-environment research contributes to the implementation of each step of the CIPs adopted pro-poor research and development cycle and to the attainment of the MDG.

d) Partnerships: effective partnerships are a critical element in the impact pathway, as partners will substantially contribute to the generation of outcomes and development efforts based on the Project outputs.

e) Capacity strengthening: training in the use and application of the procedures, methods and tools developed is a substantial non-research activity that contributes to outcomes and impact. Partners learning new tools and methods are requested to have learning sites in their own countries where tools, methods and technology options are tested with CIP backstopping.

**Output 2.** Strategies for increased resilience and adaptive capacity in Potato systems in the high Andes and SP systems in Southern China and Vietnam identified and validated by 2011.

The two outputs of the project have the same impact pathway which has the following major steps:

a) Targeting: Production Systems and their environment provides a context for germplasm or commodity research. Any potato or sweet potato variety develops best in a particular environment with a characteristic set of environmental growing conditions in terms of water, temperature and radiation regimes. A recent CCER report distinguishes two relevant aspects which Project 5 performs: (i) a check is possible as to whether a given variety is likely to thrive in a given environment by comparing environmental data with plant-specific data. This is relevant when new varieties are to be introduced, or (ii) input of environmental data of a given area is provided to breeders to breed varieties that are likely to thrive in that area. This is relevant when development of a given area is the objective and when existing varieties appear to be unsuited. It is important to point out that the targeting performed by Project 5 goes beyond the analysis of environmental data and includes other indicators such as poverty, land use and vulnerability. Therefore, Project 5 adds an important element to targeting by not only considering biotic and abiotic factors but also more broadly, environmental, economic and social conditions of the area being considered. To this end, Project 5 has a unique set of techniques to quantify such conditions in a landscape setting, even in data-poor areas, as noted by the CCER panel. It is relevant to notice that many of the analytical tools and methods have been developed by Project 5, as public goods.

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d) Partnerships: effective partnerships are a critical element in the impact pathway, as partners will substantially contribute to the generation of outcomes and development efforts based on the Project outputs.

e) Capacity strengthening: Integration sites in the Andes and ESEAP are used as training sites for NARIS.

## ***International Public Goods***

### ***Research approach to develop IPGs***

Research on Production Systems and the Environment is, by definition, a site-specific activity. It is through comparative analyses in multiple sites that methods and tools are developed and validated. Data, tools and methods will be produced in the project. Methods to improve root crop statistics, process based models to support germplasm screening work, yield forecast methods, early disease and stress diagnostic at field level based on geospatial and radiometry methods and non-linear scaling models are potential IPGs produced by the project. Closer collaboration with all other CIP Projects to support their research needs on our mandate crops are implemented.

### ***External conditions***

The work in this project is highly interdisciplinary and participatory. It thus depends on the providing of funding, especially for the high transaction costs of the participatory activities, the willingness of partners to collaborate and changes in political and environmental situations in the research/validation sites.

### ***Target ecoregions***

During the next three years (2009-2011), Project 5 will concentrate its activities in LAC, SWCA and ESEAP.

### ***Elaboration of Partners Roles***

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Bolivia	PROINPA	Implement case studies Bolivia	5 (2)
Brazil	EMBRAPA - Empresa Brasileira de Pesquisa Agropecuária	Complex systems analysis, climate change and soil carbon modeling, and MRI analysis of root growth	5(1)
Canada	University of Toronto	Nutrition assessment of vulnerable households in the Altiplano	5 (2)
Costa Rica	INTA- Instituto Nacional de Innovación y Transferencia en Tecnología Agropecuaria	Environmental vulnerability assessment of potato based systems in Plantón-Pacayas watershed	5 (1)
China	The Sichuan Animal Science Academy (SASA)	Implementation of field work	5 (1,2)
Ecuador	INIAP Instituto Nacional Autónomo de Investigaciones Agropecuarias	Environmental vulnerability assessment of potato based systems in Ecuador	5 (1)
Kenya	International Livestock Research Institute (ILRI)	Implementation on sweet potato-Livestock Research in SEAP	5 (2)
Mexico	CIMMYT International Maize and Wheat Improvement Center	Technology validation in Saraguro, Ecuador	5 (2)
Mexico	INIFAP- Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias	Environmental vulnerability assessment of potato based systems in Jalapa, Mexico	5 (1)
Peru	Instituto Nacional de Investigación Agraria (INIEA)	Links to dissemination Saline soils, SP adaptation and root crop statistics	5 (2)
Peru	Universidad Nacional Agraria La Molina	Soil science research and analysis	5 (1,2)
Peru	Centro de Investigaciones en Recursos Naturales y Medio Ambiente CIRNMA (Peru NGO)	Implement case studies in the Altiplano Peru	5 (1,2)
USA	University of Connecticut	Climate change modeling	5 (1)
USA	University of Missouri-Columbia	Livelihood strategies research	5 (1, 2)
Thailand	Department Livestock Development, DLD	Implementation of field work, Sweetpotato pigfeed utilization.	5 (2)

<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Project (Output)</b>
Vietnam	National Institute of Animal Husbandry (NIAH)	Implementation of field work, Sweetpotato pigfeed utilization.	5 (2)



## Logical Framework

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
<b>Output 1</b>	Procedures, methods and computer-assisted decision support tools to improve research targeting, crop monitoring and the assessment of production systems vulnerability to environmental changes developed and tested (By 2011).		CGIAR & NARS scientists Development agencies, and Policy makers	Use of the outputs by intended users will lead to significant changes in research capabilities, research targeting, crop assessments and statistics, yield prediction and land utilization.	Increased research capacity of NARS. Vulnerability of poor farmers living in target areas reduced. Governments improve their capacity to regulate land utilization, analyze environmental risks, predict yields and negotiate surpluses or deficit in timely manner. Improved development priorities. Improved development investment
2009	Effectiveness of partial root drying (PRD) irrigation method for potato and sweet potato in Peru established.	Practices			
2009	Early diagnostic method for potato pests and diseases using RS data developed in Peru	Practices			
2009	Early analysis of typical patterns of vulnerability with special emphasis on potato-based systems in Peru developed.	Materials			
2010	Protocol for geospatial temperature interpolation based on RS data and biophysicalmathematical tools developed.	Practices			
2010	Methods and tools for potato yield forecasting combining RS and modeling finalized and validated in the Andes	Practices			
2010	EVA for drought and climate change scenarios for potato systems in selected countries in LAC and SWCA completed	Practices			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2011	Methodology to downscale results from climate change models to local conditions developed and tested in the Andes	Practices			
2011	Sweet potato crop growth model suitable for replicating the response of the crop to different salinity levels developed.	Practices			
2011	Early diagnostic method for sweetpotato pests and diseases using RS data developed in Uganda	Practices			
2011	The feasibility of incorporating genomics information into the CIP Solanum potato physiology model to better assess GxE interactions tested	Practices			
<b>Output 2</b>	Strategies for increased resilience and adaptive capacity in Potato systems in the high Andes and SP systems in Southern China and Vietnam identified and validated by 2011		Farmers, NARS researchers, extension workers, Policy makers, and Development agencies	Adoption of the strategies by the intended users leads to an increased resilience and reduced vulnerability of targeted farming systems	Reduced environmental and economic vulnerability of target regions and populations. Increased land productivity and household income in targeted regions.
2009	Strategies for production and utilization of sweet potato to improve livestock feed supply and quality tested and validated in Vietnam and China (with ILRI)	Practices			
2010	Forage legume intercropping for improving the role of sweet potato as animal feed developed in crop livestock systems in Peru, Vietnam, and China	Practices			
2010	Key agronomic and environmental management technologies for enhancing the adaptive capacity of potato-based systems in the high plateau of the Andes identified, tested and validated	Practices			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2010	Farmers produced organic fertilizers for their effectiveness and usefulness in crop production analyzed and evaluated	Practices			
2011	Livelihood strategies that withstand climatic extremes identified and tested in the high plateau of the Andes	Practices			
2011	The role of soil microorganisms on soil fertility and productivity for potato based cropping systems of the Andes evaluated	Practices			

## 6. Agriculture and human health

### *Project Overview and Rationale*

#### *Rationale and Overview*

Agricultural production, processing and distribution systems present opportunities to enhance human nutrition and livelihoods through food-based agricultural interventions. At the same time, technology and management choices can and do present risks to human health. An analytical science-based approach that de-compartmentalizes the sectors of agriculture, ecosystem health and human health, can generate transdisciplinary evidence for establishing health risk pathways associated with agriculture technology and ecosystem management choices, demonstrating effective agricultural interventions for improved human health, and influencing policy in relevant sectors. This MTP project is designed to emphasize the positive and address the negative potential impacts of agriculture on human health. It brings health science professionals into close interaction with other CIP divisions to demonstrate the gains possible from a trans-disciplinary approach to the complex, intertwined challenges of improved agriculture productivity, poverty reduction, food security promotion and human health protection. In keeping with the support of the CG assembly for this project, we are currently recruiting a project lead with health research expertise out of unrestricted funds to complement the existing part-time and restricted health, nutrition and social science capacity.

#### *Alignment to CGIAR Priorities*

CG centers such as CIP are ideally placed to take up this opportunity given their extensive knowledge of agricultural technology options, their high legitimacy with agricultural and food related stakeholders, and their commitment to health-related Millennium Development Goals (four of the eight that the Science Council (SC) identifies as System Priorities). The Agriculture and Health Research Platform (currently in IFPRI's MTP), in which CIP forms part of the core management group, is a manifestation of both this System commitment and this opportunity to place agricultural interventions as serious options when policy makers consider resource allocations to improve health outcomes, as they are in Bamako in the last quarter of this year.

#### *Outputs Description*

##### *Changes from previous MTP Outputs*

In response to both CIP Board and EPMR panel feedback, existing outputs (now 2&3), their ordering, and their corresponding narratives have been revised and one new output (1) has been developed through project team discussions with CIP leadership.

**Output 1.** Human health and agriculture linkages that are sensitive to agricultural interventions for health mapped across learning sites and for special projects (in close collaboration with Division 1)

Description. As part of fleshing out the Pro-Poor cycle, in Project 6 we plan to systematically incorporate livelihood, nutrition and health status information into various stages of what is primarily a Project 1 activity. These include initial needs and opportunities assessment using existing data, a preliminary gap analysis, and supplementation with primary data as needed. Mapping of the links with an eye on added value associated with agricultural interventions for health would be shared with stakeholders and researchers from a variety of disciplines to prioritize particular options. In special development projects, we would apply such thinking for inclusion of food security impacts as part of monitoring and evaluation of agricultural interventions. In ongoing projects, clear causal diagram mapping can inform monitoring and evaluation activities, both during and ex-post, in keeping with Project 1 mandates.

Alignment to CGIAR Priorities. 2C - Enhancing nutritional quality and safety; 3A: Increasing income from fruit and vegetables; 5C: Rural institutions and their governance.

**Output 2.** The value of orange fleshed sweet potato (OFSP) and potato as components of food-based approaches to dietary diversification and improved nutrition are demonstrated (in close collaboration with Divisions 1, 3 & 5)

**Description:** Promotion of orange-fleshed sweet potato (OFSP) as one of a few foods that can provide very high amounts of highly bio-available beta-carotene was identified during CIPs strategic planning process as a potential major contribution to confronting widespread Vitamin A deficiency and its associated child and maternal mortality, particularly in Sub-Saharan Africa. CIP-sponsored studies in South Africa have shown that OFSP is efficacious in improving vitamin A status and can be a complementary strategy to existing nutrition intervention programs in areas where it can be grown productively. The advantage of agricultural, food based approaches are multiple: - greater coverage of the at-risk population compared to low coverage rates of public health service based Vitamin A supplementation in very poor countries such as Mozambique; - co-development of improved livelihoods for vulnerable populations with associated improvements in resources, access to Vitamin A rich foods and self-esteem compared to continuing dependency upon food handouts through HIV/AIDS treatment centers; and - sustainability of such coverage through ongoing agricultural production and marketing independent of health service cutbacks due to fiscal crises. The main current challenges related to OFSP achieving such impacts lie in limited adoption by poor small farmers and limited dietary modification by vulnerable households to include beta carotene rich OFSP. The current Harvest Plus Reaching End User (REU) project focuses on identifying cost-effective and sustainable strategies to disseminate OFSP and to create demand for OFSP in Mozambique and Uganda. Demonstrated success will be translated into best practices that can be applied to future work in this area and other biofortification programs. We are examining the potential of OFSP to improve livelihoods and to increase pro-vitamin A intake of HIV/AIDS affected households. Massive impact demonstration may be possible in the proposed sub-Saharan Africa wide project on increasing OFSP research and coverage (GATES pre-proposal currently). For potato, opportunities are being explored with Harvest Plus and colleagues working on potato diversity in Andean farming systems to better exploit the mix of potatoes and other foods in small farm diets to target potentially useful varietal improvements. In addition, community intervention programs that incorporate such potato diversity are integrated in the Project 5 ALTAGRO programs in the high Andes. Ways of best estimating the nutritional and health impacts of such approaches need to be set out.

Alignment to CGIAR Priorities. 2C - Enhancing nutritional quality and safety;

Countries of Planned Research: Mozambique; Peru; Uganda;

**Output 3.** Integrated health and agriculture strategies to reduce pesticide exposure risk and promote healthy and sustainable agriculture among farm families designed and promoted (in close collaboration with Division 4 and Urban Harvest)

**Description.** Illness related to the agricultural use of highly hazardous (WHO category 1a and 1b) pesticides affect substantial proportions of small farm households in the developing world, directly through acute poisoning of young children (accidental), emotionally distraught persons (suicide) or heavily exposed applicators (occupational) and chronic adverse health effects among a broader cross-section of farm and consumer populations (plus those from mutagenic dithio-carbamate fungicides). Understanding of adverse health effects among the scientific community, some civil society actors and some governments has moved from regarding them as controllable externalities (exposure is the farmers fault due to poor handling) to recognizing the effects as inherent consequences of current technological approaches to intensification of agricultural production among the majority of poor small farmers. Compared to grains, pesticides are extensively used in many potato production systems. CIP work has shown that pesticide dependence among small farmers in Andean communities continues due to inadequate information to farm households, including that on toxicity and alternatives, heavy domination of input markets by highly hazardous and mutagenic pesticides rather than alternative crop management technologies, and weak policy environments that could restrict use and support alternatives. In dealing with adverse health impacts of agricultural pesticide use, CG centers have a comparative advantage in that they can bring together the disciplinary mix to understand production-health relationships (methods), know or can discover ways to reduce pesticide use (knowledge), and have legitimacy among agricultural stakeholders who must be involved in improvements (social capital). CIP has linked its integrated crop management (ICM), participatory training and agricultural platform research with testing of approaches to reducing pesticide use and human exposure, a line of work that will become progressively more important for the CG as the work in high value fruits and vegetables develops. The metropolitan region horticultural systems where these crops are produced are characterized by their intensive

use of agrochemicals, as witnessed in collaborative work with Urban Harvest colleagues in Kenya. CG work with these systems will inevitably face issues of occupational exposure and food safety along the entire "food chain".

Alignment to CGIAR Priorities. 4D - Promoting sustainable agro-ecological intensification in low- and high-potential areas.

Countries of Planned Research. Bolivia; Ecuador; Indonesia; Kenya; Peru.

## ***Impact Pathways by Output***

**Output 3.** Integrated health and agriculture strategies to reduce pesticide exposure risk and promote healthy and sustainable agriculture among farm families designed and promoted (in close collaboration with Division 4 and Urban Harvest).

Drawing on the growing literature on knowledge exchange and the involvement of beneficiaries and research users in the production of research, our action research processes follow a series of deliberate steps, currently with metropolitan regions in Latin America and in future years with Urban Harvest colleagues in Africa and South East Asia. These steps seek to link the Pro-Poor Research and Development Cycle and Impact Pathway analysis approaches in ways consistent with the growing health promotion literature on shifting human health risk distributions through multiple channels..

We have met with organizations of the principal beneficiaries of the project the poor small farming households and the principal local end-users of the project results NGO and government agricultural extensionist professionals, human health NGO and government personnel and other interested stakeholders to share our understanding of the likely burden associated with agricultural use of highly hazardous pesticides and the opportunities for change in existing agricultural and human health practices. We jointly develop and implement methods to characterize current practices and associated burdens. CIP researchers then analyze the qualitative and quantitative data to share with partners for joint interpretation. We jointly decide upon potential interventions to change current practices with available resources from CIP and partner organizations, and proceed to jointly implement the interventions. Finally, we jointly set up information systems that can monitor changes that may be attributed to the interventions and in evaluation of platform work, those practices that remain unchanged and require different responses. In this way, capacity building in transdisciplinary action research occurs for agricultural and health personnel and students who participate in the processes as part of thesis research or internships.

