

CONGRESSIONAL PRESENTATION

I N S T I T U T E FOR T E C H N O L O G I C A L C O O P E R A T I O N



February 23, 1979

INSTITUTE FOR TECHNOLOGICAL COOPERATION

FY 1980

CONGRESSIONAL PRESENTATION

PREFACE

"For the rest of this century, the greatest potential for growth is in the developing world. To become more self-reliant, developing nations need to strengthen their technological capabilities. To assist them, I am proposing a new United States foundation for technological collaboration.

"Through private and public foundations and through our increasing participation in the United Nations conferences we can make technical and scientific cooperation a key element in our relationship."

Jimmy Carter
Address to the
Congress of Venezuela
March 29, 1978

"... the Congress declares that a principal objective of the foreign policy of the United States is the encouragement and sustained support of the people of developing countries in their efforts to acquire the knowledge and resources essential to development and to build the economic, political, and social institutions which will improve the quality of their lives."

Enacted by Congress as
Section 101, Chapter I of
Part I of the Foreign
Assistance Act of 1961,
as amended.
October 6, 1978

INSTITUTE FOR TECHNOLOGICAL COOPERATION
FY 80 CONGRESSIONAL PRESENTATION

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I. SUMMARY STATEMENT

SUMMARY STATEMENT

In March 1978, President Carter proposed a new institution for scientific and technological cooperation with developing countries. That initiative, the Institute For Technological Cooperation (IFTC), fills a need frequently expressed by developing country spokesmen and builds on the recognized strength of this country in science and technology. It will add an effective new means of responding to the changing circumstances of the Third World in support of our national policies.

The Institute has a dual purpose:

1. To strengthen capacities of developing countries seeking to apply science and technology to meet their needs.
2. To focus increased scientific and technological research attention on the search for better ways to meet basic human needs and approach global problems.

JUSTIFICATION

As part of the overall development assistance program, but separate in its structure and focus, IFTC strengthens the nation's ability to respond to several critical needs in line with U.S. policy.

- It mobilizes the scientific and technological talent of the U.S., both public and private, to address the critical problems of poverty and disease, and those of global concern, for example, natural resources and environmental planning. At present, only about 1% of the world's civilian R&D expenditures are devoted directly to the problems of the poorest half of the world's people.

- It increases the efficiency of assistance programs, bilateral and multilateral, by sustained, professional attention to gaps in our knowledge about small-farm food production, tropical disease control, and other problems inhibiting the effective use of aid. At present, the crops grown by the world's poorer farmers are the least known; vaccines effective in the temperate zone are failing in the tropical regions where the poor live, for reasons yet unknown.
- It aims at building the problem-solving capacity of the developing countries themselves, particularly the capacity to select and adapt technologies relevant to their needs. The use of inappropriate technologies has widened the gap between rich and poor and deprived the people of developing countries of productive employment opportunities.
- It provides a means for testing, adapting, and bringing to the stage of application technologies appropriate to the needs of the people in developing countries.
- It provides for a new relationship with advancing, "middle-tier" countries, not based on concessional aid but through a cost-shared partnership in which their skills and resources are joined with ours to solve problems of development. Mexico, Venezuela, and Colombia are examples of countries where such cooperation would be mutually beneficial.
- It provides a focal point in the U.S. Government for examining all R&D done in U.S. agencies of relevance to development and for linking such programs to international systems of information and communication so that this work has wider benefit.
- It provides a means of engaging the private sector more directly in meeting needs in developing countries.

RELATIONSHIP TO AID

IFTC will be supportive of and coordinated with AID through the International Development Cooperation Administration, and the use of joint working committees and field arrangements. IFTC is distinguished from AID in:

its primary focus on finding new and better ways to apply science and technology for development.

its promotion of technological cooperation on both development problems of the poor and global problems such as environment, energy, and natural resource development which affect the U.S. and developing countries.

STAFF AND STRUCTURE

The Institute will have a small, highly professional staff. Much of it will be on term appointments and borrowed from the private sector, other government agencies, universities, and research institutions. Experts from developing countries will be included in both the staff and the Advisory Council.

Rather than directly operate programs itself, IFTC will make grants or sign contracts with those institutions in developing countries, in the private sector, and the science community that can do the job. About 75% of its funds will be spent in the developing countries. It will act largely as a catalyst to bring together those interested and working on development problems so that efficiency is achieved.

FY 80 BUDGET

The FY 80 budget request is for \$25 million. Approximately 20% of this will be concentrated on problems of food; 25% on health, population, and nutrition; 25% on specific programs for technological capacity-building and cooperation including communications and information systems; 18% on problems of energy, environment, and natural resources; and 12% on non-agricultural employment. Careful program planning will be done throughout the first year as well as active starts made in projects where the preparations are already in place. Long-range research programs now financed by AID will also be transferred to IFTC.

II. FY 80 BUDGET SUMMARY

INSTITUTE FOR TECHNOLOGICAL COOPERATION

PLANNED PROGRAM BUDGET

FY 1980
(\$ Thousands)

1. Increasing Agricultural Productivity and Income	5,000
2. Improving Health Conditions in Developing Areas	3,000
3. Improving Population Programs	2,500
4. Nutritional Improvement	1,000
5. Strengthening Indigenous Science and Technology Capacity	2,000
6. Improved Processes of Technological Cooperation	3,000
7. Communications and Information Systems	2,000
8. Energy Planning and New Energy Supplies	2,000
9. Environmental Protection and Natural Resource Management	2,400
10. Non-Agricultural Employment	<u>2,100</u>
Total New Program Initiatives	25,000

These program allocations are based on five months of intensive planning by the IFTC Planning Office. They will continue to be refined as the planning year continues.

Of the \$25 million set aside for new initiatives, the Planning Office has calculated that approximately 27% will be used for continued intensive planning and analysis to develop effective strategies for the program areas. The balance will be used to support concrete program initiatives. (For example, in the health area, IFTC will move directly to support research on the prevention of tuberculosis.)

In addition to \$25 million for program initiatives, IFTC will assume responsibility for approximately \$66 million of AID activities that are consistent with and complement the program areas that IFTC has chosen for attention. A list of these projects is contained in the Special Concerns section of this document.

The operating costs of administering the IFTC program are not included in this presentation. For FY 1980, these funds will be provided by AID and other foreign assistance agencies on a basis to be determined by the IDCA Administrator in conjunction with OMB.

III. BACKGROUND DISCUSSION

BACKGROUND DISCUSSION

President Carter's determination to recommend a new approach to technological cooperation with developing countries, announced in Venezuela in March 1978, reflected studied conclusions that existing development efforts could be made more efficient and U.S. relations with developing countries could be better served by adding a deliberate, focused research and development program and a new pattern of scientific and technological cooperation.

The importance of science and technology, applied appropriately to meet needs in developing countries, is undeniable. The U.N. Conference on Science and Technology for Development scheduled for August 1979, and related international events offer ample confirmation of the world-wide increasing attention to the subject. The U.S. as a leader in many fields of science and technology has much to contribute and much to gain through an enhanced and well managed effort built upon our own national strengths and in response to widely perceived needs abroad. The U.S. position at the U.N. Conference is, thus, strengthened by setting forth a constructive, pragmatic program to put science and technology at the service of development, and particularly at the service of the problems experienced most by the majority of people in developing countries.

The need for a new program is borne out by the facts of research and development. Despite four decades of active international assistance programs, despite one of the most impressive periods in history of assistance from one part of the world to another, today less than 1% of the world's R&D expenditures are devoted directly to the problems that affect the one billion people of the world in deepest poverty.

We have thus not yet fully employed one of our greatest national strengths, our science and technology capabilities, in the attack on world-wide problems of poverty. Assistance programs, both bilateral and multilateral, and the internal development programs of the developing country governments themselves, are inhibited in their efforts because we do not yet have the technologies and the delivery systems that are effective under the conditions of the developing countries. This is the message of "appropriate technology", and of the larger reassessment made of the role of science and technology in development, that prompts the present proposal.

THE IMPORTANCE OF SCIENCE AND TECHNOLOGY TO DEVELOPMENT

Technology is the "science of application of knowledge to practical purposes". It is not just hardware. It is "know-how" - the means through which people can produce and accomplish things. It is one of the major elements which affect the course of development and which can be influenced through development assistance.

Science is "systematized knowledge" and, in its practical employment, "a method reconciling practical or utilitarian ends with scientific laws". The relation of science to technology is often an indirect and imperfect one. But one of the particular strengths of the United States is its having harnessed the advances in science to the needs of society. In the land grant colleges of the U.S., and in our corporations, science has been directed to and made part of the production of technology for society's use as perhaps nowhere else. Developing countries look to the U.S. for help in this matter, anxious to avoid the "free-floating" and esoteric existence that would otherwise occupy their small group of scientists. Here is a special strength of the U.S. that, outside of agriculture, has been little capitalized upon in our assistance efforts.

The U.S. role, however, has to be geared to building capacity in the developing countries. We have learned well that people in developing countries must themselves bear the greatest share of the responsibility and burden of generating increased productivity and distributing the benefits of growth on an equitable basis.

Assistance from the U.S. and others, however, can play an important - even critical - role in many situations. It can (1) provide physical capital, (2) influence developing country policies, (3) enhance the capability of socio-economic institutions and (4) increase the availability of knowledge and skills. All four of these factors can be important determinants of a country's progress toward satisfying the basic human needs of its people and sustaining self-reliant growth. Science and technology are important components of all four of these factors.

The choice among technologies is a particularly important influence on the character of development; and the availability of the knowledge and skills to make these choices is one of the crucial ingredients of a country's capacity. Countries which have reached the point of being able to make these choices prudently - which can and have selected agricultural technologies that emphasize the productivity of small farms, and industrial technologies which maximize the employment of available labor and save capital - are the countries that have advanced rapidly and with greater equity in the distribution of benefits. Unfortunately, only a few developing countries possess these skills. In African countries, for example, the number of technically trained persons is proportionally less than a third of even Asia or Latin America and one-eighth of the U.S. or Europe. Their ability to select and adapt technologies most appropriate to their needs is very limited.

DEVELOPMENT ASSISTANCE EXPERIENCE WITH TECHNOLOGY

In the last thirty years we have learned much about the role of technology in assistance programs. Several lessons from these years of experience are most pertinent:

1. Direct transfers of modern technology often have unintended adverse economic and social effects. The modification or adaptation of modern technology to meet the needs of people in different circumstances requires both technical and social/cultural knowledge.

We continue to encounter difficulties and disappointments in bringing technology to bear on development problems. It is now widely recognized, for example, that technologies well-suited to the needs of the industrialized countries may be quite unsuitable for direct transfer elsewhere. They may be wasteful of resources, utilizing scarce capital while ignoring abundant supplies of labor. They may produce goods far beyond the means of local people to afford. Their use may produce social distortions, environmental damage, and income disparities. The literature on appropriate technology provides many examples.

The appropriate technology concept, typically used with reference to capital goods, has biological analogs as well. Food grains, adapted through years of research to agro-climatic permutations of the temperate zone, yield less abundantly in the tropics. Only fairly recently has the research on wheat begun by the Rockefeller Foundation in Mexico, and on rice by the Rockefeller and Ford Foundations in the Philippines, impressively demonstrated the potential gains in yields available from adaptive research in tropical conditions.

2. Existing knowledge is inadequate to the resolution of many persistent problems of developing countries. The research and development, or knowledge-creation, capacity of the world is focused on the problems of developed countries. Only about 4% of this capacity now exists in developing countries and only a portion of this is effectively directed to the problems of the neediest groups.* Perhaps the greatest threat to the New Directions of the U.S. assistance program, the important and promising direction of assistance toward the problems of the poor themselves, is the gap in our knowledge of how to deal with these problems in their own environments.

For example, progress has been made in adapting wheat and rice to the conditions of the tropics - albeit with substantial inputs of fertilizer and pesticides. But increasing the staple crops of many of the poor - sorghum, millet, goat milk, cassava, tubers - on lands which lack irrigation facilities and whose inhabitants can ill afford commercial fertilizer, still eludes our grasp. We can help build extension services, and introduce the better varieties and practices we use in the U.S., but often we do not yet know enough of what to "extend" to such farmers that will work for them.

Similarly, modern medical and health systems which have effectively curtailed the historical scourges of Europe and the U.S. are often found to be inappropriate or inadequate to the needs of developing countries. Not only are Western methods too expensive to be widely available to people in other parts of the world, but many tropical maladies have not received the indispensable scientific scrutiny necessary for suitable treatments to be devised. Understandably, medical researchers in advanced countries are more intent on seeking the means of prevention and cure of heart disease and cancer than of schistosomiasis and river blindness. Even diseases common to the U.S. when experienced in the tropics are not responsive

* Mobilizing Technology for World Development: Report of the Jamaica Symposium, International Institute for Environment and Development, January 21, 1979.

to the same technologies; the world is becoming alarmed at the unexplained failure of polio, TB and other vaccines to work effectively in the developing countries. Other examples can be found in the field of contraceptive technology where discomfort, lack of medical services, and cultural factors have inhibited the use of methods practiced in the U.S. and Europe; and in energy where undue use of central grid systems may be placing untenable economic burdens upon the developing countries and sharpening the competition for conventional fuels.

It is evident that in agriculture and health and other important fields, the appropriate technology concept has validity but needs reinforcement. The knowledge bases on which suitable technologies must be built are simply inadequate. The genetic character and potential of tropical food staples, the parasitic source of childhood diarrhea and the interaction of malnutrition and biological resistance to disease, the potential of biomass and other renewable energy sources, are illustrative of areas needing more research and development attention.

3. The importance of building indigenous capacity. The technology transfer process, if it is really effective, should also encourage creation and useful adaptation of technologies indigenous to the developing countries, not supplant them. The process of technological change and adaptation is a never ending one because the circumstances of people change in the course of development. For these reasons, the creation of local capacity for innovation and problem-solving is an absolutely necessary element of development.

Indigenous capacity must include the delivery systems for extending technological information to the people. Such systems have to perform as an interface between the development and availability of technology from abroad and in laboratories and the needs and capacities of the people. More attention is needed to the skills and systems necessary for this role. Otherwise, we face a situation of numerous demonstration projects and experiments but very little spread effect.

THE ROLE OF RESEARCH AND DEVELOPMENT

The generation of new knowledge and its systematic application to practical tasks is commonly designated as R&D, an easy phrase which represents a very high order of scientific and technical skills, equipment, and funding. The fact that well over 90% of the world's R&D capacity is located in the industrialized countries is not particularly surprising, but it is symptomatic of the relative neglect of the problems of developing countries in the employment of scientific skills. The Jamaica symposium, cited earlier, estimated that less than 1% of R&D expenditure in health, agriculture, housing, and industrial technology is spent on the needs most relevant to the poorest half of the world population.

Much of the vital knowledge needed must be obtained in the developing countries themselves because of specific geographical characteristics or because of the importance of the social and cultural milieu in which research findings would be utilized. This is another reason why building up R&D capacity in the developing countries themselves is so important. