

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

Interim SCIENCE COUNCIL AND CGIAR SECRETARIAT

**Report of the**  
**Fifth External Programme and Management Review**  
**of the**  
**“Centro Internacional de la Papa”**  
**(CIP)**

Interim SCIENCE COUNCIL SECRETARIAT

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

This report comprises:

- a) Extract from the *Record of Proceedings* of the Annual General Meeting 2002, Manila, Philippines, 28 October to 1 November 2002.
- b) Letter from iSC Chair and CGIAR Director, transmitting the Report of the Fifth External Programme and Management Review of CIP.
- c) iSC Commentary on the Fifth External Programme and Management Review of CIP.
- d) CIP's response to the Report of the Fifth External Programme and Management Review.
- e) Transmittal letter from Panel Chair to iSC Chair and CGIAR Director.
- f) Report of the Fifth External Programme and Management Review of the "Centro Internacional de la Papa" (CIP).

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February 2003



**Consultative Group on International Agricultural Research (CGIAR)**

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**CGIAR Annual General Meeting, 2002 (AGM02)**

***External Programme and Management Review of CIP<sup>1</sup>***

Panel Chair Ed Schuh said the review Panel worked effectively in a collegial manner. The Panel appreciated the collaboration received from CIP's leadership and staff.

Summarizing the EPMR, Mr. Schuh said that the Centre, which addresses the problems of a commodity that is important to the poor, had developed and sustained a quality research and outreach programme in each of its main areas of interest.

The Centre had:

- mobilized vast genetic resources for its mandate crops;
- successfully integrated social science work with biological and natural science research; and
- worked effectively to maintain pure lines, and sustained an effective breeding programme.

He commended the Centre for the humane way in which it had scaled down staff and programmes in the face of significant budget reductions.

The EPMR highlighted the following of its recommendations:

1. Coalesce potato improvement activities into a single project.
2. Introduce more potato improvement activities in NRM work.
3. Make a stronger case with the CGIAR community about the significant differences between vegetatively propagated crops and cereals in crop improvement activities.
4. Focus social science research more directly on science and technology policy issues.
5. Develop a vision statement for the Centre, pointing it more effectively to the future.

The review Panel felt that CIP should receive more "core funding" to support the maintenance research and the costly maintenance of vegetatively propagated gene bank holdings.

Introducing CIP's response, Board Vice Chair K. K. Kim assured the Group that CIP's Board would be vigilant about the appropriate implementation of EPMR recommendations. He thanked the Panel for its valuable suggestions and recommendations. CIP had already distributed a document setting out how the recommendations were being implemented.

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<sup>1</sup> Extract from the *Record of Proceedings* of the Annual General Meeting 2002, Manila, Philippines, 30 October to 2 November 2002.

CIP DG Hubert Zandstra welcomed the commendations received from the EPMR, recommendations for strengthening the Centre's effectiveness, and iSC's supportive commentary. CIP had already responded to the recommendations of the previous EPMR, for instance, by upgrading its biodiversity facility. He pointed out that CIP had reduced its 2002 deficit by \$40,000, and prepared a conservative, balanced budget for 2003. However, he said, both the EPMR and iSC agree that CIP is "under funded."

Mr. Zandstra outlined the technical details of CIP's research, indicated what the Centre's research targets were, and said that rapid expansion of roots and tubers in Africa and Asia showed continued promise for improving health and raising income. He emphasized the fact roots and tubers were particularly significant in the fight against poverty. They were grown by the poorest farmers, were mostly rain-fed, absorbed more labor in production, and offered greater processing opportunities to producer communities. Women's participation was high in both production and post-harvest activity.

In response to the urging of the EPMR, CIP is launching a participatory visioning exercise to develop a road map for its future.

iSC Chair Emil Javier broadly supported the EPMR, and commended CIP for its positive response.

ExCo recommended that the CGIAR should endorse the recommendations of the EPMR, with the adjustments made by ExCo. The Group agreed.



Consultative Group on International Agricultural Research (CGIAR)

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**Interim SCIENCE COUNCIL**  
**Emil Q. Javier, Chair**

30 September 2002

Dear Mr. Johnson,

We are pleased to submit to you the Report of the Fifth External Programme and Management Review of CIP, conducted recently by a Panel chaired by Dr. Edward G. Schuh of the University of Minnesota, USA. The Review Report and CIP's written response to the Report were discussed by iSC at its 82<sup>nd</sup> Meeting at CIP in Lima, Peru, in April 2002. The Panel Chair made his presentation in the plenary session. The Centre was represented by Drs. Orlando Olcese, Board member, and Hubert Zandstra, Director General of CIP.

The Report of the Panel is accompanied by two attachments. The first contains the iSC Commentary, which summarizes iSC's reaction to the Panel's Report and to the Response of CIP's Board and management. The second attachment is the Response of CIP to the Panel Report.

We believe that the Panel carried out a thorough review of CIP's programmes and management. While the Report identified many strengths and achievements of the Centre, it has identified areas that require strengthening. The Panel has made 18 recommendations and several suggestions that we believe are useful for the Centre.

Yours sincerely,

*(Signed)*

Francisco J. B. Reifschneider  
Director, CGIAR

*(Signed)*

Emil Q. Javier  
iSC Chair

Mr. Ian Johnson  
CGIAR Chair  
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## **iSC Commentary on the Fifth External Programme and Management Review of CIP**

The Report of the Fifth External Programme and Management Review (EPMR) of CIP was discussed at iSC/TAC 82 at CIP headquarters in Lima, Peru, in the presence of the Panel Chair Dr. G. Edward Schuh, Dr. Orlando Olcese who represented the CIP Board, and the CIP DG, Dr. Hubert Zandstra and other CIP staff members. The interim Science Council (iSC) expresses its appreciation to Dr. Edward Schuh and his Panel for an analytical and constructive Report which offers an insightful contextualisation of CIP's work within the CGIAR's overall framework. The iSC commends the Panel for the Report which undertakes a detailed assessment of all activities of the Centre.

The iSC notes with appreciation CIP's very positive response to this EPMR Report and the actions the Centre intends to take to implement the recommendations. A number of the recommendations build upon and further reinforce the previous 4<sup>th</sup> EPMR conclusions. CIP in general has made significant progress in most of the 1995 recommendations although some of the concerns still remain.

The Report contains eighteen key recommendations and other important suggestions in various chapters. The iSC broadly endorses the Panel's recommendations and provides the following commentary, which was prepared with inputs from the CGIAR Secretariat to complement the Report.

### **Introduction**

Although not necessarily the core of its Report, the Panel called attention to the recent restatement of the CGIAR goals of not only increasing the supply of food, but also raising the income of poor farmers, and to improving the management of natural resources. In the Panel's view the addition of these goals creates a situation in which the CGIAR Centres like CIP may be evaluated unfairly. Producing new technology for small farmers is an appropriate basis for evaluating performance of the international Centres. But expecting the new production technology to be a significant factor in raising the per capita or family income of the small farmers when so many other factors affect those incomes would not be appropriate. In raising this flag of caution the Panel invoked a cardinal rule in policy making which called for one policy instrument for one policy goal.

The iSC understands the apprehension of the Panel over the multiple goals of the CGIAR. This had been the subject of debate in the Group. However, the iSC maintains that increasing food production through improvement in productivity responds directly to the goal of food security but does not sufficiently account for the equally important objectives of alleviating poverty and maintaining the sustainability of the natural resources upon which food production depends. All three goals are intimately linked with each other and are best pursued together.

Agricultural research as a policy instrument is multidimensional and it is the challenge to CGIAR Centres and their NARS partners to find win-win solutions that will advance these goals in harmony. This review of CIP reveals good examples of how these goals can be reconciled through quality research, dedicated training and capability building and

innovative partnerships/alliances with a host of research and development partners at the national and regional levels.

### **Research Achievements and Impact**

The Panel's first key recommendation is the need to coalesce all potato improvement activities into a single project to improve the identity, visibility and effectiveness of the CIP potato breeding effort and that the project leader be fully empowered with financial, budgeting and managerial authority to champion the development and delivery of a coherent breeding programme.

The Centre while appreciating the intent of the recommendation feels that the current configuration of the breeding efforts is working well so far and proposes instead to revisit the issue with a Centre-commissioned external review (CCER) in 2006 to provide the Centre sufficient time to test the present configuration.

The iSC believes that it is too soon to ask the Centre to change its structure anew without giving the Centre the opportunity to test the efficacy of its new project structure which was installed only in 2001 following the 4<sup>th</sup> EPMR recommendation. However, 2006 is too long to wait and the iSC urges the Centre instead to re-evaluate the situation within the next two years.

CIP has recently established a biodiversity and biosafety facility, which together with the fully integrated corporate database, workflow system for accession monitoring, integration of GIS, and establishment of a bioinformatics unit are likely to enhance the use of these resources for breeding and strategic research. The iSC supports the Panel's recommendation that CIP invest in a high-throughput genotyping facility for the benefit of the gene discovery and pre-breeding activities at CIP and elsewhere.

The Centre has made notable achievements in research on host-plant resistance and in integrated pest management both in pathogen identification, characterization and detection, and in developing resistant potato and sweetpotato materials. High levels of resistance to late blight have been attained in advanced breeding populations. The projects on late blight and integrated pest management are of high quality and they provide practical benefits to CIP's clientele. The Panel believes that the transfer of virus-free sweetpotato technology to China is likely to have a significant economic impact. Other important traits that are being introgressed into advanced materials include quality, particularly in sweetpotato for nutrition. The project for high vitamin A sweetpotato in Africa promises to have significant impact for women and children, in particular. CIP is also making good progress in developing markers and transgenic lines for potato and sweetpotato breeding.

The iSC notes that the Panel has doubts on whether the projects on true potato seed (TPS) and post-harvest quality will be sustainable and able to deliver, and encourages CIP to carefully assess the future of these projects.

The Panel assesses the recently initiated NRM research to be both relevant for the Andean region and the CIP-lead initiative on mountain ecosystems, and productive in developing tools and methods. It has already produced policy decision support tools, which are likely to have significance to the national partners for many different applications. A priority setting exercise for NRM within the overall strategic planning of the Centre as suggested by



the Panel should help focus further the research agenda and develop a proper balance between process oriented and application oriented research, and between production systems based on CIP mandate crops on one hand and livestock-pasture-based production systems on the other hand. Greater synergies between CIP's commodity research and the NRM work are likely to strengthen the overall coherence of CIP's research agenda.

The iSC joins the Panel in commending CIP for the effective organizational location of its social scientists, who have dual belongingness and accountability to their own specialized units within CIP (benefiting from having critical mass and professional interaction) as well as to the interdisciplinary research programme teams, in which they are integrated as members. CIP's social research on poor farmers and households has yielded strategically useful knowledge to CIP's biophysical researchers. This needs to be sustained.

The iSC is alarmed by the discrepancy between the release of CIP-derived varieties and the much lower and variable adoption of those materials. Although adoption rates are influenced by issues such as vegetative propagation, consumer preference and prevalence of plant health problems, the iSC encourages CIP, in addition to looking at physical attributes associated with adoption, to do household studies and beyond that to examine cultural features at village and region levels for adoption and impact. The iSC strongly endorses the Panel's recommendation for CIP to conduct more studies on constraints to early acceptance and adoption looking at economic profitability and policy and to develop a consistent framework for data collection and analysis.

The Panel flagged the need for CIP to reallocate its social science resources to do more research on science and technology policy. While recognizing the impressive achievements of CIP in documenting rates of return to agricultural research as important basis for making decisions on research priorities, the Panel felt that in particular the topics of resource savings effects of new technology and the economics of *in situ* vs. *ex situ* genetic conservation are very important to CIP's work and must be addressed. The Centre's response to this recommendation was positive and the iSC looks forward to seeing these items in CIP's future social research agenda.

CIP's relationship with CONDESAN in particular is quite unique, and the iSC would have liked to see more analysis of the potential benefits that both CIP and CONDESAN are likely to achieve from this partnership. The iSC commends the Centre for its long term commitment to this ecoregional consortium, which has features in line with the CGIAR's regional approach to research, stated in Plank 4 of the new Vision and Strategy. The iSC endorses the Panel's recommendations to increase the use of the CONDESAN benchmark watersheds in CIP research and the CONDESAN mechanism in the evaluation and dissemination of the research outputs. The iSC is confident that CIP as a member of CONDESAN will be able to enhance this kind of integration through the partnership. The iSC finds the Panel's recommendation on strategic framework in building partnerships important, but would have liked to see a more analytical assessment in the Report of the Centre's collaborative research partnerships as a basis for this recommendation.

The iSC appreciates the Panel's efforts to assess the quality of research based on the criteria of quality and impact of publications as well as quantity and quality of other outputs. The iSC joins the Panel in encouraging CIP to adopt a more determined and systematic strategy to publishing. In the Panel's view more of the quality work done at CIP could easily be advanced into refereed publications. Publishing in the relevant refereed scientific journals

is vital for maintaining science quality and for the Centre's visibility, competitiveness and attractiveness as a science partner.

### **Governance, Finance and Management**

The iSC is pleased that the Centre agrees with the recommendations of the Panel and has put or is planning to put in place fiscal and management policies, systems or procedures to implement them. The completion of changes in CIPFIS should be followed by the full and transparent sharing of information with managers at all levels with budgetary and planning responsibilities, as recommended by the Panel. The iSC is concerned, however, that the Board's performance in the oversight of financial and budgetary matters has not been strong. This is particularly troublesome because the last EPMR made a similar recommendation: "that the Board continually monitor CIP's liquidity and operating fund levels and establish a timetable for achieving what CIP management proposes as prudent and reasonable targets".

The review highlights the leadership role expected of the Board in promoting prudence in financial management. As this review shows, the Board should focus not only on ways of increasing revenues, but also on ways of cutting expenditures. Otherwise there is danger that Centre programmes will be stretched to levels when they begin to lose their effectiveness, critical mass, and viability. Clearly, financial discipline can be achieved only if a Board is vigilant in setting and enforcing clear priorities.

The iSC calls CIP's due attention to the Panel's recommendation to employ an international development officer, given the variable performance in resource mobilization in the past by CIP. Whether through a programme and/or officer, fund raising is a vitally important strategic activity and CIP needs to secure high level of skill in this area by itself and/or in partnership with the other Centres and the CGIAR Secretariat.

The iSC joins the Panel in its wish that the Board be more challenging and forward looking in the exercise of its programmatic/scientific oversight.

### **CIP's Future**

The iSC commends the Panel for its insightful discussion of the future of CIP. The iSC agrees fully with the Panel that the Centre should urgently engage in the development of a vision and a strategic plan that will integrate crop improvement and protection, NRM and social sciences, particularly in the context of CIP's expected funding environment and changing external conditions. The need for strategic planning and priorities was also a concern of the 4<sup>th</sup> EPMR Panel. The iSC believes that priority setting should contribute both to seeking innovative solutions to developing country problems and to setting the basic priorities to guide resource allocation in CIP. The iSC agrees with the Panel's view that priority setting needs to involve partners and constituency groups and be methodologically suitable for the different areas of activities.

The iSC notes that, as observed by the Panel, recent budgetary cuts have been made across all areas. In the Panel's perception the Centre may currently be trying to do too much and has under funding pressure developed a short-term bias in its current programmes. The iSC strongly supports the concept of basing the cuts and resource allocation on a priority setting

exercise of the Centre to ensure strength, capacity and critical mass in the high priority areas.

The iSC believes that continuous assessment is needed at CIP on the position of the Centre in the research-to-development continuum in order to develop a strong self-identity and guarantee long term impact. While accepting CIP's intention to engage in development activities as needed, the Panel cautions to do so only if this serves the weaker NARS. The iSC agrees with the Panel's view that CIP should sharpen its profile as a centre of excellence in its mandate research for the developing countries. CIP's focus on near-end-products is understandable for demonstrating impact where it is likely to be achieved effectively and in the short term. However, this should be balanced against the need for strategic research paving the way for long term relevance and impact, a point that was also strongly emphasized by the 4<sup>th</sup> EPMR. The iSC underlines the primary need for CIP is to produce international public goods.

The iSC trusts that the key recommendations and several important suggestions in this Report are helpful for the Centre. Like the Panel, the iSC strongly believes that CIP, despite the current financial difficulties, will remain an important and needed Centre.

Roots and tuber crops continue to be very valuable crops for the poor and in the marginal areas of the developing world. Because of their vegetatively propagated nature these crops require considerable research maintenance effort. Although these same crops are produced in the North, their research requirements for the developing world are quite different. CIP as the key supplier of international public good research for roots and tubers clearly deserves greater support.



March 22, 2002

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Less poverty



Healthy environments



Food security



through



Research



Training



Information



Technical assistance



on



Potato



Sweetpotato



Andean root and

tuber crops



Natural resources



Mountain ecologies

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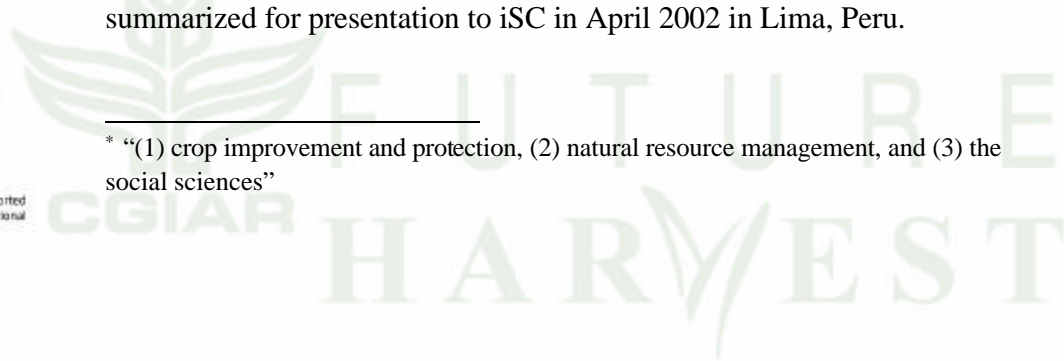
Dear Drs. Javier and Reifschneider,

We are pleased to provide this response to the recommendations of the Fifth External Programme and Management Review (EPMR) of the International Potato Centre (CIP). This response from the Centre is a consensus view reflecting the perspective of both management and the Board of Trustees.

First and foremost we want to express our great appreciation for the rich, detailed, and valuable report provided to our Centre. We are pleased that the Panel concluded **“that CIP has had significant achievements in [its three core areas]<sup>\*</sup> and that it will continue to be an important and needed Centre in the future”**. We have studied the report in considerable detail and concluded that it is a very positive evaluation, with many commendations and worthwhile recommendations and suggestions for incremental improvements.

We have elected to organize our response around the 18 recommendations found in the report. However, we hasten to point out that both the Board and management have gleaned from the EPMR process a wealth of additional suggestions that are being organized into short- and long-term implementations. These items and the planned responses will be summarized for presentation to iSC in April 2002 in Lima, Peru.

<sup>\*</sup> “(1) crop improvement and protection, (2) natural resource management, and (3) the social sciences”



Before getting to our specific response to the 18 recommendations found in the EPMP, let us note the value to our Centre of the review process itself. Our extensive preparations for the review and our self-examinations have strengthened our understanding and commitment to some independently formulated decisions, and as a consequence, even prior to the initiation of the EPMP, we have initiated changes in several areas. Often these preparatory benefits are missed or discounted, but they should not be overlooked.

## **SUMMARY RECOMMENDATIONS (by Chapter) AND THE CENTRE'S RESPONSES**

### **CHAPTER 3 – CROP IMPROVEMENT AND PROTECTION**

**CHAPTER 10** *Because of the need to improve the identity, visibility and effectiveness of the CIP potato breeding effort, the Panel recommends that the potato improvement activities be coalesced into a single project and that the leader be empowered (full financial, budgeting, and managerial accountability) to champion the development and delivery of a coherent breeding programme that captures the full potential of all the resources available to CIP.*

The Centre respectfully acknowledges the intent of this recommendation. The Centre feels that the current configuration of our breeding efforts is working well, and that making changes at this time might not improve the effectiveness of the breeding programme. The Board and management pledge to monitor the situation and to seek improved efficiencies, and will make corrections as necessary.

Recognizing the value of external reviews, the Board proposes to undertake a Centre Commissioned External Review (CCER) in 2006 to re-evaluate the structure of our project portfolio vis-à-vis plant breeding. This will provide the Centre with sufficient time to test the present configuration (i.e., gather data for the CCER), and in turn will provide the next EPMP with an external look at the merits and drawbacks of various plant breeding configurations.

**Background:** The Centre has recently completed a top-to-bottom realignment of our research project portfolio. We were pleased to see the EPMP panel's positive treatment of the resulting research project structure. The careful placement of our breeding activities within certain projects was done with much thought and discussion. We are seeking to provide interaction with the efforts of many national breeding programme partners, which in turn respond to diverse conditions and priorities. Thus, the Centre has decided that our recently completed renovations to the research portfolio need to be tested before any more changes are instituted.

*2. Because of the unique role of CIP as holder of vast genetic resources of its mandate crops, the Panel recommends that CIP urgently identify resources to establish a state-of-the-art high-throughput genotyping facility that will enable it to fully exploit its genetic*

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*2. Because of the unique role of CIP as holder of vast genetic resources of its mandate crops, the Panel recommends that CIP urgently identify resources to establish a state-of-the-art high-throughput genotyping facility that will enable it to fully exploit its genetic*

*resources in the post-genomics era. Skills and competencies in the area of bioinformatics/computational biology must be strengthened.*

**The Centre accepts** the recommendation to establish a state-of-the-art, high-throughput genotyping facility and will explore the human and financial resources implications of moving forward with this recommendation, including the implementation of collaborative arrangements with other institutions.

We stress however, that the intention of creating such an initiative would be strictly in the interest of better serving the recipients of our research efforts, and with the purpose of contributing to solving poverty, nutritional and environmental problems in our client communities.

## CHAPTER 4 – NATURAL RESOURCES

*3. Because of the need for multidisciplinary approaches for sustainable improvement of the cropping systems under CIP's mandate commodities and limited resources for research, and the need to demonstrate impact, the Panel recommends that, within the overall strategic planning of the Centre, a priority setting exercise be conducted for NRM, using an appropriate methodology, to help focus the research agenda and develop a proper balance between process oriented and application oriented research, and between production systems based on CIP mandate crops on the one hand and livestock-pasture-based production systems on the other hand.*

**The Centre accepts** this recommendation and notes the following. We are fully aware of the challenging task of making the needed trade offs among natural resource management components and agricultural productivity-oriented alternatives. We will be including this topic in the visioning and priority-setting processes outlined in our response to the recommendations regarding Chapter 10 (see below). Because of the successful methodologies and tools that have been developed through the Centre's NRM research to date, CIP is quite prepared to tackle this challenge and to implement applications-oriented research in conjunction with the most appropriate partners in the Andes and, on the global scale, through the Global Mountain Programme.

*4. Because of the unique opportunity offered by CONDESAN and its very diverse partners in providing an excellent mechanism with a large number of watershed sites for testing research hypotheses and products, the Panel recommends that all CIP scientists work together in the CONDESAN benchmark watersheds and to use the CONDESAN mechanism for the development, evaluation and dissemination of integrated technologies, and policy and management recommendations.*

**The Centre accepts** this recommendation to foster the integration of CIP scientists' with work at the benchmark sites, as appropriate to their assessed needs. However, because we participate in CONDESAN as a member, and in the spirit of collaboration, the Centre will *recommend* to our partners that CONDESAN be used as a "mechanism for the development, evaluation, and dissemination of integrated technologies, and policy and management recommendations".

**CHAPTER 10** *Because of the extremely diverse activity profile of CONDESAN on one hand and its potentially important role in combining regional interests on the other hand, the Panel recommends that CIP continue to have a strong scientific vision and methodological input in the consortium, in addition to CIP's current coordinating, administrative and facilitating role; and that the Technical Committee be revived and the coordinators of the cross-cutting themes be members of it.*

**The Centre accepts** this recommendation with enthusiasm and remains fully committed to continuing to provide strong scientific input to CONDESAN. Regarding the proposal to “revive” the Technical Committee and populate it with crosscutting theme coordinators, the suggestion will be communicated to CONDESAN leadership. (See our response to Recommendation 4 above for the rationale.)

## CHAPTER 5 – SOCIAL SCIENCES

**CHAPTER 10** *Because of the need to consider CIP's priorities on a continual basis, given constant changes in the external environment, the Panel recommends that the Centre continue the interactions of its social scientists with its biological and physical scientists, but with a broader involvement of partners and constituency groups.*

**The Centre accepts** this recommendation and pledges to continue to promote interaction between our social, biological and physical scientists, as we have historically done. The Centre appreciates the EPMP panel's commendation of this programme for its successful multi-disciplinary integration.

**CHAPTER 10** *Because science and technology policy is increasingly important in a resource constrained world, and because the economic conditions of adopting new technology varies so much from one part of the world from another, the Panel recommends that CIP reallocate its social science resources to do more research on science and technology policy issues.*

**The Centre accepts** this recommendation. The Centre would like to defer, however, the reallocation of our social science resources until the completion of the EPMP's recommended visioning, strategic planning, and priority setting exercise. Also, given the fact that the primary CGIAR mandate for doing policy research rests with IFPRI, the Centre will seek a closer working partnership with IFPRI on science and technology policy issues.

*8. Because of the potentially significant insights to be obtained from comparative studies of adoption and constraints, and because of the value attached to the results of such studies by the international donor community, the Panel recommends that CIP develop consistent frameworks for the collection and analysis of basic data on adoption and constraints (including household data), and strengthen the skills of the Centre in sophisticated statistical approaches required for the collection of such data.*



**The Centre accepts** the recommendation to strengthen the collection of data on adoption and constraints and will incorporate evaluation and definition of consistent frameworks as part of the EPMR recommended visioning, strategic planning, and priority setting exercise.

## CHAPTER 6 – PARTNERSHIPS AND CAPACITY BUILDING

*9. Because of the opportunities for partnership are overwhelming and tend to lead the Centre in multiple directions, the Panel recommends that CIP formulates a strategy for how to engage in different types of partnerships, including the private sector.*

**The Centre accepts** this recommendation and will form a Centre Task Force to assess and gather data on our expertise and experience, and to address the specific issue of strategies for partnering.

## CHAPTER 7 – CROSS-CUTTING ISSUES

*10. Because of the need to enhance CIP’s scientific reputation and ability to compete more effectively for external funding, the Panel recommends that the institute encourage more frequent publications in refereed scientific journals and set more demanding annual publication performance targets.*

**The Centre accepts** this recommendation fully, as it is vital to our future. To address these needs several creative approaches are under consideration. These ideas go beyond the points made in the EPMR’s report, and include: the reorganization of the Centre’s information services; the definition of strategies that enhance and expand outlets for peer-reviewed research results of the types produced by IARCs and our partners; and better recognition for high quality research performance, including project-based support and scientist-based rewards.

*11. Because traditional sources of funding for CIP’s activities are drying up, and because additional outside funding is needed if the Centre is to attract quality professionals to contribute to its activities, the Panel recommends that CIP reallocate resources from its management staff to hire a competent international development officer, and use the leadership of that officer, together with a marketing survey, to develop a strategic plan for increasing its external funding.*

**The Centre accepts** this recommendation, but may implement it as a “development programme” rather than a “development officer”. The distinction here is merely one of greater flexibility as we may want to look at contracting for services (rather than hiring an officer), and we may want to partner with other Centres and the Future Harvest Foundation on common resource-mobilization interests.

## CHAPTER 8 – FINANCE

*12. Because of the need to retain a healthy distance between the Centre and its External Auditor, the Panel recommends that the Board of Trustees change CIP's External Auditor at the conclusion of the current end-of-year audit/reporting cycle, and every 3-5 years thereafter.*

**The Centre accepts** this recommendation and it has been implemented.

Note: The temporary extension of the current external auditor was a result of the merger of the prior audit company (Coopers and Lybrand) with the newly contracted one (PriceWaterhouse) into a joint company (PriceWaterhouseCoopers). With the subsequent change-over of the Centre's CFO position, the normal cycle of retaining an external auditor for limited periods has resumed.

*13. Because of the need to give managers the ability to cost-efficiently conduct their business, the Panel recommends that the required changes to transform CIPFIS into a fully-fledged Management Information System be completed as soon as possible; and that managers at all levels then be given access to complete and transparent budgetary information on the activities they are accountable for, and that CIP management devise incentives to encourage and increase cost-consciousness and efficiency.*

**The Centre accepts** this recommendation and notes that the implementation of these enhancements were already planned before the EP MR and were undergoing implementation prior to the EP MR main phase. We anticipate completion of this project within a few months.

## CHAPTER 9 – GOVERNANCE AND MANAGEMENT

*14. Because of the importance of the Board's financial oversight role, and especially in view of the Centre's funding situation, the Panel recommends that the Board ensure that it receives adequate financial and budgetary information from management and that it spend sufficient time exercising its budgetary and financial oversight function.*

**The Board accepts** this recommendation and has, in the past year, moved to elevate its attention to financial oversight. This will be accomplished through enhancements to the Centre's management information system, and changes to the Centre's annual auditing arrangements.

*15. Because of the Board's important role in programmatic/scientific oversight, the Panel recommends that the Board be more challenging and forward looking in its discussions of the Centre's long-term scientific strategy.*

**The Board accepts** this recommendation and notes that it has been awaiting finalization of the change management activities of the CGIAR and the outcomes of the regional planning efforts as necessary input to this process.

*16. Because of the need to keep professional distance and independence of the Board vis a vis management, the Panel recommends that the DG not be a member of the Nominations*

*Committee and that the DDG-F/A not be the secretary to the Board and its Executive Committee.*

**The Board accepts** the first point and has already completed implementation. As to the second point, the statutes founding the Centre prescribe the position of the Secretary of the Board.

## CHAPTER 10 – THE FUTURE

*17. Because of the value of a well-articulated, encompassing vision tied together with a strategic plan, the Panel recommends that CIP develop a vision and a strategic plan that will integrate crop improvement and protection, natural resource management, and the social sciences in an approach that will guide the understanding of problems developing countries face as they experience economic development.*

**The Centre accepts** this recommendation and plans to implement it through a yearlong process of visioning, stakeholder dialogue, strategic planning, human resource capacity assessment, financial needs evaluations, and resource mobilization strategies.

*18. Because of the need to give more attention to priority setting in CIP and to maximize the effectiveness of the resources made available to it, the Panel recommends that the vision statement and the strategic plan be connected and used to establish a robust set of priorities to guide resource allocation in CIP in the coming years.*

**The Centre accepts** this recommendation, but notes our intentional postponement of priority setting activities in anticipation of the outcome of the change management exercises of the CGIAR (especially the emergence of the critically important Challenge Programmes) and this pending EPMR.

## ADDITIONAL COMMENTS

The Centre wishes to comment on some significant factual errors that are found in the EPMR report that are likely to have occurred in the panel's rush to complete the document.

1. **Fact:** CIP's Board of Trustees commissioned three CCERs in the interval since the Fourth EPMR. The Board policy is to commission all of the Centre's External Reviews (ICER/CCER), with a few notable exceptions, when it is appropriate for management to undertake such a study. Confusion over terminology appears to have initially misled an EPMR member, but subsequent assurances and factual evidence should have corrected that initial misrepresentation. To avoid future misunderstandings the Board has developed a new policy statement that clearly spells out the process to be used, and the allowable variations on that process.
2. **Fact:** The CIP Board of Trustees has practiced due diligence in the monitoring of the Centre's finances, and the casual reader of this report may be misled by the Summary Recommendation numbered 15. The Centre's Board uses a method of decision-making (which was actually complimented by the EPMR Panel) that


superficially gives the impression of a too speedy disposition of some items. In fact, the process requires that all committee reports be shared with Board members the day prior to consideration to permit everyone to read the contents and to visit with the committee members off-line with any questions or issues. Thus, when a committee report (such as our Audit Committee's report) reaches the Board for a decision it has received considerable attention, a fact that seems to have been missed by the EPMR panel. Additionally, the rules for decision-making used by the Board allow ample time for discussion by all Board members prior to any action.

It is the view of CIP's Board and our external auditors that the Centre's present auditing systems, procedures, and practices provide adequate control of CIP's finances.


**Final Note:**

The International Potato Centre expresses its deep appreciation to the members of the Fifth EPMR for a valuable exercise that will no doubt contribute to CIP's continued contribution, as the Panel concluded, as "an important and needed Centre in the future".

Regards,



Hubert Zandstra  
Director General



David R. MacKenzie  
Chair of the Board

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March 14, 2002

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Washington, D.C. 20433, USA

Dear Drs. Javier and Reifschneider,

I am pleased to transmit to you the Report of the Panel that conducted the Fifth External Programme and Management Review (EPMR) of the International Potato Centre (CIP).

Like other Centres in the CGIAR system, the International Potato Centre has experienced significant reductions in its budget since the last EPMR. The reduction in unrestricted funds has been of special significance for CIP since an important part of its budget goes to sustaining the purity, integrity, and health of the plant material that is used in its research and dissemination activities. This kind of research constitutes maintenance research, and its benefits are of global significance. The Panel feels the iSC and the CGIAR need to give this issue more priority in allocating unrestricted funds among the IARCs. Vegetatively propagated crops are different from many of the cereal species and present demanding challenges.

In making its assessment of CIP and its projects, the Panel gave special consideration to the changing environment in which CIP operates. We did that in part because of the need to take these changes into account in assessing the relevance and quality of its research, and in part so the new perspectives of the donors and the CGIAR do not impose unfair standards on the Centre.

../..

The Panel found CIP to be in good financial health, and taking important measures to reduce its expenditure to the constraints imposed by its budget. The Panel believes the Centre needs to make a significant effort to develop a vision statement for its activities that is well grounded in reality and which is connected directly to a strategic plan. That plan, in the Panel's view, should be used to develop a robust set of priorities for the future.

In spite of their diverse backgrounds and expertise, the Panel Members worked as a team with great enthusiasm and sense of purpose. I thank you for assembling such a capable team, and express my sincere appreciation to all the Panel Members for their dedication and untiring efforts in a common cause. It would be difficult to find another group of people with such divergent interests who would respond as well to an important challenge.

Sirkka Imonnen from the iSC Secretariat and Selçuk Özgediz from the CGIAR Secretariat (who helped from a distance) served as resource persons and supported the Panel throughout the review. Their assistance was effective and exemplary. They, with their comprehensive knowledge of the CGIAR System and of the CGIAR external review process, ensured the timely completion of our assignment. To both of them we owe a special debt of gratitude. We thank Rosanna Corazzi from iSC Secretariat for putting this report together.

CIP Board, management, and staff cooperated in every way possible and assured that our working environment was excellent. Our thanks to them, and especially to Rosario Marcovich and to the staff of the dormitories and the cafeteria, all of whom gave us special attention.

Finally, all the Panel Members join me in expressing appreciation for the opportunity to participate in the challenging task of conducting this Review. We hope that the Report will be useful to the CGIAR as well as to CIP and its partners.

Yours sincerely,

A handwritten signature in blue ink that reads "G. Edward Schuh". The signature is written in a cursive style and is underlined with a single horizontal stroke.

G. Edward Schuh  
Chair  
External Review Panel

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

Interim SCIENCE COUNCIL AND CGIAR SECRETARIAT

**REPORT OF THE  
FIFTH EXTERNAL PROGRAMME AND MANAGEMENT REVIEW  
OF THE  
“CENTRO INTERNACIONAL DE LA PAPA”  
(CIP)**

**Review Panel:**

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Alain Coleno  
María Elena Cruz Doren  
Ricardo Godoy  
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Jean-Yves Maillat  
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John Griffith (Consultant)

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Interim SCIENCE COUNCIL SECRETARIAT

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

March 2002

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## PREFACE

This is the Report of the Fifth External Review Panel appointed to evaluate the programme and management of the “Centro Internacional de la Papa” (CIP). The membership of the Panel and their backgrounds are given in Appendix I. The Terms of Reference of this Fifth External Review of CIP are shown in Appendix II.

The Panel’s approach to the Review has been participatory and forward-looking. In conducting the Review, the Panel has interpreted the Terms of Reference and the general guidelines for the CGIAR review process in the light of the new CGIAR vision and strategy and the new developments with respect to priority setting at the System level. The Panel has also made use of three Internally Commissioned External Review Reports. The Panel has wished to concentrate on the most strategic issues facing the Centre, after examining information pertaining to all the principal areas of the review.

The Panel attempted to evaluate CIP through establishing an understanding of the broad guidelines set by the CGIAR, and considering the prevailing scientific and client environment as well as from the documentation and other evidence reviewed on specific project areas. The Review was a dynamic process of interaction with Centre staff, although not all sites could be visited by Panel Members and not all staff was consulted.

The information on which the Panel based its decisions regarding the key concerns and issues, and its assessments and conclusions were gathered in a number of ways. These included visiting the Centre and interacting with the Board, management and staff; meeting and discussing with CIP’s regional representatives, national programme representatives and CIP’s partners at various locations in Africa, Asia and Latin America; interviewing CIP collaborators in advanced research institutes; undertaking in-depth examination of the Centre finances through a Panel consultant; identifying important issues and obtaining information through a survey letter sent to all CGIAR institutions collaborating with CIP, and to all CGIAR Members and Regional representatives. Furthermore, both the Technical Advisory Committee of the CGIAR and the CIP Board raised issues that they considered important for the review. The Panel itinerary is given in Appendix III.

Finally, the Panel had access to documents and data made available by CIP in advance and during the Main Phase of the review. The TAC and CGIAR Secretariats provided ample documentation covering CGIAR strategies, finance and organization, strategic studies and review reports. A complete list of documents given to the Panel is shown in Appendix IV. One of the documents provided by CIP was the response of the Institute to the recommendations of the last review, which is reproduced together with the Panel’s comments in Appendix V.

## SUMMARY AND RECOMMENDATIONS

CIP undertakes its activities in a world in which the context of its activities is changing rapidly. Economic conditions now reflect more open national economies, among other things. A revolution in the life sciences is changing the nature of the biological research process and opening new opportunities. And the Consultative Group for International Agricultural Research (CGIAR) is reorganizing and establishing a new *modus operandi* for implementing its endeavours.

The Panel gave most of its attention to reviewing and making suggestions and recommendations on projects falling under three core areas of the Centre: (1) crop improvement and protection, (2) natural resource management, and (3) the social sciences. It also reviewed CIP's numerous partnership programmes and considered a number of cross-cutting issues.

The projects on crop improvement and protection are multidisciplinary by nature and staffed with quality scientists. They have suffered from repeated cuts in budget, and with those cuts there was a need to reorganize the research programme. Maintenance research necessary in improving vegetatively propagated crops absorbs a significant part of the Centre's resources and is an issue donors and the CGIAR need to consider in allocating their unrestricted financial resources. Some significant outputs have been produced by the research on crop improvement and protection, both in terms of improved varieties and innovations for successful plant protection.

CIP needs to build on its genetic resources and competencies in plant breeding to create technology platforms for the delivery of public goods. In this way CIP can position itself to be the Centre of excellence for the application of science and technology to potato and sweetpotato breeding for the developing world. The research on and the adoption of new innovations to protect from various viruses in China is also impressive.

The Panel believes the crop improvement work would benefit from more centralized leadership. It also believes CIP's scientific stature would benefit from moving more of its publications into quality, refereed journals.

The research on natural resource management is of recent vintage, having been established only in 1996. The focus of NRM activities is on (a) application of the latest advances in geoinformation science and remote sensing, as well as information- and communication technologies; (b) systems analysis and the development of analytical tools and methodologies for environmental and natural resource management, and (c) management and policy recommendations related to sustainable agricultural productivity, environmental quality and human health and welfare. The Panel is impressed with the qualifications of the NRM staff. A flow of products has already begun from this group, and there is promise of much more in the future.

Social scientists in CIP are integrated into the various biological and natural research projects; there is not an independent or free-standing research group to address

economic issues *per se*. The effective integration of the social scientists with the biological and natural scientists is unique at CIP among IARCs, and has served the Centre well. The research group has made contributions in the area of helping to set the scientific priorities for the Centre, in better understanding the adoption of new technology, in science and technology policy, and in evaluating the impact of CIP's programme in society. The Panel feels a larger share of the efforts of the social scientists can be focused on science and technology policy and a limited number of macroeconomic issues without abandoning the very effective work they now do with the other scientists in the Centre.

CIP maintains a wide range of partnerships with a large number of collaborative partners. These partners range from collaborators in the industrialized countries, to collaborating NARS, to the private sector, and to the other Centres in the Consultative Group. The Centre's educational and training programme is ambitious and substantial. It contributes in important ways to the development of research capacity in developing countries and thereby to their future.

The Panel addressed a number of cross-cutting issues. These include the quality of science and the need for greater efforts to increase the publication of research in refereed journals, the relatively new and challenging problem of fund raising, public awareness and the need to provide public education on controversial issues, intellectual property rights, and collaboration with the private sector. Some of these cross-cutting issues will likely be increasingly important in the future.

Issues of finance and management were also considered by the Panel. Finance issues are especially important, given the significant reductions in total budget in recent years. A consultant helped advise the Panel on finance issues, and especially on financial controls and procedures. Recommendations were made on how financial management might be improved.

Members of the Panel participated in a week-long one meeting of CIP's Board, conducted in-depth interviews with members of the Board and CIP leaders. CIP has a very dedicated and well organized Board of Trustees, with a fairly good geographic and gender balance and solid leadership. Improvements in its operations could be made in budgetary and financial oversight, long-term programmatic vision, and assessment of management and self assessment.

Finally, the Panel feels strongly there is a need for CIP to develop a vision statement that provides a framework for integrating the various activities of the CIP into a cohesive whole and the need to use such a vision as the means to develop a comprehensive strategic plan. That plan should then be used to develop a robust set of priorities for the future that can be used to guide management in its decision making and to use with potential funders of CIP's activities. The Panel suggests that the priorities cut across the multiple activities of the Centre.

## LIST OF KEY RECOMMENDATIONS

### CHAPTER 3 - CROP IMPROVEMENT AND PROTECTION

1. Because of the need to improve the identity, visibility and effectiveness of the CIP potato breeding effort, the Panel recommends that the potato improvement activities be coalesced into a single project and that the leader be empowered (full financial, budgeting, and managerial accountability) to champion the development and delivery of a coherent breeding programme that captures the full potential of all the resources available to CIP.
2. Because of the unique role of CIP as holder of vast genetic resources of its mandate crops, the Panel recommends that CIP urgently identify resources to establish a state-of-the-art high-throughput genotyping facility that will enable it to fully exploit its genetic resources in the post-genomics era. Skills and competencies in the area of bioinformatics/computational biology must be strengthened.

### CHAPTER 4 - NATURAL RESOURCES

3. Because of the need for multidisciplinary approaches for sustainable improvement of the cropping systems under CIP's mandate commodities and limited resources for research, and the need to demonstrate impact, the Panel recommends that, within the overall strategic planning of the Centre, a priority setting exercise be conducted for NRM, using an appropriate methodology, to help focus the research agenda and develop a proper balance between process oriented and application oriented research, and between production systems based on CIP mandate crops on the one hand and livestock-pasture-based production systems on the other hand.
4. Because of the unique opportunity offered by CONDESAN and its very diverse partners in providing an excellent mechanism with a large number of watershed sites for testing research hypotheses and products, the Panel recommends that all CIP scientists work together in the CONDESAN benchmark watersheds and to use the CONDESAN mechanism for the development, evaluation and dissemination of integrated technologies, and policy and management recommendations.
5. Because of the extremely diverse activity profile of CONDESAN on one hand and its potentially important role in combining regional interests on the other hand, the Panel recommends that CIP continue to have a strong scientific vision and methodological input in the consortium, in addition to CIP's current coordinating, administrative and facilitating role; and that the Technical Committee be revived and the coordinators of the cross-cutting themes be members of it.

### CHAPTER 5 – SOCIAL SCIENCES

6. Because of the need to consider CIP's priorities on a continual basis, given constant changes in the external environment, the Panel recommends that the Centre continue

the interactions of its social scientists with its biological and physical scientists, but with a broader involvement of partners and constituency groups.

7. Because science and technology policy is increasingly important in a resource constrained world, and because the economic conditions of adopting new technology varies so much from one part of the world to another, the Panel recommends that CIP reallocate its social science resources to do more research on science and technology policy issues.
8. Because of the potentially significant insights to be obtained from comparative studies of adoption and constraints, and because of the value attached to the results of such studies by the international donor community, the Panel recommends that CIP develop consistent frameworks for the collection and analysis of basic data on adoption and constraints (including household data), and strengthen the skills of the Centre in sophisticated statistical approaches required for the collection of such data.

## **CHAPTER 6 – PARTNERSHIPS AND CAPACITY BUILDING**

9. Because of the opportunities for partnership are overwhelming and tend to lead the Centre in multiple directions, the Panel recommends that CIP formulates a strategy for how to engage in different types of partnerships, including the private sector.

## **CHAPTER 7 – CROSS-CUTTING ISSUES**

10. Because of the need to enhance CIPs' scientific reputation and ability to compete more effectively for external funding, the Panel recommends that the Institute encourage more frequent publications in refereed scientific journals and set more demanding annual publication performance targets.
11. Because traditional sources of funding for CIP's activities are drying up, and because additional outside funding is needed if the Centre is to attract quality professionals to contribute to its activities, the Panel recommends that CIP reallocate resources from its management staff to hire a competent international development officer, and use the leadership of that officer, together with a marketing survey, to develop a strategic plan for increasing its external funding.

## **CHAPTER 8 – FINANCE**

12. Because of the need to retain a healthy distance between the Centre and its External Auditor, the Panel recommends that the Board of Trustees change CIP's External Auditor at the conclusion of the current end-of-year audit/reporting cycle, and every 3-5 years thereafter.
13. Because of the need to give managers the ability to cost-efficiently conduct their business, the Panel recommends that the required changes to transform CIPFIS into a fully-fledged Management Information System be completed as soon as possible;



and that managers at all levels then be given access to complete and transparent budgetary information on the activities they are accountable for, and that CIP management devise incentives to encourage and increase cost-consciousness and efficiency;

## **CHAPTER 9 – GOVERNANCE AND MANAGEMENT**

14. Because of the importance of the Board's financial oversight role, and especially in view of the Centre's funding situation, the Panel recommends that the Board ensure that it receives adequate financial and budgetary information from management and that it spend sufficient time exercising its budgetary and financial oversight function;
15. Because of the Board's important role in programmatic/scientific oversight, the Panel recommends that the Board be more challenging and forward looking in its discussions of the Centre's long-term scientific strategy;
16. Because of the need to keep professional distance and independence of the Board vis à vis management, the Panel recommends that the DG not be a member of the Nominations Committee and that the DDG-F/A not be the Secretary to the Board and its Executive Committee.

## **CHAPTER 10 – THE FUTURE**

17. Because of the value of a well-articulated, encompassing vision tied together with a strategic plan, the Panel recommends that CIP develop a vision and a strategic plan that will integrate crop improvement and protection, natural resource management, and the social sciences in an approach that will guide the understanding of problems developing countries face as they experience economic development;
18. Because of the need to give more attention to priority setting in CIP and to maximize the effectiveness of the resources made available to it, the Panel recommends that the vision statement and the strategic plan be connected and used to establish a robust set of priorities to guide resource allocation in CIP in the coming years.

## CHAPTER 1 – INTRODUCTION

This external review of the International Potato Centre (CIP) has taken place at a time of rapid change in the environment in which the Centre operates. These changes impose significant demands on the resources of the Centre and on how those resources are managed. In this section the Panel reviews the main elements of change in the external environment, since those elements set the stage for assessing how the Centre is responding to its environment, evaluating its past performance, and thinking about its strategies for the future.

Before turning to those issues, however, it is worth reviewing two basic points. The first is the specific role of an international agricultural research centre. Such centres have a unique role to play in the global institutional infrastructure. They were established with the idea that they would create and supply two important public goods: (1) strategic research that would have leverage on the global system by leading the way towards the frontier of knowledge in developing countries, and (2) the strengthening of the National Agricultural Research Systems (NARS) in those countries, both through the discovery of new knowledge and the training of staff at the NARS. This perspective has implications for the kind of research the Centres do. It also implies that the Centres be linked to research organizations working on the frontier of knowledge in the developed countries, while at the same time cooperating with the NARS in the developing countries.

The second basic point follows from the proposition that the international centres are designed to produce knowledge and/or new production technology, both of which are powerful sources of economic growth. Government policies aside, these contributions to economic growth and development are generated in part by reducing the price of food, to the benefit of everybody in society, but especially of poor consumers who spend a larger share of their income on food. This occurs when these contributions are directed to raising productivity in the food staples. They also contribute to economic growth and development by making a country more competitive in international markets, thus enabling it to earn or save more foreign exchange needed to service international debt and/or finance the acquisition of raw materials and modern inputs needed for economic development. Finally, the new knowledge and production technology can reduce damage to the environment and thus improve the sustainability of the development process.

Some of the important challenges faced by CIP are rooted in changes in the external environment and in demands placed on the international centres, including CIP. The following are some of the most important of these changes:

### **1.1 Decline in Funding from the Traditional Donors**

The CGIAR system experienced significant growth in its funding almost from its inception. That funding has levelled out in recent years, and at the same time become more restrictive. Basic core funding as a share of the total has declined. It was this core

funding that enabled the Centres to have significant autonomy in setting the priorities for the respective Centres.

The levelling out of funding and the increase in restrictions on how the money can be used has imposed severe management challenges on CIP and other international centres. For example, it has increased the demand for external funding, and in the process imposed demands on the scientists to raise their own funding. This distracts from their research efforts. In addition, the decline in core funding incurs the risk of drawing researchers away from the strategic research they should be doing and giving more attention to the more marketable, shorter term, and more applied research. Ultimately, this runs the risk of lowering the rate of productivity growth over the longer term. The decline in core funding also causes researchers to be more risk averse in their research.

## 1.2 Increased Demands from the Donors

The goals of the donors in supporting the System have shifted from the single goal of increasing the supply of food – the main goal of the system in its early days, successively to raising the incomes of poor farmers and to improving the management of natural resources. This increase in demands on the System violates a cardinal principle of policy making, which is that to be effective there must be one policy instrument for each policy goal. The donors have over time added policy goals to the System without seeming to realize that the additional goals cannot be realized without consideration of other policy instruments. The addition of these goals to the research programme creates a situation in which Centres such as CIP may be evaluated unfairly.

This issue needs to be addressed if the concerns of the donor community are to be put in their proper perspective and given attention in shaping research priorities. For example, when the CGIAR system was established it was designed to focus on the problems of the small farmer so the new knowledge and technology it produced would not be directed primarily to large producers. However, that is quite different than having a goal of increasing the income of small farmers. The point is that **there are few technological fixes that will significantly raise the incomes of small farmers. The incomes of such families are determined for the most by other factors, such as by how many resources they own, including the land they have access to, their investments in human capital, and public policies.**

The subtlety of this point is reflected in large part in the way the new goal is enunciated. Producing new technology for small farmers is appropriate, and could and should be used as the basis for evaluating the performance of the international centres. Expecting the new production technology to be a significant factor **in raising the per capita or family income of the small farmer**, when so many other factors affect those incomes, would not be appropriate. That is the sense in which evaluating the performance of the Centres on this criterion could be unfair.

Similarly, research on natural resource management can be appropriate to increasing productivity and sustainability at the farm level. The programme thrust needs to be interpreted in that context, however, and not in the much broader context of natural resource management as a whole, in which it is often articulated. As in the case of poverty alleviation, natural resource management is a broad subject matter area, requiring macroeconomic policy, microeconomic management policy, and a variety of technological

research thrusts to properly address it. **To evaluate CIP on the broader basis would again be unfair.** More importantly, for CIP to try to respond to the broader mandate will cause it to divert resources from areas that should be playing a more central role in the programme designed to promote sustainability.

To conclude, it is somewhat ironic that in the process of focusing on the challenge of increasing the incomes of small farmers the donors are neglecting the significant contributions to poverty alleviation the Centres make in other ways. As noted above the benefits of new production technology go mostly to consumers, and in the case of food, to the poor (mostly urban) consumers and households. These benefits for CIP and for the system as a whole are substantial, yet there seems to be little recognition by the donors of these contributions.

The Panel believes the above perspective should be taken into account in evaluating the contributions of what CIP has done and as the basis for setting parameters for thinking about the future.

### **1.3 Globalization Opens New Opportunities for National Economies**

The international division of labour and specialization which international trade makes possible can be a powerful engine of economic development, especially for small countries. In fact, it can be as important as the production and distribution of new knowledge and production technology as a source of economic growth. Importantly, that new production technology, important in its own right, can also be a powerful means of increasing the competitiveness of national economies.

**Helping national economies to become more competitive in the international economy should be taken into account in setting the priorities of CIP and in its working relations with the NARS.** Being alert and having knowledge on the potential for competition from other countries can be important in shaping national trade and economic policy. Similarly, helping the country to become more competitive on the export side will enable the country to earn more foreign exchange and thus to promote a higher rate of economic development.

These considerations suggest that international trade be given more consideration in the future in setting priorities and shaping the research programme of CIP than they have been given in the past.

### **1.4 Revolution in the Life Sciences**

The world is witnessing a veritable revolution in the life sciences. Biotechnology has emerged as an effective way of producing new biological innovations and advancing the frontier of knowledge. The result in part has been to generate GMOs that have become controversial in some parts of the world. The revolution has also led to the growing importance of intellectual property rights.

CIP needs to conceptualize its programme in the context of this new technology and its objectives for advancing the goals of the Centre. This will require a different strategic overview that refers to the need to re-define priorities based on new knowledge. The new technology raises important issues about how many resources should be allocated

specifically to this area, about how the Centre relates to research centres in the developed countries, and about the proper brokerage role the Centre might play vis-à-vis the NARS. Many of these technologies are resource demanding and require the establishment of priorities based on a clear understanding of the potential as well as the limitations of the technology.

The controversy about GMOs has important implications for the role of biotechnology in the Centre's research programmes, which need to consider the societal and environmental aspects of biotechnology. A fundamental principle is that CIP deploys its new technology in a responsible way. There is also an important educational role to be played in explaining the new technology to consumers.

Biotechnology also has important international trade implications. The issue of whether the developing countries will be able to compete with the technological capability of the developed countries may surface if the developing countries are not able to keep up with the newest developments in biotechnology.

Intellectual property rights have surfaced as an important issue as the revolution in the life sciences proceeds. The ability to establish such rights in biological or life forms has substantially changed the landscape for agricultural research institutions. Both new challenges and opportunities have been created for CIP. The opportunity to create property rights in biological and life forms has provided a stimulus to the private agricultural research sector, which in some parts of the world has become big business. This creates the potential for new partners for CIP. At the same time, it creates new issues of just how to relate to the private sector as a partner. This includes the ultimate issues of who in fact owns the rights and how the revenue will be shared.

These developments also raise the issue of how the Centre gains value from its genetic resources. The potential value of technology and products has increased and therefore needs an intellectual property rights framework to understand it. There may be interests that can be marketed. A strategy will be needed to take advantage of that.

Intellectual property rights also can be an impediment to the widest possible diffusion of new biological innovations. They may cause the new innovations to be too costly for the small farmer to adopt, for example. They may also create difficulties for the NARS in their own efforts to produce locally adapted varieties and innovations.

These issues raise the important question of what is appropriate for a public institution such as CIP to do. Much of the research that was once appropriate for an institution such as CIP can and will be done in the future by the private sector. However, new kinds of research needs emerge that can only be handled by the public sector. Some of these are issues of science and technology policy for CIP itself. Others involve the adoption of the technology and the importance of trade issues.

## **1.5 Information Technology**

The rapid development of information technology is another area that has very important implications for both the research and educational programmes of CIP. On the research side, the new technology makes it possible for researchers to collaborate with each other on a global scale much easier and more comprehensively than in the past. In

addition, it makes it possible to make greater use of the new GIS and other information-based technology, and on a more ambitious scale than in the past. It also makes it possible to manipulate large bodies of data and analyze much larger sets of data, and thus to address more complex problems than in the past.

Information technology also has important contributions to make on the educational side. Educational material can be transmitted more easily, and in larger volumes. And finally, there is the potential for distance education, which for the most part is poorly understood at this time. What we seem to be learning is that distance education is time-intensive in its use of professional time, requires skilled people on both the sending and receiving end, and requires significant investments in new equipment if the system is to be effective.

In any case, CIP needs to give some attention to the role information technology can play in its future, and especially in the delivery of its new production and social science research to other parts of the world.

## **1.6 Continued Need for Public Investment in Agricultural Research**

Some observers note the continued decline in the prices of agricultural commodities, especially of food staples, and question whether continued investment in agricultural research is needed. In fact, this decline has probably contributed to the decline in resources to support such research.

A number of points are pertinent. One is that some part of the low prices in agricultural commodity markets is due to the distortions created by commodity programmes in the United States and the European Union. The United States for its part uses producer payments that amount to implicit export subsidies and artificially lead to lower prices in international commodity markets. The European Union, although also moving increasingly toward the use of producer payments, still makes significant use of explicit export subsidies. In the near term, consumers in the developing countries reap the benefits of such subsidies, although importing such cheap food subtracts from other imports that might contribute to a higher rate of economic growth.

Equally as important, the benefits of the new production technology are not available for large areas of the world. That includes Sub Saharan Africa and large parts of Asia. Policy reforms in the international trade area have also led to significant changes in domestic prices of food in many countries. The Asian Crisis, for example, and the devaluations of national currencies in that part of the world have significantly changed the terms of trade in those countries. The result is a rise in domestic food prices, which increases the social rate of return to agricultural research.

More generally, there are large numbers of problems the private sector will not address, since there is little potential to recoup the costs of undertaking such research. Such problems include natural resource management issues, social and economic problems, and new innovations that can be copied and reproduced. The later may include particular varietal improvements (crops and traits), fertilizer recommendations, solutions to poverty, and market information. Publicly supported research also plays an important role in confirming research results and new innovations distributed by the private sector.

Finally, there continues to be the benefits of the strategic research done by the International Centres. The leverage of this research on the agricultural sector as a whole, and the role it plays in relaying technological improvements from the developed country research systems to those in the NARS is demonstrably high.

## 1.7 New Strategy for the CGIAR

The CGIAR has undergone a significant self-study designed to refocus its efforts in a rapidly changing world and to make it more effective and visible in the future. This has led to a restructuring of the management of the system, a new focus on raising external funds from unconventional sources, and a new strategy for the future.

The new vision for the future is that the CGIAR will develop a two-pronged approach that contributes to the reduction of poverty and to improving food security<sup>2</sup>. This will entail support for research on agriculture and natural resources to address the needs of the poor in the more favoured environments, by assuring an adequate food supply in the future, while at the same time tackling the more complex problems of poverty in the marginal and more difficult areas.

An important consequence of the new perspective is a change in the way priorities are established for the system. In an earlier era, priorities at the system level were based on rigorous analysis by the Technical Advisory Committee (TAC) of commodity developments and poverty weighting. A great deal of effort went into this analysis, and the results and recommendations were debated and approved by the donors.

The decline in core budget support for the system weakened that system of setting priorities by making it less relevant. The new perspective that emerged from the review of the system gives higher priority to regional needs, and to a new system of Challenge Programmes that may be global or regional in scope. The Challenge programmes constitute a pragmatic approach to the larger food and poverty problems that commits the donors to participate with institutional projects that are funded on a competitive basis.

The new strategy for the system is based on seven propositions:

- The goal of sustainably reducing poverty, hunger, and malnutrition is reaffirmed;
- New developments in social, biological, and physical sciences are to be mobilized so as to bring modern science to bear on the often difficult-to-assess causes of poverty and food security;
- Highest priorities are to be given in determining relative geographic priorities to addressing the needs of people in Sub-Saharan Africa and South Asia;
- A regional approach to research planning and implementation is to be adopted to address the heterogeneous nature of poverty and food insecurity and integrate regional priorities with global priorities;

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<sup>2</sup> TAC (2000) *A Food Secure World for All: Toward a New Vision and Strategy for the CGIAR*. Technical Advisory Committee of the CGIAR. Documents No. SDR/TAC:IAR/00/14.1. TAC Secretariat, FAO, Rome.

- Increased emphasis is to be given to seeking new types of partners and using new forms of partnership to improve efficiency and effectiveness;
- A task force approach is to be adopted to address major, clearly identifiable problems where there is an opportunity for an impact to be made or to address intractable problems; and
- The role of the CGIAR as a catalyst, integrator, and disseminator of knowledge within the overall global agricultural research system is to be strengthened.

The implication of these developments for CIP is that priority setting for the system as a whole, as reflected in careful analysis of the food and agricultural sector and poverty weighting, has been significantly weakened. This means that CIP needs to give greater attention to establishing its own priorities. In doing this it will need to take its lead from the regional guidelines, and from the emerging Challenge Programmes, which will be articulated at the global and regional levels. (The Challenge Programmes are only now emerging.) CIP has an opportunity to participate in these new Challenge Programmes. At the same time, these programmes can pull programme priorities in a diversity of directions, possibly leading to dispersion and weakening of effort. Internal priority setting will thus become more important, and will need to take into account many of the issues identified above in this chapter.



## **CHAPTER 2 – THE INTERNATIONAL POTATO CENTRE**

### **2.1 Origin of CIP**

The International Potato (CIP) is an autonomous non-profit organization. CIP was created in September 1967 by Presidential Decree but only came into existence following an agreement signed on January 20, 1971 between the Government of Peru and North Carolina State University. CIP was granted the status of an international organization within Peru. CIP joined the CGIAR in 1972.

### **2.2 Legal status**

Until 1999, the Centre operated under the legal status provided by the original agreement. In 1999, the President of Peru ratified a new host-country agreement with CIP, setting out the legal framework for operations from CIP headquarters. To formally establish its international legal personality in countries in which it operates, other than Peru, CIP has recently negotiated an “Agreement for Recognition of the International Legal Personality of the International Potato Centre (CIP)” which was signed in Lima on November 26, 1999 by the governments of Peru, Bolivia, Ecuador and Egypt and the UNDP as an honorary witness. Subsequently Canada, the FAO, Sweden, Venezuela, Uganda, the Netherlands and Denmark also signed the Agreement. The host-country agreement covers project site activities, funding arrangements, and regulations related to national and international staff. The international agreement facilitates logistics for establishing CIP research initiatives in developing countries worldwide.

### **2.3 CIP’s Mandate**

CIP was originally conceived as an international Centre dedicating its activities to research of potatoes and tuberous roots, training scientists under the leadership of top class scientists, and collection, maintenance and distribution of germplasm for national and international use. This is where the legal mandate of CIP lies.

Originally CIP was a single commodity Centre and its operational mandate included potato alone. In 1985, CIP’s Board of Trustees decided to add sweetpotato to the Centre’s research agenda. In 1992 a strategy was developed to include natural resources concerns in the activities, with specific attention to highland or mountain environments. The mandate was extended further to include lesser-known Andean root and tuber crops and work in these areas became a core-funded activity with the objective of ensuring biodiversity. CIP’s current mandate, as stated in Title I, Article 4 of its November 26, 1999 Amended Statutes, is to:

- (a) “Conduct the research necessary for solving priority problems limiting the production and consumption of potato and sweetpotato in developing countries.
- (b) Help preserve the genetic variability of Andean root and tuber crops and others.

- (c) Coordinate and conduct the research necessary for developing sustainable highland management systems, with emphasis on the Andean region.”

## 2.4 CIP’s Vision and Mission

According to CIP’s vision statement, the Centre strives to reach “*universal recognition .. as the prime research organization for roots and tubers in food systems for the poor and for the management of natural resources in mountain regions.*” CIP works to “*stimulate major increases in world food supply by providing access to the full potential of root and tuber crops.*” The vision on CIP’s main commodities is based on a projection of a significant increase of their contribution to world food supplies in the future.

During the completion of the 4<sup>th</sup> EPMR, CIP was increasing its attention to natural resources management in alignment with the CGIAR’s increased emphasis on ecoregions and sustainable production. Since 1991, when the CIP’s mission statement referred to the generation of sustainable and environmentally sensitive agricultural systems, it has evolved to explicitly include the improved management of natural resources. The Centre’s mission as defined in 2000 is: “*to reduce poverty and achieve food security on a sustainable basis in developing countries through scientific research an related activities on potato, sweetpotato and other root and tuber crops and on the improvement management of natural resources in the Andes and other mountain areas.*”

CIP’s overall goals are congruent with the CGIAR’s goals; to seek sustainable solutions to poverty, hunger and the degradation of the natural resource base.

## 2.5 Project evolution

CIP’s research portfolio has changed considerably during the period under review. The evolution of the research agenda is illustrated in Table 2.1. During the first years, CIP’s research was organised in 6 research programmes, comprising a total of 34 projects and about 200 sub-projects. There was also a training programme covering 6 thematic areas corresponding to the research programmes.

In 1998, following a priority setting exercise, CIP moved away from a matrix management system into a project based management system. The new portfolio included 17 research projects on potato, sweetpotato, and natural resources management. The latter had been receiving increased emphasis since 1992, with the focus on the high mountain areas of the Andes.

In 2001 CIP implemented a new project structure, as a response to financial constraints and need to staff reduction. The aim was to increase the size of project teams as well as to reduce some activities. The new portfolio comprises of 10 “constraint” projects and 3 “partnership” projects.

CIP is the convener of two systemwide initiatives, Global Mountain Programme (since 1996) and SIUPA (Systemwide Initiative for Urban and Peri-Urban Agriculture, since 2000). In addition CIP is the coordinator of a regional consortium, CONDESAN (The Consortium for the Sustainable Development of the Andean Region, initiated in 1992-93).

**Table 2.1 - CIP Project evolution**

**1995 PORTFOLIO**

Programme 1: Production systems

- Characterization of constraints and opportunities for potato production (→ 7)
- Characterization of sweetpotato constraints and opportunities (→ 7)
- Adaptation and integration of potato production technologies (→ 1, 3)
- Adaptation and integration of sweetpotato production technologies (→ 11)
- Evaluation of the impact and sustainability of potato production technologies (→ 7)

Programme 2: Germplasm management and enhancement

- Potato collection and characterization (→ 15)
- Sweetpotato collection and characterization (→ 16)
- Sweetpotato germplasm enhancement and molecular techniques (→ 11)
- ARTC collection and characterization (→ 17)

Programme 3: Disease management

- Control of potato late blight (→ 1)
- Integrated control of potato bacterial wilt (→ 2)
- Combining resistance to potato viruses and fungi (→ 1, 2, 3)
- Detection and control of potato viruses (→ 3)
- Control of bact. & fungal diseases of sweetpotato (→ terminated)
- Molec. Aspects for detect. & control of pathogens (→ 3, 8)
- Virology of ARTC (→ 17)

Programme 4: Integrated pest management

- Potatoes with resistance to major insect & mite pests (→4)
- Integrated methods for control of potato tuber moth and leafminer fly (→ 4)
- Integrated methods for control of sweetpotato weevil (→ 9)
- Integrated methods for control of sweetpotato nematodes (→... 9)
- Integrated methods for control of Andean potato weevil (→ 4)
- Integrated methods for control of potato cyst nematodes and false root-knot nematode (→ terminated)

Programme 5: Propagation, crop management

- Propagation of healthy clonal potato planting materials in diverse agricultural systems (→ 5)
- Sexual potato propagation (→ 6)
- Propagation of healthy clonal sweetpotato planting materials in diverse agricultural systems (→ 8)
- Maintenance, international distribution, and monitoring of performance of advanced potato germplasm (→ 1, 6)
- Maintenance, international distribution, and monitoring of performance of advanced sweetpotato germplasm (→ 11)
- Abiotic stresses and potato crop management (→ ... 14)
- Propagation of ARTC and management of Andean natural resources (→ 14, 17)

Programme 6: Post-harvest management, marketing

- Expanding utilization of potato in developing countries (→ 7, terminated)
- Product development for sweetpotato in developing countries (→ 10)
- Postharvest mngt. of Andean food commodities (→ 17)

**1998 PORTFOLIO**

Projects

1. Integrated control of late blight (→ 1A, 2A, 9A)
2. Integrated control of bacterial wilt (→ 2A, 9A)
3. Control of potato viruses (→ 2A, 9A)
4. Integrated management of potato pests (→ 4A)
5. Propagation of clonal potato planting materials (→ 2A)
6. Sexual potato propagation (TPS) (→ 3A)
7. Global sector commodity analysis & impact assessment for potato (→ 10A)
8. Control of sweetpotato viruses (→ 5A, 9A)
9. Integrated management of sweetpotato pests (→ 4A)
10. Postharvest utilization of sweetpotato (→ 6A)
11. Breeding sweetpotato for high dry matter yield and adaptation (→ 5A, 9A)
- 12<sup>a</sup>. Global sector commodity analysis & impact assessment for sweetpotato (→ 10A); SIUPA (→ G1)
13. Sustainability of rice-based cropping systems featuring potato as a cash crop (→ 2A)
14. Sustainable land use in the Andes (→ 8A, R1)
15. Conservation and characterization of potato genetic resources (→ 7A)
16. Conservation & characterization of sweetpotato genetic resources (→ 7A)
17. Conservation & Characterization of Andean root and tuber crops (→ 6A, 7A ... 4A)

<sup>a</sup> In 2000 SIUPA (Strategic initiative for urban and peri-urban agriculture) became Project 12 and Global commodity analysis for potato and sweetpotato became one project.

**2001 PORTFOLIO**

Projects

- 1A. Integrated management of late blight
- 2A. Uptake and utilization of improved potato production technologies
- 3A. True potato seed (TPS)
- 4A. Integrated pest management for root and tuber crops
- 5A. Sweetpotato improvement and virus control
- 6A. Post-harvest quality, nutrition and market impact of root and tuber crops
- 7A. Conserving biodiversity
- 8A. Integrated natural resources management in mountain agroecosystems
- 9A. Gene discovery, evaluation and mobilization for crop improvement
- 10A. Global commodity analysis and impact assessment of potato and sweetpotato technologies
- G1. CGIAR strategic initiative on urban and peri-urban agriculture (SIUPA)
- G2. Global initiative on late blight (GILB)
- R1. Consortium for the sustainable development of the Andean ecoregion (CONDESAN)

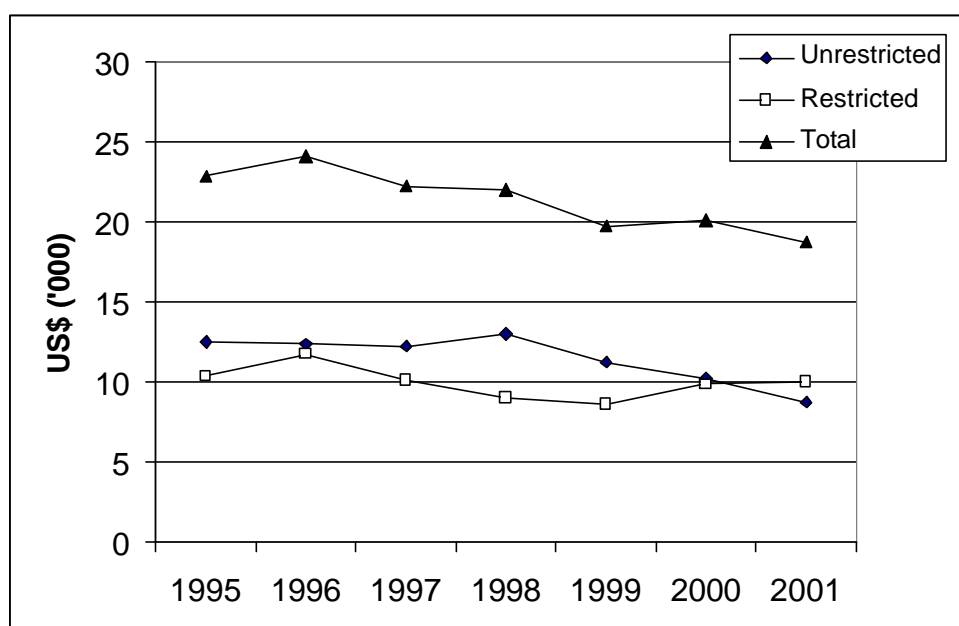
CIP has working groups on Participatory Research, Biotechnology and Knowledge Management.

In the research organization the four departments, Crop Improvement, Crop Protection, Production Systems & Natural Resources and Social Sciences, are the “homes” of disciplines offering the intellectual base and infrastructure to staff. They have no operational budgets or functional disciplinary activities. CIP’s organizational chart is shown in Figure 2.1.

CIP has staff in four regional offices and five country liaison offices. These regionally-based scientists contribute to project research and at the same time play an essential role in linking CIP and NARS and contributing to NARS institutional building.

## 2.6 Funding Evolution

During the period under review, CIP has experienced times of financial difficulties. The Centre funding has been declining since 1997. This decline has affected mostly the Centre unrestricted budget, which has diminished by 31.5% from 1995. The changes in unrestricted and restricted funding during 1995-2001 are illustrated in Figure 2.2. CIP’s funding is discussed in detail in Chapter 8.



**Figure 2.2** Trends in CIP’s unrestricted and restricted funding in 1995-2001

# International Potato Center Organizational Chart

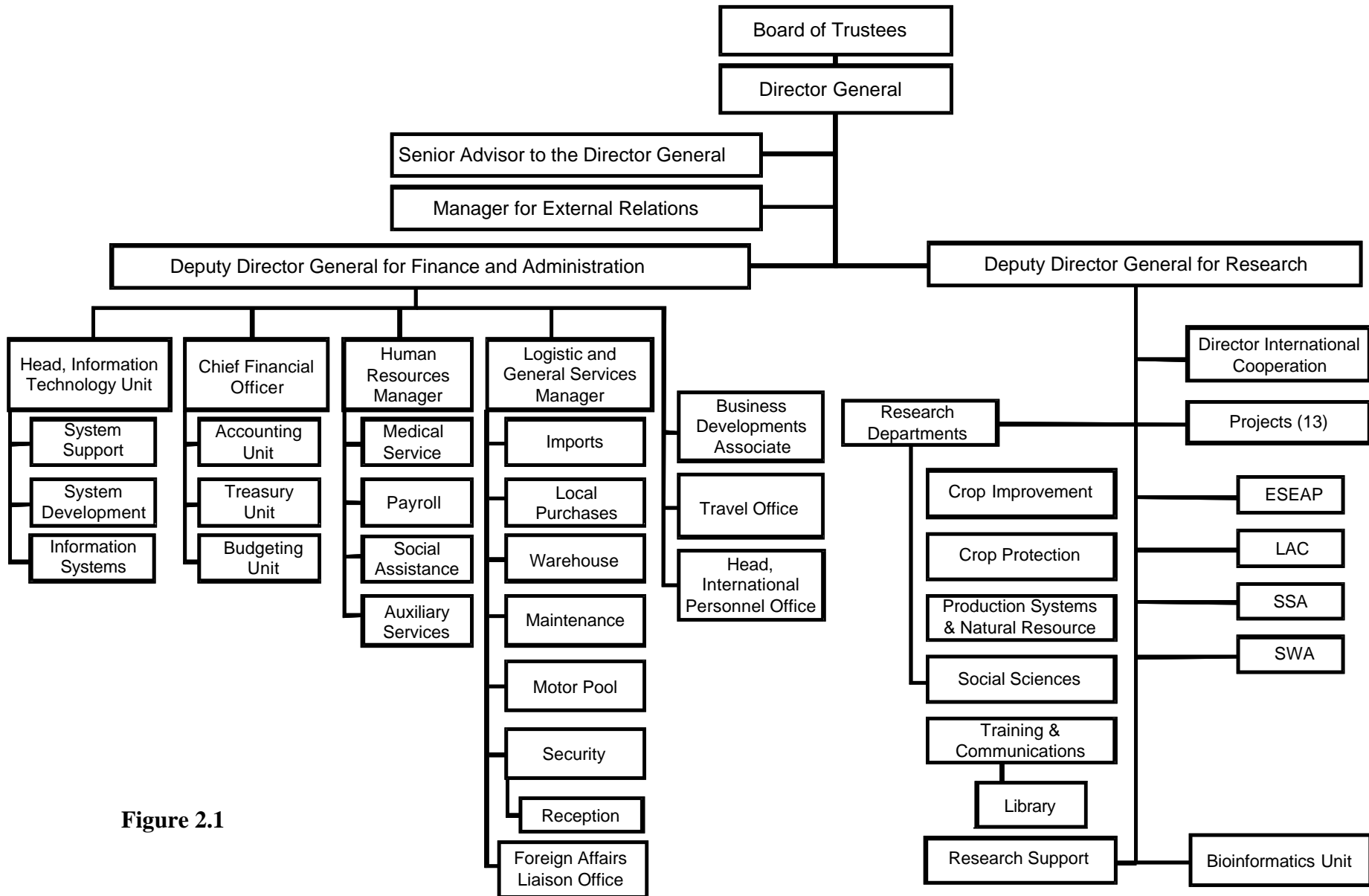


Figure 2.1

## 2.7 CIP's Mandate Crops as Global Commodities

Potato and sweetpotato are two of the world's major root and tuber crops, which play a critical role in food security in many areas of the developing world (Table 2.2). In particular, they serve as staples for the most food-insecure nations and societies in the lowest level of the socio-economic ladder. These crops have the unique capacity to produce more edible and affordable energy than most other crops, and relatively high yields even in sub-optimal conditions. They also produce a considerable amount of protein per land area. Root and tuber crops in general are versatile in terms of reasons for growing them and alternatives of end use. In a recent Inter-Centre review of root and tuber crops research in the CGIAR<sup>3</sup>, it is envisioned that an overall trend will be towards greater specialisation in end use, in the location of production, and in the types of production systems, in which root and tuber crops are cultivated. It is also likely that non-food and non-feed uses will increase, as varietal characteristics are changed through research, including biotechnology, to lower the cost as a source of raw material. In that report the annual production of potato and sweetpotato is expected to grow 2.7% and 1.25%, respectively, in 1993 – 2020. The expected market development and associated research needs for CIP's mandate crops are shown in Box 2.1. Production data for potato and sweetpotato are shown in Table 2.2.

<b>Box 2.1. Considerations on market development for potato and sweetpotato by 2020<sup>3</sup></b>					
<b>Market</b>	<b>Region (crop)</b>	<b>Factors driving growth</b>	<b>Specific research needs</b>	<b>Beneficiaries</b>	<b>CGIAR mission</b>
Rural/urban starchy staple; Other parts than roots for protein (sweetpotato)	West, South and East Asia (potato); West Africa and East Asia (sweetpotato)	Population growth	Stability in marginal areas; yield; processing; policy	Poor farmers and consumers	Food security; income
Urban vegetable	Metropolitan areas close to production	Urbanisation	High quality; marketing	Farmers and consumers	Income
Competitor with grains for starch, flour, animal feed	Asia, Latin America (sweetpotato)	Income growth	Yield efficiency; soil management; processing; marketing; policy	Farmers; industry; non-farm labour	Income
Speciality markets	Asia, Latin America, West Africa	Income growth	High quality; processing; product development;	Farmers; industry; non-farm labour	Income; biodiversity

<sup>3</sup> Scott, G.J., R. Best, M. Rosegrant, and M. Bokanda. 2000. *Roots and tubers in the global food system: A vision statement to the year 2020* including Annex. A. Co-publication of the International Potato Centre (CIP), Centro Internacional de Agricultura Tropical (CIAT), International Food Policy Research Institute (IFPRI), International Institute of Tropical Agriculture (IITA), and International Plant Genetics Research Institute IPGRI). Printed in Lima, Peru: International Potato Centre.

In the developing world, the cultivation of potato has expanded most rapidly in the subtropical lowlands. For instance, in parts of India the cultivation has increased as monoculture under irrigated conditions and high use of agrochemical inputs during the cool, dry winter months. In Asia, the increase in potato cultivation is linked to economic growth and potato is expected to gain importance as fresh and processed food. In Latin America potato will continue to be an important food commodity, but in the global perspective it will be less important.

Sweetpotato is expected to be increasingly important in areas of Sub-Saharan Africa for food security and as seasonal food and source of cash. In Asia sweetpotato is predominantly cultivated in lowland conditions in different rotations with rice. The trend in Asia has been from food security crop to cash crop and processed forms of food or feed. Both roots and vines are processed into feed or starch. Particularly in China its importance is increasing as animal feed. Sweetpotato and Andean roots and tubers will continue to be important for food security and have potential for specialised markets.

Although there are many strong potato breeding programmes in the North, CIP is quite alone in supplying for the needs of the developing countries with respect to improved genetic material and technologies for potato and sweetpotato production systems. Only some large national organizations, such as in China and Argentina, have capacity in this regard. CIP has also a unique role for the conservation and utilization of the genetic resources of its mandate crops. There are several advanced research institutes, which have excellence in the upstream research on potato. This provides an opportunity for fruitful collaboration.

**Table 2.2 - Potato and Sweetpotato Production by Region (Means for 1998-2000)**

Country/region	Potato			Sweetpotato		
	Production (million mt)	Area (million ha)	Yield (t/ha)	Production (million mt)	Area (million ha)	Yield (t/ha)
China	61.3	4.4	13.9	121.1	5.9	20.5
Other East Asia	2.2	0.2	11.2	0.8	0.1	14.5
India	22.1	1.3	17.1	1.1	0.1	8.7
Other South Asia	5.5	0.4	12.2	0.4	0.1	8.7
Southeast Asia	1.7	0.1	12.6	4.3	0.6	6.9
Latin America	16.0	1.1	14.7	1.7	0.2	7.9
West Asia / North Africa (WANA)	15.5	0.7	20.7	0.3	0.0	24.6
Sub-Saharan Africa	4.5	0.6	7.4	8.9	2.0	4.5
Developing countries	128.8	8.9	14.4	139.1	9.0	15.4
Developed countries	178.5	10.5	17.0	1.8	0.1	17.8
World	307.3	19.4	15.8	140.9	9.1	15.4

Source: FAOSTAT database, 19 February 2002.

## **2.8 CIP's Response to the Recommendations of the 1995 External Review**

At the time of CIP's 4<sup>th</sup> EPMR, conducted in 1995, the Centre had completed its reorganization, delegating more responsibilities with authority to project leaders and regional representatives. The Panel saw urgent need for strategic research where CIP was well placed for leading the way for addressing the most difficult research problems. However, the review found CIP at a crossroad in its evolution as an institution and in a need to clarify vision and operational mandate. The report emphasised the need for CIP to focus its capacity in the most important problems to attain its true potential. The Panel made 20 recommendations to assist the Centre in improving its Research and Resource Management. CIP generally agreed with the review and its recommendations. TAC also concurred with the reports analysis and recommendations. Both TAC and the Centre, however, noted the selective focus of the report, which did not allow full coverage of all Centre activities. CIP has responded effectively to most of the recommendations made by the 4<sup>th</sup> EPMR Panel. However, several issues raised in that report are still valid. The 4<sup>th</sup> EPMR recommendations, the Centre's response to them and the status of the implementation of the suggested changes, with revision by this EPMR Panel, are presented in Appendix V.



## **CHAPTER 3 - CROP IMPROVEMENT AND PROTECTION**

The philosophy driving CIP's research agenda is to reduce poverty, ensure food security and protect natural resources. The research is broadly based and focussed on alleviating constraints, with a mandate that encompasses potato and sweetpotato, two of the world's most important food crops, and the conservation and exploitation of a group of under-utilized but potentially valuable Andean root and tuber crops. The 1995 EPMP of CIP made two significant generic recommendations to improve the research programme:

- Management of the programme: the Panel recommended that CIP re-invent its matrix.
- Science leadership and quality: the Panel recommended that CIP continue to enhance the quality of research both at headquarters and in regional locations.

Major changes have been implemented in the management of the research programme since the 1995 EPMP and CIP now operates a projectized management system. A table outlining the evolution of CIP's research portfolio since 1995 is presented in Chapter 2, as Table 2.1.

Currently there is a portfolio of 13 projects, ten of which (01A- 10A) focus on high priority constraints that limit production, utilization, conservation and delivery of CIP's priority crops together with natural resource management. In this chapter we focus on those projects concerned with crop improvement and protection (1A, 2A, 3A, 4A, 5A, 6A, 7A, 9A). Table 9.3 provides the time allocation of internationally recruited staff (IRS) by project and department, allowing an overview of CIP's investment in the different projects. The 2001 approved budget provides a breakdown of restricted and unrestricted funding, revealing areas that are most critically affected by funding shortfalls.

The magnitude and complexity of many of the problems being addressed by CIP means that equitable partnerships are required to bring velocity and new competencies. These partnerships operate at different scales. Two projects (G1 and G2) are global partnerships: SIUPA (G1) focuses on urban and peri-urban agriculture and the Global Late Blight Initiative GILB (G2) focuses on global efforts to eradicate late blight disease of potato. Project R1 is a regional partnership: CONDESAN (Consortium for the Sustainable Development of Natural Resources in the Andes) which is designed to tackle issues affecting the sustainability of agriculture and natural resource management in the Andes. This is discussed in Chapter 4 and 6. For each project we outline the current approach being adopted, summarise perceived significant achievements and provide an assessment. Subsequently we comment on the overall direction and quality of the research, together with highlighting significant strategic issues.

The External Review of CIP's research portfolio takes place against a background of fundamental changes in agriculture, the life sciences, information technology and the perceived role of science and technology in society. These changes are challenging traditional research paradigms. As a consequence, those organizations that wish to thrive

in the 21st century must recalibrate their thinking and be prepared to re-define their priorities to reflect new emerging opportunities. For example, the availability of genome sequences opens up a vast range of new scientific opportunities. To capture these opportunities CIP and other organizations will need a different strategic overview that:

- considers new ways of selecting and tackling biological problems;
- reconsiders the balance between field and laboratory based research programmes and computational biology, i.e. a balance between “wet and dry science”;
- is prepared to change the emphasis of research activity to ensure that new scientific discoveries can be translated into practical solutions or products relevant to CIP’s mission;
- encourages the development of new skills and competencies;
- recognises that more emphasis will need to be placed on partnerships and that new funding and commercialization relationships may be needed;
- creates ways of deriving added value through more integrative activities.

Today, science and technology is resource-demanding and CIP will need to build on its existing strengths in a selective manner, based on its comparative advantage to establish a clear and relevant Institute identity that is sustainable. The Panel recognises that developing an appropriate research agenda in the current environment is a challenging task and seeks to present its findings and analysis in a constructive manner to help CIP position itself as a Centre of Excellence. Inevitably this will mean exercising choices on which areas to pursue, based on a coherent strategic plan that provides a clear path for future directions.

### **3.1 Integrated Management of Late Blight (Project 1A)**

In this project strategic research is conducted to develop, adapt, and integrate technologies for the management of late blight (LB) caused by *Phytophthora infestans*, the most devastating potato disease world-wide. The current focus of this project is on pathogen genetics and ecology, generating advanced breeding for resistance and integrated disease management through farmer field schools.

#### **3.1.1 Current Strategy and Overview**

Both conventional and biotechnological methods are being used to produce advanced breeding populations, clones with durable resistance to LB and tools to characterize stability and durability of phenotypic resistance, genetic structure of pathogen populations and monitoring of disease. Pathogen/host interactions are a strong feature of the project. Geographic information systems are linked with crop and disease models to understand the complexities of disease epidemiology across diverse ecosystems. Integrated disease management methods are also being designed and implemented through collaboration with national agricultural research systems, governmental and non-governmental extension agencies, and farmers. Participatory training for farmers is a feature of the project with farmer field schools (FFS) providing access to disease resistant potatoes and knowledge on how to complement resistance through management techniques. Following a change in project leadership during 2001, pre-breeding and screening of new sources of resistance and the development of molecular tools is now conducted in project 9A.

### 3.1.2 Main Achievements

- Release of 27 LB-resistant varieties in 9 countries (Peru: 6, Ecuador: 6, Costa Rica: 2, Uganda: 3, Kenya: 2, Ethiopia: 2, Cameroon: 2, China: 1), from selected LB-resistant clones.
- Comprehensive characterization of *Phytophthora infestans* populations that attack tuber bearing species in section Petota, non tuber bearing Solanum and non *Solanum solanaceae*. This work provides new insights into the evolution of the pathogen and has implications for the use wild species germplasm in breeding.
- A general strategy for LB management developed for use in FFS.
- Candidate resistance genes identified and molecular maps created localising QTL for late blight. A molecular marker database for 1,000 pathogen isolates were identified and made available through GILB.

### 3.1.3 Assessment

This project is of good quality and has historically produced reasonable publications, together with a good underpinning of pathological research for disease management and breeding. Such an inter-disciplinary project requires strong leadership which was evident until last year. There appears to be a lack of focus, with many activities being spread too thinly. The combination of modelling pathogen dynamics with studies of host resistance to late blight is a special feature of this project. Given the nature of the activities embodied in this project, strong interactions are required with at least two projects: those on uptake of improved potato technologies (2A) and on gene discovery and pre-breeding (9A). Successful integration appears to be less than optimal and some realignment is required to ensure efficient deployment of resources. A major implement for deployment of both knowledge and resistant germplasm is FFS, which needs to be linked to seed production schemes. A 'joined up' supply chain is therefore required for sustainability and ultimately to achieve impact. Given current resources a more centre wide approach to FFS may be appropriate.

The project has created high levels of general resistance to LB in advanced breeding populations based on classical breeding. This is based on centralized breeding and decentralized selection.

## 3.2 Uptake and Utilization for Improved Potato Production Technologies (Project 2A)

The goals of this project are to improve the productivity of small holder potato producers through the introduction of new genetic material. The project is built around seed potatoes, either clonal or true seed (TPS) as a delivery mechanism for new technologies.

### **3.2.1 Current Strategy and Overview**

The project is built around four main elements:

- Identification of constraints and opportunities for seed potato systems in target countries.
- Development of component technologies. These include detection methods for viruses and bacterial wilt (BW), integrated management of these diseases, TPS physiology and evaluation trials of new potato germplasm.
- Integration of component technologies.
- Putting research into practice. Particular emphasis is placed on the translation and delivery of technologies to target countries and this project is the home for many country programmes and networks. Standard evaluation trials are also managed through this project providing important information on adaptation of clones to specific regions and countries. This sub-project also provides CIP with the institutional agility to respond to social and natural disasters that cause disruption to food supplies.

### **3.2.2 Main Achievements**

- Identification of promising locally adapted clones and TPS families based on strategically placed variety selection.
- Improved institutional and individual capacity to maintain quality seed production schemes (particularly in China with the development of virus detection kits –100 kits per year- and BW detection methodology).
- Low cost testing technologies for BW and potato viruses that are developed, tested, and disseminated to farming communities through appropriate mechanisms.
- Sets of integrated management options for BW that are validated with farmers, integrated into potato cropping systems, and promoted in selected areas.

### **3.2.3 Assessment**

This project is new and any comprehensive assessment would be premature. However, it is well led and has a sense of coherence on paper. Linkages to the various breeding projects are critical, together with funding to deliver the proposed goals. This project also represents the main avenue for the dissemination of CIP germplasm and the conversion of research results into practice. Integration across and within projects will be vital for success and the Panel urges CIP to support and monitor activities that foster such catalytic interactions. The interface with national programmes forms a large part of the testing and evaluation effort together with the establishment of production chains.

## **3.3 True Potato Seed (TPS) (Project 3A)**

True potato seed enables a crop to be grown in areas where traditional production systems fail, for example, where seed tubers are scarce or not available. Poor seed technology is one of the most important factors limiting potato productivity in developing

countries. The overall objective of this project is therefore to develop improved TPS varieties and TPS parental lines through genetic enhancement for the tropical and subtropical areas where the lack of low cost quality seed tubers is the principal factor limiting potato production. In theory TPS is a compelling alternative technology to overcome problems associated with conventional propagation of tubers. The technology may be of particular relevance as a highly mobile source of planting material in disaster relief situations.

### **3.3.1 Current Strategy and Overview**

Genetic enhancement uses conventional methods, including the use of male sterility,  $2n$  gametes and parthenogenesis; and the exploitation of tuber yield heterosis resulting from crossing *Solanum tuberosum* and *S. andigena*. TPS parental lines are being developed in a genetic background of field resistance to LB. Genetic male sterility is being deployed to develop female lines suitable for the commercial production of TPS. Methods based on parthenogenetic development of a  $2n$  egg cell are also being explored.

### **3.3.2 Main Achievements**

- Male sterility has been identified in CIP germplasm and used in seed production and thereby lowering seed costs.
- In Vietnam approximately 10% of the total potato area adopted new TPS varieties.
- Seed methods were transferred and commercial seed production was established by Government and the private sector in India.

### **3.3.3 Assessment**

There is evidence that useful male and female parental lines have been developed and that they are being made available to NGOs, NARS and the private sector. The work undertaken in this project has been ongoing for some time and does not represent contemporary 'cutting edge' genetic research. The Panel is concerned that the current approaches will not lead to the scientific breakthroughs required to make TPS a sustainable reality for developing countries. Adjustments to this area of activity are required but should take into account developments in our understanding of basic biological mechanisms controlling meiosis and hence fertility in polyploids. Obvious new areas include apomixis, which is a prominent feature of CGIAR research. Although such discoveries are not at present at the point of direct application in potato, CIP researchers should be positioning themselves to exploit this information for TPS production. The mechanism(s) responsible for parthenogenesis is not fully understood and may have confounding effects on the breeding approaches being adopted in the TPS project. Overall sustainability of this project in the present form is questioned and rationalization of effort is required to accelerate the transfer of material, methodology and technology to the appropriate end user communities. In the short-term the products of the TPS project need to be transferred to the uptake and utilization pathways in project 2A and the project terminated.

### 3.4 Integrated Pest Management for Root and Tuber Crops (Project 4A)

The management of key root and tuber insect pests based on IPM strategies are pursued in this project, with emphasis on ecological sustainability. Root and tuber crops have a great importance in terms of food security. They are grown in complex production systems where yields are low due to adverse environmental factors that include weeds, nematodes, pests and diseases. Yield losses approaching 50% are common.

#### 3.4.1 Current Strategy and Overview

The project adopts a systematic and comprehensive approach to crop improvement based on the concept of responding quickly to increases in pest populations before they can cause major economic losses. To achieve this goal, knowledge of the following factors is required:

- Influence of man and the environment on the dynamics of crop and pest population interactions.
- Effects of pests on yield at different developmental stages.
- Cost/benefit analysis of a particular approach.
- Information gathering and knowledge transfer.

The main goals are to:

- Develop practical IPM approaches to manage potato and sweetpotato constraints.
- Train a cadre of IPM scientists in NARS.
- Promote IPM as a sustainable system to alleviate poverty while protecting the environment.

#### 3.4.2 Main Achievements

##### *Strategic Management for Targeted Key Pests*

New products identified to control specific pests:

- the pathogenic activity of three *Beauveria brongniartii* isolates on *Symmetrischema tangolias* larvae,
- the definition of the LC50 of Granulosis virus (PoGV) for *Tecia solanivora*,
- the evaluation of different transgenic lines; two of cv. Pito (Bt-cry9Aa) for resistance to *Phthorimaea operculella* and *Symmetrischema tangolias*;
- Parda Pastuza transgenic plants for resistance to the potato tuber moth complex (*P. operculella*, *S. tangolias* and *Tuta absoluta*);
- the transgene of soybean Kunitz trypsin inhibitor (skti-4) were evaluated for *Euscepes postfasciatus* in transgenic sweetpotato roots;

- the fungus *B. brongniartii* was tested for its efficacy on over-wintering population of the Andean potato weevil in the field.

### ***Basic Information of Key Pest Biology and Ecology***

- All geographic isolates of *P. operculella* and *S. tangolias* were monitored in Central Java, providing important information on the biology of this pest under wet tropical conditions.
- All geographic isolates of *P. operculella* were molecularly characterized and compared.

### **Host Plant Resistance to Target Pests**

- Six promising clones with moderate resistance to leafminer flies were identified under moderate LMF infestation.
- 1382 genotypes of wild potato species were tested for resistance to the Andean potato weevil.
- Several clones (gl 94007.2 and others) showed resistance to the potato cyst nematode *Globodera pallida*.

### **3.4.3 Assessment**

This project is well organised and led doing highly relevant work that has practical benefits for CIPs clientele. Training appears to be a strong component of the project together with a strong participatory element. However, the staff is over stretched and CIP is faced with two choices: either to provide more staff or review and modify the geographical distribution of effort with objective of reducing activities in certain regions. Alternatively reduced effort in sweetpotato may be more appropriate. The Panel has some concern over the scientific content of the project and more focus on fewer pests would be appropriate.

## **3.5 Sweetpotato Improvement and Virus Control (Project 5A)**

Sweetpotato contributes to the diet and income of some 600 million people in the developing world. In addition this crop is rapidly becoming a source of raw material for animal feed, starch and starch derived industrial products. The project goals are to improve sweetpotato productivity and sustainability through the development and adoption of new varieties with enhanced post-harvest qualities. The application of virus elimination technology to create and maintain healthy planting material also forms part of this project.

### **3.5.1 Current Strategy and Overview**

The diverse sweetpotato germplasm available at CIP forms the corner stone of the population improvement programme. A decentralized breeding framework is being deployed to generate new varieties with a broader genetic background and adaptability to

biotic and abiotic stresses. Molecular marker technology is being used to expand and efficiently access new sources of genetic diversity.

### **3.5.2 Main Achievements**

- Via a decentralized breeding programme a total of 76 varieties released in joint collaborations between CIP and NARS. Virus free seeds technology transferred to and widely adopted in several Chinese provinces.
- Advanced high dry matter breeding population established allowing the creation of high starch and elevated beta-carotene to be accumulated in single cultivars.
- High carotene sweetpotato (pro-vitamin A) identified providing an important link between germplasm and human health and nutrition.
- Transformation and regeneration technology successfully established for relevant sweetpotato cultivars.
- Linkage maps based on AFLPs and anchored by SSRs and CAPs markers created.

