POSTHARVEST INSTITUTE FOR PERISHABLES

ACTIVITIES REPORT

Postharvest Institute for Perishables
University of Idaho
Moscow, Idaho 83843

Cooperative Agreement AID/DAN-1323-A-00-5093-00

October 1, 1985 to September 30, 1986

University of Idaho

in cooperation with
United States Agency for
International Development

ANNUAL ACTIVITIES REPORT

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Prepared for the
United States Agency for International Development

Harvey C. Neese, Acting Director/Field Director

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I. INTRODUCTION

This report is a review of activities in the Postharvest Institute for Perishables (PIP) for the period October 1, 1985 to September 30, 1986. This is the first annual report under the new Cooperative Agreement AID/DAN-1323-A-00-5093-00 which will cover PIP activities from 1985 - 1990.

PIP has initiated a slight change of direction in its mode of operation because of a perceived need to further institutionalize its activities within the university system but yet emphasize the internationalization of PIP. The institutionalization at the university of PIP will strengthen its base of operations along with utilizing more of the university's capabilities in research, training and technical assistance. Program and project leaders will be utilized from the university system to give technical guidance to PIP activities. Increased collaboration with other international organizations will highlight PIP's activities on a wider international scale and offer alternative means of funding. The absence of PIP financed 20 person day technical assistance (TA) to AID Missions has reduced requests for short term TA as was expected. The signing of the Basic Ordering Agreement (BOA) late in FY 86, however, should increase longer term involvement in the future in project work financed by AID Missions.

In this reporting period, PIP has organized a system to develop projects within a set of programs that have been established because of their potential importance to LDC development. Longer term involvement to bring various projects to logical conclusions will be stressed. In FY 86, a beginning was made to implement the new direction of PIP. This will continue in the future. Because of budget uncertainties for most of the reporting period, and a substantial reduction when the yearly amount was finally allocated, some activities had to be omitted from previous work plan projections.

The PIP Information Center (PIPIC) continues to collect documents and offer literature and documentation services to developing countries. The demand for technical documents continues which indicates the importance of this service.

There were some changes in the PIP Core Staff during the last reporting period. The PIP staff at the end of this reporting period was as follows:

Harvey C. Neese, Acting Director, Field Director
Tom Dechert, appointed Assistant Field Director
Paulette George, Information Specialist
Carol Williams, appointed Secretary/Records Manager
Yvonne Sertich, appointed General Typist

PIP is supported by University faculty and numerous experts and specialists in many phases of perishable crops. Their names appear as consultants in the PIP computerized X-PERT Roster. These specialists are located at the University of Idaho, other universities and private sector firms in the U.S. and abroad.

II. PURPOSE, GOALS AND OBJECTIVES OF THE COOPERATIVE AGREEMENT

The purpose of Cooperative Agreement DAN-1323-A-00-5093-00 between the U.S. Agency for International Development (USAID) and the University of Idaho is to increase PIP's resource base and collaboration with U.S., LDC and international institutions. From this, a program has developed to conserve perishables after harvest by improving LDC postharvest systems and strengthening LDC institutions and staff to implement economically sound and environmentally safe programs in this area.

The assistance is intended to strengthen PIP at the University of Idaho to:

1. Carry out adaptive research related to postharvest conservation of perishables.
2. Provide technical advice and assistance on postharvest perishable problems to LDC countries.
3. Produce and selectively collect and distribute key materials on postharvest problems, and increase the capability of the Postharvest Institute for Perishables Information Center (PIPIC).
4. Train graduate students and conduct seminars, workshops and short courses in the U.S. and host countries on postharvest activities in perishable crops.

The overall goals and objectives remain the same. These are:

1. To increase the availability (without increasing production areas) of fruit, vegetable, root, tuber, spice, nut and oilseed crops, and to enhance the basic diet of people in developing countries by reducing postharvest food losses.
2. To reduce the costs of perishable commodities by improving the efficiency of the various components of a marketing system.
3. To encourage the development of processing and other industries associated with fruit, vegetable, root, tuber, spice, nut and oilseed crops for domestic or export purposes.

III. PROGRAM DEVELOPMENT AND IMPLEMENTATION

PIP began the second five year Cooperative Agreement with a more standardized research program (versus only individual projects) and increased institutionalization of PIP within the university system. In conjunction with this, efforts were also initiated to expand PIP's international contacts so that its international image would be enhanced. It is planned that each program will have an overall leader at the university to oversee technical aspects of PIP activities. Project leaders, within the programs, will also be selected to handle individual projects. Where possible and appropriate, the university would support these efforts with either faculty, time or supplementary funds.

