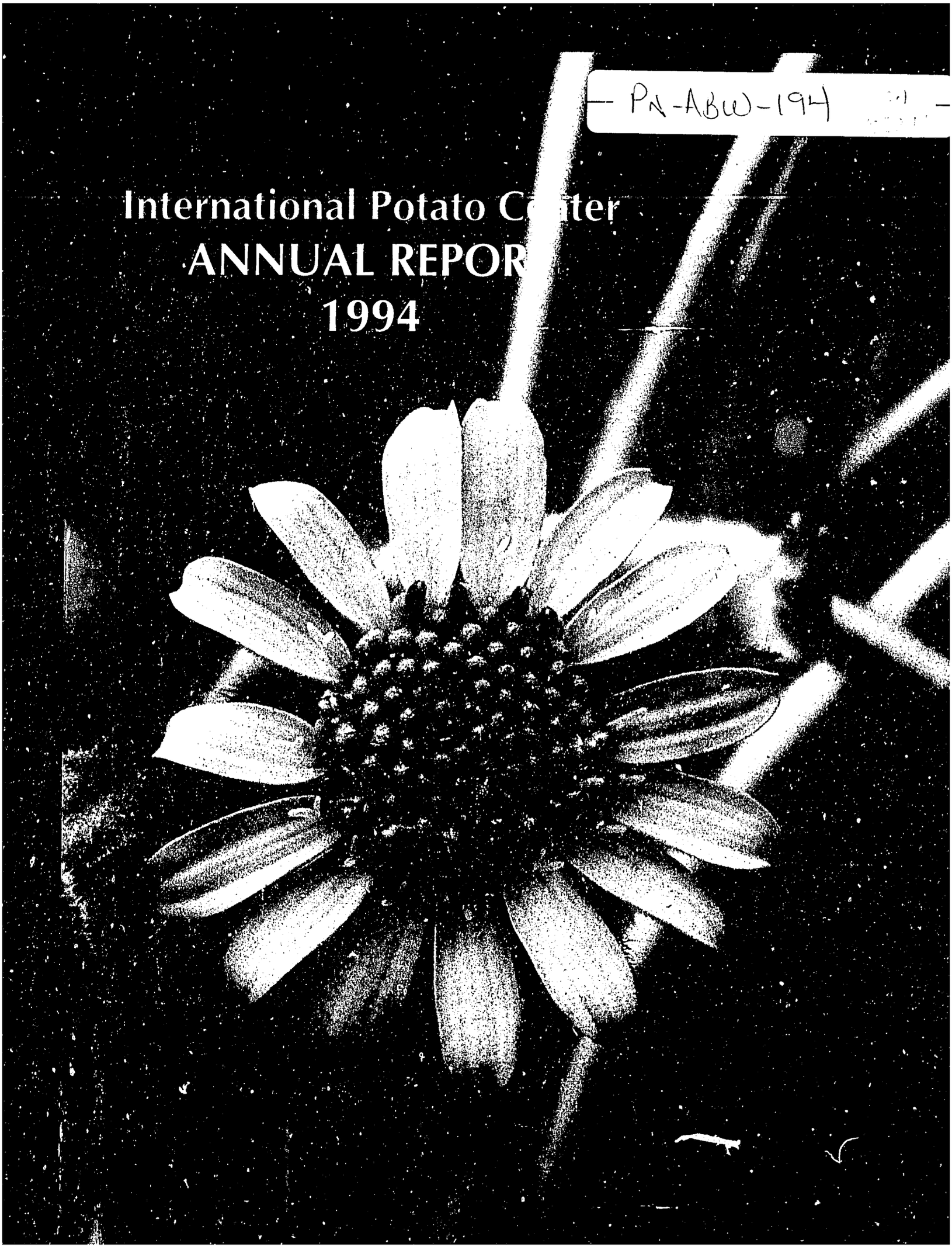
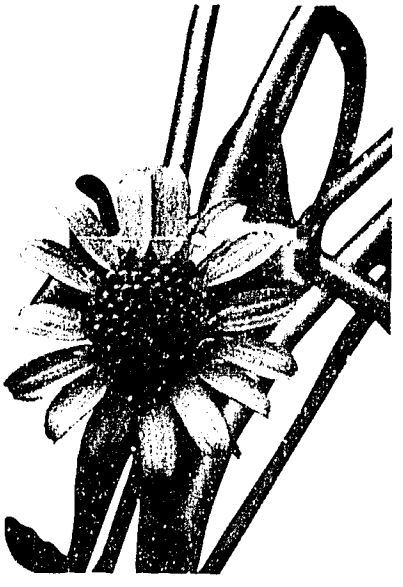
PN-ABW-194

International Potato Center
ANNUAL REPORT
1994



International Potato Center
ANNUAL REPORT
1994



Cover:
A yacón (*Polymnia sonchifolia*) flower. This Andean root crop belongs to the sunflower family. Its edible tubers, which are similar in appearance to sweetpotato roots, grow at altitudes up to 3,300 m, from Venezuela to northwestern Argentina.

Photos by
Gigi Chang

Photo right: Attacked by terrorists in 1988, CIP's highland station in Huancayo, Peru, is being upgraded to respond to new global challenges in potato research.

PN-ABW-194

CIP in 1994

The International Potato Center

Annual Report

International Potato Center
Apartado 1558
Lima 100, Peru

CIP. 1995.
CIP in 1994.
The International Potato Center Annual Report.
Lima, Peru.

ISSN 0256-6311
Press run: 2,500
Printed in Lima, Peru
May 1995

Writing/Editing:
Jack Keyser, Edward Sulzberger,
Bill Hardy, Janet Keyser, Michael L. Smith

Coordination:
Emma Martinez

Editorial Assistance:
Ana María Pérez Garland

Design and Layout:
Rubén D. Gutiérrez

Cover Design:
Cecilia Lafosse

Photomechanics:
Cecosami

Printing:
Asociación Editorial Stella

Inside matter printed on recycled paper.

Table of Contents

Introduction 4

Safeguarding the Planet's Biological Capital 8

Indonesia's Waga-Waga Community Harvests First Sweetpotatoes from Genebank 12

"Lost" Andean Roots and Tubers Travel Ancient Trade Routes 16

In Situ Conservation: A Look to the Future 20

Impact: Returns on Investment in CIP Research Projects Range from 27% to 106% 21

Pesticides Threaten Ecuadorian Farmers, But Soil and Water Are Untouched 24

The CGIAR 27

Finance and Administration 28

Donor Contributions in 1994 30

Board of Trustees 31

Staff in 1994 32

Contributions to Scientific Literature 36

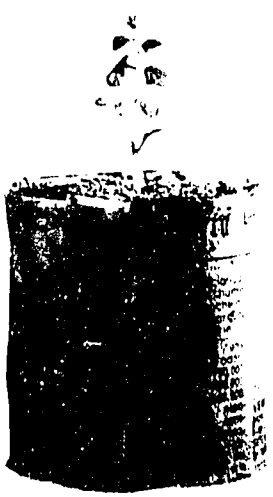
Core Research in 1994 38

Training in 1994 44

Special Country Projects and Networks 48

Acronyms and Abbreviations 50

CIP's Global Contact Points 54



Introduction

In 1994, CIP achieved greater financial stability and passed a number of important research milestones. After four difficult years, the Center is now able to plan for modest increases in scientific operations.

As readers of past annual reports know, budget cuts affecting the development community have reduced the ability of international research centers to fully meet the challenges of food security and environmental protection.

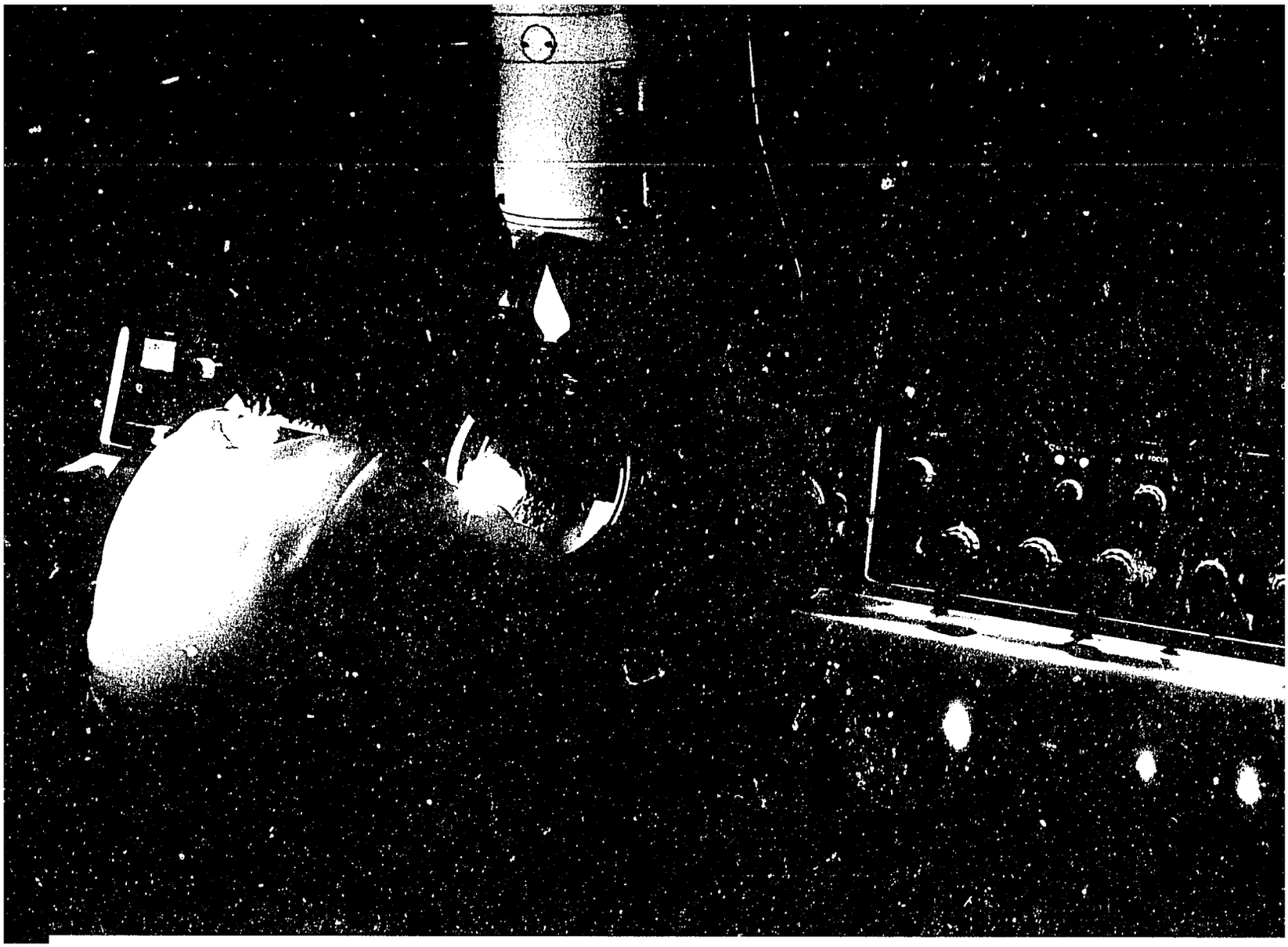
The year 1994 saw significant progress in our research program and a small increase in our investment in training. The Center's mainstay commodity work on potatoes and sweetpotatoes was marked by advances in breeding for horizontal late blight resistance and the development of true-seed hybrids. The Center's new biotechnology laboratory for advanced research on late blight and glandular trichomes began operations in mid-March. These research activities will be covered comprehensively in the Center's technical report to be published in October.

In addition, 1994 marked the first full year of operations for the CONDESAN research consortium. Still in its early stages of development, CONDESAN is helping to promote cooperation among numerous research partners in an effort to stem natural resource degradation and to create a sounder base for future increases in agricultural productivity. CONDESAN was recently designated as a core activity by the CGIAR Technical Advisory Committee (TAC).

Working at 3,800 meters, the upper limits for most types of agriculture, farmers in this Peruvian community have increased income by 30% using integrated pest management practices.

The consortium will also play an important role in the CG's new initiative for sustainable mountain agriculture to be convened by CIP. The initiative was approved following the completion of TAC's recent program and management review of the Center, which will be presented to CGIAR donors in May 1995.

In this annual report, we present updates on a range of CIP research activities.



Identification of virus diseases using electron microscopy is an impertant step toward development of virus detection practices.

We begin with an update on our work to conserve genetic resources within the context of the international debate on biodiversity. The report covers traditional genetic resources work as well as a number of novel programs involving community-level germplasm conservation and plant breeding.

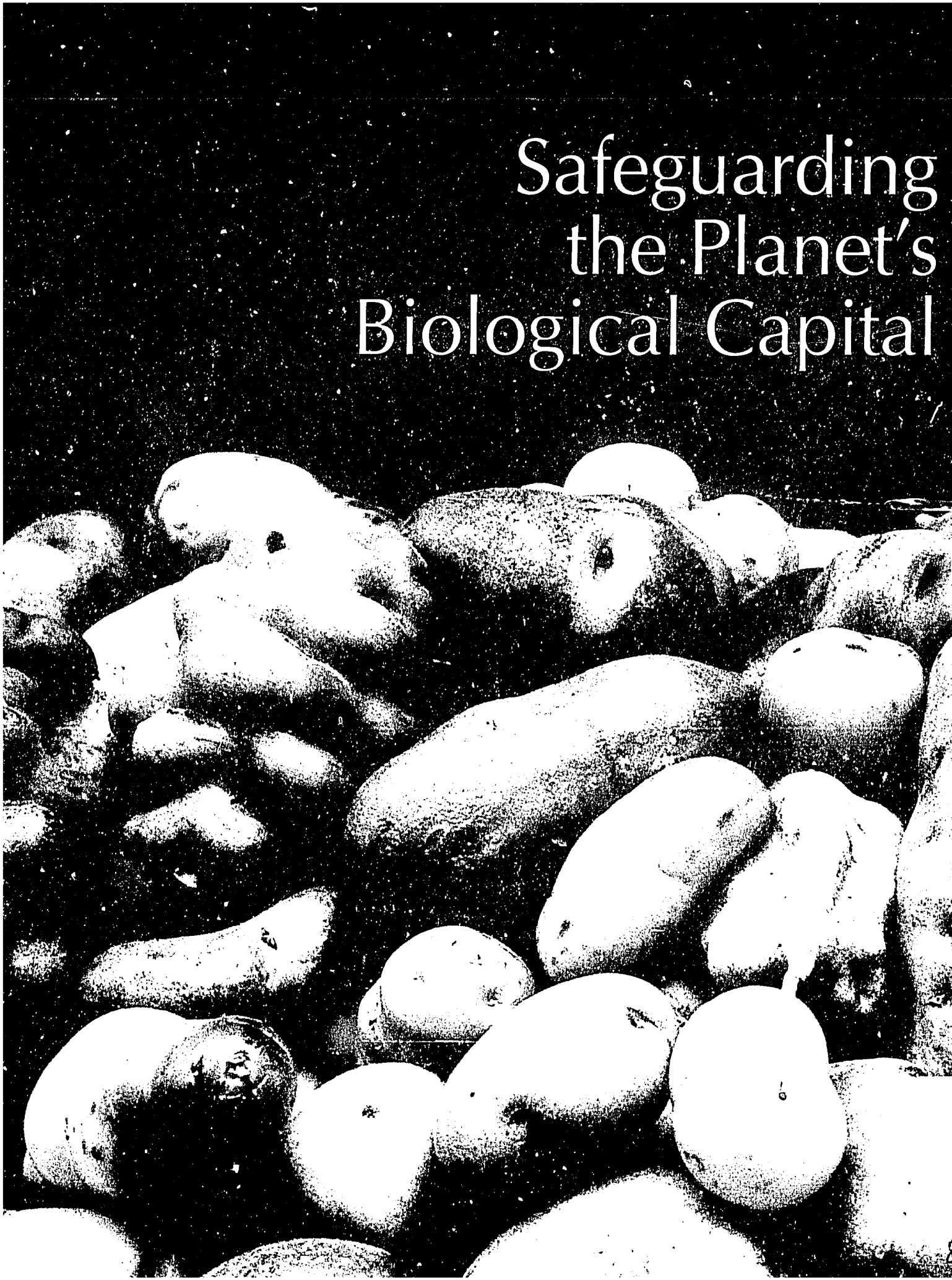
The impact of CIP projects in true potato seed, integrated pest management, and varietal development is also featured. The three case studies are part of a larger effort to document the impact of CIP research and collaboration with various partner agencies around the world.

From a CIP project in Ecuador comes a technical story that provides surprising results on pesticide pollution and its impact on the environment and health. The project illustrates the difficult choices that need to be made to balance future requirements for greater productivity, environmental concerns, and social equity. The story also points out the pressing need for more precise information about the effects of technological change and the difficulties that policy-makers will encounter when making decisions that will have consequences well into the future.

