

## NRM-CCER

# Draft Terms of Reference

### ***Background***

Germplasm and NRM research are the twin pillars on which the CGIAR bases its program to enhance agricultural productivity. NRM research is also central to CIP's vision, which states that the Center "will contribute to reducing poverty and hunger; improving human health; developing resilient, sustainable rural and urban livelihood systems; and improving access to the benefits of new and appropriate knowledge and technologies".

NRM research started within CIP as part of CONDESAN<sup>1</sup> in 1996. The focus was on implementing systems and ecoregional approaches in mixed crop-livestock systems in the Andes. Upon the decision of creating a CIP NRM research unit, an Internally Commissioned External Review (ICER) was conducted. This was also the basis for the EPMP review for the Program in 2002. Following their recommendations the NRM Program has been gradually changing towards bridging the gap between NRM and Germplasm research. The concrete steps taken include: 1) developing tools to improve GxE data extrapolation; 2) methodology for identifying drought prone areas in targeted countries, 3) development of a potato growth model, which is being calibrated with the parameters describing the genetic material produced at CIP, 4) development of rapid methods to identify potato plants under abiotic or biotic stress using remotely sensed data, and methods to assess the environmental vulnerability of targeted systems and to conduct tradeoff analyses between productivity and environmental or health vulnerability.

The NRM Division works mainly in potato and sweet potato based systems, and fulfills two critical roles: 1) the development of tools and methods for the identification of research needs and opportunities for commodity and food systems research in representative geographic and agroecological target sites, and 2) integration and validation of interventions generated by CIP's Research Divisions and other key partners in those sites, to build adaptive capacity<sup>2</sup>, thus contributing with the MDGs specifically those related to sustainability of natural resource use and poverty and hunger reduction.

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<sup>1</sup> Consortium for the Sustainable Development of the Andes, an ecoregional program convened by CIP

<sup>2</sup> The general ability of institutions, systems, and individuals to adjust to potential damage, to take advantage of opportunities, or to cope with the consequences.

Agricultural systems practiced by smallholders in developing countries are quite complex. They utilize natural resources (water, soils and biodiversity) through a combination of various crop (potatoes, other root and tubers, cereals, forages) and livestock (ruminants and non ruminants). Those systems have been sustainable in the past. However, population pressure, climate variability/change, and inadequate policies are affecting their resilience. Natural resource management and development of improved production systems require the understanding and analysis of complex interactions at various hierarchies (farm, community, watershed, ecoregion), as well as the integration of knowledge and assessment of impact at those levels. The NRM Division thus seeks to understand the behavior of these complex human-natural systems where producing potato and sweetpotato currently or potentially are key livelihood strategies. The Division also seeks to enhance the productivity and sustainability of those systems both directly through technology and management improvements and indirectly through influencing policies and programs that affect sustainable development.

## ***CIP Strategic Plan***

CIP's research assets are organized in divisions, which are homes for disciplinary expertise and partnership programs that are links to the broader set of stakeholders. Seeking a conceptual linkage between this structure and the MDGs, we created a set of research themes. These are informal organizational devices that are conceptually attractive around which teams and projects can be built, financing sought and results measured. To facilitate the connection of our research program to contributions to the MDGs we adopted an implementation approach called the pro-poor research and development cycle. The pro-poor cycle is an iterative process of targeting, needs assessment, research, linkages to diffusion for scaling up and impact assessment. The themes and pro-poor cycle are described in more detail in the CIP Vision and the CIP Strategic Research Plan.

The following paragraphs briefly describe the contribution expected from the NRM Division in the implementation of the pro-poor research and development cycle.

### **Targeting**

CIP will refine targeting in its regions by selecting geographic areas of R & D integration representing the dominant agroecologies. The targeting will seek to use the highest resolution data possible and combine it with process-based and geo-spatial models to fill in the data gaps and to generate indicator layers for analyses at different spatial scales. The indicators will include such measures as the concentration of poor people, potential for producing potato or sweet potato, livelihood dynamics, environmental vulnerability, and access to food and markets. Once the geographic areas are selected the Division will assist crop improvement in data extrapolation using models calibrated with GXE experimental results and coupled with geographical information systems. It will also help the institution and partners in specific projects to select representative

samples (farms, communities) where the whole cycle would be conducted, facilitating later scaling up and extrapolation of results.

## **Needs and opportunity assessment**

Needs and opportunity assessments depend on expert opinion but can often be improved through modeling approaches to illustrate the dimension of the need and the spill over effect of a technology. Potatoes in particular are dispersed across distinct agro-ecologies and estimates of potential opportunities are difficult. Modeling approaches will be used to design plant types (ideotype genes) targeted for specific environments to account for this spatial heterogeneity. They will be coupled with expert assessments and socio-economic surveys to get stakeholder's opinions.

In this step it is important to learn what make target systems vulnerable but also what are their robust components and identify the components that are slowly and rapidly deteriorating and their relation to their loss of resilience. A historic analysis of the external shocks (e.g. droughts, pests, ENSO, policies, etc.) will be addressed searching for possible answers to the question how have they become vulnerable? An assessment of the coping and adaptation strategies and their efficacy will also be conducted.

The identified opportunities that CIP and partners can offer the target farmers to improve their adaptive capacity will be screened through scenario analyses. Different policy and environmental change scenarios will be defined to try assessing under what circumstances they will become vulnerable.

## **Research**

In the CIP Strategic Research Plan we defined seven themes around which we will organize research<sup>3</sup>. Thus in the strategic plan our NRM research will contribute most importantly to the theme 'facilitate sustainable intensification of potato and SP based farming systems'. In this theme NRM research will:

- Develop, improve and monitor sustainable landscape scale soil-water-plant management strategies to maximize productivity while preserving or enhancing the environment;
- Integrate and validate knowledge at systems level (farm, community, landscape) to improve bio-physical and socio-economic conditions;
- Develop decision support tools and methods to facilitate screening of genetic materials for target environments considering actual and future conditions under environmental change scenarios;

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<sup>3</sup> The themes are: link farmers to markets, reduce temporal and chronic hunger in vulnerable communities, improve access to nutritious food, sustainable intensification of potato and sweet potato-based farming systems, sustainable use of biodiversity, institutional learning for pro-poor change and sustainable and healthy horticulture in and around cities.

- Develop methods using remote sensing tools for early diagnosis of important biotic and abiotic stress (e.g. drought, pests and diseases) in priority potato and sweetpotato based systems;
- Evaluate tradeoffs between production, environment and health indicators as inputs for policy decisions;
- Develop methods and tools for improving national and regional potato and sweetpotato crop statistics and yield forecasting, combining remote sensing and modeling; and,
- Extrapolate information on systems performance under similar agroecological conditions.

### **Links to dissemination**

Wide adoption of new innovations can change the balance of resource use in agro-ecosystems. The Division seeks to improve the adaptive capacity of these agro-ecosystems in face of this change. The Division will contribute to measuring and enhancing system resilience through adaptive management. System resilience is the tendency of biophysical and socio-economical relationships to persist within a system and is also a measure of the ability of these systems to absorb changes. Vulnerability is negative system outcome as a loss of resilience. Measures of resilience and vulnerability examine the variable responses of key system elements to change and whether this change creates vulnerability. The Division will also contribute to promote capacity building among stakeholders on the use of tools and methods, as well as on strategies for the development of resilient systems.

### **Impact assessment**

NRM research will provide the geo-spatial component of the impact assessment by using the tools and methods developed for improving statistics and yield forecasting, under different environmental circumstances.

### ***Terms of Reference***

The Program committee of the Board of Trustees recommended a Center Commissioned External Review (CCER) for the NRM Program. The CCER will look at the direction of the NRM research Program, in the light of the new strategic plan. More specifically, the CCER should emphasize on how the NRM research contributes to the implementation of each step of the pro-poor research and development cycle. The Committee also suggested reviewing the contribution to eco-regional research.

The review panel should help CIP addressing the following issues and associated questions:

1. The state-of-the-science in the application of complex systems theory in the NRM research at CIP
  - How the application of complex systems theory can benefit the implementation of the research and development cycle?