End-users of the science produced by these research processes include national and international researchers and development experts in agricultural, health and environment fields, extension agents, civil society organizations and policy-makers. Conditioning factors include Free Trade Agreements in the Americas which may change the market and policy context for production input costs and outputs and civil unrest which impede project implementation. Further, the weak and often adverse policy environment, which includes influential actors with strongly held positions that may be threatened by the research outputs, means that counter moves will likely occur to protect market share. CIP commits to continuing as an actor, speaking to the science generated by the research, and sharing the science internationally, with adaptation to other contexts as appropriate.

The impact pathway of adoption of IPM practices, the reduction or elimination of use of highly toxic pesticides and the adoption of resistant varieties has the cumulative effect of reducing pesticide exposure among farm household members. Pesticide exposure can have a variety of effects including impaired neurobehavioral capacity. CIP research has demonstrated that reduced exposure can result in recovery of pesticide-induced neurobehavioral impairment. CIP research has also shown that neurobehavioral impairment is associated with reduced crop management efficiency. Thus reducing pesticide use can improve neurobehavioral performance which can improve farm decision making. Improved farm decision making can improve productivity. Improved productivity can improve revenues which can improve profits. Improved profits can reduce poverty.

**Output 1.** Human health and agriculture linkages that are sensitive to agricultural interventions for health mapped across learning sites and for special projects (in close collaboration with Division 1)

These will vary for the different case studies undertaken, with part of the scientific work to carefully map likely linkages and, when data permits, model such links mathematically. With special development projects, work will inform monitoring and evaluation components to demonstrate human health impacts associated with agricultural interventions.

**Output 2.** The value of orange fleshed sweet potato (OFSP) and potato as components of food-based approaches to dietary diversification and improved nutrition are demonstrated (in close collaboration with Divisions 1, 3 & 5)

Current CIP-implemented HarvestPlus REU research includes identifying key bottlenecks in the production-marketing-consumer continuum and developing low-cost interventions to relieve these bottlenecks, including the commercial villages approach in East and Southern Africa. Using nutritional assessment methods, the role of these strategies in changing pro-vitamin A intake and vitamin A status of vulnerable groups will be assessed in conjunction with partner organizations (NGOs, NARS and universities) and the beneficiaries (small farm households and their organizations). As intervention research, change among those involved with different interventions will occur, with impacts measured among participating households. Conditioning factors include the potential of rapid climactic changes or droughts in the output areas and reductions in partner capacity through health problems including HIV/AIDS.

The impact pathway of changed dietary habits are traced through the adoption of improved varieties with high beta carotene content. The adoption of the varieties should lead to increased consumption. CIP research has demonstrated that increased OFSP consumption leads to increased beta carotene levels in the blood. Increased beta carotene levels in the blood lead to improved Vitamin A status. Improved vitamin A status leads to a host of improved health indicators including improved resistance to infections by disease, improved vision, improved general health status and reduced mortality.

### ***International Public Goods***

**Output 1.** As per pioneering work on systems approaches to sectoral determinants of public health, including agriculture, and drawing on Project 5 colleagues systems modeling work, we will generate global science for use by policy makers.

**Output 2.** CIPs research on OFSP efficacy in improving Vitamin A status is already an IPG. Methods development for large scale assessment of change in OFSP intake and Vitamin A status as part of agricultural intervention projects, will also produce an IPG. Exemplifying the difficult process of attribution of agricultural intervention effectiveness in improving nutritional status of a target population is the experience documented by the regional SSA CIP office and university partners. The team chose a suitable location to achieve an adequate effect size, mounted sufficient resources, implemented the research in a rigorous manner and analyzed it using sophisticated biostatistical techniques to demonstrate the important potential role of agricultural food-based interventions with OFSP in improving Vitamin A status. We expect similar IPGs to be forthcoming with the proposed output targets for 2009 & 2010.

**Output 3.** CIPs research on agriculture-pesticide health impact linkages has a history of producing IPGs in the demonstration of ongoing neurotoxicity with regular highly hazardous pesticide use and pioneering Trade Offs Analysis (TOA) modeling lead by agricultural economist colleagues. Demonstration of reductions in highly hazardous pesticide use and concurrent increases in net productivity in Farmer Field School (FFS) potato production plots was also an IPG. Likely future IPGs include the effects of introduction of human health concerns into agricultural production multi-stakeholder platforms, including greater emphasis on ICM and consideration of consumer food safety concerns into marketing activities, and the adaptation of multi-level modeling approaches that incorporate provincial and sub-provincial agricultural input supply and ecosystem variables into more sophisticated assessment of agroecosystem-human health relationships.

## ***Elaboration of Partners Roles***

**Output 1.** Currently under development.

**Output 2.** NARS participation occurs in current REU research in Mozambique and Uganda. Substantial stakeholder (NARS, NGO and others) consultation is currently underway GATES pre-proposal. work, including the role of nutritional and health impacts of OFSP.

<b>Major Partner</b>	<b>Strategic Role and Complimentary Capability</b>
World Vision (Mozambique)	Implementation of agriculture based interventions involving OFSP
Save (Uganda)	Work with households with HIV/AIDS on ongoing basis

**Output 3.** We aim to strengthen the capacity of NARS, university and NGO scientists and practitioners in transdisciplinary analysis and interventions. We carry out joint participation in analysis of benchmark characterization data, formulation of intervention responses, preparation of training materials, and policy advocacy through participation in multi-stakeholder platforms that guide the project process.

<b>Major Partner</b>	<b>Strategic Role and Complimentary Capability</b>
University of Toronto (ARI)	Occupational safety and environmental epidemiology
Universidad Politécnica de Chimborazo, Ecuador (University)	Integrate students in cross agriculture-health research process
COMPAPA (promoted by Papa Andina) in Ecuador with farmer organization, development NGO, and NARS participation (INIAP)	Multi-stakeholder platform which engages in designing information collection, sharing interpretation, prioritizing interventions, and implementing them
PROINPA (Research & development NGO, Bolivia)	Laboratory, staff and organizational links with Bolivian partners
Country regions e.g. Junin, Peru and municipalities e.g. Pilaro, Ecuador;	Regional and municipal development planning and agricultural staff
Ministries of Agriculture (Peru, Ecuador, Bolivia)	Monitoring pesticide use
Colorado State University (ARI)	Pesticide policy reform
Urban Harvest stakeholders	Proposal development



## Logical Framework

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
Output 1	Human health and agriculture linkages that are sensitive to agricultural interventions for health mapped across learning sites and for special projects (in close collaboration with Division 1)		Human health and agricultural development policy makers at different geographic levels (municipal to global)	Users use framework, tools and knowledge to design projects, change practices and inform policy	Small farmers and their families experience better health and reduced risk
2009	Framework for carrying out mapping exercise using existing secondary and appropriate primary data developed	Other kinds of knowledge			
2009	Mapping of linkages conducted at two learning sites e.g. LAC (Puno) and SSA	Other kinds of knowledge			
2009	Food security and other human health relevant monitoring elements included in special CIP agricultural commodity promotion and system enhancement projects at the developmental stage such that human health relevant impacts are made more explicit in agricultural intervention evaluation.	Practices			
2010	Mapping of linkages conducted at two learning sites e.g. SWCA (Orissa) and ESEAP (Bandung)	Other kinds of knowledge			
2011	Cross-site comparisons conducted and multi-case comparison report produced	Other kinds of knowledge			
Output 2	The value of orange fleshed sweet potato (OFSP) and potato as components of food-based approaches to dietary diversification and improved nutrition are demonstrated (in close collaboration with Divisions 1, 3 & 5)		Farmers, national and local decision makers from health and agriculture sectors, international researchers	Users utilize information to prioritize OFSP development pathways to reduce health risks and maximize the potential of root and tuber crops to provide energy and nutrition	Vulnerable groups have improved vitamin A status from greater availability and consumption of OFSP
2009	Increase in pro-vitamin A intake	Other kinds of			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
	demonstrated through interventions addressing OFSP production, marketing and demand creation for OFSP. (with Harvest Plus)	knowledge			
2009	Framework for joint human health, OFSP consumption and agricultural production indicators for closer estimation of likely health impacts among women and under 5 children developed (with GATES regional proposal)	Other kinds of knowledge			
2009	Strategies for increasing diet diversification among poor rural households in Uganda and Mozambique analyzed and documented (from Project 1, Output 3)	Practices			
2009	Effectiveness of community interventions including greenhouses and school programs in high-altitude Andean potato-livestock system documented (in conjunction with ALTAGRO, Project 5)	Practices			
2010	Evidence of the potential of OFSP to improve the livelihoods and contribute towards improved pro-vitamin A intake of HIV/AIDS affected households generated.	Other kinds of knowledge			
2010	Initial estimates of morbidity reduction with OFSP coverage based on joint indicators produced and tested with stakeholders in one SSA site (with GATES regional proposal)	Policy strategies			
2010	Product concept developed to enhance the nutritional traits in selected potato varieties containing traits required for adaptation and acceptance in populations consuming sufficient amounts of P or SP	Other kinds of knowledge			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
	for impact on dietary status (in conjunction with project 3 )				
2011	Quasi-experimental study of the effectiveness of food based interventions to improve the health of persons with HIV/AIDS underway.	Other kinds of knowledge			
2011	Estimates of morbidity and mortality reduction in vulnerable groups based on joint indicators produced across all SSA sites and initially tested with joint monitoring data (with GATES proposal)	Policy strategies			
<b>Output 3</b>	<b>Integrated health and agriculture strategies to reduce pesticide exposure risk and promote healthy and sustainable agriculture among farm families designed and promoted (in close collaboration with Division 4 and Urban Harvest)</b>		Farmer organizations, community leaders, development organizations, municipal and regional government officials and other action researchers	Users use framework, tools and knowledge to change practices and inform policy	Small farmers and their families experience greater productivity, reduced risk and better health
2009	Pesticide exposure pathways and potential environmental impact estimates produced for horticultural systems in three metropolitan regions.	Other kinds of knowledge			
2009	Sustainability criteria and agro-ecosystem indicators relevant to health and pesticide use in cool weather horticultural systems including potatoes are identified with stakeholders	Policy strategies			
2009	Contribution of horticulture to livelihoods determined in three metropolitan regions in Peru, Bolivia and Ecuador (with Urban Harvest)	Other kinds of knowledge			
2009	Training of healthy horticulture promoters in conjunction with NGOs and municipalities as community resources in	Capacity			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
	three metropolitan regions.				
2009	A participatory M&E plan for healthy and sustainable horticulture promotion implemented among stakeholders in three Latin American metropolitan regions (with Urban Harvest)	Capacity			
2010	Differential uptake of alternative management approaches by producer orientation (conventional to agro-ecological) and prior involvement in training demonstrated.	Other kinds of knowledge			
2010	Tools for supporting decision-making around interventions linking horticultural practices and human health developed	Policy strategies			
2011	Technologies and culturally appropriate messages for behavioral change contributing to the reduction of highly toxic pesticides in potato production assessed	Practices			
2011	Change in agro-ecosystem indicators relevant to human health documented across three metropolitan regions and shared with stakeholders.	Policy strategies			
2011	Rural-urban linkage analysis relevant to human health applied to horticulture systems in Bandung metropolitan region, Indonesia (with Urban Harvest)	Other kinds of knowledge			

## 7. CONDESAN

### ***Project Overview and Rationale***

CONDESAN is a valuable platform and partnership to address the problems of natural resources management in the Andes. Created as a consortium in 1993, CIP requested CGIAR in 1997 to recognize CONDESAN as an eco-regional program, and propose to host it as a service to the Andean research and development community. The research and policy agenda of CONDESAN is fundamental to the production of potatoes and all other commodities that depend on the water supply from the Andean System of Basins, and is highly complementary to the basic research that is being carried out by CIP on breeding for abiotic stresses and enhancing system resilience.

The Andean Ecoregion is home to an extraordinary ecological and cultural diversity where some 40 million people live. Farming (mainly tubers and grains) and livestock-raising are the main occupations, although income generation comprises additional activities for this population. Due to the degradation of Andean ecosystems, water flows are reduced, affecting those whose livelihoods depend largely on water availability, including indigenous communities, subsistence producers as well as larger producers and urban water consumers. The Andean agricultural systems are being transformed by globalization, climate change, migration, urbanization, etc., which significantly alter the context and pose new challenges for agricultural activity which impact society and the producers. Andean geographic and cultural diversity has been traditionally seen as a barrier to the development of the region and its population. Limited and poor quality information limit informed discussion and debate on issues of sustainable use development in the Andean region.

Both integrated water management practices and innovation in agricultural systems need to be up-scaled to reduce poverty and stop the deterioration of natural resources in the Andes. CONDESAN challenge is to explore its potential to synthesize and disseminate ongoing experiences that could improve the livelihoods of major portions of the Andean rural population.

### ***Alignment to CGIAR Priorities***

CONDESAN main research is relevant for priorities 4A and 5A.

4A. From benchmark basis across the Andes, CONDESAN will research on the value and means of compensation for ecosystem services; identification of extrapolation domains; water related poverty; develop and test design principles for environmental service mechanisms, impact of climate change on water availability, etc.

5A. Promoting innovations in agricultural systems to take advantage of the diversity that exist in the Andean region to improve the livelihoods of the Andean rural poor. It includes moving ahead to new agricultural paradigms and needs-based training.

### ***Outputs Description***

#### ***Changes from previous MTP Outputs***

According with its Road Map, CONDESAN research is concentrated on: (a) the integrated management of water resources and (b) the development of innovations in agricultural systems that value the Andean diversity. Following the EPMR advice and the internal feedback from CIP, CONDESAN MTP was reformulated to better describe its collaborative research.

Previous Outputs	New outputs
<b>Output 1.</b> Policies and local, national and regional recommendations for improved integrated water resource management (IWRM) in Andean countries from Venezuela to Argentina scaled up and out by 2010	<b>Output 1.</b> Improved understanding of ecosystem, land use and climate dynamics with regard of water resource management in Andean basins (2013)
<b>Output 2.</b> Institutional innovations, forms of organization and mechanisms for cooperation, training and dialogue are developed and promoted in the Andean agricultural systems to take advantage of the ecoregions natural diversity by 2011	<b>Output 2.</b> Institutional innovations, forms of organization and mechanisms for cooperation, training and dialogue in the Andean agricultural system analyzed across the Andes (2013)

**Output 1.** Improved understanding of ecosystem, land use and climate dynamics with regard of water resource management in Andean basins (2013)

Description. This output will improve the knowledge in key stakeholders in the Andes basins to promote community level work to improve the natural resource management. The research related with this output intends to increase the knowledge on the hydrological dynamics in the Andean ecosystems: Paramo, high wetlands, and high forests and the implications on land and water management. The research will also look at the relationship between natural resource management practices and its impact in the water quantity and quality downstream; the characteristics of hydrological environmental services in different Andean basins; the barriers to implement effective PES schemes and the limitations to scale up and out local good practices. The research will also look at the benefit-sharing mechanisms, including cultural and social considerations in the Andes; and the implications of climate change for agriculture, livelihoods and the environment in the Andes.

Alignment to CGIAR Priorities. 4A - Promoting integrated land, water and forest management at landscape level.

Countries of Planned Research. Argentina; Bolivia; Colombia; Ecuador; Peru; Venezuela.

**Output 2.** Institutional innovations, forms of organization and mechanisms for cooperation, training and dialogue in the Andean agricultural system analyzed across the Andes (2013)

Description. This output will strengthen institutional capacity in the Andean Ecoregion to improve livelihoods and reduce deterioration of natural resources in the Andean Ecoregion using an innovation system approach. In this regard, research will focus on understanding the existing barriers for innovation at different scales in the region and an ecoregional analysis of the experiences implementing the innovation system approach. The global drivers affecting the environment in the Andes will be also analyzed. The research will look at the design of new learning instruments and process on innovation in agricultural systems and the results of testing it through many innovation learning projects.

Alignment to CGIAR Priorities. 5A: Improving science and technology policies and institutions.

Countries of Planned Research: Argentina; Bolivia; Colombia; Ecuador; Peru.

## ***Impact Pathways by Output***

**Output 1.** Improved understanding of ecosystem, land use and climate dynamics with regard of water resource management in Andean basins (2013)

The main users are CONDESAN partners, ARI, NARS and key IMWR policy and decision makers from the local, national and regional levels in the Andes. CONDESAN looks that with better understanding of the ecosystem dynamics, the intended users can define its role and strategy in water and agriculture management. In the same

way, this knowledge should mobilize the policy maker to dialogue with the key stakeholders in order to improve the natural resource management in the Andean region.