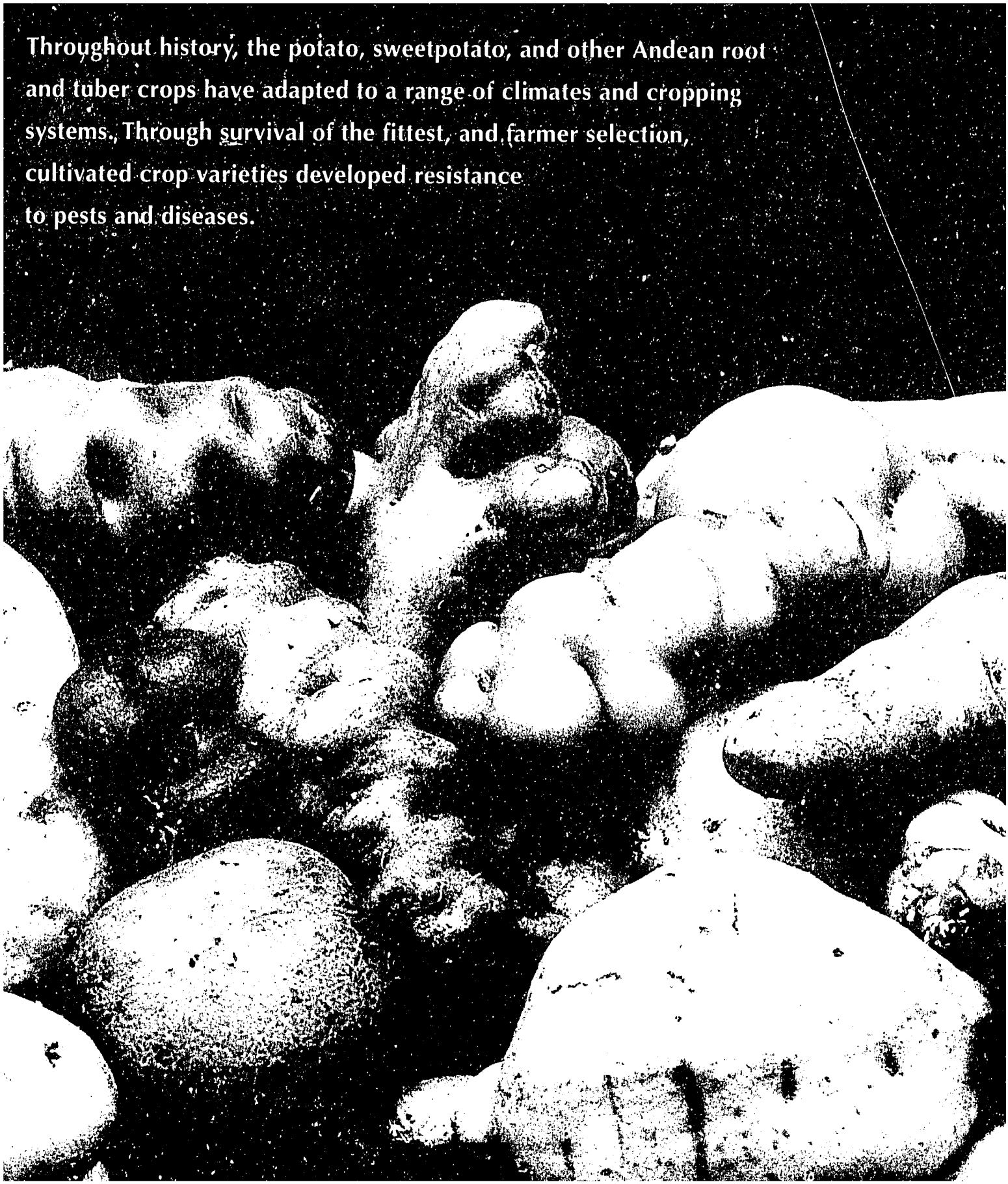
The report ends with sections on finance, staffing, governance, and other day-to-day issues. These sections provide an indication of the level of investment in CIP made by our many constituents. They include our 35 donors who continue to generously invest in CIP, our staff who provide the innovations needed to move forward on a variety of research fronts, and our cooperators in national systems and NGOs, especially in our host country Peru, who help to bring the Center's research to farmers' fields.

Hubert Zandstra
Director General
April 1995

Safeguarding the Planet's Biological Capital



Throughout history, the potato, sweetpotato, and other Andean root and tuber crops have adapted to a range of climates and cropping systems. Through survival of the fittest, and farmer selection, cultivated crop varieties developed resistance to pests and diseases.



Thousands of years ago, early farmers, such as the Quechuas in the Andean highlands and the Mayas in Mexico, selected plants that best suited their varied needs. This process led to great genetic diversity among traditional populations of potatoes and sweetpotatoes. But modern agricultural practices often mean reliance on a limited number of high-yielding, genetically uniform varieties.

Today, genetic diversity is under attack. Areas rich in plant species are being destroyed by desertification, deforestation, soil erosion, and farming itself. Uncertainty exists as to whether needed increases in world food production in the next century can be obtained without this diversity.

Over the past 25 years, the centers of the Consultative Group on International Agricultural Research (CGIAR) have accumulated the largest collection of germplasm ever assembled outside of nature. Center genebanks contain an estimated 80% of the genetic resources of major food crops grown in developing countries.

Defining a New Agenda

Until 1994, the centers managed their genetic resource work independently, without a united strategy or program. Today, they are defining a new agenda for the safekeeping of the world's vital biodiversity.

In October 1994, the CGIAR chairman, Ismail Serageldin, signed a long-awaited agreement with the Food and Agriculture Organization of the United Nations placing these priceless germplasm collections under the auspices of FAO. The CGIAR was the first major holder of food crop germplasm to sign the accord.

The pact, which establishes an intergovernmental legal and political identity for the centers' genebanks, was signed by the directors general of 12 CGIAR-affiliated centers. Hubert Zandstra signed for CIP. The agreement ushered in a new age in international cooperation for the conservation and use of plant genetic resources and established the first systemwide approach to managing CGIAR germplasm resources, which are held in trust for the benefit of humanity.

The CGIAR-FAO agreement was not without controversy. Some governments and nongovernmental organizations with environmental and development interests objected to what they saw as foot-dragging on the part of the World Bank to place the center collections under the trusteeship of FAO. The CGIAR insisted it was only following the recommendations of a special study that advised the centers to set up a systemwide network to manage germplasm resources before entering into an agreement with FAO. That has now been done. The network operates as the CGIAR Systemwide Genetic Resources Program under the direction of the International Plant Genetic Resources Institute (IPGRI).

The CGIAR program now has a steering committee to guide policies and the management of genetic resources. The centers will receive separate funding for genetic resources work, and a standardized information system and database will be developed.

Potato and Sweetpotato Accessions Maintained by CIP

Type of germplasm	Number of accessions		
	Potato	Sweetpotato	Total
Wild	1,500[a]	1,066[b]	2,566
Weedy		138	138
Native cultivars	3,694[c]	3,829	7,523
Improved cultivars	335	156	487
Breeding lines	685	1,333	1,998
Total	6,214	6,522	12,712

a. 93 wild *Solanum* species.
b. 11 wild *Ipomoea* species section Batatas,
51 wild *Ipomoea* species other sections
c. 8 cultivated *Solanum* species.

Rising Global Concerns

Even prior to the CGIAR-FAO pact, there were rising global concerns about the continuing erosion of biological diversity. The importance of reversing the alarming trend, which is undermining the world's biological capital, resulted in the United Nations' Convention on Biological Diversity, approved at the Earth Summit in Rio de Janeiro two years ago. More than 100 countries have ratified the Convention—supporting its chief goal of conserving biodiversity, and the equitable sharing of benefits arising from the use of genetic resources.

The CGIAR has offered the Convention its scientific and technical expertise and biodiversity databases. Decades-long disputes between gene-rich developing countries and gene-poor developed countries over sovereignty, access, ownership of genetic resources, and intellectual property rights are certain to be future items on the Convention's agenda.

Meanwhile, CIP scientists continue in their urgent effort to safeguard Andean roots and tubers, knowing these precious pools of biodiversity are fast disappearing. To increase the pace of the work, the Center is strengthening its use of information and training to upgrade national program capabilities. The goal is to create a network in which responsibilities for preservation, documentation, and distribution of genetic materials are broadly shared.

In this report, CIP presents updates on three current biodiversity projects, two in the Andes—the center of origin of the potato and lesser-known root and tuber crops—and another on the island of New Guinea, a secondary source of diversity for sweetpotato.

The Cost of Conservation

Genetic conservation is a painstaking, labor-intensive, and costly activity. In 1994, CIP spent $1.5 million on genetic conservation, roughly 8.2% of its $18.4 million budget. The figures include funding from the German Agency for Technical Cooperation and Swiss Development Cooperation projects, which were incorporated into the budget following the CGIAR's approval of work on lesser-known Andean root and tuber crops as a basic Center activity. The figures do not include donor investments in enhancement, cleanup, distribution, or characterization, which in 1994 totaled more than $1.0 million.

Indonesia's Waga-Waga Community Harvests First Sweetpotatoes from Genebank

In November 1994, the Dani ethnic community of Waga-Waga, in Indonesia, celebrated the first harvest from its sweetpotato community genebank. All of the farmers who participated in clearing and tilling the land shared in a feast and received a portion of the harvest of varieties selected by the community.

For CIP and Indonesian scientists, the harvest in Waga-Waga was doubly meaningful as it yielded fresh insights into the biodiversity and indigenous knowledge about the sweetpotato varieties found in the central highlands of Indonesia's Irian Jaya province.

A Secondary Center of Diversity

Researchers say the island of New Guinea (Irian Jaya occupies the western half) is a secondary center of diversity for sweetpotato. "New Guinea has enormous sweetpotato diversity concentrated in a small area and contains genetic materials that should be of use to sweetpotato breeders worldwide," says Peter Schmiediche, CIP's regional representative for East and Southeast Asia and the Pacific.

Scientists believe the crop was introduced from South America 400 years ago and developed in isolated ecological niches. During that time, evolution and local farming practices greatly broadened its known frontier. In some instances, Irian Jayan sweetpotato can be found growing at altitudes of up to 2,800 meters, considerably higher than the landraces found in South America.

"Irian Jaya and Papua New Guinea are the only places in the world where sweetpotato is cultivated under subalpine conditions," says Schmiediche. "Its adaptation to colder conditions should be extremely valuable to major sweetpotato-growing countries such as China, Vietnam, and Thailand." Growers and consumers in New Guinea have

developed huge stocks of information about its use, he says. This indigenous knowledge should also be of value in areas where sweetpotato is a major component in local farming systems, such as in northern Luzon and in the Central African highlands.

The Waga-Waga Experience

"The potential of the region's genetic material, and the knowledge associated with it, was largely untapped in Irian Jaya," says Jürg Schneider, an anthropologist who until

Feasting on traditional varieties harvested from the Waga-Waga community genebank.

Irian Jaya and Papua New Guinea are the only places in the world where sweetpotato is cultivated under subalpine conditions.

recently served as the project's coordinator.

"We found that a community garden might contain 40 cultivars, so it was apparent to us that farmers knew how to manage genetic diversity," he says. "All of these landraces have a common genetic base, but it is narrower than the one found in South America. Irian Jaya's achievement is local plant selection — selection driven by subsistence needs, not market forces or breeding criteria."

One of the initial findings of the project was that genetic erosion is taking place in

Irian Jaya because farmers are choosing faster maturing landraces. In addition, the market economy is expanding into highland areas, bringing with it other crops, such as rice. Schneider says that by moving quickly, the project is helping to prevent further erosion of both the area's genetic diversity and indigenous knowledge.

Peter Gregory, CIP's Deputy Director General for Research, adds, "Our objective as an international center is to determine why this particular community has such strong instincts for conservation of its genetic resources. The idea is to learn what the dynamics are that help its traditions survive and determine whether we can help transfer some of those elements to other locations. Community traditions will survive only if we can find ways to make local people participants in global efforts to safeguard germplasm. In doing so, we also help ensure that evolution continues under real world conditions."

Research Activities

Work officially got under way in late 1993, following several years of informal contacts with Indonesian scientists. A joint CIP-Indonesian team subsequently selected 450 sweetpotato landraces as indicative of the genetic diversity found in the area and developed a multidisciplinary approach to local research opportunities.

During field trips to Irian Jaya in 1993-94, teams of Indonesian-speaking agronomists and social scientists worked together to obtain information on tribal culture, cropping systems, and the role of women in the crop's selection-to-consumption cycle. Participating institutions included Cenderawasih University and the Central Research Institute for Food Crops.

The effort was aided by the pioneering interest of a Waga-Waga community elder with an instinct for conservation, Jordan Surabut, who began talking with Indonesian extension workers about the need to conserve local landraces as early as 1990.

Once the project got under way, Schneider says, the community selected a seven-hectare garden compound for its genebank. The area was cleared, fenced, and prepared for planting. Care was also taken to ensure that space was available for spiritual rites. An elder in charge of customary practices for land fertility was brought in to bless the field.

The first planting took place in February 1994. For the harvest the following November, Surabut invited elders from neighboring communities, who now want to get involved in preserving varietal diversity.

"Although our perception of what's going on may be quite different from theirs," Schneider says, "I am convinced that continuing this activity in community conservation is invaluable." Having the community involved in the conservation of its genetic resources is a gateway to its participation in future research.

"We believe indigenous knowledge associated with varieties can help determine desirable attributes more efficiently," Schneider contends. "In the case of Irian Jaya, farmer knowledge should help us identify cold-adapted varieties, or ones that are suited to different soil or storage conditions."

"We don't pretend to understand all of the factors at work in Waga-Waga," adds Gregory, "but we are learning fast."

Irian Jaya: a secondary center of diversity for sweetpotato.

CIP-24: A Well-Traveled Potato

CIP-24, a moderately disease-resistant potato clone, and one of China's most widely grown cultivars, was more than 40 years in the making by potato breeders on four continents.

"This example," says CIP Director General Hubert Zandstra, "shows how the free exchange of genetic material and information can translate into impact in farmers' fields."

According to CIP scientist Peter Schmiediche, the first crosses leading to CIP-24 were made in Germany in the 1950s using wild potato material of unknown origin. It was part of a collection assembled in the 1930s. An early set of seeds obtained from crosses between wild species and European cultivars was eventually sent from Germany to Argentina for further crossbreeding.

This German material was crossbred with varieties well adapted to the main producing regions of Argentina. One cross made in 1971, with parentage that included the first nationally bred potato variety released by Argentina in 1946 and two varieties released by the U.S. Department of Agriculture in the 1930s and 1940s, eventually became CIP-24. The evaluation of the variety was completed in 1979 and it was subsequently released in Argentina as Achirana-INIA (after a famous Incan irrigation canal, Achirana, in Peru). It was not a popular variety with Argentineans, and its planted area never exceeded a few hectares annually.

In 1976, CIP seed specialist Jim Bryan recognized Achirana as a clone with a potential for developing countries. It subsequently came to CIP headquarters in Peru for additional disease testing, evaluation, and distribution. After promising results in Latin America, the clone was sent from CIP to Australia for disease elimination and further distribution in Asia.

CIP-24 was introduced from CIP into China in 1978 by the Chinese Academy of Agricultural Sciences (CAAS) as an in vitro plantlet. Propagation and initial field trials were conducted by the Wumeng Agricultural Research Institute in Inner Mongolia. After multiplication, the test plantlets and original seeds were distributed to many areas in northern China.

Cultivar CIP-24—40 years in the making—now covers more than 150,000 hectares in China.

By 1993, the variety had been released in 12 tropical or subtropical potato-growing countries ranging from Madagascar to Bhutan. The cultivar is currently grown on more than 150,000 hectares in China.

CIP-24 is also helping Chinese potato farmers deal with drought. Chinese scientists say the variety yields substantially more in drought years than do local cultivars. In Inner Mongolia, where annual rainfall averages between 400 and 600 millimeters, CIP-24 produces steady yields of 10 tons per hectare in poor years and as much as 20 tons per hectare in good ones. It is also commanding good prices, which is one reason it can be found in distant markets, such as those in Guandong province near Hong Kong.

"Lost" Andean Roots and Tubers Travel Ancient Trade Routes

Researchers from Ecuador, Bolivia, Peru, and Brazil completed the first year of a five-year project in 1994 to collect, preserve, and use nine of the lesser-known Andean root and tuber crop species (see box).

"Until now, there has been little international interest in these crops," says Miguel Holle, the project coordinator. "A lot of research has been done, but it's been isolated pockets, and funding has been almost nonexistent."

Holle notes that the project combines conservation efforts with production and utilization research. Some 160 scientists from 22 institutions are receiving grant money from the project. For many participants, it represents their first opportunity to work as part of an international team and to share information and data.

Genetic Erosion May Not Be Widespread

Scientists in Bolivia have uncovered information indicating that genetic erosion of Andean root and tuber crops may not be as widespread as previously believed. Project researchers found that some varieties of oca, ulluco, and arracacha move long distances along trade routes dating back to precolonial times. It was previously thought that these root and tuber varieties were distributed mainly through bartering in local markets and rarely, if ever, spread more than 25 kilometers from their point of origin. New evidence has emerged that a number of varieties can be found up to 500 km away. On the eastern side of the Bolivian Andes, varieties thought to have been lost were found in distant villages that were loosely linked through informal trade.

Lesser-known Andean Root and Tuber Crops Maintained by CIP

Crop	Number of accessions
Oca (*Oxalis tuberosa*)	395
Ulluco (*Ullucus tuberosus*)	418
Mashua (*Tropaeolum tuberosum*)	53
Maca (*Lepidium meyenii*)	33
Yacón (*Polymnia sonchifolia*)	30
Arracacha (*Arracacia xanthorrhiza*)	24
Achira (*Canna edulis*)	20
Mauka or chago (*Mirabilis expansa*)	2
Ahipa (*Pachyrhizus* spp.)	2
Total	977

LESSER-KNOWN ANDEAN ROOTS AND TUBERS: DIETARY STAPLES IN THE HIGHLANDS

Nine Andean species with edible roots and tubers have economic and nutritional importance to subsistence families in the Andean highlands. Many of these crops are used as substitutes for expensive fruits and vegetables in the diet.

In the late 1980s, CIP began a program to rescue wild and domesticated Andean root and tuber species threatened with biological extinction or genetic erosion. They include:

Ahipa
***(Pachyrhizus* spp.)**

Ahipa, a close relative of the popular jicama, has received almost no agronomic attention to date. Usually eaten raw and in salads, its leaves and stems are toxic. Its roots are thought to have insecticidal properties.

Conservation and characterization of wild species: in the foreground (with yellow flowers), a wild yacón accession.

Brazil and Ecuador Exchange Germplasm

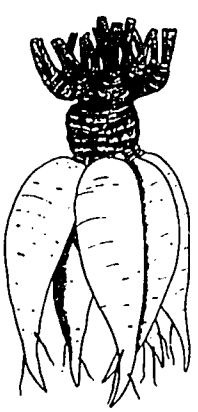
Brazil, a major producer of arracacha roots used in baby food, is providing project scientists in Ecuador with improved short-duration arracacha varieties. Native germplasm can take up to 10 months to produce a crop; Brazilian varieties can be harvested in just 7 months. Ecuador is providing native materials for Brazil's arracacha breeding program and is serving as a conduit for the exchange of native and improved germplasm with countries outside the Andes.

Reintroducing Genetic Material

In the past, farmers have usually received genetic materials from researchers in the form of single, genetically distinct cultivars. At the University of Cusco in Peru, researchers assembled, and are distributing to farmers, a mixture of clones. For example, all known yellow-colored ulluco cultivars (yellow is considered a desirable characteristic by local farmers) are being grouped and distributed. The objective is to reintroduce large numbers of varieties into farmers' fields and provide local producers

Ulluco
(Ullucus tuberosus)

Ulluco is one of the most widely grown and economically important tuber crops in the Andean region. It contains substantial levels of protein, calcium, and carotene. Local women believe that ulluco eases childbirth.



Arracacha
(Arracacia xanthorrhiza)

Arracacha is related to carrot and celery. The economically valuable part of the plant is its starchy storage root, which resembles a white carrot. Food companies process arracacha roots into a number of baby foods.

Oca
(Oxalis tuberosa)

Oca, a perennial herb, is traditionally eaten in soups and stews. Evidence from historical accounts indicates that it was a major Andean staple in pre-Columbian times. Yields of oca tubers often equal or exceed those of potato.

Mashua (*Tropaeolum tuberosum*).

Our knowledge of these crops and their biodiversity is progressing rapidly thanks to the efforts of these scientists.

with the opportunity to select cultivars that perform best under their conditions.

Detecting Viruses

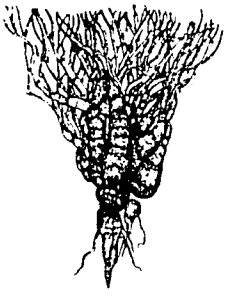
Work is progressing on development of laboratory procedures for detecting viruses in oca, ulluco, mashua, and maca. The procedures are needed for seed certification programs and for export quarantine purposes. In potato, the elimination of viruses in planting material usually results in automatic yield increases of 30%. In the case of Andean root and tuber crops, no one knows what effect viruses have on production. Tests are currently under way in Ecuador, Bolivia, and Peru to determine the precise impact of virus diseases on these crops.

Ulluco Varieties Released in Ecuador

Two ulluco varieties were released in Ecuador and distributed to farmers. The regulations for releasing a crop variety in Ecuador are rigorous, requiring extensive data from multilocational testing in farmers' fields. The releases are believed to be the first instance of an Andean root or tuber crop officially sanctioned by government. Peru's national program is planning to release its own varieties in 1995 using similar procedures. Ulluco has drawn attention from producers and policy-makers because of its

Maca
(Lepidium meyenii)

Maca is traditionally cultivated at the upper altitude limits for agriculture. Its roots are believed to possess fertility-enhancing properties. Andeans believe it improves physical and mental capacities.



Mauka
(Mirabilis expansa)

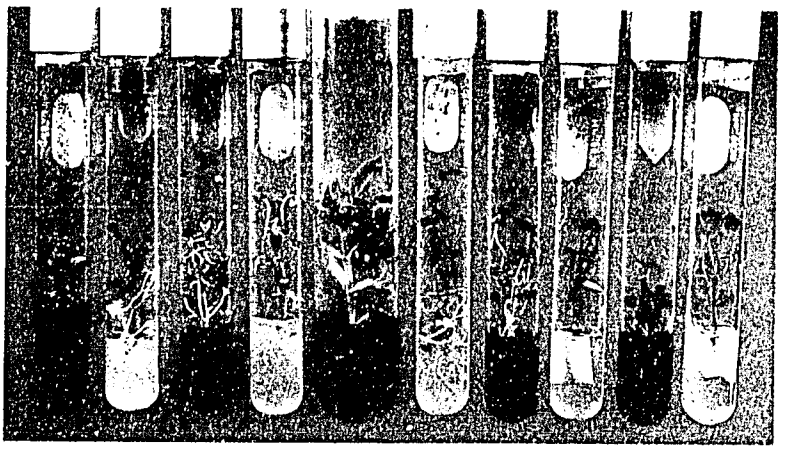
Mauka was rediscovered by scientists only in the mid-1960s. Its roots are only eaten after exposure to sunlight, which induces sugar production. The roots are flavorful and are high in carbohydrates and proteins.

Bolivian Germplasm Returned

The recent return by CIP of 165 Andean root and tuber accessions to Bolivia demonstrates the value of genebank storage and germplasm conservation.

Much of the material returned by the Center from its Andean root and tuber collection in Quito, Ecuador, had disappeared from the Bolivian collection years ago. The shipment, which was returned in the form of in vitro plantlets, included many rare varieties of oca, ulluco, and mashua.

Much of the material was collected by Finnish researchers in the late 1980s and placed in the CIP storage facilities in Quito for safekeeping.



yield potential—up to 50 t/ha—and high consumer demand.

New IPM Measures Needed

Researchers have assumed that weevil pests that attack oca behave similarly to those that infest potatoes. However, the integrated pest management practices for the control of Andean potato weevils proved inadequate for a related species that attacks oca. Researchers in Peru are currently developing control practices that reduce oca weevil infestation and significantly diminish farmer dependence on pesticides.

Primary Outcome

According to CIP Director General Hubert Zandstra, the most important result of the past year was that scientists from a wide range of institutions in the Andean region began working collaboratively to collect, conserve, and characterize lesser-known Andean root and tuber species. "Our knowledge of these crops and their biodiversity is progressing rapidly thanks to the efforts of these scientists."

Mashua
(Tropaeolum tuberosum)

Mashua, a root high in protein, thrives on marginal soils and is believed to contain high levels of compounds with medicinal and pest-repellent properties. It is infrequently consumed by men because of its reputed effects as an antiaphrodisiac.

Achira
(Canna edulis)

Achira, a little known species from the warm Andean valleys, produces a starchy corm that is processed into high-value flour. In Vietnam, achira is increasingly used to make high-quality, premium noodles.

Yacón
(Polymnia sonchifolia)

Yacón is a distant relative of the sunflower. It is not grown for its seed but for the edible roots, which are sweet and low in calories and are eaten raw. Yacón contains inulin, a natural sugar substitute, which is of considerable value to dieters and diabetics.

In Situ Conservation: A Look to the Future

In a project with broad implications for the future of biological diversity in the Andes, plans are being developed to help farmers reestablish and conserve wild ancestors of Andean potatoes and other exotic root and tuber crops in their native habitats. The proposed project, when fully funded, will be the first major effort to establish in situ, or on-farm, conservation for nine Andean root and tuber crops.

Wild Potato Restoration

For potatoes, the project will establish protected areas to help restore some of the most important wild species currently preserved in genebank collections. To identify these sites, participating scientists from CIP and national programs will use information obtained from the Inter-Genebank Potato Database, which covers all cultivated and wild potato species. This information will be used to identify "hot spots," or areas where the greatest number of wild species were found by previous collecting expeditions.

Project scientists will then conduct surveys to determine the status of biodiversity and the degree of genetic erosion in each hot spot. These efforts should provide the scientific basis for extensive in situ restoration of the species that originally grew in hot-spot areas.

Growing among the cacti, a wild potato, *Solanum bukasovii*, is a candidate for reintroduction into diversity hot spots.

Community Plant Breeding

In what may well be the most novel component of the project, scientists will also help farmers use botanical seed—or true potato seed—to select new cultivars according to local needs and preferences. The use of true seed, commonly known by its acronym TPS, will give farmers a measure of crop insurance against drought and frost.

When TPS is used for breeding, there is great variation in its offspring. The project will encourage farmers to use this natural variability to select genetic materials that solve local problems. For example, farmers whose crops are infected with potato wart will be able to select resistant clones. This should reduce their dependence on imported seed, help increase genetic diversity, and reduce the need for chemical sprays.

In addition, by using TPS, local communities can flush out yield-reducing viruses, a procedure that can now be done only in laboratories. The project will also help determine the tolerance or preference of communities for nonuniform crops, while maintaining genetic diversity.

Virus Eradication

For traditional farmer cultivars, or landraces, project scientists also plan to step up efforts to eradicate viruses and other diseases in all existing potato accessions currently held in trust in CIP's World Potato Collection. Virus-free duplicates of traditional cultivars will be provided to national genebanks according to country of origin.

A similar service will also be provided for the lesser-known Andean root and tuber crops. Studies are currently under way at CIP to develop diagnostic techniques and determine the most efficient way to eradicate the viruses that attack these crop species. This research will closely resemble past successful efforts by CIP virologists working with potatoes and sweetpotatoes.

Impact: Returns on Investment in CIP Research Projects Range from 27% to 106%

In 1994, CIP economists completed work on a series of nine impact case studies covering the Center's work in varietal improvement, integrated pest management, and improved seed technologies. The case studies represented a small but important cross section of CIP research and related technologies.

According to Center economist Thomas Walker, calculated returns on investment for the different studies range from 27% to 106%. Walker notes that the figures are extremely conservative. The table (upper right) shows the annual internal rates of return (IRR) and net benefits for each study. Normally, a return on agricultural research that tops 30-50% annually is considered successful.

CIP Impact Case Studies

Topic	Location	IRR (%)	Net Benefits ($ million)*
Late blight breeding	East Africa	92	11.0
Late blight breeding	Peru	27	9.0
CIP-24	China	106	5.0
Integrated pest management	Tunisia	64	2.0
Integrated pest management	Dom. Republic	29	0.3
Integrated pest management	Peru	32	0.6
True potato seed	India	37	200.0
Rapid seed multiplication	Vietnam	81	0.5
Seed program development	Tunisia	81	2.0

*At project maturity.

Impact Case Studies

The figures are even more encouraging, Walker believes, when considered over the longer term. "If you take the total investment in CIP since its inception and compare it with the actual and projected impact of the technologies studied, you're likely to see an annual 11% return in the year 2010." In 1994 dollar terms, an 11% annual return will equal approximately $230 million.

"Still, you can't compare impact of potatoes and sweetpotatoes with the success of high-yielding cereal crops in the 1960s and 1970s," Walker says. At the time, the harvest index for wheat and rice could be readily increased and both crops were genetically easier to work with than roots and tubers.

CIP's Deputy Director General for Research, Peter Gregory, adds, "We knew that the Center had had impact, but we never tried to systematically measure or document it. The 1989 external review pointed out the need to begin documenting our work. Because no systematic impact assessment had been done, we were also having problems estimating ex ante impact in our priority-setting. The nine case studies, which represent about a third of the projects that we think have had an impact in developing countries, should help resolve this problem."

The following are highlights from three of the case studies.

True Potato Seed in India

In India, CIP scientists and colleagues from the Central Potato Research Institute have developed true potato seed (TPS) hybrids that provide a low-cost, effective alternative to traditional seed systems. Potatoes are normally produced by planting part of last year's crop or by using imported seed tubers. TPS is derived from the small fruits produced by the flower of the plant.

Hybrid TPS production is growing rapidly in India, backed up by proven parental lines, standardized production techniques, and strong public and private-sector interest. The new hybrids yield nearly 25% more than the country's most popular clonal varieties.

Studies showed income benefits to farmers who have switched to TPS. The use of seedling tubers grown from true seed nearly doubled income per hectare compared with conventional tuber seed. By the year 2015, CIP scientists estimate that 18% of the potato growing area in India will be planted to TPS-derived materials. This would represent more than 250,000 hectares and would make India the world leader in TPS production and use.

An estimated 20 tons of TPS will meet national demand. Estimated net benefits from ex ante analysis project conservative returns of $200 million annually.

Sex Pheromones

The case studies found that integrated pest management (IPM) has been one of the most productive areas of collaborative research between CIP and national agricultural research systems (NARS). In the Dominican Republic, estimates from 31 sweetpotato fields sampled in 1991 indicate average losses of 39% from weevil infestation, a figure that translates into 40% decreases in gross income for farmers. Average estimated incidence and severity of damage were calculated at $300 per hectare.

CIP's pilot IPM project in the Dominican Republic emphasized a variety of control measures, including crop rotation, deep plowing, timely weeding, and the use of sex pheromone traps. Sex pheromones are produced by females of many insect species to attract males for mating. Experiments showed that placing the pheromone in a used plastic container filled with soapy water made for an efficient and economical trap. For farmers, pheromone traps proved to be an attractive option because of their effectiveness and low cost—each trap costs about $2.75, for a total cost of $11 per hectare.

Initial acceptance of pheromone traps was encouraging. By 1993, 15% of all sweetpotato fields in the Dominican Republic were protected by the traps. Reported thefts of pheromone dispensers attested to demand. Benefits were calculated from farmers' fields monitored in 1993 and 1994.

On average, farmers who practiced IPM produced slightly higher yields, but also experienced substantially less damage than other farmers. Without pheromone traps, damage was 1.8 t/ha; with the pheromones, damage totaled just 0.7 t/ha. The economic value of a 1.1 t/ha gain was approximately $110 per hectare.

CIP scientists believe that half of all sweetpotato in the Dominican Republic will be grown under pheromone protection by 1997. In that event, the net benefit from research should reach $300,000 annually by the year 2000.

CIP-24

Potato variety CIP-24 (see *A Well-Traveled Potato*, page 15) was introduced into China in the late 1970s and experienced rapid expansion starting in 1984. Conservatively estimated, net annual benefits in just three provinces reached $1 million in 1987 and $4 million by 1990; current benefit estimates through the year 2000 are approximately $5 million annually. This figure represents an average yield increase of 3 t/ha. In China, potatoes are valued at approximately $35 per ton,

Bottle sex pheromone traps (right) drastically reduce damage caused by sweetpotato weevils (left).

True potato seed: each berry contains up to 400 seeds.

probably the lowest price for the crop anywhere in the world.

Long-range prospects for the variety are considered to be good. CIP-24 has excellent agronomic characteristics in China's northern and southern potato-growing regions, although its relatively long growing period makes it a problem in multiple cropping systems. Its high tolerance of drought and resistance to some diseases are important in poorer areas with low rainfall. The cultivar's low rate of degeneration also makes it attractive to farmers who retain seeds over long periods of time.

Copies of the CIP impact case studies are available upon request from the Center's Social Science Department.

Potato Varietal Releases: A Study in Slow Motion

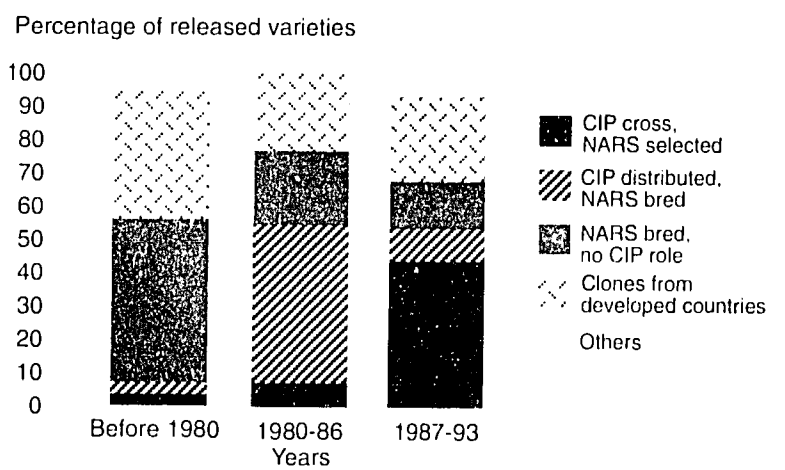
In Europe and North America, the potato varieties that people eat today are much the same as those their parents and grandparents ate years ago. The most popular potato variety in the United States, Russet Burbank, was bred in 1872.

The story in developing countries is quite different. CIP economist Thomas Walker notes that over the past 20 years, developing countries have proven themselves more likely to release and use new varieties than industrialized nations.

