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PROGRAM ON POLICIES FOR SCIENCE AND TECHNOLOGY IN DEVELOPING NATIONS ANNUAL REPORT (1974-1975)

Grant Title:	Policies for Science and Technology in Developing Nations (AID/csd-3158)
Grantee:	Cornell University
Grant Program Director:	Edmund T. Cranch, Dean College of Engineering Cornell University
AID Sponsoring Technical Office:	Technical Assistance/Office of Science and Technology
Grant Period:	8/11/71 to 8/10/76
Reporting Period:	8/11/74 to 8/10/75
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Amendment for Summer Institute	50,000.00
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Accumulated Expenditures:	$478,136.64
Anticipated for next year:	$151,863.36

SUMMARY

Developing countries are increasingly concerned that the domestic impact of science and technology utilization be consistent with national development objectives--particularly employment generation and industrial and agricultural production. This concern has created a need for information on the establishment and implementation of effective policies for research, development, external acquisition, and utilization of science and technology in developing nations. In response to this need, Cornell University is strengthening its institutional capabilities in relevant subject areas. In 1971, through a grant from the Agency for International Development, the University established a special unit for this purpose--the Program on Policies for Science and Technology in Developing Nations (PPSTDN). Cornell has been involved in international research, education, and technical assistance programs for more than fifty years; in this context, PPSTDN is providing a stimulus for new activities and coordinating relevant ongoing work.

During its first three years, PPSTDN sponsored the development of five new science and technology policy (S/TP) courses; it also sponsored a continuing series of seminars, symposia, and conferences. During this period, relevant research documents were collected and a library established; cooperative relationships were developed with S/TP related research institutions in Korea, Costa Rica, Mexico, Peru, the Caribbean, and Ghana; and the Program sponsored nineteen research projects and published the results as they were completed.

During the fourth year of the Program (the period covered by this report), two new courses were offered and a third prepared for presentation in the fall of 1975. The University established a master's degree program for Science and Technology Policy. Four new research projects were undertaken and fifteen seminars were presented. The Program sponsored a major conference which examined S/TP strategies in the

agricultural sector for their development planning relevance in the industrial sector. The library was expanded (holdings now exceed 2,400) and reorganized to more effectively meet the growing demand for its services. PPSTDN organized and presented a four-week Summer Institute on Science, Technology and Development. It involved twenty-five resource persons from Cornell and twenty-nine senior officials representing nineteen developing countries (and Canada). Faculty members and advanced graduate students associated with the Program were active in more than thirty professional conferences and twenty-one technical assistance and/or consulting projects. The requests for professional assistance grew significantly over previous levels, and new cooperative linkages were established in Venezuela, India, and Colombia. During the reporting period, PPSTDN completed the US/AID contract on "Science and Technology Policy for a Small Developing Country (Costa Rica)," and published the report outlining a S/TP planning strategy.

The Program continues to concentrate on national science policy, industrial technology policy, agricultural research organization strategy, and the sector-specific topics of housing for low-income families, low-volume roads, and technical education planning--areas in which S/TP plays a role in development strategy.

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Section I
INTRODUCTION

The use of science and technology is critical to development. Many developing countries and regional organizations have established high-level planning units to deal with science and technology policy (S/TP). Similarly, UNESCO, ILO, OECD, and other international organizations are giving increased attention to this issue. The volume of research on the topic is expanding rapidly.

A. Purpose of the Grant

Despite this interest, there is little coordination or integration within the subject field. Much of the S/TP work for developing countries grows out of discipline-specific activity. The issues, however, cut across many disciplines; if S/TP is to be used with increasing effectiveness, the study of the subject must become increasingly multidisciplinary.

Cornell University has undertaken a major commitment to the subject and, with the Agency for International Development (AID) 211(d) grant, established (1971) the multidisciplinary Program on Policies for Science and Technology in Developing Nations (PPSTDN). PPSTDN is sponsored by the University's Program on Science, Technology, and Society; the Center for International Studies; and the College of Engineering.

The Program serves four basic purposes:

(1) To establish at Cornell new research and teaching activities which focus on the S/TP issues that will be confronted by development specialists working in developing countries. The US/AID 211(d) grant contract envisioned that the new activity would be directed toward two broad topics:

"Science and Technology Policy at the National Level" and "Strategies for Applying Science and Technology to Industrialization and Rural Development."

(2) To increase awareness among faculty and students in development related subjects of the critical science and technology policy issues. Cornell is a major training institution for professionals who work on development problems. Since S/TP implementation is a highly decentralized process, one of the key purposes of the grant was to broaden the perspective of development specialists in other fields to include serious consideration of S/TP issues.

(3) To link with and engage professionals from developing countries in relevant collaborative research. The development problems of Third World countries are most likely to be solved by the citizens of those countries. With this in mind, the grant contract identified the need to build professional capability in developing nations. Collaborative research (in combination with appropriate educational opportunities as described above) helps build this capability.

(4) To respond to requests for information on how various countries approach the S/TP issues. The grant contract recognized the need for "movement toward a second generation of technical assistance in which the tutelary relationships inherent in the Point IV approach are being succeeded by increasing mutual dependence between the scientists, technologists, and administrators from industrial and developing countries." In implementing this principle, the Program serves a communication role linking S/TP specialists. Through professional consulting services and other activities utilizing Cornell's institution capabilities, it facilitates the flow of information from one developing country to another.

B. General Background and Description of the Problem

A national science and technology policy seeks to enable a country to use technology with increasing effectiveness in pursuit of national goals. While a country may have general

goals, guidelines, or preferences in its S/TP (e.g., self-reliance, the latest-and-the-best), relevant and effective practices must often be specific to a sector, a region, a particular industry, or even an individual enterprise. Nevertheless, there are a series of issues and problems which any developing country must consider in designing and implementing its S/TP. Among them are the following.

(1) Manpower Development: The education, deployment, and reward system of professional, managerial, and technical personnel at all levels of skill. One of the most common ways to build up domestic scientific and technological capability is to send students to the more industrialized nations for advanced training, but the training is often not relevant to domestic needs. When considering the alternative, however, resource constraints and the long lead-times make indigenous science and technology manpower development difficult to coordinate with development needs. When foreign technical assistance is used to build domestic educational capabilities, it is often inappropriate.

(2) Institutional Infrastructure: Shaping an institutional infrastructure for scientific and technological development. S/TP is characteristically made in a decentralized fashion; it is often the by-product of decisions made with other primary objectives in mind. This process is only partially understood, and as a result, it is difficult to manage the development of institutional networks for technological research, development, and implementation.

(3) Resource Allocation: Criteria for determining the scale of national investment in scientific and technological R & D and for the allocation of these scarce resources among competing claimants. The level of resources available for public allocation to research, development, and implementation activities is often too small to initiate and sustain activities of major significance. Multinational corporations are seldom inclined to support locally based research activities. The shortage of research resources often aggrevates the brain drain problems.

(4) Linking Producers and Users of Knowledge: Incentives and methods of linking research and development (R & D) activities to the needs of users and potential users, and of inducing the latter to make claims on available R & D facilities. The incentive structure for researchers tends to be oriented toward recognition in the international community of science rather than toward solving domestic technical problems. This situation tends to be perpetuated by students going abroad for training. Within research institutions organizational structures and incentives can discourage working too closely with the potential users of research results.

(5) Channels of Technology Transfer: Choices of channels and terms for the transfer and reception of technology from abroad. Much industrial technology is proprietary and available primarily through multinational corporations. Information on alternative sources is often difficult to obtain and assess in an effective manner. One developing country often does not know how another dealt with a particular type of problem.

(6) Criteria for Choice of Technology: Criteria for choice of available technology and search for alternative technologies. When developing countries seek to use available technology to generate employment opportunities they often find that the income distribution impact biased against labor--both in the agricultural sector and the industrial sector. When they seek to use imported technology to develop export industries it often puts them at a disadvantage because it tends to be inappropriate for local factor endowments, managerial resources, and infrastructure capabilities.

In order to deal with these issues and problems, some countries have taken new measures. In a few cases, national science foundations, or their equivalents, have come into being; commissions have been set up to regulate foreign investment and register contracts; advanced degree programs have been established; and special planning units have been created to think about the over-reaching problems of science and technology policy. These new measures are frequently

introduced in isolation, and their consequences are unknown outside of their own countries; there is little S/TP professional interaction among most developing countries. In the past there has been little research to investigate the impact of these programs. The Cornell Program on Policies for Science and Technology in Developing Nations represents a major effort to improve communication in the S/TP field, and to stimulate study and research in related topic areas.

C. Objectives of the Grant

In making the 211(d) grant to PPSTDN, the Agency for International Development worked with Cornell in establishing a number of Program objectives. They were stated as follows in the contract:

(1) Increase . . . competence and breadth of interest on problems of science, technology, and public policy relevant to developing nations;

(2) Produce a body of trained people, knowledgeable in the application of science and technology to societal problems and desirous of working with groups within developing nations on these efforts;

(3) Study the policies and practices which influence the development of indigenous science and technology in developing countries and the ways in which this, as well as imported science and technology, can be applied to the social and economic development of these countries;

(4) Develop in-depth research topics and case studies, which involve the joint participation of personnel from Cornell and the Developing Nations;

(5) Establish specific linkages through selected universities or governmental institutions within the developing nations;

(6) Develop a central library collection of reference material on science and public policy;

(7) Develop an interested and competent cadre of development conscious specialists capable of rendering useful advice and consulting services to development oriented organizations

and agencies and . . . to developing nations;

(8) Identify areas where the information base is insufficient to permit the development of rational strategies for the development of an indigenous scientific and technological capability;

(9) [Provide] . . . a core faculty . . . [for] expanding [research] efforts and . . . maintain a common, coordinated approach to problems of science and technology policy.

In seeking to meet these objectives it has been necessary to translate them into specific Program activities. Accordingly, PPSTDN has chosen to concentrate its effort on building strength in the following areas:

Course Development and Teaching
Master's Degree Program
Professional Services
Summer Institute
Research
Seminars and Conferences
Information Services

The accomplishments in each of these areas are described in Section II of this report. The relationship between these accomplishments and the Program objectives is described in Section III.

Section II
ACCOMPLISHMENTS

During its fourth year, PPSTDN continued its program of research, seminars, and course development. Building on the expertise and interest generated during the first three years of the grant, this reporting period saw the establishment of a graduate degree for science and technology policy and the development of a Summer Institute. Also, the library was greatly expanded during the year and reorganized so as to be more accessible for students and researchers.

For purposes of exposition, the Program projects and activities have been grouped into seven separate categories. In practice, however, the distinction is not as great; all of the activities are manifestations of a basic multidisciplinary approach to the issues of S/TP. The Program draws strength from the integration of effort across all categories. The research projects, for example, add depth to the course and seminar presentations. Similarly, the courses and seminars provide valuable input into the research projects by stimulating faculty and student interest in problems of S/TP in developing countries and by providing a forum for sharing experiences and ideas about these problems. Taken as a whole, the Program represents an aggregation of complementary activities.

A. Course Development and Teaching

The development of graduate and undergraduate teaching efforts related to S/TP has been a basic thrust of the Program since its inception. The resulting new courses have provided both U.S. and international students with expanded opportunities to study the practical problems of decision-making and the relationship of critical S/TP issues to the total development process. Through the

course work, students become involved in projects investigating specific issues and case studies. Several of these studies have led to more in-depth research.

As a result of the expanded curriculum, increasing numbers of students are studying S/TP related subjects. (Total enrollments exceeded 150 this year.) PPSTDN sponsorship of course development has also made it possible for faculty members with relevant interests to reorient some of their work and become involved in the field. This has significantly increased the breadth and depth of talent working on the various aspects of S/TP problems.

