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THE CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

TECHNICAL ADVISORY COMMITTEE

# REPORT OF THE SECOND QUINQUENNIAL REVIEW OF THE CENTRO INTERNACIONAL DE LA PAPA (CIP)

TAC SECRETARIAT

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

JANUARY 1984

This report comprises:

(a) Extract from "Main Conclusions Reached and Decisions Taken", CGIAR Meeting, October 31 - November 4, 1983

(b) Transmittal Letter from TAC Chairman to CGIAR Chairman

(c) CIP Reaction to both the Second Quinquennial Review and TAC's Commentary

(d) TAC Commentary on the Second Quinquennial Review of CIP

(e) Transmittal Letter from Panel Chairman to TAC Chairman

(f) The Report of the Second Quinquennial Review of the Centro Internacional de la Papa (CIP)

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

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From: The Secretariat December 16, 1983

Consultative Group Meeting

October 31 - November 4, 1983

Washington, D.C. (USA)

CIP External Program and Management Reviews - Agenda Item 5 1/

"The External Program Review Report (EPR) of CIP was presented by Dr. Robert Hougas, Chairman of the Program Review Panel and the Management Review Report (EMR) by Dr. Omond Solandt, Chairman of the Management Review Panel. The TAC Chairman, the Executive Secretary-CGIAR, Board Chairman Professor Castillo, and Director General Dr. Sawyer, all commented on the reports.

External Program Review. CIP was described as a tightly-run, cost-effective center of scientific excellence, with a dynamic and effective research program and a complex of linkages with developing and developed countries. CIP's innovative regional programs were praised, as were its use of core-funded research contracts with potato scientists in developing and developed countries, and its use of planning conferences to refine and adjust its programs. CIP's decentralized approach was seen to be a major strength, as was its emphasis on utilization of the world potato germplasm collection. CIP was praised for its good management, innovations in research planning, relations with national programs, cost effectiveness, and zero growth policy. The potential of the potato in the lowland tropics was discussed. This area of work is seen as a possible major goal in the center's work with national programs. Some concern was expressed that the EPR panel had not included much information on impact in its report. Dr. Hougas responded that the panel had made judgements on the impact of CIP's research throughout the report, but that detailed economic analyses of impact were not included in the panel's terms of reference. The Group concluded that zero growth should be expressed in terms of senior staff positions at CIP but not in monetary terms, since that could result in a continuing decline in support for research programs."

1/ Extract from "Main Conclusions Reached and Decisions Taken" Consultative Group Meeting, October 31 - November 4, 1983, Washington, D.C.

CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

**TECHNICAL ADVISORY COMMITTEE**

**The Chairman**

August 10, 1983

Dear Mr. Baum:

I have the pleasure in transmitting to you the report of the Second Quinquennial Review of CIP which was conducted in February 1983. The Review Panel was chaired by Dr. R.W. Hougas, who presented the report to TAC during its 30th Meeting at FAO in Rome in the presence of Dr. R.L. Sawyer, Director-General of CIP. The Committee noted that the Board of CIP generally agreed with the findings of the Review and that it was its intent that early action be taken on the recommendations.

TAC had the privilege of the presence of Dr. Omond Solandt when it studied the first External Management Review within the System for which CIP was the "guinea pig". The procedures established by the CGIAR Secretariat and approved by the CGIAR last May are appropriate and result in the Management Review process being complementary to the Quinquennial Review. TAC is pleased to note that CGIAR stressed that both Reviews should take place simultaneously. I am glad to report that there was excellent interaction and exchange among the members of the two Panels.

Attached to this report you will find the commentary prepared by TAC summarizing its conclusions and recommendations about CIP in light of the two Reviews. The response of the Board of Trustees to the Quinquennial Review is also attached.

In submitting to the Group its observations, TAC is pleased to report that CIP is a dynamic Centre of self-limited size without any major scientific or management problems.

TAC particularly commends CIP's achievements, in terms of output and influence on institution building, through its imaginative interaction with national programmes. Another aspect of the Centre's operation worthy of mention is the flexibility and cost-effectiveness of its use of contracts, funded from core resources to fulfill many of its specialized research requirements. TAC considers that some aspects of CIP's operational strategy might well be adapted to other parts of the System.

Yours sincerely,

Guy Camus

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## CIP REACTION TO BOTH THE SECOND QUINQUENNIAL REVIEW AND TAC'S COMMENTARY

CIP Board of Trustees is particularly pleased that the Quinquennial Review Panel and TAC have highlighted the very distinctive features which characterize the Centre. The Board is grateful for relevant recommendations which have been put into effect immediately by an unusually responsive Management and Staff. We of the Board are all proud to be associated with CIP and will continue our work with even greater enthusiasm made possible by the ideal receptiveness of the entire Centre.

Celia Castillo
Chairperson
CIP Board of Trustees

CIP Management and Staff thank the Quinquennial Review Team for the stimulation they gave us to look with them at the programme and consider changes which might make improvements. We are particularly thankful for the leadership of Dr. Robert Hougas and the care he took to see that recommendations were applicable to potatoes since several Panel members had little previous experience with this crop.

TAC has correctly noted in the Commentary that a number of recommendations have been implemented before the report goes to the Group. Recommendations implemented have all been within the present programme and priorities and the budget guidelines of TAC. We believe the Group will appreciate the speed with which CIP's Board of Trustees approved the recommendations and CIP Management and Staff have implemented them so as not to lose a year and so that the 1984 budget document would include the changes.

CIP is particularly impressed with TAC's insight expressed in the Commentary which addressed several of the recommendations about which CIP had reservations. We agree with TAC's comments on these Quinquennial Review recommendations as well as those on the Management Review implications.

Richard L. Sawyer
Director-General
CIP

# TAC COMMENTARY ON THE SECOND QUINQUENNIAL REVIEW OF CIP

1. In transmitting the report of the Second Quinquennial Review of CIP to the CGIAR, TAC wishes to commend and thank Professor R.W. Hougas and his colleagues for their thorough report. The first draft of the report was presented by Professor Hougas to TAC at its meeting in Rome in February 1983, and discussed with both him and the Director-General. Unfortunately, Professor Hougas was unable to participate with TAC and Dr. Sawyer in the discussion of the substantially refined final version at TAC 31, when the Centre's reactions to the conclusions and recommendations were considered.

2. As indicated in the response from the Chairperson of the Board, Dr. Gelia Castillo, CIP agrees in principle with most of the recommendations, and has already begun to implement some of these while reserving judgement on others. In this case TAC has no quarrel with CIP's quick reactions to the report, but it suggests that the Group may need to consider the wider implications of implementation of major recommendations by Centres before the Consultative Group has been able to discuss the reports TAC commissions on its behalf.

## Outcome of the First Quinquennial Review

3. The first Quinquennial Review recommended that CIP should give maximum priority to meeting the highest standards of quarantine procedures in order to ensure safe exchange of its materials. CIP took prompt and effective action, immediately curtailing its exchanges until reliable *in vitro* procedures were developed, and then putting these rigorously into practice. TAC joins the Quinquennial Review Panel in commending CIP for the model phytosanitary standards it is now setting. These do, however, entail a major effort by the Centre and TAC endorses the Panel's view that the development of less time-consuming methods and of better facilities for these activities merit a high priority.

4. Another area where CIP implemented major recommendations of the first Quinquennial Review is that of the social sciences. The second Quinquennial Review has both extended and qualified the earlier recommendations. Although the Centre still debates some of the new suggestions, it has nevertheless already initiated a restructuring of its research in this area and has added a new Thrust entitled "Potatoes in Developing Country Food Systems", to determine priority problems and client needs in the production, marketing and utilization of potatoes. TAC fully supports this wider framework for the social sciences at CIP.

5. Clearly, CIP has responded quickly, though not precipitately, to recommendations of both Quinquennial Reviews, reflecting its quite unusual dynamism.

Genetic Resources

6. CIP's efforts to collect and conserve the genetic resources of the potato have been outstanding. TAC supports the Quinquennial Review Panel in urging early completion of the description and documentation phase of this work, while recognizing that CIP has already taken steps to achieve this.

7. The genetic resources of the potato have already proved of great value in the Centre's work, as indicated at several points in the report, and will undoubtedly continue to be so. Consequently, CIP's efforts to ensure the conservation of these resources *in vitro* as well as *in vivo* merit continuing strong support from TAC and the donors, particularly in view of the hazards in the field and the limitations on facilities at Huancayo. After discussion of this matter with Dr. Sawyer, TAC is satisfied that CIP's many-stranded approach to the conservation of both wild species and Andean cultivars is prudent and sound.

True Potato Seed (TPS)

8. The use of true potato seed offers many potential advantages in relation to immediate food supply, storage, transport, crop hygiene and improvement, which could begin to transform potato production in the next few years. The Quinquennial Review Panel considered that CIP's efforts on TPS could be strengthened and coordinated more effectively. It is TAC's impression that CIP fully recognizes the potential of TPS and accords it high priority, but is not committing extensive funding to this work until agronomic and breeding goals can be more clearly defined, especially for small farm conditions. Nevertheless, TAC adds its encouragement to that of the Panel for the greater concentration of effort in this area.

Hot Climate Potato Production

9. CIP has long been interested in the potential spread of the potato crop to lowland tropical areas, but is aware of the problems to be solved before this becomes feasible. The two major problems are to find lines capable of tuberization at high temperatures and with resistance to bacterial wilt at high temperatures. Only when these two characteristics can be combined should CIP increase its agronomic work for the lowland

humid tropics, according to the Quinquennial Review Panel. TAC concurs, but agrees with CIP that there is real value in continuing selections and developing practices under the severe conditions of Yurimaguas, because of their potential value at less extreme sites.

10. Paragraph 310 of the Quinquennial Review report indicates that the Panel concurs with the view of the CIP Programme Committee that the Centre's first priority is to help increase potato production in areas of already proved potential. While agreeing with this view, TAC is aware that many developing countries have expressed considerable interest in the possibility of increasing potato production in lowland tropical areas. TAC would, therefore, offer much stronger encouragement to CIP than the Quinquennial Review Panel does for its Thrust in this area.

Disease and Pest Surveillance

11. At several places in the Quinquennial Review report, the Panel recommends that CIP should obtain more systematic information on disease and pest incidence and crop losses in order to determine the balance in its research efforts. However, TAC is of the view that CIP's current strategy of using assessments from three sources - its regional staff in collaboration with national scientists, its planning conferences, and senior consultants - is adequate and appropriate at this stage, but may need strengthening in the future.

Regional Activities

12. Although it is difficult to make objective assessments of co-operative activities, especially when done with a low profile like those of CIP, the evidence suggests that the Centre's regional research and training activities have been both effective and welcomed by the national systems. The covering letter from Professor Hougas identifies this as one of CIP's impressive innovations, and TAC concurs with this opinion. The five collaborative regional research associations, which are in various stages of development, will continue to require help from CIP, and a greater input from the Centre's Social Sciences in their early stages might be advantageous. Both TAC and the Panel are impressed by the way in which training programmes are organized within the regional activities. The standard of research within the younger regional associations may need careful monitoring in the early stages.

Research Management and Style

13. CIP has been notably successful in its use of planning conferences and contract research both to focus and to complement the work of the Centre. Leading potato scientists throughout the world have, through their participation in CIP's planning conferences, contributed to the orientation and practice of research at the Centre. Indeed, CIP has cast its net so wide that it is difficult to find suitable Quinquennial Review Panel members who have not been involved in these activities.

14. Examples given at many places in the Quinquennial Review report illustrate how effectively CIP has also used contract research, in both developed and developing countries. This has been crucial to progress in several thrusts, accelerating the research and the development of methods and improved materials. CIP's success with contract research must surely reflect its care in defining its objectives.

15. CIP's style of management is unusual among the Centres, and reflects in many ways the strong influence of the Director-General. It has many attractive features in the clear focussing of its research, the openness of its planning, its effective use of outside contracts, the mobility of its structuring, the effectiveness of its training, the low profile taken by the Centre in its regional activities, etc. Its management style and relatively small size have been combined with somewhat informal procedures. Many of these are noted in the Management Review. After discussion of this review with Dr. Solandt, TAC saw no cause for concern on its part. TAC supports the suggestion for changes in the accounting system to provide more timely and better information for the management of the research programmes, and understands from the Director-General that these changes are already being instituted.

16. TAC is aware of the Centre's "zero growth" policy, and agrees with the Management Review that this would be stated more realistically in terms of senior scientific positions. Until TAC has made further progress in its discussion of strategic issues, the Committee would prefer to consider CIP's budget requests on their merits each year through its usual budget review process rather than within fixed long-term policy guidelines.

17. TAC commends the Quinquennial Review report on CIP to the donors for its careful analysis and assessment of the research and technology transfer activities of the Centre. CIP emerges from the report, and from TAC discussions of it, as a trim, clearly focussed, effective and truly international Centre of high repute, yet responsive to external review and criticism.

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COLLEGE OF AGRICULTURAL
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May 13, 1983

Dr. Guy Camus
Chairman
Technical Advisory Committee
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66 Avenue d'Iena
75116 Paris, France

Dear Dr. Camus:

The final draft of the CIP Second Quinquennial Review Report is enclosed. The Panel was privileged to obtain meaningful background for its assignment in several ways. Prior to the review the chairman and three Panel members were observers of the CIP Internal Review held in December, 1982.

The Panel members unanimously and enthusiastically agree that observing CIP's Internal Review was invaluable in gaining insight to CIP's current activities and to assess the interactions between Core scientists, Regional scientists, national program leaders, CIP administration and members of the Board of Trustees. Further during the Internal Review, the Panel requested that the Director General provide Panel members a concise summary, which was received prior to the Quinquennial Review, embracing the five-year period since the first Quinquennial Review covering: significant accomplishments and other measures of progress; physical facilities added and additional facility needed for the future; a review of personnel changes among CIP's scientific and administrative staff; a copy of the Board of Trustees Charter and, lastly, changes in policy recommended by the Board and actions taken upon these recommendations. In addition, prior to the Review each member of the Panel traveled to one or more of the Regions visiting with national program and Regional scientists. Two Panel members visited institutions collaborating with the CIP under contract. Early in the Review the Panel toured CIP's field stations in Peru at Huancayo and San Ramon as well as the facilities at CIP Headquarters.

Since Panel members were present throughout CIP's Internal Review no formal presentations were made by CIP staff during the Quinquennial Review. Rather round table discussions were held with senior CIP administrators and the international scientists as grouped under CIP's research teams of thrusts, Regional Research and other activities. In each of these discussions the Panel requested that strengths, limitations, achievements and future plans be identified by each group.

/....

Dr. Guy Camus May 13, 1983

Concurrent with the Second Quinquennial Panel's review activities at CIP Headquarters a two member Management Review Team appointed by the CG Secretariat conducted an indepth review of CIP's management. Although the Panel and the Management Team conducted most of their meetings with CIP staff independently, special joint sessions and discussions were mutually agreed upon and scheduled to assure communication and exchange of views between Panel and Team members before and during the report writing phase. As a consequence of these procedures there is overall agreement in the two Reports. Members of the two Review groups were in attendance when the Panel and Team chairmen presented their respective oral reports to CIP staff. Since separate Panel and Management Team Reports have been prepared it is essential both be considered in the overall evaluation of CIP.

The draft of the CIP Second Quinquennial Review Report submitted for TAC consideration in Rome in early March, 1983 was the rough initial draft compiled at Lima in late February, 1983, which had not received any re-working by the Panel because of the time constraints imposed.

The Panel's editorial committee which met in May, 1983 was favored by the observations, comments and suggestions of CIP staff and the CIP Board of Trustees provided to the Panel's chairman and secretary at CIP in late April, 1983.

Members of the Panel were impressed with the progressive practices and innovations of CIP as exemplified by:

1) the extensive but timely usage of planning conferences of top scientists worldwide in guiding CIP's research activities, and rapid update of critical research information and methodologies;

2) the use of contracts with scientists at leading institutions to accelerate procurement of research findings, advanced methodologies and improved materials needed by CIP, and most importantly,

3) the establishment of an effective Regional Research and Training program to assure CIP's transfer of information and material needed by the national programs of developing countries.

The Report documents, in greater detail, an impressive array of CIP's scientific achievements and especially its contributions to the national programs of the developing countries through technical information, training, improved technologies and superior adapted potato germplasm for farmer use.

In overall summary CIP's progress towards its mandate objectives has been commendable, and with its now well-recognized maturity and momentum, CIP's future is bright.

Sincerely yours,

R. W. Hougas

Enclosure

AGD/TAC:IAR/83/5 Rev. 1

THE CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH

TECHNICAL ADVISORY COMMITTEE

# REPORT OF THE

# SECOND QUINQUENNIAL REVIEW OF THE

# CENTRO INTERNACIONAL DE LA PAPA (CIP)


Review Panel: Robert W. Hougas (Chairman)
Frederick L. Milthorpe
Martin E. Pineiro
Ruben L. Villareal
Martin S. Wolfe
Hubert G. Zandstra
Donald L. Plucknett (CGIAR Observer)
Patricia Roberts-Pichette (Secretary)



TAC SECRETARIAT

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

August 1983

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# EXECUTIVE SUMMARY

## WITH CONCLUSIONS AND RECOMMENDATIONS

The Panel obtained background for its assignment for the Second Quinquennial Review of the International Potato Center (CIP) in several ways:

1. A range of pertinent printed documentation, such as annual reports, proceedings of CIP-sponsored Planning Conferences, and CIP's long-range planning document, entitled "Profile 1972-2000" were sent to the Panel members.

2. At CIP's invitation four Panel members including the Chairman were observers of the CIP Internal Review held in December 1982.

3. During the Internal Review the Panel requested the Director-General to provide Panel members with a concise summary which was received prior to the Quinquennial Review, for the period since the first Quinquennial Review covering: significant accomplishments and other measures of progress; physical facilities added and additional facility needs for the future; a review of personnel changes among CIP's scientific and administrative staff; a copy of the Board of Trustees' Charter; and lastly changes in policy recommended by the Board and actions taken.

4. Each Panel member travelled to one or more of the CIP geographic regions visiting with national programme and regional scientists. Two Panel members visited institutions collaborating with CIP under contract.

5. A series of discussions were scheduled with senior CIP administrators and the international scientists as grouped under Thrusts, Regional Research and other activities.

6. Concurrent with the Second Quinquennial Panel's review activities at CIP Headquarters, a two-member Management Review Team appointed by the CGIAR Secretariat conducted an in-depth review of CIP's management. Although the Panel and Management Review Teams conducted most of their meetings separately, special joint sessions and disucssions were held to ensure communication and exchange of views between the two units, before and during the report-writing phase. Since separate Panel and Management Team reports have been prepared it is essential that both be considered in the overall evaluation of CIP.

7. The Panel has adhered to the TAC guidelines for conduct of quinquennial reviews and has responded to the series of questions concerning CIP prepared by TAC.

8. The most significant recommendations of the Panel are summarized below. Other Panel observations and suggestions are presented in the concluding section of the report covering individual Thrusts and in the Chapters. The overall general assessment of CIP as viewed by the Panel is presented in Chapter 10.

## CHAPTER 2. CIP AS AN INTERNATIONAL RESEARCH AND TRAINING INSTITUTION

### A. THE POTATO AS A SUBJECT FOR INTERNATIONAL RESEARCH

(para. 23.) From the foregoing considerations, the gains CIP has already made and the potential for even greater gains, the Panel concludes that work on potatoes should continue in the CGIAR.

### B. THE MANDATE: APPROPRIATENESS AND INTERPRETATION

(para. 26.) The Panel considers CIP's mandate to be appropriate and agrees with the strong emphasis the Centre has placed on germplasm collection, preservation and utilization. The Panel, therefore, recommends that there be no changes made to the mandate.

(para. 27.) The mandate and the list of activities, however, do not refer to storage of consumer potatoes, nor to the processing and utilization of potatoes. CIP is involved in post-harvest work, and the Panel suggests it would be appropriate for CIP to include in its mandate statement that appears in the Profile, a reference to some storage and simple processing.

## CHAPTER 3. CIP'S SOURCE RESEARCH: THE THRUSTS

### B. THRUST I: COLLECTION AND CLASSIFICATION OF TUBER-BEARING SOLANUMS

(para. 48.) The Panel endorses in principle the 1979 report of the Planning Conference entitled "Exploration, Taxonomy and Maintenance of Potato Germplasm III." Further the Panel draws particular attention to:

> "II. RECOMMENDATIONS FOR TAXONOMIC STUDIES
>
> B. Wild Species
>
> Taxonomic research on the wild species SHOULD BE CONDUCTED with a view to understanding species relationships and thus facilitate their use in plant breeding.
>
> PRIORITY 1. It is RECOMMENDED that taxonomic monographs of the wild species be prepared.
>
> PRIORITY 2. It is RECOMMENDED that emphasis should be given to biosystematic studies in the following series and species ...
>
> PRIORITY 3. It is RECOMMENDED that an Atlas of the wild species and their breeding potentials be prepared."

(para. 51.) The Panel recommends that CIP administration conduct an analysis of the adequacy of the facilities needed for maintenance and storage of the wild species collection.

## C. THRUST II: MAINTENANCE, UTILIZATION AND DISTRIBUTION OF TUBER-BEARING SOLANUMS

(para. 74.) In view of the well-recognized yearly hazards involved in the Huancayo field propagation of the primitive Andean cultivated species collection the Panel commends CIP for its decision to commit, as rapidly as feasible, all of these accessions to in-vitro culture.

(para. 75.) The Panel recommends that adequate, suitable, temperature-controlled greenhouse space be provided for the breeding programme at headquarters to assure reliable flowering and successful pollinations of parental stocks.

## D. THRUST III: CONTROL OF IMPORTANT FUNGAL DISEASES

(para. 94.) The Panel recommends CIP to obtain more systematic information on disease and pest distribution incidence and crop losses to help to determine the best balance within and among Thrusts (see Thrust IV, para. 104, and Thrust VI, para. 166).

## G. THRUST VI: CONTROL OF IMPORTANT NEMATODE AND INSECT PESTS

(para. 176.) The Panel recommends increased emphasis on the attempts to improve testing and screening technology to facilitate a reduction in size of the large support team in Nematology.

(para. 179.) The Panel commends the organization of a full Planning Conference on Control of Insect Pests within the next two years.

(para. 180.) The Panel commends the rapid progress already made towards control of potato tuber moth.

## H. THRUST VII: PHYSIOLOGIC AND AGRONOMIC MANAGEMENT OF POTATOES

(para. 200.) The Panel urges that agronomic work directed to the lowland humid tropics should be maintained at about the current low level until such time as bacterial wilt resistance is combined with heat tolerance.

## I. THRUST VIII: DEVELOPMENT OF STORAGE AND PROCESSING TECHNOLOGY

(para. 216.) The Panel urges that in processing research, identified products and processes need be submitted to a critical and realistic analysis for economic feasibility that takes into account the variable nature of supply and prices, sets attractive margins for economic returns and demands high probabilities for success.

(para. 217.) The Panel commends CIP for the well-integrated research conducted on diffuse light storage of seed potatoes and suggests that it continue to monitor further acceptance, modification and rejection of this technology.

(para. 218.) The Panel commends the continued input of the Social Science Department in a critical analysis of the place for and economic feasibility of consumer potato storage in the marketing chain and of the benefits of improved on-farm storage for consumption or sale.

### J. THRUST IX: SEED PRODUCTION RESEARCH FOR DEVELOPING COUNTRIES

(para. 228.) The Panel encourages the senior scientist to spend more time in developing techniques to eliminate seed-transmitted PSTV and to study stability of materials propagated through in-vitro, as rapid multiplication of materials by in-vitro culture becomes routine.

(para. 229.) The Panel commends CIP's action in providing regional centres in Kenya and the Philippines with technical support and facilities, and in regularly monitoring their activities to ensure production of quality seed tubers prior to redistribution.

(para. 231.) The Panel commends the preparation of the position paper entitled "Potato production from True Seed" at the International Potato Center.

(para. 232.) The Panel considers that TPS efforts could be strengthened and coordinated more effectively if the work is concentrated in one Thrust confined solely to TPS.

## CHAPTER 4. THE SOCIAL SCIENCE DEPARTMENT

(para. 263.) The Panel encourages the Department in its effort to achieve a better focused and more comprehensive research programme. The Panel endorses the Food Systems approach to achieve this focus.

(para. 264.) The Panel recommends that a part of the research effort of the Department be directed to the analyses of broad policy issues and the development of analytical information as general guidelines for the orientation of the Centre's overall research effort. Collaboration with IFPRI should be sought where appropriate.

(para. 267.) The Panel recommends that CIP study the creation of an appropriate administrative position, from a programming point of view, for research projects with strong social science components that do not fall within the present Thrusts.

(para. 268.) The Panel endorses the development of a research network proposed by the Social Science Department and recommends that initially it include, if necessary, social scientists not related to national potato programmes.

## CHAPTER 5. REGIONAL RESEARCH AND NETWORKS

(para. 301.) Product markets, consumption patterns, labour availability and input costs strongly influence the form which production

and post-harvest technologies should take. The Panel, therefore, commends and encourages CIP in the search for ways to strengthen the social science component of the regional teams (see Chapter 4).

(para. 306.) The Panel highly commends CIP for its innovative approach to the development of an effective research transfer capability, its support to national programmes and the recognition it gives to the contributions made by these programmes to potato research.

(para. 308.) The Panel commends CIP's continued participation in regional networks and, with third party funding, to continue development and support of new networks where appropriate. The Panel strongly commends technical backstopping of network research activities by staff of CIP's Research Thrusts.

(para. 310.) The Panel concurs with the view of the Programme Committee of CIP's Board (Dec. 1980 Report) that CIP's main priorities are to help increase potato production in areas of proved potential. The Panel urges that careful consideration be given to the way potato production can affect other crops in the cropping patterns used by farmers.

(para. 311.) The Panel recommends that Regional Research continue to consider resource-poor farmers as its prime target.

## CHAPTER 6. TRAINING AND COMMUNICATIONS

(para. 331.) The Panel particularly commends the work of the Training and Communications Department for its skill and efficiency in developing material for training courses and in the dissemination of information to regional scientists and elsewhere. As its functioning is essential to the success of Regional Research and Training and, hence, to the central philosophy of CIP, every effort must be made to maintain its activities at the current level even with present funding uncertainties in the system.

(para. 332.) The Panel strongly endorses CIP's policy of use of national programme scientists as instructors.

## CHAPTER 7. INTERNATIONAL COOPERATION

(para. 349.) The Panel recommends that CIP continue the practice of arranging planning conferences as a proven, highly effective means for assuring that CIP's research activities and priorities are periodically updated.

(para. 354.) The Panel suggests that avenues for wider collaboration among Centres on topics of common interest be explored.

## CHAPTER 9. MANAGEMENT AND ADMINISTRATION: ISSUES AND HIGHLIGHTS

(Para. 406.) The Panel suggests that:

(a) A more formalized procedure for programme planning be developed.

(b) Future editions of the Profile include a more in-depth definition of principles, criteria and data that led to the decisions made.

(Para. 407.) The Panel suggests that management analyse possible ways of adjusting the present research organization.

(Para. 409.) The Panel recommends that CIP study ways to increase the support staff ratio to a more effective level.

## CHAPTER 1. INTRODUCTION

1. **Chapter Outline: Background information is presented on the Consultative Group on International Agricultural Research, the Centro Internacional de la Papa and its first Quinquennial Review. This is followed by the terms of reference of the second Quinquennial Review and a brief overview of its preparation, activities and report.**

2. The Consultative Group on International Agricultural Research (CGIAR), established in 1971, is an international consortium co-sponsored by the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Agency (UNDP) and the World Bank. Its purpose is to assist developing countries increase food production through support to agricultural research and to the training of agricultural production specialists and scientists.

3. Thirty-five donors and ten non-donor developing nations comprise the CGIAR. Included as donors are 19 governments, 11 international organizations and development banks and 5 foundations. The non-donor nations represent the five major developing regions of the world and are nominated biennially at the FAO Regional Conferences.

4. The CGIAR supports 13 autonomous but complementary International Agricultural Research Centres (IARCs) each with an international staff supported by locally recruited technicians, and governed by its own international Board of Trustees. Each Centre by its mandate has responsibility at a global or regional level for a specific crop or groups of crops, or animal science component, and/or performs a service for international agriculture.

5. The CGIAR is supported by an independent Technical Advisory Committee (TAC), charged with periodic assessment of accomplishments, suitability and effectiveness of the IARC programmes. Each of the periodic assessments, usually at five-year intervals (quinquennial review), is accomplished through the use of an international panel nominated by TAC after consultation with the IARC's Board of Trustees and its senior management.

6. The Centro Internacional de la Papa (CIP), subject of this Quinquennial Review, had its origins in two contributory programmes, the USAID-funded North Carolina State University Potato Research Programme in collaboration with the Peruvian National Potato Programme, and the Rockefeller Foundation's International Potato Programme in Mexico. CIP was formally established as an autonomous non-profit-making scientific institution dedicated to research on potatoes and other tubers when an agreement was ratified by the Government of Peru in 1971. Although authorized to work on other tuberous crops, CIP, from its inception, limited its activities to potatoes. In February 1982 CIP celebrated its first ten years by hosting the Decennial Anniversary Symposium "Research for the Potato in the year 2000" attended by some 250 participants from 60 countries.

7. The first Quinquennial Review of CIP was completed in late 1976. The main recommendations from the review concerned: (a) strengthening of phytosanitary procedures; (b) prevention of genetic loss through better

management of the CIP germplasm collection; (c) development of a clearer focus for research in socio-economics; (d) clarification of the regional research; and, (e) augmentation of investigations into post-harvest storage. All of these recommendations have been specifically considered by CIP since 1976 and will be commented upon in this report under the relevant sections.

8. For the second Quinquennial Review of CIP, the responsibilities of the Review Panel are defined in the terms of reference for TAC Quinquennial Reviews of the International Agricultural Research Centres as follows:

"On behalf of the Consultative Group, to assess the content, quality, impact and value of the overall programme of the Centre and to examine whether the operations being funded are being carried out in line with declared policies and to acceptable standards of excellence.

"It is hoped that the review will *inter alia* assist the International Centres themselves in planning their programmes and ensuring the validity of the research priorities recognized by the Boards of the Centres.

"In pursuance of the main objectives, defined above, the Mission is requested to give particular attention to the following aspects:

(i) The mandate of the Centre, its appropriateness and the interpretation thereof with respect to:

(a) the immediate and long-term needs for improved food supply and human welfare in developing countries;

(b) present and possible future areas of work;

(ii) The relevance, scope and objectives of the present programme of work and budget of the Centre and of its forward plans for the next five years in relation to:

(a) its mandate and the criteria for the allocation of resources as defined by TAC;

(b) the ongoing activities of other international institutes and organizations, and of the relevant national institutes in cooperating countries and in others where the work of the institutes has bearing;

(c) the policy, strategy and procedures adopted by the Centre in carrying out its mandate, and the mechanisms for their formulation;

(d) the Centre's rationale for its present allocation of resources, its present and future overall size, and the composition and balance of the programme in the fields of research, training, documentation, information exchange and related cooperative activities.

(iii) The content and quality of the scientific and related work of the Centre with particular reference to:

(a) the results of past research;

(b) the current and planned research and the role of the scientific disciplines therein;

(c) the information exchange and training programmes, their methodologies, their specialization and decentralization, and the participation of the research staff therein;

(d) the adequacy of the research support and other facilities;

(e) the management of the scientific and financial resources of the Centre and the coordination of its activities.

(iv) The impact and usefulness of the Centre's activities in relation to:

(a) the present and potential agricultural production of the relevant countries and regions;

(b) its information exchange and training programmes;

(c) cooperation with national research and development programmes;

(d) cooperation with other international institutes and organizations.

(v) Constraints on the Centre's activities which may be hindering the achievement of its objectives and the implementation of its programmes, and possible means of reducing or eliminating such constraints.

(vi) Any specific questions which concerned members of the CGIAR, cooperating institutions, the Centre's Director or its Board of Trustees, may request TAC to examine.

"On the basis of its review, the Mission will report to the Chairman of TAC its views on the need for any changes in the basic objectives or orientation of the Centre's programme elements, and on means of improving the efficiency of operations, and will make proposals for overcoming any constraints identified under item (v).

"While the Mission should feel free to make any observations or recommendations it wished, it must be clearly understood that the Mission cannot commit the sponsoring organization, viz. the CGIAR/TAC.

Note: "When applicable, the quinquennial review mission should also assess the impact of the preceding quinquennial review on the programmes and activities of the Centre."

9. Preparations: During 1981/82, TAC in consultation with CIP's senior management, Board of Trustees and CGIAR members, prepared a list of questions for the Quinquennial Review Panel (Annex I). Following additional consultation with the CIP Board of Trustees and senior management, TAC discussed and confirmed the composition of the Review Panel (Annex II) and the detailed review programme at the 28th TAC meeting in June 1982. Both the TAC Secretariat and CIP provided the Review Panel with briefing documents which are listed in Annex III. The materials included specially prepared papers documenting the changes at CIP over the past five years, which reflect CIP's responses to the first Quinquennial Review recommendations and the further evolution of the Centre.

10. Activities: The Chairman with three Panel members and the TAC Chairman all attended the CIP Internal Review in December 1982 as observers. They took the opportunity at the time to meet members of the Board of Trustees Programme Committee, leaders of national programmes and the CIP regional scientists. Each of the Panel members visited one or more of the regional centres or collaborating institutions before assembling at the CIP headquarters 5/6 February 1983. Early in their visit Panel members had a familiarization tour of the CIP Headquarters and the stations at San Ramon and Huancayo. The programme of activities is detailed in Annex IV.

11. Because of the presence of Panel members at the Internal Review, no formal presentations by CIP staff were made during the Quinquennial Review. Instead, round table discussions and individual meetings took place between Panel members and members of the CIP staff.

12. This Quinquennial Review had a special and somewhat experimental character due to the fact that a Management Review of CIP, commissioned by the CGIAR Secretariat, took place concurrently. Although most sessions with CIP staff were held independently, there were some joint sessions and considerable discussion and exchange of opinion between the two Review groups before and during the report writing stage with the results that the two Review reports are in overall agreement. The members of both Review groups were present when the respective Chairmen made their oral presentations to the CIP staff. Although separate reports were prepared they will receive joint consideration by the CGIAR.

13. The Report: This report follows much the same structure as the first Quinquennial Review. In addition, an Executive Summary highlighting the main findings of the Panel has been prepared and forms a preface to the Report Conclusions and Recommendations.

## CHAPTER 2. CIP AS AN INTERNATIONAL RESEARCH AND TRAINING INSTITUTION

14. **Chapter Outline: Information on the world area planted to potatoes, the nutritive value of potatoes, and the potential for increased production is presented and discussed, as the rationale for CGIAR support. In the light of this rationale, the CIP mandate is reviewed together with the strategies for its implementation. No major changes in mandate or strategy are recommended.**

### A. THE POTATO AS A SUBJECT FOR INTERNATIONAL RESEARCH

15. World production of fresh potatoes was 226 million tons in 1980. Twenty percent of this was produced on 2.3 percent of the crop land in developing countries, which represents 26 percent of the world area planted to potatoes. Average yields were 10t/ha in developing countries and 23 t/ha in developed countries. These yield differences may be partly due to poor statistics and partly due to multiple-cropping in some potato-growing areas of developing countries.

16. Annual per capita consumption of potatoes varies from about 4 kg for the five lowest-producing countries to 120 kg for the five developed countries with the highest production. Per capita production for these groups was respectively 6.3 and 509 kg per year. In Andean countries, per capita consumption is typically 70 kg/year and per capita production is 74 kg/year.

17. Potato production in developing countries increased by 107 percent during the last decade, due equally to increases in area planted and yield. Production increases in Andean countries were modest (0.5 percent/year), but increases in the 60 countries with the lowest potato production averaged about 5 percent annually. In the latter countries, potatoes occupied only 1 percent of the total crop area in 1977, indicating considerable potential for future expansion of potato production.

18. The potato is one of the most nutritious human foods containing 2.1 percent protein on a fresh weight basis equivalent to about 10 percent of the dry matter. This protein is highly digestible (73 percent) and has an excellent amino acid balance.

19. In developing countries, most potatoes are grown on smallholdings, and few farmers have access to agricultural inputs, support services, and ready markets. Under these conditions, farm families consume a substantial part of their production. It is these farmers who probably will benefit most from CIP's research activities.

20. Potatoes are costly to produce. Major cash costs are seed tubers, fertilizer and chemicals for pest and disease control. On a dry matter basis, the purchase price of potatoes is almost always higher than, and often more than double that of major cereals. This may limit demand for potatoes in some regions that grow cereals such as the humid and mid-altitude tropics. Recent studies of potato consumption patterns at CIP show, however, that in these areas the role of potato is often as a highly-

valued side-dish rather than a staple food. Even in these situations there is potential for further increase in potato production.

21. The major yield increases in modern rice and wheat varieties has been obtained by reducing plant height, raising the harvest index and improving the response to higher fertilizer levels. The potato, however, already has a high harvest index (about 70 percent) so that the physiological approach to yield increases in potato will, therefore, be more complex. It is likely that the benefits from genetic resource manipulation will be concentrated in the reduction of yield losses due to diseases and pests.

22. Because of the high nutritive value and despite the difficulties associated with potato culture there is a growing demand from many developing countries for acceptable potato varieties and for technologies suitable for highly varied local conditions. The demand cannot at present be satisfied.

23. From the foregoing considerations, the gains CIP has already made and the potential for even greater gains, the Panel concludes that work on potatoes should continue in the CGIAR.

B. THE MANDATE: APPROPRIATENESS AND INTERPRETATION

24. The CIP mandate originated with an Agreement between the Government of Peru and North Carolina State University signed January 20, 1971. CIP's broadly based statutes were developed from this original Agreement, and state that CIP will pursue the following activities:

"1. Conduct research programs for the improvement of potato production and other tuberous crops, both nationally and internationally;

2. Collect, maintain and distribute germplasm for it to be used nationally and internationally;

3. Provide assistance in the development of related institutions which might be established in Peru or headquartered elsewhere;

4. Train potato technicians under the leadership of experienced scientists;

5. Publish and distribute research results;

6. Establish an information Center and organize a specialized library as well as an herbarium;

7. Organize conferences, forums, round tables and seminars' both nationally and internationally, concerning potato improvement activities;

8. Participate in all other activities related to the goals of the Center."

25. CIP now considers its mandate as redefined within its statutes, to be:

"To develop, adapt and expand the research necessary for the technology to solve priority problems that limit potato production in developing countries. This includes adapting the collective knowledge that has contributed to the stepwise increase in potato production in developed

countries. The World Potato Collection which has been accumulated by CIP provides ample opportunity for research breakthroughs through the exploitation of this large quantity of previously unavailable genetic resources." (Profile 1972-2000, 1982)

26. The Panel considers CIP's mandate to be appropriate and agrees with the strong emphasis the Centre has placed on germplasm collection, preservation and utilization. The Panel, therefore, recommends that there be no changes made to the mandate.

27. The mandate and the list of activities, however, do not refer to storage of consumer potatoes, nor to the processing and utilization of potatoes. CIP is involved in post-harvest work, and the Panel suggests it would be appropriate for CIP to include in its mandate statement that appears in the Profile, a reference to some storage and simple processing.

C. PRESENT AND FUTURE STRATEGIES FOR IMPLEMENTING THE MANDATE

28. The strategy by which CIP implements its mandate is:

"First, to identify the priority research problems for potato production and improvement in developing countries.

Second, to define the scope of CIP's work on these problems with the funding available.

Third, to identify the priority research that CIP is uniquely qualified to conduct as well as that which could be accomplished equally well at other institutions.

Fourth, to involve as many institutions as possible around the world in CIP activities through the utilization of international planning conferences for each major thrust, and research contracts for some priority problems with institutions possessing special expertise and facilities.

Fifth, to establish regional research capabilities in several areas of the world for the evaluation, adaptation and redistribution of technology to surrounding countries.

Sixth, to develop training programs at CIP headquarters and in association with regional research in order to have capable receivers of CIP technology within country programs.

Seventh, to develop a third dimension country program strategy for backstopping national potato improvement programs without accumulating a large number of special projects which would require major increases in management activities.

Eighth, to develop cooperative programs among countries for a pooling of resources for potato improvement."

29. Since CIP's mandate is to help produce technologies appropriate for improving potato production in developing countries, CIP's major strategy has been to identify characters in cultivated varieties and wild species

that contribute to improved yield, environmental adaptation, and pest and disease resistance. These characters are then recombined and the resulting genotypes are tested in the major environmental zones of Peru before the best performers are sent to the regional centres for evaluation and redistribution for possible national programme use. In some cases, tuber families with known characteristics are distributed directly to the regions for testing by national programmes. The World Potato Collection developed and maintained by CIP is a major source of new characters available to scientists at CIP and elsewhere. CIP also plays a major role in distributing cultivars of differing origin to developing countries for testing under local conditions.

30. Due to the problems encountered in the multiplication and distribution of a vegetatively propagated crop, CIP, from the beginning has devoted a considerable portion of its core budget to research and germplasm distribution programmes located in its seven regional centres. These centres are usually located in facilities provided by a national programme of a developing country, after consideration of such factors as strength of the national programme, facilities available, and access to international communications and transportation. A core-funded research scientist is stationed in each region. The high level and continuous commitment of core funds by CIP to regional programmes is unique among the CGIAR centres.

31. CIP believes its role in the transfer of technology within a country is one of support and encouragement (or backstopping) and that it should not become directly involved in staffing, funding and programme management of national projects. Whenever possible, an agency already in the country the programme or project manager while CIP plays a supporting role by providing help in the development of proposals, conducting feasibility studies, identifying staff, providing technology and training, and evaluating progress. CIP calls this its "Third Dimension" programme.

32. CIP's activities involve 3 components: research undertaken at the 4 locations in Peru (La Molina, Huancayo San Ramon and Yurimaguas) which CIP identifies as Source Research, Regional Research carried out in developing countries, and Contract Research undertaken by special institutions that support the other two components.

33. To extend its technology transfer capacity, CIP has assisted in organizing and supporting regional networks such as the Programa Regional Cooperativo de Papa (PRECODEPA) in Central America and the Southeast Asia Programme for Potato Research and Development (SAPPRAD) in Southeast Asia.

34. The Panel commends CIP for its decentralized approach to research, and to training and technology transfer through its Regional Research and Training Activities, and for its use of core funds to provide continuity and stability to regional activities.

## CHAPTER 3. CIP'S SOURCE RESEARCH: THE THRUSTS

**35. Chapter Outline: CIP considers that potato technologies are a major outcome of its source research programme. This chapter outlines the research approach and details each of the nine Thrusts. Discussion on each Thrust is structured using the headings: Description; Strengths; Limitations; Impact; Future Plans; Recommendations.**

### A. ORGANIZATION OF RESEARCH

36. CIP's mandate is to conduct research to help produce technologies for potato improvement in developing countries.

37. To fulfil this mandate CIP has established three interdependent, integrated research programmes: Source Research (considered in this chapter) at CIP's Peruvian locations, Regional Research in seven geographic regions and Contract Research in selected institutions. These last two are considered in Chapter V.

38. Thirty-three* scientists and 34 technicians supported by a field labour force and a small administrative staff, make up the headquarters research staff. These scientists and technicians are assigned, on the basis of scientific discipline and for administrative purposes, to one of six Departments: Taxonomy, Breeding and Genetics, Pathology, Nematology and Entomology, Physiology and Social Science** (Annex V).

39. CIP operates on the basis that problems constraining potato productivity can best be solved by using multidisciplinary teams. Thus, members of different departments cooperate in research projects which are grouped into Thrusts, defined by CIP as "units of common research activity." Each Thrust is headed by a Coordinator responsible for unifying the Thrust activities, but the funds for a particular project come from the Department of the Project Leader who is also responsible for project direction.

40. There are nine Thrusts:

| | | |
|---|---|---|
| Thrust I | - | Collection and Classification of Tuber-Bearing *Solanums* |
| Thrust II | - | Maintenance, Utilization and Distribution of Tuber-Bearing *Solanums* |
| Thrust III | - | Control of Important Fungal Diseases |
| Thrust IV | - | Control of Important Bacterial Diseases |
| Thrust V | - | Control of Important Virus Diseases |
| Thrust VI | - | Control of Important Nematode and Insect Pests |

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* Thirty scientists are supported by Core funds.

** For administrative purposes the Social Science Department is under Regional Research and Training; all others are under Research.

Thrust VII - Physiologic and Agronomic Management of Potatoes

Thrust VIII - Development of Storage and Processing Technology

Thrust IX - Tuber and True Seed Research

41. During 1982, there were 56 projects, distributed among the Thrusts as follows: Thrust I, 3 projects; Thrust II, 11 projects; Thrust III, 4 projects; Thrust IV, 5 projects; Thrust V, 3 projects; Thrust VI, 6 projects; Thrust VII, 3 projects; Thrust VIII, 3 projects; and Thrust IX, 8 projects and the Social Science Department 6 projects. Fifty-four percent of the staff were involved in one project, 39 percent in two projects and 6 percent in three projects (Annex V). In addition there were 68 additional research projects executed in the regions and 35 undertaken by contract.

42. The Panel members spent considerable time in discussing the Thrust research and direction with senior management and scientific staff. The remainder of this Chapter details their findings.

## B. THRUST I: COLLECTION AND CLASSIFICATION OF TUBER-BEARING SOLANUMS

### Description

43. The primary objective is to assemble as complete a collection as possible of wild tuber-bearing potatoes. In establishing exploration and collection priorities, genetic erosion, plant breeders' needs, taxonomic interest, and existence of living material, are assessed. Wild tuber-bearing accessions are classified to species and arranged according to Groups and Subgroups. It should be noted that the preservation responsibility of the primitive cultivated tuber-bearing *Solanums* was transferred to Thrust II in 1979.

### Strengths

44. The major strength of this Thrust lies in the dedication, experience and knowledge of the Coordinator who has, almost single handedly, done an enormous job of assembling over 1200 accessions of wild species of tuber-bearing *Solanum*.

### Limitations

45. The major limitation of this Thrust appears to be the slow progress in producing sufficient quantities of true seed from the wild species for storage, in completing taxonomic classification of the collection and in preparing a comprehensive publication on the biosystematics of wild *Solanum* species as recommended by the CIP's Board of Trustees in 1980 and 1981. Part of the limitation in producing sufficient quantities of seed for storage lies in the lack of suitable space for propagation.

Impact

46. The main achievements are enumerated below:

(a) The collection of wild species of tuber-bearing Solanums increased from 42 accessions (December 1976) to 1247 at the beginning of 1983 (Annex VI). To date about 650 accessions have been classified and found to belong to 90 species (Annex VII).

(b) So far, sufficient quantities of true seed for storage have been obtained from 596 accessions thus minimizing their loss.

(c) True seeds of many accessions have been sent upon request to CIP's researchers, and to scientists from Peru, Brazil, USSR, USA and Japan (Annex VIII).

(d) An inventory book of the 1247 accessions showing entry number, species name, chromosome number, data on tuber seed, true seed and other useful information has been compiled.

Future Plans

47. Three items have been selected for intensified activity:

(a) Obtain true seeds of all accessions and share them with established centres for maintenance of germplasm. The Panel was informed in February 1983 of CIP's decision to place all the Andean cultivar collection, into in-vitro culture.

(b) Completion of the taxonomic classification of accessions.

(c) Continuation of the biosystematic studies of the collection.*

Recommendations

48. The Panel endorses in principle the 1979 report of the Planning Conference entitled "Exploration, Taxonomy and Maintenance of Potato Germplasm III." Further the Panel draws particular attention to:

"II. RECOMMENDATIONS FOR TAXONOMIC STUDIES

B. Wild Species

Taxonomic research on the wild species SHOULD BE CONDUCTED with a view to understanding species relationships and thus facilitate their use in plant breeding.

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* The Programme Committee of the Board of Trustees has recommended that the Thrust I Coordinator prepare a publication on the biosystematics of wild Solanum species. The Coordinator has many years of experience and exceptional knowledge through numerous explorations and through taxonomic studies of the wild Solanum species, and consequently seems highly qualified for this assignment. Moreover, the Coordinator will be retiring in the next few years.

PRIORITY 1. It is RECOMMENDED that taxonomic monographs of the wild species be prepared.

PRIORIT 2. It is RECOMMENDED that emphasis should be given to biosystematic studies in the following series and species...

PRIORITY 3. It is RECOMMENDED that an Atlas of the wild species and their breeding potentials be prepared."

49. Because of the magnitude of the task and the limited time available the Panel urges that CIP administration take such steps as necessary to allow the Coordinator to devote full time to preparation of the taxonomic monographs and the manuscript on biosystematics.

50. If this suggestion is accepted, 1) it will be necessary that the responsibility for maintenance of the wild potato collection be transferred to another qualified scientist; and 2) the Coordinator will require increased secretarial service.

51. The Panel recommends that CIP administration conduct an analysis of the adequacy of the facilities needed for maintenance and storage of the wild species collection.

## C. THRUST II: MAINTENANCE, UTILIZATION AND DISTRIBUTION OF TUBER-BEARING SOLANUMS

### Description

52. The activities of this Thrust, ie. maintenance, distribution and utilization of the tuber-bearing Solanums, are carried out by breeders and geneticists with the close cooperation of scientists from several other disciplines. The primary goal is the exploitation of the huge reservoir of genetic variability residing in the tuber-bearing Solanums to improve the cultivated potato through breeding.

53. Maintenance: In December 1976, at the time of the first Quinquennial Review, the total number of accessions in CIP's Andean cultivar collection was in excess of 12,000. Through use of morphological and electrophoretic comparisons duplicates were eliminated and consequently the number of accessions was reduced to 5536.

54. This cultivar collection is maintained by annual field propagation at Huancayo. This practice exposes the collection to the risk of loss from disease, pests or the environment. In January 1983, for example, almost the entire collection was devastated by hail and, consequently, at the time the Panel visited Huancayo, reserve tubers from storage were being planted in pots to insure against permanent losses. As a partial safeguard, open-pollinated seed has been collected in the past years and placed in long-term storage at CIP headquarters and at the U.S. National Seed Storage at Fort Collins, Colorado. This was done in accordance with a recommendation of the Second Planning Conference on Exploration and Maintenance of Germplasm Resources. Relatively little seed has been collected from controlled pollinations.

55. The Panel was informed by the Thrust Coordinator that a decision had recently been made to place all of the Andean cultivar collection in in-vitro culture. The process will require two to three years and will demand additional suitable laboratory and storage space. Fortunately, funds from a recent Japanese grant have been provided to add a wing to CIP's main building, and a portion of this addition will be assigned for these in-vitro needs.

56. Breeding Strategy: In order to efficiently utilize this genetic reservoir, an appropriate breeding strategy must be employed. Overall the CIP strategy is one of population breeding based on recurrent phenotypic selection. The goals of this breeding approach are to (a) maintain wide genetic diversity to assure high yield and stable performance; and (b) increase the frequency of genes which determine desirable characteristics in individual genotypes and in populations.

57. There is a large array of desirable traits to be incorporated in the cultivated potato including such characteristics as resistance to late blight (*Phytophthora infestans*), bacterial wilt (*Pseudomonas solanacearum*), cyst nematode (*Globodera* spp.), root-knot nematode (*Meloidogyne incognita acrita*), viruses such as potato virus X and Y (PVX, PVY), and potato leaf virus (PLRV), heat or cold tolerance and early maturity.

58. Evaluation of the Andean Cultivar Collection: The Andean collection has been partially evaluated for desirable characteristics, especially resistance to diseases and nematodes. Five hundred and forty-two accessions, were found to possess some resistance to one or more diseases or pests. An inventory of these accessions was printed in February, 1978, and made available to interested researchers.

59. True Potato Seed (TPS): Potatoes are traditionally propagated by planting seed tubers. Because of the high cost and difficulty of obtaining healthy seed tubers in many areas of the developing countries, the alternative of propagating potatoes from true potato seed (TPS) is being explored by CIP. Under Thrust II, breeders are seeking to develop TPS progenies with desirable agronomic characteristics, uniformity and resistance to major diseases and pests. Yield comparisons have shown that $F_1$ hybrid TPS progenies outyield open-pollinated progenies by more than 50 percent. Breeders are seeking the most effective methods to exploit $F_1$ hybrids. Research on the physiological and agronomical aspects of TPS are reported under Thrusts VII and IX.

60. Documentation: Computerized documentation of the Andean cultivar collection includes data on 44 descriptors as defined in "List of Descriptors for the Cultivated Potato," CIP, 1977. This "List" has been endorsed and also published by the International Board for Plant Genetic Resources, Rome, and provides the basis for the descriptors list in the Report of the Germplasm Information Project (GRIP) prepared by the GRIP Potato Advisory Committee of the United States.

Strengths

61. The prime asset of this Thrust is the ready access to the wild and cultivated tuber-bearing *Solanum* germplasm.

62. A further major asset is the core of highly capable scientists, which at present includes five breeders, two geneticists and one cytogeneticist. The scientists conduct their respective investigations within separate well-defined projects. Scientists from several other disciplines cooperate with and provide services as needed.

63. The superior germplasm developed by CIP breeders is distributed to developing countries in the potato-producing areas of all seven Regions.

64. The research of Thrust II has been substantially strengthened and expedited through contracts with research specialists at selected institutions. CIP's policy of arranging periodic planning conferences has been highly effective in enabling Thrust II scientists to obtain current information and engage in knowledgeable interchange with other top scientists on a worldwide basis. The contacts established in these conferences often have a continuing long-term benefit through the active exchange of information and research materials.

Limitations

65. There is a critical need for adequate temperature-controlled greenhouse space for the breeding research at headquarters. An elaborate facility is not required but rather a modest and reliable means of keeping greenhouse temperatures below those limiting flower initiation and seed set.

66. Although five technical assistants are currently available, more are needed.

Impact

67. Basic Genetic Studies: As a consequence of basic studies conducted by CIP scientists and others under CIP contracts, innovative and highly effective breeding methods have been found for transfer of germplasm within the cultivated tetraploid potatoes, *S. tuberosum* (2n = 48) and *S. andigena* (2n = 48), and between these tetraploids and the numerous cultivated and wild relatives (Papers covering these studies were presented at CIP's Decennial Congress held in Lima in February, 1982). These studies embrace a wide array of genetic manipulation, some quite sophisticated, including interspecific hybridization, chromosome doubling, bridging matings, haploidy and unreduced gametes. Results from these studies are already having a profound impact on the production of breeding materials.

68. Utilization of Wild Species: Through the research of CIP scientists and those conducted under CIP contracts, the vast germplasm reservoir in the wild species is being methodically evaluated for desirable traits, especially resistance to diseases, nematodes, insects, and frost, and these traits are being transferred, where possible, through hybridization to the cultivated potato. Twenty-one wild species with one or more desirable traits are currently being utilized in CIP's breeding programmes (Annex IX).

69. Development of Improved Germplasm for the Developing Countries: CIP has started to evaluate the farm-level performance of germplasm derived from CIP crosses. This evaluation will provide a feedback to CIP about its

breeding materials. It is being conducted by CIP plant breeders, social scientists and agronomists, in close collaboration, so that in addition to physical and biological factors, the effects of social and economic factors on the performance, distribution and acceptance of varieties may be better understood. These studies require cooperation and substantial contributions from national programme scientists.

70. Through use of promising selections resulting from the CIP breeding programme along with superior selections or varieties made available from other countries and through contracts with selected laboratories, eight national potato programmes have named to date a total of 17 varieties (Annex X), while another 22 clones with varietal potential have been released to eight additional national programmes (Annex XI).

71. Further, 131 clones with resistance to one or more diseases are in variety trials in Peru (22), Colombia (10), Brazil (5), Kenya (5), Malawi (1), Ethiopia (22), Rwanda (14), Burundi (4), Tanzania (1), Seychelles (2), Turkey (2), Bangladesh (15), Nepal (8), Bhutan (10), Sri Lanka (7) and Korea (3). Another 316 advanced clonal selections are under field trials in countries of Regions I, II, III, IV, VI and VII.

Future Plans

72. The future for Thrust II appears bright. Improved germplasm distributed by CIP to the national programmes of the Regions has resulted in proven, adapted selections superior in one or more traits and in the naming of seventeen varieties. Because CIP's breeding programme is now reaching maturity through incorporation of multiple desirable traits from diverse sources, into populations and individuals, one can predict with confidence an acceleration in the output of superior clones with resistance to diseases and pests and with adaptation to the various needs and environments in the developing countries.

Recommendations

73. CIP breeders have been guided by the recommendations of several CIP sponsored Planning Conferences, the most recent being held in November, 1980 entitled "Utilization of the Genetic Resources of the Potato III." The Panel endorses in principle the thoughtful, well-conceived recommendations of this Planning Conference and feels acceptance of the recommendations will expedite CIP's utilization of available genetic resources.

74. In view of the well-recognized yearly hazards involved in the Huancayo field propagation of the primitive Andean cultivated species collection the Panel commends CIP for its decision to commit, as rapidly as feasible, all of these accessions to in-vitro culture.

75. The Panel recommends that adequate, suitable, temperature-controlled greenhouse space be provided for the breeding programme at headquarters to assure reliable flowering and successful pollinations of parental stocks.

## D. THRUST III - CONTROL OF IMPORTANT FUNGAL DISEASES

### Description

76. There is a wide range of fungal pathogens of potato, of which the most important worldwide, is late blight (*Phytophthora infestans*). More than half the effort of the Thrust is devoted to collaborating in a large breeding and screening programme for late blight resistance, and to its delivery to national programmes. Other diseases, including some affecting tubers, have also been investigated, particularly those that have caused serious problems at the Huancayo field station.

### Strengths

77. Collaboration with Thrust II has helped to identify late blight resistant clones in the breeding programme based on introductions of resistance from many diverse sources. Considerable progress has been made in combining late blight resistance with resistance to bacterial wilt and to nematodes.

78. Clones resistant to wart (*Synchytrium endobioticum*), have been developed particularly for areas such as Nepal. The contract research recommended by the first Quinquennial Review for breeding clones resistant to early blight (*Alternaria solani*), has been successful.

### Limitations

79. Although a wide range of fungal pathogens, which can be damaging to potato, has been identified, there is little systematic information available on their distribution, incidence and associated crop losses. This comment also applies to Thrusts IV and VI. There is little systematic information available on the relative importance and interactions of the pests and diseases considered by CIP to be of major importance. The information is needed to determine whether or not the appropriate balance is being maintained both within and between Thrusts.

80. Clearly, it is difficult to set up sophisticated surveys of diseases and pests in developing countries, but the basis for priority decisions could be much improved by developing relatively simple techniques. These techniques could be developed in collaboration with national programmes. For example, a team of one pathologist and one entomologist could mark and assess a large number of random plants for diseases, pests and final yield, in a defined area. The accumulated information would provide data for a multiple regression analysis so as to determine the principal components affecting yield. Such a method could be used in the Regional Programmes and the data returned to CIP headquarters for analysis.

81. In the late blight programme, one of CIP's objectives is to eliminate all qualitative resistance genes (R-genes) and select only for quantitative resistance even though both forms of resistance may be useful. There are breeding schemes that allow a high probability of selecting progeny that possess both qualitative and quantitative resistance, without progeny testing, and which could be used in potato. Apart from the usefulness of their disease control, such progeny might be more acceptable in some national programmes because of the high level of resistance expressed.

82. The environment at the late blight testing sites in Colombia and Mexico is highly suitable for the development of infection, and, particularly in Mexico, the pathogen is highly variable for host pathogenicity. Tests of breeding material at these sites expose susceptible progeny. However, the durability of resistant progeny cannot be predicted since the pathogen populations are unlikely to have been exposed previously to these newly selected resistant hosts.

83. Multilocational testing of a standard set of varieties may be uninformative with regard to pathogen adaptation because of the confounding effects of genotype-environment interaction, and the fact that the pathogen populations at each site are unlikely to have been selected by exposure to the resistance of any of the test varieties.

84. Seedling infections caused by Rhizoctonia and other pathogens are clearly of importance in relation to TPS development. Progress has been made in identifying conditions that restrict development of these pathogens, but progress could be accelerated if a Rhizoctonia-infested test area were established in the field.

85. The Panel agrees that a consultant with broad experience in crop protection chemistry should be engaged for short contracts at regular intervals at CIP; it is unnecessary to have a permanent crop protection chemist on the staff.

Impact

86. The programme is at too early a stage of development to gauge its full impact, although on a restricted scale, for example, in Peru, Costa Rica and Rwanda, there are indications of useful late blight control. Several clones containing resistance to more than one disease have also been released (Annexes X and XI). In the long term, the prospects for increased potato production through disease resistance are exciting.

Future Plans

87. Late blight is likely to be important in potato production for a long time to come, and will require a considerable amount of maintenance research. Control of the disease presents many challenges, for example, in combining resistance with earliness, in maintaining effectiveness while raising the level of resistance expressed, and in combining resistance with other important characters.

88. Strategies are needed against the highly variable late blight pathogen to provide adequate disease control and a reserve of resistance. One strategy already well in hand is to provide a much wider genetic base of resistance in the breeding programme. With the aid of tests with appropriate pathogen isolates, it should be possible to identify a wider range of resistant clones than has previously been possible.

89. As observations accumulate, it should become possible to recognize varieties that have inherent durable resistance; the variety "Atzimba" may be one such example. Varieties with this characteristic could be further exploited in the breeding programme.

90. Potatoes, heterogeneous for late blight resistance but acceptable for tuber conformity, should be developed and assessed as populations for late blight control. This approach may be particularly useful in TPS development. Populations that are based on lines that differ only in qualitative resistance are unlikely to be of much value, because of the relatively common occurrence of pathogen races with various combinations of matching pathogenicity genes. It is preferable to use lines with differing and more complex resistance.

91. Attainment of these objectives can be helped by developing appropriate cultural practices and chemical control, and combining these into systems of disease and pest management (see Thrust VI, para. 174). However, it is unnecessary to have a crop protection chemist permanently on the staff.

92. This Thrust also has an important role to play in developing TPS in collaboration with other Thrusts and with the Social Science Department.

Recommendations

93. The Panel commends the advances made in broadening the genetic base of resistance to late blight.

94. The Panel recommends CIP to obtain more systematic information on disease and pest distribution incidence and crop losses to help to determine the best balance within and among Thrusts (see Thrust IV, para. 104, and Thrust VI, para. 166).

95. The Panel recommends that testing of variation and potential adaptation in the late blight pathogen should be concentrated on isolates obtained from relevant resistant clones grown in the field, rather than from older susceptible clones.

96. The Panel recommends that, in collaboration with Thrust II, and also Thrust VII, there should be further studies of the potential value of crops of heterogeneous potato populations for disease control and yield reliability.

## E. THRUST IV - CONTROL OF IMPORTANT BACTERIAL DISEASES

Description

97. The major objective of this Thrust is control, by host resistance, of bacterial wilt caused by *Pseudomonas solanacearum*. Successful achievement of this objective is already being demonstrated in some tropical highland areas but the problem is proving more difficult at lower elevations. Progress is being made, however, with breeding lines that combine tuberisation with resistance to bacterial wilt and root-knot nematode, and that contain germplasm from several wild species.

98. The second principal objective is improved understanding and screening of tuber resistance to soft rot caused by several species, particularly *Erwinia sp*. Major contributions to this objective has also been made through contract research, and it would be of interest to investigate the potential resistance of using tubers with high dry matter content and treating them with calcium nitrate solution.

Strengths

99. Since the first Quinquennial Review there have been two major developments. The first was the implementation of the recommendations of the first Quinquennial Review and of the second Planning Conference (June, 1979), that updated the recommendations of the first Conference (1972). The second was the introduction of varieties with bacterial wilt resistance into tropical highland production.

100. Varieties with bacterial wilt resistance derived from S. phureja are being successfully released in several South American countries for highland production, and efforts are being made to select for combined resistance to bacterial wilt and late blight. Another exciting programme is the development of lines incorporating resistance from S. sparsipilum (together with resistance to root-knot nematode and potato tuber moth), S. chacoense and S. microdontum. Potential durability of the resistance is being monitored, and this should be continued: the prospects, at least for the tropical highlands, are good.

101. The successful development and introduction of bacterial wilt resistant varieties represents an excellent model of the CIP approach to disease problems, and of the value of its comparative advantage. Close and fruitful collaboration between Thrust IV and Thrust II has exploited some of the excellent contract work. It is hoped that this will continue and so provide germplasm which tuberises and maintains its resistance at increasingly higher temperatures. The prospects are encouraging, despite the complex genetic nature of the breeding material that is now being screened. Because of the complexity, further exploitation of S. phureja, which is relatively easy to handle, could be continued in the University of Wisconsin contract; this might also allow selection of resistant genotypes with greater temperature stability.

102. Efforts have been made, and should be continued, through the regional and national programmes, to encourage good farm hygiene, appropriate rotations, (such as potatoes following paddy rice), weed control, and the use of clean seed tubers that have not been cut. Such practices can obviously enhance the effectiveness and durability of host resistance, and are thus likely to be of critical importance at lower elevations in the tropics.

103. Progress has been made with Erwinia soft rots and black leg in clarifying the differentiation of species, the distribution and importance of the diseases, and the development of screening methods.

Limitations

104. Systematic information on the distribution and importance of bacterial wilt is not available and is difficult to obtain. It is required, however, in order to determine the appropriate balance within and among Thrusts. Similar information for soft rot will be more difficult to gather, because the incidence of this disease may be closely dependent on potato usage (see Thrust III, paras. 79, 80, 94).

105. At the moment, there is only one senior bacteriologist and one technician. This may be adequate, but only just, because of the large inputs from contract research and Thrust II plus the efficiency of the established screening procedures.

106. The wide distribution of severe bacterial wilt in mid- and lowland tropics, its likely increase with expanded potato production and use, and the inability of resistance selected so far from S. phureja to remain effective at high temperatures, present serious constraints on the development of potatoes for lower altitudes in the tropics. It is right, therefore, that there should be increased emphasis on this aspect.

107. Use is made in screening and selection of a world collection of isolates of Pseudomonas solanacearum. Potato populations are tested with isolates from regions for which they are destined, but it is unlikely that these isolates will be fully representative of the potential for pathogen variation in those regions. It will be necessary, therefore, to screen breeding material in the areas where selections are likely to be grown, and then to maintain close monitoring of the performance of resistant varieties as they are distributed; this will depend on the cooperation between regional and national programmes.

Impact

108. The bacterial wilt programme has had a major impact on the development of resistant varieties useful for agriculture through interdepartmental collaboration in CIP and application and development of contract research results.

109. The value of resistant varieties, such as "Molinera", is already being felt in some South American countries. Resistant selections are also proving their worth in trials in many other parts of the developing world where the disease represents a severe constraint on production (Annexes X and XI).

Future Plans

110. The future programme envisages a reduced input into the search for sources of resistance of bacterial wilt for the tropical highlands, followed at a later stage by a similar reduced effort for the tropical lowland zones.

111. This timetable may be optimistic, because the resistances selected are dependent on their durability and effectiveness across environments. Particularly at lower elevations, pathogen and environmental variation may prove to be difficult to deal with when there is an increased scale of cultivation of potatoes.

112. Furthermore, the currently used sources of resistance may not be compatible with other required plant characters. This may also necessitate the identification and use of a wider range of resistance sources.

113. Although the first two Planning Conferences have been most useful, it is not envisaged that a third conference will be required for a considerable time. Steps should, therefore, be taken to ensure continued interaction between CIP and other institutions.

114. Biological control, integrated with good farm practice and varietal resistance, may reach the stage of field evaluation within the next few years.

Recommendations

115. The Panel commends highly the rapid success achieved in developing bacterial wilt resistant lines for the tropical highland areas. Not only are the lines of great value in themselves, but their production represents an excellent justification of the approach to the problem made by CIP, involving rapid exploitation of contract research and inter-disciplinary collaboration by CIP for the benefit of highland farmers. The Panel commends the early publication of this work in a leading scientific journal.

116. The Panel agrees with the increased emphasis on the longer range programme to utilize the wilt resistance of several wild species of *Solanum* combined with resistance to other organisms, particularly the root-knot nematode. This approach should help to remove a major constraint on potato production at mid-elevations in the tropics.

117. The Panel urges further exploitation of bacterial wilt resistant material derived from *Solanum phureja* because it is relatively easy to handle. It would provide a backup to the resistance already introduced, and it might provide some lines better able to maintain resistance at higher temperatures.

118. The Panel suggests that, for control of *Erwinia* soft rot, tests should be made of the combined value of using tubers with high dry matter content, treated with calcium nitrate solution.

## F. THRUST V: CONTROL OF IMPORTANT VIRUS DISEASES

Description

119. There are at least 23 viruses, two mycoplasmas and the potato spindle tuber viroid (PSTV) which are known to infect potatoes. Currently CIP is concentrating its research efforts on identifying and working with resistances to potato leaf roll virus (PLRV), potato virus X (PVX), and potato virus Y (PVY).

120. The activities of this Thrust include: (1) development of rapid, efficient, accurate methods of detecting viruses, mycoplasmas and viroids; (2) identification of new viruses; (3) screening breeders seedlings and clones for resistance; and (4) production of antisera.

121. Visiting scientists from Universidad Nacional Agraria La Molina who have worked at CIP for several years, have made significant contributions to this Thrust.

Strengths

122. Plant Quarantine and Phytosanitary Policy: In the Conclusions and Recommendations of the section on Quarantine and Clean Propagation in the first Quinquennial Review Report, the following appears:

> "The Panel considers that production and testing of propagating material of the highest attainable health standards must have maximum priority."

123. CIP took prompt action on this recommendation by drastically curtailing import and export of plant materials until reliable methodologies could be implemented for detection of infected materials, especially by viruses. Sound and effective procedures were developed in due time and are now in place. These procedures are detailed in Annex XII and Annex XIII. A copy of CIP's Phytosanitary Statement is provided as Annex XIV; this is the only IARC Statement recognized by FAO Plant Production and Protection Division.

Strengths

124. Since the first Quinquennial Review two Planning Conferences on viruses have been held: Developments in the Control of Potato Viruses - 1977, and Strategy for Virus Management in Potatoes II - 1980. A post-Congress Workshop on Viruses, Viroids and Mycoplasmas was held in 1982. The reports of the conferences and workshop, especially the recommendations, have been useful and valuable for the various activities of this Thrust.

125. In addition, a session entitled A Review of the Policies, Procedures, Associated with the Import and Export of Plant Germplasm at the International Potato Center was held in 1981. This report, and an overall document relating to IARC cooperation with national programmes, are of particular pertinence and use to this Thrust because of CIP's very substantial involvement and leadership in quarantine matters resulting from germplasm movement.

126. Contracts with the Swiss Federal Agricultural Research Station and the Universidad Nacional Agraria, La Molina, Peru, provide antisera and improved serological techniques.

Limitations

127. There are currently limitations on research productivity. These include:

(a) fluctuating and excessively high temperatures in the greenhouse, causing unreliability in certain virus-detection techniques;

(b) a vacant research position;

(c) capacity for testing and screening plant breeding materials is almost at the upper limit;

(d) almost half of the Thrust effort is devoted to screening materials for breeding and export.

(e) inadequate space for visiting scientists.

128. CIP currently provides one high speed centrifuge for the virus work. As a consequence, this unit is very heavily used. In the event of a centrifuge breakdown, up to six months are required for repair services.

Impact

129. The research and service of this Thrust assures that all germplasm sent to developing countries and elsewhere is free of viruses.

130. Further, the Thrust scientists cooperate with the plant breeders in screening for virus resistance among the wild cultivated species, potentially resistant parental selections and populations segregating for resistance to PLRV, PVX and PVY.

131. Success has been realized in improving the various methodologies for more efficiently and reliably detecting virus infection but this is a never-ending search.

132. Antisera for PVX, PVY, PVS, Andean potato latent virus (APLV) and Andean potato mottle virus (APMV) were produced and distributed by CIP to an average of 17 countries annually for 1978-82. In addition, through a Swiss contract, PLRV and PVM antisera and monoclonal antibodies are being produced for use at CIP headquarters and for distribution.

133. Enzyme-linked immunosorbent assay (ELISA) has been used routinely since 1978 to detect PVX, PVY, PVS, APLV, APMV, PLRV and tobacco mosaic virus (TMV).

134. CIP scientists have been active in identifying novel viruses and virus strains during the past five years. New viruses and strains identified for the first time are Solanum apical leaf curling virus and wild potato mosaic virus. Recently strains of tobacco streak virus (TSV), PVY, and PVX have been identified for which there are no known sources of germplasm immunity.

135. An important and continuing component of CIP's virology research is the use of thermotherapy and other techniques to ensure the virus-free status of in-vitro cultures and material derived therefrom for export.

136. In cooperation with the breeding programme, immunity to PVX and PVY viruses, singly or combined, have been incorporated in a number of advanced clones. Extreme resistance to PLRV virus has been found in Solanum etuberosum - S. pinnatesectum hybrids developed for CIP under a contract in The Netherlands.

Future Plans

137. In view of the large proportion of time spent in screening for the presence of virus in CIP breeding materials, the Thrust V scientists should aggressively search at CIP and through contracts with leading laboratories elsewhere, for new or improved methodologies that are rapid, reliable and less time-consuming. Examples are the recently developed mono-clonal antibody and cDNA techniques which provide highly sensitive and rapid means for the detection of virus and the potato spindle tuber viroid (PSTV). As and when such methodologies are identified, CIP should give high priority to providing the new or additional facilities and equipment that may be required.

Recommendations

138. The Panel commends CIP for establishing rigorous quarantine standards which reduce to the minimum the chance of disease transport to and from the International Potato Centre.

139. The Panel endorses the recommendations of the 1982 Post-Congress Workshop on Strategies for the Control of Potato Viruses.

140. With respect to techniques of virus detection, the Panel recommends that adequate, suitable temperature-controlled greenhouse space be provided as soon as possible at CIP headquarters. This temperature-controlled space is essential to increase the reliability of virus detection tests.

141. The Panel considers the acquisition of an additional centrifuge for virology research a sound and necessary investment.

142. The Panel urges that the vacant position in virology be filled as soon as feasible to assure that virology research, as well as cooperative work with the breeding programme, is not impeded.

## C. THRUST VI: CONTROL OF IMPORTANT NEMATODE AND INSECT PESTS

### 1. NEMATODE PESTS

#### Description

143. The principal concern is breeding and screening for resistance to potato cyst nematode (*Globodera* spp.), particularly for the highland tropics, and to root-knot nematode (*Meloidogyne* spp.), mainly for the lowland tropics. Resistance to cyst nematode has to be combined with late blight resistance, while resistance to root-knot nematode, as a priority, must be combined with bacterial wilt resistance. A second major concern is the development and evaluation of biological control of root-knot nematode using a parasitic fungus, *Paecilomyces lilacinus*.

#### Strengths

144. Following the first Planning Conference in 1974, recommendations for the programme were updated by the first Quinquennial Review (1977) and the second Planning Conference (1978). The programme largely follows the guidelines of the latter Conference, though some appropriate adjustments have been made. Research developments and breeding materials are fed into the programme from one Dutch and three North American contracts. Breeding material is also developed and evaluated in collaboration with Thrust II, and field evaluation is helped by two South American contracts. Efficiency of collaboration between this Thrust and Thrust II has been improved by the transfer of Dr. M. Scurrah to the Breeding and Genetics Department.

145. Collaboration with Thrust II also involves selecting for combined resistance to cyst nematode and late blight for the tropical highlands, and for the combination of resistance to root-knot nematode, bacterial wilt (q.v.) and potato tuber moth, for tropical lowland potatoes. Good progress is being made despite the practical problems involved and the range of pathotype variability in both of the nematode genera. In response to a recommendation of the second Planning Conference, the genetic base for cyst nematode resistance is being rapidly widened. A recommendation to work on intermediate resistance to nematodes was, rightly, not followed. On the other hand, some investigations on root lesion nematodes (*Pratylenchus* spp.) have been started.

146. Since the second Planning Conference, an encouraging advance has been made in the development of biological control of the root-knot nematode, Meloidogyne incognita, using the fungal parasite, Paecilomyces lilacinus. A simple technique for rapid multiplication of fungal inoculum has been developed, and evaluation of the system is in progress on farm fields. There is also some prospect for biological control of cyst nematode using a different fungal parasite.

147. Development is in progress with simple chemical controls, using tuber dips and sprays, in contract research.

Limitations

148. Although there is general information on the distribution of the major nematode pest species, there are no systematic data available on incidence and crop losses. There is contradictory evidence about the damage caused by cyst nematode in South American countries. Relatively simple techniques could be used to obtain better information (see Thrust III, para. 80), which would assist the setting of research priorities.

149. The problem of nematode control is made more difficult by the wide range of pathotype variability. This can only be dealt with empirically, since the major part of selection in the breeding program has to be restricted to the use of only one or two pathotypes. However, a much wider range of pathotypes can be used for selection of parents, and of progeny for release, i.e., at stages of the breeding programme when relatively little material needs to be tested.

150. Screening methods are laborious and relatively slow, so that many hands are needed to maintain a throughput of breeding material which can match that for other diseases. Nevertheless, the nematology support group is large and covers a diversity of projects. The size of the group should be determined by objective assessments of priorities among pests, diseases and other needs.

151. Some of the trial results with biological control are encouraging, but variable. Experience and technique development may help to remove some of the variation. However, there is only a single parasite involved at present, so that the effectiveness of the system might be rapidly eroded if selection led to the emergence of parasite-resistant nematodes.

152. Although cyst nematode occurs characteristically in the highlands, and root-knot nematode in the lowlands, there is a zone of overlap for which clones with combined resistance might be needed.

Impact

153. Cyst nematode resistant clones already appear to have some value for potato production in Ecuador. As these and other resistant clones become more widely available, they will also provide useful tools for assessment of the importance of nematode pests.

154. The development and release of resistant clones since the first Quinquennial Review based on a wide range of wild and cultivated species, again illustrates the value of CIP's approach to contract and collaborative research and development.

Future

155. Continuation of efforts to improve the technology of testing for nematode resistance, particularly in order to reduce the labour input, is most important. This objective may be helped by a proposal from the Overseas Development Administration (UK) to fund a project on testing methods at Rothamsted Experimental Station.

156. The Profile (CIP, 1982) envisages that work on cyst and root-knot nematodes should gradually reduce to a maintenance level over the next five to ten years, allowing more attention to be focused on disease compleses and integrated pest management. This time-scale may be optimistic, which further underlines the need for better and less laborious screening methods. As resistant varieties become established in national programmes, there will be a need for collaborative monitoring of the effectiveness of the resistances used. Biological control of root-knot nematode may have an important role to play within the next few years.

157. Through the help of contract research, it may be possible eventually, to introduce nematode tolerance; this strategy should only be used in combination with resistance.

158. The importance of Pratylenchus spp., and of their interaction with bacterial wilt, will need to be evaluated objectively to determine the scale of input into control measures that may be required.

2. INSECT PESTS

Description

159. A major effort in this Thrust has been directed towards biological and chemical control methods for potato tuber moth (Phthorimaea operculella), the Andean weevil complex Premnotrypes suturicallus, and leaf miner flies (Liriomyza huidobrensis).

160. Integration of these with other methods, including cropping and agronomic practices, is also under evaluation.

161. The first Quinquennial Review recommended that there should be one entomologist working with the virologists on insects as virus vectors, and a second working on control of insect pests. This recommendation was not strictly followed; one entomologist was appointed to work on management of major insect pests, and another scientist was appointed to work on pest management in diverse ecologies of potato cultivation.

Strengths

162. For the long-term, breeding for resistance to tuber damage by potato tuber moth has been started by incorporating potential resistance sources from the wild and cultivated germplasm sources. From the contract research, resistance to foliar pests provided by glandular trichomes is being evaluated.

163. For the short-term, a wide range of control techniques is being examined to help reduce dependence on pesticides. For example in potato stores, pheromone traps, Bacillus thuringiensis, and plants with insect

repellant properties, are being used to control potato tuber moth. In the field, simple sticky traps are being developed for control of leaf miner flies.

164. Particularly for the small farmer in mid- to low elevation tropics, a number of common crop associations have been selected that limit population increase of important pests.

165. Much is being achieved rapidly with a small team.

Limitations

166. Although CIP has demonstrated the importance of certain insect pests in potato production, there is little detailed information available on distribution, incidence and crop losses (see Thrust III, para. 79, 80, 94).

167. Pheromones could probably be used effectively for important insect pests other than potato tuber moth, although there is a danger that intensive use of a particular attractant may lead to selection for insensitivity in the pest population. Consideration should be given to the further use of a range of alternative pheromones that can be easily and cheaply synthesized by other institutions.

168. Studies of crop associations for pest control are balanced towards systems of potential use for the lowland humid tropics. Given that there is doubt about the progress that may be made with potatoes for those regions, there may be a greater potential pay-off in systems of inter-cropping, strip-cropping, etc., that provide pest and disease control, and reliable yields greater than the mean of the components grown as sole crops. There may also be a considerable role for heterogeneity within potato crops that could have similar advantages (see also Thrust III, para. 90). The development and introduction of novel systems would be dependent on close collaboration with the social scientists.

169. Although glandular trichomes can provide control of a wide range of foliar pests, there is relatively little input by CIP into the exploitation of this host character. Material is now available from the Cornell contract that combines hairy foliage with high yields; this could provide a further useful tool for evaluation of pest control, at least in some environments. Dense glandular hair cover of the foliage may be found to have other effects, for example, in modifying pathogen development, and leaf temperature and water loss from the plant; such important side-effects need to be identified and monitored.

170. CIP places relatively little emphasis on control of insects as virus vectors. Virus diseases are considered to be ubiquitous and important, and since it is known for other crops that a relatively small degree of resistance to the vector can have a disproportionately large effect on virus spread, then the value of vector control should perhaps be considered more seriously.

171. Simple sticky traps for control of leaf miner fly have proved to be effective in field trials. These traps are one-dimensional and their efficiency may be dependent on their orientation in relation to wind direction and insect flight paths. This possible limitation could be avoided by using wooden boxes or tin cylinders covered with the sticky material.

Impact and Future

172. The programme has only been in operation since 1979 so that its impact on national programmes is not yet apparent. However, there is a wealth of potentially important methods of pest control already in advanced trials, particularly in relation to potato tuber moth control in stores, that is now ready for transfer through collaboration with Thrust VIII and the Social Science Department.

173. A full Planning Conference on methods of insect control and pest management is being organized for late 1983 or early 1984.

174. The development of varieties with various combinations of resistance to fungi, bacteria, viruses and insect pests, together with the availability of biological control, sensu stricto, and other methods for controlling nematodes, insects, and possibly bacteria, provide an exciting long-term challenge for collaborative efforts among most of CIP's Thrusts and the Social Science Department.

Recommendations

175. The Panel commends the progress made in developing lines resistant to potato cyst nematode for the highland tropics.

176. The Panel recommends increased emphasis on the attempts to improve testing and screening technology to facilitate a reduction in size of the large support team in Nematology.

177. The Panel urges that the nematologists proceed cautiously with field introduction of biological control of root-knot nematode because of variability in results obtained and the narrow genetic base of the control organism.

178. The Panel commends the interest in biological control of root-knot nematode which may have an important role to play within the next few years.

179. The Panel commends the organization of a full Planning Conference on Control of Insect Pests within the next two years.

180. The Panel commends the rapid progress already made towards control of potato tuber moth.

181. The Panel recommends that more consideration be given to the performance of high yielding clones with dense glandular trichomes in relation to the wide range of insect pests that might be controlled, reductions in virus infection that might be gained thereby, and other physiological and pathological interactions that may occur with hairy foliage, particularly in high temperature zones.

182. The Panel recommends the development of closer interaction between the projects on pest management and the Social Science Department.

## H. THRUST VII - PHYSIOLOGIC AND AGRONOMIC MANAGEMENT OF POTATOES

### Description

183. Research relating to field management practices to modify temperature extremes by relay cropping, intercropping, mulches, reflectants and other means, coupled with the use of clones selected for tolerance to environmental stress, is one major project in this Thrust. Associated with this is the modification of soil to alleviate highly acidic and aluminium toxicity conditions found in some tropical locations. A second major project is the exploration of agronomic and socio-economic factors related to the true seed production programme (see also Thrust IX).

### Strengths

184. The main strength of this Thrust, as with most others, lies in the wide range of genetic material available. By routine testing in the field, suitable clones can be readily selected. Sources of frost resistance in many wild species are well identified. In recent years most attention has been given to selecting for heat and high aluminium tolerance, mainly on the basis of early tuberization, fast bulking rate and yield. Under contract research at Cornell University, a screening technique based on the tuberization of cuttings at temperatures ranging from 30° to 40° under 18-hour days has shown promising results. A number of heat-tolerant lines has now been identified.

185. Vital components of the programme are the development of the basic agronomy required under adverse conditions and the interchange of information with the breeders. Information is being acquired on the management of seed tubers, methods which provide a much lower and more constant diurnal soil temperature than bare soil, interplanting with maize and other crops, and the effects of acid soils with high aluminium concentrations.

186. A second major component of this Thrust is the agronomic manipulations associated with growing potatoes from true potato seed (TPS). Complementary work on TPS, including the more physiological aspects, is also included in Thrust IX and under Regional Research (see also Annex XV). In Thrust VII, the requirements of seed-bed preparation have been established, suitable substrates and fertility levels identified, the value of shading demonstrated, and aspects of transplanting under stress investigated. Generally, a sound basic understanding of the general agronomy and economics of TPS has been acquired and this is being adapted in regions where local conditions and traditions require minor modifications.

### Limitations

187. The major limitation of the original heat-tolerant clones, based on *S. tuberosum* x (*S. phureja* x *S. tuberosum*), is their susceptibility to bacterial wilt at high temperatures (see Thrust IV). The current efforts to incorporate resistance to bacterial wilt, plus a degree of resistance to late blight, appears to be essential if potatoes are to be grown in the lowland humid tropics (dry season). The current level of agronomic effort therefore needs to be carefully appraised until such varieties become available.

188. Effort could be restricted to routine testing, based on early tuberization, rapid bulking rates and yield, at San Ramon and Yurimaguas. Extensive screening in greenhouse pot tests, apart from that continuing under contract at Cornell University, and rapid screening methods, such as those based on chlorophyll fluorescence, appear unlikely to give fruitful returns. The dry matter content of tubers is inversely related to the temperature during growth; the reasons for this, and possible ways of overcoming it, should, therefore, be explored. Generally, there is little understanding of the bases of heat tolerance and the physiological attributes of potato growth under high temperatures.

189. In respect of aluminium toxicity, major limitations are the lack of general background information for any crop and the whole complex of soil-plant interactions. Possibly, the most satisfactory way of obtaining relevant knowledge is by encouraging post-graduate studies at those universities situated in regions with these problems and which have adequate expertise in soil chemistry and plant physiology.

190. CIP should consider whether more attention should be given to ways and means of increasing the productivity of the highland areas, including the feasibility and usefulness of undertaking a maximum yield potential trial in which as many constraints as possible are removed, irrespective of costs.

191. The potato makes heavy demands on supplies of nitrogen and phosphorus in the soil. There is a strong case for CIP to identify methods which increase the efficiency of use of these nutrients. For example, an effort may be made, in collaboration with the Breeding and Genetics Department, to identify genotypes with lower phosphorus requirements or the ability to exploit available soil supplies more effectively. In this respect, studies elsewhere on vesicular-arbuscular mycorrhiza suggest that this approach is still a long way from successful agronomic exploitation. Nitrogen supplies through rotational cropping is worth further attention, especially in the cropping systems investigations being made in the Regions.

192. The major limitation to true seed (TPS) agronomy is the lack of background information, requiring de novo development of all aspects. The TPS approach is most promising and could revolutionize potato production in developing countries, but the Panel believes that there is a need to obtain much more background information. Fundamental physiology and biochemistry of the interrelationships between tuber and seed production and their interactive effects on photosynthesis, respiration, flower initiation and berry retention, need to be better understood before the agronomy for obtraining a suitable balance between high yields of tubers and sufficient seed of adequate quality can be determined.

193. Further, particular attention should be continued to be given to the comparison of different seed-bed substrates, techniques to minimize transplanting shock - already well advanced - and the control of diseases in the seed-bed. Work on the relative merits of open-pollinated and hybrid lines could be extended and of the use of seedling tubers and direct seeding in the production of consumption potatoes could be further explored. There needs to be better documentation of characteristics associated with high vigour and survival, and selection of lines which give adequate yields of tubers of suitable size and quality.

194. The Panel believes that this information is best obtained at CIP headquarters where there is already expertise and suitable genetic material. However, greenhouse space and equipment to measure photosynthesis and respiration will be needed.

Impact

195. There is no doubt that significant advances have been made in the selection of frost-, heat- and aluminium-tolerant lines.

Future Plans

196. If bacterial wilt resistance could be incorporated into the heat-tolerant lines, then it may be possible to expand production in the lowland humid tropics.

197. Future plans envisage continued attention to agronomic studies at the higher elevations and a small increase in effort in the medium altitude tropics. There will be continued pressure to hand over much agronomic work to national programmes and to place more emphasis on the agronomy of TPS production.

198. The Profile (CIP, 1982) envisages a decrease in physiological studies to zero in the year 2000; we believe this to be misguided because, as the more general aspects of production are extended to the more difficult regions, there will be a need for physiological understanding.

199. The physiological and agronomic aspects of commercial production from TPS are still in an early stage of development, and further work is required.

Recommendations

200. The Panel urges that agronomic work directed to the lowland humid tropics should be maintained at about the current low level until such time as bacterial wilt resistance is combined with heat tolerance.

201. The Panel suggests that, in view of the increasing emphasis given by CIP to the true potato seed (TPS) programme, agronomic and physiologic investigations in this area may need to be expanded (see also Thrust IX).

## I. THRUST VIII: DEVELOPMENT OF STORAGE AND PROCESSING TECHNOLOGY

Description

202. Post-harvest research for developing countries at CIP is based on principles established in temperate climates. A network of locations for post-harvest research and development is being established. Research has focused on low-cost storage for seed tubers and, to a lesser extent, for consumer potatoes and on village-scale processing for production of dehydrated potatoes and starch.

203. Social scientists participate in this Thrust through measurement of farmers' responses, demand analysis for products, identification of design

parameters for seed stores and processing equipment, feasibility and impact evaluation. Similarly, the development of processed products and nutritional evaluation requires the cooperative input of nutritional and engineering expertise.

Strengths

204. The main achievement is the utilization of diffuse light in sprout inhibition and the development of effective, low cost seed tuber storage structures. Use of diffuse light storage results in an increased yield of seed tubers in comparison with the traditional dark storage in on-farm trials. This storage method has found wide acceptance by research institutions and farmers in many countries. By 1982, 850 farmer adopters had been identified in 11 countries (Annex XVI).

205. The studies on the effects of diffused light and subsequent tuber-greening on the severity of aphids and tuber moth infestations and on infection by virus and Erwinia spp, have contributed to pest management in this type of storage.

206. Considerable success was achieved with CIP-designed washing, cooking, peeling, cutting, drying and milling equipment. A pilot plant was established and operated until the end of 1980. It has since been used for training purposes.

207. The close collaboration of technical and social scientists in the Thrust activities has contributed substantially to the development and publication of a systems oriented research methodology - the Farmer-Back-To-Farmer approach (see Chapter IV).

Limitations

208. Simple potato-processing - A 1982 study of the transfer of CIP processing technology in Peru showed that the limited demand for "papa seca," a dried potato product, the high cost of mechanizing the traditional processing methods, and the lack of technical backstopping, limited wider adoption.

Future Plans

209. The recent addition of a food-processing specialist to the staff, has led to a reformulation of the project's objectives on the basis of previous results to:

(a) extend the flexibility of the "papa seca" plant at Huancayo into a multipurpose low-cost processing unit;

(b) develop primary food ingredients in a village-level, low-cost plant for sale to food processors or for incorporation into secondary products;

(c) establish consumer requirements and the changes in equipment and product to meet these requirements.

210. The objective of this project is to arrive at a methodology for the design of low-cost potato-processing facilities for low income consumers. The overall analytical, process design and evaluation methods are to be used for training other interested parties from Peru and other regions.

211. This project will require considerable market and consumer data on food habits and market channels to different clientele. The effects of price fluctuations on demand for potatoes and other food crops used for processing will need to be understood, as will limits on labour utilization, plant capitalization, potato through-flow and product storage. In addition, information needs to be compiled and tested on basic processing principles and their application to traditional and improved potato processing technologies. Similarly, secondary processing methods must be compiled and tested for converting a range of different primary products in the preparation of other food products.

212. This project will require considerable time and expertise from the Physiology and Social Science Departments. Given the high risk nature of this project, its complexity, and the substantial demands it will place on the Social Science Department, and given CIP's primary mandate in potato production, the Panel recommends that the level of emphasis on potato-processing needs to be carefully considered.

213. The success of the diffuse light seed storage technology developed by CIP will allow the scientists to gradually shift their attention to other projects. The development of monitoring techniques and the interpretation of results can be developed in collaboration with the Social Science Department.

214. The Thrust has initiated research on storage of consumer potatoes in cool and warm temperature conditions. CIP's Profile indicates that the Thrust expects to expand this activity to nearly 40 percent of its research effort by 1985. It is understood that CIP will concentrate its research on small-scale storage and this will involve collaboration with the Social Science Department.

215. The Panel suggests CIP analyse the present level of resources and expected future directions of potato-processing and utilization research in terms of CIP's overall priorities.

Recommendations

216. The Panel urges that in processing research, identified products and processes need be submitted to a critical and realistic analysis for economic feasibility that takes into account the variable nature of supply and prices sets attractive margins for economic returns and demands high probabilities for success.

217. The Panel commends CIP for the well-integrated research conducted on diffuse light storage of seed potatoes and suggests that it continue to monitor further acceptance, modification and rejection of this technology.

218. The Panel commends the continued input of the Social Science Department in a critical analysis of the place for and economic feasibility of consumer potato storage in the marketing chain and of the benefits of improved on-farm storage for consumption or sale.

## J. THRUST IX - SEED PRODUCTION RESEARCH FOR DEVELOPING COUNTRIES

### Description

219. A range of research projects relating to physiological studies of flowering, seed development, germination and seedling vigour, as well as rapid methods of propagation by stem, leaf and nodal cuttings and the economics of seed certification programmes are coordinated in Thrust IX. The activities in this Thrust may be grouped under five headings: tissue culture, clonal multiplication and distribution, physiological quality of seed tubers, the physiology of TPS, and socioeconomic aspects of both seed tuber and TPS production and use. The investigations on tissue culture and clonal multiplication are well advanced and being conducted at a high international standard. Most of the wide range of techniques available have been adapted and developed to suit CIP's requirements and are extensively used to ensure that all clones and advanced material sent abroad are free of pathogens. They are also used in the conservation of the world collection and for the rapid propagation of clones. Closely related research in a range of in-vitro culture techniques are included. Control and improvement of the physiological quality of potato seed tubers, the maintenance and multiplication of both pathogen-free seed tubers for export and the production of virus-free seed tubers for CIP internal use, are included in component projects in this Thrust.

220. In studying the physiological quality of seed tubers, Peru has the advantage of a range of distinct ecological production sites; these are being exploited. With respect to the physiology of TPS, the Centre has the advantages of the ready availability of a wide range of genetic material, allowing the production of improved TPS families, and the breeding and other expertise to exploit this material. A promising method for producing healthy seed tubers from TPS in field beds is well advanced.

### Limitations

221. An extension of the existing tissue-culture laboratory is being constructed under a grant from Japan which will alleviate the present spatial and equipment restrictions and thereby accommodate the in-vitro culture of the World Potato Collection and the screening programme.

222. The inadequate lighting in the quarantine plant-houses during winter is restricting tuber production. Replacement of the solid bench tops by heavy wire mesh would be most desirable from a quarantine point of view.

223. The facilities for storing tubers under controlled conditions for studying the physiological quality of seed tubers are limited and delaying the progress of this project. There are also rather limited facilities for the production and extraction of TPS for distribution.

### Impact

224. The standardization of a procedure for elimination of pathogens, except PSTV, combining thermotherapy and meristem culture is a major advance allowing the dissemination of pathogen-free material. PSTV can be eliminated by a very time-consuming procedure and is used for the most valuable clones. The combination of a specific medium and storage at low temperatures allows in-vitro plants, as in maintaining the world collection, to be stored for 1.5 - 2 years thereby saving much effort. The use of in-vitro

tuberlets for the international distribution of clonal material has many advantages over in-vitro plantlets. These, and other rapid multiplication techniques, have allowed a tremendous increase in the amount of material that can be produced, thereby greatly assisting the screening of tuber families for resistance to several pests and diseases. A part of the responsibility of CIP headquarters to send appreciable quantities of materials to other countries has been replaced by the Kenya Redistribution Centre for Region III and most of Region V and the Philippine Centre is coming on line with the help of the Australian contract to serve Region VII.

225. These rapid multiplication techniques have been the subject of a number of training courses which many regional scientists are now using in their seed programmes and in multiplying small amounts of germplasm for replicated trials.

Future Plans

226. It is envisaged that studies on the use of in-vitro produced tuberlets, including storage and international distribution aspects, will continue. The transfer of the World Collection into in-vitro culture for long-term storage will be accelerated. Further attention will be given to techniques of transferring in-vitro plants to the soil and in developing and using rapid multiplication procedures in screening for resistance to pests and diseases and as research tools. The use of these techniques in the regional distribution network will be expanded.

227. A reorganization of research activities on TPS in Thrusts VII and IX will be commenced during 1983, with particular attention being given to reproductive physiology and true seed production methods (Annex XV). Regional work is to begin in 1983 in collaboration with selected national programmes. It would be more expeditious if all TPS studies were coordinated under a single thrust restricted to this work; additional basic studies would be useful (see Thrust VII).

Recommendations

228. The Panel encourages the senior scientist to spend more time in developing techniques to eliminate seed-transmitted PSTV and to study stability of materials propagated through in-vitro, as rapid multiplication of materials by in-vitro culture becomes routine.

229. The Panel commends CIP's action in providing regional centres in Kenya and the Philippines with technical support and facilities, and in regularly monitoring their activities to ensure production of quality seed tubers prior to redistribution.

230. The Panel urges CIP to review the requirements for storage facilities for use in the study of physiological quality of seed tubers.

231. The Panel commends the preparation of the position paper entitled "Potato production from True Seed" at the International Potato Center.

232. The Panel considers that TPS efforts could be strengthened and coordinated more effectively if the work is concentrated in one Thrust confined solely to TPS.

# CHAPTER 4. THE SOCIAL SCIENCE DEPARTMENT

233. Chapter Outline: **This Chapter details the history of the social sciences at CIP, their present status and the outlook for their future involvement in CIP programmes.**

## A. INTRODUCTION

234. After a slow start Social Science work has steadily grown in size and in recognition within the Centre. At its inception as a "unit" in 1973, its main objective was to support regional and national programmes. Recognition by CIP of the Unit's increased research role resulted in the creation of a Social Science Department in 1978.

235. The Social Science Department is described in the second Social Science Planning Conference (1981), as having three key roles:

1. "As members of interdisciplinary teams, we work directly with CIP biological scientists in research problem identification, design and transfer of improved potato technology appropriate to the needs of developing country producers and consumers.

2. "As social science researchers, we play a leading role in formulating an applied social science of the potato, relevant to potato agriculture in developing countries.

3. "As members of CIP's regional research program, we stimulate national programs to include social science perspectives in their work."

## B. DESCRIPTION

236. The early research of the Social Sciences Unit was directed to the assembly of published information on socio-economic aspects of potatoes in developing countries, and contracting local institutions to write country-level studies on potato production and use. These activities led to the publication of bibliographies, statistical compilations, a series of country reports and also provided information needed by the Unit to select three technical topics for in-depth farm-level research: (a) agronomic production constraints, (b) post-harvest technology, and (c) seed systems.

237. From 1978 the Department concentrated on interdisciplinary farm-level research on these three topics in the Mantaro Valley of highland Peru. While social scientists played a leading role in this research, biological scientists became increasingly involved. In 1979 the Department began a transition from in-depth research in the Mantaro Valley to a regionalization of activities. This has taken two avenues: (a) application of farm-level research methods in regional and national programmes, and (b) comparative studies of potato farming systems, marketing, and consumption in developing countries. At present the Department is executing eight main research projects (see Annex XVII). Four of these fall in Thrusts VII, VIII and IX. The remaining four are exclusive to the Department, and fall outside existing Thrusts.

238. Currently in the Department there are three Senior Scientists (two agricultural economists and one anthropologist), two post-doctorals and adequate short-term and support staff funded from core. These resources seem to be appropriate, given the present size of the Centre. However, the Panel notes the immediate loss of one post-doctoral position and the possible loss of another next year. The Panel considers that these post-doctoral positions must be kept or replaced by core staff positions at the equivalent level in order to ensure the most effective work of the available senior staff.

239. Responses to the First Quinquennial Review: The first Quinquennial Review made three major recommendations related to the Social Science Unit. The Panel commends the major efforts made by the Department to follow these recommendations.

240. The first recommendation called for a more focused research strategy and that a few specific and in-depth studies be developed.

241. It is the Panel's perception that the recommendation was in general followed. However the selection of in-depth studies was made in the absence of a general framework which could allow the integration of case study results. In the Panel's view the lack of a general framework has restricted the development of an overall and more comprehensive perspective of world potato problems.

242. The second recommendation stressed that the research effort should emphasize the development of closer working collaboration with the biological scientists, especially in Thrusts VII, VIII and IX. Three projects were initiated in response to this recommendation and are mentioned below (b), (c) and (d).

243. The third recommendation defined four main research priorities:

(a) Analysis of country reports for policy implications.

Political sensitivities, the fact that the reports were jointly issued by CIP and the respective national programmes, and the concentration of the Department on farm-level research, resulted in little policy analysis of country reports.

(b) Initiation of one or two in-depth micro-level studies.

The Department organized as its major work an intensive and in-depth study of the Mantaro Valley. The study has been completed and is of excellent quality.

(c) Initiation of one micro-level interdisciplinary research project on seed multiplication.

The Department has participated in a project of this nature in Thrust IX.

(d) Strengthen participation in the design, testing and evaluation of new storage and processing technologies.

The Department has participated significantly in a project of this nature in Thrust VIII.

## C. MAIN STRENGTHS AND CONTRIBUTIONS

244. The Department has strengthened its capacity for interdisciplinary work and has matured. Major contributions of the Department include:

(a) Expansion of knowledge on the potato in terms of production, marketing and consumption, initial mapping of world potato production zones and their socio-economic correlates and dissemination of this information, particularly in the developing world.

(b) Development of the interdisciplinary Farmer-Back-To-Farmer* methodology for generation and transfer of technology. Use of this model has been documented in the design, transfer, and evaluation of post-harvest technology. The model is now being employed in TPS research and development.

(c) Development of methods for on-farm evaluation of potato technology which are appropriate to conditions and limitations of rational programmes. These methods include procedures for formal and informal surveys procedures, farm budgeting and on-farm experiments.

(d) Institutionalization of a Social Science Department with an interdisciplinary perspective going beyond agricultural economics.

## D. LIMITATIONS

245. Although the Social Science Department can play a number of roles in the general work of the Centre, the Panel feels that its main responsibility is for research. The Department must see itself and must be seen by CIP's scientific community and management as a research team contributing to the overall research programme. The Panel feels that from an organizational point of view, the Department would probably benefit by belonging to Research (instead of Regional Research and Training), together with the rest of the research departments. However, special considerations may suggest that a change at this time would be undesirable.

246. Current research priorities are correctly focused on areas suggested by the first Quinquennial Review. However, specific projects seem to have been defined in response to research opportunities that were perceived as institutionally acceptable and useful rather than as a tightly defined and comprehensive research programme. The Panel perceives that this situation is, at least in part, a consequence of the position the Department has within the institution, which is reflected by the absence of a specific Thrust that could accommodate projects with a strong social science component.

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* The "Farmer-Back-To-Farmer" model represents a philosophy jointly developed by CIP social and biological scientists on the total research process including identification, design, testing and evaluation of potato technologies. This is outlined in Rhoades, R. and R. Booth. Farmer-Back-To-Farmer. A Model for generating acceptable agricultural technology. Agricultural Administration 11 (1982) 127-137.

247. The Department has done little work in the identification of major policy issues related to allocation of research resources between production zones, farm types and types of technologies. These studies could provide basic inputs for management decisions regarding the overall orientation of the research effort. As indicated by the recommendation of the second Social Science Planning Conference, policy analysis merits greater attention. The interaction with IFPRI in food policy matters could be highly productive.

248. The Department has progressively developed the capacity to interact with the biological scientists in collaborative projects. However, the Panel observed that this collaboration is mainly related to two Thrusts (VIII and IX). It is important to stress the potential contribution of the Social Science Department in the evaluation of the economic importance of different production and consumption constraints as an input for the selection of research priorities in Thrusts II to VI. The Panel encourages the development of mechanisms for achieving this wider collaboration.

E. FUTURE PLANS

249. Research priorities for the next five years have been defined within the general guidelines of the CIP Profile and take into account the recommendations of the second Social Science Planning Conference. Three major activities, which are endorsed in general by the Panel, have been selected:

250. The first of these activities underlines the continuing interdisciplinary teamwork with biological scientists in selected Thrusts, guided by the Farmer-Back-To-Farmer model.

> In the immediate future, the interdisciplinary teamwork of the headquarters staff will continue to focus on seed systems (production and use of true and tuber seed) and post-harvest technology.

251. The Panel endorses interdisciplinary on-farm research and its proposed relative emphasis within the Department, and encourages the Department in maintaining an appropriate balance and focus.

252. The Panel notes that although on-farm research represents an integrated approach with a number of simultaneous objectives, its actual design can emphasize one or more of the following objectives:

(a) To describe and characterize farmer circumstances within a farming systems approach.

(b) To test and adjust specific technologies to farmers' production conditions. This implies a permanent monitoring of feedback from farmers.

(c) To evaluate the impact of new technologies on production and on the welfare of different groups.

(d) To demonstrate and diffuse new technologies to farmers.

253. The Panel feels that the proper use of on-farm research in an international centre must reflect the decreasing priority of the objectives numberated above while encouraging national programmes to develop the required complementary activities. In this the Panel concurs with a similar recommendation made by the second Social Science Planning Conference.

254. In relation to this point the Panel endorses the Farmer-Back-To-Farmer methodology and its present internal balance and the high priority given to the areas of seed systems and post harvest technology.

255. A number of international centres have active on-farm research programmes using farming systems approach. Interaction with those centres could prove highly profitable.

256. The second of these activities emphasizes the consolidation and synthesis of social science research findings to date, within a Food Systems* framework.

> The Department recognizes that its research to date has lacked a strong central theme or organizing framework. For this reason, it is proposing the use of a Food Systems framework to serve as a guide for the selection of research projects and the integration of their results in general propositions concerning present patterns of potato production, marketing and consumption, technology needs, and potential effects of technological change. The Panel considers that this framework and the research conducted within it should provide a useful central theme for fruitful interdisciplinary dialogue, both within the Department and between social and biological scientists and for the identification of major policy issues.

257. The third of these activities involves the organization of a network of social scientists in developing countries conducting research on potatoes.

258. One outstanding characteristic of CIP's research organization in comparison with other Centres has been the extensive use of contract research and of regional research networks. The Social Science Department has not yet used either of these instruments extensively and the Panel notes with satisfaction their inclusion as a top priority in future plans.

259. In this regard it is important to note that national potato programmes, which have provided the institutional base for CIP's networking, usually do not have social sciences staff.

260. For these reasons the Panel encourages the Social Science Department to include in its networking social scientists located outside potato programmes and willing to work on potato problems.

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* The proposed "Food Systems" framework is more encompassing than "cropping systems" or "farming systems" research which focus narrowly on production. Food systems analysis begins with the earliest inputs in the production cycle and carries through to distribution and final consumption.

261. To implement this programme of activities, each member of the Social Science Department is expected to have two major research responsibilities: one for interdisciplinary team research based in one of the Thrusts, and one for providing leadership in a key area within the food systems studies.

F. RECOMMENDATIONS

262. The Panel commends the major efforts made by the Social Science Department to follow the recommendations of the first Quinquennial Review.

263. The Panel encourages the Department in its effort to achieve a better focused and more comprehensive research programme. The Panel endorses the Food Systems approach to achieve this focus.

264. The Panel recommends that a part of the research effort of the Department be directed to the analyses of broad policy issues and the development of analytical information as general guidelines for the orientation of the Centre's overall research effort. Collaboration with IFPRI should be sought where appropriate.

265. The Panel endorses the priority given by the Social Science Department to interdisciplinary on-farm research using the Farmer-Back-To-Farmer methodology in the development of well-adapted technologies. When appropriate, this work should be developed in close association with other international centres.

266. The Panel recommends that CIP promote mechanisms to enhance the integration of social science research into other disciplines. This integration is particularly needed to define production and consumption constraints to help guide biological research (see recommendations in Chapter III of the Report).

267. The Panel recommends that CIP study the creation of an appropriate administrative position, from a programming point of view, for research projects with strong social science components that do not fall within the present Thrusts.

268. The Panel endorses the development of a research network proposed by the Social Science Department and recommends that initially it include, if necessary, social scientists not related to national potato programmes.

269. The Panel urges CIP to maintain the present level of Core funded staff allocated to the Department and to provide adequate operating resources for a social science network.

# CHAPTER 5. REGIONAL RESEARCH AND NETWORKS

**270. Chapter Outline: CIP spends about 40% of its total budget on regional activities comprising research, training and institutional development. This Chapter details the organization and operations of the research and institutional development activities while training in the regions is included in Chapter VI. A special aspect considered here is the recent development of the regional research networks encouraged and backstopped by CIP.**

## A. INTRODUCTION

271. From the start CIP developed a regional network of stations for adaptive research and the distribution of technology to surrounding countries. These seven regional programmes also act as training bases. At these locations CIP has few physical facilities and associates closely with a national institute or a sister Centre which provides office space and logistical support at direct cost.

272. CIP staffs each of these regional locations with one senior scientist and two or three local support technicians. When a research problem justifies it, an associate expert or a post-doctoral fellow may be added to the team. Seven of CIP's thirty senior core-funded scientists and four of CIP's forty-eight scientific staff were posted in the regions in 1982. This is the most CIP has ever had and will increase only slightly as technologies such as true seed and adapted varieties are distributed. It is the intention of CIP that headquarters staff will follow the technology to the regions at key locations during the initial transfer periods and then return to headquarters to work on new priorities.

273. CIP considers that short-term consultants cannot substitute for "permanent" staff in its seven regional headquarters. The main reason the regional network has been so effective is the result of the detailed knowledge of the problems and difficulties of their individual client countries, built up by the regional scientists in the field.

274. Requests by regional staff for short-term consultancies can generally be filled by headquarters scientists in their normal routine travel. Although use is sometimes made of consultants from Europe, North America and Australia, wherever possible, a local consultant is used. This is particularly the case in Region VI (India) and South-East Asia in general.

## B. DESCRIPTION

### Research

275. Approximately two years ago a Coordinator for Research Transfer was named to work full time in Regional Research and help coordinate the technology and information ready for transfer.

276. The research covers the newer technologies according to a list of priorities developed between the Coordinator and the regional scientist. A workplan is submitted yearly before the annual internal Review, discussed in detail when CIP's regional scientists come to headquarters and followed

fairly closely during the subsequent year. Reporting follows the same lines and results are compiled as Progress Reports.

277. Thrust results are integrated into packages (technologies) to be evaluated under the local environmental conditions in the regions (Annex XVIII). CIP's Regional Research personnel consider that in transfer and evaluation of such packages the priorities and capabilities of national programmes and the size and workload of the regional teams should be taken into account. Technology groups of headquarters scientists are established at the time of the Internal Review. A technology group can involve scientists from several Departments and Thrusts, who conduct research on any of the five technologies listed below. Each regional scientist has an individual session with each technology group to help plan the work programme and integrate regional research with the scientific support needed from headquarters. The important technology packages which have emerged to date are:

a) Regional Germplasm Evaluation. Genetic material is evaluated under environmental stress and for resistance to major pathogens, insects and nematodes. Selected superior cultivars are multiplied for distribution to other countries for further evaluation under local conditions.

b) Adaptation of the Potato to Tropical Conditions. Selected clones, agronomic technology for tropical conditions, intercropping and pest and disease control are evaluated as a package in hot humid tropical areas.

c) Potato Production from True Seed (TPS). Agronomic technology, selected hybrid and open-pollinated TPS progenies and integrated pest and disease control are evaluated as a technological package.

d) Low-cost Storage and Village-level Processing. Use of indirect light in simple stores for tuber seed using inexpensive local materials. Use of potato processing by adapting the pilot plant developed at CIP.

e) Production Research. Seed production technology, optimizing potato productivity, socio-economic studies, potato production technology are included in this area of work. The nature of this research location specific and is conducted by national scientists with a catalytic involvement of CIP regional scientists.

Institutional Development

278. CIP concentrates the research and training efforts of the regional teams in priority countries that have been identified in each region. The major elements taken into consideration to determine priority countries are:

Capabilities of the national potato programme, human resources, research facilities and transportation.

Importance of the potato and potential for improvement.

Commitment of the government to improve potato production from national funds.

Existence of national expertise for cooperative research projects related to CIP priority research area.

Location of CIP regional research staff.

Existence of CIP's special projects and third dimension projects.

279. Based on these elements, countries in each region have been identified as:

Priority Country "A": Countries where CIP's regional team will concentrate its main research and training efforts in terms of travel and personal work.

Priority Country "B": Countries that have well-developed research capabilities in certain areas and are able to receive, refine and adapt CIP technology. CIP's regional team will play a catalytic role in the transfer of CIP technology.

Priority Country "C": Countries wher CIP's regional team will conduct only certain priority activities due to the restricted national research capabilities available and will play mainly a catalytic role in the transfer of CIP technology. Through exterior funding it is possible to associate them together in regional networks for research and technology transfer, such as PRECODEPA and SAPPRAD.

Networks

280. CIP has developed a carefully thought-out strategy for the creation of regional research networks of interdependent national programmes such as PRECODEPA and SAPPRAD (Annex XIX ). These networks are established as follows:

a) Countries were contacted to explore the support for the concept and an initial meeting identified available human resources in each country and attempted to link these with research priorities, both for the individual countries and within the Region.

b) From this meeting several research priorities emerged which could be accommodated by existing national expertise.

c) In order to expand the projects to a regional dimension, financial support is provided for additional facilities, regional training and consultancies to the national scientists of member countries. This budget is then presented by the Committee to a bilateral donor.

d) To get the project running smoothly, CIP provides the services of a Coordinator during the initial years. Subsequently, the Coordinator is appointed on a annual basis from among the participating countries.

281. CIP's role is both technical and financial. CIP provides technical expertise where it is not available locally or fortifies some specific areas within a research project. As a member of the Committee, CIP participates in annual meetings where programmes are reviewed and annual budgets are decided. CIP also provides an expert as a member of the periodic evaluation committees which review progress of individual research projects.

282. CIP provides facilities for financial control since the networks have no legal status and thus are not in a position to sign contracts with a donor agency. Audit of expenses is included and is paid for by the project's funds and executed by an international firm.

Response to the First Quinquennial Review

283. The first review recommended that the size of the Regional Research and Training program be stabilized. Since then, this program has increased from about 35% to 40% of the Centre's total budget. However, this increase includes costs of research conducted by CIP's regional staff on subjects that are in effect Thrust research. CIP has substantially increased the number of permanent staff positions in its Regional program. This follows the suggestion of the first Quinquennial Review. CIP has shown considerable responsiveness to national program needs and has ensured their access to improved materials in spite of stringent quarantine policies.

C. STRENGTHS

284. Regional Research activities of CIP have proven highly effective in the development of close collaboration with national research programmes. CIP has achieved a capability of access to most of the important and potentially important potato-growing countries in the developing world for delivery of genetic material from its Source Programme, for diagnostic studies of potato production systems and for evaluation of the performance of CIP materials or derived clones in those systems. This unique accomplishment, realized with modest staff inputs, was to a great measure possible because of the excellent support CIP obtains from national research institutions.

285. The development of CIP's worldwide activities demanded an active participation in institution building programmes. CIP has very wisely used its rare expertise in collaboration with third party regional or international funding agencies for this task. It placed major emphasis on strengthening or developing in national programmes, a nucleus of potato researchers and a seed-tuber production capability.

286. The next phase of CIP's regional strategy is the potato research and development networks. These are composed of four to six neighbouring countries and are designed to encourage a sharing of research activities and a transfer of the ensuing results and specialized capabilities between participants. CIP has very successfully provided the motivation and identified the financial support for networks in Central America, South-East Asia and Central Asia, and laid a solid base for networks of the Andean countries, Central Africa, and the South Cone of Latin America.

287. The specific achievements in regional research since the first Quinquennial Review are listed below for research and institutional building in each of CIP's seven regions.

288. Regional Germplasm Evaluation. Fifty-eight developing countries received improved germplasm. Twenty-nine of them have released or named improved clones. All preser aterial currently in the advanced selection stage and in varietal trial managed by Regional staff is derived from CIP's breeding programme. These materials are evaluated in close collaboration with the CIP headquarters for disease and pest resistance and environmental adaptation.

289. True Potato Seed (TPS). The technology initially developed at CIP is now being evaluated and adapted in more than 20 developing countries. This evaluation has advanced to farm level trials in India, Bangladesh, Sri Lanka and Korea. The greatest opportunity for rapid impact of this technology appears to be in the Asian region where there is a concentration of small and large vegetable growers who could readily adopt the management techniques required.

290. TPS research includes the evaluation of improved genetic progenies and agronomic practices for nursery and field management. The participation of national programmes, only five years after the work was initiated by CIP, enables national scientists to be intimately involved in the development of TPS technology. Social scientists are already involved in defining the role of this technology in cropping systems of the region.

291. Storage and Processing. More than 20 countries are evaluating the diffuse light technique for the storage of seed tubers. This has already been adopted by farmers in twelve countries (Annex XVI ).

292. More than eighty requests to help develop low-cost potato-processing methods have been received by CIP. Regional scientists are presently developing preliminary projects on potato-processing in India, Bhutan, Bangladesh, Peru, Bolivia and Korea.

293. Seed Tuber Production Technology. This is a major area of Regional Research as any varietal development depends on seed tuber production schemes for diffusion of varieties to the farming community. CIP has provided input to seed tuber multiplication schemes at different levels of complexity in more than 20 developing countries.

294. On-Farm Research. CIP's approach to on-farm research is being implemented in the following countries; Peru, Ecuador, Colombia, Rwanda, Burundi, Turkey, Tunisia, Pakistan, Nepal, Bangladesh, Philippines and Korea. These programmes are conducted by national scientists with backstopping by CIP Regional staff.

295. Regional Contract Research. Contract research in the CIP Regions is essentially of an applied type. Only where scientific capacity exists is it of a more fundamental nature. These contracts are developed with the corresponding Thrusts in CIP and funding is supplied for additional operating costs of the national scientists. In 1982 there were approximately 20 contracts of which 11 were funded by Regional Research. The others were funded directly from CIP's Departments.

296. Institutional Building. CIP has made a major contribution in the complex task of supporting the development of national seed tuber production and multiplication programmes. Annex XIX. Not only has this support established a recipient capability for CIP's improved genetic materials but it also represents a considerable saving of national funds from reduced seed imports and removes a major constraint to increased potato production.

297. The Panel recognizes the relative isolation endured by CIP's Regional staff and commends them for the ways in which they have developed their activities in often difficult environments. It is clear to the Panel that CIP has shown considerable flexibility and understanding in the technical and personal support it provides to its Regional staff.

D. LIMITATIONS

298. CIP considers that limited potato research in national programmes continues to constrain the impact of new technologies on potato production in the developing world. Part of this limitation stems from food policy decisions made at the national level, which result in insufficient resources to retain well-trained staff and provide operational funds. The Panel encourages CIP to make available convincing data about the comparative advantages of potatoes over other food sources.

299. The Panel notes with concern that there is a fragmentation of potato research development activities and resources in CIP's client countries. The Panel suggests that donors supporting agricultural development consider a wider use of CIP's proven expertise in project design and training of expatriate and local staff.

E. RECOMMENDATIONS

300. The Panel commends CIP for the flexible and responsive way in which it has deployed its regional staff. Given the increasing number of potato clones and families as well as the innovative TPS production and seed storage technologies, regional CIP staff will increasingly need to develop with national programme scientists effective ways to synthesize these components and evaluate the resulting new production methods. The Panel commends CIP in its training and institution building activities.

301. Product markets, consumption patterns, labour availability and input costs strongly influence the form which production and post-harvest technologies should take. The Panel, therefore, commends and encourages CIP in the search for ways to strengthen the social science component of the regional teams (see Chapter 4 ).

302. The Panel considers that continued funding for the regional potato research and development networks will be necessary for their effective functioning for the foreseeable future. CIP should, however, recognize the possible danger of distorting national food and research policies and should continue to encourage national programmes to increase their financial participation.

303. The Panel encourages CIP to develop an efficient means for the reporting of research results from the networks to ensure wide distribution of information to CIP headquarters staff and scientists in other regions.

304. The Panel notes with satisfaction the number of on-farm research projects in the Regional Research programmes and suggests that increased attention be given to the crop marketing and consumption constraints within which new potato production technology must function. The Panel supports the strengthening of the Regional Research "teams" with a social scientist, possibly through the associate expert mechanism.

305. The Panel commends CIP for the major contribution to the complex task of supporting the development of seed production and multiplication programmes. Not only has this established a recipient capability for handling CIP's improved genetic materials, it also represents a considerable saving of national funds from reduced seed imports and removes a major constraint to increased potato production.

306. The Panel highly commends CIP for its innovative approach to the development of an effective research transfer capability, its support to national programmes and the recognition it gives to the contributions made by these programmes to potato research.

307. The Panel supports CIP's regional network approach as an effective way to achieve horizontal transfer of technology and research capability among participating national programme researchers.

308. The Panel commends CIP's continued participation in regional networks and, with third party funding, to continue development and support of new networks where appropriate. The Panel strongly commends technical backstopping of network research activities by staff of CIP's Research Thrusts.

309. While the Panel supports CIP's initiative in placing source research staff outside its host country in agroecological environments more appropriate to particular research thrusts, CIP should also be alert to the possibility of reducing source staff to the extent that Thrusts lose their critical mass.

310. The Panel concurs with the view of the Programme Committee of CIP's Board (Dec 1980 Report) that CIP's main priorities are to help increase potato production in areas of proved potential. The Panel urges that careful consideration be given to the way potato production can affect other crops in the cropping patterns used by farmers.

311. The Panel recommends that Regional Research continue to consider resource-poor farmers as its prime target.

312. The Panel commends CIP for the close link it has maintained between its Regional Research activities and the research Thrusts at headquarters. It suggests that the Regional Research staff continue to encourage collaborators in national programmes to evaluate new potato technologies through on-farm production systems research.

# CHAPTER 6. TRAINING AND COMMUNICATIONS

**313. Chapter Outline: CIP considers training of national scientists a key element in carrying out successfully the regional evaluation and transfer of CIP technology. All training is coordinated around the priority needs of the developing countries as identified by the countries themselves. Furthermore, CIP espouses the philosophy that training is best carried out in the home country or in the region, not at headquarters. To this end all production courses are given by nationals in the regions with CIP backstopping, if necessary. An increasing number of the specialized courses are also being given in developing countries.**

## A. INTRODUCTION

314. The Training and Communications Department was established in late 1979 as an administrative unit combining training, communications and library functions. It is now a large and most effective unit. The activities are guided by three committees named as Training, Publications/Audio-visual and Library; these play an important part in maintaining a balance between research training and communications activities. The Panel views the training courses as playing an invaluable role in the upgrading of knowledge and expertise in national programmes. A list of those held during the past quinquennium is given in Annex XX and a detailed list of the courses held in one year (1982) are presented in Annex XXI.

## B. DESCRIPTION

### Training

315. The objectives of the training programme are to enable research scientists, extension workers and educators to identify existing technologies relevant to their countries' needs; identify research needs and priorities for improving potato production; evaluate and communicate the results of research conducted in their countries; participate in the transfer of appropriate technology within their countries and to surrounding countries; and to train others to identify existing technology and research needs, conduct research, evaluate results, and participate in the transfer process.

316. The programme meets these objectives by organizing: (a) production-oriented courses, mainly in the regions, directed toward farm-level problems; (b) specialized courses on areas of research for which CIP is the principal source of information and experience; (c) arranging mid-career training for visiting scientists from national programmes, giving them the opportunity to conduct research with scientists at CIP headquarters on problems of importance to the particular national programme; and, (d) providing scholarships to enable scientists from developing countries to obtain higher degrees. Facilities are also provided to allow a limited number of students to undertake thesis research.

### Communications

317. The communications activities support administration, training and research. They include the development and processing of information - preparing leaflets, booklets, visuals, etc.; in association with the

research staff for use in training courses and in the dissemination of research findings to national programme offices. Technical assistance is also provided.

Library

318. As with all libraries, this provides a central repository of published materials in the form of books, journals and reprints. It is a specialized library primarily designed to service CIP staff, but also provides services for adjacent research institutions.

C. STRENGTHS

Training

319. The main strength of the programme lies in obtaining the full cooperation of headquarters scientists and the expertise of regional scientists, and combining these with the skills of the Communications staff, who organize and catalyze the infrastructure. Information from leaders of national agricultural organizations in developing countries indicates that these training activities are most highly valued and considered to be one of CIP's most important contributions.

320. Training booklets produced at CIP are tested at least twice before being released to national programmes. In preparing courses, national programme instructors are free to choose individual components from among those prepared at CIP. Not only is there strong demand for the original English or Spanish versions but many developing countries are translating them into other languages. All training materials are periodically updated.

321. The training activities are currently evaluated on the basis of organization and content, including reaction of participants. However, evaluation processes are being extended (see Future Plans).

Communications

322. Communications form an integral part of training and remarks made there apply equally. In addition, various booklets, leaflets, etc, are developed and produced at an objective and factual level and add greatly to the dissemination of information. The "CIP Circular" published monthly until 1982 and bi-monthly from 1983, includes brief items on latest research from headquarters, regions and national programmes, reports on activities and a listing of CIP publications. Several times a year a research topic will be treated in depth. It plays an important role in transferring technology and in maintaining contact between CIP and national potato workers.

323. The Panel is impressed with the high quality of the presentation of CIP publications.

Library

324. The Library appears to be adequate in relation to the size of the Centre. It includes almost 5,000 books, 74 journals and 384 other periodicals; these cover the basic disciplines represented at the Centre as well as a full coverage on the potato. In addition, there are about 600 annual reports and a reprint collection which now numbers almost 4,000.

D. LIMITATIONS

325. With respect to physical facilities, the Department is well served, having an adequate printing-press, word processors, and other facilities, although equipment for producing slide sets is limited and there is restricted space for the press and visuals production. It has a skilled staff and, although more could no doubt be used to advantage, the Panel believes that the balance between the Department's activities and other activities is about right.

326. The Department depends for about 30 percent of its budget on special project funding. In view of the uncertainty of special funds, CIP should ensure the support to the Department is maintained.

327. The Panel notes that fewer than 5 percent of the trainees were women, an aspect which the Centre may wish to explore in depth.

E. FUTURE PLANS

328. It is anticipated that all activities will continue at about the same level as present, although there will be a gradual decrease in production-oriented courses as these are undertaken by national programme scientists and some increases in mid-career training. In farming production courses, the specific needs of each region are considered. Plans for an extensive array of activities over the next five years are well advanced (see Annex XXII).

329. It seems that no further scholarships will be available from core funds. Attempts should be made to obtain special funding for this purpose.

330. An attempt will be made in the future to evaluate each course by a follow-up procedure in collaboration with national programmes. It aims to determine what effect past training has had on production and research activities. In addition to giving some measure of the impact of a course, this procedure should be useful in modifying subsequent training activities, aiding communication with national programmes, and identifying further training needs.

F. RECOMMENDATIONS

331. The Panel particularly commends the work of the Training and Communications Department for its skill and efficiency in developing material for training courses and in the dissemination of information to regional scientists and elsewhere. As its functioning is essential to the success of Regional Research and Training and, hence, to the central philosophy of CIP, every effort must be made to maintain its activities at the current level even with present funding uncertainties in the system.

332. The Panel strongly endorses CIP's policy of use of national programme scientists as instructors.

333. The Panel believes that the balance between production-oriented and specialized training courses, as outlined in the Profile, is correct.

334. The Panel endorses the development of procedures for evaluating the impact of training courses organized by CIP, both at headquarters and in regions. In this respect the opinions of ex-participants and their employers should be sought.

# CHAPTER 7. INTERNATIONAL COOPERATION

335. Chapter Outline: **This Chapter covers contract research, planning conferences and relations with international centres. The relationships with national institutions have been dealt with in Chapter V. CIP's use of contract research and planning conferences is almost unique within the CGIAR system and has resulted in considerable benefit to the Centre in terms of knowledge advancement, scientist-to-scientist interaction and highly cost effective use of funds.**

## A. INTRODUCTION

336. The international linkages that CIP employs in the execution of its mandate include: (1) an effective contract research mechanism that allows CIP to obtain relevant information, methodologies and materials, and help stay abreast of scientific advances relevant to the potato, (2) a mechanism for transfer of CIP's research products and for feedback (3) a mechanism to obtain first class technical input for the definition of research priorities and methodologies, and (4) interactions to compare with the CGIAR sister institutions and other international centres approaches and share experiences and methodologies.

## B. CONTRACT RESEARCH

### Description

337. In addition to Source and regionally-based research, CIP also contracts research with institutions where expertise in potato research and facilities exist. Contractual agreements are drawn up for one to three years duration with the possibility of renewal.

338. During the past six years CIP has supported an average of 30 research contracts per year at an annual cost of about $440,000. These contracts are funded through the Research Departments, Regional Research and in some circumstances by participating country. The number of contracts is more or less evenly split between developed and developing country institutions. In 1982, 57 percent of the total of 35 contracts were in developing countries absorbing about one-quarter of the contract funding (Annex XXIII).

339. Some of the contributions of contract research are referred to, where appropriate, in Chapter III and elsewhere.

### Strengths

340. Contract research is one of CIP's outstanding features; it is an investment that has paid handsome dividends in many directions. The most outstanding contribution has been the development of breeding methods, which, together with the work at CIP, has provided developed material, and greatly increased the potential for the exploitation of CIP's germplasm collections.

341. Apart from their direct value, there are many side-effects of the contracts that are clearly advantageous, both to CIP and to the participa-

ting organizations. For example:

(a) CIP staff develop personal relationships with leading scientists, and are kept fully up-to-date with scientific developments.

(b) many contracts, particularly in the developed countries, draw in large amounts of local funding which multiply considerably the total value of the contracts and maintains interest in appropriate potato research.

(c) the system provides high quality, relevant training for CIP junior staff and personnel from developing countries, while motivating students in the developed countries towards an interest in agriculture of developing countries.

Limitations

342. The advantages of the contract system depend to a considerable extent on maintaining the best possible relations between the people involved, and efficient methods for transferring information and material between CIP and its collaborators. This is important in the contract organization, both for morale and for practical research, for example, in the development of breeding material.

343. Concern was expressed by some contract personnel that data on the fate of material supplied to CIP was not fed back sufficiently quickly to allow efficient selection and utilization in the ongoing research.

Impact and Future

344. The impact of the best contracts on CIP's programme is clear, and so the practice commends itself to continuation. However, it is essential that CIP maintains a policy of placing contracts at those institutions most likely to achieve required objectives.

Recommendations

345. The Panel commends highly the principle of contract research as applied by CIP.

346. The Panel recommends a tightening of procedures to ensure the best possible communications between contract collaborators and CIP.

C. INTERNATIONAL PLANNING CONFERENCES

Description

347. CIP has sponsored 12 Planning Conferences since the first Quinquennial Review involving many experts from different countries. The general format for a conference involves an agenda for the presentation of papers and structured discussion leading to the formulation of recommendations. A report of each Planning Conference is prepared representing an up-to-date overview of information in a particular research area of importance to CIP. Funding of Planning Conferences is through individual departments. The recommendations stated in the front of a report, are a synthesis of the views of the invited participants and CIP staff.

Strengths

348. The recommendations arising from these Conferences have provided valuable guidance to CIP by ensuring that research methodologies are kept current, in orienting and re-orienting research activities and in identifying new areas of research opportunity appropriate to CIP's interests. The scientist-to-scientist contact established in these Conferences often has a continuing, long-term benefit through the active exchange of information and research materials.

Recommendations

349. The Panel recommends that CIP continue the practice of arranging planning conferences as a proven, highly effective means for assuring that CIP's research activities and priorities are periodically updated.

D. RELATIONSHIP WITH THE CGIAR AND OTHER INTERNATIONAL CENTRES

350. Research interactions among international centres are limited at least in part by the specificity of their mandate. The Panel would like to suggest some actions that could be taken to facilitate these interactions.

351. CIP has a mandate that allows it to work on root crops in general, but it has elected to restrict its work to potatoes and the Panel endorses this decision. On the other hand, there are other Centres, which also work on root crops. It is likely that there are some scientific principles common to this work. This situation provides for an opportunity for scientific interaction with great potential.

352. A number of Centres work in on-farm research using a farming systems approach. TAC commissioned some years ago a "stripe" review on farming systems research that provided a comparative analysis and general guidelines for this work and recommended wider collaboration among Centres.

353. There are three avenues of potentially useful interaction. First, the centres that are working on farming systems could discuss and unify their methodological approach, their training procedures and materials, and their language so that researchers in national programmes, who are learning the methodology, can avoid confusions. Second, where farming systems include crops belonging to the mandates of different Centres, those Centres could collaborate in the analysis of the systems. Third, where appropriate, CIP and the other centres working in farming systems could collaborate with ISNAR in responding to requests from national programmes for assistance to organize on-farm research units.

Recommendation

354. The Panel suggests that avenues for wider collaboration among Centres on topics of common interest be explored.

# CHAPTER 8. SUPPORT FACILITIES, STATION MANAGEMENT AND MAINTENANCE

**355. Chapter Outline: The Peruvian facilities including computers and data processing are described in this Chapter together with the maintenance and management of these facilities.**

## A. FACILITIES

356. CIP's headquarters at La Molina consists of two main buildings and numerous subsidiary buildings including greenhouses, screenhouses, field offices, a growth chamber building, storage facilities, and shops. The 15 hectare experimental farm is adjacent to the headquarters.

357. The main building, which was completed in 1977, houses administration, laboratories, library, dormitory, cafeteria and dining room, and conference room. The building is modern and provides pleasant surroundings for the staff.

358. A second building that had been damaged by an earthquake was given by the Ministry of Agriculture and was reconstructed in 1977 to house the departments of Training and Communications, Social Science and Accounting.

359. In general, CIP's facilities are modest but adequate to carry out its research activities. The Panel observed a shortage of space at La Molina for some programmes. CIP's headquarters site is small and allows little space for the construction of new facilities. A need exists for an auditorium because the present conference rooms do not provide sufficient space for large meetings and conferences. A new auditorium is under construction. Japan has granted funds to enlarge the tissue culture laboratory and in-vitro germplasm storage facilities. This two-storey addition to the main building will provide about 190 square meters of space for tissue culture and TPS research.

360. CIP needs more screenhouse and greenhouse facilities to handle its breeding work with the World Potato Collection and the necessary accompanying pathology, entomology, and physiology research. Also, existing screenhouses and glasshouses need additional artificial lights and controlled temperature capacity. The Panel considers additional or improved greenhouse and screenhouse capacity to be a matter of very high priority (see Thrusts II and V, paras. 65 and 127).

361. The headquarters site has two wells, one for domestic use and a new 60 metre well which provides irrigation water for the 15 hectare experimental farm.

362. A twin-engined aircraft purchased since the last Quinquennial Review provides rapid transportation for CIP personnel and others from Lima to the field stations in Peru. The Management Review Report includes an evaluation of its cost-effectiveness.

## B. COMPUTERS AND DATA PROCESSING

363. CIP has decentralized its computer facilities and data processing. The Computer Committee, comprising the Executive Officer (Chairman), Director of Research, Head of Social Science Department, Controller and two

scientists, is responsible for advice on coordination of microcomputer purchase, job description (biostatistician), definition of consultant's responsibilities, protection of diskettes and equipment, user training, and security (copyright programs).

364. CIP has five small computers, each with a 64K memory capacity. There are four Apple II computers (assigned to the Accounting, Administration, Social Science and Research Departments) and a North Star II. The North Star is used for the germplasm collection data bank. Each department has acquired software appropriate to its needs.

365. Computer facilities for research are the responsibility of the Director of Research. There is a position for a biostatistician to provide support for design and operation of the available statistical programs. This position is now filled with a technician. A consultant from the Universidad Agraria works on part-time basis to help solve and counsel on the application of computers to statistical analysis. CIP needs a professional biometrician.

366. Decentralization of computer facilities is new and has not been in operation long enough to allow evaluation. However, in discussion with the staff, the Panel found that there may be research areas where additional computer capability is required. In the meantime the micro-computers being used are relatively inexpensive, accessible, flexible and probably cost-effective.

367. The Panel concurs with the recommendation of the Management Review that an indepth study of computing facilities, especially in relation to future requirements, be made.

## C. STATION MANAGEMENT AND MAINTENANCE

368. CIP has four field research sites in Peru. Three of these sites are under full control. The sites were chosen to represent four ecological zones, coastal desert at La Molina (280m), highland at La Victoria and Santa Ana near Huancayo (3280 m), middle elevation humid tropics at San Ramon (800 m), and humid lowland tropics at Yurimaguas (180 m). In 1980 the Ministry of Food granted 15 hectares adjacent to CIP headquarters for use as an experimental farm. The site was partially fenced in 1980 to provide security.

369. At Huancayo, CIP conducts its high elevation research from its Santa Ana Station headquarters, where it has some nine hectares. Improvements made there since 1977 include: quarantine facilities, greenhouses, offices, laboratories, a guest house and cafeteria, seed storage, a pilot processing plant, a house for the Superintendent, shops, irrigation facilities, and an emergency power system.

370. The other site near Huancayo, the 52 ha La Victoria farm, was granted to CIP in 1977 by the Ministry of Food. Since its acquisition, the research storage buildings and a low cost greenhouse have been erected.

371. The new San Ramon site, granted to CIP by the Ministry of Agriculture in 1982, has had the following facilities added: office and storage, rustic stores, a potable water supply and recreation facilities.

372. The Yurimaguas site has been borrowed from the Ministry of Agriculture and the land is not under the control of CIP, but space is made available upon request. A small guest-house was built at Yurimaguas in 1982.

373 The research facilities in Peru are administered by the Director of Research who is also Head of the Support Department. He is assisted by a Screenhouse/Compound Committee and a Field Committee. A Field and Greenhouse Supervisor provides daily supervision of field staff at headquarters, while a Superintendent administers the Santa Ana Station and La Victoria farm at Huancayo, and the station at San Ramon. There is also a Field and Greenhouse Supervisor at Santa Ana, and there are Field Supervisors at San Ramon and at Yurimaguas. The Superintendent at Santa Ana reports to the Director of Research at La Molina while the Field Supervisor at Yurimaguas reports to the La Molina Field and Greenhouse Supervisor.

374. Allocation of field space at all locations is controlled through the Head of the Support Department with the advice of the Field Committee. A special form, Request for Field Space, is used for individual project requirements. Allocation of screenhouse/greenhouse space in Santa Ana and La Molina is made by the Head of the Support Department with the assistance of the Screenhouse/Compound Committee. Another form, Request for Bench Space, is used to formalize these requests. Standard procedures for conducting both field and greenhouse experiments have been prepared and made available to the staff.

375. Support Department labourers are involved in land preparation, irrigation management, cultivation, planting, and harvesting. Field labourers assigned to Research Departments also assist in planting and harvesting but under the supervison of the Support Department. Routine applications of fertilizers and pesticides are made by the Support Department unless specialized applications are required. Routine surveys of insects are made by the Nematology and Entomology Department which recommends needed treatments to the field supervisors.

376. Maintenance of lawns and gardens is directed by the field supervisors. Greenhouse and screenhouse operations are under the direction of field supervisors at La Molina and Santa Ana, but since many operations are specialized, most work is carried out by Research Department personnel. The Support Department controls greenhouse and field supplies and the signing-out of hand tools.

377. The screenhouse/greenhouse areas appear tidy and well-managed but crowded. The shortage of space appears to be holding up research progress in some important areas.

378. Because of the season, little field research was going on at La Molina at the time of the Panel visit. Much of the area was planted to maize as a short-duration rotation crop (60 days). It was stated that the purpose of the maize crop was to provide additional organic matter to build up the soil. According to a statement in the booklet on standard procedures for greenhouse and field work, there is no reduction in pathogens even when a four month maize crop is used in the rotation. Also, CIP must still use soil fumigants to reduce soil pathogens. These obervations caused the Panel to ask whether the 60 days maize crop is really needed, especially since the rotation system is involved in the already-severe competition for field space at La Molina. CIP may wish to study this area of field management so that maximal use is made of the available experimental field

space. The Panel noted, however, that CIP places emphasis on good experimental design which has the added benefit of increasing the efficient use of field space.

379. The new irrigation system at La Molina seems to be working well; however, the solid set system has required some changes in tillage and land preparation methods. Machinery suitable for the new system is being studied.

380. The Panel suggests that CIP consider the following improvements at La Molina: brick or concrete lining of ditches, which would also help to reduce the rat population; construction of a perimeter road, and perhaps some land-levelling. The Panel also observed that irrigation and soil management practices at San Ramon require attention because the soil loss appears to be high.

381. The Panel noted that more attention could be paid to field sanitation and general policing of ditches, borders and field margins.

## CHAPTER 9. MANAGEMENT AND ADMINISTRATION: ISSUES AND HIGHLIGHTS

**382. Chapter Outline: Management and administrative issues which the Panel wishes to highlight are discussed in this Chapter. For a more indepth study of management practices see the Management Review Report prepared concurrently with this Quinquennial Report.**

### A. INTRODUCTION

383. As already stated in Chapter 1, the first CGIAR Management Review was undertaken concurrently with the CIP Quinquennial Review. This report then, does not cover management aspects extensively or completely so it must be read in conjunction with the Management Review report. However, there are a number of management issues that have a direct relationship to technical and scientific considerations which the Panel selected in collaboration with the Management Review team, to discuss in this report. The principles communicated and recommendations made are consistent with those included in the Management Review document.

### B. PLANNING

384. CIP has dedicated, since its early years, considerable attention to the definition of a long-range plan. Furthermore, CIP was the first of the International centres to publish, in 1979, its Profile, (which is updated biennially), where major institutional goals, and the strategies selected to achieve these goals, are described in summary form until the year 2000. The first version was written by the Director General but the most recent (1982), entirely by the responsible staff.

385. The Panel would like to congratulate CIP for the early attention given to research planning and particularly to the use of Planning Conferences as background to the Profile.

386. In addition to Planning Conferences, management has effectively used the collective knowledge of its senior staff through a loose and flexible management style which includes a large number of committees with different responsibilities.

387. The driving force behind the planning exercise has been the Director General who has used his considerable ability and experience to formulate objectives, priorities, and strategies as they first appeared in the Profile (1979). While the Panel concurs with the general direction described in the Profile it wishes to make a few comments and recommendations on the planning procedures used until now.

388. The informal non-structured procedures have served CIP well during its early years. This period was characterized by ample funds and a clear objective of rapid growth. Both elements made the careful consideration of research priorities and resource allocation among competing activities a less urgent issue.

389. The Panel feels that under the scenario characterized by a mature Centre with a zero growth policy and potential changes in top management in the foreseeable future, planning procedures become an important element

in the overall management structure, with a considerable effect on continuity and balance in future research.

390. As a consequence of this perception, the Panel wishes to raise the following three issues:

(i) Planning procedure could be improved by a more explicit definition of the production problems which provide the basis for management decisions regarding the future allocation of resources to different production zones, different farming systems and different types of potential solutions.

The Panel considers that Thrusts defined mainly on the basis of a single discipline may not be an appropriate instrument to define clearly CIP's overall research strategy nor to evaluate objectively the correct allocation of resources.

(ii) Most Planning Conferences have been organized on the basis of disciplines and have congregated researchers largely with similar disciplinary backgrounds and interests. As a consequence, Planning Conferences have concentrated their attention in discussions of a disciplinary nature emphasizing disciplinary and methodological problems.

(iii) The Panel, while endorsing the general strategy described in the Profile, considers that the document may benefit by including the analytical information that justifies the decisions implied in the plan. If this information were provided, the plan could be evaluated on common grounds by all those interested and concerned.

## C. STRUCTURE OF THE RESEARCH ORGANIZATION

391. CIP's organization of scientific personnel in disciplinary Departments and Thrusts has served its purpose well and provided a framework for the systematic organization of CIP's activities during its first ten years. Now that the Centre has matured it may be possible to make some adjustments to its organizational structure to provide an even more precise focus to research.

392. The Panel has analyzed the matrix organization presently used and feels that a number of weaknesses have developed through time obscuring its initial advantages:

(a) Most Thrusts correspond to departments. The great majority of projects included in each of these Thrusts are the responsibility of one department (Annex V).

(b) A consequence of the previous point is that research objectives within each Thrust are, to a considerable degree, guided by discipline interests and perceived problems as discussed and recommended in Planning Conferences.

(c) This discipline orientation makes difficult the clear definition of the relationship between the developmental problems which research is trying to solve and the specific research activities.

(d) Although considerable interdisciplinary work takes place within specific projects, the Thrusts do not help to promote it.

393. As a consequence of this reasoning, the research organization could be guided by the following principles:

(a) A greater effort could be made in the definition of a few agroecological zones, the identification of major production problems within each zone, and an evaluation of their relative importance from a production and human welfare point of view. This work will require the expertise of agroclimatological and soil scientists.

(b) Thrusts II to VII could be converted to new Thrusts, defined on the basis of these agroecological zones.

These Thrusts could be the focal point of research efforts directed to the utilization and improvement of germplasm adapted to the environmental and production characteristics of each zone, and of complementary research related to the agronomic principles needed for specific germplasm in each zone (e.g. nitrogen utilization, integrated pest management, etc.).

(c) Thrusts I, VIII and IX, and others that could be created in response to specific needs, would remain thematically oriented, cutting across agroecological zones.

394. The Panel feels that this approach would have the following advantages:

(a) It would allow a more precise and effective planning and programming procedure, because research priorities could be closely geared and adjusted to the relative importance of major production constraints identified in each of the selected zones. These relative priorities could provide the basis for the allocation of research resources.

(b) The Thrusts by their very nature would promote interdisciplinary work required for the solution of the identified production-consumption problems. All the existing departments would have a clear role in each of the new thrusts.

(c) It would facilitate the early convergence of breeding efforts directed to the control of different diseases, pests and stress conditions of economic importance in each of the selected agroecological zones.

(d) It would facilitate the "packaging' of improved germplasm adapted to specific conditions together with the technologies required for the production conditions in each of the selected zones. In this way it would also facilitate the diffusion of these technologies to the national programmes.

395. The Panel also suggests that an organization of this nature has several consequences which should be taken into account:

(a) Thrust coordinators would play an important (probably dominant) role in the planning and programming stage. They would provide the inputs on the basis of which management would make the major decisions regarding budget allocation within and among Thrusts.

(b) Thrust coordinators would play a larger role than at present in coordinating the different research activities including regional research towards common goals.

D. RESEARCH MANAGEMENT

396. The style of research management at CIP has several characteristics that differentiates it from other research institutions. One is the relatively informal and highly participative way in which management problems are analyzed, and, after a considerable degree of consensus has been reached, in most cases, referred to the Director General for final decision.

397. The management style has been effective and at the same time has contributed to the excellent personal relationships and sense of "belonging" of senior staff. This subject is treated in greater detail in the Management Review report under Section IV.

398. However, since the Centre has an adequate number of top management positions, the Panel is concerned about the relatively large amount of researchers' time that goes into deliberation of management issues. In view of this, the Panel concurs with the Management Review team that further decentralization of management decisions to appropriate staff is needed.

399. In this respect the Panel congratulates CIP for organizing a training programme in management aspects for its top administrative personnel.

400. TAC has requested that the Panel analyze CIP's research organization to determine the ways it may have affected the innovative nature of the research effort. The Panel considers that the research organization and management style in CIP has encouraged and stimulated scientists in exercising innovative approaches to their research. Furthermore, as indicated previously, the deliberative and relatively loose management structure that characterizes CIP, has ensured the sense of freedom and independence of individual scientists to a higher degree than in other comparable research institutions.

E. A FEW ISSUES ON PERSONNEL

401. CIP, as some other IARCs and many agricultural research institutions, does not enjoy the scientific environment of a major university campus. This implies the need for special efforts to allow staff the opportunity to participate in scientific developments elsewhere.

402. CIP has made special efforts to satisfy this need by allowing participation of staff in scientific meetings, its emphasis on contract research, Planning Conferences, sabbatical leaves, extensive interchange between headquarters and the regions, etc.

403. It is not unusual that under budgetary restrictions research management concentrates cuts on budgetary items which serve these purposes. The Panel has no evidence that this is happening at CIP.

404. The Panel has observed that the ratio of support staff to senior staff is considerably lower at CIP in comparison with similar research institutions. This observation refers to support staff at the M.Sc. and ingeniero agronomo level. The Panel considers that the present ratio is not cost effective, given the relative costs associated with each category of personnel. The Panel also considers that the productivity of senior staff, CIP's most costly resource, could be improved if more support staff were allocated to them.

405. TAC has requested that the Panel analyze whether the present budgetary restrictions in the system have affected the morale and productivity of the staff. The Panel has found no evidence of this, and congratulates CIP's management for its ability to maintain an effective research institution in the face of relatively difficult times.

## F. RECOMMENDATIONS

### Planning

406. The Panel suggests that:

(a) A more formalized procedure for programme planning be developed.

(b) Future editions of the Profile include a more in-depth definition of principles, criteria and data that led to the decisions made.

### Research Organization

407. The Panel suggests that management analyse possible ways of adjusting the present research organization.

### Personnel

408. The Panel recommends that the present special efforts be continued and further developed in order that CIP scientists maintain themselves at their respective scientific frontiers.

409. The Panel recommends that CIP study ways to increase the support staff ratio to a more effective level.

## CHAPTER 10. GENERAL ASSESSMENT OF CIP

**410. Chapter Outline: The primary purpose of this chapter is to summarize and highlight CIP's significant progress and noteworthy accomplishments since the first Quinquennial Review, and to present pertinent observations of the Panel. These cover the period 1977-1982 and are presented under these headings: A) Introduction; B) CIP's Long-Term Comparative Advantage in Potato Research; C) Advances and Improvements in Programme Operations; D) Development of Advanced Technology and Superior Germplasm; E) Contributions to Development of National Programmes; F) CIP's Profile; and G) Some Lessons from CIP.**

### A. INTRODUCTION

411. CIP is a well-established research institution with modest central facilities and outstanding linkages to both developed and developing countries. Its organizational structure and strategy are unique and were established so as to further effective relationships with research institutions in both industrialized and developing countries.

412. CIP adopted from the start a policy of using a low profile approach to its work and this is reflected by the modest size of the headquarters at La Molina and the decision that CIP should not continue to grow.

413. CIP's three-part research organization is innovative with strong and effective headquarters source research, the contract research, and the regional research programmes, making it possible for CIP to work as partners with colleagues from many backgrounds. The contract research programme, which is supported from core funds, allows CIP to add materially and intellectually to its programme through collaborative research with senior potato scientists working on priority problems. The Regional Research networks provide a mechanism for close collaboration with national programmes and a ready mechanism for technology transfer.

414. CIP operates on a network basis, and its philosophy of operation is to work with institutions as full partners. This approach has won friends and respect for the Centre. Especially useful in this regard are the Planning Conferences that involve specialists and colleagues from around the world.

415. CIP's major asset is the World Potato Collection, and the characterization and exploitation of this collection constitutes the major single area of activity for the future.

416. CIP's main products or services are improved germplasm, training, advice and consultation, and information. The Centre is just over ten years old, and its impact on production is already starting to be felt; the Panel considers that its future impact will be great.

### B. CIP's LONG-TERM COMPARATIVE ADVANTAGE IN POTATO RESEARCH

417. The exploitation of the World Potato Collection is a major task, one which CIP is uniquely qualified to carry out, since to do so requires strong programmes in genetics and plant breeding, plant pathology, entomology, and physiology. The Panel considers that one aspect of CIP's comparative advantage is its ability to provide evaluated germplasm to regional and national programmes so that known sources of resistance to insects or

diseases or other desirable traits can be used in local programmes. Some of the work involved requires fundamental research on particular problems. To ensure that this function can be carried on effectively, CIP must maintain a well-equipped and adequately staffed source research programme.

418. The other area of comparative advantage CIP is leadership and support to worldwide or regional networks. The Regional Research and Training activities already fulfill most of the support functions required, and provide a framework for future efforts.

419. There is incomplete understanding about the relative impact of climatological, biotic (pest and disease incidence) and socio-economic factors on potato production. CIP is in an advantageous position to analyze and compare the effects of these factors in the world's major potato production zones. These analyses will better define future research and development priorities for increased potato production.

420. CIP has a unique advantage in the development of methodological approaches to the solution of farm-level potato production constraints. This activity will combine experiences obtained from collaborative research activities with national programmes.

C. ADVANCES IN INSTITUTIONAL AND STAFF RELATIONSHIPS

421. CIP's relations with the host country continue to be very favourable and have been recently strengthened by the signing of an extension of the initial agreement to the year 2000.

422. CIP has made a number of improvements in its operations since the first Quinquennial Review. The following are presented as major examples of noteworthy advances during that period.

423. CIP has attracted a cadre of highly capable, well-trained scientists and overall their research has earned the respect of scientists throughout the world. An atmosphere favourable to creative research has been established and the morale among the scientists is high.

424. Acting upon recommendations of the first Quinquennial Review, social scientists have developed closer relationships with biological and national scientists. The social science unit has now been advanced to departmental status.

425. CIP established a practice of providing professional management training for senior scientists in management positions. Several schools which offer concentrated courses of 5-8 weeks have been utilized; CIP budgets funds for training of two scientists annually.

426. A healthy relationship exists between CIP management and scientists and the Board of Trustees which encourages a candid, objective interchange of views related to CIP's present and future activities.

427. Planning Conferences have been utilized by CIP as a highly effective mechanism for obtaining counsel and guidance from leading world scientists assuring a rapid update of critical research information and improved methodologies, interchanging of valuable research materials, and gaining know-

ledge of problems and potentials of potato production in developing countries.

428. CIP has developed many fruitful relationships with potato researchers in both developing and developed countries, stemming from wide participation of those researchers in Planning Conferences, the Internal Review, contract research, Regional Research and Training, study leaves and other collaborative relationships.

429. Through research contracts involving specialists in selected institutions of various countries, CIP has greatly accelerated development of improved research materials and methodologies pertinent to the advance of its Source and Regional Research in a flexible and cost-effective way. Research contracts are also being used to expedite and enhance CIP's research objectives within national programmes in the Regions.

D. DEVELOPMENT OF ADVANCED TECHNOLOGY AND SUPERIOR GERMPLASM

430. Germplasm collection, conservation, evaluation and utilization are major activities of CIP. The Panel was impressed with the scope and direction of CIP's germplasm work.

431. A valuable collection of over 1,200 accessions of wild species of Solanum has been assembled and more than 500 of these are being preserved as true seed, saving some from possible extinction. From this collection, 90 wild species have been classified.

432. Excellent progress has been made by CIP scientists in the exploitation of germplasm from the World Potato Collection through evaluation of accessions for desirable agronomic traits and resistance to major diseases followed by use of the superior selections in CIP's genetic and breeding programmes.

433. In accordance with a major recommendation of the first Quinquennial Review, CIP initiated a tighter, more efficient quarantine procedures on potato material shipped to or from CIP, which reduce to a minimum the risk of transfer of diseases and pests. CIP's quarantine policies and procedures are highly respected worldwide.

434. Basic genetic studies of the potato have revealed innovative and effective breeding methods to transfer genes between cultivated and wild species to obtain more rapid progress in potato improvement. These techniques allow greatly accelerated use of wild or primitive cultivars in potato breeding. Twenty-one species of Solanum have or are being used in breeding programmes.

435. CIP pathologists and breeders are now rapidly increasing the diversity of available genetic resistance to late blight, the most important fungus disease of potatoes. In a similar way, the bacteriologists and nematologists are rapidly introducing and combining resistance to bacterial wilt, and the cyst and root-knot nematode complexes. Together, and with the breeders, the pest specialists are also developing combinations of resistance appropriate to particular ecological zones.

436. To control nematode and insects pests, CIP is developing a number of biological and other methods which are now being welded into comprehensive

approaches to pest and disease management. Even though the pest control projects are relatively new, a range of techniques for the control of potato tuber moth and leaf miner flies has already been disseminated for testing and use in developing countries.

437. The tissue culture procedure, standardized for elimination of most pathogens and combining thermotherapy and meristem culture, is a major advance allowing massive dissemination of pathogen-free materials. Using tissue cultures maintained at low temperatures, storage of clonal selections such as the Andean cultivar collection in-vitro is possible. In-vitro cultures can be stored for 1.5 to 2 years instead of six months, thereby saving much effort and drastically reducing loss of selections due to adverse environments.

438. A new line of research is being aggressively pursued utilizing true potato seed (TPS) as a means to reduce the cost, threat of disease, and large volume seed tubers required for planting in developing countries. TPS research affects and involves all research Thrusts at CIP.

439. The diffuse light storage concept has been developed further and widely adopted as a low-cost approach to prevent unwanted sprouting in seed potato. Local adaptations of this storage system are emerging on farms in many places around the world.

440. The "Farmer-Back-To-Farmer" research methodology was developed for on-farm studies improving CIP's capacity for the generation of technologies adapted to farmers' conditions.

E. CONTRIBUTIONS TO INSTITUTIONAL DEVELOPMENT OF NATIONAL PROGRAMMES

441. CIP has adopted a strategy of working closely with national programmes in order to help them as much as possible without becoming directly involved in daily operations. The Panel was impressed with the ability of CIP scientists to work effectively with national programmes personnel.

442. Regional Research and Training programmes have provided in-depth advice on programme design and training of technical staff, contributing to the capability of many countries to take advantage of CIP's genetic materials and technologies.

443. In several countries CIP has contributed through short courses and support for post-graduate training (at times through bilateral projects), in the strengthening of national potato programmes. CIP has developed or helped to develop, training materials for regional and national training courses.

444. Increased responsibility for in-country production training by staff from national programmes has been encouraged very effectively by CIP.

445. The Regional Research programme, which is essential in meeting CIP objectives, was in the early stages of development at the time of the first Quinquennial Review. Supported mostly from core funds, it is now fully established and functions well. This programme includes active cooperation with networks of national potato programmes, which CIP encouraged and catalyzed, such as PRECODEPA in Central America and SAPPRAD in Southeast Asia. Others are being organized.

446. A regional seed distribution centre has been established in Kenya to provide disease-free seed of CIP materials to national programmes. Other centres are planned as part of a seed redistribution network designed to deal with quarantine and shipping and handling problems that are common to vegetatively propagated crops.

F. CIP'S PROFILE

447. CIP's "Profile, 1972-2000" was the first long-range plan prepared by an IARC. This publication which is updated biennially, documents plans for meeting current and future objectives along with projected changes in emphasis and effort. It also lays the basis for CIP's strategy in working with national programmes and anticipates the changes required as national programmes become stronger and provides a rationale for meeting new situations. Finally it indicates those areas of work that are most likely to be important during the next decade and those likely to be terminated or reduced in scale.

448. The Profile describes CIP policy (i) a strong research capacity at headquarters that focuses on the World Potato Collection; (ii) a global research network to work with national programmes and to utilize existing capability, wherever found; (iii) a strong training programme linked to the needs of the networks; and (iv) as soon as possible, transfer to national programmes of activities which they can carry out best. These concepts are sound in principle and seem to work well, and the Panel endorses the general approach.

G. SOME LESSONS FROM CIP

449. The Panel considers that CIP's experience provides a number of insights and lessons that may be of system-wide interest. To that end, the Panel makes the following tentative comments with the objective of promoting a wider discussion of these subjects.

450. From its early years CIP has espoused a philosophy of modesty, low profile, and strong collaboration with national programmes. This philosophy has permeated, sometimes in an intangible way, its actions and the way CIP has related to national programmes. This philosophy has resulted in better and less conflicting relationships, and has enhanced the image of CIP. The Panel feels that the nature of the relationships between CIP and national programmes will increasingly prove an invaluable asset for the diffusion of technologies.

451. One notable example of the CIP philosophy is represented by the modesty of its physical facilities in Lima. This modesty has undoubtedly helped in the relationship with Peru's national programme and the scientific community in general. It has implied some shortage of field and greenhouse capacity but it has allowed a much lower expenditure on maintenance which gives additional flexibility under the present conditions of budgetary restraints. One possible undesirable consequence of this "philosophy of modesty" is that researchers and management may incorrectly extend this frugality to their attitudes towards acquisition of research equipment and space, thereby jeopardizing research quality. The contract research approach permits CIP to move into sophisticated facilities to solve specific problems.

452. Two outstanding features of CIP's organization are the early development of a relatively large research network with national programmesand the extensive use of contract research. Both strategies have been successful and have given CIP its special institutional personality. This organization contrasts with that of most other Centres which developed on the basis of an in-house research capacity that is closely knit and sharply focused.

453. This contrast brings to mind a number of interesting issues. First, what is the appropriate balance among the three components and in which way may it change in time? It seems that one fundamental element of the appropriate balance is to insure that source research maintains an appropriate strength and its relative position as the principle element of the CIP research structure.

454. Second, as contract and regional research grow, what effects do they then have on the central structure? Some of the obvious benefits have been discussed, but might there also be disadvantages; for example, in causing some polarization in centre staff between those who are research-oriented and those who are oriented to regional operations. Could the maintenance of rapidly growing outer elements become a constraint on development at the centre? It should be noted that CIP's transfer of staff between core research and regional programmes has so far prevented such polarization.

455. Third, did the development of the regional network and contract research partially determine the present characteristics of the headquarters' programmes? To what extent is the relative looseness of CIP central organization explained by the centrifugal forces generated by these outgrowths of the Centre?

456. The Panel is tempted to hypothesize that such relationships exist, and further, that the development of a focused research programme would require in CIP's type of organization a higher degree of planning than in the alternative type of structure that is characterized by the strong Centre model followed by most other IARCs.

457. Fourth, if an important regional component is developed, what is the appropriate sequence, timing and dimension for the outposting of personnel? It is clear that given the limited size of the Centre a premature and/or excessive expansion of regional research could have damaging effects on a Centre's scientific productivity which is related to the existence of a critical mass at headquarters.

458. CIP, along with IRRI and CIMMYT, belongs to a group of Centres with narrowly defined mandates giving them world responsibility for one or a small number of crops. This model can be contrasted with centres with mandates that include a large number of crops and/or heavy regional responsibilities.

459. CIP's experience tends to confirm the effectiveness of the narrowly focused model for the generation of technologies of wide adaptability and the potential impact of their work.

460. It seems to the Panel that this effectiveness is closely related to: (a) the greater simplicity of these Centres from a management point of view; (b) the concentration of effort and thus the achievement of a minimum critical mass working on a relatively small number of problems; and (c) the possibility of concentrating efforts in the utilization of improved germplasm as the principal technology.

461. On the other hand this type of organization requires the integration of potato technology into multiple-cropping farming systems in which potatoes are widely produced. CIP seems to be effectively dealing with this problem through its close collaboration with national programmes and utilizing their site specific knowledge in the selection of research procedures and priorities.

462. After an initial period of rapid growth, CIP in 1980, adopted a zero growth policy. The CIP Management Review pointed out that if this policy is applied in relation to total constant dollars, it implies in practice a progressive reduction in research capacity. It also suggested that no research institution could maintain an effective programme under conditions of slow but permanent attrition.

463. The Panel notes that CIP has indicated that the adopted policy refers to the number of senior staff. This policy implies a small but continuing growth in operating budget. Given that the CGIAR has imposed on the mature Centres a policy of zero growth, the Panel considers this a fundamental issue within the System.

## ACKNOWLEDGEMENTS

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To all the Government officials, representatives of regional and national associations, leaders of national potato programmes and the contract leaders visited by Panel Members in Asia, Europe and Latin America, the Panel extends its thanks and deep appreciation for their assistance and hospitality and for the open, forthright and general supportive manner with which they presented their views to the Panel.

ANNEX I

## LIST OF MAIN ISSUES AND QUESTIONS FOR CONSIDERATION BY THE REVIEW PANEL

### ISSUES

1. Germplasm conservation and utilization. Present status of collections and future demands regarding their utilization in CIP programmes and national programmes.

2. Basic research requirements of CIP. Respective roles of Headquarters activities, contract research and collaborative research.

3. Potato true seeds. Assessment of potential and implications for CIP's research programmes in the future (breeding, disease control, agronomy, etc), as compared with conventional research activities for potato production with tuber seeds.

4. Post-harvest technology. Focus and relative importance in future CIP's programmes.

5. Farming systems consideratins in CIP's programmes. Scope of agronomy and socio-economic research and related cooperation with other IARCs and natinal programmes.

6. Geographical distribution of off-campus activities as related to future demands and potentials of potato production in developing countries as a staple food and as a vegetable, in particular in the lowland humid tropics. Mode of interaction with national progammes. Scope and priorities.

### QUESTIONS

A. Assessment of the Past Quinquennium

1. What was the impact of the recommendations of the first Quinquennial Review?

2. What was the output of CIP's prgrammes since the first Quinquennial review, their achievements and deficiencies in terms of a) development of new technologies, their adoption and impact, b) the creation and dissemination of new scientific knowledge, c) contribution to the development of natinal potato programmes and potato production in developing countries?

3. What is the Panel's assessment of the results of the CIP programme as regards the adaptatin of potato to hot humid tropical lowlands and the evaluatin fo the potential of true potato seeds?

4. Which results have been achieved through CIP contract work?

5. What progress has been made in meeting quarantine requirements in the movement of CIP germplasm?

6. What is the Panel's assessment of the model of reginal coperation promoted by CIP (PRECODEPA, SAPPRAD)?

7. What has been the effectiveness of the off-campus activities of CIP and its relative success and impact in different regions as related to the quality and size of the personnel involved?

8. Has the reduction in funding for the CGIAR system affected the morale of CIP staff or the quality and qantity of research being produced and transferred?

9. Within the framework of the CGIAR system, has CIP been permitted a sufficient flexibility for inrovative programmes to emerge? If so, have those been in spite of the system or because of the system?

B. Future Policies and Plans

10. Is there an adequate involvement of members of the Board of Trustees in the determination of policy and direction of the programme? Is the composition of the Board adequate for responding to policy matters concerning CIP's mandate?

11. Are the conclusions and recommendations of CIP's Planning Conferences and Long-Term Plan sound, relevant and useful in the determination of strategies and priorities, for both technology productin and transfer, and what reactions have there been from developing countries? What are their overall implications in terms of future staff and other requirements? What are the views of the management regarding these implications?

12. Is the process which determines CIP's programme adequate? Are the staff, the Programme Committee, developing countries, contracting institutins and management sufficiently involved?

13. What is the future scale of the diverse programmes of CIP not only in relative but also in absolute quan tative terms as regards the allocation of its resurces and the possibility of shifting priorities and phasing out some activities where objectives have been successfully attained?

14. Is CIP's programme encompassing mainly the research for which CIP has a comparative advantage? Is there adequate collaboration with other institutions in both the developed and developing world? Is CIP's dependence on other institutins for portions of the core programe, roductive, cost effective, and justified?

15. What is the nature and the magnitude of basic research which is and should be carried out by CIP? Does CIP make the fullest possible use of back-up and more basic research carried out in deveoped and developing country institutions? What is the nature and magnitude of such collaborative research, and what are the funding arrangements? Should a larger share of this research be financed directly by the cooperating institutions?

16. Is there an adequate team approach by management and staff to the planning, implementation and evaluation of the programme? Is there a team

approach amongst the disciplines including the social scientists? Are the social scientists sufficiently involved to ensure that technologies being developed are relevant to the priority needs in the third world?

17. Are CIP's research programmes adquately linked - through national extension services - with the needs and constraints is experienced under farmer's conditions, to ensure sufficient feedback? What effort is made to monitor the effectiveness of technology transfer?

18. Are the programmes and facilities for training at CIP appropriate and adequate for the present needs of the collaborating countries? Should greater emphasis be given to in-country training? How can the needs of African and Asian countries be best accommodated? How does CIP resolve the problems of the competing demands on its funds and on the time of its scientists for training, communication and research?

C. Regional Programmes

19. Are CIP's programmes adequately flexible to provide an effective input to national and regional programmes, to meet their changing requirements and to accomodate the need to address specific problems of soils, moisture stress, different types of cultivation and cropping systems? How can flexibility be maintained in designing strategies and responses of CIP or an International Agricultural Research Centre to problems which change in nature from place to place and with time? Should the use of resources, now allocated to "permanent" staff, be considered for additional short-term consultancies for such specific purposes?

20. Are the present regional programmes an integrated part of CIP's research, training and transfer system? Are they an extension of CIP's technologies and training into national programmes within the specific region? Are the regions flexible so that boundaries and programmes can change in accordance with needs?

21. What should be the priorit, regions for CIP's activities in the future? Are these priorities bas d on agro-ecological considerations and/or socio-economic studies of future potato potentialities and demands as related to other crops? Has CIP identified, classified and delineated the areas where potato has or will have a potential as a major staple food and those areas where potato is and would probably remain a complementary vegetable, along with other roots, tubers and vegetable crops in developing countries? What are the criteria and strategies of CIP for its future involvement in these different areas?

22. Within the framework of the mandates of the CGIAR Centes are there additional responsibilities that CIP's delivery system might accomodate for the tuber-root crops or are there activities which could be accommodated better jointly than separately for the individual tuber-root crop commodities?

D. Technical Questions

23. Will the use of new breeding techniques and TPS change the breeding strategies of CIP and its mode of cooperation with national programmes? What are the rationale and the priorities for the present and future involvement of CIP in TPS technology?

24. What is the optimum balance and focus of CIP's activities in research on pest tolerance and other aspects of potato production in the tropics? How do CIP breeding programmes cope with the variability of some of the potato pathogens in time and space?

25. Is the balance of research efforts on technology development, and assessment of the social and economic implications of the effects of those technologies appropriate? How are nutrition considerations taken into account in CIP's present and future programmes?

26. How is the concern for the small farmer reflected in the crop improvement programmes, the breeding strategies and the cooperative programmes in particular?

27. How does CIP maintain and make available to users the material in its potato collectins? What is the progress in the evaluation of germplasm since the last review and in the storage of botanical seeds?

28. What is the relative emphasis given by CIP to the use of its collection of wild potatoes in its breeding programmes for developing countries?

29. What is the methology followed by CIP in examining the farming systems in which potato is grown or may be grown? What is the optimum involvement in this field?

30. What should be the relative priority to be given by CIP to research on post-harvest technologies, storage and processing in particular? What is CIP's comparative advantage in adapting and disseminating existing post-harvest technologies?

31. Are the Communications (including Library) facilities and staff adequate and in proper balance with the rest of the institution?

32. How adequate are CIP's facilities in the host country? How adequate is the quality and number of staff? How are relatins with the hst country and its institutions?

ANNEX II

## PANEL MEMBERSHIP

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Dr. D.L. Plucknett (CGIAR Observer)
Scientific Advisor
CGIAR Secretariat
The World Bank
1818 H Street, N.W.
Washington, D.C. 20433
USA

Dr. P. Roberts-Pichette (Secretary)
Technical Advisory Committee
Food and Agriculture Organization
Via delle Terme di Caracalla
00100 Rome
Italy

Dr. Ruben L. Villareal
Deputy Director
College of Agriculture at Los Baños
University of the Philippines
College, Laguna
Philippines

Dr. M.S. Wolfe
Pathology and Entomology Department
Plant Breeding Institute
Maris Lane, Trumpington
Cambridge CB2 2LQ
UK

Dr. H.G. Zandstra
Associate Director (Animal Sciences)
Agriculture, Food and Nutrition Sciences
IDRC
5990 Iona Drive
University of British Columbia
Vancouver, B.C., V6T 1L4
Canada

ANNEX III

## LIST OF DOCUMENTS PROVIDED TO THE REVIEW PANEL

### Documents provided by the TAC Secretariat

Report of TAC Quinquennial Review Mission to the International Potato Centre, 1977

Extracts of TAC Meeting Reports

CGIAR Second Five Year Review Report, 1981

### CIP Legal Documentation and Extracts from Programme Committee and Board of Trustees Reports

CIP Statutes

Incorporation Documents

Commandment of Importation Privileges

Letter of Extension, Year 2000

Programme Committee Reports 1980, 1981, 1982

Board Minutes 1980, 1981, 1982

Summary of Changes in Policy recommended by the Full Board over the last Five Years and Actions taken on Recommendations, December 1982

### CIP Publications

Annual Report CIP 1981, July 1982

Profile 1972-2000, January 1982

CIP Research Highlights 1971-1984, January 1983

Program and Budget 1983-1984, September 1982

World Potato Facts, February 1982

Examples of Technical Information Bulletins, Training Manuals, Brochures, etc.

CIP Potato Germ Plasm Collection: Inventory of Accessions with Resistance to some Pests and Diseases

Reports of Planning Conferences (1977-1982)

Socioeconomic Research and Training, August 1977

Utilization of the Genetic Resourses of the Potato II, October 1977

Developments in the Control of Potato Viruses, November 1977

Control of Important Fungal Diseases of Potatoes II, June 1978

Developments in the Control of Nematode Pests of Potatoes II, November 1978

Maximizing Potato Productivity in Developing Countries, December 1978

Developments in the Control of Bacterial Diseases of Potatoes II, June 1979

Production of Potatoes from True Seed, September 1979

Exploration, Taxonomy and Maintenance of Potato Germ Plasm III, October 1979

Low Cost Village Level Potato Processing, January 1980

Strategy for Virus Management in Potatoes II, April 1980

Utilization of Genetic Resources III, November 1980

Social Science Planning Conference, September 1981

Post-Congress Workshops, February 1982

Internal Working Papers and Documents

Position Papers:

Potatoes for the Hot-Humid Tropics

Post-Harvest Technology and Management

Simple Potato Processing at CIP , November 1982

Strategy for Integrated Pest Management, April 1982

Potato Production from True Seed, October 1981

Regional Evaluation of TPS

Training and Communications

Organization and Strategy of CIP's Research Tenth Internal Review Program, December 1982

Regional Research and Training Work Plans 1981-1986, July 1982

Research on Potato Quality and Nutritional Composition: CIP's Position and Philosophy

Research Projects Progress Reports 1982, Vols. 1 and 2

Research Projects and Contracts 1982

Publications of the Social Science Department 1979-1982, December 1982

CIP's Major Training Activities 1983-1987, December 1982

Memoranda Outlining the Responsibilities of Library, Training, and Publications and Audiovisuals Committees, May 1981

Documents prepared by CIP at Request of QQR Panel

In response to a letter to Dr. R.L. Sawyer, 9 December 1982, from Dr. R.W. Hougas, Chairman, Quinquennial Review Panel, on recent Thrust Activities

Facilities added since last Quinquennial Review at CIP and those still needed

Personnel Changes: Scientific and Administrative, 1977-1982

Second Quinquennial Review: Summary of Progress in Thrust Research 1978-1982

The Difference, CIP 1977-1982

A CIP Reaction to Questions accumulated by TAC, December 1982

Miscellaneous Publications and Documents

Regional Potato Cooperation Program PRECODEPA. Narrative Report: Advances, Achievements and Projections during PRECODEPA's First Operation Period 1978-1982, September 1982

# PROGRAMME OF PANEL MEMBERS

A. CIP INTERNAL REVIEW December 7-11, 1982

Drs. R.W. Hougas, R. Villareal, M.S. Wolfe and H. Zandstra attended the CIP Interval Review as observers.

Visits and Interviews

Board of Trustees - Programme Committee Members

Dr. Celia T. Castillo

Dr. Raúl Figueroa

Dr. Ernst Keller

Dr. Klaus Raven

Dr. Max Rives

Dr. Noboru Takase

Dr. Mognhild Umaerus

Members of National Programmes:

| | |
|---|---|
| Dr. A. Cubillos | Chile |
| Dr. F. Manos | Ecuador |
| Dr. K.K. Kim | Korea |
| Dr. F. Ezeta | Peru |
| Dr. F. Reifschneider | Brazil |
| Dr. Haile-Michael Kidane-Mariam | Ethiopia |

B. CONTRACT RESEARCH VISITS January 11 - February 5, 1983

M.S. Wolfe

January 11 (Netherlands)

Foundation for Agricultural Plant Breeding, Wageningen:

Ir. H. Lamberts

Ir. C.A. Huijsman

International Agriculture Centre, Wageningen:

Ir. H.P. Benkema

January 12

Institute of Plant Breeding, Wageningen:
Ir. J.G. TH. Hermsen

Nematology Laboratory, Wageningen:
Ir. A.F. van der Wal

January 25 (UK)

Agricultural Chemistry Department, Glasgow University, Scotland:

Dr. H.J. Duncan (telephone interview)

M.S. Wolfe and D. Plucknett

February 1-12 (USA)

Cornell University, Ithaca, N.Y., USA:

Dr. R.L. Plaisted

Dr. E.E. Ewing

Dr. P. Gregory

Dr. W.E. Fry

Graduate students and support workers.

February 4-5

University of Madison, Wisconsin, USA:

Dr. L. Sequeira

Dr. S.J. Peloquin
Graduate students and support workers.

C. NATIONAL AND REGIONAL VISITS January 26-February 4, 1983

1. Asian Visits

January 26 (Philippines)

R.L. Villareal

Philippine Ministry of Agriculture:

Mr. R. E. Abejuela
Project Manager,
Second Laguna Irrigation Development Project - Vegetable Component

Dr. E.C. Quisumbing, Director,
Agricultural Research Office

F.L. Milthorpe

Arrival at Los Banos following flight from Sydney to Manila

January 27

IRRI - Brief tour of facilities

Philippine Institute of Plant Breeding:

Dr. E.T. Rasco, Jr.
Potato Breeder Philippine Representative,
Southeast Asia Potato Programme for Research and Development (SAPPRAD)

Luncheon meeting with representatives of Philippine Council for Agricultural and Resources Research and Development (PCARRD):
Dr. D.P. Gaspasin
Crops Research Director

Mrs. C. Magbuo
Program Specialist

CIP Santa Lucia Field Station
Dr. R. Acasio
CIP Regional Research Scientists

Dinner with CIP Regional Representatives:
Dr. P. van der Zaag
CIP Regional Representative Region VII

F.L. Milthorpe and R.L. Villareal

January 28

Los Banos to Baguio accompanied by Dr. Acasio

Republic of the Philippines
German Potato Project, Baguio:
Dr. D. F. Rottger, Virologist
Ms. S. Brunold, Assistant Specialist

Mountain State Agricultural College (MSAC):
Professor E. Sano
In-Charge, Potato Project

Return to Los Banos

January 29 (Bangkok, Thailand)

Flight from Manila to Bangkok, Thailand Asian Vegetable Research and Development Centre (AVRDC), Thai representative:
Dr C. Y. Yang
Director, Outreach Programme

January 30

Flight from Bangkok, Thailand to Dhaka, Bangladesh

January 31 (Dhaka, Bangladesh)

Bangladesh Rice Research Institute (BRRI)

Dr. Frank Sheppard
IRRI Representative in Bangladesh

Bangladesh Agricultural Research Institute (BARI):

Mr. M.D. Soraiman Khan
Principal Scientific Officer,
Oil Seeds Project

Dr. Sufi Mahinddin
Project Director,
Wheat Programme

Dr. Larry Butler
Wheat Breeder,
CIMMYT Special Project

Dr. Sharafat Hossain Khan
Head, Plant Breeding, BARI

Potato Research Center (PRC), BARI, Pathological Laboratory and Potato Experimental Fields:

Dr. J. U. Ahmad, Director

Dr..K. Shikka
CIP scientist assigned to PRC

Bangladesh Agricultural Development Corporation (BADC), tour of Kasimpur Seed Block:

Mr. A. Hashem
General Manager (Field)

Mr. M. Alam
Manager (Root and Tuber Programme)

Mr. M.M. Husain
Manager

Dinner with Dr. Sikka

February 1

Bangladesh Agricultural Research Council (BARC):

Dr. M.A. Mannan
Executive Vice-Chairman (Acting), BARC

Dr. M.M. Rahman
Member-Director (Crops and Forestry)

International Agricultural Development Service (AIDS):

Dr. David Daugherty
Project Supervisor/Adviser

Munshiganj Potato Sub-Station and farmer's field:

Mr. Hashem
Dr. Sikka

February 2

Flight from Dhaka to Delhi, India

February 3 (India)

Delhi to Sadabad-District Mathura:
Mr. S.N. Bhargava, CIP farmer cooperator

February 4

Indian Council for Agricultural Research (ICAR):
Dr. M. V. Rao, Deputy Director General

University of Delhi
Department of Botany
Dr. H.Y. Mohan Ram, Professor

National Agricultural Cooperative Marketing Federation of India, Limited (NAFED)
Mr. S. P. Sharma
Manager

CIP Regional Headquarters at Indian Agricultural Research Institute (IARI) campus:

Dr. M.D. Upadhya
CIP Regional Research Scientist
Region VI, South Asia

Dinner with Dr. Upadhya

February 5

Flight from Delhi to Lima, Peru

2. Latin American (January 31 - February 5, 1983

January 31 (Toluca, Mexico)

R.W. Hougas

Programa Regional Cooperativo de la Papa (PRECODEFA):
Ing. Agr. Roberto Rodr#guez
Assistant Coordinator
Coordinator National Potato Program,
Panama

Ing. Agr. Oscar Lionel Orozco
Secretary PRECODEPA
Coordinator National Potato Program,
Guatemala

Ing. Agr. Manuel Villareal
Coordinator PRECODEPA
Coordinator National Potato Program,
Mexico

Centre Agricultural Investigations
Toluca, Mexico:

Dr. Uriel Maldonado
Director

February 1 (San Jose, Costa Rica)

Costa Rica National Potato Programme:
Ing. Agr. Antonio Zumbado
Coordinator

R. W. Hougas and M. Pineiro
February 2

Costa Rica National Potato Program
(tour of Field Station and on-farm trial) and
PRECODEPA:

Ing. Agr. Antonio Zumbado
Ing. Ruth Murillo, National Programme Scientist
Ing. R. Amador
Ing. Y. Aguiles

Costa Rica Ministry of Agriculture:
Mr. Eladio Carmona, Director General for Research

February 3

Flight from San Jose, Costa Rica to Bogotá, Colombia

R.W. Hougas, M.F. Pineiro and H.W. Zandstra
February 4 (Bogota, Colombia)

Instituto Colombiano Agropecuario (ICA):
Dr. Fernando Gómez M., Head of ICA
Dr. Jaime Navas, Head of Research
Dr. Manual Torregrosa
Dr. Oscar Lamaud, CIP Regional
Representative, Region I, Andean Latin America

Tibaitatá Experimental Station; Tour of Station and breeding plats:

Dr. Pedro Lón Gómez
National Potato Coordinator

Ing. Armando Rodriguez
ICA Regional Potato Coordinator

Dr. Oscar Malamud

Colombian Potato Growers Association (FEDEPAPA):
Dr. Augusto del Valle, Head
Ing. Quilian Reano
Dr. Malamud

ICA Social Sciences and Communications Staff:
Dr. Fernando Bernal
Dr. Ciro Villamizar

Cocktail at Dr. Malamud's home

February 5

San Gorge, ICA Seed Farm, outskirts of Bogotá:
Ing. Pedro Corza, I/C
Seed Potato Production in ICA

Informal consultations and visits

February 6 Flight from Bogotá, Colombia to Lima, Perú

D. HEADQUARTERS VISIT February 7-19, 1983

February 5-6 Assembly of Panel Members
Preliminary meeting on schedules and agenda

| | | |
|---|---|---|
| February 7 | | |
| | a.m. | General introduction and tour of Headquarters Facilities |
| | p.m. | Meeting with Management Review Team<br>Detailed allocation of tasks and approval of agenda and report outline |
| February 8-9 | Visit to Huancayo and San Ramon | |
| February 10-11 | | Round-table discussions with Project Leaders and Cooperators (by Thrust), Senior Management, Social Science Regional Research and non-research department personnel |
| | | Evaluation of progress, identification of issues and questions |
| February 12 | | |
| | a.m. | Discussion on TAC Issues and Questions |
| | p.m. | Discussions with Management Review Team<br>Additional meeting with Regional Research personnel |
| | | Issues and Recommendations for most Chapters and some narrative text prepared and typed |
| February 13 | | Writing, typing, collation of texts |
| February 14 | | Consideration of recommendations for Chapter III (Thrusts) |
| | | Interchange with Management Review Team on preliminary findings of both Reviews |
| February 15 | | Panel consideration of recommendations for remainder of report, and preliminary approval of Chapter narrative |
| | | Second draft preparation |

| | | |
|---|---|---|
| February 16 | | Continuation of second draft preparation and Chapter by Chapter review |
| February 17 | | Continuation of text review<br>Collation of draft report<br>Management Review Team completed draft Report and circulated copies to Panel |
| February 18 | | |
| | 8:30 a.m. | Management and QQR Draft Reports given to the DG and Senior Staff |
| | 11:00 am | Oral presentation Management Review Team Chairman to CIP Staff |
| | 1:30 p.m. | Oral presentation by QQR Chairman to CIP Staff |
| | 3:00 p.m. | Panel meeting on the preliminary response from the DG and Senior Staff |
| February 19 | a.m. | Discussion on final Chapter |
| | p.m. | Departure |

## RESEARCH STAFF INVOLVEMENT IN 1982 PROJECTS CLASSIFIED BY THRUST

| STAFF MEMBER/ DEPARTMENT | THRUST I | | II | | III | | IV | | V | | VI | | VII | | VIII | | IX | | SOCIAL SCIENCE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | * PL | PC | PL | PC | PL | PC | PL | PC | PL | PC | PL | PC | PL | PC | PL | PC | PL | PC | PL | PC |
| BREEDING & GENETICS | | | | | | | | | | | | | | | | | | | | |
| H. Mendoza | | | 1 | 4 | | 3 | | | | | | 1 | | 2 | | | | 2 | | |
| Z. Huaman | | | 1 | | | 2 | | 1 | | | | 1 | | | | | | | | |
| C. Brown | | | 1 | 1 | | | | | | 1 | | | | | | | | 1 | | |
| P. Schmiediche | | 1 | 2 | 1 | | | | 2 | | | | 1 | | | | | | 1 | | |
| J. Landeo | | | 2 | 2 | | 2 | | | | | | 1 | | | | | | | | |
| H. Kidane | | | 1 | | | 1 | | | | | | | | | | | | | | |
| M. Scurrah | | | 2 | | | | | | | | | 3 | | | | | | | | |
| M. Iwanaga | | | 1 | 3 | | 1 | | | | | | 1 | | | | | | | | |
| NEMATOLOGY & ENTOMOL. | | | | | | | | | | | | | | | | | | | | |
| P. Jatala | | | | 4 | | | | | | | 2 | 1 | | | | | | | | |
| J. Franco | | | | 2 | | | | | | | 2 | | | | | | | | | |
| K. Raman | | | | 3 | | | | | | | 1 | 1 | | | | 1 | | | | |
| S. Raymundo | | | | | | | | | | | 1 | 2 | | | | | | | | |
| PATHOLOGY | | | | | | | | | | | | | | | | | | | | |
| E. French | | | | 1 | | | 2 | 1 | | | | | | 1 | | 1 | | | | |
| J. Henfling | | | | 2 | 1 | 2 | | | | | | 1 | | | | | | | | |
| C. Martin | | | | 2 | 1 | 1 | | | | | | 1 | | | | | | | | |
| L. Salazar | | | | | | | | | 2 | | | | | | | | | 1 | | |
| C. Fribourg | | | | | | | | | 1 | | | | | | | | | | | |
| E. F-Northcote | | | | 1 | | | | | 1 | | | | | | | | | | | |
| T. Bjor | | | | | 2 | 1 | | | | | | | | | | | | | | |
| PHYSIOLOGY | | | | | | | | | | | | | | | | | | | | |
| S. Sadik | | | | | | | | | | | | | 1 | | | 1 | 2 | | 1 | |
| P. Malagamba | | | | 1 | | | | | | | 2 | 1 | 1 | | | | | | 1 | |
| R. Booth | | | | | | | | | | | 1 | | 2 | 3 | | | 1 | | | |
| L. Schilde | | | | | | | | | | | | | | | | 2 | 1 | | | |
| D. Widmore | | | | | | | | | | | 1 | 2 | 1 | | | | | | 1 | |
| S. Wiersema | | | | | | | | | | | 1 | | 1 | | | 2 | | | 1 | |
| J. White | | | | | | | | | | | | | 1 | | | 2 | | | 1 | |
| TAXONOMY | | | | | | | | | | | | | | | | | | | | |
| C. Ochoa | 3 | | | 2 | | | | | | 1 | | 1 | | | | | | 1 | | |
| SOCIAL SCIENCE | | | | | | | | | | | | | | | | | | | | |
| D. Horton | | | | | | | | | | | | | | | | | | | 1 | 1 |
| A. Monares | | | | | | | | | | | | | | | | | | | 1 | |
| R. Rhoades | | | | | | | | | | | | | | | 2 | 1 | | | 1 | |
| S. Poats | | | | | | | | | | | | | | | | | | | 1 | |
| G. Scott | | | | | | | | | | | | | | | | | | | 1 | |
| REGIONAL RESEARCH | | | | | | | | | | | | | | | | | | | | |
| J. Bryan | | | | | | | | | | | | | | | | | 1 | | | |
| | 3 | 11 | | 4 | | 2 | | 4 | | 6 | | 3 | | 3 | | 9 | | 5 | | |

* PL = Project Leader
PC = Project Cooperator

Source: O.T. Page
February 1983

## SOURCE OF WILD TUBER-BEARING SOLANUM SPECIES IN WORLD POTATO COLLECTION

### CIP DEC 1982 a/

| Country | No. of Accessions | Lost Accessions | No. of current Accessions |
|---|---|---|---|
| Bolivia | 129 | 1 | 128 |
| Chile | 7 | - | 7 |
| Colombia | 12 | 1 | 11 |
| Ecuador | 47 | 2 | 45 |
| Mexico | 70 | 1 | 69 |
| Peru | 971 | 50 | 921 |
| Venezuela | 11 | — | 11 |
| TOTAL | 1247 | 55 | 1192 |

a/ Total collection was initially at least 1300 accessions. Lost accessions were noted in the inventory book.

(Source: C. Ochoa, Coordinator, Thrust I, Feb. 1983).

# LIST OF WILD TUBER BEARING-SPECIES IN THE WORLD POTATO COLLECTION

DECEMBER 1982

S. albornozii
S. abancayense
S. acroglossum
S. acaule
S. alandiae
S. ambosinum
S. amabile
S. aracc-papa
S. ayachuchense
S. berthaultii
S. blancogaldosii
S. boliviense
S. brevicaule
S. buesii *
S. bukasovii
S. bulbocastanum
S. capsicibaccatum
S. chacoense
S. chomatophilum
S. chancayense
S. chiquidenum
S. candolleanum
S. cantense
S. colombianum
S. coelestipetalum
S. cardiophyllum
S. circaeifolium
S. dolichocremastrum
S. doddsii *
S. demissium

S. etuberosum
S. flahualtii
S. fernandezianum
S. huancabambense
S. huarochiriense
S. hypacrarthrum
S. humectophilum
S. hastiforme
S. infundibuliforme
S. ingaefolium *
S. immite
S. jalcae
S. lignicaule
S. litusinum
S. limbaniense
S. leptophyes
S. laxissinum
S. maglia
S. microdontum
S. medians
S. megistacrolobum
S. minutifoliolum
S. mochicense
S. marinasense
S. mutiinterruptum
S. neovargasii
S. neoweberbaueri
S. olmosense
S. oplocense
S. pascoense

S. paucissectum
S. pichinchense
S. paucijugum
S. penneli
S. polyadenium
S. peloquianum
S. politrichon
S. pinnatisectum
S. paramoense
S. piurae
S. raphanifolium
S. rachialatum *
S. rickii
S. rhomboideilanceolatum
S. santolallae
S. subpanduratum
S. suffrutescens
S. sogarandinum
S. solisii
S. sparsipilum
S. stoloniferum
S. tarijense
S. tundalomense
S. urubambae
S. vidaurrei
S. violaceimarmoratum
S. velardei
S. villuspetalum *
S. weberbaueri
S. wittmackii

TOTAL NUMBER OF WILD SPECIES CLASSIFIED: 90

* Lost, no living material

(Source: C. Ochoa, Coordinator, Thrust I, Feb. 1983).

ANNEX VII

## LIST OF COUNTRIES SENT TRUE SEED OF WILD SPECIES

### DECEMBER 1982

| Country | Institution | No. of Accessions | No. of Species |
|---|---|---|---|
| Peru | CIP | | |
| | Department of Genetics | 65 | 18 |
| | Department of Nematology | 144 | 34 |
| | Department of Pathodology | 254 | 27 |
| | Department of Physiology | 39 | 22 |
| Peru | National Program | 52 | 23 |
| Brazil | EMBRAPA (through the Storage Division) | 154 | 34 |
| USSR | Vavilov Institute of Plant Industry | 198 | 45 |
| USA | University of Wisconsin-Madison (through Glendale Beltsville) Quarantine Service) | 168 | 50 |
| | University of California | 9 | 7 |
| | University of North Dakota | 3 | 3 |
| | University of Illinois | 23 | 23 |
| Japan | Kobe University | 4 | 3 |
| TOTAL NUMBER OF ACCESSIONS | | 1113 | |

(Source: C. Ochoa, Coordinator, Thrust I, Feb. 1983)

## WILD SPECIES UTILIZED IN BREEDING PROGRAMS AT CIP AND IN RESEARCH CONTRACTS

| Species/Resistances | Contracts | Late Blight | Bact. Wilt | PVY | PVX | PLRV | PSTV | Globodera spp. | Meloidogyne spp. | Insect Resistance | Tuber Moth | Frost | Others | Relative Progress |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. S. acaule | | | | | X | X | X | | | | | X | Bridging sp. | Advanced |
| 2. S. berthaultii | X | | | | | | | | | X | | | | Initiated |
| 3. S. bukasovii | | | | | | | | | | | | X | | Initiated |
| 4. S. bulbocastanum | X | X | | | | | | X | | | | | | Advanced |
| 5. S. capsicibaccatum | | | | | | | | X | | | | | | Initiated |
| 6. S. chacoense | X | | X | X | | | | | X | | X | | Genetic Exper. | Advanced |
| 7. S. demissum | | X | | X | | | | | | | | | | Varieties |
| 8. S. etuberosum | X | | | | | X | | | | | | | Genetic Exper. | Initiated |
| 9. S. gourlayi | X | | | | | | | X | | | | | | Initiated |
| 10. S. infundibuliforme | X | | | | | | | | | | | | Genetic Exper. | - |
| 11. S. jamesii | X | | X | | | | | | | | | | | Initiated |
| 12. S. lignicaule | | | | | | | | X | | | | | | Initiated |
| 13. S. megistacrolobum | | | | | | | | X | | | | X | | Initiated |
| 14. S. microdontum | X | | X | X | | | | | X | | X | | Genetic Exper. | Initiated |
| 15. S. multidissectum | X | | | | | | | | | | | X | | Advanced |
| 16. S. pinnatisectum | X | | | | | X | | | | | | | Cenetic Exper. | Initiated |
| 17. S. sparsipilum | X | | X | | X | | | X | X | | X | | | Advanced |
| 18. S. spegazzinii | | | | | | | | X | | | | | | Advanced |
| 19. S. stoloniferum | | | | X | | | | | | | | | | Varieties |
| 20. S. vernei | | | | | | | | X | | | | | | Varieties |
| 21. S. verrucosum | X | | | | | | | | | | | | Bridging sp. | Initiated |

NOTE: This list includes wild species that have been used in other institutions which provided CIP with their advanced breeding lines. (S. demissum, S. stoloniferum, S. spegazzinii, S. vernei).

ANNEX IX

## GERMPLASM DISTRIBUTION BY CIP: CLONES NAMED AS VARIETIES

| REGION | COUNTRY | CLONES NAMED | MAJOR CHARACTERISTICS |
|---|---|---|---|
| I | Peru | MOLINERA (BR-63.65) | *BW, LB, PLRV |
| | | CAXAMARCA (BR-63.74) | BW, LB, PLRV |
| | | AMAPOLA (BR?) | LB, BW |
| | | PERRICHOLI (374080.5) | LB |
| | Ecuador | INIAP-BASTIDAS (377520) | LB |
| | Colombia | ICA SIRENA (7.10 USA) | PLRV, PVY, PVX, BW |
| II | El Salvador | INDIA 830 (India) | LB |
| | Costa Rica (unofficial) | IRAZU (MS 65.22) | BW, LB, PVY |
| | | CHICUA (BR 63.5) | BW, LB, PLRV |
| III | Rwanda | GAHINDA (Uganda - 11) | LB |
| | | KINIGI (378669.2) | LB |
| | | NSEKO (65-ZA-5-Mexico) | LB |
| | | PETERO (Murca-Mexico) | LB |
| | | GASORE (Graso-28-Belgium) | LB |
| V | Nigeria | BR 63.5 to be named | BW, LB |
| VI | Sri Lanka | SITA (India 1085) | BW, LB |
| | | KRUSHI (India 822) | BW, LB |

* BW = Residence to bacterial wilt
HY = High yield
LB = Resistance to late blight
PLRV = " " potato leaf-roll virus
PVX = " " potato virus X
PVY = " " wart

## GERMPLASM DISTRIBUTION BY CIP: CLONES RELEASED

| REGION | COUNTRY | CLONES RELEASED | MAJOR CHARACTERISTICS |
|---|---|---|---|
| I | Bolivia | MARIVA (Peru) | Cooking quality |
| III | Kenya | CGN-69.1 (Sweden) | BW, LB |
| | | ASN-69-1 (Mexico | BW, LB |
| | | BR 63.76 | BW, LB, PVY |
| | | INDIA 1035 (India) | LB |
| | | MARIVA (Peru) | Cooking quality |
| | Ethiopia | BR 114.39 | LB |
| | | BR 114.60 | LB |
| | | BR 114.70 | LB |
| | | B 5504 | LB |
| | | ANITA (Mexico) | LB |
| | Mozambique | DTO-28 | Earliness |
| | Zaire | Montsana (Mexico) | LB |
| | | BR-63.76 | LB, BW |
| VI | NEPAL | CFJ-69.1 (Mexico) | HY, LB, WART |
| | | CFM-69-1 (India) | HY, LB, WART |
| | | NPI 106 (Germany) | PLRV, PVY, WART, LB |
| | | NPI 108 (Germany) | PLRV, PVY, WART, LB |
| VII | Fiji (To be released) | BR 69.84 | BW, LB, PLRV |
| | Vietnam | B71-240.2 (Argentina) | PLRV, LB |
| | | AFZIMBA (Mexico) | LB |
| | | CFK-69.1 (Mexico) | LB |

## GERMPLASM DISTRIBUTION BY CIP: SUMMARY

| REGION | NUMBERS OF COUNTRIES: PRODUCING POTATOES* | EVALUATING CIP GERMPLASM | WITH SELECTED OR NAMED CLONES |
|---|---|---|---|
| I | 5 | 5 | 4 |
| II | 15 | 11 | 4 |
| III | 16 | 13 | 11 |
| IV | 15 | 7 | 1 |
| V | 14 | 8 | 1 |
| VI | 6 | 6 | 4 |
| VII | 12 | 8 | 4 |
| TOTAL | 83 | 58 | 29 |

D. Horton 1981: World Potato Facts.

## GUIDELINES ON QUARANTINE ASPECTS OF INTRODUCED POTATOES

A. Applicant fills out CIP request in triplicate and submits copies to the GP & Q Committee.

B. If approved, applicant requests a Peruvian import permit and sends to the shipper.

C. Upon arrival at CIP, applicant forwards introduced material to GP & Q Committee.

D. Procedure to follow by GP & Q representatives

1. All introductions to be checked visually by Nematologist, Entomologist and Pathologist.

2. PSTV checks

   a. TPS - a 10% sample sent to Virologist unless coming from PSTV tested parents. One month plus needed.

   b. in-vitro - Samples taken ASAP for virologists. One to 1 1/2 months needed.

   c. tubers - One sprout per tuber taken. Composit samples prepared (maximum 20 tubers per variety) for each variety or clone. One month plus needed.

3. After sprout removal, tubers are dipped in a 1% or .1% solution of Tecto-60, a systemic fungicide, and stored by applicant until results are available.

4. If PSTV results are negative, recipient can plant in his planthouse. Plants to be observed and any showing virus symptoms or other diseases destroyed. If in doubt, consult with GP & Q representatives.

5. After one growing season in a planthouse, the increase can be planted in fields, observing the same precautions as in 4 above.

6. If material is introduced from a "high risk site" for Pseudomonas solanacearum (Brown rot) or Corynebacterium sepedonicum (Ring rot), a maximum of three tubers will be grown out in quarantine facilities and harvested. If found free, new tubers will be sent to the recipient.

7. All tuber/plant/in-vitro introductions must be grown in a planthouse one generation prior to field planting.

8. Restrictions or liberalization of above procedures will apply on an individual basis at the discretion of the GP & Q Committee.

E. Applicants requesting potato introductions are encouraged to introduce minimum numbers of tuber/plants/tubes/seeds of each introduction. Three to five tubers per clone introduced is encouraged. Larger numbers must be fully justified.

F. Prior to introducing potatoes, check and find out if it is already in Peru.

G. Because of delays in testing, applicants must programme importations to arrive at least one month prior to planting date and are encouraged to plan on two months.

ANNEX XIII

PI No. _____

Peru Permit No. _____

## APPLICATION FOR POTATO INTRODUCTIONS TO PERU

1. APPLICANT NAME _____

2. COUNTRY, AREA AND SITE OF ORIGIN (Be specific) _____

_____

3. WHERE GROWN: ____Field ____Plant house ____Lab ____ Other

4. FORM: ____tubers ____TPS ____in-vitro ____cuttings ____entire plants

5. CARRIER: ____Air Mail ____Air freight ____Surface ____Hand carry

6. ANTICIPATED ARRIVAL DATE: _____ (avoid December)

7. LIST MATERIALS YOU INTEND TO IMPORT:

| Cultivar/Clone Name or Number | No. Units per Entry |
|---|---|
| | |

8. JUSTIFICATION FOR THE INTRODUCTION: _____

_____

_____

_____

_____

9. HAVE THERE BEEN ANY LOCAL (point of origin) TESTS FOR PSTV OR OTHER PATHOGENS? EXPLAIN:

_____

_____

10. INTRUCTIONS (if approved):

A. Request a Peruvian import permit through the B&G Secretary and send to person sending the dispatch. It must accompany the shipment. Include CIP instruction sheet. B. Instruct sender to include the peruvian Permit and Phytosanitary Certificate of the country of origin. Observe the additional clauses required by Peru on the Certificate. C. Applicant must place introductions at the disposal of the GP & Q Committee at time of arrival.

_____ _____

Signature of Applicant Date

11. APPLICATION: ____Approved ____ Disapproved

_____ _____

Signature of Chairman of GP & Q Date

12. DISPOSITION:

____ All tubers to Quarantine for PSTV check

____ All tubers to Quarantine for growing out one generation

____ TPS to PSTV Check

____ Other _____

13. RESULTS OF Q CHECK: _____

_____

White: to GP & Q permanent files (original)

Pink: to Quarantine

Yellow: to applicant

INTERNATIONAL POTATO CENTER (CIP)

P.O. Box 5969 Lima · Peru. Cables: CIPAPA · Lima
Telex: 25672 PE. Telephones: 366920 · 354354

# PHYTOSANITARY STATEMENT

This is to certify that the tubers, true seed, *in vitro* tissue cultures or cuttings, or representative samples of them, were thoroughly examined on (*date of dispatch*):

by (*name*): _____

a Senior Scientist of the International Potato Center, and that the consignment is believed to conform to the declaration below.

## ADDITIONAL DECLARATION

CHECK APPLICABLE STATEMENT(S) / CROSS OUT NON-APPLICABLE STATEMENTS

○ The vegetative plant parts were indexed and found to be negative for viruses: A,M,S,T,X,Y, potato leaf roll, andean potato latent, andean potato mottle, tomato black ring and tobacco ring spot viruses by symptoms indicator host inoculations, by latex or ELISA serologic techniques and electron microscopy. Mother plants were examined during the growing season and found to be free of disease symptoms. Potato spindle tuber viroid (PSTV) was negative by the Yang and Hooker tomato test and by electrophoresis.

○ True seed was harvested from pathogen-tested parents which tested negatively for PSTV and potato virus T.

○ True seed from parents of unknown health status grown under greenhouse conditions. A 10 percent sample of seed has been tested and found to be negative for PSTV and potato virus T.

## DISINFECTION TREATMENTS

| DATE | TREATMENT |
|---|---|
| | |

CHEMICAL AND CONCENTRATION

# DESCRIPTION OF THE CONSIGNMENT

| EXPORTER'S NAME AND ADDRESS | CONSIGNEE'S NAME AND ADDRESS |
|---|---|
| | |

| NUMBER AND DESCRIPTION OF PACKAGES | PHYTOSANITARY STATEMENT No. _____<br>PERU PHYTOSANITARY CERTIFICATE No. _____ |
|---|---|

| ORIGIN | MEANS OF TRANSPORT | PORT OF ENTRY |
|---|---|---|
| | | |

| QUANTITY AND DESCRIPTION OF PRODUCT |
|---|
| |

To the best of CIP's knowledge this plant material was free of disease and pests at point of dispatch. No liability shall attach to the International Potato Center, or any of its officers or representative with respect to this statement.

| DATE | PLACE | SIGNATURE |
|---|---|---|
| | | |

CIP Form No. 130-R

June 1982

# ACTIVITIES ON TPS - PHYSIOLOGY DEPARTMENT

A) Reproductive Biology. Flowering, Pollination, Fruit setting, Seed Quality.

| Activities | Leader | Initiation | Termination | Thrust |
|---|---|---|---|---|
| 1. Factors affecting flowering & fruit setting. Effect of Photoperiod/temperature; Agronomic factors; Physiological manipulations/induction; | Midmore | 1983 | 1986 | IX |
| 2. Pollination systems, relative importance, effect of floral characteristics, factors affecting pollination efficiency, extent of outcrossing in o.p. progenies. Use of natural or induced male sterility for hybrid seed production. | White/Midmore | 1983 | 1986 | IX |
| 3. Seed Quality Components | | | | |
| - Practical measures of seed quality | White | - | July '83 | IX |
| - Stages of seed production affecting quality | White | - | July '83 | IX |
| - Seed quality. Components and relation to germination, early seedling growth, vigor, tolerance to transplanting shock, and feasibility of improvement. | Malagamba/White | 1983 | 1986 | IX |

B) True Seed Production Methods

| Activities | Leader | Initiation | Termination | Thrust |
|---|---|---|---|---|
| 1. Practical Methods for True Seed Production | | | | |
| - Review of methods in similar crops and field evaluation | Wiersema | 1983 | 1985 | IX |
| - O.P. vs hybrid vs hybrid/o.p. as seed prod. systems. | Wiersema | 1983 | 1985 | IX |
| - Field practices for improving pollination efficiency in field | Wiersema | 1983 | 1985 | IX |

ANNEX XV

| Activities | Leader | Initiation | Termination | Thrust |
|---|---|---|---|---|
| 2. Seed extraction, sorting and drying methods for massive seed production systems | White | 1982 | 1984 | IX |
| C) Agronomy for TPS | | | | |
| 1. Seedling tuber production | | | | |
| - Completing information on substrates and management practices for production in "nursery". Effect of tuber selection in different progenies | Wiersema | - | 1984 | VII |
| - Production in "field". | Wiersema/Malagamba | 1983 | 1985 | VII |
| - Virus control in nursery | Wiersema/Salazar | 1983 | 1985 | VII |
| - O.P. and hybrid progenies for seedling tuber production | Malagamba/Wiersema | 1983 | 1985 | VII |
| - Technology evaluation with farmers | Physiology/S.Economy | 1983 | 1986 | - |
| 2. Production of Consumption tubers | | | | |
| - Identification of traits needed for high seedling vigor and survival. | Malagamba | 1982 | 1985 | VII |
| - Evaluation of improved families in contrasting environments (o.p. + hybrids) | Malagamba | 1980 | 1985 | VII |
| - Agronomic practices for improving seedling vigor and survival in adverse environments | Malagamba | 1981 | 1984 | VII |
| - Technology evaluation with farmers | Physiology/S.Economy | 1982 | 1985 | - |
| - Direct seeding. Methods applicable to developing agriculture conditions | Malagamba/White | 1982 | 1985 | VII |
| - Massive o.p. progeny evaluation | Malagamba | 1981 | 1986 | VII |

## ADOPTION OF SEED TUBEF STORAGE IN DIFFUSE LIGHT

| | REGION<br>COUNTRY | No. STORES<br>ADOPTED |
|---|---|---|
| I | BOLIVIA | 38 |
| | PERU | 200 CENTRAL SIERRA<br>200 SOUTH SIERRA & COAST |
| | COLOMBIA | SEVERAL IN 4 REGIONS |
| II | CHILE | RESEARCH PHASE |
| | GUATEMALA | 46 |
| | HONDURAS | 26 |
| III | KENYA | 10 |
| | MADAGASCAR | 20 |
| | BURUNDI | 50 |
| | RWANDA | 25 |
| | ETHIOPIA | RESEARCH PHASE |
| IV | TURKEY | RESEARCH PHASE |
| | EGYPT | RESEARCH PHASE |
| V | TUNISIA | RESEARCH PHASE |
| VI | SRI LANKA | 100 |
| | NEPAL | NPDP. BASIC SEED PROGRAM |
| | INDIA, BANGLADESH | RESEARCH PHASE |
| VII | PHILIPPINES | 160, PROBABLY MORE |
| | THAILAND, INDONESIA | RESEARCH PHASE |

ANNEX XVII

## CURRENT SOCIAL SCIENCE RESEARCH PROJECTS

1. World Trends in Potato Production and Use
2. Peruvian Potato Agriculture in Comparative Perspective
3. Interdisciplinary research for improving the generation and transfer of TPS technology. (Social Science Department - Thrust VII)
4. Economics of seed potato certification programs in developing countries. (Social Science Department - Thrust IX).
5. Simple potato processing/low cost potato storage (post-harvest technology).
6. Marketing Patterns and Demand Characteristics for Potato in Developing Countries.
7. Potato Consumption Project - Thrust VIII.
8. Nutritional Value of Potatoes in the Human Diet - Thrust VIII.

February 1983

ANNEX XVIII

## THRUSTS INVOLVED IN THE DEVELOPMENT OF TECHNOLOGIES

| Technology | Principal Input from Thrusts |
|---|---|
| Germ Plasm Evaluation | II, III, IV, V, VI, VII |
| Adaptation of the Potato to Tropical Conditions | II, IV, V, VI, VII, IX |
| Production of Potato from True Seed | II, IV, V, VII, IX, (SS)* |
| Low-cost Storage and Village-Level Processing | III, IV, VI, VII, VIII, (SS) |
| Production Research | II, VII, VIII, IX, (SS) |

* SS = Social Science Project

## CIP REGIONAL ACTIVITIES
## Institution Building and Networks

### Region I - Latin America (Andean Zone)

Venezuela (C)* Programme is under development. A study visit by Regional Scientists and CIP seed specialists is planned and production training courses have been organized and a work plan developed.

Peru (A) CIP maintained elements of the national programme until adequate funding emerged. It identified an experienced potato leader for a World Bank/INIPA project.

CIP has accepted a Special Project on Swiss funds to develop a basic seed capacity, which includes two Social Scientists to diagnose and monitor the impact of the project at the farm level.

Colombia (A) CIP's Regional headquarters was transferred from Lima to the Tibaitata Central Research Station, Colombia. Close association with ICA has resulted in an accelerated development of the research programme. Major programmes now in progress are on late blight, bacterial wilt, virus and storage research.

Bolivia (C) Support was given to a Swiss bilateral project on potato based at Cochabamba.

Network To encourage horizontal transfer of research and results between countries, PRACIPA (Proyecto Andino Cooperativo de Investigacion en Papa) was established in 1982.

### Region II - Non-Andean Region

Brazil (A) A National Potato Program with major emphasis on utilization of genetic material was developed in EMBRAPA in cooperation with CIP.

1982 - CIP's Regional headquarters was established in Brasilia. Major support was given to the seed programme of south Brazil by CIP seed and virus specialists.

Chile (B) CIP's continued interest in cooperating with research entities was instrumental in retaining an official potato research programme during a period of considerable reorganization and cutbacks in funding.

---

* Country Priority Code (see paragraph 279)

CIP arranged for IBPGR support to University of Valdivia for collection and maintenance of native potato germplasm (primitive cultivars).

Argentina (B) CIP was asked to participate in the review of the national potato program and its subsequent plan of research.

Network Horizontal transfer of technology is being encouraged by the organizations of PROCIPA (Programa Cooperativo de Investigaciones en Papa) which includes Uruguay.

PRECODEPA (Programa Regiona Cooperativo de Papa) covers countries in Central America and the Caribbean. Its establishment was encouraged by CIP and has received major attention for the past four years from CIP headquarters and CIP's Regions I & II. The seed specialist from CIP spent a one year sabbatical in Costa Rica.

Region III - Tropical Africa

Kenya (A) CIP scientists assisted the Agricultural Development Corporation, the Seed Quality Inspection Service and other institutions to develop a major seed production programme executed by the ADC.

Ethiopia (B) CIP contract support to the programme leader enabled 4 new varieties to be produced within 6 years.

Rwanda/ CIP has major involvement with support to Rwanda/Burundi seed tuber programmes. A major accomplishment of CIP is the development of a national programme in Rwanda which covers seed tuber production, identification of new varieties and on-farm research. This special project has two expatriates and has had major spinoffs into Burundi and Zaire (Kivu Province). Contacts have been renewed with the West Uganda region.

A special Project with one expatriate was recently approved for Burundi.

Network The PRAPAC (Programme Regional Pour L'Amelioration de la Pomme de Terre en Afrique Centrale) network has objectives similar to other networks and includes Rwanda, Burundi and Zaire with prospects of other countries being included, especially Uganda.

Region IV - Middle East and North Africa

Until 1982 other countries of North Africa were included in Regional responsibility.

Turkey (A) The national programme grew from one person to approximately twelve scientists as a result of collaboration with the CIP regional scientists in Menemen, Izmir. Two scientists were trained overseas on CIP scholarships to the M. Sc. level.

This has assisted Turkey in strengthening its breeding and selection programme. Turkish scientists organized their first international germplasm management course in 1982. A post-doctoral scientist was posted to the Region for three years to study tuber moth control.

Cyprus (B) CIP provides assistance for the development of a seed programme and on-farm research.

Syria (B) Proposals for seed multiplication schemes to supply Syria and other Arab countries developed with CIP participation.

Tunisia (A) A special Project in Tunisia permitted development of a seed tuber potato multiplication system. This is now managed solely by local institutions and supplies approximately 10 percent of annual requirements.

Egypt (A) In 1983 CIP posted for the first time a senior source scientist to a region to evaluate and adapt TPS technology. His task will eventually broaden to include other technologies and Egypt will probably emerge as the new Regional headquarters.

Region V - North & West Africa (Francophone)

Until 1981 this region was headquartered in Pakistan to serve also Iran and Afghanistan. Due to unstable conditions the work concentrated in Pakistan led to the development of a Special Project for research on potato productivity and marketing financed by the Swiss.

In 1982 this Regional post was transferred to Tunisia to develop potato research programmes in West and North Africa (francophone countries).

Region VI - India, Nepal, Bhutan, Sri Lanka and Bangladesh

Nepal (B) Until 1979 CIP managed a Special Project with expatriate scientists. Since CIP has continued to provide technical support to a bilateral project, the main components of which are seed tuber production, identification of improved germplasm, storage and on-farm trials.

Bangladesh (A) The collaboration developed with BARI (Bangladesh Agricultural Research Institute) has led to the posting of a CIP scientist in an IADS team. Seed tuber production, evaluation of germplasm, TPS storage and cropping system research are the activities being developed in collaboration with the IADS team.

Sri Lanka (B) Major program development started with six-month training of Sri Lankan scientists in storage and breeding and a MS training for a pathologist. CIP's Head of Pathology spent his sabbatical year in Sri Lanka.

Bhutan (A) A Special Project is in progress for potato seed development and varietal improvement. The senior national scientist

received six months training at CIP headquarters.

Region VII - South-East Asia

Philippines (A) CIP established its regional base in Los Banos, Manila, in 1977, with headquarters at The Philippines Council for Agricultural Research (PCARR). Several institutions in the country were conducting research in various aspects of potato production, but this work was not coordinated. CIP catalyzed the formation of a Management Committee to organize a coordinated plan of research. Many Filipino scientists have received training at CIP headquarters and through CIP scholarships in USA.

South Korea (B) Close links with the Office of Rural Development (ORD) led to the establishment of the potato programme research on the role of potatoes in rice-based cropping systems. A review mission of CIP scientists helped to indicate priority research areas for future programme development.

Regional Programme contacts helped to consolidate national programmes with different levels of research capability in Thailand, Indonesia, Vietnam and Burma.

Network SAPPRAD (Southeast Asian Program for Potato Research and Development) was the second network to be established for horizontal technology transfer and it includes five countries.

## SUMMARY OF TRAINING ACTIVITIES 1978-1982

| Category | SUMMARY OF TRAINING ACTIVITIES 1978-82 Year | | | | |
|---|---|---|---|---|---|
| | 1975 | 1979 | 1980 | 1981 | 1982 |
| A. Regional Courses | | | | | |
| (i) Production-oriented: | | | | | |
| (a) No. courses | 8 | 13 | 4 | 6 | 13 |
| (b) No. participants | 157+ | 150+ | 61+ | 79+ | 1294 |
| (c) No. countries represented | 27+ | 40+ | 21+ | 11 | 15 |
| (ii) Specialized: | | | | | |
| (a) No. courses | 3 | 6 | 5 | 14 | 12 |
| (b) No. participants | 101 | 97 | 61 | 353 | 195 |
| (c) No. countries represented | 24 | 27 | 18 | 31 | 50 |
| B. Specialized courses at Lima: | | | | | |
| (a) No. courses | 1 | 3 | 1 | 3 | 3 |
| (b) No. participants | 6 | 27 | 11 | 27 | 34 |
| (c) No. countries represented | 6 | 14 | 8 | 17 | 24 |
| C. Individual Training | | | | | |
| (a) No. trainees | 5 | 14 | 22 | 20 | 16 |
| (b) No. countries represented | 5 | 9 | 14 | 9 | 8 |
| D. Mid-career Training No. | - | 1 | 3 | - | 1 |
| E. Scholarships No. | 21 | 21 | 18 | 16 | 9 |
| F. Student assistanships No. | 16 | 25 | 20 | 20 | 16 |
| G. Pre-professional trainees No. | - | 1 | 5 | 11 | 18 |

## SUMMARY OF TRAINING ACTIVITIES, 1982

| Category | Title of Subject | Site (production or specialized) | Dates (Duration) | Total Participants | Country (Participants) | Remarks |
|---|---|---|---|---|---|---|
| REGIONAL ACTIVITIES | | | | | | |
| REGION I | Production with Special on Seed Production | Peru (production) | 25 Jan-19 Feb (4 weeks) | 16 | Peru ( 1)<br>Venezuela ( 2)<br>Colombia ( 1)<br>Bolivia ( 1)<br>Ecuador ( 1) | UNDP<br>Spanish |
| | Interchange of Germ-Plasm & Quarantine Workshop | Colombia (specialized) | 26-28 Jan (3 days) | 21 | Ecuador ( 2)<br>Brazil ( 3)<br>Colombia ( 4)<br>Argentina ( 1)<br>Chile ( 2)<br>Venezuela ( 3)<br>Mexico ( 2)<br>Cuba ( 2)<br>Costa Rica ( 1)<br>Dominican Rep. ( 1) | UNDP<br>Spanish<br>(CIP/CIAT) |
| | Identification of Virus & Other Diseases of Potato (Practical Field Inspection) | Venezuela | 15-18 Mar | 18 | Venezuela (18) | Spanish |
| | Farming Systems Analysis | Peru (specialized) | 5-9 July and 3-19 Nov. (4.5 weeks) | 15 | Peru (15) | World Bank<br>Spanish |
| | Practical Virology | Colombia (specialized) | 2-12 Nov (2 weeks) | 13 | Colombia ( 5)<br>Bolivia ( 1)<br>Ecuador ( 1)<br>Peru ( 2)<br>Venezuela ( 2)<br>Costa Rica ( 1)<br>Guatemala ( 1) | DSE<br>Spanish |

ANNEX XXI

| Category | Title of Subject | Site (production or specialized) | Dates (Duration) | Total Participants | Country (Participants) | Remarks |
|---|---|---|---|---|---|---|
| REGION I (cont'd) | Tissue Culture | Colombia (specialized) | 11 Oct-5 Nov (4 weeks) | 8 | Brazil ( 2)<br>Colombia ( 2)<br>Ecuador ( 2)<br>Nicaragua ( 1)<br>(Dominican Rep( 1) | UNDP Spanish (CIP/CIAT) |
| | Fertilization | Peru (production) | 11-16 Jan (1 week) | 34 | Peru (34) | CIP support for UNA instructors' perdiems in these four Fertilization courses |
| | Fertilization | Peru (production) | 27 Aug (1 week) | 40 | Peru (40) | |
| | Fertilization | Peru (Production) | 23-28 Aug (1 week) | 26 | Peru (26) | |
| | Fertilization | Peru Production) | 27 Sept-2 Oct (1 week) | 55 | Peru (55) | |
| REGION II | Bacterial Wilt Workshop | Brazil (specialized) | 31 Aug-3 Sept (4 days) | 17 | Brazil (10)<br>Argentina ( 3)<br>Uruguay ( 1)<br>Colombia ( 2)<br>Peru ( 1) | Spanish |
| | Seed Production | Brazil (production | 11-22 Oct (2 weeks) | 22 | Brazil (17)<br>Argentina ( 2)<br>Uruguay ( 2)<br>Netherlands ( 1) | DSE Spanish/ Portuguese |



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| Category | Title of Subject | Site (production or specialized) | Dates (Duration) | Total Participants | Country (Participants) | | Remarks |
|---|---|---|---|---|---|---|---|
| REGION III | Production | Burundi (production) | 11-15 Jan (1 week) | 9 | Burundi | ( 9) | French |
| | Seed Production | Madagascar (production) | 26-30 Apr (1 week) | 14 | Madagascar | (14) | French |
| | Seed Production | Rwanda (production) | 7-11 June (1 week) | 14 | Rwanda | (13) | French |
| | | | | | Zaire | ( 1) | |
| | Regional Workshop on Potato Development & Transfer of Technology | Ethiopia and Kenya (specialized) | 23-30 Aug (1 week) | 25 | Burundi | ( 1) | UNDP |
| | | | | | Ethiopia | ( 7) | |
| | | | | | Kenya | ( 2) | |
| | | | | | Madagascar | ( 2) | |
| | | | | | Malawi | ( 2) | |
| | | | | | Mauritius | ( 1) | |
| | | | | | Rwanda | ( 1) | |
| | | | | | Swaziland | ( 2) | |
| | | | | | Tanzania | ( 2) | |
| | | | | | Uganda | ( 2) | |
| | | | | | Zambia | ( 2) | |
| | | | | | Zimbabwe | ( 1) | |
| | Germ Plasm Exchange & Quarantine Workshop | Nigeria (specialized) | 28-30 Apr (3 days) | 19 | Nigeria | ( 6) | UNDP (CIP/CIAT/ IITA) |
| | | | | | Sierra Leone | ( 1) | |
| | | | | | Ghana | ( 1) | |
| | | | | | Zaire | ( 2) | |
| | | | | | Zimbabwe | ( 1) | |
| | | | | | Kenya | ( 2) | |
| | | | | | Cameroon | ( 2) | |
| | | | | | Togo | ( 1) | |
| | | | | | Liberia | ( 1) | |
| | | | | | Malawi | ( 1) | |
| | | | | | Congo Rep.Pop. | ( 1) | |

| Category | Title of Subject | Site (production or specialized) | Dates (Duration) | Total Participants | Country (Participants) | | Remarks |
|---|---|---|---|---|---|---|---|
| REGION VI | Germ Plasm Management | Turkey (specialized) | 4-15 Oct (2 weeks) | 14 | Turkey | ( 6) | |
| | | | | | Cyprus | ( 2) | |
| | | | | | Egypt | ( 2) | |
| | | | | | Iran | ( 2) | |
| | | | | | Jordan | ( 1) | |
| | | | | | Pakistan | ( 1) | |
| | Seed Production | Bangladesh (production) | 11-29 Jan (3 weeks) | 24 | Bangladesh | (17) | UNDP |
| | | | | | Bhutan | ( 2) | |
| | | | | | India | ( 1) | |
| | | | | | Pakistan | ( 2) | |
| | | | | | Sri Lanka | ( 2) | |
| | Tuber-Borne Diseases & Pests in Seed Potato Production | Bhutan (specialized seminar) | 12-15 Oct (4 days) | 16 | Bhutan | ( 6) | |
| | | | | | Bangladesh | ( 3) | |
| | | | | | Nepal | ( 2) | |
| | | | | | India | ( 5) | |
| | Production | Bhutan (production) | | 18 | Bhutan | (18) | For extension workers |
| | Potato Production | India (production) | 29-June 15 Jul (2.5 weeks) | 7 | Bangladesh | ( 3) | 7 sponsored by CIP. Indian participants not listed. Course run by CPRI, |
| | | | | | Bhutan | ( 2) | |
| | | | | | Sri Lanka | ( 2) | |
| REGION VII | Germ Plasm Distribution & Quarantine Workshop | Philippines (specialized) | 19-23 Apr (5 days) | 21 | Philippine | ( 6) | UNDP (CIP/CIAT) only national programme listed |
| | | | | | Vietnam | ( 2) | |
| | | | | | Sri Lanka | ( 2) | |
| | | | | | Malaysia | ( 2) | |
| | | | | | Thailand | ( 4) | |
| | | | | | Korea | ( 2) | |
| | | | | | Indonesia | ( 2) | |
| | | | | | India | ( 1) | |

| Category | Title of Subject | Site (production or specialized) | Dates (Duration) | Total Participants | Country (Participants) | Remarks |
|---|---|---|---|---|---|---|
| REGION VII (cont'd) | Agro-Economic Methodologies | Philippines (specialized) | 17-28 May (2 weeks) | 16 | Philippines ( 9)<br>Thailand ( 2)<br>Vietnam ( 2)<br>South Korea ( 2)<br>Indonesia ( 1)<br>Burma ( 1)<br>Bangladesh ( 1) | UNDP |
| | Seed Production | Philippines (production) | 28 June-2 July (1 week) | 22 | Philippines (22) | |
| LIMA SPECIALIZED COURSES | Germ Plasm Management | Peru (specialized) | 11 Jan-12 Feb (5 weeks) | 9 | Philippines ( 2)<br>Brazil ( 1)<br>Ethiopia ( 1)<br>Bhutan ( 1)<br>Turkey ( 1)<br>Colombia ( 1)<br>Spain ( 1) | |
| | Potato Production from True Potato Seed | Peru (specialized | 24 May-11 June (3 weeks) | 12 | Peru ( 2)<br>Costa Rica ( 1)<br>Egypt ( 1)<br>Kenya ( 1)<br>Sri Lanka ( 1)<br>India ( 2)<br>Bangladesh ( 1)<br>Indonesia ( 1)<br>South Korea ( 1)<br>Philippines ( 1) | |

| Category | Title of Subject | Site (production or specialized) | Dates (Duration) | Total Participants | Country (Participants) | | Remarks |
|---|---|---|---|---|---|---|---|
| LIMA SPECIALIZED COURSES (cont'd) | Nematology | Peru (specialized) | 27 Sept-16 Oct (3 weeks) | 13 | Panama | ( 2) | DSE Spanish |
| | | | | | Costa Rica | ( 1) | |
| | | | | | Colombia | ( 1) | |
| | | | | | Venezuela | ( 1) | |
| | | | | | Bolivia | ( 1) | |
| | | | | | Ecuador | ( 1) | |
| | | | | | Argentina | ( 1) | |
| | | | | | Chile | ( 2) | |
| | | | | | Brazil | ( 1) | |
| | | | | | Peru | ( 1) | |
| | | | | | Philippines | ( 1) | |
| INDIVIDUALIZED TRAINING | | Peru<br>India<br>Rwanda/Kenya<br>Philippines<br>Rwanda | from 21 to 111 days; 3.5 weeks average | 16 | Chile | ( 2) | |
| | | | | | Brazil | ( 1) | |
| | | | | | Philippines | ( 6) | |
| | | | | | Costa Rica | ( 1) | |
| | | | | | Bolivia | ( 2) | |
| | | | | | Peru | ( 1) | |
| | | | | | Bangladesh | ( 1) | |
| | | | | | Zaire | ( 2) | |
| TRAINING ASSISTANT TRAINING | | Peru | 2 months | 1 | Brazil | ( 1) | |
| SCHOLARSHIPS | | Cornell Univ.<br>Univ. of Queensland<br>Univ. of Wisconsin<br>Reading Univ<br>Univ. Nacional Agraria | | 9 | Peru | ( 2) | |
| | | | | | Colombia | ( 1) | |
| | | | | | Turkey | ( 1) | |
| | | | | | Argentina | ( 1) | |
| | | | | | Philippines | ( 1) | |
| | | | | | Nepal | ( 1) | |

| Category | Title of Subject | Site (production or specialized) | Dates (Duration) | Total Participants | Country (Participants) | | Remarks |
|---|---|---|---|---|---|---|---|
| STUDENT ASSISTANTS (Bolsas) | | Peruvian Universities | | 16 | Peru | (16) | |
| PRE-PROFESSIONAL PRACTICANTS (Practicantes) | | Peru<br>Rwanda | | 18 | Peru<br>Rwanda | (16)<br>( 2) | |

## NUMBER OF COURSES PROPOSED
1983 - 1987

(incomplete but includes those associated with regional networks and international organizations)

| Category | Year | | | | |
|---|---|---|---|---|---|
| | 1983 | 1984 | 1985 | 1986 | 1987 |
| A. Regional Courses | | | | | |
| Production oriented | 21 | 16 | 18 | 16 | 15 |
| Specialized | 15 | 11 | 11 | 9 | 10 |
| B. Specialized courses at Lima | 3 | 4 | 3 | 3 | 3 |

## DISTRIBTUION OF CONTRACT FUNDS - 1982
## BY COUNTRY

| | | | | | |
|---|---|---|---|---|---|
| U.S.A. | US$ 170,400 (6)* | Colombia | US$ 16,900 (3) | Switzerland | US$4,500 (1) |
| Netherlands | 62,500 (3) | Sri Lanka | 16,500 (2) | Ecuador | 3,500 (1) |
| Peru | 48,680 (10) | Canada | 13,800 (1) | Scotland | 14,500 (1) |
| Australia | 44,000 (1) | Argentina | 10,500 (1) | Kenya | 3,100 (1) |
| Chile | 7,880 (2) | Germany | 16.600 (1) | England | 2,000 (1) |

## DISTRIBUTION OF CONTRACT FUNDS - 1982
## BY DEPARTMENT

| | US$ |
|---|---|
| Breeding and Genetics | 194,900.-- |
| Pathology | 76,000.-- |
| Regional Research & Training | 40,460.-- |
| Physiology | 79,500.-- |
| Nematology | 37,500.-- |
| Support | 6,500.-- |
| | 434,860.-- |

* Number of Contracts ( ).