These groups form part of CONDESANs network of partners that work directly with the communities. Coordination provided by CONDESAN influences users at the national and regional levels. The changes in behavior in the main users will produce the desired impact since their actions or decisions directly affect both the health of the natural resources and the livelihoods of the poor population in the Andean rural areas.

**Output 2.** Institutional innovations, forms of organization and mechanisms for cooperation, training and dialogue in the Andean agricultural system analyzed across the Andes (2013)

The main users are CONDESAN partners, innovation systems stakeholders in the Andean countries, NARs, ARI, policy makers at the local, national and regional levels in the Andes. With this output CONDESAN looks that the intended users start using the Innovation Systems approach to renovate conceptual approaches, strategies and public policies, cohesion and synergies with other stakeholders. It is also expected that regional stakeholders strengthen their links and synergies and improve their decision making and negotiation processes as well as they adopt an innovation system approach.

These groups form part of CONDESANs network of partners that work directly with the communities. Coordination provided by CONDESAN influences users at the national and regional levels. The changes in behavior in the main users will produce the desired impact since their actions or decisions directly affect both the health of the natural resources and the livelihoods of the poor population in the Andean rural areas.

### ***International Public Goods***

**Output 1.** Improved understanding of ecosystem, land use and climate dynamics with regard of water resource management in Andean basins (2013). This output will produce knowledge about the hydrological dynamics in the Andean ecosystems: Paramo, Andean Wetlands, and Andean forests and the implications on land and water management. This unique north-south mountain system with deserts on the west and the Amazon on the east provide a gradient of ecosystems from tropical to temperate from which much can be learned about water management in fragile environments.

**Output 2.** Institutional innovations, forms of organization and mechanisms for cooperation, training and dialogue in the Andean agricultural system analyzed across the Andes (2013). This output produce knowledge about how to leverage the innovation capacity of the Andean countries through using an innovation systems approach in the Andes.

The IPG produced by CONDESAN are largely of a regional nature and generated by comparing and synthesizing information, methodologies and results at an ecoregional level.

### ***Elaboration of Partners Roles***

CONDESAN is a consortium of regional partners that develops a variety of research and development activities. CONDESAN Coordination contributes to strengthen these relationship between partners and also to extend the links to other stakeholders within and outside the region by concentrating its efforts on second level activities (synthesis, comparative analyses, support to multi stakeholder platforms, etc.). InfoAndina supports partners cohesion within the consortium and disseminates their work to a wider audience.

CIP and CONDESAN are working together to strengthen CGIAR partnership platforms among the Andean region. CONDESAN creates synergies among CIP, CIAT and other CG programs including the Global Mountain Program, and the Challenge Program on Food and Water, for which CONDESAN coordinates the Andean System of Basins. CONDESAN serves as a link between the CGIAR and UN systems through a significant GEF-funded project and a FAO-funded policy initiative. The UN- based Mountain Partnership (MP) has just decentralized their operations, designating CONDESAN as the Latin American hub for the MP. Since 1996 CONDESAN host the decentralized hub of the Mountain Forum: InfoAndina.

Country	Major Partner	Strategic Role and Complementary Capability	Contribution to Outputs
Venezuela	Instituto de Ciencias Ambientales y Ecología (ICAIE) of the University of Los Andes	Applied field research, development actions, up-scaling in sites of Venezuela (Paramo Initiative )	1 and 2
	Andean Program of The Mountain Institute, NGO, Peru	Implementation of multiple components for the conservation of environmental services provided by paramo areas of Peru (Paramo Initiative)	1
	Mountain Forum, international program	Communications and information strategies for the consortium in general and individual projects and partners, analysis and dissemination of materials. InfoAndina is the regional node of the Mountain Forum for LAC	1 and 2
	CGIAR Global Mountain Program, International	Applied research on policy and institutional analysis. Innovation Market Place Initiative	2
	Grupo Randi-Randi, NGO, Ecuador	Applied research and development actions, with emphasis in IWRM and gender	1
	Centro Ecumenico de Promocion y Accion Social (CEDEPAS), NGO Cajamarca, Peru	Wide range of development actions and applied research in conservation agriculture, co-investment schemes (Paramo, ANDES- CPWF and RAMP Initiatives)	1 and 2
	CIAT, CGIAR center, regional and international	Applied research in IMWR and innovation systems, technical assistance on watershed management	1 and 2
	University of Amsterdam, Holland	Applied research (Paramo Initiative)	1
	Universidad de Caldas, Colombia (UCALDAS)	Cooperation agreement for research, development, capacity building and dissemination as well as exchange of information and publications. Collaborative project on capacity building MSc Students: Farming Production System Masters Fee Financing fund	1 and 2
	UNU-Merit-LINK Program, Holland	Cooperation for research and dissemination on issues related with innovation systems (see: <a href="http://www.innovationstudies.org/index.html">http://www.innovationstudies.org/index.html</a> )	2
	Pontifical Catholic University of Peru GRUPO, Peru	Research and technical assistance for the Lemelson Recognition and Mentoring Program (RAMP initiative)	2
	Programa de Desarrollo Rural Sostenible GTZ (Peru)	Knowledge sharing on sustainable agriculture in the Andes	



<b>Country</b>	<b>Major Partner</b>	<b>Strategic Role and Complementary Capability</b>	<b>Contribution to Outputs</b>
	Seminario Permanente de Investigación Agrícola SEPIA Peru	Research on the information and communication technology for development in rural areas of Peru	2
	Andean Community, regional (CAN)	Implementation of the Andean Environmental Agenda and support CONDESAN advocacy work in the subject of IWRM	1
	Centro de Investigación en Recursos Naturales y Medio Ambiente, CIRNMA, Peru	Research on innovation Systems in Puno region, support the implementation of the research activities of RAMP-Peru project	2
	Programa Regional para la Gestión Social de Ecosistemas Forestales Andinos (Ecuador, Perú y Bolivia) - ECOBONA	Joint research to produce a regional map on Andean Ecosystem	1
	SDC	Support the activities of the Mountain Partnership Secretariats Decentralized Hub in Latin America and the Mountain Forum Decentralized Hub	1 and 2
	Mountain Partnership	To advocate on mountain related policies in the Andean region	1 and 2
	ASOCAM	Knowledge sharing on mountain agriculture practices, innovation systems and policy influence in Andean ecoregion	1 and 2
	CGIAR CPWF	Applied research in IMWR at the seven Andean benchmark basins.	1
	Non-Profit Enterprise and Self-sustainability Team NESsT, USA	Support innovation capacity in Peruvian highlands. Joint research on innovation systems in Peru	2
	Red de Interesados en Servicios Ambientales (RISAS)	Joint research on environmental services in the Andes region.	1
	CDC-UNALM	Joint research on spatial information and Andean region ecosystems map	1

## Logical Framework

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
Output 1	Improved understanding of ecosystem, land use and climate dynamics with regard of water resource management in Andean basins (2013)		CONDESAN partners, ARI, NARS and key IMWR policy and decision makers from the local, national and regional levels in the Andes	Users define a clear strategy and expected role in water and agriculture management Policy maker dialogue with other stakeholders to improve the natural resource management in the Andes	Stakeholders work together at basin level to improve the water management
2009	Strengthen capacity of participating countries (Venezuela, Colombia, Ecuador, Peru) governmental and non governmental institutions and individuals working in paramo areas to design and implement participative paramo management plans that establish sustainable practices.	Capacity			
2009	State of the knowledge about environmental services in the Andean region documented with emphasis on the hydrological services.	Other kinds of knowledge			
2009	Ecoregional analysis of experiences on payment for environmental services schemes related to the hydrological services in the Andean region.	Practices			
2009	Assessment of the policy framework for the implementation of environmental services schemes	Policy strategies			
2009	Ecoregional Synthesis on environmental services at different scales (i.e. rural areas vs urban areas)	Other kinds of knowledge			
2009	Research framework for Benefit-sharing mechanisms related with water, including cultural and social considerations in the Andes elaborated.	Practices			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2009	Research framework for the implications of climate change on water availability and how it will affect agriculture, livelihoods and the environment in the Andes elaborated.	Practices			
2009	Policy instruments (economical, legislative, regulative) that assure the implementation of key ecosystem functions (i.e. water regulation capacity) and biodiversity conservation plans for Paramo developed, disseminated and promoted.	Policy strategies			
2009	Land Cover and ecosystem classification scheme homologated for the tropical Andes.	Other kinds of knowledge			
2009	Ecoregional Synthesis on Conservationist Agriculture practice in the Andes.	Other kinds of knowledge			
2010	Adequate water conservation friendly practices for productive activities, zoning and conservation strategies documented at nine paramo sites.	Practices			
2010	Indicators to assess the state of ecosystems conservation in the Andes validated.	Practices			
2010	Methodology for prioritization of conservation areas that explicitly include water conservation, designed and validated.	Practices			
2010	Network of microcatchments (Venezuela, Colombia, Ecuador, Peru) with basic hydrological monitoring operating, information being systematized and exchanged at Andean level.	Practices			
2011	Ecoregional synthesis on the research	Other kinds of			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
	related to the impact of Climate change on water availability, rural livelihoods and biodiversity in the Andes at three spatial scales: plot, catchments, and regional (The Andes).	knowledge			
2011	Spatial explicit models of LUCC dynamics on the Northern and Central Andes builded and validated.	Practices			
2011	GIS platform for the Andes that allows meta-analyses, and ecoregional synthesis based on data-driven framework.	Other kinds of knowledge			
<b>Output 2</b>	<b>Institutional innovations, forms of organization and mechanisms for cooperation, training and dialogue in the Andean agricultural system analyzed across the Andes (2013)</b>		CONDESAN partners, innovation systems stakeholders in the Andean countries, NARs, ARI, policy makers at the local, national and regional levels in the Andes	Users start using the Innovation Systems approach to renovate conceptual approaches, strategies and public policies; cohesion and synergies with other stakeholders. Regional stakeholders strengthen their links and synergies and improve their decision making and negotiation processes as well as they adopt an innovation system approach	Strengthen institutional capacity in the Andean Ecoregion to improve livelihoods and reduce deterioration of natural resources in the Andean Ecoregion.
2009	The structure and effectiveness of innovation capacity in technical projects implemented by CONDESAN partners documented	Practices			
2009	Global drivers affecting the mountain environment analyzed for the Andes region.	Other kinds of knowledge			
2009	Implementation of different Market Chain methodologies analyzed in the Andes region.	Other kinds of knowledge			
2009	Peruvian Innovations systems mechanism described and analyzed	Policy strategies			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
2010	Policies supporting and hindering innovation processes (including the institutional arrangements and the cooperative structures) in the Andes documented	Policy strategies			
2010	Ecoregional analysis of experiences implementing the innovation system approach in the Andean region	Practices			
2010	State of the knowledge on innovation systems and its adoption in the Andean region.	Other kinds of knowledge			
2010	Ecoregional Synthesis on Innovation System approach in the Andes	Other kinds of knowledge			
2011	Innovation Learning Projects with strategic partners designed in Andean region	Capacity			
2011	New learning instruments and process on innovation in agricultural systems designed and tested.	Practices			
2011	Mechanism for scale out learning instruments and processes on innovation in agricultural systems in the Andean Ecoregion designed	Practices			

## 8. Global Mountain Program

### *Project Overview and Rationale*

#### *Problem analysis*

Mountains amount for 24% of the earth's landmass. They embody fragile, topographically highly variable, often difficult environments that are home for 720 million people, many of whom are indigenous and culturally diverse, and amongst the world's most vulnerable, poorest and marginalized groups. Mountains are the source of 80% of the world's fresh water, 50% of the biodiversity, 35% of the world's remaining forests. They are also sensitive indicators of climate change. In the past, the mountain populations did not benefit significantly from science-based opportunities in comparison to those living in the favored environments of the lowlands. People and the environment of mountains are particularly vulnerable to processes of globalization, urbanization and climate change. They suffer from isolation, poor infrastructure, high infrastructure maintenance requirements, poor education and remoteness to markets and political power. On the other hand, mountains are rich in resources that are being increasingly exploited by international markets, national urban centers and to a lesser degree local mountain inhabitants. Overall however, lack of opportunity for mountain people and increased opportunities in cities is changing livelihood patterns and driving out-migration. These in turn are affecting the maintenance of agricultural, rural and family stability. Serious deterioration has taken place of these fragile environments and social cultural integrity. Reversing the trends requires new action frameworks and mountain specific research integrated into development action on key issues to provide more enabling policies and support to mountain people.

Reflecting on the role of the CGIAR in mountains, and the need to inter-connect the system priorities, it is apparent that individual centers have over the years invested substantial research for mountainous regions. Much capacity and experience is available in areas of agricultural technology, forestry, natural resource management, management of genetic diversity and policy. The problems in mountains are complex and often are institution and process based, rather than purely technological. However, few of these issues have been dealt with in an integrated CGIAR-wide manner, nor has there been a center level synthesis of products for mountain environment, or dialogue on development of coherent research strategies by the system to have broad impact in these complex fragile systems. The GMP is designed to facilitate linkages and develop platforms to bring the system together for collective action to create added value in mountains. In addition, it serves to better house and connect the CGIAR ecoregional mountain programs, CONDESAN and AHI in globally important issues.

The GMP intends to serve a connector in mountains among the 20 system priorities. In its approach the program not only seeks relevant research outputs but also new partnership frameworks relevant to solving mountain related issues. Thus, Output 2 is connected to the theme Strengthening Rural Urban Linkages. It covers many of the system priorities and is designed also to link to development through facilitation of a stakeholder platform on Rural Urban Linkages (RUL) that through a series of platforms bring together all important stakeholders to tackle issues collectively within a benchmark site. Using the RUL design enables the CGIAR and partners to move away from a mosaic approach to development support to a coordinated focused research for development approach. Although policy and planning research is being emphasized in the beginning, in the future tools and technologies targeted to specific livelihood options will be supported. It will provide new opportunities for commodity based centers. The expected end result is a value added product with far greater impact than what each center could produce alone.

#### *Identification of specific problems to be tackled with research*

Opportunity 1. Improving information pathways and research content for sustainable agriculture and development for mountain people through: a) development of a methodology with indigenous communities to study information/communication bottlenecks b) collecting, analyzing and packaging the CGIAR products for mountains.

a) After 35 years work by CGIAR and national partners, access for mountain people to locally relevant information and technological options for solutions to their problems and access markets is still a major bottleneck. A solution requires collaboration between research and development institutions, and integration of these activities into a larger socio-political framework such as national decentralization processes. To move

forward requires clarification of information bottlenecks, especially of the most marginalized, who are often indigenous groups. To overcome the bottlenecks new opportunities from IT and communication technologies must be integrated into a strategy designed to reach remote areas and marginalized peoples; b) On the content side, although the CGIAR has over thirty years experience in working in mountain regions, to date there has been no attempt to bring together the CGIAR offer for mountain regions. Surprisingly, many of the products of CGIAR Centers are not easily accessible.. Access to CGIAR products of the last 30 years can provide opportunities and choices for mountain people to better manage their specific needs. Secondly, the issue of access to information and innovations needs a fresh approach. The program believes that supporting development of an innovation and information marketplace for mountain people will provide a step forward to eliminating the information bottleneck. The GMP has partnered for this task with the Mountain Forum, the international body set up to support mountain people with information. The opportunity translates to Output 1 and contributes especially to SP 5D.

### ***Opportunity 2. Strengthening Rural Urban Linkages and livelihood options in mountains (RULs)***

Urban centers are growing rapidly and are increasingly affecting rural mountain areas. They act as strong sinks for agricultural and forest products, water, nutrients, minerals and people. They provide both opportunities and problems for sustainable mountain development. Unmanaged extraction of resources is depleting the resource base necessary for future livelihoods people and function of mountain ecosystems. Deforestation, mining, water contamination and overuse of soils, broken nutrient cycles and poverty-driven emigration from rural areas are causing serious degradation of the natural resource base and a decline in well-being and health of rural mountain populations. Similarly, urban areas are affected by a deterioration of rural mountain resources though reduced water quality and availability, lack of fuel, availability of agricultural products and reduced scenic quality for recreation. Excessive migration flows due to poor rural policies are overstressing scarce city resources and threatening urban sustainability. On the other hand urban centers are often engines for rural development. Strengthened linkages and better RUL planning will offer benefits to both rural and urban livelihoods and enable sustainable mountain development.