During its first three years, the Program has sponsored the development of five new courses; this year two more were developed. Five of these seven courses were presented during the reporting year:

Science, Technology, and Development

Faculty: Milton J. Esman, Government

This course deals with scientific and technological transfers between the industrialized and the less developed countries. It explores the manner in which transfers are made through bilateral assistance programs, foundations, universities, international business enterprises, and international organizations. The course entails a study of technology choice, technology transfer, adaptation problems, institutions and the implications of technology transfer for economic growth, social change, political integration, and international cooperation.

Low-Cost Housing Primarily for Developing Nations

Faculty: Floyd Slate, Engineering
Franklin J. Ahimaz, Engineering
Darrell Williams, City and Regional Planning
Peter Cohen, Architecture
Henry Richardson, Architecture
James Converse, Rural Sociology
Peter Chi, Demography
Mary Ann Griffin, Consumer Economics and Public Policy
Eric Dluhosch, Architecture

This is a multidisciplinary course involving the collaboration of faculty members from the College of Art, Architecture,

and Planning, the College of Human Ecology, the College of Engineering, and the College of Arts and Sciences. The course covers such topics as use of indigenous materials in low-cost housing, effects of the physical environment, social and economic factors, design and structural considerations, and policy issues. Students do an intensive study, as a multidisciplinary team, for a term project. They may also choose to carry out an in-depth study in their own field of concentration. In working on these projects they are introduced to the concerns and approaches to problem-solving of other disciplines. For instance, a multi-disciplinary group of students from the Low-Cost Housing Course explored the various possibilities for the use of coconut as a raw material to provide a range of activities including manufacturing and building materials for low-cost housing. The work included testing coconut fiber for reinforcing concrete for load-bearing members in low-rise housing for low-income families in the rural areas. Thus, for a rural area, such technology offers an opportunity for agricultural diversification as well as initiating a series of small-scale local industries to provide employment and savings. (Complementary industries might include coconut milk for animal nutrients, coconut shell for producing activated charcoal for water purification, coconut oil from the kernel, animal feed and building materials from the coconut husk.) This approach was proposed by Dr. Ahimaz as a pilot project to be carried out in Limon Province, Costa Rica. CONICIT has a program to initiate such a project in a cluster of coastal villages in Limon.

Transportation Policies for Developing Nations
With Emphasis on Low-Volume Roads

Faculty: Lynne Irwin, Agricultural Engineering
Gordon Cummings, Rural Sociology
Darrell Williams, City and Regional Planning

This multidisciplinary course examines processes of policy formulation, the influence of transportation policy on development, and the planning and construction of transportation facilities in developing nations. Topics considered include:

policy-making processes and strategies of implementation, economic policy and economic analysis for transportation, sociological considerations of transportation policy, and the technology of road building. A major aspect of the course is case investigation of transportation in specific countries conducted by small multidisciplinary teams of students.

Seminar in Advanced Policy Analysis:
Policies for Science and Technology in Developing Nations

Faculty: David B. Lewis, City and Regional Planning
Robert Seidel, PPSTDN

This course explores current issues related to policies for science and technology in developing countries. Lectures and discussion address these policies on the macro level, explore the institutions and sectoral policies used in various countries, and survey contemporary research on the subject. Student projects delve into the context and problems of specific science and technology policies in selected countries. Topics of student projects included choice of technology in the construction industry, the role of science education in Colombia, technology transfer in urban transportation planning, and the institutional structure of Venezuela's science and technology policy system.

Advanced Planning Analysis with Selected Applications
To Development Problems in the Third World

Faculty: David B. Lewis, City and Regional Planning

This course examines selected analytical techniques used in development planning in the third world. The course covers topics in economics, linear programming, cost benefit and cost effectiveness analysis, and financial analysis. It emphasizes their practical applications. It is designed to provide the student of international development with an overview of the basic concepts, the current state of knowledge, and the direction of research in the area of policies for science and technology in developing nations. It is also intended to provide the student of policy planning with a methodological

structure for undertaking policy analysis. Both theoretical and empirical aspects of S/TP are addressed. Students each prepare a term report on a specific issue. Many of these studies have led to further research such as master's theses and doctoral dissertations.

During the reporting year, two new courses were prepared. The first, "Seminar in Advanced Policy Analysis," is described above. The other course will be presented in the fall of 1975. It is to be a seminar on technology transfer and adaptation.

Seminar in Policy Planning in Developing Nations: Technology Transfer and Adaptation

Faculty: David B. Lewis, City and Regional Planning
Ramesh Vaidya, City and Regional Planning

This seminar will address the following topics related to the transfer and adaptation of technology: identification and analysis of the issues involved in the choice of technology in the context of development planning; economic rationale and analytical techniques for assessing the appropriateness of technology; influence of transfer channels on technological choice; role of planning and organizational mechanisms in technological choice; process of building appropriate institutions and stimulating user participation for technology adaptation; and sector-specific issues in construction, agriculture, and manufacturing and policies to encourage appropriate technology transfer in each of them. Faculty members associated with PPSTDN will participate in the course as lecturers and as leaders of case discussions.

In addition to these courses directly sponsored by the Program, several others related to S/TP are offered by the University. PPSTDN has published a "Directory of Courses Related to Science and Technology in Developing Nations" which serves the student as a current guide to relevant study opportunities in S/TP throughout the University.

B. Master's Degree Program

In 1973, Cornell established a new professional degree program in international development. Designed for experienced practitioners in international development, the program requires eleven to eighteen months of interdisciplinary, graduate level study leading to the degree of Master of Professional Studies (International Development)--MPS(ID).

In 1974, PPSTDN proposed the creation of a science and technology policy concentration within the MPS(ID) program. The proposal was accepted and admission to the new degree option was offered for the first time in the fall of 1974.

In the new MPS(ID) program approximately half the student's course work is devoted directly to science and technology policy study, the other half is in administration, policy planning, and related analytical skills which are chosen to help the student in matters of policy implementation. Each student is required to prepare a problem-solving project, involving either fieldwork or library research, approved in advance by his/her advisors. The aim of the project is to give the student supervised experience in dealing intellectually with a professional problem related to a substantive area of science and technology policy.

C. Professional Services

The professional services of Program participants are being increasingly utilized by various S/TP related organizations around the world. This work is a vital part of the Program. A representative sample is included here:

Franklin J. Ahimaz, was invited by the U.N. Office of Science and Technology to work with a team of experts convened in Geneva to consider objectives, topics, and agenda for the U.N. Conference on Science and Technology to be held in 1978-79.

--Collaborated with a team of representatives from the Ministry of the Presidency, Government of Costa Rica, in making presentations to AID, the Inter-American Development Bank, the World Bank, and the Organization of American States seeking funds to implement S/TP study initiated in Costa Rica.

Edmund T. Cranch,is a member of the National Academy of Engineering panel investigating the role of U.S. engineering schools in development assistance and was active in the meetings and report-writing activities of this group.

--Professors Ahimaz and Cranch were invited to Costa Rica to establish linkage between PPSTDN and Consejo Nacional de Investigaciones Cientificas y Tecnologicas--CONICIT, Costa Rica.

--Participated in UNESCO "Meeting on Indicators of Scientific and Technological Development" in Paris, France, September 21-October 7, 1974.

Tom E. Davis, prepared an instructional film on the transfer of technology at the request of the Organization of American States.

--Presented a series of lectures on technology transfer to ministries, government agencies, private research institutes, and universities throughout Latin America at the request of the United States Information Agency. In his presentations, he was able to share the findings of the Program's Comparative International Science Policy Project with which he has been working.

Milton J. Esman, is working on a major project in the Sudan as part of the Comprehensive Employment Strategy Program of the International Labour Office.

--Collaborating with CAFRAD (The African Centre for Training and Research in Development Administration) on a program involving management of development projects in West Africa.

--Serves as a consultant to AID on issues dealing with public administration.

David B. Lewis, went to India, Nepal, Iran and Ghana to meet with professionals in S/TP institutions. Discussions centered on the problems and programs with which their organizations are currently involved, and the possibilities for collaborative research with PPSTDN.

--Participated in the International Science Studies Program Planning Conference (at the invitation of the National Science Foundation) in Williamsburg, Virginia. The purpose of the Conference was to assess and explore opportunities for future international scientific interaction and cooperation.

Franklin A. Long, went to India as a member of the Indo-U.S. Subcommission on Education and Cultural Affairs. There he met with top level S/TP officials to discuss international research collaboration.

--A member of the National Academy of Sciences, is Chairman of the Science Advisory Group to Korea and has been active in developing PPSTDN's linkage there.

--Professors Lewis and Long went to Cario, Egypt, in May at the request of the National Science Foundation as resource personnel for the U.S.-Egyptian Workshop on Research Management and Planning. Professor Long was Co-chairman on U.S. side.

Gilbert Levine,consultant on field research planning for Colorado State University Water Management Research Program.

--Consultant for project planning, Direccion de Recuros Hidraulicos, Ministerio de Obras Publicas, Venezuela.

John W. Mellor, organized and participated in a seminar jointly sponsored by Southeast Asia Development Advisory Group of the Asia Society in cooperation with the Mekong Committee on "The Interaction of Planning and Implementation for Rural Development in the Mekong Basin," Pattaya, Thailand.

--Presented testimony, "Agricultural Production and Development in South Asia," to the Sub-Committee on the Near East and South Asia of the Committee on Foreign Affairs, House of Representatives, U.S. Congress.

Floyd O. Slate, consultant with the housing program of the East/West Center's Technology Development Institute (TDI). Last January, Professor Slate was a member of the Roving Workshop No. 1 on Low-Cost Housing, travelling to Indonesia and the Philippines. This year, Dr. Slate will be participating in the Roving Workshop No. 2 on Low-Cost Housing; the focus will be on Thailand and Korea.

William F. Whyte, prepared a study on agricultural research and development in Peru. It was submitted to the Minister of Food in Peru who circulated it to key personnel throughout the Ministry.

D. Summer Institute

PPSTDN developed and presented a Summer Institute on Science, Technology, and Development. This is a major new dimension to the Program and represents a significant commitment to linkage relationships with diverse developing countries. Twenty-nine policy-level officials from universities and ministries and other S/TP organizations representative of twenty countries participated in the four-week training institute which began on July 14. (A list of the participants is presented in Appendix A.)

The Institute program examined critical issues surrounding the basic problem of how developing nations might use science and technology with increasing effectiveness in the pursuit of their national goals. Lectures and discussions focussed on the assessment of social, economic, and political consequences of current policies and the identification of future alternatives. Institute faculty were drawn from several departments of the University as well as from other universities and international S/TP related organizations. (See Appendix B for a list of the Institute faculty.)

The program began with a review of general science and technology policy considerations at the national level. Topics included the role of science and technology in the development process, science and technology education, dependency, and technology transfer. This segment was followed by a week-long series of sessions on the agricultural sector. Presentations and discussions moved from the general--such as the role of agriculture in the development process--to the particular--such as science and technology policies for irrigation, for seed distribution, and for agricultural research. The Institute then proceeded to an exploration of industrial sector issues. Technology transfer, low-cost housing, construction, and dependency were discussed. One full day was devoted to an examination of the Chinese science and technology policies for development . In the final week, discussion focussed on the role of international organizations in the development of science and technology policies.

Complementing the lecture-seminar sessions, a series of workshops provided participants with an opportunity to address specific policy problems. In order to deal with different issues, the participants divided into two groups which worked in parallel--one focussed on the role of science and technology planning in the overall development planning process and the other on intermediate and appropriate technology. Each participant chaired one session of his/her group, offering his/her

views on a specific policy issue. Presentations varied from theoretical studies to case studies. Each presentation was followed by a discussion in which the other participants shared their own experiences with similar problems--how they had dealt with them and the consequences of their efforts. The results of the presentations were integrated into working papers which were presented by the groups to the Institute in plenary session during the final week.