Program development and implementation fall into four categories that are briefly discussed here but will be addressed in more detail on the following pages.

1. ADAPTIVE RESEARCH PROGRAM

   a. Preservation and Storage

      Adaptive research projects supporting activities are:

      - Solar refrigeration development
      - Shrink wrap packaging for potatoes/soft fruits
      - Solar drying high value crops
      - Storage of potatoes, onions and garlic
      - Chemical and physical analysis of nutmeg

   b. Postharvest Loss Assessment

      Projects to support activities:

      - Development of methodology/manual/training course for mid-level agriculturists in developing countries
      - Field testing of methodology
      - Training courses set up in various countries

   c. Marketing Research

      Field research programs will be developed to coincide with university expertise and the requirement of AID Missions under

the Basic Ordering Agreement. Emphasis for longer range marketing research programs will be with countries where the university has already established working relationships. Collaboration with private sector marketing firms will be sought with all marketing projects.

2. TRAINING PROGRAM

a. Long-term Training: M.S. students to be selected to support areas of research emphasis.

b. Short-term Training: will be conducted to support areas of emphasis as much as possible. Short-term training will be funded by AID Missions or other donor organizations.

3. TECHNICAL ASSISTANCE AND FIELD RESEARCH PROGRAM

The Basic Ordering Agreement (BOA) is a companion instrument to the Cooperative Agreement and provides financial support to the university's capabilities in research and development activities in postharvest perishable food systems. The primary sources of technical assistance and field support are requests from USAID Missions and developing countries for applied research, development and training services in postharvest perishable food systems.

4. PIP INFORMATION SERVICE PROGRAM

Information, documents and bibliographies on all phases of harvesting, handling, storage, marketing and processing related to reducing postharvest losses in fruit, vegetable, root, tuber, and spice crops are collected and sent to developing country clients as they are requested.

IV. ADAPTIVE RESEARCH PROGRAM

During the reporting period, PIP was involved in eight adaptive research projects to benefit developing countries. Initial research has been completed on some projects but there is a need for either field testing, evaluation, etc. to complete others. The adaptive research work is listed below with the various stages of completion and development.

A. PRESERVATION AND STORAGE

1. Solar Cooling. This project involves development of a low-cost cooling unit, and storage area, to remove field heat from fruits or vegetables immediately after harvest and store these for a short period of time. The device will operate in a water-zeolite system under partial vacuum and with no moving parts. Two prototypes have been constructed and tested in the Department of Chemical Engineering. Evaluation of the data as well as the economics of constructing them are needed to determine the next step in the technology transfer process. If the evaluation is technically positive, and cost effective, field testing will begin in FY 87.

2. Film or Shrink Wrap. The film or shrink wrap adaptive research project was initiated to develop a model for sanitary packaging and increasing the shelf life of perishable crops. Potatoes were used in the experimental phase to test different kinds and methods of utilizing shrink wrap in the Department of Plant, Soil and Entomological Sciences at the University of Idaho.

   It was found that potatoes could be stored at ambient room temperatures up to 12 weeks without appreciable greening or sprouting. This research could be applicable in countries where potatoes are considered a high value crop.

   An Indian research organization has expressed interest in continuing shrink wrap research but with high valued soft fruit, mainly for the export market. Discussions have been initiated for PIP to collaborate with India research centers on applying the research results to that country.

3. Solar Drying and Food Preservation. The purpose of this project is to continue to develop a more practical, inexpensive and usable solar drying unit for use in developing countries. The smaller drying units developed by PIP have been demonstrated in a number of developing countries by PIP. Use of less expensive materials for construction may be needed to promote wider use of the the small solar food dryers.

Larger drying units are being investigated to dry high valued crops, such as spices, through associations or cooperatives. PIP has initiated a literature search as a first step to determine the appropriate direction in promoting drying as a food preservation method or market preparation for sanitarily removing excess moisture from the product.

4. Storage of Potatoes and Onions. The objective of this project is to develop an appropriate technology, inexpensive facilities and methods to improve storage of potatoes, onions and garlic in developing countries. On the potato component, PIP has initiated discussions with the International Potato Center in Peru to collaborate on the project. Initial reaction has been positive.

A preliminary investigation and literature search has been initiated by PIP to determine what has been done and what is further needed in terms of research or innovations. After sufficient information has been collected, a program will be designed to improve storage facilities and methods of storage through research or extension of methods already known.