Many rural problems of poverty, food security, NRM and the environment cannot be solved without including the urban link in the management of rural resources. There are numerous key knowledge gaps in understanding and improving the effectiveness of planning and policies that affect urban and rural livelihood and agro-environmental issues. The issues need a focused, integrated research approach and territorial rather than sector-based planning, policies and support strategies. The GMP has made RULs a thematic area and developed a framework for collective action that enables CGIAR centers to use their strengths to add value to present efforts. Addis Ababa will be the first benchmark site. The GMP launched this initiative in close collaboration with the African Highland Initiative and the System Wide Urban Harvest Program. The GMP has been joined in the venture by urban and rural Ethiopian institutions research and civil institutions. The program has worked closely with the Government of Ethiopia which has added RUL in its current 5 year plan. It has worked closely with the Donnor Assistance Group (DAG) in developing the thematic area and has established a Research support group for the RUL platform, which through the GMP action was established in 2006 and chaired by the ministers of Agriculture and rural development and the minister of urban affairs.

The GMP with these partners will define key areas for research intervention through a planning process that includes collection of baseline data on livelihood and land-use issues and options of rural to urban mountain populations. The inflows and outflows of goods from rural to urban areas and the strengths and weaknesses of existing policies to optimize the benefits of RULs to attain national goals will be analyzed. Research will quantify problems such as water availability and quality, forest degradation for fuel, migration and health and contribute to better targeting of support to mountain people. The Rural Urban linkage approach would provide the basis for actions using cities as engines for rural development through better incentives for environmental stewardship, such as Payment for Environmental Services (PES). In addition, the approach contains will promote platforms for stakeholder action. This model provides a context for research for development in a defined benchmark sites where MDG impact can be measured. Establishment of benchmark sites in different continents should provide an opportunity for cross-site learning by stakeholder groups and the CGIAR. The opportunity translates to output 2 and contributes particularly to SPs 4A.

## ***Objectives***

The objectives of the GMP in the next three years are to improve the contribution of the CGIAR to the Millennium Development Goals through: a) bringing together a plan with the Mountain forum to better support information for mountain groups, an analysis of the CGIAR offer in mountains and development better mechanisms to harness the CGIAR research strengths to support sustainable mountain development; b) better understanding and connection of processes that affect sustainable mountain development, especially the role urban-rural linkages through collection and analysis of baseline information on peoples livelihood issues and options.

## ***External conditions***

The assumptions are that sufficient funding available, that partners complete their part of the agreements, that the program has sufficient institutional support to enable it to effectively function as a system wide program and that target regions will be socially and politically stable. The GMP is totally dependent on external funding for these system wide integrative activities and receives no core support from the CGIAR itself. The factually inaccurate evaluation of the program by the CIP EPMR of September 2007 and indiscriminate and unconsultative use by the Science Council of the report in its own SWEPS review in January 2008 has left the GMP vulnerable financially and less able to pursue its stated goals and support collective action of the system in mountains. It is assumed that the situation will clarify by the end of 2008 following the outcome of the 'change of management' process and the ExCo discussion of the Science Council report.

## ***Target eco-regions***

The GMP works globally. Presently, due to funding limitations, activities are concentrated in Sub Saharan Africa and Latin America. In the future activities in Asia will be included. The program also intends to increase its activities in Africa.

## ***Beneficiaries***

Rural and urban communities in mountains, local and national planners and policy makers, research scientists and institute directors, NGOs and international development organizations.

## ***Alignment to CGIAR Priorities***

The GMP output targets are aligned with System Priorities 4D and 5D.

**Output 1.** This output is crosscutting and difficult to place: it is best positioned in System Priority 4D: Agro-ecological intensification in low-/high potential areas..

**Output 2.** 5D - Improving research and development options to reduce rural poverty and vulnerability.

## ***Outputs Description***

### ***Changes from previous MTP Outputs***

Changes in the MTP 2009-2011 outputs were made to adjust operational and financial realities and to tighten the project output products. In 2008 the program had to adjust programs due to unexpected funding restrictions.

**Output 1.** Work continued to develop the umbrella framework and strategy to improve information access for mountain people following a successful planning workshop in 2007. Lack of secured funding in 2008 has force a delay of further information thematic area outputs target reporting until funds can again be secured. We do plan to report in 2010 on development both in collection of CGIAR content and market place development.



**Output 2.** There are no changes in the output. A migration research output target of work started in 2008 with IFPRI has been added for 2009. Other output targets have been tightened and their date of delivery adjusted due to funding limitations.

Output 1. Output 1: CGIAR products for mountains are available and used in an information market place for mountain people.

Description. The principal research products of the CGIAR centers for mountains are available and accessible to mountain communities in the form of a market place of innovations and opportunities. (finished 2017). A year is needed to collect and analyse information for each Center and five years are needed to develop the Information Marketplace with the Mountain Forum and communities.

Alignment to CGIAR Priorities: 4D: Promoting sustainable agro-ecological intensification in low- and high-potential areas; 5D: Improving research and development options to reduce rural poverty and vulnerability.

Countries of Planned Research: Ethiopia; Nepal; Peru.

### ***Output 2. Strengthening Rural-Urban Linkages and Livelihood Options in Mountains***

Description. Livelihood, land use & natural resources flow and a policy analyses of Rural-Urban-Rural in Ethiopian benchmark are available. (2008-2010) With CIFOR, IWMI, IFPRI, SWIUPA, AHI and national partners).

Alignment to CGIAR Priorities: 5D: Improving research and development options to reduce rural poverty and vulnerability.

Countries of Planned Research: Ethiopia.

## ***Impact Pathways by Output***

**Output 1.** CGIAR products for mountains are available and used in an information market place for mountain people.

Problem analysis. Many mountain communities still lack access to new technology and information including CGIAR products developed over the years.

Planning and action. (a) A planning workshop was held in Nepal with community leaders, scientists, NGOs, Private industry and information specialists identified needs and discussed a new approach ' innovation and information marketplace development. (b) A program was launched to collect and analyze CGIAR products relevant to mountains.

Process. (a) CGIAR products will be systematically be made more accessible in information databases and engines through partner institutions such as the mountain forum. (b) A market place concept methodology improved and tested with information groups and communities in three continents.

Results: The research and development outcomes will link with ongoing efforts of other institutions and the decentralization processes to increase information access and relevant content exchange. These in turn will enable the ability of mountain people and communities to better find solutions to their concerns and help mountain development.

### **Output 2. Strengthening Rural-Urban Linkages and Livelihood Options in Mountains**

Problem analysis: Rural and Urban development activities in mountains are still not connected. The CGIAR's action also still is rural focused and often seen as a mosaic of separate actions. In response the GMP is focusing a) on benchmark sites where on the ground action can be demonstrated b) on developing a framework for research with development through national platforms with major rural and urban actors and c) developing a research support group containing National and CGIAR centers to support the RUL platform in strategic researchable questions.

Impact pathway: The research on specific issues will feed back to the platform actors as information and tools by which more coordinated territorial planning and policies will be developed. In addition in the future tools and technologies targeted for different livelihood needs along the RUL chain will be developed to increase the effectiveness of technological support. The operational framework will enable cross sectorial and territorial action and with research support a will enable more effective rural and urban development to take place. Changes will be able to be measured in the benchmark in the future.

## ***International Public Goods***

International public goods:

- Innovation and Information Marketplace methodology based on research from mountains in three continents.
- Analysis and availability of CGIAR mountain products.
- Rural Urban Linkage operational Framework action methodology for each mountain benchmark site.
- Information on Rural Urban Linkage processes and options within and between mountain benchmark sites for territorial policy development, planning. using information land use changes, migration flows, product flows (water, forests commodities), market options, livelihood options at various linkage points and finally targeted information, tools and technologies for target groups along the chain.

## ***Elaboration of Partners Roles***

Country	Major Partner	Strategic and complementary advantage	Project (Output)
	The Mountain Forum	Global service for communication and information for mountains regions. Its role is firstly as focal point for the innovations and as partner in developing a supermarket or marketplace for innovations and options.	Output 1 (2010 & 11)
	The African Highlands Initiative	Principal partner in Africa. Houses the GMP financed mountain forum resource person. Has links to important CGIAR centers in East African highlands and national groups. The future of AHI is uncertain as it is absorbed in to the NRM theme of ASARECA in 2008. It may be that we are going to lose the value focus on highlands the AHI provided. Member of the advisory group that manages the GMP RUL Research Fellow.	Output 1 (2010-11)
	The International Center for Integrated Mountain Development (ICIMOD)	Principal GMP partner in the Hindu Kush Himalayas. It houses an information and Knowledge management program. The program would provide technical expertise on development of an innovation marketplace.	Output 1 (2010)
	The System Wide Initiative on Urban Agriculture. (Urban Harvest Program)	Concentrates on Urban parts of the research. Member of the advisory group that manages the GMP RUL Research Fellow	Output 2 (2011)
Ethiopia	Ethiopian Institute for Agricultural Research (EIAR)	Part of the RUL research support group	Output 2 (2010-11)
Ethiopia	University of Addis Ababa	Support Livelihood survey and migration research	Output 2 (2009)
Ethiopia	Addis Municipal Planning offices	Help test the models.	Output 2 (2011)

Country	Major Partner	Strategic and complementary advantage	Project (Output)
	IFPRI, CIFOR, CIAT, CIP, IWMI, ICRAF, ILRI	Members of the RUL-M research working group. IFPRI supports work on migration and product flow. CIFOR supports research on policies, deforestation and urban demand for wood-products, IWMI supports activities in upstream and downstream water management.	Output 2 (2010-11)

## Logical Framework

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
Output 1	CGIAR products for mountains are available and used in an information market place for mountain people		Professionals working on mountain issues, Mountain communities	A rational framework is available that better links CGIAR content to information needs, support and innovation exchange of mountain communities.	Mountain people who have access to information tools and options, including those of the CGIAR adapt to new global changes and take opportunities to break poverty cycles, secure food and better manage the environment leading to more sustainable mountain development and mountain functionality.
2010	The products for mountain people of CIP has been collected analyzed.	Practices			
2011	Studies with indigenous mountain communities on information sources and support, bottlenecks and solutions in three continents are available.	Other kinds of knowledge			
Output 2	<b>Strengthening Rural-Urban Linkages and Livelihood Options in Mountains</b>		The national Rural Urban Linkage RUL platform members	National and municipal authorities and civil groups collectively use the information, to better plan cross sectoral actions (including additional research needs) and later use as baseline information of changes.	Well coordinated Rural and urban planning and policies result in increased food security, wellbeing and income of mountain people and better stewardship natural resources in mountains. MDGs, especially those on poverty reduction and environment reached
2009	Results are available of a study on poverty gradient within the Rural-Urban-linkage transact in Ethiopian benchmark site (GMP)	Policy strategies			
2009	A study on the patterns of the seasonal	Policy strategies			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
	labour migration within the rural-urban-linkage frame, its impacts and policy requirements available. (GMP, AAU, IFPRI )				
2010	Water flow and availability and quality for human, livestock, energy, irrigation using the watershed approach is quantified for Ethiopian Benchmark Site. (GMP, IWMI)	Policy strategies			
2010	Sediment flow from upstream areas to downstream urban areas quantified (related to upland management deforestation, steep slope cultivation, overgrazing etc) and Compensation for Environmental Services designed (GMP - GoE)	Policy strategies			
2010	Flows of forest product to urban areas (fuel & timber) quantified. (CIFOR, GMP, ICRAF)	Policy strategies			
2010	Major products and goods flows from rural to urban and urban to rural are identified and value changes along the chain, (including market and other infrastructure). (GMP, IFPRI, ILRI)	Policy strategies			
2011	Flows of organic and inorganic pollutants and nutrients in and out of urban areas are located, quantified and mapped and assessed for impact on urban agriculture, health and downstream community wellbeing in and around Addis Ababa. (GMP, IWMI, UH, ILRI, CIP)	Policy strategies			
2011	The first components of policy decision-support and planning tools for better RUL is available (GMP, University of Zurich, CIP)	Policy strategies			

## 9. Urban Harvest

### *Project Overview and Rationale*

The developing world is increasingly urban. Forty percent of Africans and Asians now live in cities; in Latin America it is 80%. Some of the fastest rates of urban growth are in Africa, where an estimated 225 million more people will be living in cities by 2020. By that time, eight of the nine largest megacities in the world will be in developing countries. Urbanization in the developing world is also a migration of poverty and child malnutrition to towns and cities. In Latin America about 62% of the poor is now classified as urban. In Asia and Africa, the figure is about 40%. Poor families living in and around cities find themselves in a specifically urban poverty trap. While work is limited, food is expensive and takes up a major part of earnings. Services like education are more costly than in rural areas and insecurity is endemic. Lacking the social support networks common in rural communities, poor urban households are vulnerable to economic and political shocks. With these pressures on household financial resources, the family's nutritional well-being and health are at risk. Poor urban families in the South suffer a double health burden, facing typically rural nutritional, respiratory and contagious diseases as well as the new lifestyle diseases such as obesity, heart disease, cancers and diabetes. Urban ecosystems are also at risk from the rapid growth of population and poverty. City services become overstretched, local natural resources deteriorate and it is usually the poorest people whose health and safety is most compromised by these environmental problems.

Increasing numbers of poor households living in and around cities are seeking direct ways to alleviate food insecurity and secure other aspects of their livelihood through cultivating areas of land and raising livestock. As many as 800 million are estimated to be involved in this strategy world-wide with some cities, such as Dar es Salaam and Kampala having more than a third of their households pursuing urban and peri-urban agriculture. In many countries such as Kenya, Uganda, Tanzania, Mozambique, Zambia, Zimbabwe, Senegal, Poland and Thailand women predominate particularly due to their responsibility for household food security. Crop and livestock production thus offer potential solutions to food and income insecurity and can provide productive ways to conserve urban natural resources. At the same time, there is need to ensure that these benefits are not compromised by potential problems created by the agricultural activity itself. This concerns primarily the risk to densely settled urban producers and consumers from exposure to organic and inorganic contaminants that are concentrated in the urban environment. There are multiple, agriculture-related pathways air, soil, water, plants, animals and their products through which these contaminants can impact on human health.

Though urban areas in the developing world face socio-economic and environmental problems, they also present new concentrations of wealth which bring increased demand for livestock products, high-value crops and processed products as well as cut flowers and ornamental plants. Urban producers can increase their own income and food and nutrition security through better and lower cost access to diverse markets, the ability to quickly market high quality, perishable products and the advantage of establishing direct producer-consumer relations or short marketing chains. Research is needed into the actual and potential value chains and enterprise clusters linking producers to markets while paying attention to the needs and opportunities of both men and women including the young and old.

These different product markets have the potential to contribute to the economic and social development of households located along the entire rural-urban continuum. Despite the stereotype of rural agriculture and urban manufacturing, in practice the agricultural sector cross-cuts rural-urban boundaries and manufacturing and services are commonly found in rural areas. This overlap of sectors is underscored by the two-way flow of people, produce, inputs, financing and knowledge making up what is frequently referred to as rural-urban linkages, a significant portion of which is agriculture-related. This suggests that the inter-dependences between rural and urban are of greater importance than their sectoral separation. Analysis of rural-urban linkages can help us to understand where improvements in rural-to-urban food flows can contribute to better food security among the urban poor and higher incomes for rural producers. Treating the involvement of people in rural-urban flows as a heterogeneous group and recognizing differences among its members will lead to a better understanding of rural-urban linkages and development of gender responsive strategies in addressing food security for the urban poor. It can also identify where opportunities exist for urban food production to make a complementary contribution either directly or via income opportunities to household food and nutrition security.

Cities are concentrations of demand for a diversity of agricultural products. They are also nutrient sinks and repositories of other untapped natural resources. Nutrients are found in the vast quantities of wastewater and organic residues generated in urban and peri-urban areas. Cities also contain under-utilized land and water surfaces that can be put to productive use. The use of these urban resources also carries health risks, as do the use of agro-chemicals and animal raising in densely populated areas. Research is needed to identify where human health risks occur, who is affected, how to mitigate the risks, what mitigation measures is suitable for who, and how to support local producers to safely benefit from available urban resources.

The dense network of administrative jurisdictions, legal obligations, competing rights and policy prescriptions that reach into the lives of urban households is another key characteristic of cities. Agricultural activities are usually circumscribed and sometimes proscribed by ordinances and other regulations and frequently encounter competing rights for the resources deployed. Men and women have different access and control of resources and bargaining power in decision making in urban agriculture and if the national and local policies do not recognize this the interests, needs and constraints of both men and women may not equitably be addressed. Research on policies and institutions is needed to understand this situation and to develop strategies for stakeholder dialogue and platform building to better integrate urban agriculture in urban governance.