The Institute program included three field trips. A visit to the Power Project at Niagara Falls, gave the participants the opportunity to learn about large-scale hydro-electric power generation, and to study the technology policy of a resource development project jointly administered by two separate countries. In visits to the Xerox Corporation in Rochester and the General Electric Corporation , the participants met with company officials to discuss research and development policies and the role of multinational corporations in developing countries.

Some of the most valuable inputs to the Institute came from the participants themselves--in their formal presentations and in their interactions among themselves and with the Institute faculty. As a result of these interactions, formal and informal linkages are being developed both between PPSTDN and the participants (and their organizations), and among the participants themselves.

E. Research

During the four years of the grant, the Program has served as a catalyst and source of support for the development of S/TP research at Cornell. Topics studied have covered a wide range of S/TP issues but major emphasis has been placed on agriculture, low-cost housing, natural resources, industry, and research institutions.

During the past year, PPSTDN concentrated on consolidating its research program, and building the momentum of cumulative work. A number of long term projects carried over from the last reporting period were completed successfully on schedule. New projects were designed to build upon the foundation of past Program research, courses, seminars, and linkages.

Research Projects Completed

An Approach to Multi-Country Development Planning and Industrial Programming for the East Caribbean Common Market

This project, the dissertation research of Mr. Vincent Richards of Cornell's Economics Department, was sponsored in part by PPSTDN. (The report was published by the Program in the spring of 1975.) Mr. Richards has developed a regional industrial policy strategy for the seven countries of the East Caribbean Common Market. It is designed to facilitate economic integration. The study identifies industries that appear to be economically feasible given regional resources and expected demand. It also projects the expected impact of implementing the policy recommendations.

A Methodology for Formulating and Implementing Science Policy for a Small Developing Country (Costa Rica)

This project, funded by a contract from the Agency for International Development, was directed by Franklin J. Ahimaz, Assistant Program Director. The final report sets forth a methodology for formulating and implementing a science and technology policy for the development of a small country--in this case, Costa Rica. Several strategies for policy formulation and implementation are grouped and discussed. A new strategy, the "modified bubble-up approach," is presented. This methodology, initiated as a pilot effort in Limon Province, Costa Rica, approaches S/TP from the lowest level where the policy is to be implemented and encourages citizen participation at all levels of the decision-making

process--from identification of technological needs to the implementation of science and technology policies for the country. The methodology was tested in two earlier Program projects in Costa Rica (the study of natural resource potential for the regional development of Limon Province and the study of the scientific and technological education system in Costa Rica.) Preliminary results indicate that this approach has promise for application to the science and technology policy-making process in other small countries.

Based on the results of this project, a proposal has been submitted to AID Washington to utilize the methodology in another small developing country, preferably in another geographic area. The earlier projects in Costa Rica have led to a linkage with Consejo Nacional de Investigaciones Cientificas y Tecnologicas (CONICIT), which has resulted in new research proposals now under review by funding agencies--a study of policies for research in institutions of higher education in Costa Rica; a project on the use of television instructional services for the enhancement of the quality of Costa Rican education; and a project to plan the "modified bubble-up approach" in Limon Province, Costa Rica, and plan for implementing it at a national level. There is considerable enthusiasm for the project at the highest levels of Government in Costa Rica.

Basic Housing Systems in Ghana

This project directed by Professor Henry W. Richardson, Architecture, the first of a two-part study of housing in Ghana, documents the structure of housing production and delivery processes used in Ghana's urban areas and indicates the institutional and technological constraints on these processes. The study is organized into four main sections:

(1) A socio-technical analysis of selected housing production and delivery processes;
(2) An analysis of the housing sector's resource base;

(3) An analysis of housing policy implementation mechanisms; and
(4) A discussion of support structure for production and delivery networks for housing and the implications for policy.

The study concludes that Ghana's urban housing problem derives more from resources being misapplied or untapped than from their being limited. It notes that policy bodies generally overlook the extensive production and delivery networks for housing which exist outside the formal institutional structure. The implication for policymakers, then, is that more emphasis should be placed on supporting and stimulating private sector efforts in housing rather than in directly increasing the size and quantity of formal housing institutions. The work done on this study formed the basis of another Program research project, "Rural Housing Delivery Systems in Ghana and Their Implications for Rural Low-Cost Housing Policies," which is described on page 23 of this report.

Organizing for Agricultural Development: Human Aspects in the Utilization of Science and Technology

There is increasing recognition that progress in technology and in the scientific fields directly related to the growth of plants is necessary but not sufficient to produce major social and economic benefits. The agricultural scientists are now turning to the behaviorial scientists for advice and collaboration in the search for solutions to the problems of food shortages and rural development. Through an analysis of the procedures of agricultural extension agents, organizational frameworks, divisions of labor, and social structure, Professor William F. Whyte proposes a reformulation of social theory that does not abandon humanistic values but requires an examination of the conditions for realization of these values by concentration upon the structural elements influencing behavior.

Professor William F. Whyte has completed a major study of how research and development in agriculture is influenced by organizational and interorganizational relations. The study was published as a monograph by PPSTDN in October of the reporting year and republished in book form by Transaction Books, Inc., in August.

Research Projects in Progress

Comparative International Science Policy Project

This project is being carried out by Professor Tom E. Davis (Director of Cornell's Latin American Studies Program and a member of PPSTDN's Executive Committee), Antonio D'Antas Sobrinho (a doctoral candidate in Economics), Heinz Schneider (a former economics student at Cornell now living in Guatemala), and Drs. Jerry Ingles and Loretta Good Fairchild (both PPSTDN research associates).

The project extends the methodology of an earlier Mexico S/TP study of Drs. Davis and Fairchild to Brazil, Venezuela, Colombia, and Central America in order to determine what factors influence national industrial science and technology policy effectiveness. The methodology involves developing a sample of pairs of foreign and domestic firms such that the two firms in each pair are, as nearly as possible, the same size and age and produce the same product(s). When the different pairs span a broad range of industries, it is hypothesized that differences between the foreign firms and the domestic firms will reflect differences in access to resources and/or differences in management styles. The Mexico pilot study, carried out in the summer of 1974, concluded that domestic firms tend to carry on more activity of a technolocial character and depended to a greater degree on national sources of

technology, but that these differences did not result in any significant competitive advantage or disadvantage to the domestic firms. Additionally, those factors which proved important in distinguishing between the more and less successful firms within each group were different. This suggests that firms differ in terms of decision models and, therefore, that different policy tools may be appropriate for eliciting particular behavioral responses from the two types of firms.

Research on International Agriculture Centers

Between January and April, Professor William F. Whyte travelled to Peru, Mexico, and Colombia to continue his research on agricultural research centers (see page 19 for a description of Dr. Whyte's project "Organizing for Agricultural Development"). Professor Whyte's work had two main foci:

(1) The impact of policy and organizational strategies on research programs. Professor Whyte has been examining the impact of the single crop approach as opposed to the systems approach to agricultural research.

(2) The interaction among the different units of the agricultural research systems. In each country, Dr. Whyte engaged in extensive study of the interplay among the international research center (CIMMYT in Mexico, CIAT in Colombia, and CIP in Peru), the national research and extension programs, and the national university.

As a result of this work, Dr. Whyte prepared two working papers: "Problems and Potentialities of Agricultural Research in Peru," and "Policies and Strategies for International Agricultural Organizations." The first, written in Spanish, was submitted to the Minister of Food in Peru and has been reviewed by policymakers in this Ministry. Both reports will form the basis of future publications.

Agricultural Mechanization Policy in China

Dr. Benedict Stavis, a Research Associate with PPSTDN, is completing a major study of Chinese agricultural mechanization policies, and the numerous choices that have to be made which have both technological-economic and political-social dimensions. The scale and character of social organization in rural areas, the pattern of urban-rural relationships, and the nature of industrial development are intimately related to the choices made in agricultural mechanization. In China, the decisions on agricultural mechanization have, to a large extent, taken into account these social dimensions. This study is meant to clarify the social-political character of technological decisions, especially those in the sector of agricultural mechanization. A book based on the study is scheduled for publication during the coming year.

The book is part of Dr. Stavis' larger research focus on rural development which has resulted in several articles and speaking engagements on agricultural development in China. Another special focus which developed out of this concern with rural development is the world-food problem. Dr. Stavis has contributed to Cornell's efforts in studying the world food/nutrition problem through his writings and talks on the implications of Chinese agricultural policy for international food/nutrition policy.

Soybean Based Protein Beverage Preparation for School Children in Korea

The Program co-sponsored, with the Korea Advanced Institute of Science (KAIS), the initial feasibility study of a technology for producing a soybean based protein beverage for the school nutrition programs in Korea. During the spring of 1975, Professor J. R. Chung of KAIS visited Cornell to carry out, with Professor C. Y. Lee of Cornell's Geneva Experiment Station,

a two month series of trial formulation studies. Future plans for the project involve more testing both at Cornell and at KAIS. Then, if results of the tests are promising, Cornell and KAIS will issue a joint proposal for outside funding for the completion of the project. This project is a development of the linkage between PPSTDN and KAIS which began in the fall of 1972.

Rural Housing Delivery Systems in Ghana and Their Implications for Rural Low-Cost Housing Policies

This project, under the direction of Professors Henry Richardson and Darrell Williams, is an extension of the study of production systems for basic housing in urban areas which the investigators recently carried out (see page 19). It focusses on three areas of housing development in a developing economy:

(1) The decision-making and implementing process in rural housing;

(2) Developmental Linkages involving science and technology in housing, especially linkages relating to science and technology transfer between the public and private sectors and between research institutions and housing clients; and

(3) The nature of support networks required for sustaining these linkages and for ensuring the satisfactory performance of the rural housing sector.

In January of this year, the researchers travelled to Ghana to study the rural housing programs and to meet with officials of the institutions involved in Ghana's rural housing, particularly the Roof Loan Scheme and the Rural Resettlement Program of the Volta River Authority. They also collect d data on housing in Ghana which was analyzed during the spring. A report of their analysis and findings was prepared during the summer.

Housing Policy Alternatives for the Squatter Settlement in Limon, Costa Rica

The purpose of this research is to evaluate existing public housing projects in Limon, Costa Rica. Working in

conjunction with CONICIT, the Institute for Science and Technology for the Development of Costa Rica, the investigators, Professors Peter Chi and Mary Ann Griffin, constructed questionnaires to survey community perceptions of the need for various government programs and community willingness to participate in such programs. The interviews were carried out in the summer of 1974 by a Limon Youth Group under the supervision of the investigators.

During the reporting year, Professor Chi and Mark Bogan, a graduate student in social demography with experience working in Latin America, revisited Costa Rica to bring back the survey data and to interview key government officials. At Cornell, the data were then translated into English and analyzed. The final project report is currently in preparation and is scheduled for completion during the fall of 1975.

Recommendations which grow out of this study are intended to serve as a basis for modification or continuation of existing government housing policies in the Limon area.

Research Projects Funded by Outside Sources

In addition to grants made directly by the Program, the work of several researchers associated with PPSTDN has been funded, either partially or entirely, through outside sources:

(1) Dr. Benedict Stavis, Research Associate, PPSTDN

Cornell's Rural Development Committee contributed $3,800 to the support of Dr. Stavis' research on agricultural mechanization policy in China.

(2) Ramesh Vaidya, Graduate Student, City and Regional Planning, and Research Assistant, PPSTDN

Mr. Vaidya, a citizen of Nepal, is studying choice and transfer of technology in the construction industry. This study, which focusses primarily on organizational issues, will be funded by a $5,000 grant from the Technology Development Institute of the East/West Center in Hawaii.

(3) Wallace Tyner, Research Associate, Agricultural Economics

A grant from Cornell's Center for International Studies (amounting to $1,450) is helping to finance Mr. Tyner's research on energy supply policy and economic development in India.