5. Aflatoxins in Nutmeg. West Germany is considering the requirement that food processors and exporters of food products to that country test all food commodities for aflatoxins. Aflatoxins are a group of organic metabolites produced by a fungal species. Large doses of aflatoxins can cause an acute liver dysfunction that has been compared to Reyes Syndrome. Aflatoxins have also been shown to be potent liver carcinogens.

An extensive literature search was conducted by PIP to determine if aflatoxins have been found in nutmeg. The Grenada Nutmeg

Association wants to submit a rebuttal to the need for expensive testing of its nutmeg for the German market.

Based upon the literature review, it was found that although aflatoxins are occasionally known to contaminate nutmeg, it is not generally considered a "high-risk" food. Since all cases of aflatoxin contamination were reported from retail samples, and since the spores of Aspergillus flavus are found world-wide, it is reasonable to assume that fungal growth and subsequent aflatoxin production probably occurs when the product is temporarily stored under unsuitable conditions after being cracked and/or partially milled.

A report was sent by PIP to the Grenada Nutmeg Association which plans to submit it to the German health authorities.

B. POSTHARVEST LOSS ASSESSMENT METHODOLOGY

Field Study. The Postharvest Institute for Perishables has initiated this project to develop a methodology for identifying postharvest losses in collaboration with the ASEAN Food Handling Bureau and the Inter-American Institute for Cooperation on Agriculture. It is anticipated that the development of the methodology will offer a tool for developing country agriculturists and postharvest specialists to define how their agricultural commodity marketing system works, and afterwards introduce needed improvements. The use of mid-level agents in rural areas to conduct parts of the study may be a breakthrough needed to give the small number of specialists assistance in this process. By using different personnel to complete various components of each study, the amount of time and effort will be minimal to any one individual. The utilization of these mid-level agents should speed up the process of identifying losses and making relevant improvements.

The purpose of this manual is to provide food technologists, government officials, marketing specialists, extension agents, and others interested in the production and postharvest handling of perishable food, with a set of guidelines. These guidelines will facilitate the systematic collection, organization and analysis of

information relevant to planning, production, market preparation, and marketing of a specific product, from a particular geographical region within the country and during a defined time period. The data can be collected, at least partially, utilizing mid-level agents who are familiar with conditions in rural areas. Phase I has been completed by a team of specialists who spent a month in Asia putting together an initial draft of the manual. (Note: This manual is not meant to cover national studies although this regional information may contribute to national plans.)

C. MARKETING

1. Nutmeg Marketing. PIP initiated an adaptive research project with the Department of Chemical Engineering at the University of Idaho to assist the Grenada Cooperative Nutmeg Association to establish a market for nutmeg in the U.S. Grenada produces approximately one-third of the world's nutmeg supply. The research work has involved chemical and physical analyses of Grenada nutmeg for volatile oil, moisture and fat content and marketing assistance directed at improving sales to U.S. spice producers. Because of suspected high percentages of some chemical compounds, Grenada nutmeg was found to have some screening and sizing problems during the grinding process.

As a result of PIP efforts, several U.S. spice firms have collaborated to improve the marketing potential of Grenada nutmeg in the U.S. One firm has purchased 30,000 pounds of nutmeg and another is currently discussing the purchase of larger amounts of nutmeg. The AID Mission in Grenada has contributed to support of this project with Mission funds after the project was initiated by PIP. Thus far, one adaptive research contract for $28,000 has been approved and signed with AID/Grenada and another for $54,000 has been approved by the AID central office in Barbados. The latter contract will involve primarily marketing assistance to the spice industry in Grenada.

2. Marketing of Spice By-Products. PIP sent a University of Idaho

scientist to Grenada to investigate the possibility of developing and marketing the by-products of nutmeg, cocoa or bananas for a livestock feed or an energy souce. Initial results indicated that these by-products might have value for one or the other. Further investigation will be conducted to determine how these by-products might be utilized in Grenada.

V. TRAINING PROGRAM

Training activities conducted by PIP under the Cooperative Agreement fall into two categories: 1) workshops, seminars or short courses presented in-country or in the U.S. and 2) sponsored students for degree or non-degree training at a U.S. university. During the period October 1, 1985 to September 30, 1986 PIP presented two workshops in-country, and two in the U.S. Also, five students were sponsored for all or some portion of their advanced degrees.

A. Workshops, Seminars and Short Courses

1. "A Solar Drying and Food Preservation Workshop in the Eastern Caribbean." Project: PIP/Grenada/Peace Corps/Nov - Dec 85/ No. 74.

Two instructors from the University of Idaho presented a workshop in Grenada on the construction and use of a solar dryer with supplemental heat for perishable food preservation. The 10-day workshop was presented to 27 participants from Grenada, Dominica, St. Lucia, St. Vincent and Carriacou at the request of the Eastern Caribbean Peace Corps.

2. "Jamaica Solar Drying and Food Preservation Training Session." Project: PIP/Jamaica/Jan 86/No. 75.

Two employees of the University of Idaho presented a workshop in Kingston, Jamaica on the construction and use of solar dryers with supplemental heat for perishable food preservation. This demonstration, hands-on training session was conducted at the request of the USAID Mission in Kingston. The course focused on small-scale low technology for individual farmers or families.

3. "Postharvest Loss Reduction Study Tour for Iraqi Participants." Project: USDA/OICD Study Tour/July 86/No. 78.

PIP collaborated with the USDA/OICD in the presentation of a study tour in Idaho and Washington for participants from Iraq. This observational study tour was designed to help the participants gain exposure to and learn postharvest loss reduction methods in fruits and vegetables, particularly apples, cherries and potatoes.

4. "Postharvest Diseases and Loss Reduction Study Tour." Project: USDA/OICD Study Tour/Sept 86/No. 80.

PIP collaborated with the USDA/OICD in the presentation of a study tour in South Idaho for a participant from Iraq. The one week study tour concentrated on potatoes, onions, and some fruits and consisted of visits to various private sector harvest, handling, storage, and processing operations.

B. Degree and Non-degree Students

PIP supported, wholly or partially, seven developing country students during the period of this report.

1. Ms. Carmen Paterno (Philippines)
Department of Bacteriology and Biochemistry
University of Idaho

Completed M.S. degree in May 1986, which was fully supported by PIP. Thesis: "Monoclonal Antibody Production Against Colletotrichum Gloeosporioides Penz. A Potential Tool to Diagnose Anthracnose in Mangos."

2. Mr. Miguel Bastarrechea (Guatemala)
Department of Vegetable Crops
Cornell University

Completed M.S. degree in June 1986. Thesis: "Postharvest Quality in Snow Peas." Acknowledgement of some support from PIP was given in the thesis which was published by Cornell University.

3. Mr. Kiran Shetty (India)
Department of Plant, Soil and Entomological Sciences
University of Idaho

Completed M.S. degree in May 1986. Thesis: "The Use of Shrink Wraps to Extend Storage Shelf-life of Quality Potatoes." Financial support was provided by PIP. PIP also assisted Mr. Shetty in locating private sector support from Cryovac Corporation for the research. Mr. Shetty is currently working on a Ph.D. and expects to earn his degree in May of 1989. PIP is also assisting Mr. Shetty in locating support from the Indian Council of Agricultural Research for his Ph.D. studies in India.

4. Mr. Christopher Obel Gor (Kenya)

Department of Agricultural and Extension Education

University of Idaho

Expects to complete M.S. degree in May of 1988 with his education wholly supported by PIP. Thesis subject: "The Transfer of Appropriate Technology to Developing Countries."

5. Mr. Sulub Ali Aman (Somalia)

Department of Agricultural and Extension Education

University of Idaho

Expects to complete M.S. degree in May of 1987 with thesis on solar drying. Received some financial and administrative support from PIP.

6. PIP provided assistance to eighteen students from developing countries who were studying for Bachelor's, Master's, or Ph.D. degrees at the University of Idaho under funds provided by AID or FAO. PIP assistance was principally in the form of staff time to orient the students, help them find faculty advisors and place them in various departments at the University of Idaho, and provide guidance as needed during the academic year. This assistance was given to students from Somalia, Rwanda, Egypt, Mauritania, Kenya, Burkina Faso, Morroco, Pakistan, Philippines, Lesotho, China, India, Zimbabwe, and Zambia.

VI. TECHNICAL ASSISTANCE & FIELD RESEARCH PROGRAM

The initial five year Cooperative Agreement between AID and the University of Idaho provided annual core grant support for a limited number of technical assistance consultant days. This support included consultant fees, per diem, travel costs, etc. The second five year Cooperative Agreement does not have this popular technical assistance (TA) provision for AID Missions which readily shows up in TA statistics for FY 86. A new contractual mechanism, and a different funding means has been substituted for the former PIP supported technical assistance. The mechanism is called the Basic Ordering Agreement (BOA).

The BOA provides a mechanism for PIP to contract with AID Missions within its scope of work. All PIP technical assistance will be financially supported by AID Mission funds.