### **3.5.3 Assessment**

This project is successfully addressing the dual need of generating improved germplasm together with enhancing the knowledge base of sweetpotato biology/genetics. Integration of molecular biology with conventional approaches is well conceived and implemented. Good progress is being made in moving from anonymous markers to functional polymorphisms particularly for genes involved in carbohydrate metabolism. Orange fleshed, high beta-carotene varieties have immense potential to improve the vitamin A status of young children and pregnant or lactating women in Sub-Saharan Africa. An effective well led project, the connection between development and dissemination of germplasm is clearly established in China but Sub-Saharan Africa will be challenging. The Panel commends the cross disciplinary nature of the work and its efforts to integrate molecular genetics and conventional approaches to sweetpotato improvement.

## **3.6 Post-Harvest Quality, Nutrition and Market Impact of Root and Tuber Crops (Project 6A)**

The goals of this project are to diversify the utilization and increase the value of root and tuber crops. It represents an amalgam of several post-harvest activities across different projects and has been in operation since January 2001.

### **3.6.1 Current Strategy and Overview**

The main focus is on: (i) improving processing technologies, (ii) product development, (iii) equitable and socially accountable enterprise development and (iv) dissemination of knowledge of the nutritional benefits of roots and tubers, particularly beta-carotene-rich sweetpotato in Sub-Saharan Africa. The success of this effort is very dependent on market research and integration with projects on genetic resources and breeding. Work in China also includes an examination of technical and structural changes in the sweetpotato starch and food industry with the view to generate starch by small scale processors. In addition fermented mixture of sweetpotato and sun-dried chicken manure is being evaluated as a feed for pigs in Vietnam.



### 3.6.2 Main achievements

- New orange fleshed sweetpotato varieties combining traditional consumer preferences with a morphological marker for high beta-carotene content is now recognised globally as a sustainable means of combating micro-nutrient deficiency. VITAA partnership mobilised to enhance use of orange fleshed sweetpotato.
- Seventy promising native potato varieties with processing potential identified.
- Nutraceutical potential (high in oligo-fructose) of yacon identified and novel product (yacon syrup) developed.

### 3.6.3 Assessment

This project has raised some important issues regarding the way CIP can capture value from postharvest physiology. Indeed the title of the project may be misleading but the Panel recognises the potential of connecting plant products to human health particularly in the area of functional foods. To develop these concepts, however, CIP needs a more coherent strategic plan that allows the organization to differentiate itself from competitors and deliver. This requires both a scientific and business/marketing “gameplan”. From a scientific perspective does CIP have the competencies and infrastructure to support a phytochemistry programme? Is CIP fully committed to establishing a commercialization route for products emerging from this project? The EU novel food directive is of specific relevance and will directly affect the export of ARTC products. Fundamentally, this will require an entrepreneurial culture and business acumen to be established at CIP. These are some of the issues that CIP needs to address prior to embarking on such initiatives.

Until these issues are satisfactorily resolved it is difficult to envisage how this project can be sustained in its current form and should be terminated. The Panel does however appreciate the drive and ambition of the Project Leader to develop commercial products

## 3.7 Biodiversity and Genetic Resources of Root and Tuber Crops (Project 7A)

The overall objective of this project is to secure the long-term conservation of wild and cultivated germplasm from potato, sweetpotato and Andean root and tuber crops (ARTC) diversity centres. The following Table 3.1 provides information on the long-term collections held in trust at CIP for the world community, under the auspices of FAO.

These collections contain over 80% of the world’s holdings of unique samples of native potato cultivars and 50% of the wild potato species. This material provides a key experimental and crop improvement resource for both internal and external collaboration. The vegetative nature of CIP mandated crops presents specific challenges for conservation with the result that considerable investment has been placed in establishing *in vitro* conditions for conservation, multiplication and distribution. Currently, 99% of potato, 78% of sweetpotato and 86% of ARTC holdings are maintained *in vitro* for long term conservation.

### 3.7.1 Current Strategy and Overview

Complementary conservation approaches are being pursued to determine biogeographic and genetic patterns of diversity; develop linkages with on farm conservation and capture traditional conservation knowledge for root and tuber crops. The informed use of genetic resources is being promoted by identifying sources of desirable traits and distributing healthy clonal material and seed stocks. This newly configured project is organised into four sub-projects: conservation, diversity assessment, policy and technical issues pertaining to access and benefit sharing and informatics/documentation. The establishment of a fully integrated corporate database is of particular note and provides an invaluable resource to enhance quality control and monitor acquisition and distribution of clones electronically. The development of a GIS programme for the analysis of biodiversity (DIVA-GIS) is providing a very useful tool for spatial analysis of diversity in relation to various parameters.

**Table 3.1 – Number of Accessions in CIP’s Germplasm Collections and the Status**

	Wild potato		Cultivated potato		Wild sweetpotato	Cultivated sweetpotato		ARTC	
	Total	Regenerated	Total	<i>In vitro</i>	Total	Total	<i>In vitro</i>	Total	<i>In vitro</i>
FAO designated	1,917	67%	5,485	99%	804	6,257	78%	1135	86%
No. of species	136		8		63 <sup>1</sup>				9 <sup>2</sup>
Transitory collection <sup>3</sup>			4,909	100%					
International distribution	114		3,340		25	1,022		46	

<sup>1</sup> Section *Batatas* contains 85% and other sections contain 10% of reported species world wide.

<sup>2</sup> *Oxalis*, *Ullucus*, *Tropaeolum*, *Arracacia*, *Canna*, *Smallanthus*, *Lepidum*, *Mirabilis*, *Pachyrhizus*.

<sup>3</sup> CIP’s research collection of material improved or under development.

### 3.7.2 Main Achievements

- Development of the DIVA-GIS for the spatial analysis of genetic diversity, for the identification of gaps in the collections and the mapping of potential areas of diversity richness.
- Integration of genetic resources databases (passport data, *in vitro* conservation, field evaluations) in to a single corporate database. Related to these is the development of workflow System for tracking individual accessions through acquisition-introduction, processing, and international distribution.

- Design and development of core collections, using morpho-agronomic and molecular marker data, of *S. tuberosum subsp. andigena*, *S. stenotomum*, *S. gonyocalix*, and *S. phureja*.
- The establishment of security back-up collections, for potato at INTA Castellar, Argentina, and sweetpotato at CIP, San Ramon.
- Sources of resistance to viral diseases, insect resistance, BW, LB as well as dry matter content and other quality factors have been identified through massive screening of wild and cultivated accessions in the potato.
- The diversity of farmer-managed genetic resources has been linked to observed diversity of collections (native potato cultivars and ARTC) in housed at CIP for particular components of the collections using farmer knowledge and genetic knowledge (molecular markers).
- “Repatriation” of nearly 1,000 native potato cultivars to 11 farmer communities in the Peruvian Andes.

### 3.7.3 Assessment

This is a broad ranging portfolio of activities, representing a high profile area for both CIP and the CGIAR system generally. The project leader is playing an active role in the Inter-Centre Working Group on Genetic Resources and represent CIP’s interests in the Global Conservation Trust Campaign. In the new International Treaty on Genetic Resources for Food and Agriculture CIP’s mandate crops potato and sweetpotato are included in the multilateral system for exchanging germplasm. The Panel notes with concern that the species *S. phureja* is excluded from the list, as are the ARTC. Enhancing CIP’s role in this sphere of influence is viewed as being crucial to the organizations function as a future harvest centre. A high degree of integration with projects on sweetpotato improvement (5A) and gene discovery and pre-breeding (9A) is apparent and the Panel commends the staff involved. There is also good evidence that GIS is being integrated with various forms of phenotypic and molecular data providing new opportunities for inter-disciplinary collaboration. Perhaps, more clarity is required with respect to the nature and role of core collections. However, the material, methodologies and databases constitute a unique resource for breeding, conservation and future research programmes providing an experimental framework for the underpinning strategic science base of CIP and should be viewed as a source of genes and knowledge for future agricultural and bio-science enterprises. Furthermore, information emerging from this project is relevant to mountain ecosystems, providing further opportunities for internal linkages and synergy. The establishment of the Bioinformatics Unit in April 2001 is a very positive step and needs to be resourced adequately. Although the work contained in this project is a high priority area the profile of the work could be raised by more publications and mechanisms to attract visiting workers, PhD students and post-doctoral researchers. The impressive biodiversity complex, inaugurated in March 2001, provides an excellent facility for collaborative research in biodiversity and genetic resources of root and tuber crops. The Panel urges CIP to further capitalise on this investment and its intellectual capital through further integrated scientific activities and collaboration at various scales.

### **3.8 Gene Discovery, Evaluation and Mobilization for Crop Improvement (Project 9A)**

This project addresses genetic resistance to LB, viruses and BW of potato, and the efficiency of accumulation and storage of harvestable photosynthate in root and tuber crops. Strategic research is also undertaken to access genes for deployment in breeding and the development of adapted resistant varieties. The project also focuses on the development of tools and strategies for molecular breeding. Characterization and mapping of genes involved in carbohydrate metabolism also forms part of this project.

#### **3.8.1 Current Strategy and Overview**

This project embraces 5 sub-projects:

- Confirmation and characterization of new sources of priority traits.
- Discovery and characterization of genes controlling priority traits.
- Improving resistance and utility of potato.
- Root and tuber crop improvement through genetic engineering.
- Selection and utilization of advanced clones and progenitors for virus resistance.

The five elements are designed to form a continuum from applied molecular genetics through to pre-breeding, population improvement to the identification and recognition of elite clones for the lowland tropics. This project provides the basic germplasm for Project 2A (Uptake and Utilization of Technology).

#### **3.8.2 Main Achievements**

- A broad based advanced breeding population has been consolidated from CIP's longer term heat tolerance, virus resistant and postharvest quality enhancement efforts, and described in genetic terms. Two varieties have been named in Peru and 25 elite clones with virus resistance, earliness and adaptation to lowland tropical conditions identified. Loci for quantitative resistance have been identified for LB and localised on a molecular map.
- Molecular genetic analysis by neutral and candidate gene marker analysis and gene cloning has been incorporated into the evaluation and selection scheme to enhance resistance to late blight.
- Transgenic advanced breeding clones and varieties with resistance to major pests and pathogens: potato tuber moth, and PLRV virus for the potato crop and partial resistance to feathery mottle virus for the sweetpotato crop generated and currently being evaluated.
- A small number of sweetpotato ESTs involved in carbohydrate metabolism identified.

#### **3.8.3 Assessment**

This is a well led and reasonably productive project that has the potential to successfully integrate modern genetics with classical crop improvement. Creative and productive partnerships have been established with Advanced Research Institutes,

providing the basis for generating relevant good quality science. An example is the creation of large insert libraries from CIP bred material that harbour gene(s) for quantitative resistance to LB. Disciplines, such as molecular biology, pathology and genetics and breeding, are well integrated. However, the current arrangement for the development of the science and technology underpinning LB is sub-optimal and better alignment of resources is required to have greater impact. This could be achieved through transfer of relevant staff and resources from the late blight project (1A) to gene discovery project (9A).

Given the significance of genomics and biotechnology to the mission of CIP this project is under-resourced. Additional resources together with re-focussing of effort into fewer aims and objectives would enable CIP to be the Centre of Excellence for root and tuber crop genetics and breeding. CIP is well placed to exploit transgenic approaches which are particularly attractive for polyploid heterozygous species. New selectable marker systems have been developed that are more compatible with public acceptance of transgenic technology. Freedom to operate has been obtained to use the cryI (b) gene, the c2 bovine lysozyme gene and antisense constructs for solanidine UDP-glucose glucosyltransferase gene. Further effort is required in this area to define a strategic path that takes into account: freedom to operate, potential partnerships to bring technology access and velocity together with a clear definition of target traits and end user communities. Food safety and traceability may be additional factors that need consideration. Transgenic technology will need to be linked to a strong conventional breeding programme and have the appropriate legislative procedures established in the target countries. There is currently interest from the private sector in exploiting CIP germplasm for the processing market in the tropics. The skills and competency for potato breeding exist at CIP but a successful relationship with the private sector will require CIP to negotiate appropriate contracts that meet the dual need of raising funds but also meet the obligation of delivering competitive germplasm to NARS and other stakeholders. Appropriate business and negotiating skills will need to be developed by CIP staff to successfully navigate CIP through these sensitive options.

Lines of communication with projects on sweetpotato improvement (4A) and genetic resources (7A) appear to be strong and show evidence of synergy and added value providing a clear focus of activity. The outputs from classical breeding in this project together with late blight project (1A) provide an important strategic strength for CIP.

### **3.9 Genetic Resources and Crop Improvement: Future Direction and Needs**

CIP is blessed with a highly talented and motivated group of lead scientists committed to the development of improved varieties of potato and sweetpotato for the developing world. It is critical for the future of CIP that the discipline of plant breeding be adequately resourced and viewed as a core technology platform for the delivery of new and improved varieties in an environmentally sustainable manner. Furthermore, benefits arising from other disciplines such as pathology, biotechnology and biochemistry can be captured and realized in the form of improved varieties. Currently the potato improvement effort lacks visibility and cohesiveness, partly due to the distribution of effort across three projects. This situation contributes to a sense of confusion to potential partners, donors and external reviewers! Internal competition among project leaders may also contribute to inefficiencies.

Because of the need to improve the identity, visibility and effectiveness of the CIP potato breeding effort, the Panel **recommends** that the potato improvement activities be coalesced into a single project and that the leader be empowered (full financial, budgeting, and managerial accountability) to champion the development and delivery of a coherent breeding programme that captures the full potential of all the resources available to CIP.

CIP has access to unrivalled genetic resources and possesses the skills and competencies to move from genes to products via plant breeding and/or biotechnological routes. Such technology platforms are vital for the future of CIP and it is essential that this 'technology supply chain' be resourced adequately. Indeed the vision for CIP could be built around its genetic resources as a source of genes for breeders, biologists and biotechnologists. In this way CIP would build on its existing strengths and establish a clear scientific and Institute identity. The Panel urges CIP to move swiftly to establish itself as leader in the application of genomics to germplasm improvement and characterization.

Realization of this vision will require a much broader view of genetic resources that fully embraces genomics and post-genomics technologies together with informatics to connect genotype and phenotype data. The recent completion of the genome sequences of several eukaryotes, including two plant species (*Arabidopsis thaliana* and rice) has profoundly affected the way we select and answer questions in biology. A vast array of new scientific opportunities is now available to the international scientific community, but to capture these opportunities past ways of thinking need to be recalibrated. Genetic resources harbour novel genes and alleles that have been accumulated over millions of years. These genes provide the basic building blocks for future deployment in crop improvement. Furthermore the identification of novel genes brings the opportunity to create potentially new added value products. Genome science has provided us with new tools to identify and exploit these new genes in a more direct and efficient manner. So called 'allele mining' or 'horizontal genomics' provides a route to accessing the variability present in germplasm and genetic resource collections. To fully exploit CIP's unrivalled genetic resources, two areas need to be considered: linkages and partnerships with key institutions with complementary interests and skills and the establishment of facilities at CIP that will allow the variability present in CIP's genetic resources to be described and quantified at the DNA sequence level.

Given the nature of genomics research, resource allocation is of critical importance and must relate to CIP's comparative advantage to provide differentiation and create a competitive advantage. One such advantage is CIP's ability to phenotype its extensive germplasm in response to a range of biotic and abiotic stresses. Detailed knowledge of the taxonomy and biogeography of CIP's genetic resources together with the more recent development of GIS-DIVA and databases which can be interrogated, provide a sound basis for future activities. Coupling this expertise with high-throughput genotyping capacity would position CIP to be world leaders in the emerging field of association genetics. Such an area is built around connecting sequence diversity to heritable phenotypic differences and complements conventional meiotic mapping by using pre-existing genetic resources rather than creating new segregating populations. It is likely that this area will drive future gene discovery programmes providing exciting new scientific opportunities but also creating new options for breeders, biotechnologists and biologists. This new area will build on CIP's strength in genetic resources and breeding but will also allow CIP to lead a new area of research at the frontiers of scientific

knowledge that could revolutionize future crop improvement efforts. Indeed, such an area would be highly appropriate for a future Challenge Programme and help CIP position itself as a Centre of Excellence.

Because of the unique role of CIP as holder of vast genetic resources of its mandate crops, the Panel **recommends** that CIP urgently identify resources to establish a state-of-the-art high-throughput genotyping facility that will enable it to fully exploit its genetic resources in the post-genomics era. Skills and competencies in the area of bioinformatics/computational biology must be strengthened.

In conclusion, the Panel feels that there is a need to identify and resource key competencies and skills that build on CIP's comparative advantage in the area of genetic resources and their exploitation. In order to develop the appropriate infrastructure there is a need to focus and do fewer things well rather than attempt to do many things sub-optimally.

### 3.10 Virology and Bacteriology

Viruses cause serious diseases of potato and impede movement of seed and genetic resources. Similarly, sweetpotato viruses cause significant losses particularly in sub-Saharan Africa. CIP is fortunate in having the scientific expertise and facilities in virology to make major strides in these areas of activity. Research is primarily focussed on low cost detection together with supporting breeding programmes. Within the sweetpotato programme virus identification and characterization focuses on:

- Characterization of sweetpotato virus disease (SPVD).
- Effects of SPVD on yield and quality attributes.
- Screening germplasm for sources of resistance.
- Detection methods-anti-serum and ELISA kits.

Rearrangements of the project structure for sweetpotato have successfully linked variety development with variety dissemination. The transfer of virus free seed technology to China alone is believed to have had an economic impact of 145 million \$ per annum. The project on gene discovery and pre-breeding (9A) includes effort on the development of virus resistance breeding for the lowland tropical agro ecologies. This includes population improvement for multiple virus resistances and new screening methods for PLRV have been developed. Virus free seed technology plays a prominent part in the distribution of CIP germplasm globally.

There is no doubt that the expertise and facilities available at CIP for this type of work is excellent. Given the propagation system of CIP's mandate crops expertise in virology is a prerequisite. The Panel recognises that resources are stretched but feel that CIP is using current resources effectively. The dynamic nature of virus spread and infection makes it difficult to focus on a restricted range of viruses. Given the significance of virology in its broadest sense to CIP's breeding and research effort succession management is an issue that CIP should be addressing urgently.

Bacterial wilt (*Ralstonia solanacearum*) is the second most important potato disease in the world. Since host resistance is difficult to develop effort is focussed on the detection of the pathogen in soil and seeds. Since the pathogen is mainly transmitted

through the tuber seed, the use of healthy planting material is the most effective means of controlling the disease. Under cool climatic conditions plants can be infected without exhibiting visible symptoms, resulting in latent infections. Effective detection techniques for routine quarantine procedures and seed certification is therefore essential. A post-enrichment NCM- ELISA technique has been developed to allow the sensitive detection of BW. At the end of 1995 the CIP breeding programme for BW was closed. Subsequently pathologists have selected progenies for resistance, and higher levels of resistance are being sought in potato wild species. Given current resources the present arrangements appear sensible and well focussed.

### **3.11 Linkages to Other Areas of Activities**

Although much of what has been described has been built around the concept of a technology supply chain with plant breeding being the main focus of delivery these activities cannot be divorced from other environmental and societal issues. Research underpinning environmentally sustainable production systems is clearly vital to ensure a scientifically rigorous context for this supply chain. Maximizing the cross-fertilization and even awareness of activities in these disciplines is clearly a challenge. The Panel urges CIP to foster greater interactions between the crop improvement and protection projects and natural resource management.



## CHAPTER 4 – NATURAL RESOURCES

### 4.1 Introduction

Natural resources management (NRM) is of recent origin at CIP. It became an issue in the early nineties when the Consortium for the Sustainable Development of the Andean Ecoregion (CONDESAN) was established. CIP became the convenor of this ecoregional initiative. In the meantime CONDESAN has developed into a fully operational regional venture. It has also acted as a catalyst for the development of a fully-fledged NRM programme at CIP. At the time of the present review, NRM and CONDESAN are in two separate research projects: Project 8A (NRM) and Project R1 (CONDESAN).

NRM research covers a wide range of activities and topics related to soils, water, crops, livestock and pastures. Related research on biodiversity and conservation of crop genetic resources, and integrated pest and disease management is dealt with in Chapter 3, whereas social sciences, impact assessment and policy analysis are dealt with in Chapter 5.

The NRM research at CIP was reviewed in October 1999 by an Internally Commissioned External Review (ICER) team consisting of 4 members. The report of the NRM-ICER contained a large number of valuable recommendations. The 5<sup>th</sup> EPMR Panel found the Programme Evaluation Report of the NRM-ICER very useful: the report is of high scientific quality and the recommendations have helped the Panel to focus on the major issues regarding the NRM research programme at CIP.

CIP refers to its NRM programme as “integrated NRM for mountain agroecosystems”. The notion “integrated NRM” was introduced and elaborated upon in a recent TAC paper on soil and water management research<sup>4</sup>. The integrated NRM framework involves four sets of interrelated linkages:

- (1) *Links between productivity enhancing and resource conserving research, e.g., crop improvement and natural resources management;*
- (2) *Spatial or landscape level linkages, e.g., upstream-downstream linkages in a watershed framework;*
- (3) *Temporal linkages, e.g., links between present and future, or sustainability considerations; and*
- (4) *Linkages between research and the diffusion/adoption of results from such research.*

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<sup>4</sup> TAC, 1996. *Priorities and strategies for soil and water aspects of natural resources management research in the CGIAR*. Report SDR/TAC:IAR/96/2.1. TAC Secretariat, FAO, Rome.

In the following, some NRM-related highlights of the CGIAR's new strategies and priorities will be discussed briefly, as they provide the framework for evaluating CIP's NRM activities.

#### **4.2 The Context: The CGIAR's Vision on NRM**

A basic assumption of the new CGIAR vision and strategy is that increased productivity in agriculture and more effective management of natural resources are central to alleviating poverty and food insecurity, in particular in the poorest countries. Poverty alleviation and sustainable food security depend on the health of the environment and sustainability of the natural resource base on which the production of food, feed and fibre depends. Thus, conservation and enhancement of natural resources and protection of the environment are central and legitimate themes for CGIAR research. Priorities can be determined on the basis of six principles:

- (1) *The CGIAR should concentrate on NRM research that contributes to productivity enhancement and sustainability of natural resources for production of crop, livestock, forest and fish outputs that have impacts on poverty reduction and food security, giving appropriate consideration to the inter-generational equity of benefits.*
- (2) *The CGIAR Centres should use an integrated NRM focus in their planning to define problems in NRM that require research.*
- (3) *International integrated NRM research should be process-oriented to ensure maximum contribution to producing international public goods.*
- (4) *The CGIAR should give greater attention to research aimed at resolving water issues.*
- (5) *NRM research should focus its efforts around common reference locations or benchmark sites, essential for integration of the many dimensions of integrated NRM.*
- (6) *Priorities for specific NRM research themes should be determined in the context of the sustainability issues affecting productivity increases, regional priorities and comparative advantages of the CGIAR.*

Recent scientific advances in the physical sciences, such as the development of Geographical Information Systems (GIS) and Global Positioning System (GPS), are of particular relevance for NRM. The revolutionary developments in information and communication technologies (ICT) enable scientists to assemble large quantities of geographically referenced data in forms that are useful for policy making and other interventions. Remote sensing and other space satellite technologies are providing detailed geographic information that facilitates land-use planning and NRM interventions. Monitoring food and natural resource risks are facilitated and strengthened through the application of these new physical sciences and ICT.

Some elements of a conceptual framework for NRM are discussed in Appendix VI: A Natural Resource Management Paradigm.

### 4.3 NRM Programme: Achievements and Future Plans

#### 4.3.1 Evolution of the NRM Programme

The core group of researchers in the NRM programme was consolidated within CONDESAN in 1996 and became the NRM unit within CIP in 1998. From there on, CONDESAN came formally under the NRM research programme. In the current research portfolio NRM activities are located in the Projects 8A and R1. CONDESAN is formally part of the Global Mountain Programme (GMP), a global initiative on NRM in mountain agro-ecosystems, established in 1997. The GMP involves 4 IARCs: CIP (convenor), ICRAF, ILRI and ICIMOD. In early 2002, a proposal for a Challenge Programme on Sustainable Mountain Development was submitted by CIP. This proposal involves the Andes (CIP-CONDESAN), the mountain slopes in Central America (CIAT, Colombia), the African highlands (ICRAF, Kenya), the Caucasus and Central Asian mountain ecosystems (ICARDA, Syria) and the Himalaya's (ICIMOD, Nepal).

Some 90% of the NRM research is concentrated in the Andean region, and some 60-70% of that research is conducted at the CONDESAN watersheds, in collaboration with CONDESAN partners.

The focus of the NRM research is on systems analysis, soil-crop-nutrient modelling, scenario-studies, quantitative methods to assess production impacts on the environment, such as trade-off analysis as a decision support tool, climatic interpolation models, advanced experimental designs, and fractal<sup>5</sup> models for upscaling and downscaling of spatial data, information and technologies.

Because the NRM programme is of recent origin and because of the upstream focus of the research, the impact in farmers' fields is limited. The emerging impact is largely confined to the transfer of tools to partners in joint research ventures and, in a modest way, to policy makers, government agencies and private sector organizations.

#### 4.3.2 Integrated Natural Resources Management in Mountain Agroecosystems (Project 8A)

The goal of this project is to contribute to more productive and sustainable natural resources management in selected mountain agroecosystems. The management practices, technologies, policy recommendations, and analytical tools developed in the project aim at enhancing the capability of local and national researchers and authorities to analyze their problems, design alternative environmental and NRM options, and to conduct *ex ante* assessments of the tradeoffs of interventions.

The outputs of the project can be divided into four categories:

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<sup>5</sup> Certain structures in nature, such as the shore of continents or the surface of clouds, possess special kinds of geometrical complexity. The geometrical properties of such objects can be characterized by a non-integer or fractal dimensionality. Fractal theory relates the number of objects to the size (scale) of objects through fractal dimensions. Scaling problems in physical systems can be described by multifractal theory (C.J. G. Evertsz and B.B. Mandelbrot, 1992. *Multifractal Measures*. pp. 921-953. In: *Chaos and Fractals. New Frontiers of Science*. Springer-Verlag, New York.)

- (1) Research tools and methodologies designed to suit the needs of researchers in NRM. They include process-based simulation models, artificial intelligence, integration of remote sensing and models, spatial interpolation of climatic data, the use of fractals, and the analysis of tradeoffs between agricultural productivity and its impact on the environment and on human health.
- (2) Best management practices resulting from field experiments and case studies, which are documented and systematized. They include indigenous practices, best soil management practices, reclamation of saline soils, best potato management practices and technologies, erosion control practices, and improved pasture and livestock management.
- (3) Decision support systems for the *ex ante* assessment of the tradeoffs between agricultural production and environmental quality and human health, under different management and policy scenarios. With these tools, policy-makers at local, regional and national levels will be in a position to make better-informed decisions.
- (4) Capacity building aimed at strengthening institutional arrangements and empowering different members of civil society in order to understand not only the vulnerability of mountain agroecosystems but also how its destruction may affect the rural and urban populations. CD-ROMs, internet-based diffusion of results and simulations, training, and the use of 3-D virtual reality will be used to socialize the project findings and to bridge the existing gap between scientists and the general public.

The impact of the project is envisioned at three levels:

- (1) At the first level, farmers, researchers, extension agents and development workers directly involved in the research will benefit from the findings.
- (2) At the second level, researchers using the methodologies and tools, farmers adopting better management practices, and decision-makers using decision support tools and implementing policies that enhance the sustainable use and productivity of natural resources are targeted.
- (3) At the third level, initiatives will be taken to raise the awareness of the general public to better understand the significance of mountain ecosystems for their livelihood; the negative impact of unsustainable management practices and inappropriate policies on the quality of these ecosystems; and the need for policies aimed at sustainable management of natural resources and increasing productivity.

The Project is divided in 6 Sub-Projects (SP), each including a number of activities:

- SP-1: Refining methods for spatial characterization in benchmark areas:
  1. Developing tools for downscaling soil maps
  2. Developing climate interpolation models for mountain areas
  3. Introducing fractal concepts to NRM research

- SP-2: Enhancing productivity of Andean soils:
  1. Evaluating indigenous soil management practices
  2. Testing research methods to identify soil health
  3. Evaluating erosion control practices
  4. Modelling soil processes in mountain areas
  
- SP-3: Development and integration of sustainable farming systems components:
  1. Enhancing livestock productivity while protecting the environment
  2. Climate variability and household welfare in the Andes
  3. Modelling impact of changes in pest management technologies
  
- SP-4: Development and validation of tools for policy assessment:
  1. Tradeoffs in sustainable agriculture and the environment in the Andes
  2. Human health and changes in potato production technology in highland Ecuadorian agroecosystems
  
- SP-5: Building the capacity to use systems and ecoregional approaches in NARS:
  1. Systematizing R&D experiences and processes in mountain areas
  2. Developing tools to facilitate knowledge management in systems and ecoregional approaches
  
- SP-6: CGIAR Global Mountain Programme:
  1. Trans-regional comparison of watershed dynamics

Some examples of the outcomes of the NRM research will be presented in Section 4.3.4.

#### **4.3.3 Consortium for the Sustainable Development of the Andean Ecoregion - CONDESAN (Project R1)**

CONDESAN is an ecoregional partnership of some 58 organizations (30 NGOs, 5 NARSs, 9 LAC universities, 10 advanced research institutions from the North and 4 IARCs) actively working in the Andes of Venezuela, Colombia, Ecuador, Peru, and Bolivia. CIP is the convening Centre and hosts the Coordinating Unit of the Consortium. The Consortium facilitates research on cross-cutting, trans-Andean topics as well as work with benchmark watershed development teams. The major trans-Andean research themes are:

- (a) Soil and water management and conservation;
- (b) Conservation and use of agro-biodiversity of Andean roots and tubers and pasture species;
- (c) Improving farming systems, from the producer to the consumer; and
- (d) Policy research to promote sustainable development and conservation in the Andes.

Currently the Consortium works in seven benchmark watersheds from Venezuela to Bolivia. Each of the sub-consortia operating at the level of the watersheds has its own coordinator. The locations of the watersheds and some of the research topics in each of the watersheds are:

- (1) Mérida, Venezuela:  
Balancing high-input potato production with sustainable development.
- (2) Manizales, Colombia:  
Managing the Florencia cloud-forest bio-reserve and buffer zone, and developing profitable as well as sustainable management alternatives.
- (3) Carchi, Ecuador:  
Characterizing the watershed with special emphasis on potato-pasture systems. Creating a sense of commonwealth in the watershed and promoting rural prosperity based on improved management of an irrigation canal.
- (4) Cajamarca, Peru:  
Using GIS tools to help characterize the watershed. Building micro-watershed management plans with municipal authorities.
- (5) Puno, Peru:  
Intensifying production and increasing incomes in a new irrigation district: from landscape interventions and improved water management to marketing Andean products.
- (6) La Paz, Bolivia:  
Intensifying livestock production in the semi-arid Andes: landscape and risk management.
- (7) Cochabamba, Bolivia:  
Research on Andean roots and tubers in the canton of Candelaria: from prospecting for germplasm to earning profits. Developing a mechanism for facilitating discussions on water issues among stakeholders in the watershed.

The CONDESAN coordination unit also runs the Spanish language, electronic communications network “InfoAndina”, which currently includes some 800 subscribers, mostly from Latin America. In addition to producing InfoNotas and highlights from the larger Mountain Forum discussion lists, InfoAndina hosts electronic forums. The forums generally attract between 300 and 500 participants.

CIP thus participates at two levels in CONDESAN:

- **At the level of coordination and management**

CONDESAN is considered a CIP project, at par with other projects. The objective at this level is to facilitate the operation and functioning of the consortium. The Coordination Unit consists of a coordinator (IRS), a representative in Colombia (joint CIP-CIAT appointment), and a deputy-coordinator as well as an InfoAndina administrator (both special NRS appointments). The Consortium has a Board of Trustees, consisting of 8 members (DGs of CIP and CIAT, 3 representatives of partner organizations, 3 independent members) and a Technical Committee. In each of the 7 watersheds, there are sub-consortia consisting of the partners actively involved in the research and development programmes in a particular watershed. Many local NGO’s work only in one watershed, whereas other partners, such as

CIP, are involved in activities in more than one watershed. The Coordination Unit tries to coordinate between the different watershed-subconsortia: this is mainly a convening and facilitating role, as well as an information and technology sharing and transfer role. The scientific role at this level includes the coordination of the cross-cutting themes, common to all watersheds. The CIP Coordination Unit also identifies topics for projects, provides technical support to partners at the benchmark sites and helps the partners to identify potential donors for projects. CIP scientists may or may not participate themselves in such projects, and the external funding for such projects, if successful, may go directly to the lead partner in a particular project, or pass through the CIP accounts.

- **At the level of the research in the individual watersheds**

CIP scientists, notably those in the NRM programme, may participate in projects at the watershed level, together with other partners. The results of such research efforts are generally reported within CIP under the headings of the respective projects, such as farmers field schools (IPM) under project 1A, improved potato production technologies under project 2A, ARTC biodiversity conservation and characterization under project 7A, NRM-related activities under project 8A and impact analysis under project 10A.

#### **4.3.4 Staffing**

In 2001, there were about 7.5 IRS scientist-years (SY) allocated to projects 8A and R1. In addition, two “specially contracted (NRS) staff”, were allocated to CONDESAN: a Deputy Coordinator of the Consortium (1.00 SY) and an Administrator of InfoAndina (1.00 SY).

The disciplinary composition of the NRM project in 2001 was as follows:

- land use systems, modelling (0.85 SY),
- soil & crop sciences, nutrient cycling (0.80 SY),
- animal science (0.85 SY),
- agricultural economics (1.15 SY),
- agronomy (1.00 SY) and
- extension science-IPM (0.20 SY),

with a total IRS time allocation of 4.85 SY. For CONDESAN, the disciplinary mix was:

- natural resources management and GIS (0.80 SY),
- animal science (0.15 SY), and
- land use systems and modelling (0.15 SY).

The Coordinator (1.00 SY) is a Forestry Specialist, the representative in Colombia (0.50 SY) is an Agricultural Economist and the Deputy Coordinator (1.00 SY) an Anthropologist. The total time booked on the CONDESAN project, including the two NRS on special contracts, was 4.60 SY in 2001. It thus follows that the CIP input in the CONDESAN project mainly consisted of time for coordination (2.50 SY) and administration of InfoAndina (1.00 SY) and that the direct scientific input was limited (1.10 SY). This is because most of the research in CONDESAN is conducted by the

partners in the Consortium at the watershed level. The research input of CIP in the Consortium is mainly in the areas of biodiversity (Project 7A) and NRM (Project 8A) and the time of these scientists is booked on their respective projects. For example, it is estimated that about 60% of the time of NRM (about 3.0 SY) is spent directly in the CONDESAN watersheds and thus could be considered part of the overall CONDESAN research programme.

#### 4.3.5 Funding

The proportion of the Centre's total financial resources spent on NRM plus CONDESAN during 1998-2000 ranged from 15.4 to 17.7% and averaged 16.5% over the 3-year period. The NRM plus CONDESAN research appeared to attract comparatively more external funding than other projects: the proportion of the total restricted core funding acquired by these projects ranged from 20-26% over the same period.

#### 4.3.6 Achievements of NRM Research

Until the year 2001 NRM and CONDESAN were in the same project and therefore no distinction will be made between these two activities in discussing the achievements of NRM. The outputs of the project include research tools and methodologies, management practices, and policy recommendations for alleviating poverty and making mountain production systems more sustainable. The products are in different forms: publications, CD-ROMs, web-pages, software, simulation models, databases, workshops and knowledge transfer mechanisms, and training materials and documentation.

##### 4.3.6.1 Publications

The total number of publications in different categories is probably the simplest general indicator of the output of the NRM group; see Table 4.1.

**Table 4.1 - Publications by Staff of the Department of Production Systems and Natural Resources Management**

Category	97	98	99	00	01	Sum
Refereed Journal Articles	6	3	7	9	12	37
Book Chapters	4	13	2	8	9	36
CIP Publications	-	4	16	5	26	51
Workshop Proc & Others	1	15	61	71	22	170
Sum	11	35	86	93	66	294

The total number of publications is quite significant for a research group of approximately 10 persons and it is clear that a major effort has been made to disseminate the results of the research. The average annual output per person during 1997-2001 was of the order of 0.74 refereed journal articles, 0.71 book chapters, 1.02 CIP publications and 3.40 workshop proceedings or other publications (including conference abstracts). The latter category is rather high, because of particularly high scores in 1999 (61 titles) and 2000 (71 titles). This was largely due to a very active visiting scientist who scored 49 titles



in this category in 1999 and 30 titles in 2000. If these titles are not included in the total for the 5-year period, the average annual output per person would be in the range of 1.80-2.00 titles in the category workshop proceedings and other publications. The category “books” in Table 4.1 also includes conference proceedings, but only those that were refereed and published by well-known scientific publishers. The data in Table 4.1 are meant to provide an indication of the output of the NRM group: the different categories and scores by category have not been analyzed in detail.

#### **4.3.6.2 Research Outputs**

As mentioned earlier, the present NRM research programme is of recent origin and therefore impact in farmers’ fields is limited. The emerging impact is in the production of NRM research tools and the transfer of these tools to target client groups. Some examples of outputs of software or methodological outputs of NRM research are the following:

- (1) The capability of CIP in the area of geographic information systems (GIS) has been strengthened, among others through the development of the DIVA-GIS software. DIVA-GIS is a geographic information system for the mapping, management and spatial analysis of genetic resources data. It was developed by CIP scientists in collaboration with IPGRI, Rome, with support from the Environmental Systems Research Institute in Redlands, USA. DIVA-GIS can be used by scientists to (a) make maps of the sites where a plant or animal species was observed or collected, or of attributes of these species, (b) make maps of the distribution of biological diversity, (c) identify areas that have complementary levels of diversity, and (d) extract climate data for accession points<sup>6</sup>. The DIVA-GIS software is simple to use and the software as well as the manual are freely available from the CIP web-site. The software is aimed at scientists who cannot afford generic commercial GIS software, or do not have time to learn how to use them, and at anyone else who wants a GIS that is specifically made for genetic resources work. Although no formal survey has been conducted, the initial indications are that there is a clear interest in the DIVA-GIS software. Hence, it seems that the release of the software meets a real need and that it may contribute to the strengthening of the capability of NARS and other organizations to manage and analyze their genetic resources data.
- (2) NRM staff is developing a 3-D on-line virtual research laboratory to help researchers, educators and decision makers collaborate on a global basis. Working with ActiveWorlds.com, which develops on-line 3-D environments, CIP appears to be in the forefront of applying 3-D visualization of geospatial modelling. A presentation of a prototype of the virtual laboratory at the 3<sup>rd</sup> International Conference on Geospatial Information in Agriculture and Forestry, Denver, USA, 2000, won the “Best of Session Award”. Simulation models for crop growth, soil erosion and other environmental or health effects, can be linked to the virtual laboratory and thus the tool can be used to visualize simulated, “virtual” crops growing in 3-D environments. Different scenarios can be applied and the effects of rainfall and different crop management practices on yield and on soil erosion or human health can be simulated and visualized. Therefore, ultimately, this could be

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<sup>6</sup> R.J. Hijmans, L.Guarino, M. Cruz and E. Rojas, 2001. *Computer tools for spatial analysis of plant genetic resources data: 1. DIVA-GIS*. Plant Genetic Resources Newsletter, 127: 15-19.

a powerful tool in the interaction between scientists and policy makers or government officials in supporting policy or management recommendations.

- (3) CIP NRM scientists have, in collaboration with Montana State University, Wageningen University, and several national research institutes and universities in Peru and Ecuador, developed a policy decision support system for agriculture, entitled “The Trade-off Analysis Model” (TOA)<sup>7</sup>. The principal objective of the TOA model is to serve as a decision support tool for assessing tradeoffs between agricultural production and the environmental and human health impacts of agriculture, for different economic, agricultural, environmental and health policies. The conceptual model underlying the TOA decision support system represents a significant advance in the development of an integrated approach to agro-ecosystem assessment. The TOA model was tested in potato-pasture production systems in two benchmark watersheds of the Andean region: San Gabriel (Carchi, Ecuador) and La Encañada (Cajamarca, Peru). The TOA model is being used by several of CIP’s partners in the CONDESAN projects in Carchi and Cajamarca. For example, the Ministry of Agriculture in Peru, through its Soil and Water Conservation Service (PRONAMACHCS) has used the TOA software over the past year. Ten representatives of PRONAMACHCS have been trained by CIP in the use of the TOA model, as well as in the use of the associated component models: the WEPP erosion model, the DSSAT crop models, the INIAP-CIP livestock model and econometric models and subroutines. The TOA model has demonstrated its value in this analysis and the issue is being further pursued by PRONAMACHCS.
- (4) Several tools have been developed using geospatial statistics and multifractal theory. It is noteworthy that some of these tools are being used by target groups. For example, a climatic interpolation model for solar radiation is used by SENAMHI and the Peruvian Ministry of Mining to pinpoint sites in rural Peru with a comparatively high intensity of solar radiation. A network of solar panels, financed by the IDB, will be installed on the sites selected by this interpolation tool. Models for mixed crop-livestock systems have been developed and tested. The results of scenario evaluations have been implemented in Puno, Peru. The understanding of how farmers cope with climatic variability and how their decision-making process is affected by climatic forecasts has been successfully evaluated.

The output of the current NRM and production systems research mainly consists of tools and methods. However, some of the ongoing activities in the context of CONDESAN are directly addressing practical problems. Also, some of the earlier NRM activities, have generated concrete examples of impact on rural communities.

An example of a recent CONDESAN activity, in which CIP was involved, is the establishment of a public forum for discussing issues of water rights in Bolivia in 2000, which was perceived as being successful.

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<sup>7</sup> J.J. Stoorvogel, J.M. Antle, C.C. Crissman & W. Bowen, 2001. *The trade-off analysis model version 3.1: A policy decision support system for agriculture. User guide*. Laboratory of Soil Science and Geology. Wageningen University, Wageningen, The Netherlands.

An example of an earlier activity in which CIP and ILRI staff were involved, is the development of a production programme in the Altiplano to improve the income of rural households under the leadership of an NGO (CIRNMA). This production programme had two major components:

The quinoa programme with the introduction of varieties tolerant to the adverse climatic conditions of the Altiplano in combination with a package of management practices. This technology has increased the average yields of the 900 households in the programme from 600 kg/ha to 1200 kg/ha.

The alpaca/sheep sweater project is helping to generate employment and increase the incomes of the participating households. CIRNMA is currently working with 40 peasant communities and exporting some 7000 sweaters annually to North America.

These examples of outputs of CIP's involvement in CONDESAN are given (a) to underline that some concrete results are available even though the current NRM research programme is of recent origin, and (b) to illustrate the wide range of products generated in the context of CONDESAN.

#### **4.3.7 Future Plans**

The present NRM project started in January 2001 and is expected to end by December 2005. The planning of the project, as reflected in the project logframe worksheets, looks thorough and realistic, although its implementation seems to depend heavily on the realization of restricted or special-project funding. The further development and testing of many of the analytical tools will take several years, but once completed, they will no doubt provide a valuable set of databases, methodologies, mechanisms for the extrapolation and delivery of research results, policy and management recommendations, decision support tools and other software products, that will place CIP among the top CGIAR institutions in the field of integrated NRM.

CIP has recently submitted a proposal for a Challenge Programme on Sustainable Mountain Development. If successful, this programme will enable CIP to share its methodologies and analytical tools with its sister institutes, and to further test and develop these products to the benefit of all scientists involved in research on mountain agro-ecosystems.

### **4.4 Assessment of Quality and Relevance of CIP's NRM Programme**

#### **4.4.1 General Focus and Relevance**

NRM research at CIP compares very well with the CGIAR priorities for NRM research: it is clearly "integrated" in its design, most of the components may be expected to contribute to productivity enhancement, it focuses on process-oriented and cross-cutting issues, it generates relevant methodologies and decision-support tools, its field activities are concentrated on benchmark watersheds, the most recent advances in physical sciences and ICT are applied in the research, and the NRM research programme seems to be very well connected, with the North, the South and with other IARCs. CIP NRM also plays a leading role in the emerging systemwide initiative on mountain ecosystems.

Because of the relatively small size of CIP's NRM programme and in order not to dilute the activities of the NRM group too much, the Panel **recommends** that a strategic planning exercise be conducted to focus the research programme and to develop a balance between process-oriented and application-oriented research. The current emphasis on process-oriented research is in line with the CGIAR criteria for NRM, but should be accompanied by appropriate mechanisms for the transfer of these research tools to the target clients. This may require more application-oriented research to demonstrate the value of the tools developed, and to transfer these tools to the client groups. In addition, application-oriented research may help to develop criteria for *ex ante* impact analysis of process-oriented research and the usefulness of methodological and analytical tools.

CIP's mandate for NRM research relates to mountain ecosystems, primarily in the Andes, and this is much broader than potato-, sweetpotato- or even ARTC-based production systems. In large areas of the Andes, livestock is the main commodity and the prevailing agro-ecosystems are crop-livestock-pasture systems. Currently the NRM team is doing relevant work on livestock-based systems in conjunction with the ILRI-convened SLP. Although the relevancy and quality of this work are not questioned, the Panel fears that the NRM group may be diluting its efforts too much. The Panel therefore **recommends** that a strategic planning and priority setting exercise be conducted to set a proper balance between the resources allocated to production systems based on CIP's mandate crops on the one hand and livestock-based production systems on the other hand. The Panel feels that, in view of the strength of CIP in root- and tuber-based technologies, the likelihood of achieving significant impact in farmers' fields in root- and tuber-based production systems would be larger than in other production systems. Also, it would seem to be a high priority for CIP to demonstrate impact in farmers' fields in potato-, sweetpotato- or ARTC-based production systems.

This recommendation does not imply that the Panel would not encourage CIP to participate actively in the SLP or to convene the GMP, but it cautions the CIP NRM team not to lose the issue of impact out of sight and to keep a general balance in the NRM research programme. The Panel believes that *ex ante* impact expectations should be important in guiding the NRM programme and that close collaboration between NRM scientists and their colleagues from the Commodity Improvement and Social Science research teams, will increase the likelihood that concrete impact in farmers' fields will be strengthened in the near future.

The NRM research appears to be highly relevant to the problems of the Andean region. Only research in the area of water (hydrology) is virtually absent, even though research on water was rated very high in the CGIAR analysis and also seems to be of great importance in the Andean region. The reason for this is that there appears to be no IRS level hydrologist in the NRM team. At present, one of the NRM staff is looking after soil-crop-water relationships and surface water hydrology, but this is not a sustainable arrangement. Hence, if CIP feels that water issues are of importance in the Andean region, the expertise of the NRM team would have to be strengthened in this respect.

#### 4.4.2 Quality

In general, NRM staff seems to be highly qualified and motivated, and the research seems to be of high quality, to the extent that the Panel can judge this on the basis of

discussions with the staff concerned, the CIP programme reports, the NRM ICER report and additional publications provided to the Panel. In fact, it is remarkable that CIP has been able to attract and keep such highly-qualified NRM scientists, in a time of downsizing and dwindling budgets. It is hoped that the CIP management will be able to maintain the current level of quality of the group of NRM scientists.

The titles of the NRM publications cover a range of topics from basic and strategic science and method development, such as the application of fractals to scaling theory or the use of multichannel radar imagery in mapping different types of vegetation, and issues related to environmental quality, such as the leaching of carbofuran, to issues of a more direct practical significance, such as estimating the frost risk in potato production in the Andean Altiplano or changes in land use in the Canete valley in Peru.

The Panel commends the NRM group for diverse publications and broad coverage of topics, and suggests that more of the work be published in refereed scientific journals, which the Panel believes would not require much additional effort.

#### **4.4.3 Staffing**

Most of the NRM and CONDESAN research is funded through restricted or special project funding, and many of the scientists involved in this research are appointed on the basis of special projects, for the duration of the projects concerned. For example, in 1996, all scientists involved in the NRM programme were appointed on the basis of special projects, except for two jointly appointed staff (CIP-CIAT and CIP-IFDC), that were partly funded by CIP. In 2001, this situation had somewhat changed in that 2 scientists had been shifted to core funding and 4 scientists were jointly funded between CIP and partner institutions (CIAT, IFDC, USDA-CRSP and ILRI). If the understanding of the Panel is correct, then regular scientists would be more flexible in the planning of their activities and time allocation, and might be more committed to the institution they are working at, thus providing a greater degree of continuity in the knowledge and expertise in a particular programme.

The situation in which a large proportion of the scientists is appointed on the basis of special projects might thus provide a threat to the continuity of the scientific quality and expertise that is built up in a research programme. If indeed NRM is considered to be an essential component of CIP's research agenda, then the Centre should consider taking steps to ensure the continuity and quality of its human resources in this respect.

#### **4.4.4 Funding**

A significant part of the Centre's expenditures appears to be "fixed" in research support services and facilities, international cooperation, training, information, general services, and administration and management. Hence, it may be expected that much of the unrestricted core funding will be used to cover those expenditures. Therefore, the direct investments in research may become comparatively more dependent on restricted core and special project funding. An analysis of the spending on research at CIP over the past 5 years, would suggest that research tends to be more vulnerable to downsizing in times of shrinking Centre budgets than other items in the budget (see Chapter 8). In principle, this is an undesirable situation and if indeed NRM is considered an essential and indispensable

element of CIP's mission and research portfolio, then the Centre should explore ways of increasing the continuity of the research activities, also in times of shrinking budgets.

Furthermore, the Panel is concerned that, at present, many of the NRM scientists seem to spend a significant proportion of their time on writing research proposals for external funding, and on administering existing externally funded, sometimes highly fragmented, project portfolios and reporting to a wide range of donors. The solution to this problem might not be easy in a time of decreasing funding. However, in the view of the Panel, the CIP management would have to explore whether the proportion of core funding to research could be increased. It is conceivable that this would be a good investment: with more continuity in the research programme and in the research partnerships, one would expect to be able to show more impact in the field than is presently the case, and this might in turn convince donors to fund additional activities. Hence, with a clear and focused research agenda and continuity in the operations, writing of proposals might well be less time consuming and more clearly targeting specific donors, than appears to be presently the case.

#### **4.4.5 Strategy and Priority Setting**

As is the case with other areas of CIP's research mandate, NRM could benefit from a thorough strategic analysis and priority setting exercise. This was also a strong recommendation of the NRM ICER. The NRM team has, in fact, conducted an internal strategic planning exercise following the 1999 review, which is the basis for its current, more focussed research planning. In view of the fact that a large proportion of the current NRM project portfolio consists of projects that receive restricted or special project funding, it is questionable whether a further priority setting exercise would be a very useful exercise at the present time.

Nevertheless, the Panel feels that a strategic analysis and priority setting effort could help the NRM programme to develop a shared vision and focus, even if restricted funding is largely driving the agenda. A clear strategy and set of research priorities would help to focus the NRM research, ensure a degree of continuity in essential research endeavours, increase the probability of impact, foster collaboration between scientists, reduce transaction costs of obtaining external funding and increase the scientific output.

##### ***4.4.5.1 Priority Setting Methodology***

A strategic analysis and priority setting exercise as envisioned by the Panel would be a process in which, among others, CIP's research partners, both in the North and in the South, would play an important role. Also, it is somewhat questionable whether the methodology used in the preparation of the 1998-2000 Medium-Term Plan<sup>8</sup> would be suitable for this purpose: the fact that the methodology is assumed to be unsuitable for social sciences and economic research, as well as for germplasm conservation and biodiversity characterization, raises the question whether it is suitable for NRM. This is partly because the benefits of environmental quality, human health, and sustainable use of natural resources cannot only be measured in terms of increases in productivity or some other economic parameter.

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<sup>8</sup> T. Walker and M.-H. Collion, 1997. *Priority Setting at CIP for the 1998-2000 Medium-Term Plan*. CIP, Lima, Peru.

Therefore the Panel suggests that CIP pay attention to this issue at the upcoming priority setting exercise. The combination of commodity improvement, integrated crop protection, social sciences, germplasm conservation and NRM requires a more novel approach to the formulation of strategy and to priority setting, even though the approaches used in the past may have proven their value for commodity oriented research. It may be noted in this respect that other CGIAR Centres have developed priority setting methodologies that consider parameters such as sustainability, equity and internationality, in addition to economic benefits<sup>9</sup>.

#### 4.4.6 CONDESAN

The EPMP Panel is pleased to note that CIP has taken effective action on the recommendation of the NRM ICER to move CONDESAN out of the NRM project and grant it an independent status within CIP. At the same time, the Panel stresses that it is important that close links be maintained between CONDESAN and CIP's research programmes. This also applies to the commodity improvement research at CIP. For example, the Panel would have expected that the CONDESAN mechanism would be used by CIP commodity scientists to test and disseminate seed-based technologies. However, the Panel has seen little or no evidence in the field or otherwise that this would be the case. Therefore, the Panel encourages scientists in the areas of crop improvement, crop protection, social sciences and NRM to work together in the CONDESAN benchmark watersheds and to use the CONDESAN mechanism for the development, evaluation and dissemination of integrated technologies, and policy and management recommendations, in collaboration with relevant partner organizations. Also, the Panel feels that it is important that the CONDESAN coordination team continues to have a strong scientific input and exert intellectual leadership at the level of the watershed sub-consortia.

With regard to the latter point, the Panel believes that the Technical Committee of CONDESAN, which is basically a scientific advisory committee, should be revived. It could be composed, among others, of the scientific coordinators of CONDESAN's cross-cutting themes.

The Panel further notes that CONDESAN is presently looking at much the same donors as CIP does for its external funding. Although one can understand this from CIP's perspective, the Panel suggests that CONDESAN should more actively try to liaise with the large development projects in the Andean region. For example, the Panel understands that IFAD is investing hundreds of millions of dollars in development projects in the Andean region, and that the same applies to some other funding agencies and development banks. Hence, there may be opportunities for CONDESAN that should be explored more vigorously.

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<sup>9</sup> T.G. Kelley, J.G. Ryan and B. Patel, 1995. *Applied participatory priority setting in international agricultural research: Making trade-offs transparent and explicit*. *Agricultural Systems*, 49: 177-216.

## 4.5 Summary and Recommendations

The NRM research programme was established in 1996, as part of CIP's involvement in CONDESAN and in reaction to the broadening of CIP's mandate to include an ecoregional responsibility for the mountainous agro-ecosystems of the Andes.

The focus of the NRM programme is on (a) application of the latest advances in geoinformation science and remote sensing, as well as in information- and communication technologies, (b) systems analysis and the development of analytical tools and methodologies for environmental and natural resources management, and (c) management and policy recommendations related to sustainable agricultural productivity, environmental quality and human health and welfare. The analytical tools developed by the NRM group are relevant to other researchers involved in mountainous agro-ecosystems and should be shared with them through mechanisms such as the Global Mountain Programme.

The Panel is impressed by the qualifications of the NRM staff and the quality of the research, and is of the opinion that the emerging impact of this research has the potential of becoming fully visible over the next 5 years, if the programme focuses on a limited set of priority issues and analytical tools, as well as a set of priority agro-ecosystems, and if effective and efficient use is made of the available means.

The Panel **recommends** that, within the overall strategic planning of the Centre, a priority setting exercise be conducted for NRM, using an appropriate methodology, to help focus the research agenda and develop a proper balance between process-oriented and application-oriented research, and between production systems based on CIP mandate crops on the one hand and livestock-pasture-based production systems on the other hand. This process should also contribute to team building and developing a shared vision among the members of the team. Strengthening of the NRM expertise in the field of hydrology and surface water management would be desirable.

The Panel welcomes the decision of CIP management to grant the CONDESAN project an independent status at par with other CIP projects. The Panel considers it important, however, that close links be maintained between CONDESAN and CIP's research programmes. The Panel **recommends** that scientists in the areas of crop improvement, crop protection, social sciences and NRM, work together in the CONDESAN benchmark watersheds and to use the CONDESAN mechanism for the development, evaluation and dissemination of integrated technologies, and policy and management recommendations.

The Panel feels that it is important that the CONDESAN coordination team continues to have a strong scientific input and exert intellectual leadership at the level of the watershed sub-consortia. The Panel **recommends** that CIP continue to have a strong scientific vision and methodological input in the consortium, in addition to CIP's current coordinating, administrative and facilitating role, and that the Technical Committee of CONDESAN be revived and that the coordinators of the cross-cutting themes be members of this committee.



## CHAPTER 5 – SOCIAL SCIENCES

### 5.1 Introduction: The Role of the Social Sciences at CIP

The social science capability of the CGIAR is widely distributed within the system. At the centre is the International Food Policy Research Institute (IFPRI), which does a great deal of the core policy work needed in this area. It also does the basic tracking of the changing outlook for the major commodities of interest to the system and to the CGIAR Group. The priorities for their programmes on science and technology policy, production, consumption and nutrition, and international trade are set at the global level, and for the system as a whole.

In addition to this core capability, the system also has social science capability in the individual international agricultural research centres. The social science programmes of the individual research centres vary a great deal, reflecting their missions and mandates. It is in that context that the role of the social sciences at CIP must be understood.

CIP is in its essence a technological platform whose main mission is to deliver strategically defined new production technology to be adopted by and adapted to conditions in the NARS, for eventual adoption by small farmers in the developing countries. An ongoing framework for thinking about the social sciences at CIP might be as follows:

- (a) To help set priorities based on rigorous analysis of national, regional, and world economic trends affecting potato, sweetpotato, and Andean tubers and root crops;
- (b) To do analytical research essential to establishing science and technologies pertinent to potatoes and sweetpotatoes in the developing countries;
- (c) To understand farmer early acceptance, adoption, and diffusion of CIP-related technologies;
- (d) To assess the impact of new technologies on different outcomes (such as yields, labour use, and income), on different stakeholders, and on different levels of social or spatial organization, such as individuals, families, villages, watersheds, or nations;
- (e) To assist in developing institutional social science capacity in NARS.

The above framework is not fully comprehensive in coverage. The role of social scientists in NRM research, particularly in the context of the trade-off model, is covered in Chapter 4. This section focuses on the role of social science in the crop improvement of potato and sweetpotato.

### 5.2 The Social Sciences at CIP

Table 5.1 provides data on the number of internationally recruited social scientists at CIP, by their disciplinary background and level of training in 2002. The majority of

CIP's social scientists are economists, but a sizeable minority comes from other backgrounds, most prominently anthropology and agricultural extension.

**Table 5.1 - Disciplinary Background of Internationally Recruited Social Scientists at CIP, 2002**

<b>Field</b>	<b>Degree</b>	<b>Number</b>	<b>Percent</b>
Economics	PhD	6	46.2
Economics	M. Sc.	2	15.4
Anthropology	PhD	2	15.4
Extension/communication	PhD	2	15.4
Extension/communication	M. Sc.	1	7.7
<b>Total</b>		<b>13</b>	<b>100.0</b>

Source: Raw data supplied by CIP.

People from other disciplinary backgrounds who might be doing applied work in the social sciences are not included in Table 5.1. At least three internationally recruited staff members who do not have an academic background in the social sciences – an agronomist, a nutrition/crop scientist, and a specialist in tropical crop sciences and GIS – nonetheless do work that involves a strong social science component.

From 1996 to 2001 the total number of internationally recruited social scientists working at CIP ranged from 12 to 16 each year. CIP has been successful in obtaining special project funds to strengthen its social science capacity and such funds have been used to fund about half of their regular staff. Three of the regular staff have been co-funded with other institutions.

In spite of downsizing during the past five years, CIP has maintained the size of its social science staff. Many of these staff have been assigned to regional and country research management and to administrative responsibilities.<sup>10</sup> That has left about 9.5 scientist years of core-funded social scientists allocated to research - which is typical of an IARC of CIP's mandate and size. This is equivalent to about 16.7 percent of CIP's total research manpower. (See Table 9.2 in Chapter 9).

Table 5.2 provides data on the time-allocation of the senior social scientists (in full-time person equivalents) to different areas and projects for 2002. Those data show that the time of social scientists is allocated across a wide range of projects. In general, social scientists are more active in projects that feature downstream research.

<sup>10</sup> One of the core-funded social scientists was the regional representative for Sub-Saharan Africa from 1996 to 2001. Two other core-funded social scientists have served as the regional representative for the East, Southeast Asia & the Pacific (ESEAP) region, and still another social scientist was the country liaison officer for Ecuador.

**Table 5.2 - Allocation of Social Scientists to Projects in 2002**

<b>Project number and name</b>	<b>Number of social scientists working in the area/project</b>	<b>Full-time person equivalents</b>
2A Potato seed uptake and use	5	1.98
10A Impact Assessment	4	1.90
6A Post harvest	4	1.63
1A Integrated Control of Late blight	4	1.25
G1 Urban agriculture (SIUPA)	1	0.85
8A Natural Resources	3	0.75
G3 CONDESAN	2	0.55
4A Integrated Pest Management	2	0.25
7A Genetic Resources	1	0.15
G2 GILB	1	0.10
9A Gene discovery	1	0.05
3A True potato seed	1	0.05
5A Sweetpotato Br virus	0	0.00
<b>Total Research Scientist Years</b>		<b>9.51</b>

Source: Statistics compiled from raw data supplied by CIP.

This widespread diffusion of the social science inputs among a wide range of projects and programmes reflects the decision some years ago to integrate the social scientists with the biological and natural scientists in projects or programmes. This pattern of resource allocation also responds to the demands of project leaders who are usually biological scientists. For example, the heavy participation of social scientists in late blight research since 1996 was stimulated by the demands of a new project leader who believed in the value social scientists could make in an interdisciplinary research setting. The Panel will later discuss whether this has been an effective way to exploit social science research capability.

Table 5.3 provides data on the published output of the social scientists from 1996 until the present. These data suggest that each social scientist at CIP produces on average a total of 4.24 publications per year, mostly written in English. Most of the output is published in conference proceedings (1.22/person/year) or in CIP publications (1.07/person/year). The impact of these publications is discussed elsewhere in the report.

A recently updated bibliography of the Social Sciences Department at CIP from 1977 to 2001 shows the changing agenda in social science research. From 1996 to 2001, areas receiving increasing attention were global studies of potatoes and sweetpotatoes, participatory research methods, varietal change and plant breeding, pest and disease management, biodiversity and *in situ* conservation, NRM, demand, consumption, nutrition, and impact assessment. Areas of diminishing importance were country and

regional commodity studies, potato seed systems, diagnosis of production constraints and opportunities, marketing, and social sciences in agricultural research.

**Table 5.3 - Average Yearly Published Output of Social Scientists at CIP:  
1996-Present**

<b>Type of published output</b>	<b>Average annual output/person</b>
Conference proceedings	1.22
CIP publications	1.07
Refereed articles	0.83
Chapters in book	0.52
Other	0.45
Books	0.15
<b>Total</b>	<b>4.24</b>
(English)	3.20)

Source: Statistics compiled from the resume of 10 social scientists at CIP.

### **5.3 The Achievements of CIP Social Sciences**

The goal in this section is to document and assess the achievements of CIP social scientists since the last EPMR in 1995. The analysis focuses on the following five fields: (a) analysis to set priorities, (b) science and technology policy, (c) adoption studies, (d) assessment of impacts, and (e) strengthen social science research capacity in national programmes. Whenever appropriate, stock is taken of what the previous EPMR recommended, CIP's response, and the current view on the topic.

#### **5.3.1 Analysis to Set Priorities**

Priority setting and how CIP has addressed the issues raised by the previous EPMR are addressed in Appendix V. The emphasis in this section is on more strategic analyses undertaken by the social scientists.

##### **5.3.1.1 Achievements**

CIP's approach to setting priorities has been based on the views of the scientists within CIP and it has been simple and straight-forward. Participatory meetings held in 1996 produced a ranking of projects based on their perceived importance by CIP scientists<sup>11</sup>. The social scientists at CIP then did "quick and clean" benefit/cost analyses of the projects and found convergence between the perceived ranking of projects by the scientists and the actual rates of return estimated for them. Out of that exercise came more research on topics such as sweetpotato and late blight, but not necessarily a reallocation of funds to the top-ranked projects.

<sup>11</sup> This process did not consider genetic resources projects, or the social sciences.

In several of CIP's publications on priority setting one finds a discussion of the limitations of the participatory methods used to set priorities and of the methods to estimate benefits and costs. One also finds in such documents a clear understanding of what CIP needs to do in the future for the priorities to be incorporated more efficiently into the planning and budget of CIP. The Panel understands that CIP has been waiting for the EPMP to finish its work before doing another exercise to set priorities for the next five years. That exercise needs to be done soon, because much has changed since the last exercise in priority setting.

To help set the stage for the next analysis of priorities for CIP the social scientists have published two useful monographs in the last two years that were undertaken in collaboration with other centres of the CGIAR, especially IFPRI. In those publications, the authors assess past world trends in root and tuber production to make projections for the next two decades. Another forward-looking study is a study of the effects of global warming on potato production, which is still in draft form.

Sweetpotato has not received as much attention as potato by the social scientists. Evaluation of post-harvest technology, especially in China, has had an effect on CIP's research priorities. Almost all of the social sciences work on post-harvest technology in the last five years has been concentrated on sweetpotato.<sup>12</sup> CIP has also done a good job in assembling and publishing detailed maps of the distribution of potatoes and sweetpotatoes. Demand for these maps is high, and this spatial database provides the platform for *ex ante* assessment with GIS.

CIP research with national partners in Bolivia on the comparative assessment of yields on more than 1000 farmer fields shows that potato yields from statistical crop cuts are about 40% higher than farmers' oral reporting of multiplication ratios that is the basis for national estimates. This is an important contribution to improving national data, and can contribute to improvements in national policy.

### **5.3.1.2 Assessment**

More attention could be given to the analyses of regional economic, political, and social trends as the basis for setting priorities and to how those trends might affect the adoption or impact of the technologies produced by CIP. For example, NAFTA, MERCOSUR, and other regional trade pacts are changing the barriers to international trade and thus changing the conditions under which new technologies, crops, knowledge, and perhaps people move across national borders. Some of these regional accords will do economic harm to potato producers in poor nations and dampen the incentives to adopt

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<sup>12</sup> Examples include: Peters, D. and C. Wheatley. 1997. *Small Scale Agro-Enterprises Provide Opportunities for Income Generation: Sweetpotato flour in East Java, Indonesia*. Quarterly Journal of International Agriculture 36(4):331-352. (2043-080-E). Espinola, N., H. Creed, M.E. Ugaz and M. Van Hal. 1998 *Desarrollo de un Alimento Complementario con Camote para Niños de 6 meses a 3 años*. Social Science Department Working Paper 1998-8. Lima:CIP. 37 p. Also in: *Impact on a Changing World. Programme Report 1997-1998*, International Potato Centre, Lima, Peru. P. 295-302 (1301-131-E) (1301-131-A). Peters, D. 1998. *Improving Small-scale Livestock Production in Developing Countries: The Case of Pig Production in Northern Vietnam*. World Animal Review 91 (2):2-12. (2404-080-E). Peters, D. 1998. *Sweetpotato Processing for Poverty Alleviation and Rural Stability: A Case Study of Yilong county in Sichuan, China*. The Seventh Symposium on Society and Resources Management. May 27-31, 1998, Colombia, Missouri.

new technologies produced by CIP. At the same time, however, such trade accords will also open new trade opportunities for other countries and create new opportunities for research partnerships that may allow developing nations to remain competitive. The Panel found only one study on this topic, dated to 1999, and it was done as a stand-alone piece of work, concerned only with Latin America. The Panel found no analytical studies of comparative advantage in potato production across nations, a surprising gap since such studies could point to future potential partners for CIP and nations where CIP might wish to invest.

The Panel also did not find easily accessible and current data sets that would allow researchers to do basic analyses of historic trends of yields or prices in regions or nations. Such analyses can be useful in understanding what has been accomplished and for planning for the future. At CIP headquarters the Panel found the standard updating of FAO statistics on crop yields. Several sets of time series data on prices have also been compiled for selected countries for the on-going analysis of cyclical price patterns. However, the Panel found no simple and accessible database on yields and real (inflation-corrected) prices over time, nor data disaggregated to the provincial or regional level in the different nations where CIP works<sup>13</sup>. Simple historic statistics, such as the price of potatoes relative to the price of other commodities, can reveal a great deal about where CIP should focus its efforts.

The dearth of reliable secondary data on productivity warrants special mention. CIP social scientists need to maintain a watching brief on these yield and area data as they are revised by FAO. For example, in the late 1990s, FAO revised the area of sweetpotato in Nigeria from 15,000 to 380,000 hectares. This revision imparts a strong positive bias to any trend analysis of sweetpotato production in Sub-Saharan Africa. Potato and sweetpotato area in China may be overestimated by as much as 1,000,000 hectares for each crop and yield may be underestimated by as much as 30%. CIP social scientists do not have a comparative advantage in “getting the secondary data right” but they should be a lobbying force for better data collection in institutions charged with that task. The Panel suggests that CIP social scientists collaborate more closely with institutions such as IFPRI, the World Bank, and regional organizations to assemble such information so that researchers find it more accessible and easier to use.

### 5.3.2 Science and Technology Policy

Shaping the priorities of a research centre such as CIP requires a base in a science and technology policy for the sector. Science and technology policy issues involve the balance among basic, strategic, and applied research; the availability and needs of human capital to produce and adopt the new knowledge and technology required by the sector; incentives to produce the new technology – an increasingly important issue with the new revolution in the life sciences and a larger role for the private sector; the resource-saving effects (positive or negative) of new production technology; and the allocation of research resources across regions. Much of this work needs to be done with an *ex ante* perspective rather than the more traditional *ex post* perspective.

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<sup>13</sup> There are exceptions for nations with recent agricultural censuses, such as Peru, or countries such as India and China where district and county level data sets have been painstakingly assembled over time by CIP scientists.

Of the above dimensions to the problem, perhaps the one needing explanation is the resource-saving effects of the new technology. To be adopted by farmers it is important that the technology save or economize on the resource that is relatively the scarcest. Hence, if land is the relatively scarce resource the technology should enhance the productivity of land, or be land-saving. From a different perspective, if labour is the relatively scarce resource then new technology that increases labour requirements is not likely to be adopted. For the decision makers at CIP these issues are important in designing the research policies (i.e., science and technology policies), respectively, for Sub-Saharan Africa (a labour scarce region) and Asia (a land scarce region)

The instruments or tools for such analyses include the social rate of return to investments in particular technologies and regions, the resource-saving effects of the new technology, and the rates of return among various technological thrusts. Other parameters useful in making such judgements and creating the science and technology policy for the sector include benefit/cost ratios, net present value of the new technology, and so on.

IFPRI has done a substantial amount of research that bears on science and technology policy for the CGIAR system as a whole. However, the social scientists at CIP should be addressing the science and technology policy issues for CIP and the programmes covered by its mandate. An inherent feature of such research is that it requires the close collaboration of the social scientists with the biological and natural scientists.

### ***5.3.2.1 Achievements***

Research in this area can be organized by the audience to which it is directed. Biological scientists in potato and sweetpotato crop improvement should be one of the main targets for use of information generated by social science research under this rubric. For the period of analysis of this EPMR, the Panel found several examples of the incorporation of such information in technology design and targeting. One such example was a comparative assessment of on-farm trial data from Egypt, India, Indonesia, and Peru which showed that the prospects for TPS were brightest when the cost of conventional seed tubers was equivalent to more than 22% of the value of production. This empirical rule of thumb has been used by TPS scientists to target interventions. Another example involved combining a global late blight database on sprays and yield gains from resistant varieties with a simple forecasting model to generate more refined information on whether the benefits from the adoption of blight-resistant varieties were largely in the form of yield gains or in cost-savings in fungicides. Higher priority is accorded by the biological scientists to regions where benefits take the form of gains in productivity.

An economic analysis of the scale of potato plant breeding has generated information on spatial and institutional priorities that has subsequently been incorporated in CIP's potato breeding strategy (largely reconfirming what the Institute was already doing). As another example, economic analysis of new rustic storage technologies for potatoes in India showed that at current costs this intermediate technology could not compete with farmers' traditional storage or with energy-intensive cold storage.

Donors and research management at CIP are two other important audiences. Both of these groups should be interested in the rate of return to investments in CIP. Social scientists at CIP have documented the positive rates of return to research in CIP-related

potato and sweetpotato technologies<sup>14</sup>. These case studies showed rates of return that ranged from a low of about 26-30% to a high of 80-102%, suggesting that there are ample opportunities to reallocate research resources from low-payoff activities to higher payoff activities. Research on IPM to control weevil in potato and sweetpotato and research on late blight resistance in Latin America yielded the lowest returns. Research on late blight resistance in Africa and resistance to droughts and viruses in China had among the highest rates of return.

More recently, CIP has produced other case studies that continue to show relatively high rates of return to investments in CIP-related technologies. Some of the results from studies undertaken since the earlier publication by Walker and Crissman are summarized in Table 5.4. These data suggest that the returns continue to be positive, and continue to vary widely among activities, from a low of about 29-42% for research on true potato seed and extension in Vietnam to 202% for research on virus-free sweetpotato in the province of Shandong, China. This variation in the rates of return can and should provide important information for shaping CIP's research programme.

**Table 5.4 - Recent Estimates of Rates of Return to Investment in CIP-Related Potato and Sweetpotato Technologies<sup>15</sup>**

<i>Area</i>	<i>Technology</i>	<i>Year</i>	<i>Internal Rate of return</i>	<i>Net present value (in US\$ million)</i>	<i>Notes</i>
World	Global potato & sweetpotato	1971-2010	14%	62.1	10% discount rate
Shandong, China	Virus-free sweetpotato	1988-2020	202%	550 – 620	10% discount rate; range depends on adoption rate
Vietnam	True potato seed research & extension	1990-2010	29-42%	0.25 - 2.92	10% discount rate
Cuba	IPM for sweetpotato	Early 1990s-2020	49-73%	3.4 - 31.3	10% discount rate; range reflects different scenarios

The source is indicated in the footnote below.

<sup>14</sup> Walker and C. Crissman - 1996. *Case studies of the economic impact of CIP-related technologies* – CIP, Lima, is a book that summarizes the results from a variety of case studies.

<sup>15</sup> Source: Fuglie, K. et al. 2001. *The economic impact of true potato seed in Vietnam* – CIP, Lima; Maza, N. et al. 2000. *Impacto del manejo integrado del tetuan del boniato (Cylas formicarius) en Cuba* – CIP, Lima. Fuglie, K. et al. 1999. *Economic impact of virus-free sweetpotato planting material in Shandong province, China*. CIP, Lima.



An interest (discount) rate of 10 percent has been used in calculating the internal rate of return and the net present value for the results presented in Table 5.4. That rate is usually judged to be reasonable for the developing countries. For the developed countries, however, a rate of 4 percent is usually judged to be more appropriate. The choice of a discount rate has a significant effect on the net present value of the new technology. The net present value of the benefits from the new technology increases from the US\$62 million shown in the table to US\$564 million when discounted at the lower interest rate.

It is worth noting that national governments can borrow from international institutions such as the World Bank at rates ranging from 4 to 7 percent, and in the case of some funds on long terms. If the rates of return on the research done by CIP is representative of the rates of return that could be obtained by national programmes, investing in agricultural (potato) research is a high payoff investment for national policy makers as well as for the international community.

### **5.3.2.2 Assessment**

The efforts of CIP's social scientists to document the rates of return to agricultural research undertaken by its staff and collaborators in the field is impressive, and provides an important basis for decision making about its research programme and priorities. However, so far it has neglected some important areas. For example, the issue of the resource saving effects of new technology, or whether it increases the demand for labour by increasing labour requirements, has not been addressed. These resource-saving effects are important in those parts of the world where CIP works, such as labour-scarce Sub-Saharan Africa. The technology designed for land-scarce Asia needs to be different than that for labour-scarce Sub-Saharan Africa.

Another neglected issue is the economics of alternative ways of obtaining genetic diversity, an important global issue. Although CIP's main goal in this area is to enhance *ex situ* conservation, it also carries out projects to enhance conservation in the fields of farmers. This work in the first instance aims to understand the dynamics of conservation of crop diversity on farms. This research has been conducted in Latin America through the project on Andean Roots and Tubers, and in Asia, through the UPWARD network in Philippines and through a Swiss-funded special participatory research project in Indonesia. Based on careful documentation of the dynamic processes, these projects are seeking ways to strengthen this form of conservation, both at the micro-level, and also by influencing national plant genetic resources policies. The importance of obtaining global diversity is an important global issue and deserves more policy attention than it is receiving. Data on comparative costs per accession of different forms of conservation and estimates of their sustainability over time would be useful. That kind of research, perhaps carried out in collaboration with IFPRI and IPGRI, or other institutions, could permit the formulation of more concrete policy options, such as direct payments to farmers to manage diversity at the farm level. Policy makers would then have alternatives to consider in establishing policy. The relevance of this to CIP social scientists is the relative uniqueness of the vegetative propagation of the commodities in which it specializes.

### 5.3.3 Studies of Early Acceptance and Adoption

The early acceptance and adoption of new technologies (or better, of innovations) is an intermediate step in the process of modernization rather than an end in itself and serves as an indicator of whether the technologies produced by CIP enjoy acceptance by users. That is why the Panel has placed the studies of early acceptance and adoption in a separate section rather than to discuss them together with impact studies, which are discussed in the next section.

CIP's research in the area of adoption and diffusion has in general focused on early acceptance of validated technologies in a pilot site or in an on-farm testing framework. The economic evaluation of on-farm trials of TPS in India, Indonesia, Peru, and Egypt, referred to earlier, is an example of the attention given to on-farm validation and early acceptance research at CIP. In contrast, research to identify factors that explain the variation in adoption and subsequent diffusion is sparse. Studies of the determinants of adoption merit emphasis because they uncover bottlenecks, which researchers can then try to untangle, either by research or by changing public policies.

The Panel believes it important to distinguish between adoption studies, constraints studies, and participatory research. These concepts overlap in practice, thus leading to confusion. CIP has concentrated on participatory research, which is a middle ground between adoption research (identifying the factors that shape the pace of adoption) and constraints studies (which try to identify why farmers do not adopt new innovations. Participatory research at CIP comes close to the latter, and is consistent with the view of the CGIAR. In the last TAC report on Vision and Strategy, for example, the authors note that the failure to carry out constraint studies leaves researchers in the dark about why technologies diffuse or do not diffuse and, thus, how best to combat poverty. (For reference see Chapter 1, page 6).

#### 5.3.3.1 Achievements

The Report of an Internally Commissioned External Review (ICER) of Participatory Research noted that CIP has historically excelled in developing methods of participatory research with farmers, the goal being to identify the attributes of potato varieties that ought to guide some of the work of natural scientists (Douglas Horton, Daniel Selener, and Adiel Nkonge Mbabu, 2000). The same can be said of its participatory work with farmers to manage pests and diseases, the use of chemicals in farming, or the choice of post-harvest technology.

CIP social scientists have made an impact on how social scientists in general think about and do research on farming in collaboration with farmers. Some of the classic work on participatory farming research was developed at CIP during the 1980s and early 1990s. In that research, farmers are listened to and their advice is used to guide scientific research.

How widely diffused are CIP technologies in the developing world today? The answer will obviously vary by type of technology. However, if one focuses on improved potato varieties, one finds that only 5-6 percent of the area under potato production in a sample of some 30 developing nations can be traced to CIP's work. That rate may be

reasonable given the technological difficulties of vegetatively propagating potatoes. In the Panel's view, however, it appears to be low - after nearly 30 years of research.

This low rate of adoption suggests the need to continue to search for a better understanding of why these technologies are not spreading at a faster rate. In answering this question CIP should attempt to learn more about the specific bottlenecks that farmers face in adopting the technologies. As an example of such research, CIP's social scientists found that small NARS tried to adopt and promote CIP's varieties, while large NARS instead promoted their own new varieties<sup>16</sup>. This could contribute to a low rate of adoption at the farm level.

The Panel believes that the research needs to go beyond the matching up of physical characteristics of the potatoes and the desires of the farmers, which appears to characterize much of CIP's adoption research. Answers to the question might reveal that some of the technologies are unsuited to the specific agro-economic conditions of the farmers. Alternatively, perhaps the technologies are well suited from a technical point of view, but are not profitable in farmers' fields. There is even the possibility that the technologies might be ideally suited to farmer's growing conditions, and that the technologies could be profitable, but only after governments remove certain policy-amenable barriers to adoption.

Another possible answer is that CIP is too conservative in promoting the improved varieties produced by its scientists. In any case, answers to the question of why only about five percent of the area in developing nations are under CIP varieties after nearly 30 years of work requires the collection and analysis of primary data and a better understanding of what drives adoption. This issue is important because the eventual rate of return to investments in agricultural research is increased substantially by the early adoption of the technology.

### 5.3.3.2 Assessment

The Panel was struck by what it considered to be an excessive micro-level focus of adoption studies in project plans, studies, and personal interviews at CIP. The social scientists on the Panel were particularly concerned with the singular preoccupation – perhaps driven by the heavy preponderance of biological and natural scientists at CIP - with the physical attributes of the crop or of the technology in the decision to adopt, and with the lack of attention given to economic profitability and to policy-level variables that could influence the rate of diffusion. The CGIAR's new Vision and Strategy emphasizes the importance of understanding the policy-level constraints to adoption if the goal is to alleviate poverty. Marketing studies could also contribute to understanding this issue.

Although participatory research became the *modus operandi* for many areas of CIP's research, it has not resulted in high-profile visible publications, at least not since the last EPMR. The Panel found only 3-4 refereed articles on participatory research published by CIP social scientists since 1996. One of them, significantly, published only last year, is titled, "What happened to participatory research at the International Potato Centre?"<sup>17</sup> The

<sup>16</sup> Evenson, R.E and Gollin, D. (Eds.) 2002. *The Global Impact of Germplasm Improvement by the International Agricultural Research Centres*. CABI, London.

<sup>17</sup> G. Thiele, et al. 2001. *What happened to participatory research at the International Potato Centre? Agriculture and Human Values* 18:429-446

authors observe that participatory research had now become more mainstream in the Centre after a period in which it seemed it might wither because TAC provided no encouragement.

CIP does not do significant in-house research on adoption – an observation made by the previous two EPMPR (1995, p. 36). The Panel found it significant that the document on social science publications by CIP contained only two entries on adoption. The adoption issue is typically buried in impact assessments, and even then the topic receives scant attention. CIP has not done any studies on historical trends in adoption at the national or regional level. Such studies could help identify the role of variables such as prices, availability of land, and labour- intensity of the new technology on the rates of adoption.

The Panel found an excellent comparative international study on rates of adoption of CIP varieties, which was discussed above.<sup>18</sup> It did not find, however, many published, refereed case studies of adoption at the village or regional level. A report still in unpublished form covers a careful study of adoption in the Andes, with an excellent set of data.<sup>19</sup>

Such studies of adoption as there have been at CIP have not shared a common method for collecting or analyzing information. Some of the studies have been ethnographic or descriptive, others have used multivariate estimations, and none of the studies followed the process of adoption through time. These shortcomings are unfortunate, and for at least two reasons. First, the collection of Panel information on adoption from several sites could position CIP far beyond what any other CGIAR Centre is doing or what any university could ever hope to accomplish. Second, the collection of longitudinal information from the same subjects, households, and localities allow researchers to explore dynamic processes of adoption as well as the effect of adoption within and across households in a way that cannot be done in a single cross sectional study. It is the latter that tend to dominate at CIP.

#### 5.3.4 Impact Assessment

This section addresses the research on the socioeconomic impacts of CIP's technologies. The last EPMPR recommended that CIP “develop a strategy for continuously monitoring and evaluating the performance of its research outputs in terms of their impact – both positive and negative – on welfare, gender, and the environment”.

CIP has done its assessment of impacts almost exclusively at the level of villages, households, and people, and more recently, at the level of watersheds. Economy-wide impacts of potato technologies, have not been assessed. That may be appropriate, given the low rate of adoption of some of its technologies, such as improved varieties. However, *ex ante* studies of potential impact might serve as a useful guide for policy makers in allocating public resources to agricultural research and related activities, and to designing policies to promote agricultural modernization.

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<sup>18</sup> Walker, T., Y.P. Bi, J.H. Ji, P.C. Dam, and E. Funke, *Potato Genetic Improvement in Developing Countries and CIP's Role in the World*. Chapter 15 in Evenson and Gollin, op. cit.

<sup>19</sup> Godtland, Erin. 2001. *Reducing Poverty in the Andes with Genetically Improved Potato Varieties: The Importance of Knowledge and Risk*. Ph.D. Thesis, University of California - Berkeley.

CIP's impact assessments have not generally included the impact of its programmes on consumers, despite the continued commitment to that group of stakeholders by the CGIAR. Poor urban consumers tend to be among the major beneficiaries of the decline in prices produced by new farm technologies, yet such consumers have not generally been included in CIP's impact assessments. This is significant since CIP responded to the recommendations of the last EPMR (p.xiv) that it planned "to continue monitoring the results of its research in the areas of farm and *consumer income*" (the Panel's emphasis).

CIP's programme on urban and peri-urban agriculture is a step in the direction of giving more attention to urban consumers. However, that programme is mostly for the future, and it remains to be seen who the ultimate beneficiaries will be.

#### **5.3.4.1 Achievements**

In seeking to measure outcomes, CIP has focused chiefly on measuring the effect of new technologies on income and yields. It has put much less emphasis on measuring the effect of its new technologies on other indicators of quality of life, such as health, nutrition, or work effort.

According to estimates by CIP, yields of potatoes and sweetpotatoes in developing nations increased by 1.60 percent and 2.00 percent each year, respectively, from the early 1960s until the year 2000. Such improvements in yields suggest that CIP's work has contributed to a tangible, visible, and important achievement in potato production technology globally. Since only a small volume of potatoes enters the international market, it is more difficult to assess the effect of technological improvements in the production of potatoes on world prices. A comparative study that assessed trends in real prices for potatoes in major potato producing areas might be very important for understanding the contribution or challenges faced by CIP.

The most comprehensive evaluation of the impact of new CIP technologies on household income suggests that the gains are, as expected (see Chapter 1), modest. In a study done in 1998 in the Shandong Province of China, CIP researchers found that adoption of virus-free seeds of sweetpotato increased yields by 30 percent, but this translated into an increase of total household income of farmers of only 1.6-3.6 percent. The larger share refers to the farmers of the poorer regions, while the smaller share refers to the farmers of the more prosperous regions.<sup>20</sup> The modest impact results from the small area of the farms planted to sweetpotato. Similarly, in a study of the economic impact of true potato seed in Vietnam, the authors found that new technologies increased agricultural and total household income by 1.9 percent and 1.2 percent, respectively.<sup>21</sup> These results suggest that the impact of new farm technologies produced by CIP have a progressive, although modest, impact on the distribution of income.

Although one of the missions of CGIAR centres is to reduce malnutrition, the Panel found only one study from CIP (see footnote 12) that tried to assess the impact of

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<sup>20</sup> Fuglie, Keith O. et al. 1999. *Economic impact of virus-free sweetpotato planting material in Shandong province, China* - CIP, Lima.

<sup>21</sup> Fuglie, K. et al. 2001. *The economic impact of true potato seed in Vietnam* - CIP, p. 21.

new technologies on the nutritional status of consumers. Similarly, none of the published studies tried to assess the impact on the nutrition of adopters, whether measured through dietary recall or through simple anthropometric indices. A subjective summary of 10 success stories of CIP-related technologies, however, suggests that the technologies had a modest effect in improving the incomes of women and a positive effect on health.<sup>22</sup> CIP has also started work on combating vitamin A deficiency in Africa by developing and promoting the use of orange-flesh varieties of sweetpotatoes that contain high  $\beta$ -carotene. Those studies are in progress and have not yet produced measurable results. However, they have the potential to have a large impact on the nutrition of women and children.<sup>23</sup> Monitoring nutritional effects will become increasingly important as the VITAA project on orange-fleshed sweetpotato receives more donor support.

CIP's most important work on the impact of new technologies on health has been carried out in northern Ecuador in a region of high production potential. It has focused on documenting the effect of using chemicals in potato production. That work was multidisciplinary and participatory, and measured outcomes before and after the intervention. The intervention consisted in training farmers by using fluorescent tracers on people in the household who applied and who did not apply chemicals so as to document the dangers of using chemicals in farming. That study shows a high impact at the local level; people in the study bought clothing to protect themselves against the dangers of chemicals.

#### **5.3.4.2 Assessment**

Studies of the impact of new technologies on other indicators of quality of life besides nutrition, such as time allocated to work and leisure by children and women, or school attendance and the school performance of children, would contribute in a direct way to the broader CGIAR mandate of helping to understand in a more comprehensive way how the research of CIP contributes to improving the plight of the poor. The Panel also recommends that CIP attempt to measure the impact of new technologies on the distribution of income, either within the household, village, or nation. The authors of the last EPMP made a similar suggestion (p. 37).

An impediment to assessing the impact of CIP's technology on human nutrition, gender, and other welfare issues is the proclivity of its social scientists to focus on farms as their unit of measurement instead of the household. More attention given to the household as an economic entity would substantially enrich the data gathered in survey efforts and expand the kind of analyses that can be done. Data gathered with a perspective of the new household economies as a guide would enable the researchers to throw more light on activities within the household and how they affect adoption, and on how off-farm labour market conditions affect the adoption of new technologies.

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<sup>22</sup> Walker, 2000. *Reasonable Expectations on the Prospects for Documenting the Impact of Agricultural Research on Poverty in Ex Post Case Studies*. Food Policy, 25 (515:530).

<sup>23</sup> Jan Low, Thomas Walker, and Robert Hijmans 2001. *The potential impact of orange-fleshed sweetpotatoes on vitamin A intake in Sub-Saharan Africa* - Unpublished paper, CIP.

### **5.3.5 Strengthening Social Science Capacity in NARS**

#### ***5.3.5.1 Achievements***

CIP has been successful in attracting special project funding which incorporates a significant capacity-building component for social science and participatory research. The UPWARD network in Asia builds capacity through a combination of small grants projects, which are monitored by UPWARD staff, and linked training workshops and courses that are held at regular intervals. (This programme was established through a special grant from the Dutch Government in 1989, was renewed for a second phase in 1994, and has continued to be funded annually through restricted core.) Over a thousand national researchers from eight Asian countries have benefited from this dual track capacity building approach in the last four years. Over the past two years, the demand for this type of capacity building has reached the point at which UPWARD now offers regular annual training courses, not only for Asian researchers but also for participants from other developing countries.

In Latin America, through the funding of country programmes in Bolivia and Ecuador, CIP social scientists have worked closely with national researchers to strengthen survey methodology, data analysis and the conduct of trials. Impact assessment of root and tuber crops is one of CIP's market niches in the training of NARS social and biological scientists. However, it appears that little has been done to strengthen social science capability in Sub-Saharan Africa.

#### ***5.3.5.2 Assessment***

Strengthening social science capability in the NARS is important and CIP should continue to mobilize resources for that purpose. It appears that in attempting to multiply their skills the social scientists at CIP are attempting to capitalize on what they do best. The Panel recommends that the kinds of programmes now available to social scientists through the UPWARD programme be extended to Sub-Saharan Africa. The Panel also believes that more attention should be given in all the strengthening programmes to improving the capacity to design and redesign new institutional arrangements, for these are the vehicles by which policy is changed.

### **5.4 The Future of the Social Sciences at CIP**

Like scientists in the other disciplines, the social scientists at CIP work under tremendous pressure – they have to manage projects, raise money, show visible results, satisfy donors, analyze results, and publish those results, at least some in refereed journals. The social scientists have the added disadvantage (for some purposes) of being allocated broadly across the multiple research programmes of the Centre. As a prelude to the last section on recommendations, the Panel in this section highlights areas it believes are in need of re-appraisal and possible strengthening by CIP as it looks to the future.

#### **5.4.1 Conceptual Framework**

For social scientists to work effectively as a team, they need to share a common conceptual framework about how households, firms, and individuals relate to each other and to the larger economy and society of which they are a part. That framework will

enable them to share a common language, and a common way of defining and thinking about the problems they address. It will also enable social scientists from different disciplines to generate synergy among themselves, and with the other scientists at the Centre. The Panel suspects, for example, that the absence of a macroeconomic perspective at CIP, and the lack of attention to consumers in impact assessment studies, are a result in part of the absence of a shared view of how improved farm technologies are expected to influence the economy as a whole. A firmer conceptual understanding of the impact of agricultural technologies on the rest of the economy, including on natural resources, and of how they contribute to economic growth and development could do a great deal to identify priorities for research and to link the projects so identified together. With such a conceptual framework the total output from the social scientists would have a better chance of being greater than the sum of the parts.

#### **5.4.2 Methods for Collecting Information**

CIP impact case studies are a good example of using the same approach to focus on a few key variables related to economic impact. Benefits are translated into US\$/ha, and these estimates from the *ex post* research also provide a perspective for priority setting. Several CIP social scientists are well versed in this form of project appraisal and as many as six have participated in presenting the approach to NARs scientists interested in impact assessment.

Nevertheless, CIP has not collected standardized field data. As a result, it has produced many valuable case studies that are difficult to compare. The absence of a common method for collecting and storing socioeconomic data makes it difficult to draw generalizations and maximize the impact of lessons learned. It is through generalizations drawn from comparative studies that CIP could have an influence far beyond the CGIAR system.

An important issue in making impact assessments is to have treatment and control “communities” and then to measure changes in the outcome from a common base. A randomized experimental research design does not necessarily have to be used to evaluate treatments – although such an approach should be used whenever possible since it would partially remove attribution bias. Instead, the Panel suggests that at the very least, impact assessments should have a baseline study and control samples. The Panel also recommends that the social scientists at CIP consider adopting some of the recent methodological advances that use experimental research design to evaluate high-profile public policy interventions.

The Panel feels that CIP needs a small clearing house for methods in the social sciences, staffed by an applied statistician in the behavioural sciences with experience in experimental research design. This person could advise CIP projects about such issues as strategies for sample selection, ideal sample size (given the budget constraint of the project), attrition bias, and self-selection biases. Each of these is likely to be common at CIP given the strongly participatory method of work used by its social scientists.

#### **5.4.3 Analysis**

The Panel believes the social sciences at CIP need to move beyond the case study approach. Case studies are valuable for understanding local constraints or for highlighting



success stories. However, they are not enough – or at least they need to be aggregated and compared with each other - to draw generalizations and broader lessons that will be of interest to the broader public and for addressing policy issues. Walker’s article (cited in footnote 13) is an example of a bold effort to compare case studies and draw generalizations. In that study Walker, drawing on his own personal, first-hand knowledge, compared the performance of 10 stellar CIP projects in reducing poverty. CIP needs to do more such studies, but with more objective, quantitative information and with more analytical rigor.

Given the paucity of rigorous studies of adoption and of assessments of new technologies, the Panel suggests that CIP narrow its focus on two of its lines of research. One of the first priorities should be to develop transparent guidelines on which technological diffusions to monitor, and which outcomes to measure (see below under “Information”). The present criteria of CIP for selecting projects for impact assessment seem sensible and simple and should be continued. Those criteria include: the expected size of the benefits and the novelty of the innovation or the likely outcome. For obvious reasons related to the demands of donors and to shrinking funds, CIP should increase the analytical rigor of its impact assessments. The second priority should be to carry out the analysis of national, regional, and global trends, and the analysis of science and technology policy in conjunction with IFPRI, building on the recent collaborative research initiative of using that institute’s IMPACT Model for projections, rather than doing this work exclusively at CIP.

#### **5.4.4 Information**

The data for social science analysis is scattered, uneven in quality, and difficult to compare across sites. CIP needs to have on its web page the best up-dated secondary information on basic indicators of success for the different nations. In particular, for developing nations and particularly for nations where CIP works, CIP should have clean, up-dated historic statistics on variables such as yields, real prices, share of expenditures on roots and tubers by income status, rates of return on agricultural research (from CIP’s various case studies), and percentage of national production (or area planted) attributable to CIP technologies. These data could be placed in the World Potato Atlas website that has been developed by CIP’s GIS specialist. Since most of this information is already available in secondary sources, the Panel encourages CIP to work more closely with (IFPRI, bilateral, and other multilateral) institutions that already collect such data. This would free CIP to focus on the collection and collation of primary information from the field, where its comparative advantage lies.

For those projects in which CIP decides to carry out an impact assessment the Panel suggests that a wide net be cast in terms of the outcomes to be measured, and for several reasons. First, most CGIAR centres, including CIP, have focused on measuring only agronomic outcomes and income. Although important as a first step, new technologies could have other, unanticipated impacts that merit research. The Panel realizes that IFPRI is doing a comparative analysis of non-orthodox indicators of quality of life likely to arise from the introduction of new farm technologies, but we believe that CIP could replicate and test IFPRI’s findings at little or no additional cost. Precisely because so little rigorous, *comparative* research has been done on the effect of new technologies on the quality of life of children and women, or on equity within the household or village, CIP could take a bold first step and position itself at the vanguard of

the CGIAR system in comparative studies of impact assessment. Second, casting the net widely will incur only modest additional costs. Having incurred the cost of having a surveyor measure yields or income, it is but a small step to ask a few additional questions about school attendance, take the height and weight of children, or ask about the time allocated to leisure. Obviously, any one of these outcomes could be expanded and deepened and require more resources. At this point the Panel is simply suggesting that various outcomes be measured in a simple yet accurate way.

A more ambitious approach is to focus more carefully on the household to understand in more depth what happens as new technology is adopted or new policies change the conditions under which the families operate. Such data are costly to obtain, but they can be very rich for understanding both the impact of the new technology and for understanding why it is not adopted if that is the case. An intermediate approach would be to hold a conference in which the results of previous household studies are reported and reviewed for lessons that might be used.

If the results of both the simple and more complex studies point to significant first round effects of the new technologies, then other researchers could develop more fine-grained instruments to measure the outcomes. The pay-offs of such an empirical exercise could be large. Suppose, for instance, that new technologies do not increase income, but lead to reduced demand for child labour and greater school attendance. Then, CIP could argue that its technology helped to reduce poverty, not necessarily by increasing income, but by lowering barriers to the education of children. CIP will be unable to find and estimate these links unless it decides to measure un-orthodox outcomes.

#### **5.4.5 People**

The key to the success of social science research at CIP will be the quality of the researchers CIP recruits and retains. The international social scientists at CIP work under pressure and many have been pushed to the role of project managers rather than being critical analysts – a concern that the authors of the last EPMR also raised (p. 37). The social scientists at CIP have served their biological scientist colleagues and the management of CIP exceedingly well. At the same time, they have contributed less in carving out their own niche as contributors in their own right to knowledge in the social sciences. Whether that can be changed will depend on whether CIP wants to change the role of the social scientists at CIP and in so doing recruit a different kind of social scientist.

### **5.5 Strengthening Social Science and Recommendations**

#### **5.5.1 Strengthening the Social Sciences at CIP**

CIP social scientists score high marks in generating information that has been potentially useful to biological scientists, research management, and donors. In fact, within the CGIAR system they excel in that regard. This admirable performance, however, has entailed a trade-off in not contributing at the frontier of more disciplinary-oriented social science research based on field survey methods.

In the next five years, the Panel believes that CIP social scientists should contribute more to the frontier of knowledge in their respective fields. The Panel also

believes they can do that in ways that do not detract or subtract from the contributions they are now making. In fact, the Panel believes that a new perspective will in fact enhance the contributions they are now making. The new perspective will essentially add a new dimension to their current work on science and technology policy, and strengthen their adoption work by taking a household perspective to what they do. These suggestions will enable them to capitalize on what they are now doing, and to build on their existing strengths.

The additional work in science and technology policy involves a more careful analysis of the resource-saving effects of the new technology produced by CIP and a parallel analysis of relative resource scarcity in the various regions in which CIP works. The differences between labour-abundant Asia and land-abundant Sub-Saharan Africa provide an excellent opportunity to study an issue that is pertinent to the entire CGIAR system. The analysis of the effects of the new technology on labour requirements at the farm level will be of interest in their right.

The new household economic perspective has been discussed above. However, the distinction between a farm operation perspective and a household perspective is important. If one wants to understand poverty and how new production technology can contribute to alleviating it, it is imperative that the role of off-farm activities in the income of the household and how the various members of the household participate in the off-farm labour market be researched.

**Recommendations** - The recommendations that follow are designed to move CIP closer to the type of work on the social sciences envisioned by the CGIAR's Technical Advisory Committee, as discussed in its publication cited below<sup>24</sup> and to allow CIP to capitalize on its comparative strengths. In particular, the Panel **recommends** that CIP does the following:

1. Because of the need to consider CIP's priorities on a continual basis, given constant changes in the external environment, the Panel **recommends** that the Centre continue the interactions of its social scientists with its biological and physical scientists, but with a broader involvement of partners and constituency groups.
2. Because science and technology policy is increasingly important in a resource constrained world, and because the economic conditions of adopting new technology varies so much from one part of the world to another, the Panel **recommends** that CIP reallocate its social science resources to do more research on science and technology policy issues.
3. Because of the potentially significant insights to be obtained from comparative studies of adoption and constraints, and because of the value attached to the results of such studies by the international donor community, the Panel **recommends** that CIP develop consistent frameworks for the collection and analysis of basic data on adoption and constraints (including household data), and strengthen the skills of the Centre in sophisticated statistical approaches required for the collection of such data.

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<sup>24</sup> *A Food Secure World For all. Toward a New Vision and Strategy for the CGIAR* (p. 33-35).

Several of these recommendations could be implemented in 2003 when the existing project on impact assessment and global commodity analysis is scheduled to end. These recommendations provide the building blocks for the development of a new project.

## CHAPTER 6 – PARTNERSHIPS AND CAPACITY BUILDING

Partnerships are covered in various chapters of this report as part of the project overviews. These partnerships are very important for CIP. About US\$2 million is budgeted in 2002 for more than 100 contracts with partners. These partnerships are very diverse but sometimes seem to be based more on personal relationships than to come from a coherent institutional framework. The Panel, therefore, attempts in this chapter to offer a framework for CIP to examine its current and prospective partnerships. The chapter also attempts to provide an overview of partnerships and to examine them from the perspective of CIP's overall objectives. The Centre has been partnering with other organizations from its inception but, although there is no precise comparative data over time, there seems to have been a clear upward shift in the mid 90s.

The chapter introduces first a framework for examining partnerships (sections 6.1, 6.2), then presents an overview of CIP's partnerships (sections 6.3, 6.7) and discusses Training and Publications (section 6.8) and Farmers Field Schools and Participatory Research (section 6.9).

### 6.1 Importance of Partnerships and Capacity Building for CIP

There are two major sets of reasons for which partnerships and capacity building is important for a Centre such as CIP: efficiency in the use of resources and effectiveness in terms of end results and impact.

*Efficiency* – The funding for agricultural research is becoming more problematic and the complexity and cost of conducting such research is increasing, especially in the biological fields. Constituting research teams that would cover all the required skills and expertise would be prohibitive even for the best-funded organizations. The alternative for a Centre such as CIP is to have a more limited, but world class, set of skills and to partner with other world class teams with complementary skills. This reduces cost, ensures the integration of CIP in the scientific community, facilitates the maintenance of the scientific competitiveness of the team, increases the chances of a breakthrough and has the added advantage of increasing the chances of obtaining collaborative funds when proposals are submitted jointly. The downside is that partnerships can have high transactions costs and those need to be weighed against expected benefits.

*Effectiveness* - The measure of CIP's success in reaching its goal of alleviating poverty and assuring food security will be the effectiveness of its research at the level of the ultimate beneficiary, whether poor farmer or poor consumer. This requires a transfer of technology which CIP is not equipped to achieve, and which it cannot hope to achieve without the help of appropriate, capable and carefully selected partners close to users. There is also a need for partnering, if only through effective communication, with public authorities and other influential parts of civil society to make sure that the economic, legal and fiscal environment is not an impediment to the goals CIP and the member countries are trying to reach. In addition, for impact to occur, whether through adoption of a new variety or new farming techniques, it is not sufficient to have a new technology to offer, or

a means to transfer it effectively, or the right environment; there also needs to be acceptance and buy-in before adoption occurs. Increasingly, and quite rightly, local communities want to be involved and have a say on what will affect them. How this process takes place will determine acceptance and this will vary from region to region. CIP will need the active involvement of local partners for this to occur.

## 6.2 Major Objectives for Partnerships at CIP

**Acquisition/Sharing of Expertise** - This is the simplest case of partnership since it is generally clear what CIP is looking for and where to obtain it. Partners are selected for their knowledge and expertise and for their ability, interest and willingness to share them. The difficult question is to determine which expertise CIP will need in the long-term future that it doesn't have now and where to obtain it.

**Technology Transfer** - In partnerships for technology transfer the potential partners are those involved in the technology transfer process in the country concerned. One can distinguish four types of partners: the Ministry of Agriculture, applied research organizations, extensions services, and farmer associations and/or ground level NGOs. Success for such partnerships will depend on: (a) carefully selecting a limited number of stable and reliable partners, i.e., partners who are likely to be present in the long haul, (b) involving the partners from the beginning of the process, and (c) obtaining the involvement of the people who have a stake in the objectives and results of the work or who are in key permanent positions, e.g., in the Ministry of Agriculture. Of course, for the transfer to occur, it is vital to ensure that the new technology can be easily used and that it is compatible with the daily constraints of the users. An examination of CIP's projects and of its strategy for training shows that these elements have been taken into consideration (e.g., IPM in Indonesia and the seed production system in China and Uganda).

**Network Launching** - In this type of partnership there is no specific recipe for success but there are two basic elements which CIP needs to clarify before the launch: the objective/nature of the network and CIP's exit strategy.

In CIP's portfolio there are two broad types of network with different objectives:

- *establish a link between people* to share expertise. This is more an issue of communication than collaboration or partnership hence the number of members or the nature of the organizations involved is not important. GILB is an example of such a network;
- *launch a consortium* for applied research and development on a broad subject that goes beyond CIP's expertise and that may include large social aspects. CONDESAN and SIUPA are examples of such networks. In these cases scientific partnerships are needed to cover areas outside CIP's expertise and others types of partnerships are needed with the local communities concerned so as to ensure a full, frank and pragmatic contribution.

With respect to exit strategy, CIP needs to think ahead of time when and how it will withdraw and make sure that structures are in place to ensure the long term financial and organizational viability of the network.

### 6.3 Advanced Research Institutions of the North

CIP currently collaborates with more than 50 research institutions and universities in the industrialized world. Most of CIP's research projects are involved in such scientific cooperation, which often rests on personal relations. Examples of high level collaborations are: Cornell University (genetic resources of root and tuber crops), University of Wisconsin (nutritional aspects of orange flesh sweet potato), Sainsbury Laboratory in Norwich (carbohydrate metabolism), Montana State University (policy decision support systems for agriculture), IPGRI and the Environmental System Research Institute in Redlands (geographic information system for mapping, management and spatial analysis of genetic resources data), CRP-CU Gabriel Lipman in Luxemburg (gene identification for resistance to late blight). Other partner institutions are located in, e.g., Australia, Canada, France, Germany, Great Britain, The Netherlands, New Zealand.

Comments received by the Panel from *past and current* CIP collaborators from the North are generally positive. Individual CIP scientists are described as highly motivated, responsive, collaborative and respectful of the contributions of the partners. As a Centre, CIP is considered attractive because of its rich collection of biological material (a "treasure") and because it represents a good base for linkage with the farmers through field trials.

### 6.4 Private Sector

Four kinds of private sector relationship are or will be relevant to CIP. Overall the Centre appears to be aware of the potential, but also the challenges, that are implicit in the formation of sustainable partnership with the private sector.

***National Private Sector*** - In many developing countries the private sector is not well established. For example, in Africa the seed market is largely undeveloped and the chain from primary producer to product development is fragmented. In parts of Latin America and Asia the private sector is developing rapidly with the establishment of small, medium and even large enterprises, including farmer co-operatives, playing an increasingly important role in the distribution of seeds and germplasm, and agronomic packages. In this situation the challenge facing CIP is to create relationships that are appropriate, sustainable and that generate revenue in an equitable manner.

***Multinational Private Sector*** - The multinational private sector also plays a role at the national level in seed markets, in particular. In that sense its role is similar to that of national companies, and it provides a channel for sustainable adoption of Centre innovations. However, the influence and power of the multinational private sector as a negotiating partner is quite different. CIP has entered into discussions with some large multinational companies with the goal of creating win-win situations in which CIP would benefit both from having research funded and having its research products disseminated and the company would gain by having access to competitive germplasm for commercialization. However, linking the rather different interests of these partners is not necessarily a smooth process. CIP might therefore consider alternative ways for engaging the private sector, possibly based on a "bidding system", which may be acceptable to a CGIAR Centre.

Within the private sector, agriculture is recognized as a knowledge- and information-based industry. The increased competitive environment has resulted in proprietary genes and more restricted technology access. There is also a trend towards more alliances and an evolving industry structure. Under these circumstances, negotiations with the private sector can be a frustrating experience that CIP is aware of. In theory there should be possibilities to negotiate the rights for segmented markets, assuming that the commodity for which the technology is applied will not enter international markets. Alternatively CIP can copy a technology intended to reach countries where patents do not apply. Finally CIP can invent around protected technologies, and join forces with other Centres and advanced research institute to do so.

In some cases the multinational private sector can provide a potential funding source for Centres. The Panel encourages CIP to develop new tactics for partnership with the private sector. It is now realistic for CIP to consider strategic alliances with the private sector to gain access to technology, but based on the principle of generating public goods. This kind of an arrangement may be more acceptable to the private sector, which is less interested in potato and sweetpotato than, for instance, in maize and wheat. Donating component technology could be an opportunity for the multinational companies to gain much needed positive publicity in the Ag-biotechnology arena. Licensing agreements or accepting any donated technology must explicitly allow uninhibited access of the product to the intended beneficiaries.

**Private Foundations** - Private foundations are seen by CIP as potential donors, and the Centre is tailoring its fund raising campaign towards these organizations. The Panel encourages innovative thinking in looking for non-traditional partners for research and associated funding.

## 6.5 National Agricultural Research Systems

CIP maintains very active and strong relations with NARS at headquarters and in the regions. CIP's last MTP shows that for the period 2000-2002 it has budgeted about 15% of its expenses to support NARS and network activities. Practically all of its projects are connected to NARS in various types of partnerships. Some examples of the partnerships that Panel Members were able to experience firsthand are given below.

The case of China perhaps illustrates best the significant impact CIP can have when working with strong partners. CIP works with about 20 different institutions in that country and its contribution to the development of potato and sweetpotato in China has been fully acknowledged through the "*award of friendship*", the highest award from the Chinese government for international cooperation. This contribution covered: germplasm (with resistance to diseases and pests, better yield and traits for quality, earliness), IPM technology, seed system technology (TPS), biotechnology (virus and disease detection and management), and pedagogy of the transfer process. A similar recognition has been given by Vietnam.

In Indonesia CIP works with several organizations, the main two being the Research Institute for Legumes and Tubers (RILET) and the Research Institute for Vegetables (RIV). Both institutes appreciate, and wish to further develop, the collaboration in areas such as germplasm, IPM technology and socio-economic research. In Uganda CIP staff has close relations with partners, including high-ranking government



officials, and appreciation was expressed for CIP's technical backstopping and formal and informal training. As a result, CIP's work is well grounded since a large share (40%) of sweet potato varieties in Uganda can be traced to its work. Worries about the future of the relationship were also expressed since CIP and the government seem to be suffering from funding shortfalls.

In Ecuador, there is a close and well appreciated relationship with INIAP, e.g., on plant breeding, Late Blight and farmer field schools (funded by FAO). As a result, INIAP's potato programme did not suffer while other programmes declined. INIAP very much wants the collaboration to continue.

CIP needs to adapt its relations to satisfy the needs of very different types of NARS. Some of them, especially in Asia and Latin America, have enough capacity and skilled human resources to carry out their own specialized research agenda. For example, Brazil's EMBRAPA has a budget of US\$ 500 M and 2,096 staff, of which 31% have a PhD. Argentina's INTA has a budget of US\$134 M and 1,015 staff, of which 13% have a PhD. In an open trade environment with market allocation of resources, stronger NARS tend to be market oriented and to give more attention to enhancing competitiveness. These NARS also need to focus on the identification of value-added products adapted to their consumers and commercial trends. From CIP these NARS expect scientific input, high level training, germplasm, and new expertise. Both CIP and these NARS could enhance their synergy by developing joint research proposals that might also stand better chances of funding.

CIP has been involved in establishing three major regional networks: PROCODEPA (Central America, The Caribbean and Mexico) PRAPACE (Eastern and Central Africa) and UPWARD (Asia) (see Chapter 4). These networks are focussed on enhancing the capabilities of the countries for a more sustainable production, producing better seeds, increasing productivity, processing and marketing. Participatory research and gender studies have been conducted within the framework of these networks.

Weaker NARS, instead, need more support in research and basic training. They are often more closely linked with extension services and farmers. In these cases CIP can expect increased impact through the Farmers Participatory Research/Farmers Field School system because it allows trials under local conditions which are vital for the adoption of the new varieties and methodologies.

Future contributions CIP should prepare itself to make in its relations with NARS may be difficult to obtain from the NARS themselves. When Asian NARS were asked by the Panel Members what their long term needs would be in their relations with CIP it was surprising that the answers remained within the areas of support currently provided by CIP. It was apparently difficult to envisage what the future requirements would be and therefore, what kind of technology or expertise CIP has to acquire to satisfy their needs.

A concern expressed by some collaborators in Africa was how CIP would integrate the demands of the NARS in the framework of the Challenge Programmes priority setting on the other hand and the regional priority setting on the other hand.

## 6.6 Non-governmental Organizations

Although NGOs are generally considered part of the NARS, we cover them separately in this chapter in view of their specific role in partnerships. Donors want to involve civil society in the CGIAR's work, especially those organizations that work more upstream with the farmers than the traditional formal research - extension systems. Indeed, a number of CIP projects or activities partner with national or international NGO's, e.g., CIP's project on the uptake of potato technologies (2A), CONDESAN, SIUPA, UPWARD and Papa Andina. IPM activities are also good examples of work with NGOs, through the farmer field schools. In the future these partnerships could increase, especially in projects dealing closer with the final users of research and technology. In many countries the extension services have been privatized and NGOs are increasingly filling this gap. NGOs also offer different views on how to approach poverty problems, on participation by different social segments of society and on NRM. Some NGOs focus on environmental management in the poorest sectors while others focus on methodologies and techniques for improving access to markets to maximize available resources and thus increase income. NGOs can help to increase field impact, support participatory research, develop improved connections with farmer's organizations, and submit collaborative proposal to donors. Some NGOs, however, tend to be less stable and less reliable thus increasing project risk. This needs to be taken into account when selecting partners for a project.

## 6.7 Systemwide and Regional Initiatives

CIP is involved in three major partnership arrangements: one network, Global Initiative on Late Blight (GILB) - Project G2; one Strategic Initiative on Urban and Peri-urban Agriculture (SIUPA) - Project G1; and one consortium created in 1993 - Project R1, called Consortium for Sustainable Development of the Andean Eco-region (CONDESAN). The latter is by far the most significant in terms of activities and resources. CIP also convenes The Global Mountain Programme and coordinates UPWARD, a special project on participatory research in Asia.

### 6.7.1 Global Initiative on Late Blight (GILB)

GILB was launched in 1996 as a specialised network to connect all the scientists working on Late Blight. Its objective is to exchange results and ideas, to promote joint collaborations and to improve Late Blight control in the world. This CIP initiative was received with great enthusiasm in the scientific community as attested by the success of the first project meeting in 1996 at CIP. A 1999 global conference on Late Blight gathered 165 participants from 40 countries. Another conference is scheduled to be held in Hamburg, Germany, in July 2002. At the end of 2001 GILB had 670 members. The network is activated through a web-site operated by CIP and a newsletter is published three times a year. Six regional linkage groups and four thematic groups were also established. An international comparative trial was conducted for 3 years in diverse agro-ecological situations and a collective study is in development on *Phytophthora infestans* population. Relevant research techniques and relevant scientific databases are linked to or are available on the GILB web-site.

GILB's 2002 budget is US\$ 158,000, all from unrestricted funds, but it faces funding problems in the coming years. The Panel believes that GILB is a network that

should be maintained and supported by CIP because its activities are core to CIP's mandate and because it gives CIP visibility in the scientific community. Future plans should strive to enhance or at minimum stabilize GILB's financial position. Proposals are being developed to that effect.

### **6.7.2 Strategic Initiative on Urban and Peri-Urban Agriculture (SIUPA)**

CIP is the Convening Centre for SIUPA that was formed in 1999 with a US\$500,000 contribution from the CGIAR. SIUPA was established to improve the security of the food supply and the income of poor populations living in the outskirts of large cities or in peri-urban areas. SIUPA cooperates with around 40 institutions, donor agencies, NGO's, local governments and five other CGIAR Centres. It is focused on food supply and health problems. SIUPA has three major objectives in relation to urban and peri-urban agriculture: (i) contribute to enhanced food security, improved nutrition and higher incomes, (ii) reduce the negative environmental impact of UPA, and (iii) enhance its positive potential as an essential component of sustainable cities. In this respect it is working on four issues: production, marketing and utilization of perishables and tree products; agriculture and urban livelihoods; health and environmental impacts of urban agriculture; and agricultural and non-agricultural use of urban resources. CIP has budgeted US\$158,000 for SIUPA for 2002

This global and regional network of about 40 partners has developed a research programme that is responsive to regional priorities and at the same time addresses themes of global significance. It has established research and development "anchor sites" in Southeast Asia (Vietnam, Indonesia, Philippines) and in Sub-Saharan Africa (Nairobi, Cameroon). In Peru it has a project with the Instituto de Nutrición which links production and processing of sweet potato for supplementary child nutrition. SIUPA has submitted different funding proposals for about US\$500,000 as well as a first idea for a CGIAR Challenge Programme.

Since the bulk of the work is carried out in Asia and Africa but out of headquarters, SIUPA generates high transaction costs for CIP. The Panel suggests that CIP consider moving the seat of SIUPA to a country nearer to the heart of its activities.

### **6.7.3 Consortium for Sustainable Development of the Andean Eco-region (CONDESAN)**

CIP is the convening Centre for this eco-regional partnership which was created to coordinate the actions of a large number of organizations and institutions working on research and development for the sustainable management of natural resources, specifically those located in the mountain areas of the Andes. CONDESAN is discussed extensively in Chapter 4. At present it groups some 58 very diverse organizations (NGOs, NARS, regional universities, ARIs and IARCs) working in common to improve rural income, social equity and the management of natural resources.

CONDESAN is a nodal point where the views and expertise of diverse partners working on watersheds are combined and integrated in a plethora of activities, e.g., resource management at different levels, rural development, social coordination, cooperation with local governments, small scale economic activities. The work is concentrated mainly in pilot sites situated above 2,000 meters in the Andes mountains:

Merida in Venezuela, Manizales in Colombia, Carchi in Ecuador, Cajamarca and Puno in Peru, Cochabamba in Bolivia and Jujuy in Argentina. The consortium also manages an electronic network, InfoAndina, which helps to connect its members and other parties interested in social problems and natural resources (currently about 800 subscribers).

The CONDESAN concept is original and covers two distinct types of activities. First it is a development project which carries out specific activities. Second, CONDESAN is a way to promote common views, exchanges, and field work in trans-Andean topics and work in benchmark watersheds. This is done in a participatory, bottom-up approach involving willing parties. CONDESAN is a dynamic type of partnership that includes active, passive and prospective members who may operate their own projects and who change their role in the partnership depending on whether or not they are performing joint activities at a given point in time.

Since 2001 CONDESAN has become independent from CIP's NRM Project, although the coordinator, the deputy coordinator and the Info Andina administrator are CIP staff and CIP's DG is a member of the CONDESAN Board. For 2002, CIP devoted US\$1.7 million of its budget to CONDESAN, about 7.6% of its total budget.

CONDESAN, in close relation with the Integrated Natural Resource Management in Mountain Agro-ecosystems Project, can make an important contribution by unifying field experiences under a common theoretical, conceptual and methodological framework. This will enable it to be more influential in policy making. Nevertheless, the Panel is concerned that CONDESAN may have too many and too diverse a set of activities, thus diluting its possible impact. The Panel suggests that CONDESAN and its partners identify the key issues to focus on and examine how the diverse components fit with each other, and that CIP examine its scientific and methodological role in the Consortium

#### **6.7.4 Other Systemwide Initiatives**

CIP is the convening Centre in two systemwide initiatives (GMP; see Chapter 4, and SIUPA; see Chapter 6) and the coordinator of the regional consortium CONDESAN (see Chapters 4 and 6). In addition, CIP is involved in several other systemwide initiatives, which are briefly discussed below. It was not possible for the Panel to go in depth into assessing CIP's role in each of these initiatives. At the outset it would seem that they provide a rational linkage between CIP and other CGIAR Centres and partners outside the CGIAR. CIP's participation in the research programmes derives from its core competencies. However, it would seem that additional funding for CIP through the systemwide programmes has not been substantial.

**Central Asia and Caucasus Regional Programme (CACRP)** - CIP's involvement in this ICARDA-led initiative is justified by the fact that potatoes are a very important commodity in the targeted region. CIP contributes to the programme through training in disease detection and seed production, in particular. Germplasm evaluation and variety improvement are additional areas of activity. Through the consortium CIP has obtained approximately US\$160,000 of the CGIAR. CIP's further involvement in, for instance, establishing potato seed programmes in some of the countries in the region is dependent on success in obtaining special funding. Some collaborators observed that CIP's involvement in this programme has been weakening.

**Participatory Research and Gender Analysis (PRGA)** - CIP is an affiliated member of PRGA and a participant in its steering committee. CIP's activities financially supported by PRGA, since its initiation in 1998, have included evaluation of the impact of participatory methods in Peru and assistance to participatory breeding in Bolivia through a national research organization. PRGA's financial contribution was a grant of US\$ 36,000 and financing a training workshop. PRGA has also supported CIP's own participatory research on late blight and IPM. CIP's experience in terms of methodology and results has been recognised by PRGA and is used for providing justification for continued external funding for this systemwide initiative.

**Rice-Wheat Consortium for the Indo Gangetic Plains** - CIP's role focuses on the deployment of potato as an alternative to wheat in rice-wheat cropping systems. CIP is responsible for the field site in Bihar, India and works collaboratively in several other sites. Support for CIP-related activities is equivalent to \$42,000 per year, mainly in the form of operating budget for on-farm research. CIP's direct investment in the project is equivalent to 10% of the time of the regional representative for SWA and about 50% of the time of one regionally-based, nationally-hired agronomist.

**Systemwide Genetic Resources Programme (SGRP)** - CIP has been involved in SGRP from its inception. Through SGRP, CIP has obtained funding for participation in the meetings of the Inter-Centre Working Group on Genetic Resources (ICWG-GR) and to attend and organise specialised workshops. SGRP is also a forum for collaborative projects among Centres. The Global Conservation Trust, initiated by SGRP and FAO in connection with the International Treaty on Genetic Resources for Food and Agriculture, is expected to strengthen genetic resources management at Centres and enhance fundraising from non-traditional sources. There has been financial support for acquiring hardware and software, and for salaries of database managers/programmers. Total financial support so far approaches US\$ 100,000.

**Systemwide Information Network for Genetic Resources (SINGER)** - SINGER, which is part of SGRP, has provided support for improving the databases of Centres' genetic resources. The compiled CGIAR wide genetic holdings database includes data from CIP, which was one of the first Centres to be actively involved in SINGER. CIP has contributed to SINGER by helping to set standards for relatively low cost technology for the network. Both financial support in acquiring hardware and software and pressure from SINGER have helped CIP to consolidate its data into a single database which subsequently has allowed CIP to address data quality issues, and implement the workflow system related to germplasm management. Recent advances, supported by SINGER, have included compilation of a single database for the Asian sweetpotato germplasm collection and establishing the DIVA-GIS and related MapServer website.

**Systemwide Livestock Programme (SLP)** - CIP is involved in SLP through its NRM activities. It has contributed to the research in two areas, modelling mixed crop-livestock systems and in virtual laboratories. CIP has received US\$ 833,100 for two small grants and two research projects, which are implemented with local partners in Peru, Bolivia and Tibet, and co-executed with the Global Mountain Programme (GMP). CIP is participating in SLP's governance and management as a member in the Livestock Programme Group.

**Systemwide Programme on Integrated Pest Management (SP-IPM)** - CIP has been involved in SP-IPM since the beginning in 1996. The aim of the programme is to engage the Centres in an effort to make IPM the preferred crop protection strategy for farmers around the world. CIP is a coordinator of two out of the total of 11 on-going projects within SP-IPM, namely the “Farmer participatory research – IPM task force” and “IPM impact assessment”. CIP will also co-ordinate the planned “Global Initiative on Leafminer Flies”.

**Systemwide Programme on Collective Action and Property Rights (CAPRI)** - CIP has participated in the steering committees meetings and provided information to the Centre-wide project inventory. Research related to the themes of this initiative has been limited. Technologies for which group action is most important are those related to the integrated management of bacterial wilt particularly those dealing with the production and movement of seed.

**The African Highlands Initiative (AHI)** - CIP implements the GMP through ecoregional programmes, one of which is AHI in East Africa. CIP has been a partner in AHI since 1992. Potato and sweetpotato are cultivated in the densely populated, intensively cultivated highlands above 1500 m, which are in AHI’s focus. During the first phase, 1995-1997, CIP contributed to organising the IPM component and did research on bacterial wilt, the management of which, in order to be effective, requires reaching all the way to the community management of watersheds. The research, which was collaborative with CIAT and NARS scientists, provided a link between the commodity research and NRM. In the second phase, 1998-2001, the focus shifted to testing methodologies for participatory NRM on various scales. Two of the AHI benchmark sites in Uganda and Ethiopia are also sites for an IFAD-funded project on FFS for potato late blight and seed management. During the third phase, CIP envisages broadening of the agenda in farmer field schools and community-based seed systems to complement CIP’s core research. CIP considers AHI as the principal entry point for field activities in NRM in eastern and central Africa. CIP has had AHI funding for a research fellow during six years.

## **6.8 Training and Publications**

### **6.8.1 Training**

#### ***6.8.1.1 Objectives and Strategy***

The objectives of training at CIP, as described in CIP’s training vision are to “*be a vehicle for interaction, input and collaboration with a wide range of partners enabling the Centre to achieve its mandate. ... create effective mechanisms for the introduction of technologies to achieve sustainable improvements in the productivity and utilization of CIP’s mandate crops, and in the management of natural resources in the developing world. ... create an international network of highly capable research scientists..*”. In 1999 CIP’s Board approved a new training strategy which integrated training fully with the research programme. According to this strategy, training is a mechanism to enable CIP to streamline research priorities, enhance capabilities for faster and more adequate collaborative technology development, facilitate community-level adaptation of improved technologies, and bridge with current and future partners.

The impact is attained through three channels: strengthening capacity for independent research, improving training skills to create a multiplier effect, and contributing to CIP's global community of interest. Training is targeted for research scientists from national programmes, extensionists, practitioners working at community level and technical personnel working in industrial setting.

#### ***6.8.1.2 Organization and Processes***

The training staff at CIP consists of a unit chief, a distance education technologist, a training assistant and an events coordinator. Training is operated on a three-year rolling plan according to (a) research priorities, (b) CIP's comparative advantage and (c) national programme needs and capabilities. Project staff, with input from regional representatives and national staff, is primarily responsible for proposing the plan of activities. Training staff manages and guides the training process, including maintenance of a database, while the training itself and its learning contents are the responsibility of research staff. The programme pays attention to developing the instructor skills of both internationally and nationally recruited staff. Training materials are available on the Internet for the recurrent courses.

#### ***6.8.1.3 Developments and Achievements in Training***

CIP's training programme is divided into two categories: the development and enhancement of research skills and capacity building for sustainable production. It is provided for groups and for individuals (degree and non-degree training) at headquarters and regions. CIP also facilitates training in other institutions.

Training at CIP has remained responsive to the needs of the stakeholders and seeks to match these with the specific goals of the projects. Two elements have guided the way training has evolved at CIP. First, it has aimed to facilitate the delivery of research results and, second, to strengthen the national technical and scientific capacity. Both principles are geared towards increasing the impact of research on end users. The programme has been consistently at the service of the institutional goals of CIP. An example is the support that training will provide this year (2002) to help expand the area cultivated with CIP derived potato varieties, a specific goal of Project 2A (Uptake and utilization of improved potato production technologies). The strategy is to give particular emphasis to themes relevant for reaching this goal.

Between 1995 and 2001, 10,187 persons were trained in group courses (Table 6.1). In addition, about 40 persons per year, on average, received individual training, mostly during short training period at CIP headquarters (Table 6.2). The participants include researchers, extension agents, educators, and specialists in agrobusiness. The fluctuation between years is due to a difference in the number of short courses (1-7 days), in particular. Trainees from the NARS have formed the largest group receiving training at CIP, followed by participants from universities and trainees from NGOs, the latter group being very small.

**Table 6.1 – Length, Attendance and Location of CIP Group Training Courses  
1995-2001**

	1995	1996	1997	1998	1999	2000	2001	Total
<b>Length of course</b>								
< 8 Days	29	34	56	45	43	32	32	271
8-31 Days	17	18	14	5	7	14	3	78
> 1 Month	1	0	0	2	0	0	0	3
No of participants	1108	1125	2744	1428	1447	1138	1197	10187
% Women	18	16	16	16	19	24	29	
<b>Location</b>								
Latin America	24	37	49	30	20	18	11	199
Peru	15	30	38	26	13	10	17	149
Others	9	7	11	4	7	8	4	50
Africa	14	7	15	13	8	15	4	76
Asia	10	7	6	9	20	11	9	72
Total	48	51	70	52	48	44	34	347
% Decentralised	68.8	41.2	45.7	50	72.9	77.3	50	

A positive feature of CIP's group training is that a large part is decentralised to the regions (Table 6.1). CIP is a member of the IARC/NARS Training Group in Africa, which aims at coordinating training provided by the CGIAR Centres and the regional partners. The tendency is to offer the more advanced training at headquarters, while the more practical subjects, such as production, IPM and seed multiplication, are given in partnership with national programmes. Individual training is provided mostly at CIP headquarters. Participants going through individual training have mostly come from Latin America. There has also been relatively high participation in individual training from Asia, but the number of African trainees has been nearly zero during the recent years. This is partly due to the fact that in Africa there is less demand on the type of specialised upstream training offered by CIP and that there are alternative opportunities in Europe at lower cost. The proportion of women receiving individual training in 1995-2001 has decreased from what it was in 1990-1995 (34.4% vs. 30.8%) although it remained high in Latin America (some 40%). There has also been a gradual increase in the proportion of women attending group training during the two last years (Table 6.1).



**Table 6.2 – Regional Distribution and Gender Division in Individual Training  
1995-2001**

Region	Year							No of participants	Women
	1995	1996	1997	1998	1999	2000	2001		
Latin America	27	24	29	20	12	37	15	164	43.3%
Africa	11	12	10				2	35	16.7%
Asia	4	6	8	11	10	16	21	76	10.5%
Total in Developing	42	42	47	31	22	53	38	275	30.8%
Men	27	33	29	20	17	37	27	190	
Women	15	9	18	11	5	16	11	85	

CIP regularly provides courses on IPM, Late Blight, and general aspects of crop protection. During the 1990s the Centre has gradually moved towards more specialised topics in training. The number of courses on production and seed multiplication has diminished. The new themes introduced during the very recent years are more social science oriented, including participatory methods, farmer field school, socioeconomics, marketing and nutrition. New themes also include molecular biology and genetic transformation. The training materials provided by CIP come in many different forms serving CIP's efforts to establish information technology assisted training methods as an effective means of reaching clients globally.

#### **6.8.1.4 Assessment**

CIP's training programme has traditionally been one of the strongest points in CIP's partnership activities. It has helped increase the influence of the Centre among scientists and experts in the Regions. A study made in the NARS in the 1980s identified CIP's training as a key contribution.

The programme has strong positive characteristics. It has evolved dynamically over time along with the shifting importance of subject matters in the Centre; it has used modern methodological tools; it has been effective in the dissemination of research conducted by CIP; it has adequately identified the changing demands of the users, which has also helped other projects keep up to date with the national and regional demands; and it has promoted coordination between projects.

The Panel commends CIP for aligning its training activities with the research projects and thus providing it status and visibility that has been acknowledged by the NARS. CIP has been in the forefront of developing and testing technology assisted training methods, including distance learning. Evaluation and monitoring is built into CIP's training strategy and the Panel encourages CIP to carry this out systematically. It is now even more important to monitor the success and quality of the new training methods, to learn from the experiences, and to share these experiences with other Centres.

## 6.8.2 Publications

### 6.8.2.1 Library

CIP's library has a collection of 12,000 books and these highly specialized in potato, and Andean root and tuber crops. They also maintain subscriptions to some 50 journals. As the areas CIP is involved with have increased, users would like the selection of books and journals to be broadened.

The main clients of the library are CIP's staff and the students and professors from Universidad Agraria La Molina. An internal survey of users on the quality of the library, which a significant proportion of IRS and NRS researchers answered, was conducted in 2001. The results indicate that the responding users are generally satisfied with the services of the library in support of their scientific work and that efficiency has increased through the use of electronic media. However, there was a view that services had been reduced because of budget cuts since the late 1980s

### 6.8.2.2 Publications

One aspect of the quality of science is the quality and relevance of the publications disseminated by the institution. Table 6.3 describes the types of publications, distribution and target audiences. This issue is further elaborated on in Chapter 7 – Cross-cutting Issues.

**Table 6.3 – Publications at CIP**

<b>Publications</b>	<b>Print run</b>	<b>Audience</b>
<i>1. Institutional documents:</i>		
Medium Term Plan, Programme and Budget, Annual Report,	Around 150	Internal, CGIAR
	Around 1500	
<i>2. Technical publications</i>		
	Around 500	Scientists, Libraries
<i>3. Programme report</i>		
	2,250	Donors, Partners, Libraries
<i>4. Proceedings</i>		
	Variable	Participants and others
<i>5. Books</i>		
Potatoes of South America: Peru, Bolivia (En., Sp.)	3,000	Specialists
Potatoes, treasure of the Andes (En., Sp.)	3,000	General public

The Panel is concerned that there is no publications policy and that decisions are made independently in different parts of the organization: some are made by the DDG of Research, some by the Departments and some by the DG's Office. The Panel realizes that these publications have different objectives and target audiences but the result is that there is no coherent approach to CIP's external image. There would be merit in constituting an Editorial Committee which would propose a policy; define standards of publications for the appropriate media; define marketing and media strategies; propose a multi-year publications programme; and ensure implementation of the above.

As an example of what CIP publishes a bi-annual Programme Report that describes in detail results of the Centre's scientific work. In view of the fact that home publications are not considered refereed, the Panel feels that it would have more impact for CIP if the excellent articles which constitute the Programme Report were submitted by their authors to refereed journals and the Programme Report made into a compilation of abstracts of said articles. Most scientific organizations nowadays seem to follow such publication strategy.

## **6.9 Farmer Field Schools and Participatory Research**

At the same time CIP was providing training to NARS it was also involved in participatory research and training at the ground level. Participatory research at CIP is founded on the conceptual framework established by the FAO-FFS programme. CIP is widely using Farmer Field Schools (FFS) to successfully train field technicians and farmers in different countries. FFS is an informal way of training adults, based on the principle that farmers have broad field knowledge and experience. The programme is focused on basic elements of agriculture and ecological practices and works through participatory research combined with the practical experience of farmers. The programmes for trainers and farmers are based on the growth stage of the crops and last one full crop cycle. This means that the crop provides the focal point for learning and that the farmers can immediately translate this learning in practice on their own farms. With their newly acquired knowledge farmers become better clients of the extension services and can be more discerning with respect to training.

Participatory research has been largely implemented since the eighties in rice IPM and adapted by CIP to potato and sweet potato. For IPM and integrated management of late blight the methodology gave excellent results. The 2000 CIP programme report mentioned a paper on the evaluation of potato genotype through pilot scale farmer field school in the Peruvian Andes. The paper presents some of the technical results of experiments conducted by groups of farmers participating in FPR-FFS and shows that time was saved in adoption of new varieties and access for the researchers to an extended number of ecological situations improved.

Another example comes from the IPM project in Africa and Indonesia. In that case, the FFS methodology is applied in its original conceptual framework, including the integration of agro-ecosystem components, disciplines, methodologies. It is participatory at all stages and has four distinct phases: needs and opportunity assessment, technology development, learning model development (FFS) and institutionalization, monitoring and evaluation of IPM-FFS. The monitoring and evaluation phase uses five indicators: financial capital, human capital, social capital, environment capital, institutional capital. Participants in the programme have a 24% higher net income than non-participants and they show a behavioral change in terms of field sanitation practice and use of pesticide. The whole process is supported by a number of technical books and leaflets in local languages.

Farmer Field Schools and participatory research have proved to be successful approaches in technology diffusion, especially in plant protection, in different regions: Asia, Africa and Latin America. In the framework of sustainable agriculture a more ecological concept is needed and CIP's scientists are working along those lines. The Panel

suggests that CIP examine whether the concept and methodology of FFS could be adapted to the area of NRM.

### **6.10 Overall Assessment**

Partnerships have been a key in CIP's approach since its inception. CIP's collaboration with its set of diverse partners is well done and has produced solid results on the ground. Collaborators the Panel consulted or spoke to were generally satisfied with the nature and quality of the relationships and agreed that CIP has a lot to offer. The training programme, in particular, is impressive.

The Panel commends CIP for its efforts in this area. It suggests, however, that CIP's partnerships could be even more effective if they were anchored in a more coherent and better defined strategy based on the framework outlined at the beginning of this chapter. Such a strategy would help (a) clarify the reasons for entering partnerships, (b) select the appropriate partners, (c) clarify the respective expectations of the partners and the conditions under which the partnership will be carried out.

Because of the opportunities for partnership are overwhelming and tend to lead the Centre in multiple directions, the Panel **recommends** that CIP formulates a strategy for how to engage in different types of partnerships, including the private sector.

## CHAPTER 7 - CROSS-CUTTING ISSUES

This chapter deals with the following cross-cutting issues: (1) intellectual property rights, (2) transgenic crops and biosafety, (3) public education on controversial issues, (4) impact on women's livelihood, (5) CIP as a regional Centre, (6) research quality assurance, and (7) fund raising.

### 7.1 Intellectual Property Rights

Intellectual Property Rights (IPR) have become more prominent in recent times due to the increased value attached to technology, processes and products. Although IPR is often associated with increasing income streams for an organization, IPR issues can also inhibit collaboration with various partners e.g., NARS, ARIs and potentially the Private sector. It is therefore essential that organizations actively manage IPR within their research programmes. The main areas of IPR concern within CIP are: genetic resources held in trust, patent violation, IPR and patenting of research arising from CIP activities together with access and transfer of CIP germplasm.

It is clear that CIP has carefully considered its IP position and developed its first policy statement on the sharing and benefits of CIP-generated technology in February 1998. The DDG-R office also compiled a book in November 1998 "Genetic Resources, Biotechnology and Intellectual Property Rights" which articulates the Centre's position on these topics. Subsequently an external audit was conducted and approved by CIP management committee in October 1999. This audit concluded that CIP should be commended on developing a series of protocols and procedures to address IP issues. The audit identified few significant concerns but made 17 recommendations.

CIP has made good progress in developing an IPR database that includes legal arrangements for donor-funded activities. Several databases have been constructed including; germplasm held in trust by CIP, proprietary and or genetic material used by CIP researchers and proprietary technology being used by CIP researchers. The genetic resources information system also provides an efficient means of tracking germplasm flow with appropriate materials transfer agreements (MTA).

CIP will consider acquiring IPR on Centre-generated products only for the purpose of keeping such products in the public domain and protecting the access of developing country researchers and producers.

One patent is currently pending<sup>25</sup>. Patents are potentially costly to file and protect. Hence if the purpose of acquiring IPR on Centre generated products is to protect access for developing country researchers and producers then the Panel suggest that the simpler solution would be to publish the findings.

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<sup>25</sup> Provisional application at the Patent and Trademark Office of the USA (June 04, 2001). Title: "Selecting genetically transformed plant cells from introducing the *dhdps-r1* gene, a mutant from of the *dihydrodipicolinase synthase (dhdps)* gene from *Nicotiana sylvestris* RAEC1".

Overall the Panel feels that the audit commissioned in 1999 provides an excellent basis for creating the appropriate IP culture at CIP.

## **7.2 Transgenic Crops and Biosafety at CIP and the Regions**

CIP is playing a leadership role in the development of transgenic approaches and associated biosafety standards in Latin America. This dual role of providing technical information and advice to policy makers in Peru and neighbouring countries is of critical importance. Training also appears to be an important element.

All activities related to the use of genetically modified organisms at CIP are subject to safety regulations to guarantee proper protection of the environment, including human health. CIP has extensive experience in handling transformed plants for both international exchange and in-house production and management under greenhouse and field conditions. The Centre has adopted internal guidelines to ensure the safe handling of transgenic plants, which have been endorsed by the Peruvian Ministry of Agriculture. A law was enacted in 1999 to prevent the risks associated with the use of genetically modified organisms, and now regulates the use of transformed plants. CIP adopts a precautionary approach in all operations involving transformed plants.

CIP has built a unique biosafety facility in Peru and probably in Latin America to conduct greenhouse experiments on genetically modified organisms. This facility is composed of 8 cubicles fully isolated from the environment and independent from each other with respect to temperature, humidity and illumination. Waste from each cubicle is treated independently and fluids are first chemically treated before passing on a sandy filter to end up in ordinary sewage. All solid materials are autoclaved within the facility before being eliminated.

All work associated with transgenic crops is carried out in accordance with the International Convention on Biological Diversity, as well as to the highest international standards regarding the use of intellectual property and genetically modified organisms.

CIP is involved in discussions with the Government of Peru on the final details/guidelines for the release of transgenic crops. The staff involved is to be commended for their effort in this area. The financial sustainability of the biosafety facility is a cause for concern.

## **7.3 Public Education on Controversial Issues**

New technology almost always raises questions from society - witness the Luddites of the past. In today's world, questions about the impact of the new biological technology are increasingly raised. Similarly, there is concern that we live on a small planet and that the actions of men and women may influence the evolution of the environment in deleterious ways.

There tends to be polarization of positions on these issues. At the one extreme are those who believe science has the answer to all questions and that therefore there should be no concern for the future. At the other extreme are those who believe new knowledge

can often be dangerous and have negative effects on both the population and the environment.

The Panel believes CIP has a responsibility to help educate the public on controversial issues that derive from its programmes. For example, it is the Panel's view that CIP should be an advocate for the responsible deployment of technology, such as transgenics, in the developing world. It is also important that CIP is in a position to communicate independent advice on controversial issues such as transgenic biology. Helping to erase the uncertainty in the public's mind about these issues will help engender public support for CIP, while making a contribution to general public education.

The Panel believes CIP can contribute with two modest initiatives.

The first would be to develop educational material that would help build confidence in genetically engineered products, that would explain IPR issues, and that would explain legislation and constraints in particular countries. This material should also explain the basis of many of the arguments against genetically engineered products.

The second initiative would be to develop a communication programme that would deliver the above material in short, accurate, and easily understandable forms. This material should be made available to the media, and also CIP's research community and partners.

#### **7.4 Impact on Women's Livelihood**

The issue of gender as a possible modifier in priority setting was discussed at the time the priority setting methodology was developed. Ultimately, gender did not figure as a modifier because of lack of adequate data and because of methodological difficulties. Nevertheless, gender is a factor considered in several projects, in particular those related to sweetpotato, and in several countries, notably in Vietnam and Indonesia.

CIP's most intensive effort to target interventions towards women in farming households took place in two districts of Western Kenya where vitamin A deficiency is common and where orange-fleshed sweetpotato have been identified as the least expensive year round dietary source of this micronutrient<sup>26</sup>. In this region, sweetpotato are a woman's crop. Therefore, women's groups were singled out as the appropriate unit for intervention, and this work was funded by the International Centre for Research on Women (ICRW). More than 700 female care givers were interviewed with one young child selected at random from each household. Women received education on the role of vitamin A in the diets of both children and adults. The main objective of the study was to identify orange-fleshed sweetpotato varieties with high yield and high acceptability of appearance and taste that are appropriate for consumption by adults and young children. The study lasted for three years and featured baseline, pre-intervention, and post-intervention questionnaires with three seasonal planting of new orange-fleshed sweetpotato varieties. The evaluation of the study was also published by the ICRW in their

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<sup>26</sup> Low, J., P. Kinyae, S. Gichuki, M. Anyango Oyunga, V. Hagenimana, and J. Kabira. 1997. *Combating Vitamin A Deficiency Through the Use of Sweetpotato*. Lima: CIP. 110 p.

research report series<sup>27</sup>. A representative of the ICRW is a member of the Steering Committee of the VITAA Project.

## 7.5 CIP as a Regional Centre

The Panel addressed the issue of CIP possibly becoming a regional Centre for the Andes and concluded that limiting the Centre to such a perspective would be too confining, especially in light of the role of potato and sweetpotato in other parts of the world. On the other hand, CIP's NRM research concentrates on the mountain ecosystems of the Andean region. Similarly, CIAT's NRM research focuses on the tropical region of Latin America, with some emphasis on the lower altitudes and the hillslopes, especially in Central America. This could be a basis for CIP and CIAT to collaborate more closely in the area of NRM on an ecoregional basis, with focal points in the Andean and Central American regions. In that case, CIAT would concentrate on the lower altitudes and CIP on the higher altitudes. The crop mandates of both Centres complement each other and would add value to the production system research of each of the Centres. It should be noted that some of the methodologies and technologies coming out of the ecoregional NRM research may be relevant to other regions in the world and therefore the participation of both Centres in systemwide initiatives, such as the Global Mountain Programme convened by CIP should be encouraged.

The Panel believes that, in general, CIP should build on its existing relations with CIAT in constructive ways that strengthen the programmes of both Centres while at the same time economizing on resources for both Centres. The most significant step the Panel feels that might be taken is to consider the possibility of joint hires between the two Centres, as is now the case with one IRS. Such hires may make it possible to add intellectual strengths to both Centres and their programmes at a reduced cost. The issue of accountability and performance evaluation needs to be considered carefully in making such a decision, however.

It goes without saying that the recommendation to work more closely with CIAT does not exclude forming closer ties with IPGRI, ILRI, IFPRI or other CGIAR Centres.

## 7.6 Research Quality Assurance

This is traditionally a difficult area to evaluate, particularly for an organization such as CIP which has a wide range of disciplines which span strategic and applied research. Fundamentally, publication of findings is an essential part of research and is an important criterion for evaluating scientific quality. Publications do not arise in a vacuum and often reflect the Institute's culture, priority setting and ethos. Indeed, professional recognition is a powerful motivator and key to maintaining staff morale. Scientific publishing also provides a peer reviewed system of recognising scientific achievements and can catalyse scientific collaborations.

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<sup>27</sup> Hagenimana, V., M.A. Oyunga, J. Low, S.M. Njoroge, S.T. Gichuki, and J. Kabira. 1999. *The Effects of Women Farmers' Adoption of Orange-Fleshed Sweet Potatoes: Raising Vitamin A Intake in Kenya*. Washington, D.C.: International Centre for Research on Women.



The current EPMR had a more difficult task than expected in evaluating the quality and productivity of the science at CIP. To make a realistic evaluation the following would be required:

- A complete list of publications for the period by category (refereed journal, book, conference paper) that identifies authors and their contributions.
- Science citation indices.
- Evidence of other scientific outputs, e.g., software, varieties, patents.
- Measures of esteem for IRS.

Unfortunately, much of this information was not readily available to the Panel and this hampered its ability to address the issue of science quality and productivity in a comprehensive manner.

Within CIP a Programme Management Team (PMT) has been established and is charged with advising the DDG-R on matters of programme oversight and policy. In addition, the PMT uses a Project Evaluation, Monitoring and Assessment (PEMA) approach to evaluate and monitor projects and to assess the overall status of the programme. CIP is to be commended for establishing an administrative structure that focuses on these issues. However, the Panel found it difficult to understand what mechanisms are in place to assure science quality and the setting of exacting standards. The Panel senses that the main focus is on monitoring internal milestones, structural organization and the raising of funds, rather than assuring the efficient use of existing funds. This in turn may compromise science quality to the long-term detriment of CIP.

CIP scientists published 0.63 (Crop Improvement and Protection), 0.74 (NRM) and 0.83 (Social Science) journal articles per annum per IRS during the review period. Comparative statistics are notoriously difficult to interpret but can often provide a yardstick against which one can measure relative performance. Almost 10 years ago (1993) the average CGIAR scientist published 0.58 journal articles per annum. However, more up to date information (95-97) from ILRI suggests much higher average rates per ILRI-scientist: 2.48 refereed articles per annum. Within the Crop Improvement Division of IITA an average of 1.60 refereed articles were published per year between 1995 and 1999. Although these examples may represent the more extreme end of the distribution within the CGIAR they do emphasise the demanding expectations being set in internationally competitive research organizations. Refereed publications only provide one metric of performance. Significant lists of achievements presented for each project obviously provide evidence of productivity in these areas.

The Panel strongly encourages CIP to place more emphasis on the reporting of original research and to identify a portfolio of priority journals that can be targeted on a regular basis for submission of refereed manuscripts. Acceptance of publications by such journals is a measure of quality of research, and will be increasingly important as CIP researchers seek outside funding. In addition, CCERs or ICERs could be used to enable peer review and scientific quality assessment. This would of course require that the TORs specifically cover the quality of science issues. It does not appear as if past CCERs or ICERs addressed quality of science in any detail. Members of the Board could also be encouraged to reinforce CIP's scientific quality assurance. Attendance of CIP staff at

scientific meetings should also be encouraged and used as an incentive for staff to present and publish their findings.

Because of the need to enhance CIPs' scientific reputation and ability to compete more effectively for external funding, the Panel **recommends** that the Institute encourage more frequent publications in refereed scientific journals and set more demanding annual publication performance targets.

## **7.7 Fund Raising**

CIP has of necessity been giving more emphasis to raising funds to support its research and educational programmes. It is conscious of making the public more aware of its contributions, has identified staff to concentrate on helping raise funds from outside sources, has encouraged staff to actively pursue outside funding, and has hired professionals to help write grant proposals. The Panel believes these are all steps in the right direction.

Raising the resources to sustain priority programmes in the Centre will be an increasingly important challenge in the future, however. There is no evidence that support from the donor countries of the past will grow in the future. If anything, it may actually decline. The same applies to the World Bank, who has already sent signals to indicate that funding from that source may decline substantially in the future.

The CGIAR system is giving considerable thought to this issue, and has committed itself to a fund-raising effort through its Future Harvest programme. Renaming the Centres "Future Harvest" Centres is a step in that direction. How that programme will evolve, and how productive and effective it will be is yet to be seen. CIP needs to take its own future in its hands and make a serious commitment to fund raising that could support a significant share of its research.

An important key to successful fund-raising is to make the public and potential donors aware of CIP's activities. It is fair to say that most IARCs are only now beginning to think about public awareness, how to do it effectively, and how it differs from the more standard communication programme. Public awareness is especially important for the IARCs, for the bulk of their funding will need to come in the future from the now-developed countries, and these are the parts of the world that probably know least about their work. The central Future Harvest programme is working on this issue, and has made some promising starts. However, there will still be a significant role to be played by CIP specifically for potato and sweetpotato research.

The Panel believes that CIP should think of its fund-raising efforts as involving three components:

- **Private and Semi-Public Organizations**

The Panel believes that most attention should be given to this area in the near future, in part because there is much lost ground to be made up. To move forward in this area the Panel believes that CIP should hire a high quality development officer. This should be a person who is knowledgeable about international funding sources, especially the private sector and major philanthropic foundations. To do this effectively, this person

has to have a lot of presence and charisma, and be sensitive to the importance of public awareness issues. In fact, many organizations imbed the development and public awareness function in the same person.

The person filling this position should be able to understand CIP's programmes so as to communicate them effectively, and be able to work effectively with colleagues. That means to travel with the DG and scientists to assist them in making their case for their project. An important asset for this person will be one or more proposal writer(s).

Two initiatives are essential for moving ahead in this area. The first is a "market" survey of the potential for fund raising and the form in which it might be raised. The second is to develop a strategy for fund raising based on that survey. Future Harvest at the system level will be doing market surveys to identify potential donors and the form in which they might contribute. The part that is unique to CIP will have to be done internally.

- **Present Donors**

In the future the individual IARCs will probably have to work more effectively with the current donors of the system to sustain present contributions. There is a public awareness function in this case as well, especially as the goals of the system have to be more effectively promoted among government representatives and the public in the country they represent.

The Panel suggests that this function be retained with the Director General, as it has been handled in the past. However, with a quality development officer in residence that person may be able to assist the DG in preparing material for and developing a strategy for such sessions.

- **Developing Country Governments and Donors**

The Panel suggests that CIP devote more effort to attracting funding from governments in the developing countries. Some members of the Panel were impressed with the importance attached by representatives of the developing countries of the services they received from CIP. The Panel suggests that CIP try to capitalise more effectively on the credibility they have with the developing countries and persuade the representatives of those countries to in essence purchase the services of CIP. The Panel suggests that the DG play the central role in further developing this source of funding.

Because traditional sources of funding for CIP's activities are drying up, and because additional outside funding is needed if the Centre is to attract quality professionals to contribute to its activities, the Panel **recommends** that CIP reallocate resources from its management staff to hire a competent international development officer, and use the leadership of that officer, together with a marketing survey, to develop a strategic plan for increasing its external funding.

## CHAPTER 8 – FINANCE

CIP's financial position deteriorated significantly over the recent past mainly, like in other CGIAR centres, because of a reduction in unrestricted funding. Consequently, budget cuts are being implemented. While CIP has competent accounting staff and a newly-recruited Chief Financial Officer, some changes are necessary in the areas of financial controls, systems and procedures.

### 8.1 Financial Resources

During most of the period under review, CIP's income has been on a declining trend, from US\$ 23.3M in 1995 to US\$ 19.0M in 2001, a 19% decline (see Table 8.1). The change has been almost entirely due to a 32% reduction in unrestricted income, from US\$ 12.7M to US\$ 8.7M. Restricted income is slightly lower than in 1995 in absolute terms but now represents 53% of total income (vs. 45% in 1995). This is about average in the CGIAR. Expenses, on the other hand, did not decrease correspondingly (-12%) thus resulting in significant operating deficits in two of the last three years: US\$ 1.3M in 1999 and US\$ 1M in 2001, with a further US\$ 1.3M deficit projected for 2002. The Operating Fund, which had been very low at the beginning of the period, was replenished in 2000 by the sale of CIP's aircraft and a special CGIAR allocation; however, it is projected to fall again below US\$ 1M at the end of 2002 (Exhibit 8.1). CIP's Operating Fund is significantly lower than that of other CGIAR Centres. As already mentioned in the previous EP MR report, its replenishment will require constant attention from management and the Board.

Over the period (1995-2001), resource allocation to research (including the DDG Research's Office) decreased by 16.5% (Table 8.2) but remained at 70 to 74% of total expenditures (Table 8.3). In contrast, expenditures on general administration (referred to as research management in CIP) have increased by 9%, a worrying trend, and now represent 12% of total expenditures (vs. 9% in 1995); these expenditures, however, include contingency funds and fund raising allocations. Excluding such funds, Research Management Expenditure represented 10% of total expenditures in 2001. This still means that no progress has been made in answering the previous EP MR's recommendation that, in relative terms, expenditures on research should increase and expenditures on administration should decrease.

Overall expenditures on personnel decreased as much as income (-19%) but this was due entirely to a decrease in the Nationally Recruited Staff category (Table 8.4). Expenditures on Internationally Recruited Staff merely returned in 2001 to their 1995 level. Personnel expenditures now represent 47% of total expenditures (vs. 50% in 1995). The distribution of expenses by major categories, as indicated in Table 8.4, is about average for the CGIAR.

**Table 8.1 - CIP - Income and Expenses  
in US\$ million**

	1995 Actual	1996 Actual	1997 Actual	1998 Actual	1999 Actual	2000 Actual	2001 Actual	% Change 2001/1995	2002 Budget
<b>Income</b>									
Unrestricted	12.7	12.4	12.2	13.0	11.2	10.3	8.7	-31.5%	8.3
Restricted	10.4	11.7	10.1	9.0	8.6	9.9	10.0	-3.8%	11.6
	<b>23.1</b>	<b>24.1</b>	<b>22.3</b>	<b>22.0</b>	<b>19.8</b>	<b>20.2</b>	<b>18.7</b>	<b>-19.0%</b>	<b>19.9</b>
Other Income	0.2	0.2	0.4	0.4	0.4	0.5	0.3		0.3
Special Allocation									
CGIAR Special Allocation						0.8			
Aircraft sale	-	-	-	-	-	1.8	-		-
	<b>0.2</b>	<b>0.2</b>	<b>0.4</b>	<b>0.4</b>	<b>0.4</b>	<b>3.1</b>	<b>0.3</b>		<b>0.3</b>
	<b>23.3</b>	<b>24.3</b>	<b>22.7</b>	<b>22.4</b>	<b>20.2</b>	<b>23.3</b>	<b>19.0</b>	<b>-18.5%</b>	<b>20.2</b>
<b>% of Restricted to Total Income</b>	<b>45%</b>	<b>48%</b>	<b>44%</b>	<b>40%</b>	<b>43%</b>	<b>42%</b>	<b>53%</b>		<b>57%</b>
<b>Expenses</b>									
<b>Operations</b>									
Unrestricted	12.8	12.6	12.9	12.9	13.1	10.7	10.2	-20.3%	10.3
Indirect Cost Recovery	(1.1)	(1.1)	(1.0)	(1.0)	(0.9)	(0.6)	(0.7)	-36.4%	(0.9)
	<b>11.7</b>	<b>11.5</b>	<b>11.9</b>	<b>11.9</b>	<b>12.2</b>	<b>10.1</b>	<b>9.5</b>	<b>-18.8%</b>	<b>9.4</b>
Restricted	10.4	11.7	10.1	9.0	8.6	9.9	10.0	-3.8%	11.6
Capital / Depreciation	0.7	0.7	0.7	0.7	0.7	0.5	0.5	-28.6%	0.5
	<b>22.8</b>	<b>23.9</b>	<b>22.7</b>	<b>21.6</b>	<b>21.5</b>	<b>20.5</b>	<b>20.0</b>	<b>-12.3%</b>	<b>21.5</b>
<b>Capital Fund</b>		<b>0.1</b>		<b>0.4</b>					
<b>Operating Fund (Deficit)</b>	<b>0.5</b>	<b>0.3</b>	-	<b>0.4</b>		<b>2.8</b>		-	
					<b>(1.3)</b>		<b>(1.0)</b>		<b>(1.3)</b>
<b>Operating Fund Balance</b>	<b>0.8</b>	<b>1.1</b>	<b>1.1</b>	<b>1.5</b>	<b>0.2</b>	<b>3.0</b>	<b>2.0</b>	-	<b>0.7</b>
Operating fund days	11	15	15	23	3	46	38		13

**Table 8.2 - CIP - Expenses by Cost Centre  
in US\$ million**

	1995 Actual	1996 Actual	1997 Actual	1998 Actual	1999 Actual	2000 Actual	2001 Actual	% Change 2001/1995	2002 Budget
Research (1)	17.6	18.7	17.4	16.3	16.1	15.3	14.7	-16.5%	16.2
Training (2)	0.7	0.7	0.7	0.7	0.7	0.5	0.5	-28.6%	0.4
Information (3)	0.9	0.9	0.9	0.9	0.9	0.8	0.8	-11.1%	0.8
Research Management (4)	2.2	2.2	2.2	2.2	2.2	2.3	2.4	9.1%	2.6
Operations (5)	1.8	1.8	1.8	1.8	1.8	1.7	1.8	0.0%	1.7
Exchange rate - Variation									0.2
Capital / Depreciation	0.7	0.7	0.7	0.7	0.7	0.5	0.5	-28.6%	0.5
	<b>23.9</b>	<b>25.0</b>	<b>23.7</b>	<b>22.6</b>	<b>22.4</b>	<b>21.1</b>	<b>20.7</b>	-13.4%	<b>22.4</b>
Operating & Capital Fund	0.5	0.4	-	0.8	-	2.8	-		-
	<b>24.4</b>	<b>25.4</b>	<b>23.7</b>	<b>23.4</b>	<b>22.4</b>	<b>23.9</b>	<b>20.7</b>	-15.2%	<b>22.4</b>

**Table 8.3 - CIP - Distribution of Expenses by Cost Centre  
in Percentage**

	1995 Actual	1996 Actual	1997 Actual	1998 Actual	1999 Actual	2000 Actual	2001 Actual	2002 Budget
Research	72%	74%	73%	70%	72%	64%	71%	72%
Training	3%	3%	3%	3%	3%	2%	2%	2%
Information	4%	4%	4%	4%	4%	3%	4%	4%
Research Management	9%	9%	9%	9%	10%	10%	12%	12%
Operations	7%	7%	8%	8%	8%	7%	9%	8%
Exchange rate - Variation								1%
Capital / Depreciation	3%	3%	3%	3%	3%	2%	2%	2%
	<b>98%</b>	<b>98%</b>	<b>100%</b>	<b>97%</b>	<b>100%</b>	<b>88%</b>	<b>100%</b>	<b>100%</b>
Operating & Capital Fund	2%	2%		3%		12%		
	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

(1) Includes Office of DDG Research, Office of Director of International Cooperation, labs, experimental stations, regional administration and technical cooperation.

(2) Does not include training and development of CIP staff.

(3) Includes Library, Communications and Information Technology Units.

(4) Includes Board of Trustees, Office of the DG, Office of the DDG Fin. & Admin., Finance, Human Resources, Public Awareness, External relations, Logistics Unit, Travel Office. Starting in 2001 this includes provisions for fund-raising and contingency for approximately US\$ 400,000.

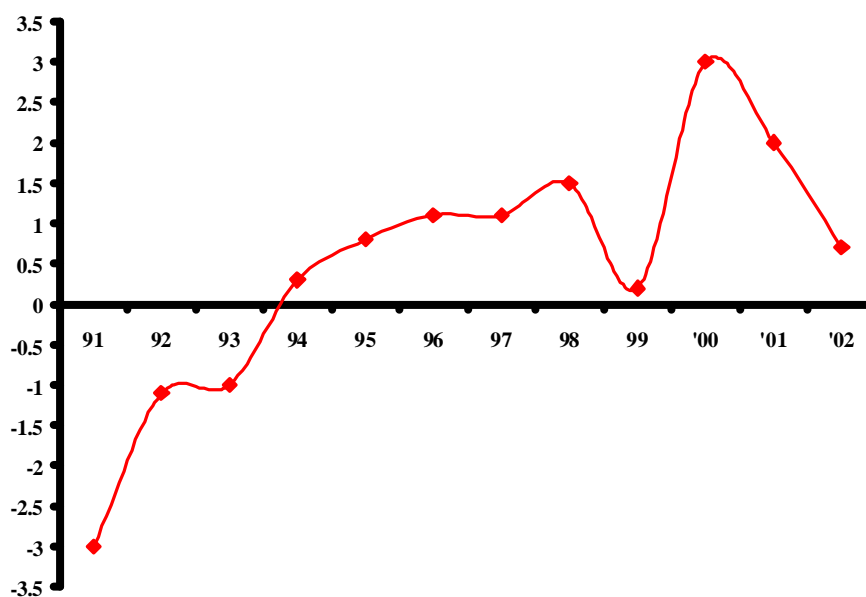
(5) General Services Office: Motor Pool, Maintenance, Security, Guest House, Reception, Lodging & Food and General Expenses.

**Table 8.4 - CIP Expenses by Major Categories  
in US\$ million**

	1995		2001	
	US\$	%	US\$	%
<b>Personnel</b>				
IRS	5.3	22	5.3	26
LRS – HQ	4.2	18	3.8	18
LRS – Regions	<u>2.5</u>	<u>10</u>	<u>0.6</u>	<u>3</u>
Total	<b>12.0</b>	<b>50</b>	<b>9.7</b>	<b>47</b>
Travel	3.1	13	1.7	8
Supplies	2.3	10	1.9	9
Services	5.5	23	6.7	32
Capital	<u>0.3</u>	<u>1</u>	<u>0.2</u>	<u>1</u>
	<b>23.2</b>	<b>97</b>	<b>20.2</b>	<b>98</b>
Capital / Depreciation	<u>0.7</u>	<u>3</u>	<u>0.5</u>	<u>2</u>
	<b>23.9</b>	<b>100</b>	<b>20.7</b>	<b>100</b>
Operating & Capital Fund	<u>0.5</u>		-	
	<b>24.4</b>		<b>20.7</b>	

In order to balance its budget in 2003, CIP is currently implementing a budget cutting programme with the objective of achieving US\$ 0.3M savings in 2002 and US\$ 1.5M savings in 2003, US\$ 1M of which in research and US\$ 0.5M in research support and administrative and financial services. While the targets for reduction were set by CIP management, the process of identifying potential savings was participatory. In the research area project managers were asked for their suggestions and in the non-research areas working groups were constituted to come up with recommendations for savings. As a result, management has been reviewing, simplifying and integrating processes or services and has started a process of outsourcing other services (e.g., motor pool, printshop). This initiative is to be commended, and management should continue to examine other outsourcing options in order to save costs and improve efficiencies. However, care should be taken to outsource only non-strategic services for which skills and expertise is easily available locally so that providers can be put in competition or so that an internal capability can be easily reconstituted should the outside providers fail to live up to expectations. It should be noted that some of these measures had been suggested close to seven years ago by the previous EPMP and could have been implemented earlier. To alleviate this funding crisis, CIP has also stepped up, with some success, its efforts in fund-raising. This is discussed elsewhere in this report.

**Exhibit 8.1 – CIP Operating Fund**  
**Actual 1991 – 2001, Estimated 2002**



**in US\$ millions.**

Operating fund days	4	11	15	15	23	3	46	38	13
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The Panel strongly encourages CIP to continue its efforts in controlling its costs and raising funds but the Panel is concerned that the efforts at cost control are made mostly by continuing to shave at the margin in each area, to the point of risking to fall below critical mass, rather than maintaining a contingency plan which would include a well thought-through cost reduction strategy involving tough choices, possibly dropping or severely curtailing some activities or projects, and linked to CIP's overall priority setting exercise.

## **8.2 Financial Controls**

While CIP has a competent accounting staff and the recent appointment of a newly-recruited Chief Financial Officer has considerably enhanced the Department's competencies, its external audit arrangements, its internal audit capability and its staffing practices are less than adequate for a centre of its size, however.

### **8.2.1 External Auditing**

One important measure of the 'quality' and 'completeness' of an external audit is the substance of the accompanying Management Letter, where the auditors offer comments and advice on current practices and suggest improvements where appropriate. The last two Management Letters (for the periods 1999 and 2000) had little by way of substance - with no recommendations or even suggestions as to possible improvements. Yet the Panel believes that there is good reason for a number of substantive improvements that should, and can quickly be made to enhance financial security, including enhancements to CIP's Financial Information System (CIPFIS). One would have expected



external auditors to have picked up on these deficiencies and reported same to the Board. They did not.

Further, it is customary for the external auditors to conduct surprise audits of cash and other key items throughout the year under review. No such external audits have been performed, although the accounting department has done cash audits twice a year and other audits upon request of the CFO and the DDG F/A. Such information has been provided to the external auditors. The Panel is concerned that the current External Auditors may have become too close to, and familiar with CIP, and rely too heavily on its CIPFIS to be truly independent and effective as required by their mandate. This is of special concern since, following a consolidation between Coopers & Lybrand (CIP's early audit firm) and Price Waterhouse, the same Partner has serviced the CIP account for at least six years.

Because of the need to retain a healthy distance between the Centre and its External Auditor, the Panel **recommends** that the Board of Trustees change CIP's External Auditor at the conclusion of the current end-of-year audit/reporting cycle, and every 3-5 years thereafter.

### **8.2.2 Internal Auditing**

CIP does not have a full-time internal audit function. However, the accounting department performs, from time to time, internal assessments of various actions and procedures. These assessments led Centre management to bring in external experts for advice on such matters as travel expenditure, pension, human resources matters or cost-saving opportunities. This initiative is to be commended, but the approach does not typically provide the organization with a 'watchdog' capability - one that can focus on every day activities and controls in key areas (such as supplies or inventories) that fall outside the purview of the external audit remit, but must nevertheless be examined on a routine basis by someone who builds upon, and extends the scope of an institutional knowledge over time.

As will be noted below, CIPFIS does have an excellent set of accounting controls built into the system but, while they are good and necessary, they do not provide the added level of control that is available through the use of an independent, knowledgeable expert who takes time to review how things are done, why they are being done in a certain way, and where there are opportunities for improved controls and/or reduction in risk of fraud and/or misappropriation of assets.

To build this audit capability, and yet to save costs, the Panel suggests that CIP engage the services of a recently retired, experienced auditor (perhaps from a large multi-national company or audit firm with offices in Lima) on a less-than-full time basis to conduct such audits as may be decided by the Director General or the Board.

### **8.2.3 Accounting Staff Procedures**

In any accounting department there is always the enhanced risk of fraud since it is this staff that is directly responsible for exercising control over money, data entry, and the integrity of the systems--running the checks and balances built into the accounting systems and procedures. In order to minimize the opportunities for fraud, accounting departments

typically adopt a number of personnel-related practices that, together, improve the controls over possible irregularities. In CIP one such practice should be adopted as soon as possible. Every accounting staff member should take his/her annual leave entitlement for a minimum of two consecutive weeks each year, and such leave should be taken over the end/commencement of an accounting period (typically one week before, and one week after the end of a month) so that a different staff member is responsible for data entry during that critical accounting period.

Although potential for fraud and abuse is always present in any organization, it does not appear to have happened at CIP. This is a credit to the systems and to the people running them. Nevertheless, it is good practice, from time to time, to review control practices and procedures to prevent fraud.

The previous EMPR noted that CIP was not following CGIAR guidelines in the presentation of some areas of accounting and financial statements and urged management to remedy that situation. The Panel is pleased to note that CIP is now in compliance with CGIAR financial reporting guidelines.

### **8.3 Financial Reporting and Budget Monitoring**

CIP's Financial Information System (CIPFIS) was developed internally at CIP at a relatively low cost and it has an excellent design and good functionality - *as an accounting system*. However, it is not a true 'financial' information system as currently thought of in the financial community and, compared to good financial systems, it lacks many important features. For example, CIPFIS:

- (i) has no commitment system to record and track forward expenditures;
- (ii) has a capital asset acquisition module that does not yet record and track capital expenditures that have been made, but not yet delivered (although this module is in the process of being upgraded);
- (iii) has no cost/benefit analysis capabilities; and
- (iv) does not utilize time recording to capture and allocate CIP's major expenditures, i.e. salaries and benefits that account for almost half of CIP's total expenditures thus negating the opportunity for meaningful budget-vs-actual analyses and management reporting of same.

While CIPFIS is technologically very advanced (for example, it is possible to scan original documents, such as invoices, into the data base and extract the information again if necessary, and it is web-based for easy access everywhere in the world), it is only partially integrated into other CIP systems such as purchasing and warehouse. It was developed for accounting and budget purposes and is being upgraded to serve basic business processes (e.g., planning, budgeting, and control).

Absent a management information system that captures all expenses and commitments on a timely basis, and absent a system that provides the necessary cost/benefit analytical capability (i.e., at least the capability to relate the total cost of major research activities to their global output), it falls to the senior management team and the accounting staff to generate reports that give, at the aggregate level, a picture of where CIP

is at any point in time. The shortcomings of CIPFIS in this regard may, at least partly, contribute to CIP's difficulty in adjusting its costs to its decreasing revenues.

The problem is that Project and Activity/Task leaders—the people with budget and line-item responsibilities—have no accurate, up-to-date way to track and analyze how well they are doing on each project in time to make the significant changes that may be required to stay within budget, or to re-direct the course of the project. In addition, they do not have access to a full and transparent picture of their project's budget and costs. They have flexibility to rearrange their priorities and shift their expenses from one category to another within their budget allocation. However, that allocation does not include about 50% of the costs, i.e. personnel costs. Hence it is difficult to make people accountable and cost conscious when they only have access to partial information and control over partial expenditures. An improved CIPFIS which would provide the required data would go a long way towards (a) giving managers, at all levels, the capability to more accurately budget for, and control, expenditures, and (b) making them accountable for their management of these resources. The competency to undertake this management task, however, will have to be inculcated in each manager over the next year or so. Along the same lines, CIP management should not only provide its staff and managers incentives for successfully raising funds but also incentives for efficiently managing the activity they are accountable for; i.e., a manager who finishes the year under budget because of his/her efforts at cost-consciousness should not be punished by seeing his/her next budget being cut correspondingly (as is often the case in many organizations), but should be allowed to carry over all or part of these savings, as is done in some CGIAR Centres. Other means can be considered such as bonuses, public recognition, etc.

CIP's new Chief Financial Officer has made the enhancement of CIPFIS into a business process-driven Management Information System (as distinct from an accounting system) a major priority with early deadlines for achieving significant upgrades. The Panel strongly endorses such changes. Because of the need to give managers the ability to cost-efficiently conduct their business, the Panel **recommends** that the required changes to transform CIPFIS into a fully-fledged Management Information System be completed as soon as possible; and that managers at all levels then be given access to complete and transparent budgetary information on the activities they are accountable for, and that CIP management devise incentives to encourage and increase cost-consciousness and efficiency.

The Panel further suggests that the Chief Financial Officer be asked to take the lead in training CIP staff (at all manager levels) in good business practices—once the underlying information is made available, and the Board make the achievement of such changes a major measure of the Director-General's performance.

## CHAPTER 9 – GOVERNANCE AND MANAGEMENT

### 9.1 Governance

#### 9.1.1 Board Structure, Composition and Meetings

According to its Statutes, CIP's Board of Trustees is composed of "not less than ten persons" but, in practice, has consisted of 12 members. The Director General of CIP is the only *ex officio* member of the Board. The Board has two representatives of the host country, one proposed by the Minister of Agriculture and the other proposed by the National Agriculture University La Molina (in recognition of its key role in the creation of CIP). Three members are proposed by the CGIAR. The remaining six members are selected by the Board itself.

Board members are elected for a three-year term which can be renewed once (or more "under conditions of exceptional circumstances"). These limitations do not apply to the Director general nor to the host country representatives. The Board Chair and Vice-Chair are elected for a two-year term renewable once. CIP's Deputy Director General for Finance and Administration serves as Secretary to the Board. The Board and its committees meet in ordinary session once a year at headquarters for one full week. Board members are expected to be present the full week and are so instructed by the Board Chair. The Board meeting is generally preceded by visits of Board members to various CIP sites and Board members report on their visit to the full Board.

The composition of the Board, with gender, nationality, discipline, term in office and committee responsibility of each Board member, is indicated in table 9.1 for the period since the last EPMR. No more than two members can be of the same nationality (not counting the Director General). At the time of its March 2001 meeting the Board had a good regional balance and a very respectable gender balance (one-third women). In terms of background, the Board could have more financial, private sector, management, and human resources expertise, all, preferably, with knowledge of modern life sciences. However, the small size of the Board is a restricting factor in this respect.

#### 9.1.2 Board Committees

The Board is organized into four traditional committees: Executive, Programme, Audit and Nominations. The composition of the committees and their roles is stipulated in CIP's Amended Statutes as well as in the Board Handbook which are given to all Board members.

## International Potato Centre (CIP) - Board Members 1995-2001<sup>28</sup>

Name	Board Committees	Gender	Nationality	Discipline	Nominated by	Start	End
Lindsay Innes	M-PC, C-BOT, M-EC, C-NC, C-AC	M	United Kingdom	Genetics	Board	05/01/1988	04/30/1995
Raven, Klaus	M-AC, V-BOT, C-AC, C-NC, M-EC	M	Peru	Entomology	Member Co	03/01/1990	02/04/2000†
Toshihiro Kajiwara	M-AC	M	Japan	Plant Pathology	Board	04/01/1990	03/31/1996
Setijati Sastrapradja	M-NC, C-PC, M-EC	F	Indonesia	Botany	CGIAR	05/01/1990	04/30/1997
K.L. Chadha	M-EC, C-AC, C-NC	M	India	Horticulture	Board	05/01/1990	04/30/1997
Durward Bateman	M-PC, C-PC, M-EC	M	United States	Plant Pathology	Board	04/01/1991	03/31/1997
Zandstra, Hubert George	M-EC, M-NC	M	Canada	Agronomy	Ex-Officio	05/01/1991	indef
Alfonso Cerrate	M-PC	M	Peru	Plant Breeding	Member Co	04/15/1992	04/30/1995
Schilde, Lieselotte	M-PC, M-NC	F	Germany	Biotechnology/Microbiology	CGIAR	03/01/1993	02/28/1999
ter Kuile, Martha	C-BOT, C-AC, C-NC, C-EC	F	Canada	Administration	Board	05/01/1993	08/26/1997
Moise Mensah	M-NC, M-PC	M	Benin	Economics	Board	05/01/1994	04/30/1997
Verhoeff, Koenraad	M-PC, V-BOT, M-EC, C-AC, C-NC	M	Netherlands	Plant Pathol./Ecology/ Research Mgmt.	Board	03/01/1995	03/30/2001
Fajardo-Christen, Adrian	M-PC, V-BOT, M-EC, C-AC, C-NC	M	Peru	Economics	Member Co	03/01/1996	09/09/1998
Kaneda,Chukichi	M-PC, M-AC	M	Japan	Plant Breeding	Board	03/01/1996	02/28/2002
Xuan, Vo Tong	M-PC	M	Vietnam	Agronomy/Farming Systems (NRM)	Board	03/01/1996	01/27/2000
Barcena, Alicia	M-NC, M-PC	F	Mexico	Ecology/Environment/ Public Admin.	CGIAR	03/01/1997	02/29/2000
Chowdhury, M.Sujayet Ullah	M-AC	M	Bangladesh	Microbiology	Board	03/01/1997	03/14/2001†
MacKenzie, David Robert	C-BOT, C-EC, M-NC	M	United States	Plant Breeding	Board	03/01/1997	02/29/2003
Sengooba, Theresa	M-PC	F	Uganda	Agronomy	Board	03/01/1997	02/29/2003
Wang, Ren	M-PC, C-AC, C-NC, M-EC, V-BOT	M	China	Entomology	CGIAR	03/01/1997	01/19/2000
Takahashi, Josefina	M-PC	F	Peru	Plant Pathology	Member Co	09/10/1998	09/09/2001
Pehu, Eija	M-PC, C-PC, M-EC	F	Finland	Plant Breeding	CGIAR	03/01/1999	02/28/2002
Olcese, Orlando	M-PC, M-AC	M	Peru	Biochemistry	Member Co	03/27/2000	03/31/2003
Godfrey, James	M-PC, C-AC	M	United Kingdom	Agricultural Entrepreneur	Board	04/14/2000	03/31/2003
Kim, Kang-kwun	V-BOT, M-EC, M-PC, C-NC, M-AC	M	Korea, Republic	Horticulture	CGIAR	08/01/2000	03/31/2003
Swaminathan, Madhura	M-PC	F	India	Economics	Board	03/31/2001	03/31/2004

<sup>28</sup> Notes: Board Committees – Acronyms

C ? Chair  
M ? Member  
NC ? Nominating Committee

BOT ? Board of Trustees  
EC ? Executive Committee  
PC ? Programme Committee

Nominated by

V ? Vice Chair  
AC ? Audit Committee  
Ex-Officio ? In their official capacity  
Term Dates – End

Member Co ? Nominated by the Host Government  
indef ? The term end-date is indefinite.

†Deceased

*The Executive Committee* is composed of the Board Chair and Vice-Chair, the Chair of the Programme Committee and the Director-General. It generally meets twice a year. Its secretary is the Board Secretary. The terms of reference of the Executive Committee also cover the supervision of CIP's finances. As is the case in other Boards, there is some overlap between discussions held in the Executive Committee and those held in full Board meetings, but that is because CIP's Board does discuss these matters fully and does not appear to be a mere rubber stamp of its Executive Committee. The Panel notes with concern that the Secretary to the Board and to its Executive Committee is the Deputy Director General for Finance and Administration which could create potential problems since much of what the Board and the Executive Committee discuss are finance, personnel and administrative matters. The Panel believes that the function of Secretary to the Board and to the Executive Committee should be entrusted to a senior staff from the DG's Office rather to one of the Directors.

*The Programme Committee* meets once a year for two days during the Board's ordinary session. While it has a specific composition of 6 members, in practice, all Board members attend the Committee's meeting because the Board's annual meeting is structured in such a way that all Board members are present during the meeting of the Committee. Several members of the Board and of management feel that the Programme Committee may try to cover too much or go into too much detail at the expense of offering more vision and challenge to CIP's research management. The Panel concurs that the Programme Committee should focus on helping to define a vision for the future and a corresponding strategy.

*The Audit Committee* is composed of the Vice-Chair of the Board and two other members of the Board. There may have been an expectation that the Audit Committee would also function as a finance committee but it was clarified in its revised Terms of Reference, agreed to during the Board's March 2001 session, that this function belonged to the Executive Committee. The Board, however, needs to make sure that the Audit Committee includes members with strong financial expertise and good understanding of internal and external financial control processes.

*The Nominations Committee* is chaired by the Vice-Chair of the Board and includes two members designated every two years by the Board Chair. In CIP the composition of the Nominations Committee is unusual in that the two members are currently the Board Chair and the Director-General. The reason given by the Board is that it does not want to have a "regular" Nominations Committee. In its March 2001 report to the Board, the Committee stated that "the name of the Committee might be misleading as the Committee should be seen as setting out a strategy for the Board with respect to filling vacancies in the Board. The Board then decides on further actions". The Committee feels that it has not been very lucky with the CGIAR Secretariat's database of potential board members and that, therefore, it needs to spend much more time searching for potential CIP board members. The Board Chair sees this as one of his major roles and since, in the Board's view, the Director-General is the person who has more time and more contacts than other Board members to do searches it seemed more efficient to the CIP Board to include the DG in the Committee. While the DG is the most involved in searches for potential board members, all Board members are solicited for suggestions. The Panel is very concerned about a Director General being closely involved in the identification and

screening of new members of a body he/she reports to and about the potentially excessive influence the DG may thus have on the Board's composition.

### **9.1.3 Assessment of the Board's Performance**

To make the assessment of the Board's performance one Panel Member attended the entire one week Board meeting in March 2001 and another attended part of that meeting. In addition, the Panel conducted an in-depth individual interview with each Board member following a detailed interview guide which had been given to Board members in advance of the interview. The Panel also reviewed minutes of Board and Committee meetings as well as the Board Handbook and other documentation given to the Board.

***Structure of Meetings and Attendance*** - The Board's meetings are well organized and well attended. As mentioned earlier, the structure of the meeting over one week and the chairman's expectations pretty much ensure that Board members are present for the whole week of meetings. Members who do not attend regularly are not renewed for a second term.

***Information and Documentation*** - The documentation sent to Board members in advance of the meetings is timely, extremely well organized and generally complete and extensive thus facilitating the preparation of Board members and increasing the efficiency of Board discussions. However, the Board found that the clarity of project budget information provided to the Board could have been better, i.e., as projects had been reorganized the information provided did not allow the Board to readily determine how the budgets were evolving from one year to the next. The Panel concurs and experienced itself difficulties in obtaining accurate, consistent and timely information.

***Conduct of Meetings and Decision-making*** - In its discussions and decision making process the Board uses Robert's Rule of Order. These rules are part of the Board Handbook and are explained to new Board members. They are used systematically and make it very clear what is put up for discussion and what is being put up for vote or decision. In the Panel's view this significantly increases the Board's efficiency and the clarity of its decision making.

***Level of Engagement of Board Members*** - Board discussions witnessed by the Panel were open and went in quite some depth on some topics (e.g., vision for the future of CIP, fund-raising). The Panel felt that the Board members' involvement in the discussions was serious and intense whether during the meetings or off-meeting. In addition, there are frequent contacts by electronic mail but some Board members felt that e-mail exchanges between the Board Chair and the Director-General could be made more open to the rest of the Board. While Board members are highly satisfied with how the Board operates, several of them expressed the view that the Board sometimes shies away from tough topics or might exercise some self-censure, e.g., with respect to human resources issues. Making sure that this doesn't happen is as much the responsibility of each and every member of the Board as it is the responsibility of the Board Chair.

***Follow-up to Board Decisions*** - Board members are satisfied with the minutes of the Board meetings which they do receive in draft for comment. A table summarizing the follow-up given to decisions made at the previous Board meeting is distributed as part of

the advance documentation sent to Board members. The Panel found these summaries to be quite good even if sometimes the follow-up to more minor decisions was not indicated. In addition, the Board Handbook contains a list of all decisions made by the Board since CIP's creation; the decisions are organized into major categories (Board administration, Centre administration, finance and budget, programme, security) and listed chronologically in each category, thus facilitating follow-up or research about past Board decisions. With respect to follow-up to committee meetings, minutes are written right after the meetings and submitted to the full Board over the following two days of Board meetings for discussion by the Board.

***Board Policies and Procedures*** - Apart from the use of Robert's Rule of Order and a statement on conflict of interest, the CIP Board doesn't have its own set of policies and procedures. It operates according to generally agreed CGIAR policies and procedures for board operations.

***Formulation of Centre Policies and Oversight of Centre Operations*** - Board members are satisfied that the Board has a say and an appropriate influence on the definition of major Centre policies (e.g., financial, budgetary, programmatic, personnel). However, some Board members are less convinced that the Board entirely exercises its oversight role, especially in the finance/budget area. The Panel fully concurs. While the Board extensively discussed fund raising issues at its March 2001 meeting, its discussion of the budget and of the Centre's expenses (whether operational, administrative or personnel related) was limited and, in the Panel's view, not up to what it should have been. Similarly, the Board did not spend time discussing the audit report, the financial statements or, for example, CIP's investments. While it is the role of the Audit Committee to help the Board fulfill its fiduciary responsibility, it is the role of the Board to assess, discuss and comment on the Centre's financial and budgetary situation. This is not to say that the Panel feels there is something wrong with that situation but simply that the Board could have been more diligent in exercising its oversight in this area.

As part of its oversight role, the Panel also feels that, beyond discussing current and upcoming projects, the Board could be more provocative and challenging in discussing longer term scientific and programmatic issues and devising a corresponding strategy. The Panel also suggests that the Board could spend time assessing and monitoring, with help from CIP management, the risks facing the Centre, e.g., GMO risks, risks in losing key donors or key staff, risks of project failures, foreign exchange risks, etc.

***Use of ICERs as an Instrument of Board Oversight*** - The Panel received from Board members conflicting information as to the extent of the Board's involvement in discussing possible topics for ICERs, the commissioning of ICERs, the Centre's response to their recommendations and the monitoring of the implementation of these recommendations. The Panel feels that the Board's involvement with ICERs is too limited and that the Board is cutting itself from what could potentially be a very useful tool in its oversight function.

***Relations with Management and Staff*** - Relations between the Board and management or staff are good. Meetings are organized between the Board and project managers (without the presence of management) and with all staff. Time is also scheduled for individual meetings between Board members and staff.



**Assessment of Management's Performance** - The Board is involved in the selection and the performance assessment of not only the Director-General but also of the two deputy DGs. The Board assesses the DG's performance based on a list of the DG's achievements which is itself based on a list of milestones submitted the prior year. It doesn't appear, however, that the Board has much input in the preparation of those milestones which seem to be mainly programme or budget related with limited coverage of human resources or administrative matters. The Panel suggests that the Board have a more comprehensive list of criteria by which to assess the DG's performance and to discuss the weight to give to these criteria prior to making the assessment, otherwise each Board member makes his/her own subjective weighing. At the session attended by Panel Members, the Board nevertheless did a reasonable job of assessing the DG's performance. The Board also discusses the overall assessment by the DG of the performance of the two DDGs. Generally accepted management/governance practice is that direct assessment by the Board should best be left to the DG, though he/she may choose to get the Board's input. But if the Board were to decide to also remain involved in assessing the performance of the DDGs, it should do so based on objectives and weighted criteria, as for the DG.

The CIP Board also decides on the compensation increase for the DG and endorses the increase proposed by the DG for the DDGs. In this respect the Board discusses only *percentage* increases without knowing (except for the Board Chair) the actual salaries to which the proposed increases will apply. The Panel was told that it was a past Board decision not to want to know the actual salaries and to trust the Board Chair that the salaries were in line and/or competitive with the market. While the Panel understands some of the reasons for this approach it does not feel comfortable with it and it suggests that Board members should know exactly what it is they are deciding on, preferably based on adequate comparative information with other CGIAR Centres and other relevant organizations. It is the Panel's view that, at its March 2001 session, the Board merely endorsed increases proposed by the Chair and by the DG even though, at least in the Panel's view, they were not entirely consistent with the performance evaluation that had just been discussed. As in the case of performance assessment, the question also applies as to whether the Board should be involved in deciding the DDGs' salary increases.

**Assessment of the Board's Own Performance** - While Board members filled a short questionnaire on the Board's performance, the Panel found this process to be very perfunctory. It was done very quickly at the end of the meeting, the questionnaire was very short and not extremely helpful and the results not really discussed. The Panel suggests that the Board develop a more meaningful questionnaire based on the CGIAR board handbooks, and that it schedule more time for its discussion. If need be, the analysis of the questionnaire could be done after the meeting and the results distributed by e-mail and a preliminary discussion started by e-mail with a full discussion scheduled at the next full Board meeting. With respect to the Board's committees, there is no attempt to assess their performance. An approach similar to the one described above could be adopted.

**Board Leadership** - Board members are very satisfied with the current Board leadership. The Panel also found the Board Chair to be effective even if sometimes not fully aware of the weight and impact of his own views and statements. The Chair manages the agenda well, makes sure to involve all Board members and makes very good use of Robert's Rule of Order which, as mentioned earlier, greatly enhances the Board's efficiency. Board members and management stressed the availability of the Board Chair,

his efforts in keeping Board members informed and his involvement in CIP affairs all year long. As part of the Board's self assessment there is an assessment of the Board's leadership. It was also conducted very hastily which means that the Chair did not get the benefit of any significant feedback. The Panel, however, recognizes that this is a difficult exercise which does not come naturally to many Board members. It might be more effective for the Board to select one trusted Board member who will be charged to get feedback from his/her colleagues, summarize it and provide it privately to the Chair.

***New Board Member Induction*** - When feasible, new Board members attend, as observers, the Board meeting prior to the beginning of their term so as to get acquainted in advance with CIP business. They also meet separately with the Board Chair and with the Director-General and they are given a copy of the Board Handbook which contains a wealth of relevant information. This gives new CIP Board members a lot of background information. New Board members are also invited to attend CIP's June "annual meeting" when projects are discussed in detail. While the induction process and the Board Handbook are found satisfactory, current Board members and members of CIP management suggested that new Board members would benefit from exposure to or briefing on, e.g., CGIAR in general, key current CIP and CGIAR issues, IPRs, systemwide programmes, internal and external reviews, public good issues. More generally, several Board members felt that the whole Board could benefit from increased exposure to donors and to NGOs. Briefings are offered by the CGIAR Secretariat and CIP may consider having each new Board member who is not familiar with the GIAR System attend one CGIAR Annual Meeting.

The CIP Board should be commended for having helped guide the Centre during a period of heavy downsizing and major changes in the CGIAR environment. There is, however, room for improvement in a few key areas.

The Panel therefore **recommends**:

1. that the Board ensure that it receives adequate financial and budgetary information from management and that it spend sufficient time exercising its budgetary and financial oversight function;
2. that the Board be more challenging and forward looking in its discussions of the Centre's long-term scientific strategy; and
3. that the DG not be a member of the Nominations Committee and that the DDG-F/A not be the Secretary to the Board and its Executive Committee.

## **9.2 Organization and Management**

CIP's current organization chart is shown in Chapter 2, Figure 2.1. Activities are organized in two major blocs, Finance/Administration and Research, each headed by a Deputy Director-General. Since the last EPMR changes were made in both areas. In the Finance/Administration area the major changes are: the direct reporting to the DDG of the Human Resources and the Travel functions, and the creation of a Business Development Associate position, the role of which is to provide support in CIP's fund raising efforts.

In the Research area, the research activities have been reorganized from 6 programmes into 10 projects plus 3 global and regional partnership projects as discussed earlier in this report. The Regions have been reduced from 5 to 4 and the Research Departments have been reduced from 6 to 5. The Director of Genetic Resources position has been eliminated while the Director of International Cooperation position has been maintained. A Bioinformatics unit has also been created.

The most appropriate structure for any organization depends, among other, on objectives and mandate, changing circumstances and environment, budgetary constraints, skills and expertise of managers, etc. The Panel does not pretend to fully comprehend all of these factors in the case of CIP but nevertheless wishes to point out areas where it feels there have been longstanding issues which management needs to deal with.

The Panel has been concerned that over the past few years the organizational structure in the Office of the DDG-Research has created confusion at the regional level and puzzlement at headquarters because of the lack of clarity in role definition and accountability between the DDG-Research and the Director of International Cooperation. This lack of clarity has not simply disappeared with the recent departure of the DDG Research.

The Panel recognizes the need for support to the DDG Research but feels that there are several ways in which such support could be provided and therefore suggests that CIP consider the present structure as only one of the possible alternatives. Another alternative could be to reconsider the need for a Regional Director for Latin America, in view of the fact that most activities in the region occur in Peru and Ecuador, and to expand the role and responsibilities of the remaining regional directors, especially in view of the sharp reduction in regionally based staff which presumably decreased their managerial load. In such a scenario there may not be a need for a Director of International Cooperation. The DDG Research could be directly overseeing the upstream activities which shape and define CIP's programme (needs assessments, preparation of regional plans, project development, etc.) and have someone else provide support in supervising/coordinating some of the implementation activities. As can be seen in other centres, this support function may not have to be a director level position. In any case, irrespective of what form the support to the DDG Research will take, the issue of respective roles and accountabilities will need to be addressed urgently.

Another area where managerial attention is required is that of communications (i.e., publications, public awareness). At a time when resource mobilization is key to the development or even survival of CGIAR Centres, CIP needs to be "out there" projecting its "corporate image" and sending a convincing message to the scientific community about the quality and effectiveness of its science and to existing and potential donors alike that giving money to CIP is an effective use of their limited funds. Yet, by most accounts, this area has not been working well for quite some time. Not only has there been a lack of clarity in role definition, responsibilities and reporting relationships of the various parties involved, but, and more importantly, there has been a lack of clear vision, leadership and operational strategy. The result has been, among other, an *ad hoc* publications programme, a comparatively limited number of refereed journal articles even though the base material (i.e., the research studies) exists, and a high turnover in some of the areas concerned (e.g., Publications). The Panel understands that CIP management is currently considering a merger of the various units involved. This is a possible first step but, in and

of itself, it will not ensure that the requisite skills will be present and the needed leadership and vision will emerge. In addition, care will need to be taken that this communication function be closely linked, if not integrated with CIP resource mobilization efforts.

Finally, the Panel notes that CIP may have a team of competent managers who have led the organization through difficult and changing times and who permitted the achievements described in earlier chapters but CIP did not have, over the past few years, a cohesive management team, i.e., a group of managers working in unison, with one voice, towards a common purpose. By their own account, members of the management team have had misunderstandings and dissensions which lead to confusion and to the lack of resolution of longstanding issues.

The Panel urges the DG to urgently resolve the accountability and role clarification issues in the Research area and in the communications area and to use the opportunity of changes at the managerial level to rebuild the cohesiveness of the management team.

### **9.3 Research Management**

#### **9.3.1 Organization of Research**

The reorganization of research activities from programmes to projects, the creation of the Programme Management Team (PMT) and the priority setting exercise gave CIP a solid and coherent framework for the organization and management of research. The Panel commends the former DDG Research and the CIP management team as a whole for it. Nevertheless the Panel did not find much trace, neither at the Board nor in the PMT, of significant strategic discussions about the long-term scientific future of the Centre or the evolution of the needs of CIP's partners in relation to the likely evolution of science.

As mentioned earlier in the report, since the last EPMR, CIP has organized its research activities in projects and partnerships and scientists are reporting organizationally to four thematic departments. This structure seems to have served CIP well. The Panel sees no reason for changing it and it has not heard any major concern about its operation though the number and nature of the projects themselves will undoubtedly keep evolving, e.g., as recommended in Chapter 3.

#### **9.3.2 Priority Setting**

In 1992, in mid 1996 and in late 1996, CIP conducted highly structured, multi-criteria priority setting exercises. These are described in Priority Setting at CIP for the 1998-2000 Medium-Term Plan. The 1992 exercise was based on a quantitative scoring model which involved all headquarters based scientists. The mid-1996 exercise was less formal and less structured but it involved regional scientists. The late 1996 exercise was based on a conventional economic model to more rigorously quantify expected project benefits. The exercise involved the regional representatives who had consulted with their staff and with their NARS beforehand. Feedback was also provided to the NARS afterwards. The Panel commends CIP for conducting such exercises and recognizes their usefulness in terms of project prioritizing and consensus building within the Centre. Nevertheless, the Panel wonders whether they did not mostly involve prioritizing existing or upcoming projects and activities at the expense of a longer-term reflection about the evolution of CIP and its partners beyond the immediate future.

In this respect, the Panel feels that, in addition to her/his more traditional activities of organizational and programmatic thinking and project monitoring (including budget monitoring, controls, inter-project coherence and inter-regional coherence), a key responsibility of the DDG Research is to provide such strategic thinking for debate by the Board's Programme Committee. This kind of exercise would have to be based, among other, on: (a) a regional analysis of the state of CIP's current and prospective partners and on their likely evolution; (b) a synthetic analysis of the likely scientific advances in the areas relevant to CIP; and, in view of the above, (c) an analysis of the type of skills and expertise that CIP will need to acquire or to find in its partners.

### **9.3.3 Project Monitoring**

From an operational point of view the projects use Logframe to establish and monitor milestones. The DDG Research with the PMT monitors progress. Progress is also discussed at CIP's "annual meeting" when all scientists gather to discuss project evolution.

From a budgetary point of view, project leaders receive each year a budget covering variable expenses (supplies, services and travel). They can shift expenses between those categories but have to stay within the overall envelope allocated. Section 8.3 on Financial Reporting and Budget Monitoring discusses the limitations of CIP's financial system (CIPFIS) for project budget monitoring, the difficulties it creates for project leaders and the Panel's recommendation in that respect.

## **9.4 Human Resources Management**

### **9.4.1 Staffing**

Table 9.2 shows that, because of funding shortfalls, overall staffing at CIP has been reduced by 33% between 1995 and 2001 (from 846 staff to 569). This compares with a 19% reduction for all Future Harvest Centres during this period. The reduction in CIP is due mainly to a drastic decrease in Nationally Recruited Staff (NRS) based in the regions while the number of NRS at headquarters remained constant, resulting in a one-third overall decrease of NRS (versus a 21% decrease for all CGIAR Centres). On the other hand, the number of Internationally Recruited Staff (IRS) declined by 26%. It should be noted, however, that the number of IRS was significantly reduced in Research Management (56%). In Research/Research Support there has been a decline of 23% of IRS. The reduction in IRS was 43% in the regions while the IRS in headquarters decreased by 10%. Significant additional reductions of NRS and, to a lesser degree, IRS had started to be implemented as the Panel was finishing its work (March 2002). It should be noted that staff reductions have been more important than appears from Table 9.2 because staff levels of IRS and NRS had increased from 1996 to 1998. Significant staff reductions had also already been conducted during the period covered by the last EPMP (1990-1994). Hence, over a ten-year period (1992-2001) IRS has declined by 33%, NRS at headquarters by 18% and NRS in the regions by a minimum of 76%. (Peak employment in CIP was in 1988.)

**Table 9.2 – Staffing - 1995/2001**

	1995	2001	Percentage Change
<b>Research and Research Support</b>			
IRS	65	50	-23%
NRS	746	487	-35%
Total	811	537	-34%
<b>Research Management</b>			
IRS	9	4	-56%
NRS	0	0	
Total	9	4	-56%
<b>Training/Communications</b>			
IRS	3	3	0%
NRS	23	25	9%
Total	26	28	8%
<b>TOTAL</b>	<b>846</b>	<b>569</b>	<b>-33%</b>
<b>Headquarters based staff</b>			
IRS	40	36	-10%
NRS	434	432	0%
Total	474	468	-1
<b>Regional based staff</b>			
IRS	37	21	-43%
NRS	335	80	-76%
Total	372	101	-73%
<b>TOTAL</b>	<b>846</b>	<b>569</b>	<b>-33%</b>
<b>Internationally recruited staff</b>			
Male	71	44	-38%
Female	6	13	116%
Total	77	57	-26%
<b>Nationally recruited staff</b>			
Male	617	377	-39%
Female	152	135	-11%
Total	769	512	-33%
<b>TOTAL</b>	<b>846</b>	<b>569</b>	<b>-33%</b>

The Panel notes the significant staff cuts CIP had to implement over the years but it is concerned that they have been almost exclusively at the expense of regional operations. However, the Panel commends CIP management for having carried out the staff reductions in a considerate way and with care and concern for staff. In view of the difficult economic situation in most countries where CIP has staff, the separation package for NRS has been more generous than required by law, e.g., CIP has kept these staff on the payroll and under health insurance longer than required and it has offered professional support to help them face these difficult career/employment changes.

#### **9.4.2 Gender, Nationality and Disciplinary Breakdown**

Table 9.2 shows that female IRS have significantly increased in percentage terms (116%) while male IRS declined by 38%. This trend is somewhat similar to that in the rest of the CGIAR Centres where the total number of IRS women has increased by 23% during the period while the number of male IRS decreased by 11%. During the 1995-2001 period CIP was the CGIAR Centre with the second fastest growth in female IRS who now represent 23% of total IRS. This is a major increase since 1995 and somewhat above

average for all CGIAR Centres in 2001. In the NRS category women now represent 26% of the total, which is a clear increase over 1995 when they represented 20% but is slightly lower than the average for all CGIAR Centres. Women NRS suffered less from the staff reductions (-11%) than male NRS (-39%).

With respect to national/regional diversity of CIP IRS, Peruvian nationals and USA nationals constitute the two largest groups (respectively 19% and 18% of 57 IRS on board). The regional breakdown is: Europe: 30%; Central and South America (including Peru): 25%; North America (USA, Canada): 19%; Africa/North Africa/Middle East: 14%; Asia/Australia: 12%. World Bank Part II country nationals represent 49% (dual nationals have been counted with their country of origin) which is the same as the CGIAR average.

The time allocation of IRS in the four departments: Crop Improvement and Genetic Resources; Crop Protection; Production Systems and Natural Resources Management; and Social Science (excluding those IRS whose time is not allocated to projects) is shown in Table 9.3. The allocation is fairly balanced between the four departments with Social Science coming ahead at about 30% of total time allocation. Of note is how dispersed the time allocation is among projects.

### **9.4.3 Competitiveness and Attractiveness**

A major concern of any organization, especially during periods of downsizing, is the extent to which it remains competitive and is able to retain its better staff and to attract the new talent it needs. Despite any issue they may have with CIP, most staff the Panel spoke to, whether IRS or NRS, believed that CIP was still a good and attractive place to work for and that they would not hesitate to recommend it to others. However, the current round of staff cuts, just started, has affected staff morale. Nevertheless, CIP management feels that, so far, it has had little problems attracting either IRS or NRS of the calibre it requires even though a detailed CGIAR Compensation Survey conducted in 1999 showed that CIP's total compensation package for almost all IRS categories was generally average or lower than average. The fact that the general leave package (annual, sick, maternity, etc.) was generally in the higher bracket and the attractiveness of CIP's location maybe playing a role in CIP's ability to hire highly qualified staff.

**Table 9.3- Time allocation (in staff years) of internationally recruited staff (IRS) by project and department<sup>29 30</sup>**

Department	Projects													Total
	1A Late Blight	2A Seed and utilization	3A TPS	4A IPM	5A SP Breeding	6A Post- harvest	7A Genetic resources	8A NRM	9A Gene discovery	10A Impact	G1 SIUPA	G2 GILB	R1 CONDESAN	
Crop improvement, Genetic resources	1.10	2.05	0.50	-	0.70	0.85	2.40	1.00	2.00	-	-	0.20	-	10.80
Plant protection	3.15	2.75	0.25	1.75	0.75	0.35		0.25	1.00	0.05	0.05	0.10	-	10.45
Production systems	0.55	3.05	-	0.10	0.20	0.60	0.65	2.65	-	0.55	-	-	2.60	10.95
Social science	1.40	2.30	0.05	0.70	0.20	2.80	0.15	1.35	0.05	1.95	1.35	0.25	1.05	13.60
<b>Total</b>	<b>6.20</b>	<b>10.15</b>	<b>0.80</b>	<b>2.55</b>	<b>1.85</b>	<b>4.60</b>	<b>3.20</b>	<b>5.25</b>	<b>3.05</b>	<b>2.55</b>	<b>1.40</b>	<b>0.55</b>	<b>3.65</b>	<b>45.80</b>

**Table 9.4– Number of nationally recruited professional staff (NRS) by department and category<sup>4</sup>**

Department	Associate researcher	Assistant researcher II	Assistant researcher I	Total
Crop improvement, Genetic resources	5	16	10	31
Crop protection	3	11	5	19
Production systems	2	3	8	13
Social science	1	2		3
Training			2	2
<b>Total</b>	<b>11</b>	<b>32</b>	<b>25</b>	<b>68</b>

<sup>29</sup> Excludes IRS whose time is not allocated to projects

<sup>30</sup> Source: Constructed from CIP data



For the first time in 2001 CIP participated in a compensation survey conducted by Price, Waterhouse, Coopers for local positions. The survey shows that while for the majority of its NRS positions CIP is in the second quartile or in the middle of the range there is a number of positions where CIP is in the lowest quartile or at the minimum. There are only very few positions where CIP is in a leading position. CIP management, however, believes that the survey does not fully reflect benefits. This, as well as high local unemployment and a good working environment in CIP, allows the Centre to remain competitive and attract good candidates.

Complaints were expressed to the Panel that NRS positions in the administrative and support areas were better compensated than same level positions in the science area. The Panel was not in a position to verify this but CIP management indicated that this was due to stiffer competition in the local market for administrative type positions.

#### **9.4.4 Training and Development**

At a time when almost everything is changing rapidly in its external and internal environment (funding, technology, business processes, skills requirements, partnering, etc.) it is vital for CIP to have staff who, at minimum, are and remain at their peak technical, professional and/or managerial skills and preferably even develop them further. It is the staff's responsibility to ensure that they maintain or develop such skills but it is the organization's responsibility to encourage and facilitate such "maintenance" or development. Many staff at CIP, whether IRS or NRS, have complained about either inaccessibility or unequal accessibility to training and development. It appears that (i) training/development needs are not really discussed between staff and their manager at performance appraisal time, (ii) training is more dependent upon availability of funds in a given project than on needs, (iii) access to training varies between IRS and NRS, between administrative staff and research staff, between headquarters and regional staff. The Panel urges CIP management to remedy this situation. The Panel understands that, as a first step, the limited funds for training/development of CIP staff will be centralized and, as a priority, spent on group training. A three-person committee has also been formed to establish a policy on training and development as well as rules and criteria for access to it. Beyond that, needs assessments will need to be made and care will need to be taken to ensure that all staff categories (IRS/NRS, male/female, etc.) have equal access to training/development that is needed and relevant for their position.

#### **9.4.5 Varia**

**Performance Appraisal** - In CIP, as in many other organizations and CGIAR Centres, a formal performance appraisal is in place but the Panel believes that its implementation is less than adequate. The performance evaluation form and criteria for IRS staff have been reviewed recently to better reflect changing expectations, e.g., fund raising, teamwork, contribution to institutional culture. As it currently is, however, the process is exclusively retrospective while it should also be forward looking, i.e., cover the staff's training/development needs to help them prepare for CIP's future challenges. The Panel encourages the DG to make CIP managers, at all levels, accountable for the systematic implementation of an effective performance appraisal process. The DG and DDGs should lead by example and have their performance appraised in a more systematic fashion using relevant criteria.

**Grievance Process** - In many CGIAR Centres the handling of staff grievances is a difficult problem. NRS who feel that their issue has not been resolved fairly within the organization generally have a recourse through local labour laws. Because of the international character of the CGIAR Centres, IRS do not have such a recourse and there is the potential for managerial abuse, i.e., because of the generally flat organizational structure at the level of IRS the person whose action or decision is being appealed by the IRS would often be part of the managerial chain of command who would normally review the grievance. To circumvent this problem some CGIAR Centres have instituted a bi- or tri-partite process, i.e., representatives selected by staff sit on review panels which examine IRS and, in some centres, also NRS grievances. CIP does not have such a process but the Panel understands that, following a recent case, management is considering establishing a new grievance process. The Panel strongly encourages management to pursue such an approach in cooperation with staff. The Panel suggests that, at the same time, CIP simplify and clarify its sexual harassment procedure. More generally, the Panel suggests that the CGIAR as a whole consider establishing a systemwide grievance process that could serve staff in all Centres.

## **9.5 Administration**

The Finance and Administration Department of CIP covers four major units (Finance; Human Resources (NRS); Information Technology; and Logistics and General Services) as well as a Travel Office, a Business Development Associate and an International Personnel Officer. The most important issues in the areas of Finance and Human Resources have already been discussed. Information Technology and Logistics/General Services are briefly discussed hereunder. The Panel did not have time to look at the Travel Office in any detail; in any case, most of the work related to travel is handled by a travel agency located on-site and the Panel understands that it was subject to an internal audit some two years ago with positive results.

### **9.5.1 Information Technology**

CIP's approach to information technology is to be commended. It is reasonable, refreshing, low cost, client oriented and, above all, appears effective and efficient. The Information Technology Unit strives to use technology in the service of information rather than focusing on technology per se. It is innovative and has not lost sight of the fact that technology is the means to an end, not the end itself. Through use of existing equipment and through judicious standardization of systems architecture and systems development for science and administration, the unit has been able to offer good service and to operate on a low budget. Its challenges in the near future are to (a) better integrate systems which were developed in isolation in other parts of CIP so that they can become more effective management tools (e.g., CIPFIS), and (b) replace ageing hardware (e.g., a large number of aging desktop computers) which require heavy support, tie up a significant portion of its helpdesk and frustrate the users. Apart from the frustration with old desktops, the unit has received high marks from users for its excellent service and responsiveness despite a significant increase in its workload. The Panel was impressed by the unit's clear strategy and, among other, by the Germplasm workflow and database.

### **9.5.2 Logistics and General Services**

The Panel did not detect any fundamental issue in this area. Project leaders did have some complaints about procedures in the Motor Pool and about not being consulted for the selection of trucks and equipment. They also complained about bureaucratic procedures and delays in Purchasing but at the same time recognized that scientists may not be planning their purchases very well but then expect immediate delivery when they do order. Cars and trucks are the biggest purchasing expense. While they are not bought following a true competitive bidding process, quotes are requested from several dealers just as several quotes are requested for the provision of other goods and services. A detailed "Authorization Procedure Checklist" determines who can commit up to what amount of money for which types of goods and services. The checklist also covers levels of decision making in the areas of human resources (position creation, staff recruitment, benefits, etc.), budget preparation and implementation, payments, delivery of internal services, etc.

As part of the budget cutting exercise conducted in early 2002 this entire area has been reviewed. Seven of the 14 working groups established to look at possible savings dealt with services from this unit. Measures proposed and to be implemented in 2002 covered: elimination of subsidies (cafeteria), increased efficiency (purchasing), reduced inventories, better utilization of facilities or better occupancy (dormitories, guesthouse), and outsourcing (buses, half of the car fleet). CIP management expects that these measures will save several hundred thousand dollars. As mentioned elsewhere in this report, similar measures were taken in other parts of the organization (e.g., outsourcing of printing). The Panel commends CIP for taking such measures though they could have been taken at the first signs of the funding crisis.

## CHAPTER 10 - THE FUTURE

CIP has a tradition as an international agricultural research Centre that has adapted to changing conditions over time. It has assembled an able and committed work force that is capable of extending the frontier of science while at the same time addressing the practical problems of society. It has mobilized its resources to respond to a changing agenda as conditions in its external environment have changed. It has changed the way it has financed its programmes. And it has contributed to feeding hundreds of millions of additional people, many of them destitute and malnourished.

Previous chapters have contained the Panel's assessment of CIP's various programmes in some detail. At a number of places in the report, however, the Panel has made reference to the need for CIP to develop a vision of the future as a guide for its planning and decision-making. We have emphasized that need for a number of reasons:

1. There is a lack of clarity in the vision CIP currently articulates for itself and others. The Panel's perception is that individual programmes have a vision of where they are headed, but a vision that shapes the strategy and programmes of the Centre as a whole, from science through operations to management is lacking.
2. In a time of change, leadership that articulates a vision of the future is critical to making the important choices CIP needs to make. The Panel believes the Centre is currently trying to do too much. If CIP is to focus its programme and at the same time respond to the changing conditions identified in Chapter 1, a well-articulated vision of the future is an imperative.
3. The Panel's perception is that funding problems have caused there to be a short-term bias in current programmes. A strong vision statement will help to focus on the longer term.
4. The need to take a longer term perspective on programme development emphasizes the importance of strategic planning. That kind of planning can only be done if there is a vision for the Centre as a whole. Moreover, a vision connected to a strategic plan will provide a path to the future.
5. CIP will eventually be forced to develop a stronger set of priorities for its programme. The lack of a vision-based set of priorities can lead to diffuseness and lack of depth in its programmes.
6. The Centre needs a stronger self-identity if it is to compete for resources in an increasingly competitive international economy.

The Panel believes that CIP should engage in a significant visioning exercise to position itself for the future. That is something for which only CIP can provide the leadership. However, the exercise itself should include its partners and the constituencies

upon which it relies. Resource people from outside can be of assistance in helping to assure that the right questions are asked.

The Panel offers the following suggestions that might be considered in developing CIP's vision for the future:

1. **CIP should accept the challenge of being a Centre of Excellence.** In many respects it already is. However, this concept should guide how CIP thinks about itself and should pervade all dimensions of its activities. The Panel would emphasize that being a Centre of Excellence does not imply elitism, nor that the CIP be on the frontier of knowledge per se. In our view, it can and should pursue excellence in everything it does as a strategic research Centre, ranging from its scientific programmes to its operations and to its management. Moreover, the Panel believes CIP's leadership should articulate that concept regularly.
2. **The key to developing a sound vision statement for CIP is a strong conceptual framework for its programme.** That framework must provide the means for thinking about how new agricultural technology and international trade contribute to economic development, about how economic development in turn affects the pattern of consumption and the configuration of the production sector, and about the nature of the adjustment problems the sector faces. There is a need for conceptual frameworks in thinking about individual parts of CIP's programmes, such as plant breeding and the study of the adoption of new technology. The overall vision statement for CIP, however, demands a broader perspective that helps to bring all the pieces together, including the management of natural resources. One of the key opportunities for CIP is to create added value through integrative activities.

Developing this framework may be an area in which outside resource people can be helpful. The combination of a biological scientist and social scientist of stature in each of their respective fields, and who tend to think about the larger issues of this sector of the economy, would be useful.

3. **CIP should link knowledge from the frontier of science to the social, economic, and technological problems of society.** The challenge is that the frontier of science is moving out at a rapid pace and the distance between that frontier and the practical problems of society grows larger and larger over time. This growing gap will be one of the greatest challenges facing both CIP and the CGIAR system as they move into the future. It is the source of the frequent charge heard around the world that science is growing increasingly irrelevant. At the same time, it is an opportunity for CIP to help bridge the gap by linking research institutions in the industrialized countries with the problem solving NARS and NGOs in the developing countries through the strategic research it does.
4. **CIP should continue to link or integrate the social sciences with the biological and natural sciences as it attempts to come to grips with the problems of society.** CIP has set an important example of how this can be done - an object lesson for everybody, given the rarity of such integration operationally. The future portends the emergence of more and more problems in society in which

such cooperation will be an imperative. The management of natural resources to assure sustainable increases in agricultural development is an important example.

The real payoff from such integration will come in the area of science and technology policy - if CIP chooses to strengthen its programmes in that dimension.

5. **CIP should recognize that the research capability in the developing countries will continue to grow over time but at different rates.** That means that CIP must be prepared to change the way it thinks about the NARS, their capability, and how it relates to them. The expectation is that the entire system will continue to move upstream in its scientific and technology programmes as economic development proceeds. One can expect a process that begins with the NARS capitalizing on the results from CIP and continues as they progressively develop autonomy in their programmes and eventually link with CIP and institutions in the North on a basis of equals.
6. **CIP might want to consider itself a technology platform as it thinks about its future.** One of its main mandates is to deliver a flow of new knowledge and technology that can be focused on solving problems in the developing countries. The managerial challenge of the Centre is to sustain that flow of knowledge, innovations, and technology by mobilizing available resources and to assure that it gets focused on the right problems.

Keeping its efforts focused on the right problems includes the constraint that CIP continue to produce and deliver public goods as it looks to the future. The definition of a public good will change over time as economic, institutional, and technological conditions change. Such changes can have important implications for CIP and the focus and range of its programmes. It needs to keep a watching brief on these potential changes in its ever-changing agenda. This will be the key to its relevance to addressing the problems of the potato sector and the associated problems of society.

The related point is the over-riding imperative of developing a robust set of priorities for CIP. Past budget costs have been imposed in such a way as to sustain the main elements of CIP's effort. The strong vision statement suggested above, together with the strategic plan that follows from it, will enable CIP to articulate a more cohesive and internally complementary set of priorities.

The Panel concludes its remarks by expressing its appreciation for the daunting task the Centre faces in responding to the ever changing reality in which it operates – changes in the economic, social, and environmental reality, changes in the science on which its programmes are based, a decline in core funding for its programmes, and a changing constituency base. The Panel's goal has been to be helpful, with an emphasis on putting the Centre's programmes into a larger perspective as CIP looks to the future. The Panel has every confidence that as CIP moves into that future it will have the confidence and wisdom to do what is needed to mobilize the resources it needs, to bridge the gap between the frontier of knowledge and the application of that knowledge to solve the problems of the world, and to help build the capacity to improve the lives of millions of destitute people.

Because of the value of a well-articulated, encompassing vision tied together with a strategic plan, the Panel **recommends** that CIP develop a vision and a strategic plan that will integrate crop improvement and protection, natural resource management, and the social sciences in an approach that will guide the understanding of problems developing countries face as they experience economic development;

Because of the need to give more attention to priority setting in CIP and to maximize the effectiveness of the resources made available to it, the Panel **recommends** that the vision statement and the strategic plan be connected and used to establish a robust set of priorities to guide resource allocation in CIP in the coming years.

## ACKNOWLEDGEMENTS

The EPMR Panel expresses its sincere appreciation to the Board, Senior Management and all staff of CIP for their support and assistance during this review. The Panel wishes to thank Dr. and Mrs. Hubert Zandstra for their hospitality in welcoming the Panel to Lima. The project leaders are warmly acknowledged for responding accurately to the several requests by the Panel during the Main Phase.

The Panel Chair and two members had the chance to visit the Ministry of Agriculture and they thank the Vice Minister Mr. Efrain Palti Solano for his valuable comments and information. The Panel's meetings with the Director of INIA, Dr. Carlos Antonio Salas Vinatea, a new CIP Board member and with staff of the La Molina University were very useful for understanding CIP's relations with the host country institutions

The Panel had an opportunity to visit some of CIP's country programmes and partners in East Africa (Kenya and Uganda), Asia (China, Vietnam and Indonesia), and Latin America (Ecuador, Bolivia and Peru) and wishes to express its gratitude for all the support, information and hospitality provided by CIP's outreach staff and the Centre's collaborators in the countries that were visited. The Panel wishes to thank Keith Fuglie, Peter Ewell, Greg Forbes and Andre Devaux for making all the preparations for the field visits.

There is a number of other CIP staff who either directly or indirectly helped the Panel by providing the necessary logistical and other support. They are many indeed, but the Panel wants to mention especially the help received from Mariella Altet – External Relations Officer in the preparation of this review. The Panel greatly appreciates the kind services provided by the staff in the CIP dormitory and restaurant.

The Panel was fortunate to have Rosanna Corazzi of the iSC Secretariat assisting in the word-processing and preparation of this Report, in addition to handling a number of other report-related tasks. She was ably assisted by Rosario Marcovich of CIP.

It is the Panel's pleasure to also thank the iSC Secretariat (particularly Sirkka Immonen who accompanied the Panel throughout) and the CGIAR Secretariat (particularly Selçuk Özgediz who provided management support to the review team) for the coordination and management of this review and for guidance throughout. The Panel thanks Irmi Braun-Castaldi from the iSC Secretariat for making travel and administrative arrangements during the Initial and Main Phases of the review.



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**Education:** Holds a Bachelor's degree in Agricultural Education from Purdue University (1952), a Master's of Science degree in Agricultural Economics from Michigan State University (1954), and a Master's of Arts (1958) and a Ph.D. degree in Economics (1961) from the University of Chicago.

**Expertise:** Agricultural and applied economics; international trade and monetary policy; science and technology policy, and agricultural and economic development.

**Experience:** Has held a variety of positions in academic, governmental, and non-governmental organizations. Just prior to assuming the Orville and Jane Freeman Professorship in 1997, he had served as Dean of the Humphrey Institute of Public Affairs for ten years (1987-1996). Prior to that he had held a faculty position at Purdue University (1959-79), and was Head of the Department of Agricultural and Applied Economics at the University of Minnesota (1979-84). He also served as Programme Advisor to the Ford Foundation in Brazil (1966-1972), as Senior Staff Economist to President Ford's Council

of Economic Advisors (1974-75), as Deputy Under-Secretary for International Affairs and Commodity Programmes at the U.S. Department of Agriculture (1978-79), and as Director of Agriculture and Rural Development at the World Bank (1984-87). He also served as Acting Assistant Director for Community and Resource Development, Agricultural Extension Service, University of Minnesota (held jointly while serving as Head of Department of Agricultural and Applied Economics). International experience includes Visiting Professor, Federal University of Vicosa, Brazil, 1963-65; Consultant to Ford Foundation, Colombia to review country programme in agricultural economics, in 1970 and 1971, and Consultant to agricultural economics programme, Universidad Católica, Santiago de Chile, 1975. Has served as Chairman of the National Academy of Science Bi-National Committee on Agricultural Economics (1967-72). He chairs the Board for International Food and Agricultural Development (BIFAD), which advises the Administrator of the U.S. Agency for International Development, and co-chairs the U. S. Food Security Advisory Committee (FSAC) which advises the U.S. government on food security policy (both White House appointments). He also serves on the Board of Trustees of the International Food Policy Research Institute (IFPRI), the National Research Council's Board on Agriculture and Natural Resources (BANR), the International Scientific Advisory Committee (ISAC), which advises the Dutch government on the Eco-Regional Fund, and the Board of Trustees of the Sasakawa Africa Association. He is the author or co-author of six books, has edited an additional six books, and has over 150 technical and scientific papers to his credit. He is an elected Fellow of the American Academy of Arts and Sciences, an Honorary Professor at the Federal University of Vicosa in Brazil, holds an Honorary Doctorate in Agriculture at Purdue University, and has a room named in his honour at the University of Sao Paulo in Brazil. He is also President of the American Agricultural Economics Association, received 5 National Awards from that Association and was elected Fellow.

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**Education:** Ph.D. in Natural Sciences, University of Rennes (1973) (Title of thesis 'Contribution to the taxonomical study of several pathogenic pseudomonas'.) B.Sc. in Agronomy, National Institute of Agronomy, Paris (1960) (branch of Plant Pathology).

**Expertise:** Agronomy, pest disease management, plant pathology, plant production, phytopathology, bacteriology, microbiology, plant diseases.

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Erwinis phytopathogens; 1973-76: Head of Research and Director of the Plant Pathology station of the Antilles in Guadeloupe. In this post, worked with tropical plants, in particular, market garden and alimentary plants (egg-plant, peppers, tomatoes, yam, lettuces, beans and vines), large-scale farming (cane sugar, banana), floral farming (*anthurium*); 1965-1973: Officer-in-Charge of Research, Plant Pathology Chair, Higher National Agronomy School, Rennes. Work concentrated on bacterial diseases of market garden plants and on the diseases of potatoes and plants grown on a large scale; 1960–1965: Research Assistant, Plant Pathology Station, Agronomy Research Centre, Versailles. Member of various professional societies, examples of which are: 1992-2000: Président du conseil scientifique de l’Institut technique des céréales et des fourrages; 1983-1993: Membre du Conseil scientifique du Centre de coopération internationale de recherche agronomique pour le développement ( C.I.R.A.D.) and 1996-2000: Président du Conseil scientifique de l’institut national d’horticulture. His mother tongue is French, and he has excellent knowledge of English and Spanish.

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**Expertise:** Soil physics and chemistry, soil fertility and nutrient cycling, environmental issues, spatial information systems and remote sensing, land use planning, research management, education and impact assessment.

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analysis, agro-ecological zoning, technology transfer and on NARS relations; 1992-1994: Director, Resource Management Programme, ICRISAT, India - Focus on scientific quality, integrated systems-approach to research, technology development, impact assessment and NARS collaboration; 1986-1992: Director, Institute for Soil Fertility, The Netherlands - Shift of focus to integrated approach of soil fertility with emphasis on environmental quality and soil ecology, introduction of systems analysis and simulation modelling; 1984-1986: Soil Scientist, Leader, Nitrogen Programme, Agro-Economic Division, International Fertilizer Development Centre, USA - Projects in Asia and West Africa - Collaboration with IARCs and NARS; 1980-1984: Senior Soil Chemist, Farming Systems Research Programme, ICARDA, Aleppo, Syria; 1977-1979: Project Leader, Soil and Groundwater Quality, State Institute for Drinking Water Supply, The Netherlands; 1978: Fulbright-Hays Visiting Scientist, Dept. of Agronomy, New Mexico State University; 1973-1977: Graduate Assistant, Dept. of Soils and Fertilizers, Agricultural University, Wageningen; 1972: Research Assistant: Institute for Application of Atomic Sciences in Agriculture, Wageningen. Editor, Fertilizer Research, presently Nutrient Cycling in Agro-ecosystems (since 1979), Editor, International J. of Applied Earth Observation and Geoinformation (1999-2001), Editor, Asian J. of Geoinformatics (since 2000), Editor Pédologie (1987-1992), Honorary Member of the Indian Society of Remote Sensing (1999); Honorary Professor, Centre of Environmental Science, Anna University, Chennai, India (2000). Over 70 publications.

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**Expertise:** Plant genetics, genome science, population genetics, biodiversity and conservation of genetic resources, molecular breeding, crop improvement; breeding of wheat, barley, potato; molecular studies on rice, soybean, groundnut and various tree species.

**Experience:** June 1998-June 2000: DuPont Company, USA. Responsible for wheat genomic research and management of strategic alliances with the John Innes Centre in UK. 1987-1998: Head of Cell and Molecular Genetics Department, SCRI Scientific interests: Structural and functional genomics of cereals; DNA diagnostics to support molecular breeding strategies for trait introgression; Map-based identification of novel gene function; Gene discovery for forest biotechnology; Factors determining patterns of genetic variation in natural plant communities. Responsibilities in e.g. co-ordination and management of national and international programmes of research funded by DFID, EU and commerce; in fostering, encouraging and managing inter-departmental links through the formation of joint, multi-disciplinary projects; in strengthening links with university-based researchers and national and international institutes. Evaluation of research proposals for BBSRC, NERC, EU, UNDP, FAO and International Foundation for Science. Consultant to UNDP Biotechnology programmes in Latin America and Asia. Member of External Review Team for ICARDA (Plant Breeding Methodologies) and IITA (ICER). Member of Editorial Board of *Heredity* (1989-93); *Potato Research* (1987-93); Associate Editor of *Molecular Ecology*. 1990 Broekhuizen Prize, for outstanding contributions to cereal science research in Europe. 1993 Honorary Senior Lecturer, Universities of Dundee and St Andrews; 1995 Honorary Professor, Oregon State University, USA; Herriott-Watt University, Edinburgh. To date 200 refereed scientific papers, several book chapters, two patents and one book published.

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**Expertise:** Finance, organizational change, and general management.

**Experience:** 1966-74: Structural Design Engineer: Lend Lease Corporation, Sydney, Australia. Refinery Logistics Manager: Esso Standard Oil (Aust) P/L, Sydney. Management Consultant: McKinsey & Company, New York and Melbourne, Australia. Chief Manager, Strategic Planning: ANZ Banking Group Melbourne, Australia. 1974-1997: The World Bank: positions of increasing responsibility within the Bank Group,

culminating, in 1986, in appointment as Chief Financial Officer for the Multilateral Investment Guarantee Agency (MIGA). 1997-1998: Chairman of the Board, Holy Cross Health, Silver Spring, MD, and member of other corporate and non-profit boards. During World Bank career, also undertook many short-term assignments as a financial advisor to the CGIAR Secretariat. Examined the budget requests for all IARCs and visited each Centre to discuss financial matters: undertook a six-week study of the managerial tasks and processes at IRRI; and reviewed management processes at CIP. Consultant to the First Quinquennial Review Panel of WARDA (1978). Member of the First Triennial Review Panel of ICIPE (1983). Member of the 1993 Interim External Review of CIMMYT; Consultant to the 1996 EPMP of ICRISAT. Member of the 1997 EPMP of IPGRI. Consultant to the 1997 EPMP of CIMMYT. Member of the EPMP Panel of WARDA 2000. Member of the EPMP Panel of ISNAR 2002.



# TERMS OF REFERENCE

## FOR EXTERNAL PROGRAMME AND MANAGEMENT REVIEWS

### OF CGIAR CENTRES

## BACKGROUND

### Context

1. The Consultative Group on International Agricultural Research (CGIAR) is an informal association of over 50 members that supports a network of 16 international research centres in agriculture, forestry and fisheries. The CGIAR aims, through its support to the Centres, to contribute to promoting sustainable agriculture for food security in developing countries. Because the Centres constitute the core of the CGIAR, the effectiveness of each Centre is crucial to the continued success of the CGIAR (as a System).
2. Each Centre is an autonomous institution operating within the mandate assigned to it by the CGIAR, and is governed by a legally constituted Board that has full fiduciary responsibility for managing the Centre. To ensure accountability in an essentially decentralized system, each Centre is expected to be responsive to the CGIAR, which provides financial support for its work.
3. The CGIAR has established a tradition of External Programme and Management Reviews (EPMRs) to provide a mechanism of transparency and accountability to the Members and other stakeholders of the CGIAR System. EPMRs are the joint responsibility of TAC and the CGIAR Secretariat, and are conducted for each Centre approximately every five years. As each Centre is autonomous, EPMRs provide a measure of central oversight and serve as an essential component of the CGIAR's accountability system.

### Integrated System of Reviews of Each Centre

4. Besides the EPMRs, Centre Commissioned External Reviews (CCERs) are undertaken at each Centre. These CCERs are commissioned by the Centre Boards to periodically assess the quality and effectiveness of particular aspects of a Centre's work. The terms of reference (TORs) for each CCER are determined by the Centre, based on broad principles endorsed by the CGIAR at ICW95 (ref. document entitled *Improving the Quality and Consistency of CGIAR's External Centre Reviews*, dated October 24, 1995).
5. EPMRs complement the CCERs by providing a CGIAR-commissioned and comprehensive external assessment of the Centre's programme and management, especially its future directions and the quality and relevance of its research. The TORs for

the EPMRs (which update the “standard TORs” endorsed by the CGIAR at MTM95) are provided below. Guidelines for undertaking the reviews are issued separately.

## TERMS OF REFERENCE

### Objectives and Scope

6. EPMRs seek to inform CGIAR members that their investment is sound, or recommend measures to make it so. Members of the CGIAR and other stakeholders can be informed whether the Centre is doing its work effectively and efficiently. EPMRs are both retrospective and prospective; and help ensure the Centres’ excellence, relevance and continued viability, and the CGIAR System’s coherence. Each review is expected to be strategic in orientation and as comprehensive as the situation warrants.

7. The broad objectives of EPMRs are to: a) provide CGIAR members with an independent and rigorous assessment of the institutional health and contribution of a Centre they are supporting; and b) to provide the Centre and its collaborators with assessment information that complements or validates their own evaluation efforts, including the CCERs.

8. The EPMR panel is specifically charged to assess the following:

- a. The Centre 's mission, strategy and priorities in the context of the CGIAR's priorities and strategies;
- b. The quality and relevance of the science undertaken, including the effectiveness and potential impact of the Centre's completed and ongoing research;
- c. The effectiveness and efficiency of management, including the mechanisms and processes for ensuring quality; and
- d. The accomplishments and impact of the Centre’s research and related activities.

9. The topics expected to be covered by the EPMRs are listed below.

## TOPICS TO BE COVERED

### A. Mission, Strategy and Priorities

- The continuing appropriateness of the Centre's mission in light of important changes in the Centre and its external environment since the previous external review.
- The policies, strategies, and priorities of the Centre, their coherence with the CGIAR’s goals (of poverty alleviation, natural resources management, and sustainable food security), and relevance to beneficiaries, especially rural women.

- The appropriateness of the roles of relevant partners in the formulation and implementation of the Centre's strategy and priorities, considering alternative sources of supply and the benefits of partnerships with others.

**B. Quality and Relevance**

- The quality and relevance of the science practised at the Centre.
- The effectiveness of the Centre's processes for planning, priority setting, quality management (e.g., CCERs, peer reviews and other quality and relevance assurance mechanisms), and impact assessment.

**C. Effectiveness and Efficiency of Management**

- The performance of the Centre's Board in governing the Centre, the effectiveness of leadership throughout the Centre, and the suitability of the organization's culture to its mission.
- The adequacy of the Centre's organizational structure and the mechanisms in place to manage, coordinate and ensure the excellence of the research programmes and related activities.
- The adequacy of resources (financial, human, physical and information) available and the effectiveness and efficiency of their management.
- The effectiveness of the Centre's relationships with relevant research partners and other stakeholders of the CGIAR System.

**D. Accomplishments and Impact**

- Recent achievements of the Centre in research and other areas.
- The effectiveness of the Centre's programmes in terms of their impact and contribution to the achievement of the mission and goals of the CGIAR.

## APPENDIX III

### ITINERARY OF THE EPMR PANEL

The Panel Chair and one member attended CIP's Board meetings held at CIP Headquarters in Lima, March 2000. The whole Panel visited the CIP headquarters from 1 to 7 October 2001 for the Initial Phase of the Review. Senior research and management staff gave presentations on the mission, organization, financial and research management and specific project activities. During the Initial Phase the Panel met with representative from the university La Molina. The Panel also made one field trip together to CIP's research station in Huancayo. Between the Initial Phase and the Main Phase, the Panel members visited the major CIP regional sites in East Africa, Asia and Latin America.

Two Panel members visited CIP field programmes in East-Africa 13–18 December 2001. In Nairobi, Kenya, the members visited CIP's regional office, had discussions also the directors of the Kenyan Agricultural Research Institute (KARI) and visited ILRI. They also visited the Plant Quarantine Station Muguga (KEPHIS) and field experiments at Loreto School and the University of Nairobi. In Kisumu, they were shown a sweetpotato research site at KARI's Kakamega station and they saw on-farm activities with CBOs. The members then travelled to Uganda where they visited Kachwakano and Kalengyere stations and saw a farmer field school nearby. They were briefed about sweetpotato research at Namulonge Research Institute and they visited sweetpotato farmers in the neighbourhood. They furthermore paid a visit to the Kawanda Research Station and Makerere University in Kampala. They had discussion with the directors of the Ugandan National Agricultural Research Organisation and met with the Executive Secretary of the sub-regional organisation, ASARECA.

Two Panel members travelled to China (5–14 January 2002) to see CIP's regional work on potato and sweetpotato and to meet with policy makers and national research collaborators. They visited the Chinese Academy of Agricultural Sciences and the Ministry of Agriculture. From Beijing the Panel member continued to Shandong province where they visited the Shandong Academy of Agricultural Sciences to discuss collaborative work on potato and sweetpotato. They also visited a biotechnology centre and field trials. One Panel member then continued to Vietnam where he saw a TPS production site in Red River Delta and TPS potato growing in Tien Hai, Thai Binh province. The Panel member also saw sweetpotato variety trial in Thuy Duong in Thai Thuy. At the CIP-Hanoi office discussions were held with Vietnamese research partners. Meanwhile the other Panel member travelled to Indonesia and there first to visit the Research Institute for Legumes and Root Crops (RILET) in Malang, East Java. He also saw highland collection of sweetpotato genetic resources. At CIP-Bogor office the Panel member met with CIP staff. A visit to Research Institute for Vegetable in Lambang, West Java was also in the programme.

A consultant, John Griffith, visited CIP from 25<sup>th</sup> January to 2<sup>nd</sup> February, on behalf of the CIP EPMR Panel, to examine the financial position of the Centre. He submitted a report on his findings to the Panel Chair.

Two Panel members visited the CIP regional office in Quito in Ecuador in from 21 to 23 February 2002. They had a station tour and heard about CIP's work in Ecuador. A visit to Riobamba was cancelled due to general strike. Instead, discussions were held in Quito with CIP staff, partners from INIAP and other collaborating organizations. From Ecuador the Panel continued to Peru Cajamarca to see CONDESAN work. They met with PRONAMACH (the Peruvian soil and water agency), and CARE which has farmer field schools in the area. Furthermore they visited the Cumbemayo and Chetilla watersheds to see work on pilot farms, storage, reforestation, rural tourism, aromatic herbs, livestock, agriculture and handicrafts. The Panel members also saw the NRM work in the Jaquetepeque watershed, La Asuncion and the Puclush watershed. In Sao Pablo they visited the watershed association. They also had an opportunity to see the Gallito Ciego Dam and the erosion problems.

In Bolivia the visit of one Panel member included discussions with CIP staff, field visits, introduction to germplasm collection activities, participatory research, water consultations among other topics. The PROINPA network, COSUDE development agency and CONDESAN were among the stakeholders met.

The Panel reassembled at CIP headquarters from 25 February to 16 March 2002, for the Main Phase of the review. The Panel had a chance to have individual discussions with project leaders and staff in training and management for further information and clarifications. The Panel Chair and two members had also discussions at the Ministry of Agriculture and INIA.

The chapters of the report were shared with the Management Team and the relevant senior staff at the Panel Draft stage for factual corrections. On 15 March the report was presented to the Board Chair and other Board members and subsequently to the CIP staff.

## APPENDIX IV

### *LIST OF DOCUMENTS PROVIDED TO THE PANEL*

#### **A. Documents Provided by the TAC/iSC and CGIAR Secretariats**

##### *To All Panel Members:*

1. Guidelines and TOR for EPMRs.
2. Food Secure World for All: Toward a New Vision and Strategy for the CGIAR.
3. Report of the Fourth External Programme and Management Review of the “Centro Internacional de la Papa” (CIP).
4. Documents regarding the most recent TAC strategic studies involving the Centre:
  - (a) Systemwide Review of Plant Breeding Methodologies in the CGIAR and the Sub-report for CIP.
  - (b) First Review of Systemwide Programmes with an Ecoregional Approach.
  - (c) Priorities and Strategies for Soil and Water Aspects of Natural Resources Management Research in the CGIAR.
  - (d) CGIAR Priorities for Marginal Lands.
  - (e) CGIAR in Latin America and the Caribbean: Interactions, Achievements and Prospects.
  - (f) Report of the Inter-Centre Review of Root and Tuber Crops Research in the CGIAR.
5. The TAC Commentaries on CIP's 1998-2000, 1999-2001, 2000-2002, 2001-2003, 2002-2004 MTPs.
6. Roots and Tubers in the Global Food System. A Vision Statement to the Year 2020.
7. Regional Approach to Research for the CGIAR and its Partners.
8. Most recent CGIAR Annual Report.
9. Most recent CGIAR Brochure and Directory.
10. CGIAR ICW00 End of Meeting Report.

*Supplementary documents, to relevant Panel Members (including the Chair):*

11. Reference Guides for CGIAR International Agricultural Research Centres and their Boards of Trustees, August 1997. (Only to Panel Chair and management specialists.)
12. Most recent volume of the CGIAR Board of Trustees Directory (October 2000).
13. Most recent CGIAR financial guidelines and manuals.
14. Committees and Units of the CGIAR: Roles, Responsibilities, and Procedures.

**B. CIP Documents to EPMR Team**

*To All Panel Members and/or available at the Centre for reference:*

- (15) CIP Annual Report, 1993-2000.
- (16) Programme Report, 1995-1998.
- (17) CIP Training Programme Vision, 1996-2001.
- (18) Priority Setting at CIP: An Indicative Framework for Resource Allocations, 1993.
- (19) The International Potato Centre's Strategy for the 1990s and Beyond.
- (20) Priority Setting at CIP for the 1998-2000, Medium-Term Plan.
- (21) Overview of CIP Research and Training Achievements, September 2001.
- (22) Strategic Issues for consideration by EPMR.
- (23) Centre's Internal Management Structure, 2001.
- (24) Participatory Research at CIP, April 2000.
- (25) The Natural Resource Management Programme at CIP, October 1999.
- (26) Review of Nematology Activities at CIP, December 1998.
- (27) Potato and Sweetpotato Breeding Strategies, June 1997.
- (28) CIP Responses to 1995 EPMR Recommendations Relating to the Research Programme.
- (29) Evolution of CIP Projects since the 1995 EPMR.
- (30) List of CIP Staff Publications 1995-2001.
- (31) List of Science Awards Received by CIP and Staff, 1995-2001.

- (32) List of CIP Agreements with other Centres and Institutions.
- (33) List of 2001 Outgoing and Recently Completed Contracted Projects in US\$ thousand.
- (34) Agreement for the Recognition of the International Legal Personality of the International Potato Centre (CIP).
- (35) Host Country Agreement between The Government of Peru and the International Potato Centre (CIP).
- (36) Agreement for Scientific Cooperation between The Government of Peru and the North Carolina State University.
- (37) Table of the Board composition over the last five years.
- (38) Board Handbook.
- (39) Board Minutes, 1966-2000.
- (40) Brief description of the Centre's information management systems and procedures.
- (41) Table of the Minimum Position Requirement for Internationally Recruited Staff.
- (42) List of Senior Staff with Summary of Qualifications, 2001.
- (43) Table on the Turnover of Staff over the last five years by Category (since 1996).
- (44) External Auditors Reports, 1996-2000.
- (45) Financial Reports, 1996-2000.
- (46) Local compensation surveys used by the Centre.

***Additional documents provided to Mr. J. Griffith and/or Mr. Jean Yves Maillat:***

- (47) Manuals on Administrative and Financial Procedures, including Levels of Signature Authority.
- (48) Personnel Manuals and Procedures.
- (49) Monthly or Quarterly Financial/Budget Reports submitted to Management and Project Leaders.
- (50) 1999 Audit of Intellectual Property.
- (51) Clarifications Needed on Operations of CIP's Board.



- (52) Audited Financial Statements for the Years 1997-2000.
- (53) Management Letters for the Years 1997-2000.
- (54) Report of the BOT Audit Committee for the Years 1998-2001.
- (55) Approved Budget for the Year 2002.
- (56) Cash flow for the Months of November and December 2001.
- (57) Potatoes: Production, Marketing and Programme for Developing Countries, 1987.
- (58) Scientist and Farmer Partners in Research for the 21<sup>st</sup> Century, Programme Report 1999-2000.
- (59) Outputs of CIP Projects for the recent years.
- (60) Income and expenses for the years 1995-2002.
- (61) Income, expenses, capital, cash position for the years 1994-2004.
- (62) Expenses by cost center for the years 1994-2004.
- (63) Expenses by unit of expenditure for the years 1994-2001.

#### **4<sup>th</sup> EPMR RECOMMENDATIONS - RESPONSES – CURRENT VIEW and 5<sup>th</sup> EPMR PANEL OBSERVATIONS**

The 4<sup>th</sup> External Programme and Management Review of CIP in 1995 made 20 recommendations. CIP's original response to these recommendations, a statement of CIP's progress provided during the 5<sup>th</sup> EPMR and the Centre's current view are presented in this Appendix, which in addition provides the Review Panel's assessment of the status of implementation of the recommendations.

##### **Recommendation No. 1: Centre Mandate (Section 3.1 and Chapter 4)**

With respect to CIP's vision and mandate, the Panel recommends that CIP define the Centre's nature by formulating a vision statement and clarify through its operational mandate CIP's degree of commitment to global germplasm research *vis-à-vis* assuming an ecoregional responsibility for the Andean region.

##### **CIP's initial response**

CIP concurs with the Panel on the question of vision and mandate and shall act promptly to comply with its recommendation. We believe that the new vision and mandate statement should reflect recent changes within the CGIAR with regard to natural resources management concerns expressed in Agenda 21 and the system's response to the global mountain agriculture initiative. CIP intends to maintain within its mandate a strong commodity focus, one that fully addresses productivity issues and that continues to provide a useful synergy between commodity and ecoregional research.

##### **5<sup>th</sup> EPMR Panel's observations**

CIP has assumed an ecoregional responsibility for the Andean region. The need for a clearly articulated unifying vision still applies. See recommendations No. 18 and 19.

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##### **Recommendation No. 2: Relations with NARS (Section 3.2)**

With respect to NARS-supporting activity, the Panel recommends that CIP disengage itself from technical assistance activities and non-research technology adoption activities.

**CIP's progress statement**

As regional technical assistance networks and country programmes fall out of favour with donors seeking more impact from investment, CIP has begun to move away from technical assistance activities and strictly technology adoption activities. However, the increasing donor emphasis on maintaining flow along the research-development continuum, to assure that technology investments are deployed, has simultaneously created a new awareness in CIP of enhancing development activities based on CIP technologies. CIP has recently responded to this challenge in several ways with both potatoes and sweetpotatoes while recognizing the continuing need to centre its activities in the research arena rather than in the development area where it has no critical strategic advantage.

**CIP's current view**

This may have been a good recommendation at the time but has been superseded by events in the international donor community, and in NARS. We believe we need to move into the development arena when and where necessary. We don't anticipate that it will be a heavy involvement, but to assure uptake and adoption of our technologies, the continuum needs to be developed and maintained.

**5<sup>th</sup> EPMR Panel's observations**

The Panel agrees that there is a need to work closely with NARS, notably the weaker ones, in order to disseminate CIP's technologies through the national systems. This may involve a limited amount of targeted technical assistance and technology adoption activities where necessary.

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**Recommendation No. 3: Management of Programmes (Section 3.3)**

With respect to organizational structure, the Panel recommends that CIP re-invent its matrix, incorporating good management principles, to obtain the full benefits from the structure.

**CIP's initial response**

We are somewhat puzzled by the Panel's comment concerning the programme matrix, as a broad range of disciplines play a role in each of our programmes (all of which are based on major commodity constraints). CIP benefits from its approach to matrix management in a number of ways. For example, the current matrix provides the flexibility needed to allocate staff resources across programmes and projects, and helps to reconcile commodity, discipline, and programme concerns. It also plays an essential role in maintaining the integrity of research projects and subprojects in the regions. We believe that the current system works well and will provide the stability needed for successful evolution of the Center's research. We accept the Panel's comments concerning overlap in leadership between programmes and departments, a matter which awaits resolution. As to the future, we are evaluating the possibility of establishing a matrix geared more towards ecology-defined production systems based on commodities. Such a matrix would allow an even wider range of disciplines to participate in each of our six programmes.

**CIP's progress statement**

With its move to project-based management at the beginning of 1998, CIP moved away from a programme-based matrix project management system towards a fully projectized research management system. Research management has been based on good management principles associated with a fully projectized system and few problems have resulted. The totality and detailed description of the Projectized Research Management System at CIP is described in a paper prepared for the EPMR panel by the DDG-Research.

**CIP's current view**

Recommendation was a good one. The new projectized system is working well. It avoids the problems of a matrix and is easier to manage, but take a great deal of the time of the DDG-R due to the very lean staffing in that office.

**5<sup>th</sup> EPMR Panel's observations**

CIP has implemented a projectized research management system. Over time we would expect more attention to be paid to monitoring scientific quality and productivity.

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**Recommendation No. 4: Opportunity Analysis (Section 3.4)**

With respect to priority-setting, the Panel recommends that CIP consolidate existing information into *ex ante* analyses, to develop analytically valid strategies for each mandated commodity, disaggregated by region.

**CIP's Initial Response**

CIP concurs with the Panel's statement that opportunity analysis is required at regular intervals. Such an exercise was conducted in 1993 and will be repeated before the next planning cycle. Given the urgency of meeting both productivity and sustainability concerns over the next twenty years, CIP will assign a high priority to those activities most likely to achieve impact and will weight its priorities accordingly. We believe the analytical approach that CIP has used to identify priorities is preferable to alternative instruments now available. The current process effectively and transparently recombines existing information into *ex ante* analyses. It is particularly useful in achieving institutional consensus on priorities and is easy to update. We will, of course, consolidate new information into future analyses as the Panel suggests. It should be noted that, although the Center has prepared regional action plans, we consider that cross-regional factors play an important role in priority setting for global strategic research. We therefore plan to maintain the "project" as CIP's principal unit of analysis.

**CIP's progress statement**

In response to this recommendation and to support CIP's 1998-2000 Medium Term Plan, we undertook a quite detailed priority setting exercise during September 1996. Expected benefits and costs were estimated for CIP research projects for target and spill-over countries. This work was reported in: Walker, T. and Collion, M.-H. 1997. Priority setting at CIP for the 1998-2000 Medium Term Plan. Lima: CIP, 48 pages. These estimates have contributed to CIP's Regional Action Plans and have been periodically revisited by CIP's regional representatives.

**CIP's current view**

*Ex ante* analysis has guided CIP's programme for the last 5 years and has provided the information for good decision-making. We continue to do *ex ante* analysis now for specific programme or project areas.

**5<sup>th</sup> EPMR Panel's observations**

The Panel suggest that the methodology for priority setting be reviewed to more explicitly include criteria such as sustainability and equity, in addition to economic criteria.

**Recommendation No. 5: Resource Allocation (Section 3.5)**

With respect to programme expenditure shares, the Panel recommends that CIP continue to increase research spending to reach, by 1997, at least the mean level of the CGIAR centres, with spending on administration and operations reduced accordingly.

**CIP's initial response**

CIP concurs with the Panel's recommendation in this area. For 1995, allocations to the research and research support programmes have been calculated against a Board-approved budget of 53% and 9%, respectively. This closely approximates averages for the CGIAR system. Similar ratios are planned for 1996. Generally speaking, research programmes and research support are highly fungible. We therefore believe that when allocations to research across centers are compared, it is preferable to use the sum of allocations to both research and research support.

**CIP's progress statement**

At the beginning of 1998, our research programme was restructured from 6 Research Programmes into 17 Research Projects; resource allocation was as follows:

Year	Research	Unrestricted	Restricted
1997	Programs I to VI	\$0.9M	\$8.6M
1998	Projects 1 to 17	\$1.3M	\$9.2M

**CIP's current view**

Not sure this is relevant anymore. We need to support our projects at all time with a minimum baseline of acceptable unrestricted funding for each one, and then make strategic decisions as to where the higher priority needs are for additional UR support. If that is done, it is not so important how it relates to other CG spending except perhaps as a percentage comparison.

**5<sup>th</sup> EPMR Panel's observations**

Although comparisons between CGIAR Centres are difficult, the Panel believes that the issue is still relevant and warrants the continued attention of the CIP management. CIP should stay focused on getting more money directly into its core research activities. Maintenance research for CIP's core activities need to receive priority for unrestricted fund allocation.

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**Recommendation No. 6: Impact Assessment (Section 3.6)**

With respect to impact assessment, the Panel recommends that CIP develop a strategy for continuously monitoring and evaluating the performance of its research outputs in terms of their impact - both positive and negative - on welfare, gender, and the environment.

**CIP's initial response**

CIP appreciates the Panel's commendation on impact assessment, and plans to continue monitoring the results of its research in the areas of farm and consumer income. In the future, increasing emphasis will be placed on environmental impact, focusing on pesticide use, damage to soil resources, and methodology development for impact analyses of alternative land-use systems.

**CIP's progress statement**

CIP's 1998 project set included a self-standing project on global commodity analysis and impact assessment in which targeted assessment studies were carried out to evaluate research outputs. The importance of this set of activities was fully recognized in the reconfigured 2001 project set where the Global Commodity Analysis and Impact Assessment Project is retained and continues to operate. Published outputs of this project are available on request

**CIP's current view**

This has been very helpful in decision-making and in validating CIP investments.

**5<sup>th</sup> EPMR Panel's observations**

There is still a need for evaluation of impact on workplan, gender and the environment.

**Recommendation No. 7: Germplasm Enhancement and Breeding (Section 3.7)**

With respect to crop improvement, the Panel recommends that TAC commission a mid-term review (in 1997) of the potato and sweetpotato genetic enhancement and breeding efforts at CIP.

**CIP's initial response**

The Center continues to refine its strategy for potato and sweetpotato enhancement and breeding. We welcome the suggestion of a review in 1997 and will keep TAC apprised of all future CIP-initiated reviews.

**CIP's progress statement**

The requested review was commissioned and carried out in 1998. The review document, as well as TORs for the review panel, have been distributed to the EPMR panel. In addition, CIP's breeding activities were included in the CGIAR Systemwide Review of Plant Breeding Methodologies in 2000. The Panel's specific comments about CIP and CIP's responses are available upon request.

**CIP's current view**

The Breeding ICER was helpful, as was the system review of plant breeding; however, we are limited in our ability to respond. We need to invest more in breeding in both sweetpotatoes and potatoes, probably more in traditional aspects at the moment rather than molecular aspects.

**5<sup>th</sup> EPMR Panel's observations**

Plant breeding is vital for the future of CIP. A specific recommendation is made for potato breeding (No. 1). Good progress has been made in connecting breeding to genetic resources and genomics. The Panel recommends enhancement of this area of endeavour.

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**Recommendation No. 8: True Potato Seed (Section 3.8)**

With respect to the future of TPS at CIP, the Panel recommends that CIP devolve true potato seed (TPS) technology to specifically-identified, research-strong NARSs and private enterprise.

**CIP's initial response**

CIP greatly appreciates the Panel's remarks on true potato seed (TPS), but wishes to state that it does not produce TPS on a commercial scale. Small quantities of TPS are produced for the evaluation of parental lines and for seed quality studies. Efforts have been made to devolve existing technology to NARS and the private sector. CIP continues to maintain a policy of open access and non-exclusivity with respect to TPS. The Center concurs with the Panel that clearer research end-points need to be defined. To that end, ex ante analyses will be conducted to determine under which scenarios TPS production is most likely to prevail. These efforts should help to determine the appropriate contribution of CIP,

public-sector NARS, and the private sector. We anticipate that additional research is needed in the areas of reproductive biology, horizontal resistance to late blight, and earliness.

### **CIP's progress statement**

Since the last EPMR, CIP's research on TPS has become increasingly focused in terms of both countries and issues to be addressed. It concentrates on improving targets such as tuber size distribution in breeding for higher yielding and earlier maturing TPS progenies. Complementary work on maximizing the role of TPS to contribute to improved potato seed systems in selected developing countries is carried out in CIP's technology utilization project on potatoes (Project 02A in the 2001 Project Portfolio). CIP's investment in TPS research has declined since the EPMR in 1995. However, some investment is still warranted for two reasons. First, TPS as a seed system is not a mature technology in the sense that it represents a reasonable investment opportunity for the private sector or for a public sector NARs without CIP's involvement. Parts of the TPS system are mature. Research progress in the production of botanical seed has been excellent, and TPS can be produced in most developing countries that are interested in deploying the technology. Effective seed quality and storage protocols have also been developed and have been disseminated to NARs partners. More research progress is needed in improving the performance of TPS progenies. Targets have been set for several characteristics, mainly earliness and tuber size distribution. Targets have also been established for regions within countries where TPS is most likely to make a contribution. On-farm studies of earlier TPS progenies show that TPS has a role to play when conventional seed tuber cost exceed 22% of the value of production. Limited adoption points to the need for further progeny improvement. Currently, about 10,000 hectares are planted to TPS mainly in India, Vietnam, Bangladesh, and Peru. Without improvements in progeny performance, it is unlikely that TPS will make a larger contribution to improving seed systems in developing countries. Presently, neither the adoption area nor the economic prospects are bright enough to elicit private or public sector investment without CIP's involvement. A role for TPS in disaster relief is another motivation for CIP's continuing involvement. TPS is a seed security blanket when El Niño occurs and has also contributed to the rapid renewal of planting material in several relief efforts. The maintenance of a supply of good quality planting material for relief purposes is not a research activity but evaluation of its role is. CIP also plays a role in the quality testing of TPS. Much of the EPMR comment centres on institutional incentives for TPS technologies. As a rule, CIP discourages domestic production of TPS in lieu of imports from either Chile or India, two countries with a demonstrated capacity and interest in producing TPS. CIP's parental lines are freely available to any party who wants to produce hybrid progenies. We do not believe that this open access policy unduly dampens incentives for private sector TPS production because production of TPS seed is still a relatively complicated process that offers many opportunities for the generation of trade secrets. We do not feel that CIP's involvement with TPS has crowded out private sector investment. It is an interesting footnote, that TAC has recently expressed concerns about CIP's lower level of investment in TPS.

### **CIP's current view**

CIP has looked at TPS in a different way. It is unlikely that NARS will adequately maintain strength in TPS breeding and seed technology given their own constraints. We believe TPS is sufficiently important in certain situations that CIP needs to continue to cover the researchable issues



and promote its adoption in those situations. The value of our staying in TPS has been demonstrated significantly in the case of disaster relief and mitigation. We have focused carefully on the researchable areas in the TPS project, and on the deployment in appropriate situations in the Uptake and Utilization project. We believe this is the right course to follow for the time being.

#### **5<sup>th</sup> EPMR Panel's observations**

TPS still requires investment in research in some basic biological mechanisms such as meiosis control and fertility polyploid. The Panel agrees with the recommendations of the 4<sup>th</sup> EPMR.

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#### **Recommendation No. 9: Pest and Disease Management (Section 3.9)**

With respect to crop protection research, the Panel recommends that CIP carefully select a small number of key crop protection research activities and, for these, move up-stream to do carefully-targeted, global-perspective strategic research for potato and sweetpotato.

#### **CIP's initial response**

Crop protection research at CIP has only recently emphasized IPM synthesis (systems) research. This effort includes a number of accumulated component technologies in biological control, pheromone application, and crop management. Center scientists have developed a methodology or framework for IPM synthesis that appears to have wide application. The methodology is currently being finalized in collaboration with the systemwide IPM initiative. It is expected that this work will be given priority for two more years, at which time the balance will most likely shift back to strategic research on other priority pests.

#### **CIP's progress statement**

*Potatoes:* CIP's potato pest and disease management programmes have been refocused and reduced to the most globally important and strategically significant constraints (Late Blight, Bacterial wilt and key insect pests). In the case of IPM, emphasis is on addressing only the pests of global and regional importance such as Leafminer flies, whiteflies, and tuber moths, moving certain activities to lower priority ranks. The IPM project is joining the system wide project on whiteflies and soon will be leading a similar global project on Leafminer flies. For pests of regional and local importance, the IPM project at CIP will facilitate the flow of available information in the respective regions. Here the project is drawing on the strengths of CIP's partnerships with NARS and NGOs for implementation of proven IPM components. A shift from "IPM diffusion" to an "IPM research first" mode is well underway.

**CIP's current view**

A good recommendation that has resulted in significant efforts to re-emphasize the research elements of the projects in both sweetpotato and potato. The focus is also honing in on specific insects where CIP has an advantage and can make an impact.

**5<sup>th</sup> EPMR Panel's observations**

The 4<sup>th</sup> EPMR recommendation has been fully understood and implemented. The impact disease-free and resistance sweetpotato germplasm in China is impressive.

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**Recommendation No. 10:**

With respect to deployment of scientists, the Panel recommends that CIP concentrate its crop protection research programme at a central location in order to provide a nucleus sufficient to undertake globally-important, strategically-significant crop protection research, to further the potato and sweetpotato mandate of the Centre.

**CIP's initial response**

CIP seeks to reinforce disciplinary support of outposted scientists, without losing access to relevant pest syndromes that would result if all crop protection scientists were placed in one location.

**CIP's progress statement**

CIP has maintained a strong Headquarters based team, but the need to approach crop protection through participatory research demands the location of staff in the regions.

**CIP's current view**

We are once again limited in response due to budget concerns.

**5<sup>th</sup> EPMR Panel's observations**

CIP's 1995 response is still valid. Effective partnerships are the key to this recommendation.

**Recommendation No. 11: International Movement of Research Germplasm (Section 3.10)**

With respect to the global potato and sweetpotato germplasm collections, the Panel recommends that CIP accelerate the clean-up and pathogen-testing of potato and sweetpotato accessions, by developing plans and a strategy for doing this, including the necessary arrangements for partnerships, including contracts, to complete the work before the year 2000.

**CIP's initial response**

CIP concurs with the Panel's recommendation that priority be given to the maintenance and distribution of germplasm. For the time being, we believe that cleanup efforts should focus on a core collection of cultivars and wild species. CIP has advanced considerably in the clean up of wild species and is pursuing new funding for the collection at large. Until additional money becomes available, we believe that the current rate of cleanup coincides with current demand. It should be noted that access to the gene pool is largely assured for the present through the availability of botanical seed.

**CIP's progress statement**

The annual rate of pathogen elimination between 1995-1999 did not increase. Facilities and logistics were not conducive to larger scale cleaning up operations. Most efforts were dedicated to improve conservation methods. Cleaning up clones by contract with CRP-CU, Luxembourg, was carried out for 33 potato clones. The process was slow and comparatively very costly. With the restructuring of CIP germplasm acquisition and distribution procedures, germplasm flow, including pathogen elimination, gradually improved. Requirements of health status for local and international distribution were further defined. Between 2000-2001, yearly pathogen elimination increased to over 200 for potato and 150 for sweetpotato. The Germplasm Acquisition and Distribution Committee (GADC) defined priorities for cleaning up. Curators' requests have the highest priority, and cleaning up long-term holdings will be a continuous process. GADC will approve all other requests with priority given to material to be exported. Currently, 32% and 11% of potato and sweetpotato, long-term holdings, respectively, are available for international distribution (health status HS2). Including material cleaned for local distribution (health status HS1) and non-cleaned accessions a total of 3755 (potato) and 4407 (sweetpotato) clones still remain to be processed for pathogen elimination for international distribution. Greatly improved procedures, currently under implementation, will allow clean up of nearly 1000 accessions/per year, each of potato and sweetpotato.

**CIP's current view**

Germplasm conservation, maintenance and handling have improved and efficiency has increased tremendously. We are now systematically moving through the collections and cleaning them, but with a balanced strategy that allows for CIP and partner needs to be met for other germplasm also (i.e. new varieties or experimental clones). The new biodiversity complex and the more efficient systems will allow us to make good progress towards completely cleaning the collections now. We are meeting international demand for our material through this process. If an accession is requested which is not scheduled for cleanup, we do react by moving it to the top of the priority list.

**5<sup>th</sup> EPMR Panel's observations**

CIP has responded positively and made excellent progress. Creation of electronic databases to monitor movement of germplasm is a significant development for genetic resources management and utilization.

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**Recommendation No. 12: Seed Distribution to Farmers (Section 3.11)**

With respect to the proposed seed distribution experiment, the Panel recommends that CIP undertake a limited number of clearly defined institutional experiments to test the hypothesis that potato cultivars with resistance to major pests and diseases will diffuse through the informal seed sector if an initial volume of seed is made available.

**CIP's progress statement**

CIP conducted an experiment to verify the potential for informal diffusion of potato varieties with resistance to pests and diseases if an initial volume of seed is made available. The experiments were conducted in Mountain Province in The Philippines, Kabete Province in Uganda and Central Province in Kenya. In the three sites informal community-based seed production was organized and promoted. The community-based schemes were supported by the provision of large volumes of first generation (g1) quality seed. The community seed schemes would then multiply one or more times and sell to their neighbours. The results were mixed. In the Philippines, the local collaborators selected a variety to promote that was capable of replacing the existing popular variety only under conditions of heavy white fly pressure. The new variety was sufficiently late to recover from white fly damage while the existing popular variety was unable to recover. Otherwise the informal distribution network, while initially very local, gradually spread and the introduced material is widely found though not extensively grown. In Kenya, while the introduced variety had good acceptance and good performance, the informal seed distribution in the selected site was too fragmented to realize widespread distribution and thus remained concentrated in a single locale. The example of success of the hypothesis occurred in Kabete Province in Uganda. With good institutional support from the national agricultural research institute and favourable market prices producing good income for the farmer participants the initial phase of the experiment identified varieties with good acceptance and a seed multiplier group with good distribution potential. The early results were sufficient to attract an NGO that financed a large project that has greatly expanded the diffusion of the variety.

**CIP's current view**

A good recommendation that has led us to the present Uptake and Utilization project, which is focused around seed as a delivery mechanism. This has been partly a result of the knowledge we gained from working in informal seed systems and understanding the uptake paths.

**5<sup>th</sup> EPMR Panel's observations**

The recommendation has been implemented and is now part of project 2A.

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**Recommendation No. 13: Post-Harvest Technology (Section 3.12)**

With respect to post-harvest technology, the Panel recommends that CIP expand macroeconomic *ex ante* studies of the competitiveness of major sweetpotato-based products in the key countries that the programme has selected for potential impact.

**CIP's progress statement**

Most of CIP's post-harvest research capacity has focused since the 1995 EPMR on ex ante assessments of sweet-potato based products in China, Vietnam and Eastern Africa. This was reflected in the establishment of a sweetpotato post-harvest project (transition from programme to project mode) in the 1998 project set, and the more explicit market focus of the current post-harvest project (since 2001). Breeding efforts are concentrated on increasing the dry matter content of sweetpotatoes following a priority setting exercise which identified that as the key to successful post-harvest use in CIP's target developing countries. In China considerable financial and staff resources were dedicated to identify sweetpotato feed and starch markets and to develop component technologies to increase the competitiveness of sweetpotato versus domestic and imported staples. In Eastern Africa, CIP's collaborative research focused on product development and enterprise development to stimulate sweetpotato flour production and use. In 2000 and 2001, CIP initiated the VITAA Partnership to promote orange-fleshed sweetpotatoes to reduce Vitamin A deficiency in East Africa. This effort included an ex-ante assessment of potential impact. CIP has also increasingly turned its attention to the post-harvest market aspects of native Andean root and tuber crops (including potatoes) with the aim of increasing farmer income and also providing incentives for biodiversity conservation. Overall, CIP's response to this recommendation has sharply focused its post-harvest strategy for all its commodities and has put the Centre on target for significant impact in this increasingly important area of research. There is no doubt that at this time, CIP focus a staffing shortage in this important research area.

**CIP's current view**

A good recommendation that has led us, along with other external factors, towards a heavier emphasis on sweetpotato post-harvest products. In general, post-harvest products, nutrition and marketing are getting much more emphasis now in CIP.

**5<sup>th</sup> EPMR Panel's observations**

In the new project (6A) there is neither the competency nor critical mass in this area for CIP to make real progress. A separate project is not justified and many of the activities can be catered for in other projects such as 5A.

**Recommendation No. 14: Science Leadership and Quality (Section 3.13)**

With regard to scientific quality and its relation to scientific leadership in dealing with global responsibilities for potato and sweetpotato, the Panel recommends that CIP take early steps to enhance the quality of CIP's research, both at CIP-Lima as well as in the regions.

**CIP's initial response**

CIP fully accepts the Panel's comments on science quality, but cautions against associating downstream research and impact with quality concerns. Current plans call for CIP to strengthen its plant breeding and late blight research capacities and to increase its leadership in these areas. CIP also plans to strengthen *ex ante* and *ex post* project reviews and to augment its use of peer reviews and research publications.

**CIP's progress statement**

Steps taken include an in-depth analysis of operations of key areas to determine where weaknesses existed. Over time, these analyses have led to a concerted effort to help staff understand and improve quality factors (publications, peer-reviewed research, statistical accountability, focused outputs, adherence to research objectives, etc.). These efforts have resulted in staff reductions in areas of weakness. In many cases staff reductions were also connected with reduction in low-priority areas of research; however, in some cases staff contracts were not renewed so that gradual changes could be made to more productive, higher quality research efforts. In addition, in 1998 the Programme Management Team was created as an advisory body to the DDG-Research on issues of programme management. In 1998 the PMT initiated the first annual project evaluation, monitoring and assessment system in CIP's history. After three years of experience with the system, it is now nearing maturity and has resulted in scrutiny of the entire project set to assure quality research and limit "mandate creep" through non-agenda research. Other components of project management put into place by the Office of the DDG-Research have introduced numerous quality control points into the research programme. These include: annual sub-project and project reporting; a system of accountability for funded research projects including submission, approval and reporting; an intellectual property database; a germplasm acquisition and distribution system (electronic); electronic publications report system; electronic travel request and report system, intranet-based project portfolio system with milestones, logframes, etc. The advances in scientific quality are evident in a much strengthened biannual programme report.

**CIP's current view**

Much effort has gone into reacting to this recommendation. We put a high value on quality and have tried to reflect that both in selected downsizing of staff and new hires. We will continue to work towards higher quality as well as more precision in measuring quality.

**5<sup>th</sup> EPMR Panel's observations**

The situation is better. The quality is good but the presence in quality publications could be stronger. Each scientist must have a clear publication strategy. Issues related to science quality and leadership require continued attention from the CIP management. Publication of research results in refereed journals should be encouraged. The Panel believes that quality of science needs reinforcing.

**Recommendation No. 15: CIP Governance (Section 3.14)**

With respect to the Centre's financial health, the Panel recommends that the Board continually monitor CIP's liquidity and operating fund levels, and establish a timetable for achieving what CIP management proposes as prudent and reasonable targets.

**5<sup>th</sup> EPMR Panel's observations**

The “good” years of 1995-1998 were not used to sufficiently re-build the operating funds so that when the leaner years came (1999 onwards) the operating fund could only be re-built through the sale of CIP's aircraft and special allocations from the CGIAR. Deficits in 1999, 2001 and 2002 (projected) will bring the operating levels down to its low level of 1995.

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**Recommendation No. 16: Finance and Resources (Section 3.15)**

With respect to CIP's fixed assets and certain associated operating costs, the Panel recommends that CIP periodically review its investments in service areas, where local alternatives exist, in order to determine whether or not to dispose of possible excess capacity, thereby adding to capital fund reserves and possibly reducing operating costs overall.

**5<sup>th</sup> EPMR Panel's observations**

The major asset CIP disposed of was its aircraft in 2000. With respect to services it is only now (2002) that CIP is implementing the outsourcing of some support services (e.g., printing, transport). CIP should have been more diligent with respect to this recommendation.

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**Recommendation No. 17: Research Focus (Chapter 4)**

With respect to CIP's research focus, the Panel recommends that CIP engage in formal strategic planning to "put a person on the moon" (e.g. growing potatoes profitably without pesticides). The selected research should represent priority research challenges employing CIP's special advantages and science capacity.

**CIP's progress statement**

CIP responded enthusiastically and directly to this recommendation by creating, with partners, the Global Initiative on Late Blight (GILB). The “person on the moon” analogy was to the objective of ridding the world of late blight disease in a 10-year period by focusing research around the world on this objective. Late Blight is the single most costly plant disease in the world. GILB has been tremendously successful in its own right, especially in the last four years of its existence. A milestone was passed in 1996 with a successful global meeting which reinforced the appreciation of both developing and developed countries for GILB's work. However, GILB has not fulfilled the analogy of a “person on the

moon”. It has been more valuable in filling an empty niche which has linked researchers worldwide and increased awareness of late blight’s devastating effects; but there is as yet, little evidence that it has decreased those effects *per se*. As a result of this recommendation CIP has, however, continued to operate in the context of potential “person on the moon” opportunities. We feel that the most likely candidate is the new VITAA partnership which truly has the potential to create huge impact on sustainable livelihoods in East Africa and beyond.

#### **CIP’s current view**

This was done, as was probably a good recommendation, but the topic chosen was probably not a “person on the moon” project. GILB was the result of this recommendation and while it has been extremely successful in its own right, it is doubtful that it can solve the late blight problem. A more likely “person on the moon” project is going to be VITAA – Vitamin A for Africa – a project, which CIP can assuredly succeed in, and one, which will have a tremendous impact. It is also a model for linking health and agriculture and for building a sustainable partnership throughout the region. It will truly be CIP’s woman on the moon project!

#### **5<sup>th</sup> EPMR Panel’s observations**

The 4<sup>th</sup> EPMR recommendation referred to a more ambitious goal. The Vit AA project could provide such an example if it solved a problem that could not be solved by another means. The Panel thinks that what was meant in the 4<sup>th</sup> EPMR was also to enhance a process of strategic scientific brainstorming. The methodology for research priority setting needs to be reviewed, to include equity, gender and sustainability concerns. Strategy development is a continuous process. The Panel feels that strategic planning is still inadequate and that the Centre lacks an uplifting vision of its future.

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#### **Recommendation No. 18: Partnerships with NARS (Chapter 4)**

With respect to CIP’s relationship with NARSs~ the Panel recommends that CIP increase its strategic partnerships for collaborative research and training with research-strong NARSs, to take advantage of growing research capacities of national systems, particularly in Asia and Latin America.

#### **CIP’s initial response**

The Center’s use of contract research, especially in developing countries, has provided numerous opportunities in the past for completing important research tasks. At the same time, contract research has helped to strengthen national programme cooperators. We agree with the Panel that there is a need to expand such collaboration, and we shall make every effort to do so. In anticipation of these initiatives, CIP is developing more cost-effective and efficient methods for conducting core training programmes. The strengthening of national programme cooperators, we believe, is a prerequisite for ensuring impact and is an issue of systemwide importance. It should be noted that CIP’s so-called non-core-funded



country programmes are financed entirely from special project funds. Such grants do not limit CIP's access to high-quality staff and frequently provide unique opportunities for effective research partnerships.

### **CIP's progress statement**

CIP has taken this recommendation to heart and has incorporated the spirit of it into its relationships with NARS. As examples, we have developed a close and mutually beneficial relationship with Chinese research partners in both sweetpotato and potato which builds on the great Chinese capacity and uses CIP as a research-focusing partner. We have continued to move our partnership with India to a more equitable basis by helping them rely on their own strengths. This has been more difficult in other parts of the world, specifically Latin America, but we have also made progress in Africa with the increasing capability of the Uganda programme, as well as an emerging new partnership with South Africa.

### **CIP's current view**

A good recommendation but NARS have suffered considerably over the past 7 years. Their objectives have changed considerably. In other words, it has been a moving target. In spite of this, CIP has succeeded to the extent possible with countries such as India, China (very successfully), Argentina, etc. More can certainly be done.

### **5<sup>th</sup> EPMR Panel's observations**

CIP's answer reflects the reality of its relations with NARS. These institutions are changing their strategies and it is necessary for CIP to evaluate with which NARS it is possible to establish closer research relationships. The response appears to be appropriate.

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### **Recommendation No. 19: Scientific Leadership (Chapter 4)**

With respect to scientific leadership, the Panel recommends that CIP pay greater attention to the necessary balance between science quality, programme responsiveness (to donors' priorities), and research relevance (to NARSs' needs) as a continuing research management responsibility, leading to scientific leadership.

### **CIP's initial response**

Since the last EPMR, CIP has conducted a limited amount of downstream research to help national systems achieve short-term, measurable impact. During this same period, the Center has invested significantly in research that addresses major upstream topics, including the improvement (through both conventional and biotechnological methods) of host plant resistance in our major commodities. When compared with staff reductions and development of planning documents, investments in so-called downstream research have had little impact on the Center's core programme. In the future, greater predictability and stability at the system level should help to offset these difficulties and further enhance research quality and productivity.

**CIP's progress statement**

For the past four years, the Office of the DDG-Research has attempted to envision and develop CIP's research programme in line with this highly relevant and insightful recommendation. As donor priorities became more focused over those four years, it has become increasingly important to have a programme that is holistically managed and resting on all these cornerstones. Many components were put into place; however, the staff resources available to the ODDG-R were (and still are) extremely limited in being able to carry out all the necessary underlying foundation building to reach this holistic, integrated vision. Science quality has increased (including scientists' awareness of quality issues), a new integrated project set has been instituted, basic protocols and processes have been put into place on the research side. What CIP has not been able to accomplish is to carry through with the country and regional priority-setting as a foundation for continuing evolution of our research projects, and the links to donor priorities through the establishment of a centre-specific donor information system (we have parts, but not an operative system linked to the priorities of our target countries and to CIP's research outputs). This continues to demand critical attention. The increasing trend toward designated funding covering fractions of projects, and the increasing dependency on bilateral and regional funding sources have made it more difficult to strike this desired balance.

**CIP's current view**

We have paid attention and have made good progress. It continues to need very hard work. It also suffers from the structure of the Office of the DDG-Research, as well as structure of management at CIP. There is only one person in the ODDG-R with the expertise to organize and manage this at the highest level, and the job is monumental. There is little flexibility to put the right team into place to do it, and the job is simply overwhelming for one person to manage and keep track of. It still needs to have a heavy concentration but in a more systematic way that has some efficiency built in rather than in the more "old-fashioned" ways which simply aren't relevant or appropriate anymore.

**5<sup>th</sup> EPMR Panel's observations**

This recommendation is still pertinent. CIP should not confuse scientific leadership with management. The recommendation refers to "scientific leadership" and still needs to be retained as an objective.

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**Recommendation No. 20: Germplasm Responsibilities (Chapter 4)**

With respect to germplasm responsibilities, the Panel recommends that CIP accelerate its clean-up, documentation, and distribution of the global collections of its mandated crops.

**CIP's initial response**

CIP concurs with the Panel's recommendation that priority be given to the maintenance and distribution of germplasm. For the time being, we believe that cleanup efforts should focus on a core collection of cultivars and wild species. CIP has advanced considerably in the clean up of wild

species and is pursuing new funding for the collection at large. Until additional money becomes available, we believe that the current rate of cleanup coincides with current demand. It should be noted that access to the gene pool is largely assured for the present through the availability of botanical seed.

#### **CIP's progress statement**

CIP has responded to this recommendation with a complete overhaul of the germplasm acquisition and distribution system. A synopsis of this new system will be available to the Panel. The Centre did not totally agree that clean-up and distribution needed to be accelerated because it is an expensive process and much of the material in the collections is never requested. When it is requested, it can enter the clean-up process immediately. However, with the new system a balanced response has been put into place to react to external and internal demands for clean germplasm. The Germplasm Acquisition and Distribution Committee approves all clean-up requests and allocates a specific amount of “clean-up time” to different categories, including routine clean-up of global collection material whether it is requested or not. The new system meets all demands, and in addition assures that the global collection steadily moves toward the goal of being cleaned. The overhaul of the in-vitro unit during the past three years has tremendously increased efficiency. The new facilities available in the Biodiversity Complex have also increased efficiency.

#### **CIP's current view**

See Section 3.10

#### **5<sup>th</sup> EPMR Panel's observations**

CIP has handled this recommendation in a pragmatic way. The commitment is impressive and the result excellent. The issue is whether sufficient unrestricted funds are available at CIP for this important core task.

### A NATURAL RESOURCE MANAGEMENT PARADIGM

#### Policy Objectives and Instruments

An important issue, raised in Chapter 1, is that of policy objectives and policy instruments to realize those objectives. If new objectives are added to the mission of a Centre, the policy instruments to realize those new goals should be added at the same time. Or, alternatively, the Centre should be given the means to develop such policy instruments.

The enormous impact that the seed-based technologies of the Green Revolution have had clearly demonstrates that the delivery mechanism required to generate and disseminate those technologies existed at the time and was highly effective. Hence, when Centres such as CIMMYT and IRRI set out to increase the production of rice, maize and wheat in developing countries they were able to generate a policy instrument that proved to be efficient and effective. The term “policy instrument” is interpreted here as encompassing (a) research capabilities, (b) upstream and downstream linkages with research and development partners, and (c) mechanisms for the dissemination of technologies.

#### The Marginal Areas

The criticism of the Green Revolution that it was largely confined to the traditionally most productive areas in the developing world, resulted in an increased interest in NRM and related research issues within the CGIAR. It thus seemed appropriate to follow a two-pronged approach:

- continue NRM research in the high-input production systems on the more productive land, aimed at generating technologies that provide low-cost and high-quality food for the (urban) consumer, while generating employment opportunities in the production areas and limiting the negative effects of agricultural production on human health and the environment, and
- intensify NRM research in the low-input systems on the more marginal lands, aimed at generating technologies that optimize the use of limited natural resources, while conserving the natural resource base and maintaining or improving environmental quality and human health, and providing more and better quality food for the producers, while generating some marketable food surpluses to raise rural incomes.

The paradigms for NRM have been in an almost constant state of flux within the CGIAR system: farming systems, production systems, low external input sustainable agriculture (LEISA), environment, human health, organic farming, global change, carbon sequestration, gender issues, biodiversity, participatory methods, indigenous knowledge,

*in situ* conservation, sustainability, public goods, ecological farming, inter-generational equity, partnerships, empowerment, agroecology, externalities, ecoregions, and so on. Notwithstanding the wealth of ideas and concepts in this respect, there are few examples of successful NRM-based technologies for marginal areas, developed and disseminated through the CGIAR system, that have contributed significantly to alleviating poverty and increasing food security in the developing world.

### **Definitions**

One problem in the discussion around the paradigms for NRM is that of definition of terms. Notions such as “environmental quality” or “resource degradation” are quite difficult to define as their definitions refer to specific functions of natural resources. For example, for soil, these functions include the production function (agriculture), filter or buffer function (environment) and ecological functions, including the *refugium* function, that is providing the physical environment for soil biota to live. Hence, a soil may be of low quality with regard to agricultural production, but still function very well as a buffer for toxic chemicals in the environment.

Also, sustainability or soil degradation are not static properties, but relate to the dynamics of systems. They are the result of a series of simultaneously occurring processes. Whether soil erosion occurs, or nutrient depletion, or salinization, can only be determined by studying the processes which cause these phenomena. A study of the soil itself may reveal whether these processes have occurred in the past. It may also provide an indication of their cumulative effect, but does not provide information as to the actual occurrence or intensity of these processes under the present environmental and management conditions. This is one of the reasons why simulation modelling has become so important in modern agroecology: simulation models allow us to study the effects of processes on soil parameters and quality indicators, under different environmental, and soil and crop management conditions.

### **Elements of a NRM Paradigm**

A paradigm for NRM research at CIP could include the following elements:

- (1) The NRM research programme should have a clear strategy, set of priorities and focus. The potential NRM area is very wide and diverse and without a clear focus the programme could easily be diluted to an extent that there would be no visibility and no impact whatsoever. Also, NRM research is generally long-term research and to have any impact at all, research topics, locations and partnerships would have to be carefully selected.
- (2) The NRM research programme should be closely linked to the Commodity Improvement (breeding and crop protection) programme, that is, NRM research should focus on potato- sweetpotato- or ARTC-based production systems. NRM research and technology development should include the technology package that goes with a seed-based technology in a particular production system, but also pay attention to other components of the production system. In addition, impact of production practices on the environment, aspects of sustainability and equity, upstream-downstream linkages in a watershed, and socio-economic and policy aspects should be considered. Finally, the possible contribution of integrated

NRM technologies to poverty alleviation of producers and consumers should be examined.

- (3) Not only should NRM and Commodity Improvement be linked at the programme level, but scientists should be encouraged to communicate and interact on a regular basis, and collaborate on common benchmark sites.
- (4) NRM research at CIP should focus on the more basic and strategic aspects of NRM, such as soil-crop-nutrient modelling; quantitative methods for the assessment of the impact of production practices or technologies on the environment; spatial and temporal systems analysis; expert systems and decision support tools; innovative methods for the acquisition, processing and analysis of spatial data; and methods or algorithms for upscaling and downscaling of spatial data, information and technologies. These component models and methodologies should be integrated, or at least be made compatible, in user shells or decision support tools for watershed management.
- (5) Since much of this more basic and strategic NRM research tends to be driven by scientific and technological developments, care has to be taken not to lose the application and the end-user out of sight. Mechanisms have to be designed to ensure that the research is addressing real needs of target groups, and that the tools do indeed reach the target groups. Also, at the downstream end of the technology transfer, methods for the transfer of knowledge and technology to farmers, such as the concept of farmers' field schools for IPM technology, have to be further developed and tested.
- (6) The output of NRM research may be, among others, (a) scientific data, knowledge, information, methods, models or software, (b) improved NRM technologies or management recommendations, and (c) socio-economic or policy recommendations. Of course, this listing is not exhaustive, but it illustrates the diversity in outputs of NRM research.
- (7) NRM scientists should determine, for each of their output categories, who their clients are and then create delivery mechanisms for each of those product categories in order to reach those clients. For example, in the case of scientific products, the primary clients may be the world scientific community, in which case publication of the research results is an appropriate way to reach the target group. On the other hand, if policy recommendations are the output considered, then policy makers, or the circle of people that may be expected to influence policies or policy makers, would be the target group.
- (8) Once a strategy and research focus have been determined, mechanisms for collaboration between scientists within CIP have been effectuated, and categories of research outputs, as well as their associated clients have been determined, the delivery mechanisms for NRM research have to be developed. It seems that the CONDESAN consortium may well serve as an example of how this could be done.
- (9) A delivery mechanism for NRM technologies aimed at an ecoregion, such as the Andean mountain region, should bring together basic science and expertise from

universities and research institutions in the North, international strategic research and expertise from IARCs, and knowledge and expertise from the South through the involvement of regional, national and local organizations. For CIP such a mechanism would provide a framework for (a) problem identification and research priority setting, (b) establishing participatory research partnerships and North-South linkages, (c) generating and testing of production practices and technologies, (d) reaching client groups, (e) obtaining funding and donor recognition, and (f) achieving impact in farmers' fields and, ultimately, for alleviating poverty.

- (10) An issue of special importance to NRM technologies is how to reach the farmers. Unlike in the case of seed-based technologies, where mechanisms for the extension and dissemination of technologies exist in many countries, in the case of NRM technologies, such mechanisms are often absent. For NRM technologies to be successful, they would have to be developed in a participatory mode with farmers or other stakeholders (e.g. environmentalists, civil engineers) concerned. Alternative NRM technologies will only be adopted by farmers if they have an economic or social interest in doing so. In the case of NRM technologies, other than irrigation-based technologies, the economic effects may become visible only after a number of years. This is in contrast to many seed-based technologies, where the economic effects often appear after one growing season.

The points 1-10 above do not pretend to be a comprehensive paradigm for NRM research: they do illustrate, however, the complexity of NRM research in an international context.

Finally, it may be appropriate to quote the concluding remarks of Bernard Tinker and Jock Anderson in their strategic review of NRM research on soil and water<sup>1</sup>:

*“Natural resources management” is an excellent rallying cry, but it has little meaning unless the question is asked: “management for what?” Conservation of the status quo is clearly not the answer. Within the CGIAR the only purpose must be management for higher productivity, to meet the demands of an increasing and hopefully better fed population. Within this, equity must be improved by an appropriate share of the benefits going to the poorest farmers and their families. Finally, this must be done whilst preventing or decreasing damage to the resources, so that preservation of resources is linked directly to their use.*

*However, this is not sufficient now that we understand how far the effects and impacts of this use may spread: to neighbours in diseases and weeds, downstream in silting and pollution, to the globe in greenhouse gases and biodiversity effects. If all these levels of damage can be kept within acceptable limits, then we have some of the key conditions for sustainable use, which is the objective of natural resources management.”*

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<sup>1</sup> TAC, 1996. *A strategic review of natural resources management research on soil and water* (compiled by P.B. Tinker & J.R. Anderson). Report SDR/TAC:IAR/96/9. TAC Secretariat, FAO, Rome.

GLOSSARY OF ACRONYMS

AFLPS	Amplified fragment length polymorphism
AHI	African Highlands Initiative
ARI	Advanced Research Institute
ARTC	Andean Root and Tuber Crops
BW	Bacterial wilt
CAB International	Commonwealth Agricultural Bureau
CACRP	Central Asia and Caucasus Regional Programme
CAPS	Cleaved amplified polymorphic sequence
CAPRI	Systemwide Programme on Collective Action and Property Rights
CCER	Centre Commissioned External Review
CG	Consultative Group
CGIAR	Consultative Group on International Agricultural Research
CIAT	Centro Internacional de Agricultura Tropical
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo
CIP	International Potato Centre
CIPFIS	CIP Financial Information System
CIRNMA	Centro de Investigación en Recursos Naturales y Medio Ambiente (CIRNMA)
CONDESAN	Consortio para el Desarrollo Sostenible de la Ecoregión Andina (Consortium for the Sustainable Development of the Andean Ecoregion )
CRSP	Collaborative Research Support Programme
DDG	Deputy Director General
DG	Director General
DIVA-GIS	Geographic Information System for Diversity Analysis of Genetic Resources Data
DNA	Deoxyribonucleic acid
DSSAT	Decision Support System for Agrotechnology Transfer
ELISA	Enzyme linked immune serological assay
EPMR	External Programme and Management Review
ESEAP	East and South East Asia Office
EST	Expressed sequence tags
EU	European Union
FAO	Food and Agricultural Organization of the United Nations
FFS	Farmers Field School
GILB	Global Initiative on Late Blight
GMO	Genetically Modified Organisms
GMP	Global Mountain Programme
GIS	Geographic Information System
GPS	Global positioning Systems
IARC	International Agricultural Research Centre
IDB	Inter-American Development Bank



ICARDA	International Center for Agricultural Research in the Dry Areas
ICER	Internally Commissioned External Review
ICIMOD	International Centre for Integrated Mountain Development
ICW95	International Centres' Week, 1995
ICWG-GR	Inter-Centre Working Group on Genetic Resources
ICRAF	International Centre for Research in Agroforestry
ICT	Information and Communication Technologies
IFDC	International Fertilizer Development Centre
IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
ILRI	International Livestock Research Institute
INIA	Instituto Nacional de Investigación Agraria
INIAP	Instituto Nacional Autónomo de Investigaciones Agropecuarias
INTA	Instituto Nacional de Tecnología Agropecuaria
IPGRI	International Plant Genetic Resources Institute
IPM	Integrated Pest Management
IRRI	International Rice Research Institute
IRS	International Recruited Staff
ISNAR	International Service for National Agricultural Research
LAC	Latin America and the Caribbean
LB	Late blight
LEISA	Low Input Sustainable Agriculture
LMF	Leaf minor fly
MENA	Middle East and North Africa
MERCOSUR	Southern Common Market
MTM95	Medium-Term Meeting, 1995
MTP	Medium-Term Plan
NAFTA	North American Free Trade Agreement
NARI	National Research Institute
NARS	National Agriculture Research System
NASH	Nucleic Acid Spot Hybridization Test
NCM-ELISA	Nitrocellulose Membrane-ELISA
NGO	Non-Governmental Organization
NRM	Natural Resources Management
NRS	Nationally Recruited Staff
ODA	Overseas Development Agency
PC	Personal Computer
PL	Project Leader
PLRV	Potato leafroll virus
PSTV	Potato spindle tuber viroide
PMT	Programme Management Team
PRAPACE	Programme Régional d'Amélioration de la Culture de la Pomme de Terre et de la Patate Douce en Afrique Centrale et de l'Est
PRECODEPA	Programa Regional Cooperativo de Papa
PRGA	Participatory Research and Gender Analysis
PROINPA	Proyecto de Investigación de la Papa
PRONAMACHCS	Programa Nacional de Manejo de Cuencas Hidrográficas y Conservación de Suelos
PVY	Potato virus X
PVX	Potato virus Y

QTL	Quantitative trait loci
OGPA	Oficina General de Planificación Agraria
R&D	Research and Development
RS	Remote sensing
RTC	Root and Tuber Crops
SENAMHI	Servicio Nacional de Meteorología e Hidrología del Perú
SGRP	Systemwide Genetic Resources Programme
SINGER	Systemwide Information Network for Genetic Resources
SLP	Systemwide Livestock Programme
SIUPA	Strategic Initiative on Urban and Peri-urban Agriculture
SP-IPM	Systemwide Programme on Integrated Pest Management
SMAD	Sustainable Mountain Agriculture Development
SSA	Sub-Saharan Africa
SSR	Simple sequence repeats
SWA	South and West Asia
TAC	Technical Advisory Committee
TOA	Trade-off Analysis Mode
TOR	Term of Reference
TPS	True Potato Seed
UDP-glucose	Uridine diphosphoglucose
UNDP	United Nations Development Programme
UPWARD	Users' Perspective with Agricultural Research and Development
USDA	United States Department of Agriculture
VITAA	Vitamin A for Africa
WANA	West Asia and North Africa
WEPP	Water Erosion Prediction Project