(4) Stephen MacRae, Graduate Student, Natural Resources

Mr. MacRae received a $500 grant from the Center for International Studies to assist in his research on the impact of technological change on development. Using energy flow as the currency of his model, Mr. MacRae's study is designed to apply simulation modeling to the analysis of ecological, economic, social, and cultural factors of a small community in Peru.

(5) John Mellor, Professor, Agricultural Economics (PPSTDN Executive Committee)

Professor Mellor, funded by a $213,751 contract from AID, is carrying out a research project to analyze the effects of agricultural innovations on income, employment, and farm production. A major goal of this research is to develop policy recommendations to facilitate (1) more efficient allocation of agricultural research resources, (2) adjustment of the environment to optimize the social benefits of a given technology, and (3) formulation of compensatory programs to increase the net contribution of technology to social objectives, praticularly with respect to income distribution and employment.

(6) Vincent Richards, Graduate Student, Economics

Mr. Richards received a $500 grant from the Center for International Studies to assist in his research on "An Approach to Multi-Country Development Planning and Industrial Programming for the East Caribbean Common Market." This dissertation, published and partially funded by PPSTDN, is described in detail on page 17.

(7) Pamela Melvin, Graduate Student, City and Regional Planning

Ms. Melvin received a $500 grant from the Center for International Studies to help finance a trip to Kenya where she is studying the development of alternative forms of technical education.

(8) Ichiro Sasaki, Graduate Student (new Master's Degree Program)

Mr. Sasaki's tuition and expenses for two years (approximately $25,000) are being funded by the Yamaichi Company, a Japanese financial corporation by whom Mr. Sasaki is employed. These funds are being used to finance his study of science and technology policy, specifically the choice of technology in commercial agriculture.

(9) David Edelman, Graduate Student, City and Regional Planning

Mr. Edelman is doing research on the energy crisis and the development process of low income countries. Using Tanzania and Kenya as case studies, he is analyzing how the impact of the energy crisis differs with development strategies. His studies are being partially supported by a research assistantship appointment (approximately $4,000) in Cornell's Program on Science, Technology, and Society.

F. Seminars and Conferences

The PPSTDN seminars and conferences offer a forum for those involved in Program related research to present the results of their work and receive the benefit of feedback from their colleagues. They provide opportunities for new people, either within the University or outside, to make contact with and become involved in Program related activities. They also serve as an input into the development of various other Program projects (such as last year's series of transportation seminars which provided the basis for the course on Low-Cost Transportation).

Seminars

Fifteen seminars were presented by the Program during the reporting year. During the latter half of the year especially, emphasis was directed at presentation of Program sponsored research. Seminars were open to the University community and as a result, several different colleges within the University were regularly represented. The seminars are listed below:

David McVoy, Assistant Director for Technical Services, AID, "Search for Shelter--An African Experience"

Jamlong Atikul, Graduate Student, Policy Planning and Regional Analysis, Cornell, "A Planning Model for Thailand"

Edmund T. Cranch, Dean, College of Engineering, Cornell, and Director, PPSTDN, "Science Indicators"

James Nickum, Department of Economics, University of California at Long Beach, "Management of Irrigation Systems in the People's Republic of China"

Jean Claude Ziv, Graduate Student, Policy Planning and Regional Analysis, Cornell, "Transportation Planning Techniques and Possible Transfers to LDC's"

Loretta Good Fairchild, Research Associate, PPSTDN, "Manufacturing Sector--Technological Choice Problems"

Jerry Ingles, Research Associate, PPSTDN, "Regional Differences in the Manufacturing Industry in Venezuela"

Milton Barnett, Professor of Rural Sociology and Asian Studies, Gilbert Levine, Professor of Agricultural Engineering, and Walter Coward, Assistant Professor of Rural Sociology, "Policies for Irrigation in Developing Nations"

Norman Uphoff, Director, Rural Development Committee, Cornell, "Political and Administrative Issues Involved in the Implementation of Labor Intensive Technology in Development"

Phyllis Andors, Graduate Student, Political Science, Colombia University, "Role of Women Labor in China"

David Vail, Assistant Professor of Economics, Bowdoin College, "Developing Intermediate Technology for Rural Development and Ujamaa in Tanzania"

Romir Chatterjee, Department of Economics, Rider College, "Agricultural Mechanization in Maharashtra"

Robert Lewis, Assistant Professor of Urban Studies and Planning, Virginia Commonwealth University, "Diffusion of Technology in Mexico"

John Montgomery, Professor of Public Administration, Kennedy School, Harvard University, "Problems of National Science Policy: Citizen Involvement and Responsive Behavior"

Floyd Slate, Professor of Structural Engineering, Cornell, "Low-Cost Housing in Developing Countries"

Conferences

The Program sponsored a major conference at Cornell on March 5, 1975. The conference addressed S/TP issues in the industrial and agricultural sectors. More than one hundred faculty members and professionals from outside the University participated in the meetings. The morning session, relying largely on Program research, concentrated on industrial sector policies, while afternoon papers dealt with international experience with agricultural policies. The discussion explored the relevance of the agricultural experience for the development of industrial science and technology policies. The papers presented at the conference included:

"Science and Technology Policy Issues: A Comparison of the Agricultural and Industrial Sectors," by Tom E. Davis, Department of Economics, Director of the Latin American Studies Program, and Executive Committee, PPSTDN.

"Science and Technology Policy for Manufacturing in Mexico," by Jerry Ingles, Research Associate, PPSTDN.

"A Comparison of Foreign and Domestic Firms in Monterrey: Performance and Sources of Technology," by Loretta Good Fairchild, Research Associate, PPSTDN.

"International Agricultural Research Institutes as a Part of a Science and Technology System," by Edwin Oyer, Director of Cornell's Program in International Agriculture.

"Relating Agriculture Resource Allocation to Multiple Goals," by John Mellor, Professor, Department of Agricultural Economics, Cornell.

Participation in Other Conferences

Several Program associates attended and made presentations at S/TP related conferences during the year. Such participation served both to share the results of PPSTDN's work and to keep the Program aware of recent developments within other professional organizations. The conferences at which Program participants presented papers or made other significant contributions are listed below.

Franklin J. Ahimaz, presented a seminar to the Advisory Council Meeting on 1975 World Congress on Energy, Education, and Utilization, September 27, 1974.

--Presented "Engineering Education in Developing Nations, Some Policy Issues," American Society for Engineering Education (ASEE), International Division Meeting in Tuscon, Arizona, January 16, 1975.

--Participated in AID's Technical Assistance office of Science and Technology (TA/OST) Annual Strategy Planning Symposium at Georgia Technical Institute, Atlanta, Georgia, May 6-9, 1975.

--Chairman, Workshop on Human Settlements, World Congress on Educating Engineers for World Development, ASEE, June 10-12, 1975, Estes Park, Colorado; Also on Congress Steering Committee.

Edmund T. Cranch, presented "The Role of Science and Technology in Developing Nations" US/AID TA/OST Contractor's Coordination Meeting, San Antonio, Texas, December 9-11, 1974.

--Participated in the World Congress on Engineering Education for World Development, American Society for Engineering Education (ASEE), Estes Park, Colorado; National Academy

of Engineers Panel meeting on "The Role of U.S. Engineering Schools in Developing Assistance" in Fort Collins, Colorado June 9-20, 1975.

Milton J. Esman, participated in "Preparatory Workshop on Training Programme on Management of Development Projects" at the African Training and Research Centre in Administration for Development, Tangier, Morocco, January 13-25, 1975.

--Produced in collaboration with others: "CAFRAD's African Programme for Training in the Management of Development Projects" at the African Training and Research Centre in Administration for Development, Tangier, Morocco, August 1-15, 1975.

--"Growth, Employment and Equity--A Comprehensive Strategy for Sudan" produced in collaboration with others, International Labour Office, Geneva, Switzerland, July 1975.

Loretta Good Fairchild, presented papers at:

--Seminar, International Development Seminar Series, April 8, 1975, Georgia Institute of Technology, Program of Employment Generation through Stimulation of Small Scale Industry in the Developing Countries, Atlanta, Georgia.

--Joint Session of the Economic Section of the Southwestern Social Science Association and the Association for North American Economic Studies, Annual Meeting, March 29, 1975, San Antonio, Texas.

Jerry L. Ingles, "Science and Technology Policy for the Manufacturing Sector in Latin America" presented at the Conference of the Rocky Mountain Council for Latin American Studies, Tempe, Arizona, April 24-26, 1975.

Gilbert Levine, "Improving the Performance of Agricultural Development Projects: Part I, A Proposed Design Process" and "Part II, An Example of a Systems Approach to Design Decisions: An Irrigation Example" presented at the Mekong Development Seminar, the Southeast Asia Development Advisory Group of the Asia Society, Pattya, Thailand, August 20-24, 1974, in collaboration with L. Small and J. Ingersoll.

--"Some Critical Issues in Irrigation Planning for Southeast Asia" presented at the Seminar on Water Resource Problems in Developing Countries, Economic Development Institute, University of Minnesota, April 3-4, 1975, in collaboration with T. Wickham.

--"Engineering Education for Water Management in Developing Countries" presented at the Annual Meeting, American Society for Engineering Education, Fort Collins, Colorado, June 15-20, 1975.

David B. Lewis, participated in the National Science Foundation International Science Studies Program, Williamsburg Planning Workshop, Williamsburg, Virginia, June 23-24, 1975.

Franklin A. Long, presented papers on
--"Social Problems: What Can Scientists Do?" ACS Meeting, September 11, 1974.

--"Economic Growth, Technology, and the Quality of Life" prepared for the Woodrow Wilson International Center for Scholars, November 1974, Washington, D.C.

--"U.S. Policies for Energy Production and Use" India, January 29, 1975.

--"Limits of Growth" Cornell University, March 7, 1975.

--"Energy, Chemistry, and Growth" Chemistry Colloquium, April 15, 1975, Cornell University.

John W. Mellor, "Economic and Social Implications and Choices Related to Change in Agricultural Technology" paper presented at the Second International Seminar on Change in Agriculture, Reading, England, September 9-19, 1974.

--Participated in the Development Strategies Seminar, Center for International Studies, Cornell, November 10-11, 1974.

--Participated in the seminar "Science and Technology Policy in Developing Countries" at the International Workshop on Training and Research for Extended Rural Development in Asia, Center for International Studies, Cornell University, November 22, 1974.

--"Rural Technology and Employment" seminar presented at the National Manpower Seminar on Rural Employment and Poverty, U.S. Department of Labor, Washington, D.C., April 28, 1975.

--Participated in the conference on China's Agriculture and Economic Development, sponsored by the Committee on Scholarly Communication with the People's Republic of China, National Academy of Sciences, Washington, D.C.

Benedict Stavis, "Training Cadres in China for Rural Development" Cornell Rural Development Committee Workshop on Research and Training for Extended Rural Development, Ithaca, New York, November 23, 1974.

--"How China Solved its Hunger Problems" Cornell U.S.-China People's Friendship Association and Coalition for the Right to Eat, November 25, 1974.

--"How China Solves its Food Problems" International Studies Program, University of Toronto, Toronto, Canada, February 10, 1975.

--"China's Green Revolution Appraised" International Studies Program, University of Toronto, Toronto, Canada, February 10, 1975.

--"Commune Institutions in Rural Development: A Comparative Analysis" American Association for Asian Studies, San Francisco, California, March 26, 1975.

--Chairperson, "Worker's Participation in China" Panel of the Second International Conference on Self Management, Cornell University, June 6, 1975.

G. Information Services

In its role as a center for S/TP education and research, PPSTDN has devoted particular attention to the acquisition and organization of S/TP information. This Program activity is especially important to researchers and practitioners because of the growing volume of relevant information being published. PPSTDN's information services consist of two main projects, the development of its library and the development and publication of bibliographies.