The BOA was approved late in Fiscal Year 86 -- too late to be utilized extensively for this period. Without the BOA mechanism to contract with AID Missions, and an absence of PIP core grant funds, there was no means for PIP to provide technical assistance to the Missions. A number of potential project requests by AID Missions had to be cancelled because of the absence of a contractual mechanism. Despite the disruptions in the TA process, the following assistance projects were initiated this reporting period:

1. Cocoa/Nutmeg By-Products as an Energy/Feed Source.

   TA was provided to the nutmeg and cocoa associations in Grenada to examine the feasibility of utilizing agricultural by-products for an energy or livestock feed source. PIP sent a UI faculty member to spend a month in Grenada to advise on this project. It was found that cocoa and nutmeg by-products are widely dispersed in Grenada, making a central facility impractical. Local, smaller development of bio-gas generation systems could be a viable alternative for both cocoa and nutmeg by-products. The PIP consultant recommended a test of the nutmeg outer cover, the pericarp, as a possible small livestock feed source. The test is presently being set-up. A bio-gas generation prototype is currently in operation in Grenada. Data from this facility will determine the feasibility of

utilization of cocoa and nutmeg bio-products.

2. Grenada Nutmeg Marketing Efforts.

PIP has been assisting the Grenada Cooperative Nutmeg Association to penetrate the U.S. market with its nutmeg. PIP's efforts resulted in an order for 30,000 pounds of nutmeg from one U.S. spice processor and currently, discussions are continuing for the purchase of 300,000 pounds by another U.S. spice processor. The marketing efforts have been funded primarily by PIP. However, the Grenada AID Mission has proposed to assist in funding marketing efforts for Grenada nutmeg.

3. Caribbean High Impact Agricultural Marketing Project (HIAMP).

PIP was included as a collaborator in a proposal by Development Alternatives, Inc. (DAI) for the long term AID supported HIAMP project in the Caribbean. Development Alternatives was awarded the contract and discussions have been initiated between PIP and DAI to determine PIP's part in the five year project.

4. Central America Non-Traditional Agricultural Export Support.

PIP was also included as a collaborator in this project which was awarded to Chemonics, Inc. by AID/ROCAP in Central America. PIP personnel have begun discussions with Chemonics, Inc. to determine PIP's role in this five year project.

5. Postharvest Loss Investigation in Thailand, Indonesia and the Philippines.

This project consisted of a condensed report from extensive work and observations by the following investigators: Dr. Samson C.S. Tsou of the Asian Vegetable Research and Development Center (AVRDC) in Taiwan, Dr. James R. Jones, University of Idaho, Dr. James R. Hicks, Cornell University and Mr. Nasrun Hasibuan from the Indonesia Ministry of Agriculture. The Postharvest Loss Assessment Methodology project was an extension of the above investigations.

VII. PIP INFORMATION SERVICE PROGRAM

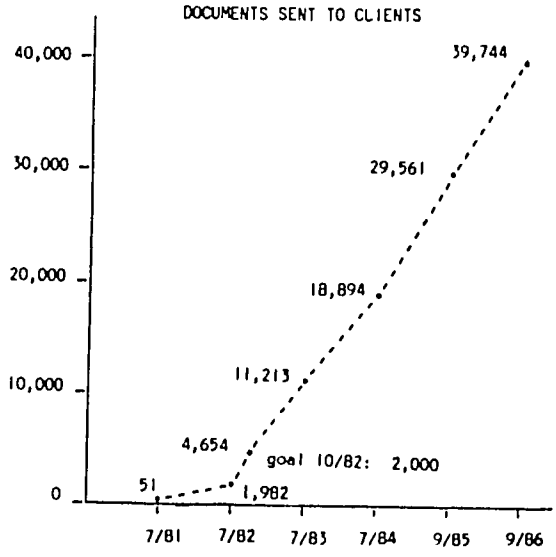
This portion of the report covers the activities of the Postharvest Institute for Perishables Information Center (PIPIC).

The activities of the Information Center during the past 12 months will be discussed with particular emphasis on the collection size, materials distributed, the clients served, and client responses to PIPIC services.

Collection Size: There are 9,617 titles in the PIPIC collection with 675 titles added since September 1985.

Documents in Collection	
July 1981	922
July 1982	4,354
July 1983	5,875
July 1984	7,328
July 1985	8,697
Sept 1985	8,842
Sept 1986	9,617

New additions to the collection are announced through New Titles which was published twice during this 12 month period with 1150 copies being distributed. By a 2 to 1 margin, clients preferred to have more documents listed rather than abstracts of fewer documents. Hence, abstracting of documents ceased with the first New Titles of FY 1986.