## ***Alignment to CGIAR Priorities***

CIP acknowledges the Science Council view, expressed in its commentary on CIPs 2007-2009 MTP that Urban Harvest does not at present fall within the current SPs. The financial reporting of this project has been moved to the appropriate non-agenda columns in Financial Table 1. However, CIP continues to believe that urban and peri-urban agriculture is an important livelihood strategy for millions of households in the developing world and is highly relevant to the CGIAR mandate. For this reason, and in expectation of a future change in thinking about Urban Harvest by the Science Council, which was intimated in the commentary, we discuss alignments with System Priorities below.

A large part of this project's research effort is geared towards improving gender responsive urban and peri-urban livelihoods through agriculture and this focuses attention on the opportunities offered to producers in and around cities to take advantage of high value markets for both crops and livestock, captured in SPs 3a and 3b. Another research component addresses the issue of management of urban and peri-urban natural resources, both the opportunities which urban areas offer as nutrient sinks, but also the risks that agriculture acts as a pathway for multiple contaminants to enter the food system and negatively affect human health. This area of research relates to priority 4D, the sustainable agro-ecological intensification in low and high potential environments. A third area of research effort is related to policy options and institutional and planning strategies to support safe and sustainable agricultural production in urban areas. This is primarily aligned with Priority 4A, integrated land, water and forest management at landscape level.

## ***Outputs Description***

### ***Changes from previous MTP Outputs***

CIP's sixth external program and management review took place since the previous MTP, which included the recommendation for CIP to disengage from the Urban Harvest SWEP. This part of the recommendation was not accepted by CIP's Board of Trustees and this decision was supported by the Executive Council of the CGIAR and by the full CGIAR during its AGM. CIP's BOT did propose that the Urban Harvest program should seek closer linkages with CIP's own commodity program. This has resulted in an effort to more strongly emphasize work in horticultural systems located along rural-urban continuum, where potatoes are commonly found together with other solanaceous and non-solanaceous vegetables.

**Output 1.** Innovative technologies and practices developed for strengthening livelihoods security and increasing productivity and marketing of agricultural commodities along the rural-to-urban continuum (2011)

Description. The goal of Urban Harvest is to stimulate the contribution of agriculture within and around cities to, alleviate poverty and increase food and nutrition security whilst contributing to the sustainability of urban livelihoods and the urban environment.

To address these objectives, a research framework has been developed which draws on earlier insights into sustainable livelihoods and urban ecosystems health and consists of three elements: **Stakeholder and policy analysis and dialog** seeks understanding of the actors, policies and institutions concerned in urban agricultural activities and develops methods for communication and consensus among actors and legitimacy for urban agriculture in policy and regulatory schemes. The element of **Livelihoods and markets** targets production, processing, marketing and consumption systems along the rural-urban transect and identifies technology interventions to enhance incomes and increase food and nutrition security. **Urban ecosystem health** focuses research attention on the feedback mechanisms between agricultural activities and population, community and environmental health (see Annex 1). Urban Harvest applies a gender responsive approach in addressing its goal and objectives and has developed a gender statement to enhance gender mainstreaming in its research process.

The research under this output uses a gender sensitive livelihoods approach to understand the contribution of agriculture to the mix of livelihoods strategies of low income urban and peri-urban households and identifies strategies and technologies to enhance the contribution of agriculture to income and food security, both within production systems and along input and output marketing chains of high value urban and peri-urban (UPA) crops and livestock products. It is directly related to Priorities 3A goal 2 and 3B goal 1 which target improved livelihoods of poor farmers and laborers through increasing income from fresh marketing of fruits, vegetables and livestock products or through adding value via enhancing quality or through agro-processing activities. Research particularly addresses collective action for improved marketing as a key strategy. Some of the crops in these systems are also candidates for biofortification (sweetpotatoes, beans, potatoes) and provide opportunities for enhancing the nutritional status of beneficiaries, especially young children.

Alignment to CGIAR Priorities. 3A - Increasing income from fruit and vegetables; 3B: Increasing income from livestock.

Countries of Planned Research. Bolivia; Ecuador; Indonesia; Kenya; Peru; Uganda.

**Output 2.** Methods developed to enhance the safety and sustainability of agriculture along the rural-to-urban continuum and the uptake of urban sources of nutrients (2011).

Description. The research for output 2 benefits from ecosystems health thinking with a gender perspective to identify opportunities for nutrient recycling from solid and liquid organic residues in urban and peri-urban areas, to address water and soil quality issues and to measure and mitigate negative impacts on human health of biological and chemical contaminants including agro-chemicals which get into the food system through agriculture. This output utilizes the concept of rural-urban linkages to understand nutrient and biomass flows between rural and urban areas. This area of research relates to priority 4D, the sustainable agro-ecological intensification in low and high potential environments.

Alignment to CGIAR Priorities. 4D - Promoting sustainable agro-ecological intensification in low- and high-potential areas.

Countries of Planned Research: Bolivia; Ecuador; Indonesia; Kenya; Peru; Uganda;

Output 3: Policy options and institutional and planning strategies to support safe and sustainable agricultural systems along the rural to urban continuum are developed (2012)

Description. Since peri-urban landscapes are mosaics of multiple land uses, often with conflicting demands on resources, research in this output has a spatial and institutional focus, analyzing changing patterns of land use within municipalities, the multiple stakeholders driving these changes and the way existing plans, policies, norms and by-laws address or not the competing uses of urban natural resources. Policy interventions are focused on methods for integrating agricultural use of natural resources within municipal planning and organization and for planning a more rational management of the different uses to maximize poverty alleviation, social inclusion and sustainability of the urban environment. This output is primarily aligned with Priority 4A, integrated land, water and forest management at landscape level.

Alignment to CGIAR Priorities 4A - Promoting integrated land, water and forest management at landscape level.



Countries of Planned Research. Bolivia; Ecuador; Indonesia; Kenya; Peru; Uganda.

## ***Impact Pathways by Output***

**Output 1.** Innovative technologies and practices developed for strengthening livelihoods security and increasing productivity and marketing of agricultural commodities along the rural-to-urban continuum (2011).

Urban Harvests impact pathway is closely linked to the pro-poor R&D cycle which forms the basis of CIPs MDG-oriented strategy. It uses the following criteria to carefully target urban settlements where impact can be expected:

- Large urban centers in distinct eco-regions with concentrations of poor people (megacity focus)
- Urban centers with high proportion of food and nutrition insecure
- Countries with high urbanization rates
- Mother-child food security systems
- Small city systems with close links to rural hinterland
- Urban/peri-urban systems widely distributed (eg, peri-urban small-holder commercial vegetable production)

## ***Locations with CG logistical support***

Based on these targeting criteria, the gendered pro-poor research cycle of diagnostic and needs assessments, research interventions and going to scale for dissemination have been undertaken through regional networks of anchor cities - urban and peri-urban sites where pilot research interventions are scaling out initiatives are located. Other cities in each of the regions are linked to Urban Harvest activities through information-sharing and capacity-building networks. These are referred to as contact cities. Current and expected anchor sites by country and ecology involved in the impact pathway for this Output are: Manila capital region, Philippines (humid tropical lowlands); Bandung metropolitan region, Indonesia (humid tropical lowlands); Kampala, Uganda (sub-humid tropics); Nairobi, Kenya (sub-humid tropics); Nakuru, Kenya (sub-humid tropics); Lima, Peru (desert); Huancayo metropolitan region, Peru (cool tropics); Cochabamba metropolitan region, Bolivia (cool tropics); Ampato metropolitan region, Ecuador (cool tropics)

Outputs will be used by national and local researchers, extension agents and city agriculture officials, as well as CSOs who are partners in the anchor sites indicated above. It is expected that these users will work with producer, processing and marketing organizations to enable the uptake of the practices in anchor cities and facilitate their spread to contact cities. The increased efficiencies and/or alternative, higher value markets accessed are expected to impact on incomes and food security of targeted households.

**Output 2.** Methods developed to enhance the safety and sustainability of agriculture along the rural-to-urban continuum and the uptake of urban sources of nutrients (2011)

The impact pathway for this Output also builds on the pro-poor R&D cycle, using similar targeting criteria. Current and expected anchor sites by country and ecology involved in the impact pathway for this Output are: Bandung metropolitan region, Indonesia (humid tropical lowlands); Kampala, Uganda (sub-humid tropics); Nairobi, Kenya (sub-humid tropics); Nakuru, Kenya (sub-humid tropics); Lima, Peru (desert); Huancayo metropolitan region, Peru (cool tropics); Cochabamba metropolitan region, Bolivia (cool tropics); Ampato metropolitan region, Ecuador (cool tropics).

Users of the outputs include policy makers, city officials researchers and urban health professionals, as well as CSOs. It is expected that the practices, policy strategies and other kinds of knowledge which are the major types of output will be integrated into urban and peri-urban policies and planning and that this outcome will result in the enhanced productive use of urban natural resources and decreased health risks from agricultural pathways into the food system.

**Output 3.** Policy options and institutional and planning strategies to support safe and sustainable agricultural systems along the rural to urban continuum are developed (2012)

The impact pathway for this Output also builds on the pro-poor R&D cycle, using similar targeting criteria. Current and expected anchor sites by country and ecology involved in the impact pathway for this Output are: Manila capital region, Philippines (humid tropical lowlands); Bandung metropolitan region, Indonesia (humid tropical lowlands); Kampala, Uganda (sub-humid tropics); Nairobi, Kenya (sub-humid tropics); Nakuru, Kenya (sub-humid tropics); Lima, Peru (desert); Huancayo metropolitan region, Peru (cool tropics); Cochabamba metropolitan region, Bolivia (cool tropics); Ampato metropolitan region, Ecuador (cool tropics).

The impact pathway for this output depends on the functioning of dialogue platforms which are established among local stakeholders to facilitate the uptake of policy options and planning strategies which are the institutional and policy outcomes expected from this output. This platform is also expected to facilitate the outcomes in Output 1 and especially Output 2 of this project. In other words, in an integrated, systems-oriented project, impact pathways cannot be isolated across Outputs. The specific impacts expected in the impact pathway of Output 3 involve the reduction of risk from food, water and soil borne contaminants and the enhancement of the urban environment and income and food security opportunities for the local population through sustainable utilization of urban natural resources.

### ***International Public Goods***

Urban Harvest has two major approaches to developing IPGs. The first is to emphasize the testing and validation of strategies, frameworks and methods, which are the major types of outputs, in multiple sites, after they have been developed initially in a single or sometimes in two sites. This allows for adjustment and leads to greater robustness. The second is to carry out comparative, meta evaluations of similar output targets from sites in different regions.

### ***Elaboration of Partners Roles***

Networking knowledge exchange at the national and regional level occurs through networks centered on the anchor cities and contact cities described above and also through linking to existing regional networks of national organizations concerned with urban agriculture, management and development, such as that developed through the RUA Foundation network of regional resource centers, the Municipal Development Program in Eastern and Southern Africa and the Urban Agriculture National Research, Development and Extension Network in the Philippines. This type of networking brings together researchers, city officials and decision-makers and CSOs. Globally, Urban Harvest is a member of the Steering Committee of the Support Group on Urban Agriculture and Forestry (SGUA), a global coalition of donor and development organizations established in 1996. Under the coordination of the International Development Research Centre, SGUA promotes networking and co-operation in urban agriculture in developing countries, fosters North-South learning and helps link agriculture with other urban development challenges.

Country	Partner	Strategic role/complementary advantage	Output to which partner contributes
	AVRDC	Urban horticultural systems, indigenous African vegetables	1
	CIAT	Agro-enterprise innovation	1
	CIP	Sweetpotato varieties, seed technology, potato ICM, farmer field school skills, GIS and modeling, agriculture and health	1, 2, 3
	ILRI	Diagnostic and action livestock research, utilization of manures, risk assessment	1, 2,
	IWMI	Wastewater use for vegetables, flooding control	2
	GMP	Rural-urban linkages in mountain environments	1,2
	PRGA	Gender mainstreaming	1,3
	UPWARD	Rural-urban agro-enterprises, livelihoods and marketing studies	1,2

Country	Partner	Strategic role/complementary advantage	Output to which partner contributes
	University of the Philippines, Los Baños	Horticultural research, urban planning, GIS	1,3
	University of the Philippines, Diliman	GIS, Multi-agent systems (MAS)	3
	Kenya Agricultural Research Institute	IPM, policy analysis, technology transfer	1,3
	University of Nairobi	Soil studies and water use, health risks	2
	Jomo Kenyatta University	Waste water studies	2
	Egerton University	Urban horticultural systems, Nutrition, livelihoods and livestock research	1,2
	Ministry of Agriculture and Fisheries, Kenya	Livestock development, water and irrigation	
	Nairobi Water and Sewerage Company	Policy development, wastewater reuse	2
	Farm Concern International (CSO)	Market chain analyses, product development	1
	Greentowns, Kenya (CSO)	Community mobilization, participatory technology testing, local govt. facilitation	1,2,3
	Mazingira Institute/NEFSALF (CSO/CO)	Building a model for organization of urban farmers	1
	Nakuru City Council, Kenya	Urban environmental management, regulatory framework for urban agriculture, nutrition and health	1,3
	Makerere University, Uganda	Urban planning, public health issues, nutrient cycling	1, 2, 3
	Kampala City Council, Uganda	Land use policies, urban planning, regulatory frameworks, public consultations, convener role	3
	Environmental Alert, Uganda (CSO)	Community organizing, advocacy	1,3
	KUFSALCC (CSO)	Dialogue platform, facilitation	3
	Ministry of Agriculture, Animal Industries and Fisheries (MAAIF), Uganda	Agricultural and food policy analysis	3
	National Agricultural Research Organization (NARO), Uganda	Horticultural crops, livestock research	1
	Instituto de Investigación Nutricional (IIN), Perú	Child nutrition research	1
	National Agricultural University, Peru	Vegetable and livestock production modules, environmental health	1,2
	CEDEPAS (CSO)	Producer organization methods, policy interventions	1,3
	RAAS (CSO)	FFS methods	
	PROINPA (CSO)	Horticulture, FFS methods, socio-economics	
	Promoción de Desarrollo Sostenible (IPES) (CSO)	Municipal policy análisis, urban planning	3
	Municipalidad Lurigancho-Chosica, Lima, Peru	Urban management policies, land use planning, convener role	3
	Rimac River Water Users' Association	Irrigation water management, farmer representative	2,3

Country	Partner	Strategic role/complementary advantage	Output to which partner contributes
	(JUR), Peru		
	Municipalidad de Pillaro, Ampato, Ecuador	Urban management policies, land use planning, convener role	1,2,3
	University of Toronto, Dept. of Public Health	Health risk assessment in urban agriculture, health related policies	2,3
	Ryerson University, Toronto	Food and nutrition security analysis in urban context	1
	CIRAD	Urban horticulture	1
	Universidad Politecnica de Madrid	Territorial planning and policy for urban areas	3