Library

The Program library serves as a reference center on science and technology policies for developing nations. Used by Program associates, other members of the University community, and visitors, it maintains and makes available books, papers, and periodicals on S/TP matters of general policy, current developments, and case studies.

The target for the reporting year was to respond effectively to the growing demand for service. During this period the entire library was moved to a new and larger facility. The classification system was expanded and reorganized to make it more accessible and useful for Program activities and for research projects of other faculty members and students. The acquisitions program was expanded, increasing the holdings of the library from 945 documents and 45 periodicals to 2,200 documents and 194 periodicals. Major subject concentrations were developed in education, housing, transportation, planning, and industrialization. Other important sections include agriculture, energy, and water control. The geographic focus of the materials is diverse, but emphasis has been placed on countries where Program participants are involved in research, such as Costa Rica, Colombia, and India.

To complement its own materials, the library maintains linkages with other information sources in the University including the University library system, special collections, and private holdings of individual faculty members involved in science and technology policy research.

Bibliographies

While the library's orientation is to serve the University community, there exists a large external group of researchers and practitioners who seek access to S/TP information. To serve this group, the Program has initiated a series of topic-specific

bibliographies. This activity involves searching the literature for materials relevant to a specific S/TP issue and gathering the citations for these materials in one source to facilitate research or reference. During the reporting period two bibliographies were completed; one was published and the other will go to press in September.

Science and Technology for International Development: A Selected List of Information Sources in the United States and Bibliography of Selected Materials

This report, compiled by Mary Ann Acton, is part of a continuing effort to identify and document the availability of relevant information sources in the United States which might be of use to scholars and practitioners working on policies for science and technology in developing nations.

The first section presents a list of U.S. based libraries which have some of the most comprehensive and complete holdings in fields related to S/TP in developing countries. It also contains some of the smaller, more specialized collections which are of particular significance.

The second section is a bibliography of selected references on science and technology, emphasizing particularly the transfer of technology to developing countries, industrialization, and small-scale industries. The bibliography is not exhaustive but gives a broad overview of the key works on these topics.

Bibliography on Transportation for Developing Nations

This bibliography was a collaborative effort of Professor Lynne Irwin, Coordinator; John Sutter and Marie Helen Collion, Graduate Student Researchers; and Holly Bailey, Graduate Student Editor. The purpose of the bibliography is to cite a representative cross-section of foreign and domestic literature on the subject of transportation for developing nations. The focus is on material published principally during the period 1960-1974.

Approximately 1,000 annotated entries have been included. While this does not exhaust all that has been published, it is a significant survey of the important recent literature, both from America and from other countries.

Note: This bibliography will be available for distribution in the fall.

Section III

IMPACT OF GRANT SUPPORTED ACTIVITIES IN ACHIEVING GRANT OBJECTIVES

Program activities during the fourth year of the grant both broadened and deepened Cornell's institutional capabilities in subject areas related to science and technology policy in developing nations.

Courses and seminars served to interest many new students and faculty in the relevant issues; the Program's interdisciplinary approach helped introduce people interested in one aspect of S/TP to complementary activities in other disciplines, and expanding their exposure to the complex nature of the problems. The courses and seminars catalyzed and assisted in the development of several research projects sponsored by both the Program and also by other departments in the University. The Program library became a center for science and technology policy information not only for Program associates but also for students and faculty throughout the University. Thus, through these and other activities, the Program served increasingly as an initiating and coordinating center for S/TP activities in the University.

Through its research projects, the Program addressed other grant objectives--especially to produce a body of new research-based knowledge relevant to the field (science and technology) and "develop . . . case studies which involve the joint participation of personnel from both Cornell and the developing nations." Knowledge developed in Program-sponsored research and case studies is made available through the resulting reports and publications. (See Appendix C for a complete listing of reports and publications.)

PPSTDN involvement of personnel from the developing countries is not limited to students on the campus;

professionals from developing countries have become increasingly active in Program projects. For example, the work in Costa Rica involves the collaboration of several professionals from that country. In another example, faculty members from KAIS are actively participating with Program members in the soybean based beverage project (see page 22). The establishment of the Summer Institute anticipates the significant increase in this type of collaboration. Institute participants returning home will be familiar with the Program and its potential, and several have already explored the possibilities for follow-up collaboration on S/TP work in their own countries.

The Program has addressed its objective of producing a "body of trained people, knowledgeable in the application of science and technology to societal problems and desirous of working with groups within developing nations of these efforts" through several avenues--the most visible being the development and offering of new courses (see pages 7-11). Through these offerings, the Program encourages faculty and students to focus on S/TP issues in development. The Program-published "Directory of Courses Related to Science and Technology in Developing Nations" and the counseling of Program associates help introduce students to additional relevant coursework on campus. Research and seminar participation reinforce other activities in rounding out training.

During the reporting year, the Program expanded its training function with the establishemnt of its Master's Degree Program (see page 12) and the Summer Institute (see pages 14-16). Also grant resources have been directed toward research which complements the teaching structure--particularly analysis of the policies and practices influencing the development of indigenous S/TP in developing countries and the ways in which indigenous as well as imported technology can, by appropriate adaptation, be applied to the social and economic development of these countries. The Comparative International Science Policy Project (see page 20) and the course on technology transfer are particularly

concerned with the relationship between indigenous and imported technology and the role of each in the development process.

The Program has devoted considerable effort to the objective of identifying areas where lack of information and analysis is a crucial limiting factor to the establishment of rational policies by the less developed countries. The courses "Seminar in Advanced Policy Analysis: Policies for Science and Technology in Developing Nations " (see page 10) and "Science, Technology, and Development" (see page 8) emphasize the importance of identifying the key issues in the science and technology policymaking process. Case studies are emphasized both in course readings and in individual research projects to provide the student with a methodological structure for undertaking policy analysis. Additionally, to improve access to existing documentary information resources, the Program maintains a library and publishes topical bibliographies.

Another Program goal has been to develop a core faculty and a coordinating center to catalyze and support an integrated multidisciplinary approach to studying problems of science and technology policy. Appendix C provides a listing of faculty members actively involved with Program projects. The interaction of these people from the different parts of the University has indeed served to develop a coordinated approach to S/TP study, resulting in the development of interdisciplinary courses, research projects, and seminars.

The low-cost housing efforts exemplify two types of coordinating functions served by PPSTDN. First, the efforts are interdisciplinary, involving the inputs of several different fields (engineering, architecture, sociology, economics, etc.). Second, the efforts are coordinated across projects, with the courses, the bibliography development, the research projects (in Costa Rica and Ghana), and the housing seminars all serving to reinforce each other, resulting in an intense, cohesive approach to problems of low-cost housing.

Its research, seminars, courses, library, and linkages have made the Program a center for strengthening and coordinating the development of S/TP activities at Cornell, and, through these activities, to serve as a catalyst for S/TP development in the field.

Section IV
OTHER RESOURCES FOR GRANT RELATED ACTIVITIES

Many projects related to PPSTDN are funded, partially or entirely, by outside sources. These external funds, in addition to their inherent recognitional factor, contribute to the growth of the accomplishments and capacity of the Program. The research-related projects which have been funded by outside sources are described earlier in this report, beginning on page 24. For convenience of the reader, the amounts are summarized on the following page.

In addition to these research funds, the Program received substantial amounts of other non-grant funding.

Cornell: Special Expenditure Budget

In July of the reporting year, PPSTDN received a $2,000 grant from Cornell's Center for International Studies. The money is to be used to pay for office furniture and for pertinent travel and research projects outside the scope of the agreement with AID, but essential to the Program.

Cornell: Overhead

As part of its contribution to the S/TP effort, Cornell University provides the Porgram with office space, heat, electricity, and supplementary resources (such as janitorial and security services, access to the University library system, etc.). The estimated value of these services is $38,000.

Cornell: Faculty Time

Another University contribution to the Program comes in the form of faculty time. Salaries for the teaching of courses are paid by the department that sponsors the course rather than

Investigator	Project Title	Amount	Source
Benedict Stavis Research Associate, PPSTDN	"Agricultural Mechanization in China	$ 3,800	Rural Development Committee, Cornell
Ramesh Vaidya Research Assistant, PPSTDN; Graduate Student, City and Regional Planning	"Choice and Transfer of Technology in the Construction Industry"	5,000	Technology Development Institute, East West Center, University of Hawaii
Wallace Tyner Research Associate, Agricultural Economics	"Energy Supply Policy and Economic Development in India"	1,450	Center for International Studies, Cornell
Stephen MacRae Graduate Student, Natural Resources	"Impact of Technological Change on Development"	500	Center for International Studies, Cornell
John Mellor Professor, Agricultural Economics	"Effects of Agriculture Innovations on Income, Employment, and Farm Production"	213,751	Agency for International Development
Vincent Richards Graduate Student, Economics	"An Approach to Multi-Country Development Planning and Industrial Programming for the East Caribbean Common Market"	500	Center for International Studies, Cornell
Pamela Melvin Graduate Student, City and Regional Planning	"Alternative Education in Kenya"	500	Center for International Studies, Cornell
Ichiro Sasaki Graduate Student, MPS(ID)	"Choice of Technology in Commercial Agriculture"	Tuition + Living Expenses	Yamaichi Company, Japan
David Edelman Graduate Student, City and Regional Planning	"Energy Crisis and the Development Process of Low Income Countries"	4,000	Program on Science, Technology, and Society, Cornell

by PPSTDN itself. The contribution in the form of faculty time is estimated at more than $100,000.

USAID: Science Policy in a Small Developing Country (Costa Rica)

An AID purchase order for $2,000 was received by the Program to cover travel expenses incurred in the Costa Rica housing effort. With these funds, Professor Franklin Ahimaz traveled to Costa Rica for meetings with CONICIT to discuss past efforts and future linkages between Cornell and Costa Rica. Also, Roberto Villalobos and Rolando Coward, two Costa Ricans who have been actively involved with the housing program, were enabled to visit Cornell for two weeks. During that time, they met with members of PPSTDN, presented a seminar on the Limon housing situation, discussed housing with several faculty and students, and assisted with the data analysis for the housing policy survey.

USAID: Science and Technology for International Development--A Selected List of Information Services in the United States

This report, funded by a $2,480 purchase order from AID, was completed and published by the Program during the reporting year. A description of the report and its relevance is to be found on page 34.

USAID: Summer Institute on Science, Technology, and Development

The Summer Institute sponsored during the summer of 1975 was funded by the Agency for International Development. To facilitate the accounting procedures, the funds ($50,000) were conveyed to PPSTDN through an amendment to the original 211(d) grant.

Section V
UTILIZATION OF INSTITUTIONAL RESPONSE CAPABILITIES IN DEVELOPMENT PROGRAMS

Professional Services

PPSTDN receives a nearly continuous flow of inquiries ranging from modest informational queries to rather substantial requests for professional services. Table III of Appendix D (page 65) lists the major requests for assistance made to the Program during the reporting year and the Program response to these requests.

It should be noted that the requests for assistance reflect a growing recognition of the Program's strength in certain areas of S/TP. For example, the Government of Costa Rica has asked for a continuation of the Limon study, confirming satisfaction with the joint Cornell-Costa Rica efforts in studying the natural resource potential of that area. Growing Program involvement in the area of small-scale business led to a request from the government of Papua-New Guinea for ideas to assist in the development of their small-scale enterprise program. A request from USAID/Colombia for assistance on a labor intensive farm-to-market road project reflects recognition of the Program's competence in transportation policy and in choice of technology in the construction industry. A request from the government of Pakistan for assistance in drawing up their science and technology plan came as an acknowledgement of the Program's interest in the overall science and technology planning process. Other examples of utilization of institutional response capabilities in development programs are listed in the section on "Accomplishments--Professional Services" beginning on page 12.

Study Opportunities

PPSTDN-sponsored courses are being heavily utilized by both students from developing countries and by others; the rate of utilization appears to be increasing. Each new course introduced attracts a good enrollment. The courses are designed to complement one another and the Program's research activities. When a student takes one course, he or she usually follows on to take more; thus building a cummulative momentum to utilization. During the past year at least thirty-five graduate students from developing countries have been actively involved with PPSTDN; many in more than one course or project. These students, most of whom intend to return home, come from a wide range of countries, including Malaysia, Colombia, India, Pakistan, Thailand, Antigua, Costa Rica, Uganda, Korea, Chile, Nigeria, Nepal, Ethiopia, Taiwan, Philippines, Indonesia, Mexico, Panama, Hong Kong, and Turkey.

Collaboration (Linkages)

The emerging institutional linkages between other S/TP related organizations and PPSTDN reflect a growing utilization of Cornell's institutional response capabilities. Some of these linkages, such as the Cornell-Costa Rica linkage and the linkage with KAIS, are mentioned elsewhere in this report. New linkages are developing with Venezuela, Ghana, and India. Gilbert Levine recently visited Venezuela at the request of their Ministry of Public Works to discuss a relationship(between Cornell and the Ministry)to cooperate on project planning. Franklin Long has been advising the Ministry of Science and Technology in Korea.

Resource Mobilization

The Summer Institute illustrates utilization of another aspect of the institutional response capability--resource mobilization. Although the Institute had been discussed lengthily at preliminary levels, final approval of the project and receipt of funds did not come until the middle of April. Within three months PPSTDN was able to develop a dynamic curriculum which attracted top quality applicants from around the world. This was made

possible by Cornell's institutional strength and capability as a center for coordinated S/TP efforts.

Spin-Off Programs

Closely related to PPSTDN is the Program on International Studies in Regional Planning (ISRP), which was set up in 1972 in part with funding from PPSTDN. ISRP participants work both directly and informally with PPSTDN. ISRP faculty research includes Professor William W. Goldsmith's work on the growth of secondary cities in Colombia, Professor Stan Czamanski's studies of regional development in Iran and Israel, Professor Stuart Stein's work on housing in Puerto Rico, and Professor Thomas Vietorisz's research on industrialization, technology, and national development policy in Mexico. ISRP is seen as a focus for Cornell's teaching and research activities in the field of regional planning in developing countries, and there are now twenty registered students from developing countries in that program.

Another effort under development is the newly proposed Low-Cost Housing Program. Building on the work done by PPSTDN's Low-Cost Housing Group (seminars, courses, bibliography, research projects), this new program would serve as an institutional focus and base for the expansion of Cornell's efforts to develop mechanisms for providing housing for low-income families in developing nations. The basic preparatory work has been completed. If funding develops as anticipated, the program is expected to begin during the next reporting period.

Section VI
NEXT YEAR'S PLAN OF WORK AND ANTICIPATED EXPENDITURES

The activities planned for next year (1975-1976) include both the continuation of current projects and the beginning of new ones integrated with and complementing current program efforts.

A. Course Development and Teaching

During the coming year, the Program plans to sponsor the presentation of four courses. Two of these, "Transportation Pol-cies for Developing Nations with Emphasis on Low-Volume Roads" and "Advanced Planning Analysis with Selected Applications to Development Problems in the Third World," were described in this report on pages 9 and 10. In addition, the Program expects to sponsor the following two courses:

Low-Cost Housing for Developing Nations--Workshop for Physical Planning and Site Selection and Design

This course, complementing the course on Low-Cost Housing for Developing Nations which was offered during the reporting year (see page 8), is designed as a follow-on to the basic course focussing on particular aspects of architecture and engineering as they relate to low-cost housing construction, materials, etc. The coursework emphasizes physical layout and structural issues.

Seminar on Policy Planning in Developing Nations: Technology Transfer and Adaptation

Offered for the first time this year, the seminar will explore the international transfer of technology to developing nations and the policies used to guide this process. Case studies will be emphasized. A more detailed description of the issues dealt with in this course is presented on page 11 of this report.

B. Degree Program

The MPS(ID) Program described on page 12 will be offered again during the coming year. Enrollment is expected to increase significantly.

C. Professional Services

Plans for association with other S/TP related organizations call for the continuation and strengthening of present linkages and the broadening of Program involvement with international science and technology policy organizations.

Professor Floyd O. Slate's ties with the Technology and Development Institute (TDI) of the East West Center will continue during the coming year. He will participate in another roving workshop on low-cost housing, this time to Thailand and South Korea. His plans also include a semester of his sabbatic year as a Senior Research Fellow at TDI to help prepare a book on low-cost housing and to investigate the possibility of setting up multidisciplinary housing courses in Indonesia and Thailand.

Professor Franklin Long plans an October trip to Korea to continue his science policy work there. The linkage with Korea is also being strengthened by the continuing collaboration of KAIS and Cornell on the soybean based beverage project.

The Costa Rica linkage is to be developed still further over the coming year. Three proposals for funding of projects based on PPSTDN's earlier work in Costa Rica have been sent to outside organizations for consideration. The proposals involve policies for research for institutions of higher education in Costa Rica, television instructional services for enhancing the quality of education, and a continuation of the Limon study in response to a request from the Costa Rican government.

The other professional affiliations mentioned earlier in this report (pp. 12-14) are expected to continue during the coming year.

D. Summer Institute

PPSTDN expects to repeat the Summer Institute next year. The possibility of holding a regional institute based on the same format but convened in a developing country is being explored.

E. Research

Comparative International Science Policy

During the year, results of the interviews carried out during the summer of 1975 will be analyzed. The report of these results and their policy implications will be published by the Program.

An article on Colombia is planned, replicating the Mexico case study described on page 20. The Mexico report is to be updated using data from 1974 which was collected from a survey mailed to participants in the earlier Mexico study.

Another task for the coming year is the standardization of the tape files of the various countries involved in the study to make the data more accessible for use by graduate students in the analysis of technology transfer issues.

Plans are also being considered for an extension of this methodology to countries in Asia and Africa.

Housing Policy Alternatives for the Squatter Settlement in Limon, Costa Rica

Plans for this project involve final analysis of the survey data and their policy implications, and preparation of a final report. (For more detail on the study, see page 23.)

Soybean Based Protein Beverage Preparation for School Children in Korea

After more testing at both KAIS and Cornell and a visit by Professor Lee to KAIS for joint tests, the feasibility of further development will be determined. If it seems appropriate to proceed, the two institutions will prepare a joint proposal to obtain research funding from an outside agency.

Agricultural Technology Policy in China

The Program plans several activities in this field. The first task is the publication of Dr. Benedict Stavis' "Agricultural Mechanization in China." Dr. Stavis plans to continue his study of rural transformation in China, leading to articles and speaking engagements on the topic. Also, building on contact made through the Program, he plans a systematic study of agricultural programs in India for eventual comparison with China.

Economic Development and Technological Change: The Colombian Rural Development Projects

This research project of Sergio Sepulveda, a Chilean doctoral student in agricultural economics, has been approved for joint funding ($4,000 from PPSTDN) with the International Agriculture Program. Mr. Sepulveda plans to travel to Colombia in late September to study the impact of technological change on unemployment, output and income distribution among small farmers. He will be working with the rural development projects sponsored by ICA (Instituto Colombiano Agropecuario). He plans a comparative analysis of adopters and non-adopters of specific new techniques to determine the impact of innovativeness on productivity, use of labor, and finance. His research is meant to serve as a base for the development of a general governmental policy framework to deal with selective adoption of technology in the agriculture sector.

The Relationship Between Science and Technology Policy and Transportation Strategies--The Case of Ghana

This research project is being undertaken by John Sutter and Marie Helene Collion, both graduate students. The major objectives of their research are:

(1) To analyze the relationship between government development policy and the type of transportation network built as a result of that policy;

(2) Using Ghana as a case study, to analyze in detail its technology policies as they relate to the building of primary roads and rural feeder roads;

(3) To come to an understanding, based on this case study, of the changes and adaptations necessary in transportation policy to increase responsiveness to the needs of the rural population and to identify the key constraints impeding the effective utilization of technology policy for rural road development.

Ms. Collion and Mr. Sutter have been studying transportation policy in developing nations through the Program-sponsored courses and through their work on the transportation bibliography (see page 34).

F. Seminars and Conferences

The seminars will be continued as they were organized in the past. A regular seminar series, focussing on Program research, is seen as the core of the effort. This will be supplemented with periodic presentations by outside speakers on topics of special interest to the Program.

Complementing the regular seminars, Dr. Benedict Stavis has organized a faculty seminar program focussing on the world food problem. This interdisciplinary series of presentations and discussions is to be presented in the fall of 1975.

G. Information Services

Library

Plans for the library involve continuation of reference assistance and lending operations. Now that the system has been well organized and capacity expanded, emphasis will be placed on increasing the rate of acquisition of documents useful for the development of S/TP research.

Bibliographies

The Transportation Bibliography is to be printed and made available during this year. Several new topics covered by Program-related research are being considered as subjects for new bibliography development, but final selections have not yet been made.

Section VII
INVOLVEMENT OF MINORITY PERSONNEL AND WOMEN

A significant number of women and minority group members were either employed by PPSTDN or involved in Program sponsored research during the reporting year. The Program follows the Affirmative Action guidelines in its hiring practices, issuing notices of upcoming positions in conjunction with the University minority recruitment program.

The Program has benefitted by the diversified backgrounds and interests of its participants, and there has been no difficulty in identifying or hiring well qualified women and minority group members. A listing follows.

Name	Origin	Sex	Nature of Involvement
1. Mary Ann Acton	--	Female	Compiled third annual report and two bibliographies later published by the Program
2. Franklin J. Ahimaz	Asian American	Male	Assistant Director of the Program; Professor and Director of Division of Basic Studies, College of Engineering
3. Holly Bailey	--	Female	Editor of low-cost transportation bibliography
4. Kathleen Beauregard	--	Female	Senior Administrative Secretary
5. Debra Biamonte	--	Female	Summer Institute Secretary
6. Susan Biamonte	--	Female	Program Secretary
7. Peter S. Chi	Oriental American	Male	Co-investigator for Chi/Griffin Research Project
8. Marie Helene Collion	European	Female	Research for low-cost transportation bibliography
9. Loretta Fairchild	--	Female	Research Associate, Comparative International Science Policy Project
10. Nancy Gallant	--	Female	Research Assistant, Librarian
11. Tilhun Giday	African	Male	Research for low-cost transportation bibliography
12. Mary Ann Griffin	--	Female	Co-investigator for Chi/Griffin Research Project
13. Diane Hopkins	--	Female	Research for low-cost transportation bibliography
14. C. Y. Lee	Oriental	Male	Principal Investigator (Cornell) for Soybean-based Beverage Preparation for School Children in Korea

Name	Origin	Sex	Nature of Involvement
15. Fernando Nasmyth	Spanish American	Male	Participant in the Costa Rican Project
16. Porus Olpadwala	Asian	Male	Associate Director, Summer Institute
17. Vincent A. Richards	Caribbean	Male	Author, "An Approach to Multi-Country Development Planning and Industrial Programming for the East Caribbean Common Market"
18. Henry Richardson	African	Male	Principal Investigator, Basic Housing in Ghana Project
19. Antonio D. Sobrinho	Latin American	Male	Research Investigator, Comparative International Science Policy Project
20. Irma Telling	--	Female	Consultant for Chi/Griffin Research Project
21. Ramesh Vaidya	Asian	Male	Research Assistant
22. Darrell Williams	Caribbean	Male	Co-investigator, Basic Housing Systems in Ghana Project
23. Paula Wolk	--	Female	Consultant for Comparative International Science Policy Project