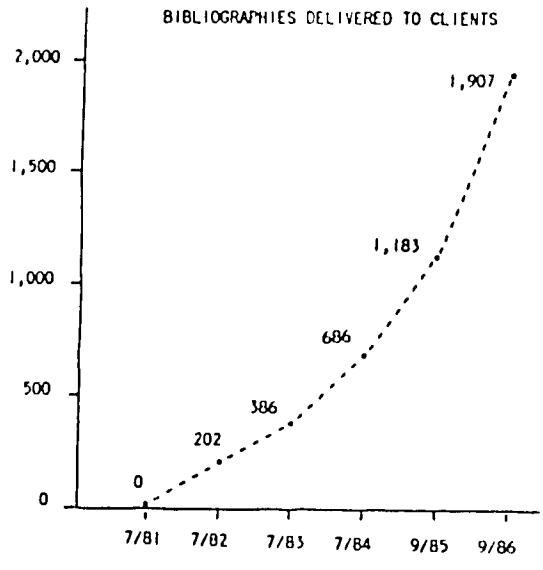


Materials Distributed: Within the last 12 months 8,664 documents have been distributed (approximately 725 per month). This brings the total number of documents distributed to 39,744. Roughly 15% of the materials were distributed in microfiche to a small number of libraries which order large quantities. Aproximately 99% of PIPIC users rely on paper copies.

Bibliographies where envisioned by the cooperative agreement to be major works which were to be printed and distributed in multiples copies around the world. A fifth is now in progress. The series is:

	Published	Copies Distributed to Date
Roots & Tubers: A Postharvest Bibliography	1981	150
Export Marketing: A Bibliography	1983	750
Exotic Fuits: A Postharvest Bibliography	1983	475
EDB Alternatives for Perishables: A Bibloigraphy	1985	180
Storage of Potatoes, Onion and Garlic in the Developing World	1987	-

The Information Center, however, has greatly expanded the definition of bibliography to serve the single PIPIC user. As a result, the PIPIC collection's database and those commercially available through Dialog and other vendors are regularly searched to create individualized bibliographies. During the year, 640 such bibliographies were produced and distributed. This is 50% of the total number sent in the first 5 years of operations. A total of 1,907 individualized bibliographies have now been distributed. Those bibliographies on solar dryers and appropriate-level food processing are still the most frequently requested.



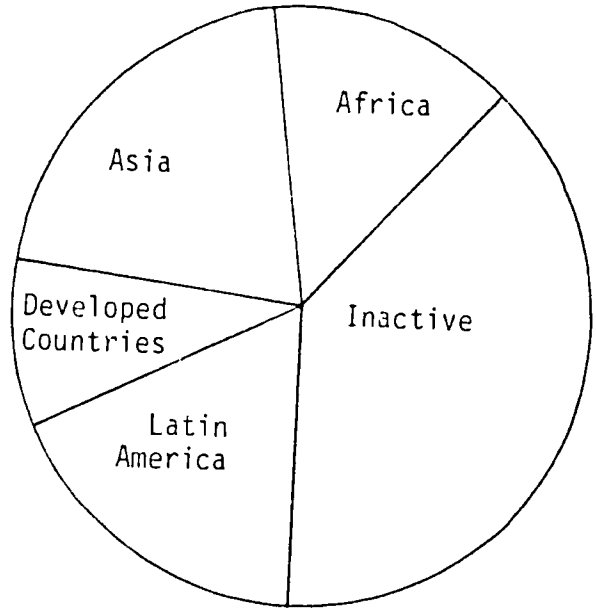
Clients Served: Over the years the contacts have continued to grow as can be seen from the following chart. On October 1, 1986, 895 clients were being served in 114 countries. This is an increase of 94 clients and 5 countries in the last 12 months. A "client" may be an individual, but more often is an agency or institution where two to five people receive materials. A person is added as a "client" only after a second request has been filled. During FY 1986, PIPIC served more than 350 new people with only 25% being added as new clients.

PIPIC Clientele

Number of Clients		Number of Countries
July 1981	12	8
July 1982	242	70
July 1983	327	90
July 1984	547	101
July 1985	767	108
Oct 1985	801	109
Oct 1986	895	114

The following pie chart illustrates the current geographic distribution of the PIPIC clients. Those who are "inactive" are clients from whom there was no correspondence for a period of 15 months. Before inactivating, a card is sent to each individual who is given a chance to remain active if desired.

This year 179 former clients were removed from current mailing lists. The total once served and inactivated is now 351 or 39% or total clients. This rate of infrequent use led to the development of the policy to add a new client (and send New Titles regularly) only after two orders were received.



Those in developed countries (Western Europe, the USA, Japan, Australia and New Zealand) are primarily development workers in either government or private agencies within these countries. An estimated two dozen are fee-paying clients at this time.

Client Response to Services: There are two different forms of regularized feedback requested from PIPIC users.

With each order, a postcard "Satisfaction Survey" is included. In the last year, 350 postcards were sent to clients with 184 or 53% being returned. The primary purpose of these postcards is to determine whether the client received

what was requested and to check on the physical quality of the materials. For example, 78% of those receiving a bibliography said it was adequate while 12% judged it as too general and 8% felt it was too specific. Copy quality was judged to be occasionally "difficult to read" by 9% and 3% said some were illegible. Microfiche quality was the problem in 12% of the cases where problems were seen. As copy quality has increased, it was found that more people are critical of less significant faults. Over half of those returning the cards used the space provided to comment. Of these, 52% were "thank yous", but 21% used this to request more documents and another 19% requested bibliographies or other kinds of information. Uses of the information include: 75% for research, 39% for teaching and 28% for extension. Approximately 18% of the documents go into a library (primarily in Asia), and there are, in addition, 15 other kinds of uses identified. (Since there can be more than a single use, these add up to more than 100%.)

The second kind of feedback is an annual survey distributed to all active users. Those in January of 1986 were received through the summer. Of the 629 surveys distributed, 169 clients responded to the survey (27%) which is a third more than last year. The most useful function was to ascertain for each returning client their own language abilities and the availability of microfiche equipment. Nearly 1/2 of the clients who answered can now use microfiche. More than 1/3 have VCR capabilities. This kind of information allows for better individualized service to clients. Another major aid was areas of interest to users. One third of PIPIC users are interested in beverage crops which was being considered for elimination. Surprisingly, 78% of users are interested in commercial level operations and only 17% individual households. The reverse was expected to be true. These answers guide PIPIC collection development.

Other Activities in PIPIC

Paulette George's paper, co-authored with Donna Schenck-Hamlin from the Post-Harvest Documentation Service (Kansas State University), was published in Special Libraries V.77, N.2, Spring 1986, pp 80-89. The title is "Using Special Libraries to Interface With Developing Country Clientele."

In July PIP presented a poster session at the International Food Legume Research Conference held in Spokane, Washington. Some 13 users from different countries were contacted at this conference.

While training Mr. Angel Ulloa from Ambato, Ecuador, PIPIC was able to use microcomputer technology to perform some of its activities. This was so successful we are now exploring a major conversion of our entire operation to microcomputers.

After a trial membership, PIPIC has been made a permanent member in the UNICO-sponsored Industrial and Technical Information Bank (INTIB) which allows PIP to tap resources of special agricultural and industrial libraries worldwide.

VIII. PIP REPORTS OR PIP SUPPORTED DOCUMENTS PUBLISHED IN FY 86

The following articles were published on PIP activities in FY 86:

1. "Postharvest Loss Investigation in Thailand, Indonesia and the Philippines." GTS Report No. PIP/Southeast Asia/Nov. 85/No. 58.2.

2. "A Solar Drying and Food Preservation Workshop in the Eastern Caribbean." GTS Report No. 74/Nov-Dec 85.

3. "Jamaica Solar Drying and Food Preservation Training Session." GTS Report No. 75/Jan 86.

4. "A Comparative Study of Grenadian and Indonesian Nutmegs." Research Report No. 3/Feb 86.

5. "The Use of Shrink Wraps to Extend Storage Shelf Life of Quality Potatoes." Thesis Research Report No. 4/May 86.

6. "Adaptive Design and Development of a Zeolite-Water Solar Refrigerator." Project Status Report/July 86.

7. "Composition of Fresh Grenadian Nutmeg." Project Status Report/July 86.

8. "Composition of Processed Grenadian Nutmeg - Atlantic Spice." Project Status Report/July 86.

9. "Composition of Processed Grenadian Nutmeg - McCormick Spice." Project Status Report/July 86.

10. "Aflotoxin Contamination in Nutmeg." Project Status Report/September 86.

IX. NETWORKING

Network Building. PIP has attempted to increase its collaboration with other international organizations and databases in order to develop a larger impact for funds expended. The networking contacts are broken down into two components: major and minor contacts. Major contacts reflect an on-going project or potential for one whereas minor contacts indicate an interaction but not necessarily on-going project work. Below is listed a summary of organizations pertaining to network building activities this reporting period.

A. Major Contacts

1. Winrock International/Indian Council for Agricultural Research (ICAR), India
   Project: Shrink Wraps for Soft Fruits
   Postharvest Loss Methodology Assessment

2. Central Potato Institute (CIP), Peru
   Project: Low Tech Methods and Facilities for Potato Storage

3. ASEAN Food Handling Bureau and Inter-American Institute for Cooperation on Agriculture (IICA)
   Project: Postharvest Loss Methodology Assessment

4. USDA Hawaiian Research Station
   Project: Collaboration on how shrink wraps affect eggs and larvae of fruit flies on soft, tropical fruits.

5. Ministry of Industry and Commerce/Jamaica
   Project: Research on postharvest losses for dasheen, a root crop and export potential in Europe.

6. McCormick Spice
   Project: Marketing and adaptive research related to Grenada produced nutmeg.

7. Sigma One (Consulting Firm)
   Project: Marketing research in developing countries.

8. Development Alternatives, Inc. (Consulting Firm)
   Project: Collaboration with DAI on the High Impact Agricultural Marketing Project in the Caribbean.

9. Chemonics, Inc. (Consulting Firm)
   Project: Collaboration with Chemonics on the Non-Traditional Agricultural Export Support Project for Central America.

10. University of California at Davis
    Project: Collaboration to organize a joint postharvest loss training session for participants from developing countries.

11. Technical University of Ambato, Ecuador
    Project: Sending university horticulturist extension specialist to interact with fruit growers in Ecuador.

12. Appropriate Technology Institute
    Project: Transfer of adaptive research technologies to developing countries.

13. United Nations Industrial Development Organization (UNIDO)/ the Industrial and Technical Information Bank (INIIB)
    Project: Information service exchange with UNIDO database.

B. Minor Contacts

Malaysia

Ministry of Agriculture
Agricultural Extension Services, Dept of Agriculture
Sub-Committee on Food Handling, Dept of Agriculture

Federal Agricultural Marketing Authority
Malaysian Agricultural Research and Development Institute
Faculty of Food Science & Technology, University of Agriculture
Horticulture Department, University Pertanian Malaysia

Singapore

Primary Industries Enterprises (PTE) Pte. LTD
Sembawang Field Experiment Station

Thailand

Institute of Food Research & Product Development, Tasetsart University
National Research Council of Thailand
Department of Agricultural Extension
Department of Plant Pathology, Chiang Mai University
Department of Food Science & Technology, Chiang Mai University
Ministry of Agriculture & Crops
Department of Agriculture
Royal Thai Project
Institute of Food Research & Product Development, Kasetsart University
Thailand Institute of Scientific & Technological Research
Department of Horticulture, Kasetsart University

Indonesia

Agriculture Services for Food Crops
Malang Horticulture Research Substation
Lembang Horticulture Research Institute, AARD
Agriculture Section, Secondary Crops Project
Education and Human Resources Office
Directorate General of Food Crops, Ministry of Agriculture
Directorate for Horticulture Product Development
Central Research Institute for Horticulture

Philippines

ASEAN Postharvest Training and Research Center
Food Development Center, National Food Authority/Food Terminal, Inc.
Food and Nutrition Research Institute
Philippine Council for Agriculture & Resources Research & Development (PCARRD)
Institute of Plant Breeding, University of Philippines at Los Banos
Agroprocessing & Marketing Project Directorate
Office of Rural & Agriculture Development
Philippine Root Crop Research & Training Center
Southeast Asian Regional Center for Graduate Study & Research in Agriculture
Postharvest Horticulture Training & Research Center (PHTRC), University of Philippines at Los Banos
Bureau of Plant Industry
Bureau of Agriculture Extension, Ministry of Agriculture & Food

United Kingdom

Tropical Development and Research Institute
Institute for Development Studies

Taiwan

Asian Vegetable Research and Development Center

Colombia

Institute for Colombian Farming

U.S.

Consortium for International Development (CID)
Weyerhauser Inc., Tacoma Washington

X. PIP Staff Time Devoted to Program Components

There were approximately 77 person months of staff time (including professional and non-professional) utilized during the reporting period. This includes both full time and part time employees. The estimated amount of staff time spent for each program component may not be indicative of the proportion of the budget expended. For example, although 33 person months was estimated for the PIP Information Service, much of this was part time clerical staff.

The staff time is estimated below for five program components which covers in total the PIP activities.

A. Program: Adaptive Research
Est. Staff Time: 12 person months

B. Program: Training
Est. Staff Time: 10 person months

C. Program: Technical Assistance and Field Research
Est. Staff Time: 16 person months

D. Program: PIP Information Service
Est. Staff Time: 33 person months

E. Program: General Administration (does not include administration for each of the program components).
Est. Staff Time: 6 person months

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