## Logical Framework

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
Output 1	Innovative technologies and practices developed for strengthening livelihoods security and increasing productivity and marketing of agricultural commodities along the rural-to-urban continuum (2011)		Researchers, extension agents and CSOs at international and target country level, city agricultural officials, producer and processor organizations in target cities	Innovations spread among producers in target cities and in contact cities[1] [1] Contact cities include urban areas which participate in workshops, capacity-building activities and learning visits to target cities, but where no direct research activities are undertaken by this Project	Producers increase incomes through higher productivity and access to alternative markets
2009	Contribution of horticulture to livelihoods determined in metropolitan regions in Peru, Bolivia and Ecuador (with CIP Division 6)	Other kinds of knowledge			
2009	Livestock production framework for enhanced use and sale of animal source foods (ASFs) validated in Kampala (with CIAT)	Practices			
2009	Collective action options identified for agricultural interventions for HIV-AIDS affected households established in Nakuru, Kenya (with ILRI)	Practices			
2009	At least two scaling out strategies identified for urban agriculture interventions in Peru, including targeting capacity building approaches for technical and administrative personnel	Policy strategies			
2009	Model of commercial villages approach to agro-enterprise development tested for African leafy vegetables and sweetpotato in Nairobi (with FCI, CIP, AVRDC)	Practices			
2009	Viability of converting contaminant-prone urban food production into seedling enterprises tested in Kenya (with CIP,	Policy strategies			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
	AVRDC, FCI)				
2010	Relative opportunities and constraints of horticulture-based agro-enterprises along rural-urban transects in Peru and Bolivia assessed	Other kinds of knowledge			
2010	Collective action options for urban horticulture marketing determined from Kampala case study	Practices			
2010	Methods for increasing consumption of safe vegetables in Nairobi determined	Policy strategies			
2011	Rural-urban linkage analysis applied to horticulture systems in Bandung metropolitan region, Indonesia	Other kinds of knowledge			
2011	Food and nutrition security interventions for HIV-AIDS affected households evaluated in two African cities	Practices			
<b>Output 2</b>	<b>Methods developed to enhance the safety and sustainability of agriculture along the rural-to-urban continuum and the uptake of urban sources of nutrients (2011)</b>		Policy makers, city officials, researchers, urban health professionals, CSOs	Users integrate the methods into urban policies and planning	Reduced human health risks from UPA and enhanced productive use of urban natural resources in agriculture
2009	Agricultural technologies for improved water management tested in Kampala	Practices			
2009	Candidate technologies for agricultural recycling of organic wastes evaluated in Kampala	Practices			
2009	Participatory risk assessment methods for livestock keeping evaluated in Kampala (with ILRI)	Policy strategies			
2009	Adaptation of rustic reservoir model for simple water treatment of irrigation water applied in two new horticultural systems	Practices			
2010	Management options and capacity	Policy strategies			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
	building strategies for agricultural recycling of organic wastes developed, based on Kampala, Nairobi and Nakuru studies				
2010	Enhanced agricultural recycling of domestic and agricultural wastes through use of micro-organisms validated in two sites in Latin America (with CIP)	Practices			
2010	Rural-urban biomass flows and impact on rural and urban natural resources assessed in Kampala	Policy strategies			
2010	Contaminant pathways characterized in horticultural systems in the Bandung metropolitan region, Indonesia	Other kinds of knowledge			
2011	Typology of exposure pathways for contaminants in horticultural production and marketing systems developed and mitigation options identified based on comparative case studies in Latin America, Africa and Asia	Other kinds of knowledge			
<b>Output 3</b>	<b>Policy options and institutional and planning strategies to support safe and sustainable agricultural systems along the rural to urban continuum are developed (2012)</b>		Municipal authorities, producers, national governments, multilateral agencies	Stakeholders involved in consultative planning processes in local government resulting in urban and peri-urban agriculture and NRM being incorporated into policies and development targeting	Improved policies, reduced risks and better use of urban resources lead to increased food security and income contribution from UPA
2009	Strategies for inserting urban NRM and agriculture into land, waste and health policies developed in Nairobi	Policy strategies			
2009	Policy framework for safe and sustainable urban food production available in Lima and Kampala, involving by-laws, food quality standards (FQS) and/or certification of urban and peri-urban	Policy strategies			

Output	Output targets	Output target type/Verification	Intended users	Outcomes	Impacts
	agricultural commodities (with CIAT and Polytechnic University of Madrid).				
2009	Application of multi-stakeholder dialogue approach, including community awareness and capacity building to empower them to engage with city authorities in Kampala and Nairobi	Capacity			
2009	A participatory M&E plan implemented among stakeholders in metropolitan regions in Peru, Bolivia and Ecuador, involving platforms for healthy and sustainable horticulture (with CIP-Div 6 and 1)	Capacity			
2010	Criteria and municipal-led implementation strategy for safe and sustainable urban food production established in other Latin American sites	Policy strategies			
2010	Indicators developed to track policy implementation for reducing health risks from peri-urban pesticide use elaborated in Latin America and Africa	Policy strategies			
2010	A participatory M&E plan for healthy and sustainable horticulture implemented among stakeholders in Bandung metropolitan region, Indonesia	Policy strategies			
2011	Decision-support tools developed for incorporating healthy and sustainable urban food production into municipal planning and policy-making, drawing on lessons from Latin America, Africa and Asia	Policy strategies			



## ANNEXES

### Implementation of EPMR/CPER Recommendations

As listed in the EPMR report	Center's Response	Implementation		
		Milestones	Progress achieved	Target date of completion
<p>#1. The Panel recommends that the current organizational structure be modified to include:(i) Division on Partnership and Research on Partnerships, with the double mission of: (1)assisting CIP in the development of regional and country program partnerships specifically oriented to the mobilization of the Center's main OUTPUTS; and (2)conducting research of an international-public-goods nature in the field of CGIAR System Priority 5C, Rural Institutions and their Governance, whose goal is: "To enhance the role that rural organizations and innovative institutional partnerships play in maximizing impact from agricultural research and increating marketing platforms for smallholder producers."</p> <p>(ii) a identifiable space for CIP's Regions as Regional Programs – with true Regional Directors; (1) to design and implement regional and country partnerships, joint research activities in association with the Research Divisions, training programs and events; and (2) to realize the potential research spillovers among countries within and across Regions.</p>	PARTIALLY ACCEPTED	<p>Impact Enhancement Project Outputs and Output targets modified</p> <p>Output target reports</p> <p>Regional business plans that recognize potential research spillovers among countries in regions.</p>	Impact Enhancement Project Outputs and Output targets modified to include research on partnership	2009

As listed in the EPMR report	Center's Response	Implementation		
		Milestones	Progress achieved	Target date of completion
<p># 2. The Panel recommends that CIP develops a completed version of its Strategic Plan, that includes the following considerations:</p> <p>(i) The relevant Millennium Development Goal targets to which CIP expects to make a contribution through its research of an international-public-goods nature should be clearly defined as "impact boundaries" in the typical sequence:</p> <p>Inputs? outputs? outcomes? impacts (ii) The Center "output boundaries" should be clearly recaptured as being new potato, sweetpotato and Andean Roots &amp; Tubers technologies, plus the policies and institutional innovations related to these commodities.(iii) An analysis of the needs and opportunities in the target areas <i>vis-a-vis</i> the CGIAR Science System Priorities should be conducted for a better alignment of CIP's research portfolio. (iv) Based on the needs and opportunities assessment of target areas(following CIP's Pro-Poor Research and Development cycle) plus the available scientific information and impact assessment analyses, a more robust, cohesive and internally complementary set of priorities should be developed together with a business plan.</p>	ACCEPTED	<p>Workplan for producing completed version of Strategic Plan</p> <p>Draft version of strategic plan for presentation to CIP Board</p> <p>Board approval of new version of strategic plan</p>	Workplan completed	2009

As listed in the EPMR report	Center's Response	Implementation		
		Milestones	Progress achieved	Target date of completion
<p># 3. The Panel recommends that a CCER be commissioned immediately to review the Division's current goals, research agenda and human resources; that the CCER's recommendations be acted-upon immediately after the review's completions; and that the CCER's Terms of Reference:</p> <p>i. Require that the Review produce a well-defined strategy ,research agenda and needed human resources; and ii. Consider the desirability of making this Division the integrator of social science research at CIP as a means to make further progress in the implementation of the 2002 EPMR recommendations6, 7 and 8.</p>	ACCEPTED	<p>Terms of Reference for CCER</p> <p>CCER report for presentation to CIP Board</p> <p>Board approval of CCER report and CCER recommendations implementation plan</p>	As per SC recommendation we will wait until the CG Stripe Review of Social Science is completed before conducting the CCER.	2009
<p>#4 The Panel recommends that CIP:</p> <p>i Accelerate the characterization of the remaining genotypes in the Center's genebank, and that this be completed for all key traits; ii. Produce a compendium based on passport, morphological and molecular data and characterization results for key biotic and abiotic stresses; and iii. Make this information widely available to all collaborating NARS to enable them to make choices of what may be needed to enhance their genotype selection and crossing schemes.</p>	ACCEPTED	<p>Project budget reallocated to characterization</p> <p>Output targets updated to include characterization and compendium</p> <p>Output target reports</p>	<p>Budget reallocated</p> <p>Output targets updated in present MTP</p>	2012
# 5. The Panel recommends that CIP implement fully-fledged potato and	ACCEPTED	Output targets updated to include	Regional Potato breeding programs	2012

As listed in the EPMR report	Center's Response	Implementation		
		Milestones	Progress achieved	Target date of completion
sweetpotato breeding activities at the regions so that parental lines/varieties expressing superiority over existing cultivars, and possessing required regional attributes are developed.		additional regional breeding activities Output target reports Funding proposal to strengthen SSA potato breeding	established in China and India Regional sweetpotato breeding program established in SSA. Regional potato breeding and germplasm exchange network established in Latin America	
# 6. The Panel recommends that CIP focus on developing breeding lines tolerant to these stresses [warming and water scarcity], by using biotechnological as well as conventional approaches to develop practical screening techniques.	ACCEPTED	Output targets updated to include additional emphasis on breeding targets Output target reports	Line development started in Peru and India	2011
# 7. The Panel recommends that CIP make a full assessment of the actual and potential constraint to regional potato production posed by nematodes (PCN and free-living), and plan its research on integrated crop management accordingly.	ACCEPTED	Terms of Reference for assessment Assessment report Assessment report recommendation implementation plan	Terms of Reference completed	2009
# 8. The Panel recommends that the Integrated Crop Management Division should take up the opportunity to investigate jointly options for drought avoidance and tolerance, jointly with other Divisions.	ACCEPTED	Funding proposals to implement recommendation Research contracts Research contract reports		2012
# 9. The Panel recommends that CIP implement Recommendations 1 to 6, and Recommendation 8; (2) CIP implement Recommendation 7, with reservations; and	ACCEPTED	CCER recommendation implementation reports		2010

As listed in the EPMR report	Center's Response	Implementation		
		Milestones	Progress achieved	Target date of completion
(3) CIP not implement Recommendations 9 and 10 of the 2007 NRM CCER, unless these actions are dictated by the priority-setting exercise.		Output target reports		
# 10. The Panel recommends that: (1) CIP use the 2007 NRM CCER's analysis and recommendations, and the Panel's reaction to them, as inputs to conduct a sounding priority setting exercise, as recommended by the 2002 EPMR; and (2) CIP initiate that exercise without further delay.	ACCEPTED	NRM Priority review document	Document draft published for comment and review	2008
# 11. The Panel recommends that: (1) the Agriculture and Human Health Division be phased out; more specifically, that agricultural-health interface activities (crop breeding for bio-fortification, reduction of pesticide exposure and the needed trans-disciplinary research to integrate agriculture and health) be carried out through joint research activities and promotion of partnerships (for output mobilization) under the leadership of CIP's other Research Divisions; and (2) CIP agrees the terms of the recommended "phasing out" with all concerned parties, taking into account projects underway and people involved.	NOT ACCEPTED	Participation and leadership in CG Agriculture and Health Platform  CIP Agriculture and Human Health strategic plan updated  Active search for full time leader position for Agriculture and Human Health Division	Membership in management team of platform  Draft plan completed for comment and review  Division leader position announcement posted and search initiated	2009
# 12. The Panel recommends that: (1) CIP disengages from convening CONDESAN; (2) the Board of CONDESAN, the Head of the Coordination Unit, and CIP, in	NOT ACCEPTED	Shared CIP-CONDESAN output targets  Output target reports	Output targets updated in present MTP	2009

As listed in the EPMR report	Center's Response	Implementation		
		Milestones	Progress achieved	Target date of completion
coordination with the Alliance, discuss and agree on the exit strategy, and define a working plan for a three-year transition period; and (3) this working plan addresses the financial repercussions for CONDESAN and CIP.				
# 13. The Panel recommends that: (1) CIP disengages as the convening Center for the GMP; the Board of the GMP and CIP, in coordination with the Alliance, discuss and agree on an exit strategy and a working plan for a transition period; and (3) this working plan address the financial repercussions for the GMP and CIP.	PARTIALLY ACCEPTED	Transition plan based on results of CG Change Process		2009
# 14. The Panel recommends that: (1) CIP disengages from being the convening Center for the Urban Harvest SWEP; (2) CIP sets terms of disengagement in coordination with the Alliance; and CIP assure donors to this Program that CIP will carry on its responsibilities until the completion of current project activities.	PARTIALLY ACCEPTED	Terms of reference for a CCER on urban and peri-urban agriculture  CCER report  CCER recommendations implementation plan		2009
# 15. The Panel recommends that the Board pay urgent attention to the systematic rotation and replacement of Board positions, and to Board and Committee leadership and succession planning.	ACCEPTED	Board agenda item and minutes of decision	Completed	2007
# 16. The Panel recommends that the	ACCEPTED	Board agenda item and minutes of	Completed	2007

As listed in the EPMR report	Center's Response	Implementation		
		Milestones	Progress achieved	Target date of completion
Board establish a systematic and comprehensive schedule of programmatic CCERs for the next five-year period and that funds be budgeted for this purpose.		decision. Budget allocated		
# 17. The Panel recommends that: (1) CIP budget annually and explicitly, for Board approval, its capital expenditures, based on the Center's actual needs; and (2) that the Center allocate the necessary funds to respond to the most urgent needs as identified in its recently prepared capital assessment plan.	ACCEPTED	Capital replacement plan Capital budgets allocated according the capital replacement plan	Plan approved by board 2008 budget allocated according to the plan.	2008
# 18. The Panel recommends that CIP invest, without delay, in a commercially available ERP suitable to its requirements.	ACCEPTED	Alignment with CIMMYT and IFPRI Terms of Reference for consultancy for design and implementation of shared ERP among CIP, CIMMYT and IFPRI Consultancy Report Installation of shared ERP	Alignment discussions concluded	2010

## FINANCING PLAN

**CIP-Table 1: Allocation of Project Costs by Priority Area and Priorities, 2009. In US\$ million.**

Project	Priorities											Non-Priority Area			Total
	Area 1	Area 2			Area 3	Area 4		Area 5				Develop- ment activities	New research areas	Stand-al- one training	
	1A	2A	2B	2C	3A	4A	4D	5A	5B	5C	5D				
Project 1. Partnerships, Markets and Policies for Pro-poor R&D..						0.613		2.288	0.561		0.864				4.326
Project 2. Sustaining Potato and Sweetpotato Biodiversity for Current and Future Generations	0.958														0.958
Project 3. Genetic Enhancement and Crop Improvement		6.573	1.422	1.814											9.809
Project 4. Crop Management for Sustainable Intensification of Potato and Sweetpotato Based Cropping Systems		6.798				0.306	1.227			0.040	0.391	0.919			9.681
Project 5. Systems Approaches to Build Adaptive Capacity in Potato and Sweetpotato Based Systems						0.264	1.391					0.970			2.625
Project 6. Agriculture and Human Health				0.202	0.213					0.171					0.586
Project 7. Consortium for the Sustainable Development of the Andean Ecoregion - CONDESAN						1.366		0.157				0.455			1.978
Project 8. Global Mountain Program															
Project 9. Urban Harvest													1.618		1.618
<b>Total</b>	<b>0.958</b>	<b>13.371</b>	<b>1.422</b>	<b>2.016</b>	<b>0.213</b>	<b>2.549</b>	<b>2.618</b>	<b>2.445</b>	<b>0.561</b>	<b>0.211</b>	<b>1.255</b>	<b>2.344</b>	<b>1.618</b>		<b>31.581</b>



**CIP-Table 2. Allocation of Project Costs to CGIAR Priorities, 2007-2011. In US\$ million.**

PROJECTS PRIORITIES	Actual 2007	Estimated 2008	Proposal 2009	Plan 1 2010	Plan 2 2011
<b>Project 1: Partnerships, Markets and Policies for Pro-poor R&amp;D</b>					
4A	0.265	0.694	0.613	0.776	0.839
5A	2.546	2.674	2.288	2.602	2.704
5B	1.236	0.636	0.561	0.711	0.769
5D	0.224	0.978	0.864	1.092	1.183
Development Activities	0.156	0	0	0	0
Stand-alone Training	0.509	0	0	0	0
<b>Total Project</b>	<b>4.936</b>	<b>4.982</b>	<b>4.326</b>	<b>5.181</b>	<b>5.495</b>
<b>Project 2: Sustaining Potato and Sweetpotato Biodiversity for Current and Future Generations</b>					
1A	1.302	1.326	0.958	0.923	1.64
<b>Total Project</b>	<b>1.302</b>	<b>1.326</b>	<b>0.958</b>	<b>0.923</b>	<b>1.64</b>
<b>Project 3: Genetic Enhancement and Crop Improvement</b>					
2A	4.201	5.975	6.573	5.498	6.35
2B	1.582	1.278	1.422	1.18	1.372
2C	1.447	1.518	1.814	1.433	1.735
4D	0.027	0	0	0	0
5C	0.019	0	0	0	0
<b>Total Project</b>	<b>7.276</b>	<b>8.771</b>	<b>9.809</b>	<b>8.111</b>	<b>9.457</b>
<b>Project 4: Crop Management for Sustainable Intensification of Potato and Sweetpotato Based Cropping Systems.</b>					
2A	3.264	4.474	6.798	7.501	7.034
4A	0.003	0.141	0.306	0.35	0.322
4D	0.65	0.566	1.227	1.403	1.287
5C	0.081	0.018	0.04	0.045	0.042
5D	0.332	0.18	0.391	0.448	0.41
Development Activities	0.299	0.424	0.919	1.051	0.964
<b>Total Project</b>	<b>4.629</b>	<b>5.803</b>	<b>9.681</b>	<b>10.798</b>	<b>10.059</b>
<b>Project 5: Systems Approaches to Build Adaptive Capacity in Potato and Sweetpotato Based Systems.</b>					
4A	0.677	0.326	0.264	0.245	0.261
4D	1.243	1.642	1.391	1.239	1.383
Development Activities	0.718	1.106	0.97	0.837	0.969
<b>Total Project</b>	<b>2.638</b>	<b>3.074</b>	<b>2.625</b>	<b>2.321</b>	<b>2.613</b>
<b>Project 6: Agriculture and Human Health</b>					
2C	0.271	0.219	0.202	0.216	0.196
3A	0.326	0.214	0.213	0.244	0.142
5C	0.19	0.188	0.171	0.181	0.176
<b>Total Project</b>	<b>0.787</b>	<b>0.621</b>	<b>0.586</b>	<b>0.641</b>	<b>0.514</b>

PROJECTS PRIORITIES	Actual 2007	Estimated 2008	Proposal 2009	Plan 1 2010	Plan 2 2011
<b>Project 7: Consortium for the Sustainable Development of the Andean Ecoregion - CONDESAN</b>					
4A	0.893	2	1.366	1.27	1.155
5A	0.128	0.228	0.157	0.145	0.132
Development Activities	0.944	0.735	0.455	0.418	0.389
<b>Total Project</b>	<b>1.965</b>	<b>2.963</b>	<b>1.978</b>	<b>1.833</b>	<b>1.676</b>
<b>Project 8: Global Mountain Program</b>					
4A	0.249	0.011	0	0	0
5D	0.047	0	0	0	0
Stand-alone Training	0.157	0.043	0	0	0
<b>Total Project</b>	<b>0.453</b>	<b>0.054</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Project 9: Urban Harvest</b>					
New Research Areas	1.196	0.873	1.618	3.305	2.092
<b>Total Project</b>	<b>1.196</b>	<b>0.873</b>	<b>1.618</b>	<b>3.305</b>	<b>2.092</b>
<b>Total</b>	<b>25.182</b>	<b>28.467</b>	<b>31.581</b>	<b>33.113</b>	<b>33.546</b>

**CIP-Table 3: Summary of Project Costs, 2007-2011. in million US\$.**

Project	Actual 2007	Estimated 2008	Proposal 2009	Plan 1 2010	Plan 2 2011
Project 1: Partnerships, Markets and Policies for Pro-poor R&D	4.936	4.982	4.326	5.181	5.495
Project 2: Sustaining Potato and Sweetpotato Biodiversity for Current and Future Generations	1.302	1.326	0.958	0.923	1.640
Project 3: Genetic Enhancement and Crop Improvement	7.276	8.771	9.809	8.111	9.457
Project 4: Crop Management for Sustainable Intensification of Potato and Sweetpotato Based Cropping Systems	4.629	5.803	9.681	10.798	10.059
Project 5: Systems Approaches to Build Adaptive Capacity in Potato and Sweetpotato Based Systems	2.638	3.074	2.625	2.321	2.613
Project 6: Agriculture and Human Health	0.787	0.621	0.586	0.641	0.514
Project 7: Consortium for the Sustainable Development of the Andean Ecoregion - CONDESAN	1.965	2.963	1.978	1.833	1.676
Project 8: Global Mountain Program	0.453	0.054	0.000	0.000	0.000
Project 9: Urban Harvest	1.196	0.873	1.618	3.305	2.092
<b>Total</b>	<b>25.182</b>	<b>28.467</b>	<b>31.581</b>	<b>33.113</b>	<b>33.546</b>

**CIP-Table 4. Summary of Priority Costs, 2007-2011. In US\$ million.**

Priorities	Actual 2007	Estimated 2008	Proposal 2009	Plan 1 2010	Plan 2 2011
1A	1.302	1.326	0.958	0.923	1.640
2A	7.465	10.449	13.371	12.999	13.384
2B	1.582	1.278	1.422	1.180	1.372
2C	1.718	1.737	2.016	1.649	1.931
3A	0.326	0.214	0.213	0.244	0.142
4A	2.087	3.172	2.549	2.641	2.577
4D	1.920	2.208	2.618	2.642	2.670
5A	2.674	2.902	2.445	2.747	2.836
5B	1.236	0.636	0.561	0.711	0.769
5C	0.290	0.206	0.211	0.226	0.218
5D	0.603	1.158	1.255	1.540	1.593
Development Activities	2.117	2.265	2.344	2.306	2.322
Stand-alone Training	0.666	0.043			
New Research Areas	1.196	0.873	1.618	3.305	2.092
<b>Total</b>	<b>25.182</b>	<b>28.467</b>	<b>31.581</b>	<b>33.113</b>	<b>33.546</b>

**CIP-Table 5: Investments by Undertaking, Activity and Sector, 2007-2011. In US\$ million.**

	Actual 2007	Estimated 2008	Proposal 2009	Plan 1 2010	Plan 2 2011
<b>Increasing Productivity</b>	<b>8.229</b>	<b>9.642</b>	<b>12.177</b>	<b>12.195</b>	<b>12.482</b>
Germplasm Enhancement & Breeding	4.065	4.870	6.280	6.191	6.404
Production Systems Development & Management	4.164	4.772	5.897	6.004	6.078
Cropping systems	4.164	4.772	5.897	6.004	6.078
Livestock systems	0.000	0.000	0.000	0.000	0.000
Tree systems	0.000	0.000	0.000	0.000	0.000
Fish systems	0.000	0.000	0.000	0.000	0.000
<b>Protecting the Environment</b>	<b>4.118</b>	<b>4.655</b>	<b>4.964</b>	<b>5.469</b>	<b>5.032</b>
<b>Saving Biodiversity</b>	<b>2.403</b>	<b>1.061</b>	<b>0.767</b>	<b>0.738</b>	<b>1.312</b>
<b>Improving Policies</b>	<b>3.570</b>	<b>2.961</b>	<b>2.610</b>	<b>3.163</b>	<b>3.033</b>
<b>Strengthening NARS</b>	<b>6.862</b>	<b>10.148</b>	<b>11.063</b>	<b>11.548</b>	<b>11.687</b>
Training and Professional Development	2.368	3.422	3.941	3.939	4.133
Documentation, Publications, Info. Dissemination	2.434	3.212	3.495	3.737	3.740
Organization & Management Counselling	0.086	0.000	0.000	0.000	0.000
Networks	1.974	3.514	3.627	3.872	3.814
<b>Total</b>	<b>25.182</b>	<b>28.467</b>	<b>31.581</b>	<b>33.113</b>	<b>33.546</b>

**CIP-Table 6. Project Investments by Developing Region, 2007-2011. In US\$ million.**

Project	Region	Actual 2007	Estimated 2008	Proposal 2009	Plan 1 2010	Plan 2 2011
Project 1. Partnerships, Markets and Policies for Pro-poor R&D	Asia	0.642	0.921	0.599	1.060	1.327
	CWANA	0.147	0.336	0.247	0.205	0.205
	LAC	3.283	2.352	2.850	2.774	2.740
	SSA	0.864	1.373	0.630	1.142	1.223
<b>Total Project</b>		<b>4.936</b>	<b>4.982</b>	<b>4.326</b>	<b>5.181</b>	<b>5.495</b>
Project 2. Sustaining Potato and Sweetpotato Biodiversity for Current and Future Generations	Asia	0.493	0.410	0.294	0.268	0.221
	CWANA	0.082	0.162	0.149	0.167	0.136
	LAC	0.384	0.434	0.312	0.314	1.140
	SSA	0.343	0.320	0.203	0.174	0.143
<b>Total Project</b>		<b>1.302</b>	<b>1.326</b>	<b>0.958</b>	<b>0.923</b>	<b>1.640</b>
Project 3. Genetic Enhancement and Crop Improvement	Asia	0.753	0.846	1.101	0.829	0.748
	CWANA	0.610	1.199	0.951	1.124	0.899
	LAC	3.839	4.286	2.223	1.260	1.237
	SSA	2.074	2.440	5.534	4.898	6.573
<b>Total Project</b>		<b>7.276</b>	<b>8.771</b>	<b>9.809</b>	<b>8.111</b>	<b>9.457</b>
Project 4. Crop Management for Sustainable Intensification of Potato and Sweetpotato Based Cropping Systems	Asia	1.647	1.406	2.160	4.111	4.255
	CWANA	0.356	0.356	0.518	0.478	0.532
	LAC	0.692	0.801	0.662	0.802	0.948
	SSA	1.934	3.240	6.341	5.407	4.324
<b>Total Project</b>		<b>4.629</b>	<b>5.803</b>	<b>9.681</b>	<b>10.798</b>	<b>10.059</b>
Project 5. Systems Approaches to Build Adaptive Capacity in Potato and Sweetpotato Based Systems	Asia	0.072	0.144	0.137	0.143	0.141
	CWANA	0.087	0.000	0.000	0.000	0.000
	LAC	2.283	2.613	2.347	2.031	2.325
	SSA	0.196	0.317	0.141	0.147	0.147
<b>Total Project</b>		<b>2.638</b>	<b>3.074</b>	<b>2.625</b>	<b>2.321</b>	<b>2.613</b>
Project 6. Agriculture and Human Health	Asia	0.023	0.008	0.008	0.008	0.008
	CWANA	0.013	0.009	0.008	0.009	0.009
	LAC	0.379	0.364	0.377	0.421	0.295
	SSA	0.372	0.240	0.193	0.203	0.202
<b>Total Project</b>		<b>0.787</b>	<b>0.621</b>	<b>0.586</b>	<b>0.641</b>	<b>0.514</b>
Project 7. Consortium for the Sustainable Development of the Andean Ecoregion - CONDESAN	LAC	1.953	2.963	1.978	1.833	1.676
	SSA	0.012	0.000	0.000	0.000	0.000
<b>Total Project</b>		<b>1.965</b>	<b>2.963</b>	<b>1.978</b>	<b>1.833</b>	<b>1.676</b>

Project	Region	Actual 2007	Estimated 2008	Proposal 2009	Plan 1 2010	Plan 2 2011
Project 8. Global Mountain Program	Asia	0.018	0.000	0.000	0.000	0.000
	CWANA	0.018	0.000	0.000	0.000	0.000
	LAC	0.079	0.054	0.000	0.000	0.000
	SSA	0.338	0.000	0.000	0.000	0.000
<b>Total Project</b>		<b>0.453</b>	<b>0.054</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>
Project 9. Urban Harvest	Asia	0.023	0.018	0.011	0.012	0.012
	CWANA	0.003	0.026	0.023	0.024	0.025
	LAC	0.325	0.207	0.631	1.311	0.567
	SSA	0.845	0.622	0.953	1.958	1.488
<b>Total Project</b>		<b>1.196</b>	<b>0.873</b>	<b>1.618</b>	<b>3.305</b>	<b>2.092</b>
<b>Total</b>		<b>25.182</b>	<b>28.467</b>	<b>31.581</b>	<b>33.113</b>	<b>33.546</b>

**CIP-Table 7: Summary of Investments by Developing Region, 2007-2011. In US\$ million.**

Region	Actual 2007	Estimated 2008	Proposal 2009	Plan 1 2010	Plan 2 2011
SSA	6.978	8.552	13.995	13.929	14.100
Asia	3.671	3.753	4.310	6.431	6.712
LAC	13.217	14.074	11.380	10.746	10.928
CWANA	1.316	2.088	1.896	2.007	1.806
<b>Total</b>	<b>25.182</b>	<b>28.467</b>	<b>31.581</b>	<b>33.113</b>	<b>33.546</b>

**CIP-Table 8. Expenditure by Object, 2007-2011. In US\$ million.**

Object of Expenditure	Actual 2007	Estimated 2008	Proposal 2009	Plan 1 2010	Plan 2 2011
Personnel	10.633	12.653	14.061	14.738	14.939
Supplies and services	7.613	7.640	8.491	8.898	9.019
Collaboration/ Partnerships	3.939	4.643	5.160	5.408	5.481
Operational Travel	2.035	2.421	2.689	2.819	2.857
Depreciation	0.962	1.110	1.180	1.250	1.250
<b>Total</b>	<b>25.182</b>	<b>28.467</b>	<b>31.581</b>	<b>33.113</b>	<b>33.546</b>

**CIP-Table 9. Member and Non-Member Unrestricted Grants, 2007-2009. In US\$millions - NC = National Currency**

Member	Type NC	Actual 2007 (US\$)	Actual 2007 (NC)	Estimated 2008 (US\$)	Estimated 2008 (NC)	Proposal 2009 (US\$)	Proposal 2009 (NC)
<b>Unrestricted Grants</b>							
<b>Member</b>							
Australia	AUD	0.188	0.250	0.228	0.250	0.228	0.250
Belgium	EUR	0.443	0.308	0.485	0.307	0.410	0.307
Canada	CAD	0.748	0.774	0.984	0.774	0.775	0.774
China	USD	0.130	0.130	0.130	0.130	0.130	0.130
Germany	EUR	0.313	0.230	0.363	0.230	0.308	0.230
India	USD	0.038	0.030	0.037	0.037	0.037	0.037
Ireland	EUR	0.268	0.200	0.315	0.200	0.268	0.200
Korea, Republic of	USD	0.050	0.050	0.050	0.050	0.050	0.050
Norway	NOK	0.405	2.300	0.491	2.500	0.452	2.500
Philippines	PHP	0.017	0.780	0.007	0.390	0.007	0.390
Sweden	SKR	0.990	6.600	1.111	6.600	1.016	6.600
Switzerland	SFR	0.887	1.000	1.007	1.000	0.886	1.000
United Kingdom	GBP	1.371	0.670	1.331	0.670	1.328	0.670
United States	USD	0.050	0.050	0.050	0.050	0.050	0.050
World Bank	USD	1.150	1.150	1.500	1.500	1.500	1.500
<b>Subtotal</b>		<b>7.048</b>		<b>8.089</b>		<b>7.445</b>	
<b>Non-member</b>							
Others		0.000	0.000	0.000	0.000	0.000	0.000
<b>Subtotal</b>		<b>0.000</b>		<b>0.000</b>		<b>0.000</b>	
<b>Total Unrestricted</b>		<b>7.048</b>		<b>8.089</b>		<b>7.445</b>	

**CIP-Table 9a: Member and Non-Member Unrestricted and Restricted Grants, 2007-2009. In US\$ millions.**

Member / Non-Member	Actual 2007	Estimated 2008	Proposal 2009
<b>Unrestricted Grants</b>			
<b>Member</b>			
Australia	0.188	0.228	0.228
Belgium	0.443	0.485	0.410
Canada	0.748	0.984	0.775
China	0.130	0.130	0.130
Germany	0.313	0.363	0.308
India	0.038	0.037	0.037
Ireland	0.268	0.315	0.268
Korea, Republic of	0.050	0.050	0.050
Norway	0.405	0.491	0.452
Philippines	0.017	0.007	0.007
Sweden	0.990	1.111	1.016
Switzerland	0.887	1.007	0.886
United Kingdom	1.371	1.331	1.328
United States	0.050	0.050	0.050
World Bank	1.150	1.500	1.500
<b>Subtotal</b>	<b>7.048</b>	<b>8.089</b>	<b>7.445</b>
<b>Non-member</b>			
Others	0.000	0.000	0.000
<b>Subtotal</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>
<b>Total Unrestricted</b>	<b>7.048</b>	<b>8.089</b>	<b>7.445</b>
<b>Restricted Grants</b>			
<b>Member</b>			
Australia	0.246	0.342	0.247
Belgium	0.501	0.728	2.320
<b>Member / Non-Member</b>	<b>Actual 2007</b>	<b>Estimated 2008</b>	<b>Proposal 2009</b>
Brazil	0.003	0.031	0.000
Canada	2.111	2.140	1.823
CGIAR	0.154	0.137	0.050
Denmark	0.024	0.000	0.031
European Commission	2.486	1.353	1.327
FAO	0.083	0.035	0.000
Germany	0.231	1.102	0.588
IDRC	0.618	0.556	0.868
IFAD	0.051	0.000	0.449
India	0.200	0.100	0.000
Ireland	0.165	0.369	0.369
Italy	0.202	0.233	0.201
Korea, Republic of	0.074	0.093	0.000
Luxembourg	0.405	0.413	0.201
Netherlands	0.033	0.000	0.000
New Zealand	0.364	0.481	0.478
OPEC Fund	0.012	0.075	0.063
Peru	0.219	0.296	0.150
Rockefeller Foundation	0.190	0.215	0.227
Spain	0.494	1.202	1.024
Switzerland	1.238	1.414	1.190
United Kingdom	0.076	0.000	0.215

Member / Non-Member	Actual 2007	Estimated 2008	Proposal 2009
United States	1.600	0.657	3.011
World Bank	0.098	0.694	0.310
<b>Subtotal</b>	<b>11.878</b>	<b>12.666</b>	<b>15.142</b>
<b>Non-member</b>			
Alliance for a Green Revolution in Africa (AGRA)	0.000	0.211	0.203
ASARECA	0.188	0.009	0.000
Bill and Melinda Gates Foundation	0.511	0.010	0.822
Bioversity International	0.228	0.000	0.000
Member / Non-Member	Actual 2007	Estimated 2008	Proposal 2009
CIAT	1.229	0.635	0.968
CIMMYT	0.000	0.405	0.521
Common Fund for Commodities - CFC	0.412	1.351	0.401
FONTAGRO	0.177	0.368	0.409
Generation/CP	0.000	0.316	0.000
Global Crop Diversity Trust (GCDT)	0.050	0.000	0.000
Global Environment Facility (GEF)	1.276	1.790	1.578
HarvestPlus/CP	0.233	0.833	0.276
IFPRI	0.482	0.054	0.000
IITA	0.199	0.000	0.000
Int'n Center for Insect Physiology and Ecology (ICIPE)	0.098	0.131	0.127
Iowa State University	0.000	0.000	0.020
IRRI	0.002	0.000	0.000
Kansas State University	0.004	0.006	0.000
Kilimo Trust	0.215	0.281	0.148
McKnight Foundation	0.000	0.032	0.000
Michigan State University	0.003	0.000	0.000
Natural Resources Institute (NRI)	0.010	0.000	0.000
Others	0.773	0.956	3.355
Swedish University of Agricultural Sciences	0.005	0.020	0.016
US Dept of Agriculture (USDA)	0.003	0.004	0.003
<b>Subtotal</b>	<b>6.098</b>	<b>7.412</b>	<b>8.847</b>
<b>Total Restricted</b>	<b>17.976</b>	<b>20.078</b>	<b>23.989</b>
<b>Total Grants</b>	<b>25.024</b>	<b>28.167</b>	<b>31.434</b>

Summary and Statement of Activities	Actual 2007	Estimated 2008	Proposal 2009
<b>Total Grants</b>	<b>25.024</b>	<b>28.167</b>	<b>31.434</b>
<b>Center Income</b>	<b>0.792</b>	<b>0.625</b>	<b>0.603</b>
<b>Revenue</b>	<b>25.816</b>	<b>28.792</b>	<b>32.037</b>
<b>Total Investment</b>	<b>25.182</b>	<b>28.467</b>	<b>31.581</b>
<b>Surplus (Deficit)</b>	<b>0.634</b>	<b>0.325</b>	<b>0.456</b>



**CIP-Table 10: Allocation of Member Grants and Center Income to Projects, 2007-2009. In US\$ millions.**

Project	Member		Actual 2007	Estimated 2008	Proposal 2009
Project 1. Partnerships, Markets and Policies for Pro-poor R&D	Member	Australia	0.000	0.139	0.103
		FAO	0.053	0.035	0.000
		Germany	0.000	0.522	0.095
		IDRC	0.104	0.167	0.013
		Korea, Republic of	0.030	0.030	0.000
		New Zealand	0.364	0.481	0.478
		Spain	0.256	0.350	0.150
		Switzerland	1.134	1.248	1.139
		United Kingdom	0.076	0.000	0.000
		World Bank	0.026	0.030	0.000
	Non Member	CIAT	0.652	0.000	0.773
		IFPRI	0.243	0.000	0.000
		Kilimo Trust	0.194	0.281	0.148
		Others	0.063	0.000	0.000
Unrestricted + Center Income		1.741	1.699	1.427	
<b>Project Total</b>			<b>4.936</b>	<b>4.982</b>	<b>4.326</b>
Project 2. Sustaining Potato and Sweetpotato Biodiversity for Current and Future Generations	Member	Belgium	0.000	0.006	0.000
		Brazil	0.000	0.031	0.000
		European Commission	0.804	0.437	0.376
		World Bank	0.000	0.314	0.093
	Non Member	Bioversity International	0.228	0.000	0.000
		Global Crop Diversity Trust (GCDT)	0.050	0.000	0.000
		Others	0.015	0.018	0.000
		US Dept of Agriculture (USDA)	0.003	0.004	0.003
Unrestricted + Center Income		0.202	0.516	0.486	
<b>Project Total</b>			<b>1.302</b>	<b>1.326</b>	<b>0.958</b>
Project 3. Genetic Enhancement and Crop Improvement	Member	Belgium	0.501	0.722	2.320
		Brazil	0.003	0.000	0.000
		CGIAR	0.017	0.000	0.000
		Denmark	0.024	0.000	0.031
		Germany	0.183	0.539	0.455
		IDRC	0.000	0.000	0.445

Project	Member	Actual 2007	Estimated 2008	Proposal 2009	
	India	0.200	0.100	0.000	
	Italy	0.202	0.233	0.201	
	Korea, Republic of	0.044	0.063	0.000	
	Luxembourg	0.405	0.413	0.201	
	Netherlands	0.017	0.000	0.000	
	Peru	0.140	0.236	0.150	
	Rockefeller Foundation	0.190	0.215	0.227	
	Spain	0.095	0.606	0.574	
	United Kingdom	0.000	0.000	0.115	
	United States	1.480	0.657	0.000	
	Non Member	Alliance for a Green Revolution in Africa (AGRA)	0.000	0.211	0.203
		ASARECA	0.092	0.000	0.000
		Bill and Melinda Gates Foundation	0.511	0.000	0.400
		CIAT	0.499	0.586	0.195
		CIMMYT	0.000	0.405	0.521
		FONTAGRO	0.177	0.178	0.221
		Generation/CP	0.000	0.316	0.000
		HarvestPlus/CP	0.077	0.370	0.000
		IFPRI	0.058	0.011	0.000
		Iowa State University	0.000	0.000	0.020
		IRRI	0.002	0.000	0.000
Michigan State University		0.003	0.000	0.000	
Others		0.091	0.252	1.120	
Unrestricted + Center Income		2.265	2.658	2.410	
<b>Project Total</b>		<b>7.276</b>	<b>8.771</b>	<b>9.809</b>	
Project 4. Crop Management for Sustainable Intensification of Potato and Sweetpotato Based Cropping Systems	Member	Australia	0.246	0.203	0.144
		CGIAR	0.007	0.000	0.000
		European Commission	1.682	0.916	0.951
		Germany	0.048	0.041	0.038
		IFAD	0.051	0.000	0.449
		Ireland	0.165	0.369	0.369
		Netherlands	0.016	0.000	0.000
		OPEC Fund	0.012	0.075	0.063

Project	Member		Actual 2007	Estimated 2008	Proposal 2009	
		Peru	0.038	0.020	0.000	
		Switzerland	0.048	0.000	0.000	
		United Kingdom	0.000	0.000	0.100	
		United States	0.115	0.000	3.011	
		World Bank	0.000	0.262	0.217	
	Non Member	ASARECA	0.096	0.009	0.000	
		Bill and Melinda Gates Foundation	0.000	0.010	0.422	
		CIAT	0.063	0.049	0.000	
		Common Fund for Commodities - CFC	0.412	1.351	0.401	
		FONTAGRO	0.000	0.190	0.038	
		HarvestPlus/CP	0.156	0.463	0.000	
		IITA	0.199	0.000	0.000	
		Int'n Center for Insect Physiology and Ecology (ICIPE)	0.098	0.131	0.127	
		Kansas State University	0.004	0.006	0.000	
		Others	0.115	0.087	1.566	
		Swedish University of Agricultural Sciences	0.005	0.020	0.016	
		Unrestricted + Center Income		1.053	1.601	1.769
		<b>Project Total</b>			<b>4.629</b>	<b>5.803</b>
	Project 5. Systems Approaches to Build Adaptive Capacity in Potato and Sweetpotato Based Systems	Member	Canada	1.653	1.859	1.536
Canada			1.653	1.859	1.536	
CGIAR			0.000	0.000	0.050	
Peru			0.041	0.040	0.000	
Spain			0.143	0.246	0.300	
United States			0.005	0.000	0.000	
Non Member		FONTAGRO	0.000	0.000	0.150	
		McKnight Foundation	0.000	0.032	0.000	
		Others	0.060	0.145	0.000	
Unrestricted + Center Income			0.736	0.752	0.589	
<b>Project Total</b>			<b>2.638</b>	<b>3.074</b>	<b>2.625</b>	
Project 6. Agriculture and Human Health	Member	Canada	0.128	0.213	0.243	
		IDRC	0.126	0.000	0.000	
	Non Member	IFPRI	0.152	0.031	0.000	

Project	Member		Actual 2007	Estimated 2008	Proposal 2009
	Unrestricted + Center Income		0.381	0.377	0.343
<b>Project Total</b>			<b>0.787</b>	<b>0.621</b>	<b>0.586</b>
Project 7. Consortium for the Sustainable Development of the Andean Ecoregion - CONDESAN	Member	CGIAR	0.130	0.137	0.000
		Switzerland	0.056	0.166	0.051
		World Bank	0.057	0.088	0.000
	Non Member	CIAT	0.012	0.000	0.000
		Global Environment Facility (GEF)	1.276	1.790	1.578
		Others	0.340	0.313	0.075
	Unrestricted + Center Income		0.094	0.469	0.274
<b>Project Total</b>			<b>1.965</b>	<b>2.963</b>	<b>1.978</b>
Project 8. Global Mountain Program	Member	Canada	0.237	0.000	0.000
		FAO	0.030	0.000	0.000
	Non Member	IFPRI	0.029	0.012	0.000
	Unrestricted + Center Income		0.157	0.042	0.000
<b>Project Total</b>			<b>0.453</b>	<b>0.054</b>	<b>0.000</b>
Project 9. Urban Harvest	Member	Canada	0.093	0.068	0.044
		IDRC	0.388	0.389	0.410
		World Bank	0.015	0.000	0.000
	Non Member	CIAT	0.003	0.000	0.000
		HarvestPlus/CP	0.000	0.000	0.276
		Kilimo Trust	0.021	0.000	0.000
		Natural Resources Institute (NRI)	0.010	0.000	0.000
		Others	0.089	0.141	0.594
Unrestricted + Center Income		0.577	0.275	0.294	
<b>Project Total</b>			<b>1.196</b>	<b>0.873</b>	<b>1.618</b>
<b>Total Restricted</b>			<b>17.976</b>	<b>20.078</b>	<b>23.989</b>
<b>Total Unrestricted + Center Income</b>			<b>7.206</b>	<b>8.389</b>	<b>7.592</b>
<b>Total</b>			<b>25.182</b>	<b>28.467</b>	<b>31.581</b>

**CIP-Table 11. Internationally and Nationally Recruited Staff, 2007-2011. In US\$ million.**

	<b>Actual 2007</b>	<b>Estimated 2008</b>	<b>Proposal 2009</b>	<b>Plan 1 2010</b>	<b>Plan 2 2011</b>
NRS	473	493	507	514	516
IRS	60	62	70	76	77
<b>Total</b>	<b>533</b>	<b>555</b>	<b>577</b>	<b>590</b>	<b>593</b>

**CIP-Table 12. Currency Structure of Expenditure, 2007-2009. In millions of units and percent.**

Currency	Actual 2007			Estimated 2008			Proposal 2009		
	Amount	\$ Value	% Share	Amount	\$ Value	% Share	Amount	\$ Value	% Share
IDR	1333.043	0.140	1	1585.821	0.170	1	1735.929	0.190	1
INR	11.260	0.290	1	12.697	0.300	1	14.991	0.330	1
KES	35.750	0.560	2	47.122	0.726	3	62.110	0.944	3
Others	0.000	0.460	2	0.000	0.557	2	0.000	0.722	2
PEN	23.166	7.800	31	24.940	8.600	30	28.122	9.371	30
PHP	4.884	0.122	0	5.670	0.129	0	52.518	1.140	4
UGX	823.879	0.480	2	951.206	0.576	2	1189.728	0.749	2
USD	0.000	15.330	61	0.000	17.409	61	0.000	18.135	57
<b>Total</b>		<b>25.182</b>	<b>100 %</b>		<b>28.467</b>	<b>100 %</b>		<b>31.581</b>	<b>100 %</b>

**CIP - Table 13. Statement of Financial Position (SFP), 2007-2009. In US\$million.**

Assets, Liabilities and Net Assets	2007	2008	2009
Current Assets			
Cash and Cash Equivalents	4.741	3.328	3.251
Investments	11.917	13.792	14.334
Accounts Receivable			
- Donor	1.602	1.401	1.601
- Employees	0.152	0.151	0.144
- Other CGIAR Centers	0.000	0.000	0.000
- Others	0.311	0.305	0.301
Inventories	0.410	0.405	0.401
Pre-paid Expenses	0.409	0.387	0.377
Total Current Assets	19.542	19.769	20.409
Non-Current Assets			
Net Property, Plan and Equipment	3.686	3.736	3.766
Investments	0.383	0.401	0.421

Assets, Liabilities and Net Assets	2007	2008	2009
Other Assets	0.000	0.000	0.000
Total Non-Current Assets	4.069	4.137	4.187
Total Assets	23.611	23.906	24.596
Current Liabilities			
Overdraft/Short Term Borrowings	0.000	0.000	0.000
Accounts Payable			
- Donor	8.071	8.233	8.534
- Employees	0.104	0.105	0.106
- Other CGIAR Centers	0.000	0.000	0.000
- Others	4.390	4.181	4.061
Accruals and Provisions	0.450	0.344	0.323
Total Current Liabilities	13.015	12.863	13.024
Non-Current Liabilities			
Accounts Payable			
- Employees	0.388	0.401	0.401
- Deferred Grant Revenue	0.000	0.000	0.000
- Others	0.407	0.466	0.509
Total Non-Current Liabilities	0.795	0.867	0.910
Total Liabilities	13.810	13.730	13.934
Net Assets			
Unrestricted			
- Fixed Assets	3.373	3.423	3.453
- Unrestricted Net Assets Excluding Fixed Assets	6.428	6.753	7.209
Total Unrestricted Net Assets	9.801	10.176	10.662
Restricted	0.000	0.000	0.000
Total Net Assets	9.801	10.176	10.662
Total Liabilities and Net Assets	23.611	23.906	24.596

**CIP-Table 14: Statement of Activities (SOA), 2007-2009. In US\$ million.**

		Unrestricted	Restricted		Total		
			Temporary	Challenge Programs	2007	2008	2009
Revenue and Gains	Grant Revenue	7.048	16.576	1.400	25.024	28.167	31.434
	Other revenue and gains	0.792	0.000	0.000	0.792	0.625	0.603
	Total revenue and gains	7.840	16.576	1.400	25.816	28.792	32.037
Expenses and Losses	Program related expenses	3.928	16.576	1.400	21.904	25.637	29.329
	Management and general expenses	4.615	0.000	0.000	4.615	4.656	4.606
	Other losses expenses	0.000	0.000	0.000	0.000	0.000	0.000
	Sub Total expenses and losses	8.543	16.576	1.400	26.519	30.293	33.935
	Indirect cost recovery	-1.337	0.000	0.000	-1.337	-1.826	-2.354
	Total expenses and losses	7.206	16.576	1.400	25.182	28.467	31.581
	Net Operating Surplus / (Deficit)	0.634	0.000	0.000	0.634	0.325	0.456
	Extraordinary Items	0.000	0.000	0.000	0.000	0.000	0.000
	NET SURPLUS / (DEFICIT)	0.634	0.000	0.000	0.634	0.325	0.456
Object of Expenditure	Personnel	4.256	5.864	0.513	10.633	12.653	14.061
	Supplies and services	2.216	4.809	0.588	7.613	7.640	8.491
	Collaboration/ Partnerships	0.000	3.914	0.025	3.939	4.643	5.160
	Operational Travel	0.311	1.578	0.146	2.035	2.421	2.689
	Depreciation	0.423	0.411	0.128	0.962	1.110	1.180
	Total	7.206	16.576	1.400	25.182	28.467	31.581