In Europe and North America, market forces and a dependence on agrochemicals have virtually locked older varieties into place. This is not so, however, in the developing world, where farmers are eager to experiment with less chemically dependent breeding lines.

Potato varieties released in the 1970s and early 1980s, Walker says, came almost exclusively from clones bred in industrialized countries and, to a lesser extent, from national breeding programs (see Figure). By the mid-1980s, however, NARS-bred clones—identified and distributed by CIP—accounted for almost half of all developing-country varietal releases.

Currently, materials selected from CIP-bred populations account for about 40% of all such releases, a figure that Walker believes will rise substantially as the superior qualities of CIP-bred parents—in particular their disease and pest resistance—become better known.



Pesticides Threaten Ecuadorian Farmers, But Soil and Water Are Untouched

In the fields above San Gabriel in the mountains of northern Ecuador, a farmer with a backpack sprayer applying a pesticide to a potato crop is a common scene.

This scene, repeated daily on millions of farms throughout the developing world, poses a dilemma. It has polarized two important interest groups – environmentalists and agriculturalists – and locked them in a bitter policy struggle.

In recent years, the debate on the sustainability of modern agricultural technology has increasingly focused on health and environmental issues. Concerns include depletion of natural resources, soil erosion, water pollution, deforestation, and the contamination and poisoning caused by agricultural chemicals. The dilemma is how to balance agricultural development that includes the use of chemical inputs with the demands of sustainable agriculture that is environmentally sound.

The issue is not just an academic question in Ecuador. Environmental groups there claim that potato farmers who use chemical pesticides are poisoning the environment. Based on these arguments, the environmental lobby has recommended banning numerous pesticides, including insecticides used to control the Andean potato weevil, the most devastating potato pest in the Andes. The farm lobby opposes this proposition.

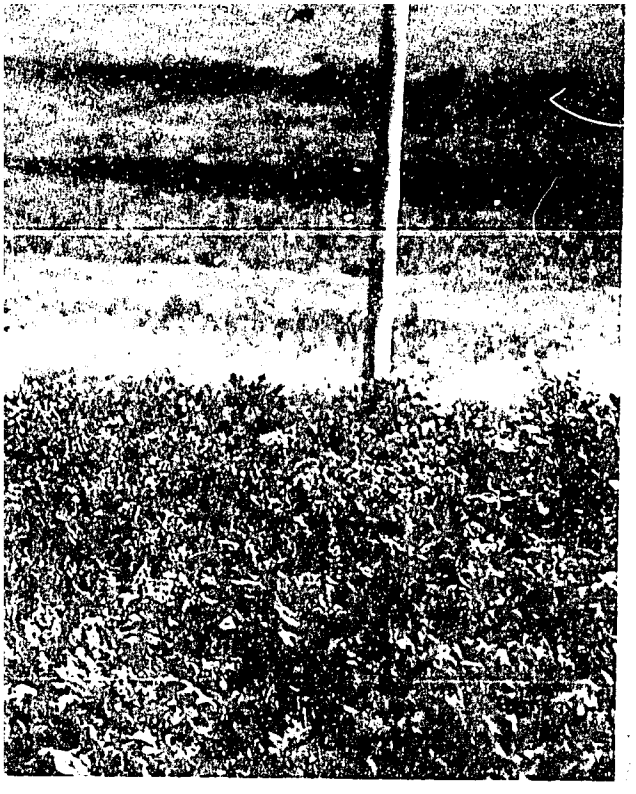
Classic Agriculture-Environment Conflict

Charles Crissman, a CIP economist, says that the Ecuadorian situation is a classic agriculture-environment conflict – the trade-off between agricultural production and environmental quality. With powerful interests on both sides, the issue will in all eventuality be decided in the political arena. Unfortunately, issues such as this are characterized by a lack of solid information on the size of potential trade-offs. For example: How much agricultural production must be given up to improve the environment or health? Politicians, who intuitively understand trade-offs, frequently operate without the information needed to back up their decisions.

Addressing the environment-agriculture dilemma, the CGIAR is encouraging its member institutions to incorporate issues of sustainability into their research agendas. One response of the CGIAR centers has been to initiate research programs based on agroecosystems rather than on commodities alone.

In a recent research project headed by Crissman, the Center looked at yield and the environmental and health impacts of pesticide use in potato production in the San Gabriel area. Besides shedding light on the ongoing Ecuador debate, the research is valuable for the Center, whose principal charge is to generate improved agricultural technologies, especially for poor farmers.

"New technologies can increase crop yields and farm incomes, but they can also have indirect or 'off-site' impacts," Crissman says. "These latter impacts have become more important in evaluating new technologies and returns to research. For example, the largest benefit of integrated pest management (IPM) may not be fewer crop losses, but rather the reduced contamination from less insecticide use."



White patches on a farmer-volunteer are used to measure exposure to pesticides.

Pesticide Impacts

For the study in northern Ecuador, CIP scientists are working with counterparts from Ecuador's Catholic University, Montana State and Cornell universities in the United States, and McMaster University in Canada. Together they have designed a research method to provide an extensive analytical backdrop that combines field-level relationships among farm management practices, the environmental characteristics of the land, and nonpoint pollution with impacts on human health. To be useful for policy analysis, the research methodology was designed to make a link between human health and the physical changes in environmental and resource quality attributable to agricultural practices.

The basic premise was that a well-known economics tool, benefit-cost analysis, could provide the framework to combine disciplinary models and data for policy analysis. A research team of soil scientists, epidemiologists, medical doctors, and agricultural economists applied the model in research that focused on groundwater pollution and farm worker poisonings.

An Eightfold Increase in Pesticide Poisonings

Working in two adjoining watersheds in San Gabriel over a two-year period, researchers found that when potato farmers used combinations of chemical pesticides to control the Andean weevil and late blight, the amount of pesticides leaching out of the potato root zone was well below World Health Organization standards, even in worst-case scenarios. The combined effects of the high organic matter content of the volcanic soils, the short half-life of the active ingredients of the compounds used, and the light rainfall pattern moved the chemicals slowly through the soil, where they bound with the organic matter and degraded relatively rapidly.

The experimental results thus refute the arguments of the environmental lobby. In potato production similar to that of the study site—which includes most of Ecuador—environmental contamination from pesticides is minimal.

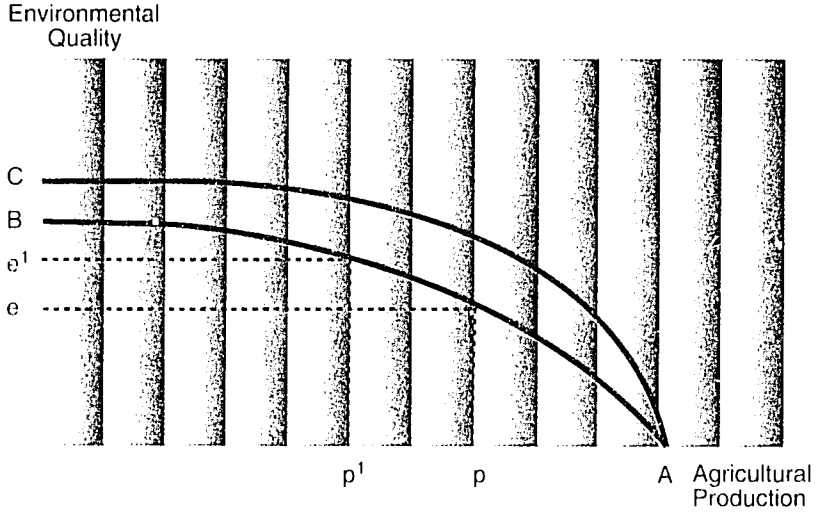
These results, however, fail to consider health impacts. Following up on poisonings reported by health care providers, the research team found that there was an eightfold increase in the rate of reported pesticide poisonings in the San Gabriel region—from 21 cases per 100,000 persons to 171 per 100,000. Further follow-up showed that the majority of these cases were men engaged in pesticide spraying. Tests of San Gabriel spray operators showed a consistent pattern of chronic rash and central nervous system damage from pesticide residues absorbed through the skin, specifically the hands.

Results from models shed considerable light on the Ecuador debate. "Pesticide use in potato production is not contaminating the environment," Crissman says, "but is poisoning a large segment of the rural population. The policy prescriptions are thus markedly different for these different outcomes. Instead of an environmental policy outcome such as water quality regulations, what is recommended are public health policies such as health education programs."

Environmental and Production Trade-offs

Despite information gleaned from disciplinary models, policy-makers frequently confront the problem of how much production should be sacrificed to achieve environmental or health goals. Trade-off possibility frontiers are a practical tool for making that decision (see figure).

The slope of the trade-off possibility frontier tells policy-makers how much environmental quality must be traded for an increase in agricultural output. The research conducted in northern Ecuador provides empirical estimates of trade-off possibility limits.



Trade-off frontiers are frequently used to illustrate concepts of efficiency, choice, and technological change. This figure shows that for an improvement in environmental quality from e to e¹, the community must sacrifice agricultural production from p to p¹. Whether a one-unit improvement in the environment is worth two units of lost agricultural production is a decision for policy-makers. In the case of the San Gabriel study, a new late-blight-resistant potato variety that requires less fungicide should cause the frontier to shift outward from AB to AC. The result would be a higher level of environmental quality for the same level of production.

A serious limitation for making environmental research compatible with policy analysis is the unit of measurement by which the models operate. A soil scientist typically works at the plot or field level whereas policy analysis is conducted at the national or regional level. The problem is one of aggregation, that is, how to aggregate up from a field-level observation to a unit compatible with policy analysis. In the framework of the San Gabriel study, models were used to measure probability distributions representing phenomena such as weather, physical characteristics of the field, pesticide applications, and input and output prices. These probability distributions are incorporated into the integrated simulation model, which permits a series of "what if" questions.

The "what if" questions can include scenarios of different economic policies such as taxes on the pesticides, price supports for potatoes, or changes in technology such as the introduction of varieties with resistance to late blight or IPM practices. By inserting these changes into the integrated simulation model, a series of point estimates of agricultural output and environmental or health quality is produced. These points are connected, thus creating the trade-off possibility frontier.

Questions of sustainable agriculture lead to considerations of off-site effects of agricultural practices that lead to concern for the state of the ecosystem in which agriculture operates. CIP has recently begun research on these phenomena. This set of problems is distinct from that of resolving commodity-related problems with experimental trial-type agricultural research and calls for new thinking on methods. The research on pesticide impacts in Ecuador is illustrative of possible new research methods. These methods still use the well-established strengths of disciplinary research, but new meaning is given to the word "interdisciplinary" when disciplinary concessions are made to accommodate different units of measurement, making it possible to integrate the results of one disciplinary model into another. The other obvious difference is the use of modeling, including both deterministic and probabilistic models in statistical and simulation analyses. In extremely diverse ecosystems such as the high Andes, experimental trial approaches are expensive and time-consuming. Modeling that can be extrapolated across broader areas may be a more efficient way to spend research money.

The CGIAR

A Renewal of the International Agricultural Research System

For nearly a quarter century, the CGIAR—the Consultative Group on International Agricultural Research—has been one of the most effective means for advancing sustainable agriculture and food security in developing countries.

A voluntary consortium of some 45 private and public donors, CGIAR provides funding for 16 international agricultural research centers. In 1971, it began by supporting a nucleus of four centers working on the production of the basic food crops grown in tropical areas. CIP was accepted as a CGIAR center in 1972. Today, the CG system also includes research on livestock, forestry, fisheries, irrigation, policy, and institution building.

By taking advantage of the scientific breakthroughs of the Green Revolution, the CGIAR quickly became a leading research contributor in efforts to meet the challenge of global hunger and poverty. Later, the centers responded to international concerns for safeguarding dwindling natural resources and achieving environmentally sustainable development.

Today, the CGIAR is undergoing a process of renewal involving the development of more sharply focused research priorities, improved governance, and greater efforts to promote scientific partnerships. To those ends, the system's three co-sponsors—the Food and Agriculture Organization (FAO) of the United Nations, the United Nations Development Programme (UNDP), and the World Bank—have appealed to supporters for assistance. Led by the World Bank's one-time special financial package approved in 1994, government agencies, multilateral donor organizations, and private foundations are responding to the CGIAR's financial needs for a long-term commitment to meet global food demand that is expected to double by 2025.

Developments at CIP reflect the changes taking place in the CGIAR system. Drawing on its extensive germplasm collections, CIP has made impressive gains in the sustainable improvement of potato and sweetpotato worldwide, while incorporating environmental concerns into its programs and worldwide networks.

Today, with an international emphasis on ecoregions, CIP is ready to use its extensive experience in mountain agriculture to convene projects involving a variety of partners, including CGIAR centers, national systems, nongovernmental organizations, and the private sector. The work will promote more sustainable agricultural systems in the Andes, Himalayas, and highlands of East Africa.

Finance and Administration

CIP made special efforts in 1994 to maintain the strength of its potato and sweetpotato commodity programs, while carrying out new responsibilities in tropical mountain ecologies.

The Center's response to Agenda 21 and to other international efforts to sustain environmental quality has resulted in a small program for threatened Andean root and tuber crops focused on preserving their biodiversity in mountain regions. CIP also became the convening center within the CGIAR for a global research program on Sustainable Mountain Agricultural Development.

The Center's financial health brightened considerably after three consecutive years of downsizing, the retirement of outstanding debt, and improved conditions in Peru. CIP is now well poised to meet future challenges. The Center's total core budget for 1994 was $15.4 million, up from $15.6 million in 1993. The increase was partially due to pledges for new core activities in mountain agriculture and a restricted core activity for sweetpotato research in Southeast Asia. In addition, the Center shifted – at the request of the CGIAR – more than $2 million in complementary funding into its core budget, thereby allowing the World Bank to release new funding to other centers. Complementary funding totaled $5.7 million, bringing the Center's total revenues to $24.1 million.

Operating expenses increased in 1994 because of inflation in many of the countries where the

Facsimile screen from CIPFIS, CIP's on-line project-based budgeting system.

CIPFIS Analysis of Budget Status 1995

2	Level 1:		Research Management
203	Level 2:		Research Support
20302	Level 3:		Huancayo
503	Expenditure:		Supplies

Month	Debit	Credit	Expenditure	Accrual Expend.
January	14,511.28	7,519.05	6,992.23	6,992.23
February	7,312.39	1,790.62	5,521.77	12,514.00
March	5,843.42	1,720.90	4,122.52	16,636.52
April	3,553.45		3,553.45	20,189.97
May				20,189.97
June				20,189.97
July				20,189.97
August				20,189.97
September				20,189.97

F1-Help ✥ Move ←Transactions ESC-Exit

BALANCE SHEET (US$000)	1994	1993
	Year ended 31 December	
Current Assets		
Cash and short-term deposits	3,150	1,684
Securities	52	49
Accounts receivable:		
Donors	3,834	2,382
Employees	434	440
Others	267	130
Inventories	740	863
Prepaid expenses	1,155	931
Total current assets	9,632	6,479
Investments	670	451
Loans to Employees	508	424
Fixed Assets		
Property, plant, and equipment	19,944	19,781
Less accumulated depreciation	(10,485)	(10,012)
Total fixed assets (net)	9,459	9,769

Center operates. This was caused, in part, by revaluation of the local currencies or decreased rates of devaluation vis-à-vis local inflation. This trend had a significant impact in Peru, where the Center spends about 40% of its budget, and in Kenya, Ecuador, and the Philippines. CIP's purchasing power fell by an estimated $1.5 million in 1994. As a result, the Center froze several important international positions and reduced the number of locally recruited staff. Increased costs and eroded purchasing power are an ongoing concern.

Substantial renovations of CIP's highland experiment station began in Huancayo, Peru, the site of terrorist attacks in 1988. The Huancayo site will be used for training and expanded research on late blight, genetic conservation, virology, and true seed. Improved security in Peru has allowed CIP to reinstitute operations in Huancayo. Research at the Yurimaguas experiment station in Peru was terminated, however, and operations at the San Ramón station were reduced by one-third as some research activities shifted to regional locations in Africa and Asia.

The Information Department went on-line to Internet, with the Peruvian Scientific Network as its local carrier. The department switched over to Microsoft Mail and CGNET II services for enhanced electronic mail and fax services for research and support staff. A similar upgrading is planned for regional offices.

CIP's main scientific databases—germplasm, in vitro, seed distribution, and pedigree—were integrated and made accessible through the Center's local area network. This means that all CIP scientists, including those using our new Geographic Information Services, have access to the Center's most important scientific databases. CIP databases will eventually be accessible to scientists working in the regions and elsewhere.

During 1994, CIP continued to improve its financial information services through the CIPFIS system. This user-friendly, on-line, project-based budgeting and accounting system was fully established at headquarters and at experiment stations in Peru. Each budget unit has 24-hour-a-day computer access to its current expenses and budget status reports. CIPFIS has proved to be a strong management tool for resource allocation and decision-making.

The table below summarizes CIP's finances in 1994. A complete, audited financial statement is published separately, and can be requested from the Controller's Office, CIP headquarters, Lima, Peru.

BALANCE SHEET (US$000)	1994	1993
	Year ended 31 December	
Current Liabilities		
Bank overdrafts	0	74
Short-term loans	225	592
Advances from donors	3,717	793
Accounts payable:		
Research contracts and organizations	905	1,097
Suppliers and taxes	865	968
Provisions for severance indemnities	44	29
Total current liabilities	5,756	3,553
Long-term Loan	511	437
Accruals and Provisions	180	0
Net Assets		
Capital invested in fixed assets	9,459	9,769
Capital fund	2,448	2,179
Unexpended fund balance	1,915	1,185
Total net assets	13,822	13,133

Donor Contributions in 1994

CIP has had broad, strong support from its 35 donors. Ten funders provided contributions worth one million dollars or more each. Another three gave more than half a million dollars each.

DONOR (ranked by levels of core contribution in US$000)	CORE	COMPLEMENTARY
World Bank*	2,610	
Japan	1,348	
European Economic Community	1,327	
United States of America	1,200	141
Denmark	1,094	
Germany	1,055	96
Inter-American Development Bank	1,050	158
Switzerland	1,040	3,091
Canada	978	
Sweden	900	
United Kingdom	698	336
United Nations Development Programme	593	556
Netherlands	554	282
Austria	390	
Italy	170	30
France	150	71
Australia	142	
Norway	133	
Belgium	125	231
China	90	
Finland	86	
Korea	60	
Spain	50	
India	25	
International Development Research Centre		409
Asian Development Bank		99
Natural Resources Institute		85
Rockefeller Foundation		47
Danida/Ireland/Mexico		29
British Embassy (in Peru)		21
OPEC Fund for International Development		17
Sociedad Química y Minera de Chile		12
Calbee Potato Inc.		8
Centro Internacional de Agricultura Tropical		5
CARE Perú		4

* Includes $800,000 provision for "cost recovery."

Board of Trustees

Executive Committee

Chairperson
Dr. Lindsay Innes
Deputy Director, Scottish Crop Research Institute
Dundee, Scotland

Mrs. Martha ter Kuile
(from May 1994) CIDA Representative,
Canadian Embassy
Guatemala City, Guatemala

Dr. Setijati Sastrapradja
Botanist,
National Centre for Research in Biotechnology
Indonesian Institute of Sciences
Bogor, Indonesia

Dr. Hubert Zandstra
Director General, International Potato Center
Lima, Peru

Program Committee

Chairperson
Dr. Setijati Sastrapradja

Dr. Alfonso Cerrate
Executive Director,
Instituto Nacional de Investigación Agraria
Lima, Peru

Dr. Durward Bateman
Dean, College of Agriculture and Life Sciences
North Carolina State University
North Carolina, USA

Dr. K. L. Chadha
Deputy Director General (Horticulture),
Indian Council for Agricultural Research
New Delhi, India

Dr. Lieselotte Schilde
Professor, University of Tübingen
Tübingen, Germany

Dr. Moise Mensah
(from May 1994)
Cotonou, Benin

Audit Committee

Chairperson
Mrs. Martha ter Kuile
(from May 1994)

Dr. Toshihiro Kajiwara
Director, Japan Plant Protection Association
Tokyo, Japan

Dr. Klaus Raven
Professor, Universidad Nacional Agraria
Lima, Peru

Nominations Committee

Chairperson
Mrs. Martha ter Kuile
(from May 1994)

Dr. Klaus Raven

Dr. Franz Winiger
Department of Potato Production
FAP Zurich-Reckenholz
Zurich, Switzerland

Staff in 1994

Directors

Hubert Zandstra, PhD, Director General
José Valle-Riestra, PhD, Deputy Director General for Finance and Administration
Peter Gregory, PhD, Deputy Director General for Research
Roger Cortbaoui, PhD, Director for International Cooperation

Program Leaders

Production Systems
Thomas S. Walker, PhD

Germplasm Management and Enhancement
Ali Golmirzaie, PhD

Disease Management
Edward R. French, PhD

Integrated Pest Management
Fausto Cisneros, PhD

Propagation, Crop Management
Patricio Malagamba, PhD (until Sept.)
Mahesh Upadhya, PhD (from Sept.)

Postharvest Management, Marketing
Gregory J. Scott, PhD

INTERNATIONAL COOPERATION

(country) = post location, but activity regional in scope
country = post location

Latin America and the Caribbean (LAC)
Fernando Ezeta, PhD, Regional Representative *(Peru)*
Liaison Office - Chile
Primo Accatino, PhD [1]
Liaison Office - Ecuador
Charles Crissman, PhD

Sub-Saharan Africa (SSA)
Peter Ewell, PhD, Regional Representative *(Kenya)*
Liaison Office - Nigeria
Humberto Mendoza, PhD [3]

Middle East and North Africa (MENA)
Carlos Martin, PhD, Regional Representative *(Tunisia)*
Liaison Office - Egypt
Ramzy El-Bedewy, PhD

South and West Asia (SWA)
Mahesh Upadhya, PhD, Regional Representative (until Sept.)
Sarathchandra Hangantileke, PhD *(India)* (from Sept.)

East and Southeast Asia and the Pacific (ESEAP)
Peter Schmiediche, PhD, Regional Representative *(Indonesia)*
Liaison Office - People's Republic of China
Song Bo Fu, PhD
Liaison Office - Philippines
Enrique Chujoy, PhD (until Feb.)
Gordon Prain, PhD (from Feb.)

Internationally Recruited Staff

Departments

Breeding and Genetics
Peter Gregory, PhD, Acting Head of Department
Humberto Mendoza, PhD, Geneticist *(Nigeria)* [3]
Primo Accatino, PhD, Breeder, *Chile* [1]
Edward Carey, PhD, Breeder *(Kenya)* [3]
Enrique Chujoy, PhD, Geneticist *(Philippines)*
Il Gin Mok, PhD, Breeder *(Indonesia)*
Haile M. Kidane-Mariam, PhD, Breeder *(Kenya)*
Juan Landeo, PhD, Breeder [3]

[2] Staff who joined during the year
[3] Staff who left during the year
[4] Staff funded by special projects
[1] Project Leader

CIP biotechnologists Dapeng Zhang, Marc Ghislain, and Rosario Herrera.

Genetic Resources

Ali Golmirzaie, PhD, Geneticist, Head of Department [1]
Carlos Arbizu, PhD, ARTC Consultant [2]
Fermin de la Puente, PhD, Germplasm Collector [2, 3]
Marc Ghislain, PhD, Molecular Biologist
Michael Hermann, PhD, Andean Crop Specialist *(Ecuador)* [3]
Zosimo Huaman, PhD, Germplasm Curator [4]
Koshun Ishiki, PhD, Associate Expert, *Ecuador*
Carlos Ochoa, MS, Taxonomist, Consultant
Bodo Frognitz, PhD, Geneticist
Kazuo Watanabe, PhD, Cytogeneticist *(USA)* [4]
Dapeng Zhang, PhD, Breeder

Nematology and Entomology

Fausto Cisneros, PhD, Entomologist, Head of Department [1]
Ann Braun, PhD, Entomologist *(Indonesia)* [3]
Aziz Lagnaoui, PhD, Entomologist *(Tunisia)*
Nicole Smit, MS, Associate Expert, *Uganda* [3]

Pathology

Luis Salazar, PhD, Virologist, Head of Department [1]
Gregory A. Forbes, PhD, Plant Pathologist *(Ecuador)*
Edward R. French, PhD, Bacteriologist [4]
Teresa Icochea, PhD, Pathologist, Consultant [2]
Upali Jayasinghe, PhD, Virologist *(Philippines)* [3]
Pedro Ovarzun, PhD, Mycologist *(Ecuador)*
Sylvie Prior, PhD, Bacteriologist *(Tunisia)* [3]
Maddalena Querci, PhD, Molecular Virologist [4]
Lod J. Turkensteen, PhD, Adjunct Scientist, *Netherlands*

Physiology

Patricio Malagamba, PhD, Physiologist, Head of Department (until Sept.) [1]
Mahesh Upadhya, PhD, Physiologist, Head of Department (from Sept.) [1]
James L. Bryan, MS, Senior Seed Specialist [2, 3]
Oscar Hidalgo, PhD, Senior Seed Specialist [3]
Yoshihiro Eguchi, MS, Associate Expert *(Indonesia)* [3]
Ramzy El-Bedewy, PhD, Breeder, *Egypt*
Vital Hagenimana, PhD, Physiologist *(Kenya)* [2, 3]
Sarathchandra Hangantileke, PhD, Physiologist *(India)* [4]
Jukka Korva, MS, Fellowship Agronomist, *Ecuador* [3]
Noël Pallais, PhD, Physiologist [3]
Christopher Wheatley, PhD, Physiologist *(Indonesia)* [3]

Social Science

Thomas S. Walker, PhD, Economist, Head of Department [1]
Alwyn Chilver, MS, Associate Expert, *Indonesia* [3]
Charles Crissman, PhD, Economist *(Ecuador)* [3]
Peter Ewell, PhD, Economist *(Kenya)* [3]
Robert Jan Hijmans, PhD, Associate Expert [2, 3]
Jan Low, PhD, Economist *(Kenya)*
Gordon Prain, PhD, Anthropologist *(Philippines)* [3]
Gregory J. Scott, PhD, Economist
Jürg Schneider, PhD, Associate Expert, *Indonesia* [3]

Research Support

Fausto Cisneros, PhD, Entomologist, Head of Department [1]
Francisco Muñoz, PhD, Head of Quito Station, *Ecuador* [2]

Training

Fernando Ezeta, PhD, Head of Department (until March)
Patricio Malagamba, PhD, Head of Department (from March)
Pons Batugal, PhD, Technology Transfer Coordinator [2]

Information

Carmen Siri, PhD, Head of Department (until March) [2]
Michael L. Smith, Journalist, Head of Department (from March)
Bill Hardy, PhD, English and Spanish Writer/Editor

Directors' Offices

Office of the Director General

Edward Sulzberger, MS, Assistant to the DG

Office of the Deputy Director General for Finance and Administration

William A. Hamann, BS, Assistant to the DDGF&A

Office of the Deputy Director General for Research

José Luis Rueda, PhD, Coordinator, Andean Natural Resources

Special Country Projects

SEINPA, Peru

Efraín Franco, MS, Economist, Team Leader [2, 3]

FORTIPAPA, Ecuador
Albéric Hibon, PhD, Economist, Team Leader [1]

PROINPA, Bolivia
Andre Devaux, PhD, Seed Specialist, Team Leader
Nelson Estrada, PhD, Breeder [1]
Javier Franco, PhD, Nematologist
Enrique Fernandez-Northcote, PhD, Virologist
Graham P. Thiele, PhD, Technology Transfer Specialist
Greta Watson, PhD, Human Ecologist

Liaison Office - Burundi
Donald Berrios, MS, Agronomist [1]

Uganda
Lyle Sikka, MS, Consultant on Seed Technology [1]
Nicole Smit, MS, Associate Expert [1]

Consortium
CONDESAN
Miguel Holle, PhD, Biodiversity of Andean Crops [1]
Rubén Darío Estrada, MS, Natural Resources Economics *(Colombia)*
Robert Jan Hijmans, PhD, Associate Expert [1]
Carlos León-Velarde, PhD, Animal Production Systems
Elías Mujica, MS, Anthropologist, Adjunct Scientist
Osvaldo Paladines, PhD, Andean Pastures *(Ecuador)*
Mario Tapia, PhD, Agroecologist [1]

Networks
SAPPRAD
Eufemio T. Rasco Jr., PhD, Coordinator *(Philippines)* [1]

UPWARD
Gordon Prain, PhD, Coordinator *(Philippines)*

Controller's Office
Carlos Niño-Neira, CPA, Controller
Oscar Gil, CPC, Internal Auditor [1]

Office of the Executive Officer
César Vittorelli, Ing. Agr., Acting Executive Officer

NATIONALLY RECRUITED STAFF (Peru only)

Departments

Breeding and Genetics
Walter Amoros, MS, Associate Geneticist
Jorge Espinoza, MS, Associate Geneticist

Genetic Resources
Fausto Buitron, Ing. Agr., Tissue Culture Coordinator
Gisella Orjeda, MS, Biologist
Alberto Salas, Ing. Agr., Taxonomist [1]
Roxana Salinas, Ing. Agr., Biotechnologist

Nematology and Entomology
Jesús Alcázar, MS, Agronomist [1]
Alberto Gonzalez, MS, Nematologist
Erwin Guevara, Ing. Agr., Agronomist
María Palacios, Biol., Biologist [1]

Pathology
Christian Delgado, MS, Biochemist
Segundo Fuentes, MS, Plant Pathologist
Charlotte Lizárraga, MS, Plant Pathologist
Hebert Torres, MS, Agronomist

Physiology
Rolando Cabello, Ing. Agr., Asst. Agronomist
Nelly Espinola, MS, Nutritionist

Social Science
Hugo Fano, Economist
Víctor Suárez, BS, Statistician

Research Support
Lombardo Cetraro, Biologist, Field & Greenhouse Supervisor, San Ramón
Roberto Duarte Piskulich, Ing. Agr., Greenhouse Supervisor, La Molina
Lauro Gomez, Supervisor, Huancayo
Hugo Govas, Ing. Agr., Supervisor, Yurimaguas
Abilio Pastrana Ramírez, Accountant, San Ramón [1]
Mario Pozo, Ing. Agr., Supervisor, La Molina
Miguel Quevedo, Ing. Agr., Off-station Field Supervisor, Cajamarca
Víctor Otazú, PhD, Superintendent, Huancayo Experiment Station

Statistics Unit
Beatriz Eldredge, Biometrist, Research Database Assistant *
Alfredo Garcia, MS, Biometrist, Coordinator
Felipe de Mendiburu, Biometrist, Research Database Assistant

Training
Nelson Espinoza, Biol., Training Specialist
Americo Valdez, MS, Training Material Specialist

Information
Communication Unit
Emma Martinez, MS, Supervisor Media Production
Gigi Chang, MS, A.V. Section Coordinator
Information Technology Unit
Anthony Collins, Coordinator
Jorge Palomino, VAX and Network Manager *
Pia Maria Olden, Database Manager
Library
Eurelia Sala de Cabrejos, MS, Coordinator *
Martha Crosby, BA, Librarian
Cecilia Ferreyra, Circulation and Reference, User Services
Carmen L. Podestá, Archives and Verification *

Controller's Office
Miguel Saavedra, CPA, General Accountant
Rebeca Cuadros, Senior Accountant *
Edgardo de los Ríos, CPA, Senior Accountant
Vilma Escudero, BS, Accountant
Accounting Unit
Rosario Pastor, BS, Senior Accountant
Jorge Bautista, BS, Accountant
Blanca Joo, CPA, Accountant
Eduardo Peralta, Accountant
Budget Unit
Alberto Monteblanco, CPA, Senior Accountant
Denise Giacoma, CPA, Accountant
Treasury Unit
Luz Correa, CPA, Accountant
Sonnia Solari, Chief Cashier

Office of the Executive Officer
Foreign Affairs Liaison
Marcela Checa, Liaison Officer

General Services
Aldo Tang, Comdr. (ret.), General Services Manager
Equipment and Maintenance
Gustavo Echecopar, Ing. Agr., Supervisor *
Security
Jorge Locatelli, Capt. (ret.), Supervisor
Transportation
Carlos Bohl, Supervisor
Hugo Davis Paredes, Chief of Vehicle Maintenance
Jacques Vandernotte, Chief Pilot
Percy Zuzunaga, Co-Pilot

Human Resources
Juan Pablo Delgado, Human Resources Manager
Estanislao Perez Aguilar, Paymaster
Martha Pierola, BS, Social Worker
David Haltin, MD, Medical Officer

Logistics
Lucas Reaño, CPC, Logistics Manager
Arturo Alvarez, Purchasing Officer
Jorge Luque, MBA, Warehouse Officer
Roxana Morales Bermúdez, Purchasing Officer
José Pizarro, Purchasing Officer

Visitors, Travel, and Auxiliary Services
Rosa Rodríguez, Manager
Auxiliary Services
Mónica Ferreyros, Supervisor
Travel
Ana María Secada, Supervisor
Visitors' Office
Mariella Corvetto, Supervisor

Contributions to Scientific Literature

Alcázar, J., W. Catalán, K.V. Raman, F. Cisneros, H. Torres, and O. Ortiz. 1994. Control integrado del gorgojo de los Andes. Boletín de Capacitación No. 5. CIP, Lima, Perú. 18 p.

Amauri Buso, J. and R.N. Espinoza (comps.). 1994. Enfermedades bacterianas de la papa: Memorias del taller, Brasilia, Brazil, 15-18 March 1993. EMBRAPA-PROCIPA-CIP, Lima, Perú. 100 p.

Cadenas, C. and T. Icochea. 1994. Comportamiento de 196 clones de *Ipomoea batatas* (L.) Lam. ante la pudrición negra de raíz *Lasiodiplodia theobromae* (Pat.) Griff. & Maubl. Fitopatología 29(3):197-201.

Chilver, A.S., A. Koswara, and D. Rachmanunddin. 1994. The economic viability of true potato seed (TPS) in Indonesia. Working Paper Series No. 1994-1. CIP, Lima, Perú. 28 p.

Cisneros, F. and P. Gregory. 1994. Potato pest management. In: Proceedings of the Presidential Meeting on "The Impact of Genetic Variation on Sustainable Agriculture." Aspects of Applied Biology 39. Association of Applied Biologists, UK. p. 113-124.

Darrasse, A., S. Priou, A. Kotoujansky, and Y. Bertheau. 1994. PCR and restriction fragment length polymorphism of a pel gene as a tool to identify *Erwinia carotovora* in relation to potato diseases. Appl. Environ. Microbiol. 60(5):1437-1443.

Das, G.P. and K.V. Raman. 1994. Alternate hosts of the potato tubermoth, *Phthorimaea operculella* (Zeller). Crop Protect. 13(2):83-86.

Doucet, M.E., E.L. Ponce de Leon, and J. Franco. 1994. *Spiralula arvensis* y su asociación con *Nacobbus aberrans* en el cultivo de papa en Bolivia. Nematropica 24(1):69-72.

Ekanayake, I.J. 1994. Estudios sobre el estrés por sequía y necesidades de riego de la papa. Guía de Investigación No. 30. CIP, Lima, Perú. 38 p.

Ewell, P.T., H. Fano, K.V. Raman, J. Alcázar, M. Palacios, and J. Carhuamaca. 1994. Manejo de plagas de la papa por los agricultores en el Perú: Informes de un proyecto interdisciplinario de investigación en determinadas regiones de las zonas altas y de la costa. Serie de Investigación No. 6. CIP, Lima, Perú. 72 p.

Ewell, P.T., K.O. Fuglie, and K.V. Raman. 1994. Farmers' perspectives on potato pest management in developing countries: Interdisciplinary research at the International Potato Center (CIP). In: Zehnder, G.W., M.L. Powelson, R.K. Jansson, and K.V. Raman (eds.). Advances in potato pest biology and management. APS Press, St. Paul, MN, USA. p. 597-615.

Fonseca, C., M. Daza, C. Aguilar, N. Bezençon, M. Benavides, H. Fano, H. Goyas, G. Prain, H. Roncal, and S. Tafur. 1994. El camote en los sistemas alimentarios del yunga norte del Perú. Documento de Trabajo No. 1994-4. CIP, Lima, Perú. 40 p.

Fonseca, C., J.P. Molina, and E.E. Carey. 1994. Farmer participation in the selection of new sweetpotato varieties. CIP Research Guide No. 5. CIP, Lima, Perú. 28 p.

Forbes, G.A. and M.C. Jarvis. Host resistance for management of potato late blight. In: Zehnder, G.M., M.L. Powelson, R.K. Jansson, and K.V. Raman (eds.). Advances in potato pest biology and management. APS Press, St. Paul, MN, USA. p. 439-457.

Forbes, G.A. and J.T. Korva. 1994. The effect of using a Horsfall-Barratt scale on precision and accuracy of visual estimation of potato late blight severity in the field. Plant Pathol. 43(4):675-682.

French, E.R. 1994. Strategies for integrated control of bacterial wilt of potatoes. In: Hayward, A.C. and G.L. Hartman (eds.). Bacterial wilt: The disease and its causative agent, *Pseudomonas solanacearum*. CAB International, Wallingford, UK. p. 199-207.

French, E.R., G. Forbes, and J. Landeo. 1994. Ola migratoria de variantes más agresivas de *Phytophthora infestans* amenaza a la papa. Fitopatología 29(1):15-18.

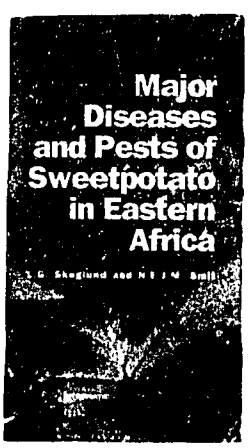
Ghislain, M., V. Frankard, D. Vandenbossche, B.F. Matthews, and M. Jacobs. 1994. Molecular analysis of the aspartate kinase-homoserine dehydrogenase gene from *Arabidopsis thaliana*. Plant Mol. Biol. 24:835-851.

Golmirzaie, A.M., P. Malagamba, and N. Pallais. 1994. Breeding potatoes based on true seed propagation. In: Bradshaw, J.E. and G.R. Mackay (eds.). Potato genetics. CAB International, Wallingford, UK. p. 499-513.

Gregory, P. 1994. The potato's global potential. In: Zehnder, G.M., M.L. Powelson, R.K. Jansson, and K.V. Raman (eds.). Advances in potato pest biology and management. APS Press, St. Paul, MN, USA. p. 632-655.

Hagenimana, V. R.E. Simard, and L.-P. Vézina. 1994. Amylolytic activity in germinating sweetpotato (*Ipomoea batatas* L.) roots. J. Amer. Soc. Hort. Sci. 119(2):313-320.

Hagenimana, V., L.-P. Vézina, and R.E. Simard. 1994. Sweetpotato α- and β-amylases: Characterization and kinetic studies with endogenous inhibitors. J. Food Sci. 59(2):373-377.



This list includes selected journal articles, book chapters, and CIP publications. CIP staff made many other contributions such as invited papers presented at meetings and published in proceedings. CIP's Library can provide a complete list of publications generated by CIP in 1994.

Herrera, J., G. Scott, N. Espinola, W. Amorós, and M. Ato. 1994. Perspectivas para el desarrollo agroindustrial de la papa en el Perú. Debate Agrario (Perú) 19:67-86.

Kerridge, P.C. and B. Hardy (eds.). 1994. Biology and agronomy of forage *Arachis*. Centro Internacional de Agricultura Tropical (CIAT), Cali, Colombia. 209 p.

Larenas de la F., V., T.H. López, and L.P. Accatino. 1994. Introducción, selección y comercialización de nuevas variedades de batata (camote) en Chile. Serie La Platina-INIA No. 45. Instituto Nacional de Investigaciones Agropecuarias (INIA). Santiago de Chile. 46 p.

Larenas de la F., V., T.P. Ramírez, T.H. López, and L.P. Accatino. Producción de papa utilizando semilla botánica con agricultores de la zona central de Chile. Serie La Platina-INIA No. 56. Instituto Nacional de Investigaciones Agropecuarias (INIA). Santiago de Chile. 24 p.

León Velarde, C.U. and R.A. Quiroz. 1994. Análisis de sistemas agropecuarios. Uso de métodos biomatemáticos. Centro de Investigación de Recursos Naturales y Medio Ambiente/Centro Internacional de la Papa/Consorcio para el Desarrollo Sostenible de la Ecorregión Andina (CIRNMA/CIP/CONDESAN). La Paz, Bolivia. 238 p.

Malamud, O.S., T. Ames de Icochea, and H. Torres. 1994. Potato disease management in Latin America. In: Zehnder, G.M., M.E. Powelson, R.K. Jansson, and K.V. Raman (eds.). Advances in potato pest biology and management. APS Press, St. Paul, MN, USA. p. 616-626.

Mendoza, H.A. 1994. Development of potatoes with multiple resistance to biotic and abiotic stresses: The International Potato Center approach. In: Zehnder, G.M., M.E. Powelson, R.K. Jansson, and K.V. Raman (eds.). Advances in potato pest biology and management. APS Press, St. Paul, MN, USA. p. 627-642.

Ortiz, R. and Z. Huamán. 1994. Inheritance of morphological and tuber characteristics. In: Bradshaw, J.E. and G.R. Mackay (eds.). Potato genetics. CAB International, Wallingford, UK. p. 263-283.

Palacios, M., K.V. Raman, J. Alcázar, and F. Cisneros. 1994. Control integrado de la polilla de la papa. Boletín de Capacitación No. 4. CIP, Lima, Perú. 18 p.

Pérez, W., L. Gutarra, and E. French. 1994. *Pythium ultimum* Trow., causante de pudrición acuosa en tubérculos de papa en el Perú. Fitopatología 29(3):191-196.

Raman, K.V. 1994. Potato pest management in developing countries. In: Zehnder, G.M., M.E. Powelson, R.K. Jansson, and K.V. Raman (eds.). Advances in potato pest biology and management. APS Press, St. Paul, MN, USA. p. 583-596.

Raman, K.V., A.M. Golmirzaie, M. Palacios, and J. Tenorio. 1994. Inheritance of resistance to insects and mites. In: Bradshaw, J.E. and G.R. Mackay (eds.). Potato genetics. CAB International, Wallingford, UK. p. 447-463.

Salazar, L.F. 1994. Virus detection and management in developing countries. In: Zehnder, G.M., M.E. Powelson, R.K. Jansson, and K.V. Raman (eds.). Advances in potato pest biology and management. APS Press, St. Paul, MN, USA. p. 643-651.

Scott, G.J. 1994. The emerging world market for potatoes and potato products with particular reference to developing countries. Economie & Gestion Agro-Alimentaire (France) 30:19-27.

Skoglund, L.G. and N.E.J.M. Smit. 1994. Major diseases and pests of sweetpotato in Eastern Africa. CIP, Lima, Perú. 67 p.

Thakur, K.C., M.D. Upadhya, S.N. Bhargava, and A. Bhargava. 1994. Bulk pollen extraction procedures and the potency of the extracted pollen. Potato Res. 37:245-248.

Valkonen, J.P.T., S.A. Slack, R.L. Plaisted, and K.N. Watanabe. 1994. Extreme resistance is epistatic to hypersensitive resistance to potato virus Y in a *Solanum tuberosum* subsp. *andigena*-derived potato genotype. Plant Dis. 78(12):1177-1180.

Walker, T.S. 1994. Patterns and implications of varietal change in potatoes. Working Paper Series No. 1994-3. CIP, Lima, Perú. 54 p.

Watanabe, K., M. Orrillo, M. Iwanaga, R. Ortiz, R. Freyre, and S. Pérez. 1994. Diploid potato germplasm derived from wild and land race genetic resources. Amer. Potato J. 71(9):599-604.

Watanabe, K.N., M. Orrillo, S. Vega, R. Masuelli, and K. Ishiki. 1994. Potato germplasm enhancement with disomic tetraploid *Solanum acaule*. 2: Assessment of breeding value of tetraploid F_1 hybrids between tetrasomic tetraploid *S. tuberosum* and *S. acaule*. Theor. Appl. Genet. 88(2):135-140.

Zandstra, H.G. 1994. The CGIAR response to new challenges in agro-environmental research in developing countries. In: P. Goldsworthy and P.F. de Vries (eds.). Opportunities, use, and transfer of systems research methods in agriculture to developing countries. Kluwer Academic Press, Netherlands. p. 29-39.

Core Research in 1994

Program, Project, and Activity	Locations and Partner Institutions
Characterization of constraints and opportunities for potato production	
Yield-gap analysis	• Ecuador - INIAP
Farmer participation in clonal evaluation	• Bolivia - PROINPA
Characterization of potato production systems	• East Africa - PRAPACE
Characterization of sweetpotato constraints and opportunities	
Sweetpotato characterization	• Africa • India - CTCRI (ICAR) • Southeast Asia
Users' Perspective with Agricultural Research and Development (UPWARD)	• Asia • China* • Netherlands - Wageningen U
Adaptation and integration of potato production technologies	
Varietal adaptation to diverse agroecologies	• Bolivia - PROINPA • Cameroon - IRA • Chile - INIA • North China • Peru - U Tacna • Philippines - MMSU
Adaptation of cultivated diploid potato species	• USA - NCSU
Intercropping	• Tunisia - ESH
Expanding production to new regions	• Burundi - ISABU • Dominican Republic - MA • USA - U Georgia
Adaptation and integration of sweetpotato production technologies	
Varietal adaptation to diverse regions	• Africa • Asia • Cameroon - IRA • China - GAAS • Egypt - MA • India - CTCRI (ICAR) • Peru - INIA
Evaluation of the impact and sustainability of potato production technologies	
Impact assessment	• Argentina - INTA • Bangladesh - BARI • Bolivia - IBTA • Chile - INIA • China - CAAS • Colombia - CORPOICA • Dominican Republic - MIP • East Africa - PRAPACE • Ecuador - INIAP • Egypt - ARC • Ethiopia - IAR • India - CPRI (ICAR) • Indonesia - LEHRI • Kenya - KARI • Madagascar - FIFAMANOR • Nepal - NPRP • Peru - INIA • Sri Lanka - DA • Taiwan - TARI • Vietnam - BRC, INSA
Pesticides and sustainability	• Canada - McMaster U • Ecuador - INIAP, MA • USA- Cornell U, Montana SU
Potato collection and characterization	
Collection, characterization, conservation, and distribution	• Peru - CERRGETYR/Cusco, UTC • USA - USDA
In vitro conservation	• Ecuador - INIAP • Peru
Germplasm improvement for use in marginal but sustainable agriculture	• Chile - U Austral

* For reasons of space, we will write China instead of People's Republic of China in this list.

CIP's extensive research collaboration brings together many partners worldwide. This table summarizes CIP's core research activities in 1994, and the principal places and institutions involved.

Program, Project, and Activity	Locations and Partner Institutions
Potato germplasm enhancement, application of molecular technology	
Germplasm enhancement	• Chile - INIA • Italy - ENEA • Peru • USA - Cornell U
Genome mapping and application of marker technology	• Argentina - INTA • Brazil - CNPH (EMBRAPA) • Chile - INIA • Netherlands - CPRO - DLO, IPO - DLO • Philippines - UPLB • UK - SCRI • USA - Cornell U
Potato genetic engineering for pest and disease resistance	• Austria - ARCS • Belgium - PGS • Chile - CUC • Italy - Viterbo U, U Naples • Peru • UK - Axis Genetics Ltd., ODA • USA - LSU, SPI
Sweetpotato collection and characterization	
Collection, characterization, conservation, documentation, distribution, and evaluation	• Argentina - INTA • Bangladesh - TCRC (BARI) • Brazil - CNPH (EMBRAPA) • China - XSPRC • Honduras - CURLA (UNAH) • Mexico - INIFAP • Paraguay - IAN • Peru
In vitro conservation and virus eradication	• Austria - ARCS • Peru • USA - Cornell U • Venezuela - FONAIAP
Collection and evaluation of indigenous knowledge	• Indonesia - UPWARD
Sweetpotato germplasm enhancement and molecular techniques	
Combining traits using conventional techniques in diverse agroecologies	• China - GAAS, JAAS • East Africa (Kenya - KARI, Tanzania - MOA, Uganda - NARO) • Indonesia - CRIFC • Peru • USA - USVL
Utilization of wild relatives of sweetpotato	• Germany - U Tübingen • Peru • UK - U Birmingham
Molecular techniques for sweetpotato improvement	• Japan - Nagoya U • Peru
Andean root and tuber crop collection and characterization	
Germplasm management in farmers' fields (in situ)	• Bolivia - IBTA, NGO • Ecuador - INIAP • Peru - INIA, UNSAAC, UNSCH, NGO
Development of a network for ex situ conservation	• Argentina - INTA • Bolivia • Brazil - CNPH (EMBRAPA) • Chile - U Austral • Colombia - CORPOICA • Ecuador - INIAP • Peru - UNDAC, UNSAAC, UNSCH, URP, UTC
In vitro conservation and distribution	• Ecuador - INIAP • Peru - UNMSM, UNSCH
Pathogen eradication and seed production	• Ecuador - INIAP • Peru - INIA, UNCP, UTC
Commodity systems analysis	• Bolivia-UMSS • Ecuador - INIAP, U Ambato • Peru - UNA, NGOs
Control of potato late blight (Phytophthora infestans)	
Breeding and screening for resistance	• China - SAAS • Colombia - CORPOICA • Ecuador - CIP-Quito • Kenya - KARI, CIP • Mexico -INIFAP • Peru - INIA

Program, Project, and Activity	Locations and Partner Institutions
Integrated control Fundamental host-pathogen research	• Bolivia - PROINPA • Ecuador - FORTIPAPA, Central & Catholic universities, Quito, CIP-Quito • Kenya - KARI • Netherlands - IPO - DLO • Peru - INIA • Philippines - UPLB • Scotland - SCRI • USA - Cornell U
Integrated control of potato bacterial wilt	
Fundamental research for control strategies	• China - CAAS • Colombia - CORPOICA • England - RES • Peru
Development of resistance	• Brazil - CNPH (EMBRAPA) • China - CAAS • Indonesia - LEHRI • Mauritius - MSIRI • Peru - INIA • Philippines - DA
Integrated control	• Burundi - ISABU • Kenya - KARI • Peru - CEPESER, INIA
Combining resistances to potato viruses and fungi	
Development of virus- and viroid-resistant materials	• France - INRA • Peru - UNA • Poland - IPR, IZ • Tunisia - CPRA
Breeding for early blight resistance	• Peru
Selection of combined resistance to viruses and fungi	• Argentina - INTA • Brazil - CNPH (EMBRAPA) • Cameroon - MA • Central America & the Caribbean • Colombia - CORPOICA • East Africa - Kabete RS, Mau Narok RS • Ecuador - INIAP • Egypt - MA • Nigeria • Paraguay - MA • Peru - INIA • Philippines - NPRCRTC •PROCIPA • Uruguay - CIAAB (INIA) • USA - Cornell U • Venezuela - FONAIAP
Control of field and storage diseases of Andean root and tuber crops, including potato	
Development of resistance to soft rot and blackleg	• Peru - UNA
Integrated control of *Erwinia* diseases	• Tunisia - ESH
Control of soil-borne fungi	• Peru - INIA
Diseases of ARTC	• Peru
Detection and control of potato viruses	
Resistance to PLRV	• Peru - U Ica • Scotland -SCRI
Detection of viruses and viroids	• Bolivia - PROINPA • China - U Inner Mongolia •Colombia - CORPOICA • India- CPRI • Peru - UNA
Epidemiology of PVY	• Tunisia - INRAT
Transmission of potato viruses and viroids	• Peru • Philippines - NPRCRTC
Identification and control of sweetpotato viruses	
Detection, identification, and eradication of viruses	• Peru
Resistance to viruses	• Israel • Peru - UNA
Integrated control	• Kenya • Madagascar • Rwanda • Tanzania • Uganda

Program, Project, and Activity	Locations and Partner Institutions
Control of bacterial and fungal diseases of sweetpotato	
Etiology of fungal and bacterial diseases	• Kenya - NAL • USA - LSU
Resistance to diseases	• Southeast Asia - SARIF and NRI - UK
Molecular approaches for detection and control of pathogens	
Genetic resistance and probe development	• Peru • England - The Sainsbury Lab.
Virology of Andean roots and tubers	
Detection and characterization of viruses	• Bolivia -PROINPA • Ecuador - INIAP • Peru - CICA-Cusco, INIA-Puno, UNA, UNMSM, UNSCH
Elimination of pathogens	• Peru - INIA, UNCP, UTC
Production loss by viruses	• Bolivia - PROINPA • Ecuador - INIA • Peru - CICA, UNCP
Potatoes with resistance to major insect and mite pests	
Development of resistant genotypes for potato tuber moth and leafminer flies	• Peru • USA - UNDP
Potatoes with glandular trichomes	• Peru • USA - Cornell U
Transgenic potatoes with insect resistance	• Belgium - PGS • Peru
Field evaluation of resistant plants	• Peru - CIED
Integrated methods for control of potato tuber moth	
Generation of technologies	• Bolivia • Colombia • Dominican Republic • Peru - TALPUY, INIA, CARE • USA - UNDP
Use of sex pheromones and granulosis virus	• Bolivia • Colombia & Peru - PRACIPA • Dominican Republic - MIP • Tunisia
Applied field management	• Bangladesh-BARI, TCRC • Bolivia - PROINPA • Colombia - CORPOICA • Dominican Republic - MIP • Egypt • Kenya - KARI • Morocco - IAV, INRA • Tunisia - CPRA, INRAT • Venezuela - FONAIAP • Yemen - AREA, SPPC, YGPPP
Integrated methods for control of sweetpotato weevil	
Development of resistance	• Asia • Peru • USA - Miss SU
Use of sex pheromones	• Cuba - INIVIT • Dominican Republic - MIP
Biological control	• Cuba - INIVIT • Peru
Applied field management	• Bangladesh - BARI, TCRC • Cuba - INIVIT • Dominican Republic - MIP • Indonesia • Kenya - ICIPE, KARI • Philippines - UPLB, ViSCA • Uganda
Integrated methods for control of sweetpotato nematodes	
Development of resistance	• Peru
Applied field management	• Peru - UNSAAC, farmer co-ops

Program, Project, and Activity	Locations and Partner Institutions
Integrated methods for control of Andean potato weevil	
Development of resistance	• Peru - INIA
Cultural and biological control methods	• Bolivia - PROINPA • Peru - INIA
Applied field management	• Bolivia - PROINPA • Colombia - CORPOICA • Ecuador - FORTIPAPA, INIAP • Peru -CARE, INIA, TALPUY
Integrated methods for control of potato cyst nematode and false root-knot nematode	
Crop rotation schemes	• Peru (Cajamarca, Cusco, Puno)
Applied field management	• Bolivia - PROINPA • Ecuador - INIAP • Peru - INIA • PRACIPA
Propagation of healthy clonal potato planting materials in diverse agricultural systems	
Research support to in-country basic seed programs	• Bangladesh - TCRC (BARI) • Bolivia - PROINPA • Burundi - ISABU • Cameroon - IRA • Colombia - CORPOICA • Ecuador - FORTIPAPA, INIAP • Italy - IAO • Paraguay - IAN, SEAG • Peru - SEINPA • Philippines - PCARRD • Uganda • Venezuela - FONAIAP • West Africa
Sexual potato propagation	
Breeding for improved TPS families	• Argentina - INTA • Chile - INIA • China - SAAS, YNU • India • Italy - U Naples • Kenya • Peru
TPS agronomic adaptation to diverse agroecologies	• Bangladesh - TCRC (BARI) • China - CAAS Egypt • India - CPRI (ICAR) • Indonesia - LEHRI • Italy - IAO • Montserrat - CARDI • Morocco - IAV • Nepal - PDP (DA) • Nicaragua - MA • Paraguay - IAN • Peru - INIA, SEINPA • Philippines • Sri Lanka • Tunisia - CPRA • Vietnam
Studies on TPS production	• Bangladesh - TCRC (BARI) • Chile - INIA • India - CPRI (ICAR) • Indonesia - LEHRI • Nepal -PDP (DA) • Peru • Turkey - AARI
Sweetpotato production through improved management techniques	
Crop management practices	• Burundi - ISABU • Cameroon - IRA • China - GAAS, UCRI • Peru - UNA • Philippines
Studies on tolerance of abiotic stresses	• China - GAAS, UCRI • Egypt • Peru - U Tacna • Philippines
Management of forage-type sweetpotatoes	• Peru - UNA
Maintenance, international distribution, and monitoring of performance of advanced potato germplasm	
Ongoing activities (seed units)	• Kenya • Peru • Philippines

Program, Project, and Activity	Locations and Partner Institutions
Maintenance, international distribution, and monitoring of performance of advanced sweetpotato germplasm	
Ongoing activities (seed units)	• Kenya • Peru • Philippines
Abiotic stresses and potato crop management	
Breeding for improved tolerance of abiotic stresses	• Bolivia - PROINPA • Chile - INIA • Peru - U Tacna • Philippines • Southeast Asia
Agronomic research for potatoes grown under stress	• Egypt - MA • Peru - UNA • Philippines - PCARRD • Uganda - MA • USA - U Georgia
Propagation of Andean root and tuber crops and management of Andean natural resources	
Seed production, Andean root and tuber crops	• Ecuador -INIAP • Peru - INIA, PICA, UNCP, UNDAC
Management of Andean natural resources	• Peru - UNA
Expanding utilization of potato in developing countries	
Low-cost storage of table and seed potatoes	• China - CAAS • Egypt - MA • India - CPRI (ICAR) • Kenya - KARI • Pakistan - PSPDP/AIT • Philippines - UPLB • Thailand - Chiang Mai U
Potato breeding for processing	• India - CPRI (ICAR) • Peru - INIA • Philippines - PCARRD, Benguet U • Tunisia - INRAT
Marketing and demand for potatoes	• Colombia - CORPOICA • England - U Oxford • Netherlands - Wageningen U • USA - IFPRI, Stanford U • Tunisia - INRAT
Potato processing	• China - CAAS • Peru - Centro de Ideas
Product development for sweetpotato in developing countries	
Evaluation and distribution of elite sweetpotato materials for processing	• China - CAAS • Indonesia - CRIFC • Kenya - KARI • Peru - INIA, UNA • Philippines - PCARRD • Uganda - NARO • USA - NCSU • Vietnam - INSA
Marketing and demand for sweetpotatoes	• Argentina - IESR/INTA • Bangladesh - BARI/CIDA • China - CAAS, CNCQS • Indonesia - CRIFC • Kenya- U Nairobi • Netherlands - Wageningen U • Peru - INIA • Philippines - PCARRD, UPLB • SAPPRAD • USA -Stanford U
Processing of sweetpotato	• Cameroon - PDA, IRA • China - CAAS, SAAS/ UPWARD • India - CTCRI (ICAR) • Indonesia - CRIFC/UPWARD, IPB, SARIF • Kenya - KARI • Peru - IIN, UNA • Philippines - PCARRD, UPLB, Benguet U, SEARCA • SAPPRAD • Tanzania - MA, TFNC •Uganda - NARO, NRI • UK - NRI • USA - Cornell U, UNDP • Vietnam - INSA/UPWARD, AIT
Postharvest management of Andean natural resources	•Bolivia - IBTA • Brazil - EMBRAPA, EPAMIG, EMATER •Colombia - CORPOICA •Ecuador - INIAP, FUNDAGRO •Peru - INIA

Training in 1994

Program and Title	Countries Represented	Partner Institution
II National course on potato seed production (3 days)	Paraguay	DIA/IAN/PROCIPA
Course on sweetpotato production, multiplication, and storage (3 days)	Egypt	
Macroeconomic policies, regional integration, and Andean food systems: The case of potato (2 days)	Bolivia, Canada, Colombia, Ecuador, Peru	IDRC
Workshop on performance monitoring and impact assessment for agricultural research scientists in Eastern and Central Africa (10 days)	Kenya, Malawi, Uganda	USAID/CIP
Course on rapid multiplication and tissue culture techniques (12 days)	Chile, Peru	IDB Special Project
First Asian workshop on biotechnology, germplasm evaluation, and breeding (4 days)	Bangladesh, China, India, Indonesia, Philippines, Sri Lanka, Thailand	UNDP Special Project
Course on sweetpotato germplasm characterization and evaluation (11 days)	Cuba, Guatemala, Honduras, Mexico, Nicaragua, Peru, Venezuela	IDB Special Project

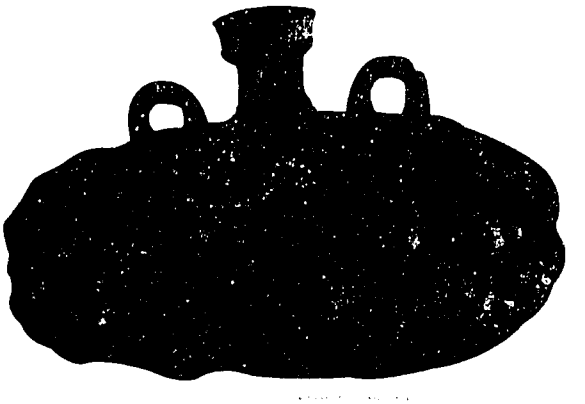
CIP entomologist-trainer María Palacios with Peruvian cooperators.

Program and Title	Countries Represented	Partner Institution
Biotechnology workshop (4 days)	Argentina, Bolivia, Chile, Uruguay	UNDP Special Project
In-country workshop on baseline studies and germplasm collection (5 days)	Tanzania	
Vines to roots: Sweetpotato breeding for impact (3 days)	China, Cuba, Indonesia, Kenya, Nigeria, Peru, Philippines, Rwanda, USA	
III International training on sweetpotato variety evaluation (4 weeks)	Indonesia, Philippines, Sri Lanka, Thailand	SAPPRAD
Regional workshop on selection and germplasm management (6 days)	Costa Rica, Cuba, Ecuador, El Salvador, Honduras, Mexico, Nicaragua, Panama	PRECODEPA
Field virology for potato and sweetpotato (12 days)	Chile, Italy, Peru, USA	IDB Special Project
Advanced virology (4 weeks)	Chile, India, Peru, Syria, USA	IDB Special Project
Virus diseases in potato (5 days)	Peru	
Integrated pest management: Information gathering and planning workshop (8 days)	Philippines	UPWARD/ SANREM
Workshop on IPM of sweetpotato weevil (6 days)	Cuba, Dominican Republic	IDB Special Project
International course on IPM of potato (10 days)	Bolivia, Chile, Colombia, Dominican Republic, Ecuador, Peru, Venezuela	IDB Special Project
II Course on integrated pest management: Andean potato weevil and tuber moth (2 days, six in-country courses)	Peru	IDB Special Project
IPM for sweetpotato (4 days)	Uganda	

The responsibilities of CIP's staff members posted at our regional offices involve ongoing collaboration to support national program needs. Some of this is carried out through the courses and workshops in this list. But much of CIP's support comes from less tangible, day-to-day exchanges. Specialized individual training in 1994 at headquarters served 37 participants from 17 different countries.

Program and Title	Countries Represented	Partner Institution
III Latin American course on potato production from TPS (12 days)	Brazil, Cuba, El Salvador, Guatemala, Nicaragua, Peru	IDB Special Project
Potato cropping with emphasis on soil and fertilization management (3 days)	Peru	IDB Special Project
In-country course on seed potato production (10 days)	Peru	PIPAC
Course on seed production (15 days)	Italy, Mexico, Peru, Syria	IDB Special Project
Potato seed production techniques (3 days)	Burundi	Burundi Special Project
Regional course on root crops management and development (26 days)	Kenya, Malawi	SARRNET
In-country course on potato seed production (5 days)	Ethiopia	
Workshop on true potato seed (6 days)	Burundi, Egypt, Ethiopia, Rwanda, Tunis, Uganda	
Skills training on sweetpotato production (2 days)	Philippines	UPWARD
True potato seed training for farmers (2 days)	Philippines	UPWARD/ NOMIARC—ADB Special Project
Sweetpotato production and management (2 days)	Philippines	UPWARD
International training workshop on storage of potatoes in developing countries (6 days)	Bangladesh, India, Kenya, Nepal, Pakistan, Rwanda, Sri Lanka, Thailand, Tunisia, Vietnam	COTESU/Pakistan-Swiss Potato Development Project
Workshop for biological scientists on performance monitoring and impact assessment (10 days)	Kenya	USAID/REDSO

Program and Title	Countries Represented	Partner Institution
International workshop on INFOANDINA (2 days)	Bolivia, Canada, Chile, Colombia, Ecuador, Mexico, Peru, USA	CONDESAN
Workshop for monitoring biological performance and impact assessment (10 days)	Kenya	USAID/REDSO
Statistics and use of MSTAT (13 days)	Kenya	PRAPACE
Workshop on planning and participatory methods (4 days)	Philippines	UPWARD/ SANREM
Workshop on planning and methods for root crop utilization (6 days)	Vietnam	UPWARD/CIP/NRI/ INSA/PHTI
International training on farm household diagnostic skills (8 days)	Philippines	UPWARD
Seminar on indigenous knowledge in agricultural research (6 days)	Indonesia	UPWARD



Special Country Projects and Networks

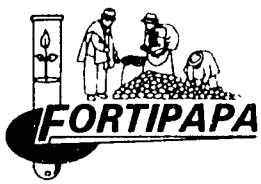
Location	Project Title	Donor
RESTRICTED CORE		
Multiple sites	Improved genetic resistance for disease and virus eradication	Austrian government
Sub-Saharan Africa	Selection, maintenance, and distribution of improved potato and sweetpotato planting materials in Sub-Saharan Africa	BMZ/GTZ-Germany
Andean zone	Germplasm characterization and utilization of Andean root and tuber crops	BMZ/GTZ-Germany
Multiple sites	Production of improved potatoes	Italian government
Multiple sites	Integrated pest management	Netherlands government
Andean zone	Conservation and improvement of the Andean agroecosystem	Spanish government
Multiple sites	Biotechnology-assisted breeding to reduce pesticide use in potato production	UNDP
SPECIAL COUNTRY PROJECTS		
East & Southeast Asia	Field testing of true potato seed in lowland tropics	ADB
Burundi	Potato and sweetpotato improvement	AGCD-Belgium
Latin America	Development of human resources to improve the production and use of potato, sweetpotato, and Andean root and tuber crops	IDB
Andean zone	Policies for sustainable rural development	IDRC-Canada
Andean zone	Sustainable Andean development	IDRC-Canada

Location	Project Title	Donor
Andean zone	Consortium for the Sustainable Development of the Andean Ecoregion-CONDESAN	IDRC-Canada
Andean zone	Sustainable highland agriculture	IDRC-Canada
South Asia	Development of potatoes and sweetpotatoes for South Asia	Japanese government
Andean zone	Andean highlands consortium	Netherlands government
Andean zone	Biodiversity of Andean root and tuber crops	COTESU-Switzerland
Indonesia	Preserving the biodiversity of sweetpotato in Indonesia	COTESU-Switzerland
Ecuador	FORTIPAPA-Phases I and II	COTESU-Switzerland
Bolivia	PROINPA-Phases II and III	COTESU-Switzerland
NETWORKS		
Asia	SAPPRAD	ACIAR-Australia
East & West Africa	PRAPACE	USAID
Caribbean	PRECODEPA	COTESU-Switzerland
Andean zone	PRACIPA	IDRC-Canada
Southern Cone (South America)	PROCIPA	IDB
Asia	UPWARD	Netherlands government
Africa	SARRNET	USAID

Many donors provide CIP with complementary or restricted core funds for specific research projects. These initiatives often fall outside the bounds of activities listed earlier. Technical assistance efforts to fortify national programs—in particular CIP's Special Country Projects and Networks—are among these complementary activities.

Acronyms and Abbreviations

AARI	Aegean Agricultural Research Institute, Turkey
ACIAR	Australian Centre for International Agricultural Research
ADB	Asian Development Bank
AGCD	Administration Generale de la Coopération au Developpement, Belgium
AIT	Asian Institute of Technology
ARC	Agriculture Research Center, Egypt
ARCS	Austrian Research Centre at Seidersdorf
AREA	Agricultural Research and Extension Authority, Yemen
ARTC	Andean root and tuber crops
BARI	Bangladesh Agricultural Research Institute
Benguet U	Benguet State University, Philippines
BMZ	German Ministry for Economic Development and Cooperation
BRC	Biotechnology Research Center, Vietnam
CAAS	Chinese Academy of Agricultural Sciences
CARDI	Caribbean Agricultural Research and Development Institute, Trinidad
CEPESER	Central Peruana de Servicios
CERRGFTYR	Centro Regional de Recursos Genéticos de Tubérculos y Raíces, Universidad Nacional San Antonio Abad de Cusco, Peru
CGIAR	Consultative Group on International Agricultural Research, USA
Chiang Mai U	Chiang Mai University, Thailand
CIAAB	Centro de Investigaciones Agricolas A. Boerger, Uruguay
CIAT	Centro Internacional de Agricultura Tropical, Colombia
CICA	Centro de Investigación en Cultivos Andinos, Peru
CIDA	Canadian International Development Agency
CIED	Centro de Investigacion, Educacion y Desarrollo, Peru
CIP	International Potato Center, Peru
CNCQS	Chinese National Centre for Quality Supervision and Test of Feed
CNPH	Centro Nacional de Pesquisa de Hortaliças, Brazil
CONDESAN	Consortium for the Sustainable Development of the Andean Ecoregion
Cornell U	Cornell University, USA
CORPOICA	Corporación del Instituto Colombiano Agropecuario
COTESU	Cooperacion Tecnica Suiza, Switzerland
CPRA	Centre de Perfectionnement et de Recyclage Agricole de Saïda, Tunisia
CPRI	Central Potato Research Institute, India
CPRO-DLO	Centre for Plant Breeding and Reproduction Research-Agriculture Research Department, Netherlands
CRIFC	Central Research Institute for Food Crops, Indonesia
CTCRI	Central Tuber Crops Research Institute, India
CUC	Catholic University of Chile
CURLA (UNAH)	Centro Universitario Regional del Litoral Atlantico-Universidad Autonoma de Honduras
DA	Department of Agriculture
DIA	Direccion de Investigacion Agricola, Paraguay
EMATER	Empresa de Assistência Tecnica e Extensão Rural do Estado de Minas Gerais, Brazil
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária, Brazil
ENEA	Comitato Nazionale per la Ricerca e per lo Sviluppo dell'Energia Nucleare e delle Energie Alternative, Italy
EPAMIG	Empresa de Pesquisa Agropecuaria de Minas Gerais, Brazil
ESEAP	East and Southeast Asia and the Pacific, CIP region
ESH	Ecole Superieure d'Horticulture, Tunisia



FAO	Food and Agriculture Organization of the United Nations, Italy
FONAIAP	Fondo Nacional de Investigaciones Agropecuarias, Venezuela
FORTIPAPA	Fortalecimiento de la Investigacion y Produccion de Semilla de Papa, Ecuador
FUNDAGRO	Fundacion para el Desarrollo Agropecuario, Ecuador
GAAS	Guandong Academy of Agricultural Sciences, China
GIS	geographic information systems
GTZ	German Agency for Technical Cooperation
IAN	Instituto Agronomico Nacional, Paraguay
IAO	Istituto Agronomico per l'Oltremare, Italy
IAR	Institute of Agricultural Research, Ethiopia
IAV	Institut Agronomique et Veterinaire, Morocco
IBTA	Instituto Boliviano de Tecnologia Agropecuaria
ICAR	Indian Council of Agricultural Research
ICIPE	International Centre for Insect Physiology and Ecology, Kenya
IDB	Inter-American Development Bank
IDRC	International Development Research Centre, Canada
IESR/INTA	Instituto de Economia y Sociologia Rural del Instituto Nacional de Tecnologia Agropecuaria, Argentina
IFPRI	International Food Policy Research Institute, USA
IIN	Instituto de Investigacion Nutricional, Peru
INIA	Instituto Nacional de Investigacion Agraria, Peru
INIA	Instituto Nacional de Investigaciones Agropecuarias, Chile
INIA	Instituto Nacional de Investigaciones Agropecuarias, Uruguay
INIAP	Instituto Nacional de Investigaciones Agropecuarias, Ecuador
INIFAP	Instituto Nacional de Investigaciones Forestales y Agropecuarias, Mexico
INIVIT	Instituto Nacional de Viandas Tropicales, Cuba
INRA	Institut National de la Recherche Agronomique, France
INRAT	Institut National de la Recherche Agronomique de Tunisie
INSA	National Root and Tuber Crop Improvement Institute, Vietnam
INTA	Instituto Nacional de Tecnologia Agropecuaria, Argentina
IPB	Bogor Agricultural University, Indonesia
IPGRI	International Plant Genetic Resources Institute, Italy
IPM	integrated pest management
IPO-DLO	Institute for Plant Protection-Agriculture Research Department, Netherlands
IPR	Institute for Potato Research, Poland
IRA	Institut de Recherche Agronomique, Cameroon
IRR	internal rates of return
ISABU	Institut des Sciences Agronomiques du Burundi
IZ	Instytut Ziemniaka, Poland
JAAS	Jiangsu Academy of Agricultural Sciences, China
KARI	Kenyan Agricultural Research Institute
LAC	Latin America and the Caribbean, CIP region
LEHRI	Lembang Horticultural Research Institute, Indonesia
LSU	Louisiana State University, USA
MA	Ministry of Agriculture
McMaster U	McMaster University, Canada
MENA	Middle East and North Africa, CIP region
MIP	Programa de Manejo Integrado de Plagas, Dominican Republic
Miss SU	Mississippi State University, USA
MMSU	Mariano Marcos State University, Philippines
MOA	Ministry of Agriculture, Tanzania
Montana SU	Montana State University, USA

MSIRI	Mauritius Sugar Industry Research Institute
Nagoya U	Nagoya University, Japan
NAL	National Agricultural Laboratories, Kenya
NARO	National Agricultural Research Organization, Uganda
NARS	national agricultural research systems
NCSU	North Carolina State University, USA
NGO	nongovernmental organization
NOMIARC	Northern Mindanao Agricultural Research Center, Philippines
NPRCRTC	Northern Philippine Root Crops Research and Training Center
NPRP	National Potato Research Program, Nepal
NRI	Natural Resources Institute, UK
ODA	Overseas Development Administration, UK
OPEC	Organization of Petroleum Exporting Countries
Oxford U	University of Oxford, England
PCARRD	Philippine Council for Agriculture & Resources, Research & Development, Philippines
PDA	Provincial Delegation of Agriculture, Cameroon
PDP	Potato Development Program, Nepal
PGS	Plant Genetic Systems, Belgium
PHTI	Postharvest Technology Institute, Vietnam
PICA	Programa de Investigacion de Cultivos Andinos, Peru
PIPAC	Programa de Investigacion para Papa y Camote, Peru
PRACIPA	Programa Andino Cooperativo de Investigacion en Papa, CIP network
PRAPACE	Programme Regional de L'Amelioration de la Culture de la Pomme de Terre et de la Patate Douce en Afrique Centrale et de l'Est, CIP network
PRECODEPA	Programa Regional Cooperativo de Papa, CIP network in Central America and the Caribbean
PROCIPA	Programa Cooperativo de Investigaciones en Papa, CIP network in Southern Cone
PROINPA	Proyecto de Investigacion de la Papa, Bolivia
PSPDP	Pakistan Swiss Potato Development Program
RDSO	Regional Development Services Office (USAID)
RES	Rothamsted Experiment Station, UK
RS	research station
SAAS	Sichuan Academy of Agricultural Sciences, China
SANREM	Sustainable Agriculture and Natural Resources Management, network in Southeast Asia
SAPPRAD	Southeast Asian Program for Potato Research and Development, CIP network
SARII	Sukamandi Research Institute for Food Crops, Indonesia
SARRNET	Southern Africa Root Crop Research Network
SCRI	Scottish Crop Research Institute
SDC	Swiss Development Cooperation
SEAG	Servicio de Extension Agricola y Ganadera, Paraguay
SEARCA	Southeast Asian Regional Center for Graduate Studies and Research in Agriculture, Philippines
SEINPA	Semilla e Investigacion en Papa, Peru
SPI	Smart Plant International, USA
SPPC	Seed Potato Production Center, Yemen
SSA	Sub Saharan Africa, CIP region
Stanford U	Stanford University, USA
SWA	South and West Asia, CIP region

TALPUY	Grupo de Investigación y Desarrollo de Ciencias y Tecnología Andina
TARI	Taiwan Agricultural Research Institute
TCRC	Tropical Crops Research Center, Bangladesh
TFNC	Tanzania Food and Nutrition Centre
TPS	true potato seed
U Ambato	Universidad de Ambato, Ecuador
U Austral	Universidad Austral, Chile
U Birmingham	University of Birmingham, England
U Georgia	University of Georgia, USA
U Ica	Universidad San Luis Gonzaga de Ica, Peru
U Inner Mongolia	University of Inner Mongolia, China
U Nairobi	University of Nairobi, Kenya
U Naples	University of Naples, Italy
U Oxford	University of Oxford, England
U Tacna	Universidad Jorge Basadre Grohmann de Tacna, Peru
U Tubingen	University of Tubingen, Germany
UCRI	Upland Crops Research Institute, China
UMSS	Universidad Mayor de San Simón, Bolivia
UNA	Universidad Nacional Agraria, Peru
UNCEN	Universitas Cenderawasih, Indonesia
UNCP	Universidad Nacional del Centro del Perú
UNDAC	Universidad Nacional Daniel Alcides Carrión, Peru
UNDP	United Nations Development Programme, USA
UNMSM	Universidad Nacional Mayor de San Marcos, Peru
UNSAAC	Universidad Nacional San Antonio Abad de Cusco, Peru
UNSCH	Universidad Nacional San Cristobal de Huamanga de Ayacucho, Peru
UPLB	University of the Philippines, Los Baños
UPWARD	Users' Perspective with Agricultural Research and Development, CIP network
URP	Universidad Ricardo Palma, Peru
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
USVL	United States Vegetable Laboratory
UTC	Universidad Tecnica de Cajamarca, Peru
VisCA	Visayas College of Agriculture, Philippines
Viterbo U	Universita Degli Studi Della Tuscia, Italy
Wageningen U	Wageningen University, Netherlands
XSPRC	Xuzhou Sweet Potato Research Center, China
YGPPP	Yemen/German Plant Protection Project
YNU	Yunnan Normal University, China

CONDESAN

CIP's Global Contact Points

(as of March 31, 1995)

Latin America and the Caribbean Regional Office/Headquarters

■ Peru
International Potato Center
Apartado 1558
Lima 100, Peru
Phone: (51-1) 436-6920/435-4354
Fax: (51-1) 435-1570
Telex: 25672 PE
Cable: CIPAPA, Lima
Internet/E-mail:
cip@cgnet.com or cip@cipa.org.pe

Research Stations

■ Colombia
Rionegro
c/o CIP-ICA (La Selva)
Apartado Aéreo 128
742 Rionegro, Antioquia
Colombia
Phone: (57-4) 537-0161/537-0079
Internet/E-Mail:
cipcol@sigma.eafit.edu.co

■ Ecuador
Estación Experimental INIAP Santa Catalina
Km 17 Panamericana Sur
Quito, Ecuador
Phone: (593-2) 690-362/63
692-602/695
Fax: (593-2) 692-604
Internet/E-mail:
cip-quito@cgnet.com or
irs@cip.org.ec or stacata@cip.org.ec

Special Projects

■ Ecuador
FORTIPAPA (at Santa Catalina Station, same as above)
Phone: (593-2) 690-364/695
Internet/E-mail:
cip-quito@cgnet.com or
fpapa@cip.org.ec com or
fpapa@cip.org.ec

■ Bolivia
PROINPA (IBTA-CIP)
Man Cesped 293
Casilla Postal 4285
Cochabamba, Bolivia
Phone: (591-42) 49506/49013
Fax: (591-42) 45708
Internet/E-mail: proinpa-bolivia@cgnet.com or
proinpa@papa.bo

Sub-Saharan Africa Regional Office

■ Kenya
P.O. Box 25171
Nairobi, Kenya
Phone: (254-2) 63-2054/63-2206/63-2151
Fax: (254-2) 63-0005
Telex: 22040
Cable: CIPAPA, Nairobi
Internet/E-mail: cip-nbo@cgnet.com

Liaison Office

■ Cameroon
c/o Delegation of Agriculture
North West Province
Bamenda
P.O. Box 279
Phone: (237-36) 2289
Fax: (237-36) 3893 (public booth)
(237-36) 3284 (Skyline Hotel)
Telex: 58442 (NWDA)

■ Nigeria
c/o IITA
PMB 5320, Ibadan
Phone: (234-22) 400300-318
Fax: 874-1772276 via INMARSAT Satellite or
(234-2) 241221
Telex: TROPIB NG (905) 31417, 31159
Cable: TROPFOUND, IKEJA
Internet/E-mail: iita@cgnet.com
Attn: H. Mendoza/CIP

■ Uganda
P.O. Box 6247
Kampala, Uganda
Phone: (256-41) 567670
Fax: (256-41) 567635
Internet/E-mail: ciat-uganda@cgnet.com

Network

■ PRAPACE
PRAPACE/Uganda
c/o National Agricultural Research Organization (NARO)
P.O. Box 295
Entebbe, Uganda

This list indicates CIP's principal contact points worldwide, by region. A more detailed list, including current staff contacts, can be obtained from the office of the Director for International Cooperation.

Middle East and North Africa Regional Office

■ Tunisia
11 Rue des Orangers
2080 Ariana
Tunis, Tunisia
Phone: (216-1) 71-6047
Field phone: (216-1) 53-9092
Fax: (216-1) 71-8431
Telex: 14965 CIP TN
Internet/E-mail: cip-tunis@cgnet.com

Liaison Office

■ Egypt
P.O. Box 17
Kafr El-Zayat, Egypt
Phone: (20-40) 58-6720
Fax: (20-40) 317476
Telex: 23605 PBTNA UN

South and West Asia Regional Office

■ India
IARI Campus
New Delhi 110012, India
Phone: (91-11) 574-8055/574-1481
Telex: 3173140 IIIN
3173168 IIC IN
Cable: CIPAPA, New Delhi
Internet/E-mail: cip-delhi@cgnet.com

East and Southeast Asia and the Pacific Regional Office

■ Indonesia
c/o CRIFC
P.O. Box 929
Bogor 16309, West Java, Indonesia
Phone: (62-251) 317951/313687
Fax: (62-251) 316264
Internet/E-mail: cip-bogor@cgnet.com
Lembang Annex
Fax: (62-22) 28-6025
Internet/E-mail: cip-indonesia@cgnet.com

Liaison Offices-Philippines

■ Los Baños Office
c/o IRRI
P.O. Box 933
Manila, Philippines
Phone: (63-94) 50235, 50015-19, ext. 248
Fax: (63-2) 5224240
Internet/E-mail: g.prain@cgnet.com

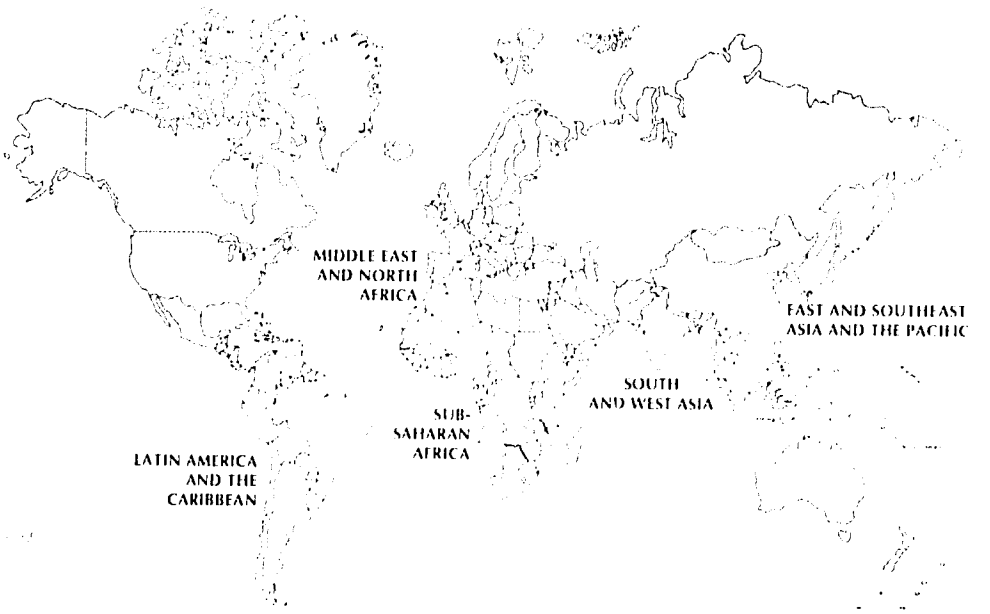
■ Baguio Office
c/o NPRCRTC
P.O. Box 1234
2600 Baguio City, Philippines
Phone: (63-912) 3083910/ (63-74) 4322439
Internet/E-mail: cip-baguio@cgnet.com

■ China
c/o The Chinese Academy of Agricultural Sciences
Bai Shi Qiao Rd. No. 30
West Suburbs of Beijing
Beijing, People's Republic of China
Phone: (86-1) 831-6536
Fax: (86-1) 831-5329
Telex: 22233 or 222720 CAAS CN
Cable: AGRIACA
Internet/E-mail: cip-china@cgnet.com

Networks

■ SAPPRAD
(same as Philippines - Los Baños Liaison Office)

■ UPWARD
(same as Philippines - Los Baños Liaison Office)



We dedicate this report to our colleagues
detained while in service to agriculture and the CGIAR.

Martin Bicamumpaka, Rwanda, February 2, 1995
Thomas R. Hargrove, Colombia, September 23, 1994