Appendix A

SUMMER INSTITUTE ON SCIENCE, TECHNOLOGY, AND DEVELOPMENT PARTICIPANTS, BY COUNTRY

BRAZIL

Vivianne Ventura Dias: Financiadora de Estodose Projetos

CANADA

Ernest Mercier: Special Advisor, Ministere des Affaires Inter-Gouvernementales, Gouvernement du Quebec

CHILE

Ricardo Berner: Chief Engineer, Marketing of Technology, Technology Institute of Chile

COLOMBIA

Miguel A. Infante: Economic Researcher, Colciencias

ARAB REPUBLIC OF EGYPT

H.M. Sadek: Vice President for Graduate Studies and Research, Alexandria University

Hussein Ghanem: Senior Technological Officer, Directorate of Industrial Planning and Researchers, General Organization of Industrialization

Mahmoud Abdel Raouf: Senior Expert, Agricultural Planning, Institute of National Planning

Shafik Balbaa: Secretary General, Supreme Council of Universities

ETHIOPIA

Theophilus S. Karumuna: Associate Economic Affairs Officer, U.N. Economic Commission for Africa

GHANA;

David d'Alembert Ardayfio: Lecturer, Mechanical Engineering Department, University of Science and Technology

Hugh K. Quartey-Papfio: Deputy Director of Agriculture, Ministry of Agriculture

INDIA

Mohammad Mansurul Hoda: Head, Department of Appropriate Technology and Environment, Gandhian Institute of Studies

B.V. Rangarao: Professor, Jawaharlal Nehru University

P. Subba Rao: Faculty Member, SIET Institute

Raghbir Singh: Professor and Head, Department of Extension Education, Punjab Agricultural University

INDONESIA

Achie Sudiarti Luhulima: Head, Bureau of Coordination and Science Policy, Indonesian Institute of Sciences

KENYA

Peter Gacii: Secretary, National Council for Science and Technology, Ministry of Finance and Planning

KOREA

Kyung Mok Cho: Director, Program Development, Ministry of Science and Technology

MEXICO

Rosa Maria Pinon: National Council of Science and Technology

Edgar R. Ubbelohde: Head, Technical Department, Confederacion de Camaras Industriales

NEPAL

Chhabi Lal Gajurel: Reader in Chemistry, Department of Chemistry, Tribhuvan University

NIGERIA

Oji O. Okereke: Principal Research Officer, Projects Development Agency

PAKISTAN

S.G. Murtaza Shah: Joint Secretary, Scientific and Technological Research Division

PHILIPPINES

Manolo I. Abella: Director, Bureau of Employment Service, Department of Labor

SAUDI ARABIA

A.H. Al-Moajil: Assistant Professor, University of Petroleum and Minerals

Idris A. Tairi: Financial Analyst, Industrial Studies and Development Centre

SUDAN

M. Sid Ahmed Goreish: Executive Secretary, National Council for Scientific and Technological Research

TURKEY

Turhan Armutcu: Head, Feasibility Study Section, Fizibilite Etudleria Servis Sefi, MTA Enstitusu Plan-Proje

Appendix B

SUMMER INSTITUTE ON SCIENCE, TECHNOLOGY, AND DEVELOPMENT
RESOURCE PERSONNEL

Franklin J. Ahimaz, Assistant Dean, Professor and Director, Division of Basic Studies, College of Engineering; Assistant Director, Policies for Science and Technology in Developing Nations

Milton L. Barnett, Professor, Rural Sociology and Asian Studies

Jack Chen, Senior Research Associate, China-Japan Program; Peace Studies Program

Peter M. Cohen, Adjunct Associate Professor, Architecture

James W. Converse, Assistant Professor, Rural Sociology

Edmund T. Cranch, Professor, Engineering; Dean, College of Engineering

Tom E. Davis, Professor, Economics; Director, Latin American Studies Program

Matthew Drosdoff, Professor, Agronomy

Ismael Escobar, Inter-American Development Bank, Washington D.C.

Milton J. Esman, Professor, International Studies; Government; Director, Center for International Studies; John S. Knight Professor in International Studies

William W. Goldsmith, Associate Professor, City and Regional Planning; Field Representative, City and Regional Planning; Field Representative, Latin American Studies

Gilbert Levine, Professor, Agricultural Engineering; Director, Water Resources and Marine Science

David B. Lewis, Director, Summer Institute; Assistant Professor, City and Regional Planning; Assistant Director, Policies for Science and Technology in Developing Nations

Franklin A. Long, Professor, Chemistry; Member, Science, Technology, and Society; Henry R. Luce Professor of Science and Society

Milton Leitenberg, Research Associate, Peace Studies Program

Derek Lovejoy, Senior Technical Advisor, United Nations Development Program, New York

Fred Moavenzadeh, Professor, Civil Engineering, Massachusetts Institute of Technology

John W. Mellor, Professor, Agricultural Economics

Henry M. Munger, Professor, Vegetable Crops

Edwin B. Oyer, Professor Vegetable Crops; Director, International Agricultural Development

Henry W. Richardson, Assistant Professor, Architecture; City and Regional Planning

Mary Sheridan, Department of Anthropology and East Asian Studies Program, York University, Downsview, Ontario

Floyd O. Slate, Professor, Structural Engineering, Department of Civil and Environmental Engineering

Benedict R. Stavis, Research Associate, Policies for Science and Technology in Developing Nations

Pete Suttmeier, Department of Government, Hamilton College, Clinton, New York

Erik Thorbecke, Professor, Economics; Chairman, Department of Economics

Norman T. Uphoff, Assistant Professor, International Studies; Government; Chairman, Rural Development Committee

Evan Vallianatos, Center for Population Studies, Harvard University, Cambridge, Massachusetts

David J. Vail, Assistant Professor, Department of Economics, Bowdoin College, Brunswick, Maine

Thomas Vietorisz, Visiting Professor, City and Regional Planning, Cornell University; Professor, Economics, New School for Social Research, New York

William F. Whyte, Professor, Industrial and Labor Relations

Darrell F. Williams, Assistant Professor, City and Regional Planning

Appendix C

PUBLICATIONS BY PROGRAM ASSOCIATES

Program Publications and Reports (Cumulative)

Unemployment in Jamaica and the Contribution of the Bauxite-Alumina Industry to the Employment Program by L. George Nelson.

Toward an Andean Common Market for Science and Technology by Robert N. Seidel.

Low-Cost Housing for Developing Nations--A New Course At Cornell University by Floyd O. Slate, reprinted from TECHNOS January 1974.

Low-Cost Housing for Developing Countries, An Annotated Bibliography 1950-1972 by Floyd O. Slate.

Housing Strategies for a Developing Economy, A Comparative Analysis and Evaluation of Housing Production Systems in Ghana by Henry W. Richardson.

The Natural Resource Potential for Regional Development of Limon Province: A Preliminary Survey by the Cornell-Costa Rica Team; Spanish edition not available.

Diagnostico del Sistema de Educacion Cientifica y Tecnologia de Costa Rica y Bases Para Su Planificacion a Largo Plazo by Mariano Ramirez Arias, Jose Brenes Andre and Oscar Torres Padilla.

Cornell-KAIS Workshop--Curriculum Planning, Interdisciplinary Research, and Technology Transfer by KunMo Chung, Korean Advanced Institute of Science, resident for Summer 1973 at Cornell.

Policies for the Application of Science and Technology to Development, OST Symposium, May 7-10, 1973.

Energy Subsidy as a Criterion in Food Policy Planning by Malcolm Slesser.

Energy Subsidy in Protein Formation: Its Use as a Policy Planning Tool by Malcolm Slesser.

Information Management in Development Administration: On Technology's Promise for Policymaking in Developing Countries by Daniel Dumas.

Preliminary Linear Programming Analysis of Colombia by Joel Brainard.

Selected Problems of Developing Countries by Joel Brainard.

Preliminary Study of the Water Resources of the Atlantic Coast, Costa Rica, by Jorge de la Guardia.

*Science and Technology for International Development: A Selected List of Information Sources in the United States and Bibliography of Selected Materials by Mary Ann Acton.

Science, Technology, and the Development Process by Franklin A. Long.

*Organizing for Agricultural Development by William Foote Whyte.

*Policies of International Agencies to Coordinate Activities in Developing Countries: Colombia, A Case Study by Franklin J. Ahimaz and Daniel Kops.

Social Injustice and Optimal Space-Time Development: Extensions and an Application to the Minamata Mercury Pollution Case by Yoshifusa Kitabatak

Science Policy-Making for Development: Reflection on Five Cases by John D. Montgomery and Milton J. Esman.

*An Approach to Multi-Country Development Planning and Industrial Programming for the East Caribbean Common Market by Vincent Richards.

*A Methodology for Formulating and Implementing Science Policy for a Small Developing Country (Costa Rica) by Franklin J. Ahimaz.

Directory of Courses Related to Policies for Science and Technology in Developing Nations by Nancy Gallant.

*Published during reporting year.

Articles

"Sowing the Seed of Political Stability," by Benedict Stavis in the Far East Economic Review, October 4, 1974.

"Engineering Education in Developing Nations: A Concern of a Multidisciplinary Cornell Program," by Franklin J. Ahimaz in Engineering, Cornell Quarterly, August 1974.

"Low-Cost Housing for Developing Countries," by Floyd O. Slate in Engineering, Cornell Quarterly, August 1974.

"Transportation and National Development," by Lynne Irwin in Engineering, Cornell Quarterly, August 1974.

"Cornell's Activity in Tropical Water Management, by Gilbert Levine in Engineering, Cornell Quarterly, Autumn 1974.

"Policies of International Agencies to Coordinate Activities in Developing Nations: Science and Engineering Education in Colombia: A Case Study," by Franklin J. Ahimaz and Daniel Kops in TECHNOS, September 1974.

"Economic Growth, Technology and the Quality of Life," by Franklin A. Long, scheduled for publication by the Woodrow Wilson Institute and by the Bulletin of the Atomic Scientist.

"Indices Financiero para Empresas Manufactureras que Operan en Monterrey Metropolitano Periodo 1960 a 1973," by Loretta Good Fairchild.

"Science, Technology, and the New International Economic Order," by Franklin J. Ahimaz et al in Science and Public Policy, February 1975.

"Models of Economic Growth and Land-Augmenting Technological Change in Foodgrain Production," by John W. Mellor in Nurul Islam (ed.), Agricultural Policy in Developing Countries, The MacMillan Press, Ltd., London, 1974.

"Low-Cost Housing for Developing Countries," Masalah Bangunan 20:1, 13-18 (March 1975), from Regional Housing Centre, Bandung, Indonesia.

Film

"Technology Transfer and Economic Development," by Tom E. Davis, United States Information Agency, 1975.

Book

Organizing for Agricultural Development, William Foote Whyte, Transaction Books, Inc., August 1975.