- Is there a right balance between the process-oriented and the application-oriented research?
2. The adequacy of systems approaches for building adaptive capacity in potato- and sweet potato-based systems in target areas
    - Is there a right balance between crop-based and production systems-based research?
    - Given CIP's vision and mandate, are the priorities of the NRM research set right?
  3. The contribution of CIP to the development of tools and methods for ecoregional research and their usefulness in the implementation of the pro-poor research and development cycle
    - Who has primarily benefited from CIP NRM research?
    - What tangible development outcomes have been achieved/can be expected from the NRM research?
  4. Implementation of ICER and EPMP recommendations
    - What institutional mechanisms are required to extend the collaboration between the NRM research and eco-regional programs like CONDESAN and the Global Mountain Program?
    - What institutional mechanisms are required to extend the collaboration between the NRM research and all other CIP research programs?
    - What should be the nature and the extent of this collaboration?
  5. Adequacy of funding and staffing
    - What skills are missing or can be strengthened for the NRM research?
    - What is the suggested level of funding required to effectively supporting CIP's vision and mandate?

### ***CCER panel***

The program committee of the BOT met in April 2006 and recommended to invite an external panel of two members. The disciplines suggested were: complex systems theory, and ecoregional research. We have confirmed two widely recognized experts to serve on the panel.

### **Complex Systems Theory**

**Silvio Crestana** (Brazil) – President of EMBRAPA, Brasilia, Brazil. This is the job that Francisco Reifschneider held before moving to the CG. Dr Crestana brings a unique combination of complex systems theory and agricultural research experience and management.

### **Ecoregional Research**

**Johan Bouma** (The Netherlands) – Dr Bouma, a soil scientist, was coordinator of the Ecoregional Fund and former advisor to the Minister of Agriculture. He brings the

ecoregional research perspective together the policy focus and experience in commodity research. He has a broad knowledge of NRM research in the CG centers.

### ***Selected Documents to be supplied***

1. NRM Research in the CGIAR: Background Papers Considered by TAC/ISC. Consultative Group on International Agricultural Research, Science Council. Science Council Secretariat, September 2003.  
<http://www.fao.org/wairdocs/tac/y5313e/y5313e00.htm>
2. A Joint Board/Management Policy Statement. Internally Commissioned External Reviews (ICERs) and Center Commissioned External Reviews (CCER)  
<http://inrm.cip.cgiar.org/test/documents>
3. Chapter 4 – Natural Resources [http://sol/documents/cipepmr\\_5\\_2003\\_final.pdf](http://sol/documents/cipepmr_5_2003_final.pdf)
4. Report of the Program Committee  
<http://sol/documents/Program%20Committee%20Minutes%20March%202005.pdf>
5. Natural Resources Management Research Impacts: Evidence from the CGIAR. Consultative Group on International Agricultural Research, Science Council. Standing Panel on Impact Assessment (SPIA). Science Council Secretariat, December 2005
6. Internally Commissioned External Review ICER, on Natural Resource Management, CIP, Lima (PSNRM). October 7-12, 1999.  
<http://sol/research/DDGR/Icers/NRM%20Final%20Report%20Oct%201999.pdf>
7. ICER Recommendations <http://inrm.cip.cgiar.org/test/documents>
8. Terms of Reference. Internally Commissioned External Review, Natural Resource Management
9. Impact Assessment & International Public Goods of NRM Research. Report of the combined workshop of the Standing Panel on Impact Assessment and the 6<sup>th</sup> meeting of the CGIAR Task Force on Integrated Natural Resources Management, held at IRRI headquarters, Los Baños, The Philippines. June 13-16<sup>th</sup>, 2005. <http://inrm.cip.cgiar.org/test/documents>
10. The World Bank Operations Evaluation Department (OED). The CGIAR at 31: An Independent Meta-Evaluation of the Consultative Group on International Agricultural Research. Thematic Working Paper, Natural Resources Management Research in CGIAR: A Meta-Evaluation. Christopher B. Barrett, Cornell University. <http://inrm.cip.cgiar.org/test/documents>
11. Medium term Plan 2006-2008 and Financing Plan for 2006. November 2005.  
<http://sol/documents/MTP2006-2008.pdf>
12. CIP-Vision <http://sol/RESEARCH/DDGR/CIP-Vision/>
13. Strategic Planning <http://sol/research/DDGR/Strategic-Plan/Draft/Compiled-version.doc>