Appendix D

TABULAR SUMMARIES

Table I

Distribution of 211(d) Grant Funds and Contributions from Other Sources of Funding*
Reporting Period 8/11/74 to 8/10/75

Grant Objectives/ Outputs	211(d) Expenditures: Period Under Review	Cumulative Total	Projected to End of Grant	Non 211(d) Funding Amount
Course Development and Teaching	$ 12,021.47	$103,963.35	$ 15,186.34	
Degree Program	12,347.13	12,347.13	22,779.50	
Professional Services**	5,761.99	41,585.36	10,630.44	CIS Grant $2,000
Summer Institute	53,728.00	53,728.00	ø***	
Research	72,020.88	162,549.45	80,487.58	Science Policy in a Small Developing Country, $10,935.22; Costa Rica Mission, $1,818.11
Seminars & Conferences	15,112.42	83,170.71	15,186.34	
Information Services	11,007.62	20,792.64	7,593.16	Science and Technology for International Development, A Selected List of Information Services, $2,460
TOTALS	$181,999.51	$478,136.64	$151,863.36	$17,213.33

James A. Kirby
Supervisor, Grant and Contract Accounting
September 18, 1975

*The figures represent best estimates

**This figure includes only services funded directly by the Program

***Does not reflect expected funding from external sources

Table II-A

211(d) Expenditure Report: Actual and Projected Summary Under Institutional Grant #AID/csd-3158, Reporting Period 8/11/74 to 8/10/75

Line Items Conforming to Budget in Grant Document	Expenditures to Date: Reporting Period	Expenditures to Date: Cumulative Total	Projected Expenditures	Total
Salaries	$101,803.83	$290,659.81		
Fringes	10,915.53	28,312.08		
Travel	28,547.28	76,459.35		
Communications	3,654.18	10,236.33		
Rentals	961.47	2,916.93		
Outside Services	17,216.22	22,225.80		
Supplies & Materials	14,767.84	31,837.82		
Conferences & Seminars*	Ø	Ø		
Employment Expenses	Ø	212.89		
Publications Costs	3,279.06	4,819.71		
Student Aid**	Ø	820.00		
Other	854.10	9,635.92		
TOTALS	$181,999.51	$478,136.64	$151,863.36	$630,000

James A. Kirby
Supervisor, Grant & Contract Accounting
September 18, 1975

*Expenses allocated to functional categories

**Does not reflect wages paid to students for services rendered.

Table II-B

211(d) Expenditure Report
Reporting Year Detail
Under Institutional Grant #AID/csd-3158
Reporting Period 8/11/74 to 8/10/75

I. Salaries

A. Academic

Name	Percent of Time Charged to Grant	Amount
F.J.Ahimaz	50	
D.B.Lewis	46.97	
L.G.Fairchild	100	
J.L.Ingles	100	
B.R.Stavis	50	
R.N.Seidel	100	
TOTAL		$60,442.50

B. Other

	Percent of Time Charged to Grant	Amount
Library	86	
Clerical	99	
Other (Principally student wages)	97	
TOTAL		$41,361.33

C. Fringe Benefits

16% of Emp Salary	$10,915.53

II. Student Wages

Name	Country of Origin	Amount
R. Vaidya	Nepal	
N. Gallant	U.S.A.	
W. Biddle	U.S.A.	
M. Acton	U.S.A.	
D. Kops	U.S.A.	
M. Collion	France	
T. Giday	Ethiopia	

continued on following page

Table II-B, continued

II. Student Wages, continued

Name	Country of Origin	Amount
J. Sutter	U.S.A	
M. Bogan	U.S.A	
F. Nasmyth	Costa Rica	
D. Edelman	U.S.A	
P. Olpadwala	India	
S. Schmeiser	U.S.A	
R. Fairchild	U.S.A	
TOTAL		$28,774.19

III. A. Consultants -- not applicable

B. Guest Lectures, Visitors, etc. -- Approximately 50 professionals came to Cornell as guest lecturers or visitors to PPSTDN. Costs associated with these visits total approximately $4,360. This total includes honoraria, transportation and living expenses paid for by the 211(d) grant.

IV. Travel

Domestic -- The Program sponsored 22 domestic trips by its employees, totalling $10,256.96.

Foreign -- The Program sponsored 13 foreign trips by its employees, at a cost of $16,313.12.

V. Equipment --not applicable

VI. Library acquisitions during the reporting year totalled $1,256.74.

VII. The Program sponsored five publications at a cost of $3,279.06.

VIII. Other

Telephone & Telegraphs	$1,948.85
Postage	1,618.28
Shipping	87.05
TOTAL	$3,654.18

Table III

Major Requests for Program Assistance
Reporting Period 8/11/74 to 8/10/75

Description	Assisted by	Requested by	Funded by	Size of Effort: Amt.	Size of Effort: Man-Days	Results
1. Mount Joint efforts with the University of Costa Rica in i. Educational technology in Costa Rica	University of Costa Rica	Neville Clark Binns, Director of Physics Department, University of Costa Rica	--	--	--	Proposals for Funding have been prepared
ii. Aerial Photography interpretation	Government of Costa Rica	Government of Costa Rica	Govt. of Costa Rica	--	--	Proposals for funding have been issued
2. Follow up on study of natural resource potential of Limon Province, Costa Rica	Government of Costa Rica	Government of Costa Rica (Ministry of Presidency	Govt. of Costa Rica	--	--	Proposals for Funding have been issued
3. Pick-and-Shovel Road Project--PPSTDN to provide consultant on road selection criteria for rural roads in Colombia	Government of Colombia	USAID Colombia and William Gardner, Engineering (Transportation Division, AID)	USAID Colombia	--	2-4 wks.	Still being planned
4. Program to serve as advisor to Regional Council in policy and planning formulation and	Chief of Planning IFAM	Regional Development Council, Limon Province, Costa Rica	--	--	--	--

Description	Assisted by	Requested by	Funded by	Size of Effort Amt.	Man-Days	Results
conduct a training session for Costa Rica on regional planning						
5. Information to assist in the building up of a program of small industries	Department of Business Development, Papua, New Guinea	E. Hovey, Assistant Secretary for Technology and Small Industry	--	--	--	Information and references sent and contacts set up for future cooperation
NOT FULFILLED						
1. Consultant to participate in efforts of National Science Council to formulate national science policy	National Science Council	Henry Arnold, Director, TA/OST-AID	USAID Pakistan	--	3-4 wks.	Chairman of National Science Council (Pakistan) resigned, project suspended

Appendix E
PROGRAM PARTICIPANTS

A Program Participant is a person (faculty, staff or student) who is involved in PPSTDN related activities. The projects of these individuals are not necessarily all funded by the Program, but they do relate to science and technology policy issues and they are linked in with on-going PPSTDN efforts.

Executive Committee

Franklin A. Long, Chairman
Henry R. Luce Professor of Science and Technology in Society
Professor of Chemistry

Edmund T. Cranch
Director, PPSTDN
Dean, College of Engineering

Franklin J. Ahimaz
Assistant Director, PPSTDN
Assistant Dean, College of Engineering
Director, Division of Basic Studies, Engineering

David B. Lewis
Assistant Director, PPSTDN
Assistant Professor, Department of City & Regional Planning

Donald W. Barton
Director, New York State Agricultural Experiment Station at Geneva, New York
Associate Director for Research, College of Agriculture and Life Sciences

Tom E. Davis
Director, Latin American Studies Program
Professor, Department of Economics

Matthew Drosdoff
Director, Tropical Soils Project
Professor, Department of Agronomy

Milton J. Esman
Director, Center for International Studies
John S. Knight Professor of International Studies
Professor, Department of Government
Professor, Graduate School of Business & Public Administration

Gilbert Levine
Director, Water Resources and Marine Sciences
Professor, Department of Agricultural Engineering

Daniel P. Loucks
Chairman, Department of Environmental Engineering
Associate Professor, Department of Environmental Engineering

Kenneth L. Robinson
Professor, Department of Agricultural Economics

Floyd O. Slate
Professor, Department of Structural Engineering

William F. Whyte
Director, Program on Employee Participation in Ownership and Management
Professor, School of Industrial and Labor Relations

Research Associates

Loretta Good Fairchild
Research Associate, PPSTDN

Jerry L. Ingles
Research Associate, PPSTDN

Robert N. Seidel
Research Associate, PPSTDN

Benedict R. Stavis
Research Associate, PPSTDN

Other Faculty

Milton L. Barnett
Professor, Department of Rural Sociology

Lee Y. Chang
Assistant Professor, Department of Food Science

Jack Chen
Senior Research Associate, China-Japan Program/Peace Studies

Peter S. Chi
Assistant Professor, Department of Sociology
Program Associate, International Population Program

Peter M. Cohen
Associate Professor, Department of Architecture

Howard E. Conklin
Professor, Department of Agricultural Engineering

James W. Converse
Assistant Professor, Department of Rural Sociology

E. Walter Coward
Assistant Professor, Department of Rural Sociology

Gordon J. Cummings
Professor, Department of Rural Sociology

Eric J. Dluhosch
Assistant Professor, Department of Architecture

William W. Goldsmith
Associate Professor, Department of City & Regional Planning

MaryAnn Griffin
Assistant Professor, Department of Consumer Economics & Public Policy

Lynne H. Irwin
Assistant Professor, Department of Agricultural Engineering

Myunghwan Kim
Associate Professor, Department of Electrical Engineering

Milton Leitenberg
Research Associate, Peace Studies

Ta Liang
Professor, Department of Civil & Environmental Engineering

James A. Liggett
Professor, Department of Civil & Environmental Engineering

William L. Maxwell
Professor, Department of Operations Research

John W. Mellor
Professor, Department of Agricultural Economics

Henry M. Munger
Professor, Department of Plant Breeding/Vegetable Crops

Peter J. Murphy
Assistant Professor, Department of Civil & Environmental Engineering

Edwin B. Oyer
Director, International Agriculture Program
Professor, Department of Vegetable Crops

Vithala R. Rao
Associate Professor, Graduate School, Business & Public Administration

Henry W. Richardson
Assistant Dean, College of Art, Architecture, & Planning
Assistant Professor, Department of Architecture

Erik Thorbecke
Professor, Department of Economics

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Appendix F

PROGRAM SPONSORED RESEARCH PRIOR TO REPORTING PERIOD

(8/11/71 - 8/10/74)

1. "Energy Subsidy in Protein Production: Its Use as a Policy Planning Tool" by Malcom Slesser

2. "Organizations in Peru Relevant to Science-Technology Policies" by William F. Whyte

3. "Computer Application and Industrial Development" by Clifford Orloff

4. "Comparative Research on Science and Technology in the COMECOM, OECD, and Developing Countries" by Karel Stregl

5. "Science, Technology and Development in the Andean Nations" by Robert N. Seidel

6. "Technological and Economic Aspects of the Jamaican Alumina Industry - A Case Study with Inherent Policy Implications" by L. George Nelson

7. "An Industrial Policy for an Economically Integrated Caribbean Commonwealth" by Vincent Richards

8. "An Investigation into the Nature of Basic Housing Systems in Developing Countries Using the Case of Ghana" by Henry R. Richardson and Darrell F. Williams

9. "Evaluation of Family Planning Experimental Information and Education Programs at Maternidad Concepcion Palacios, Caracas Venezuela" assisted by Philip Paden

10. "ENCA (Encuesta Nacional de Consumo de Alimentos) Project in Peru" by William F. Whyte

11. "Evaluation of the Impact of Alternative Forms of Economic Development on the Nutritional Status of Low-Income Groups in Colombia, South America" by Joel Brainard

12. "Quo Vadis Cybernetic Civilization? National Policies for Science and Technology and Industrial Democracy: A Hypothetical Model for an Industrially Semi-Developed Country" by Karel Stregl

13. "Preliminary Study of the Water Resources of the Atlantic Coast, Costa Rica" by Jorge de la Guardia

14. "Social Injustic and Optimal Space-Time Development: Extensions and an Application to the Minimata Mercury Pollution Case" by Yoshifusa Katabatake

15. "Machine Recognition of Hangul: Systems Approach" by Myunghwan Kim

16. "Soybean-Based Protein Preparation for School Children in Korea" by Lee Y. Chang and Jong Rak Chung

17. "The Impact of Technology Policy on Regional Development: A Study of Agricultural Processing Industries in Colombia" by William W. Goldsmith

18. "The Urban Freight Transportation Planning Process: An Input-Output Approach to a Methodological Framework" by Kang-Won Lim

19. "A Comparison of Foreign and Domestic Firms in Monterrey, Mexico: Performance and Sources of Technology" by Loretta Fairchild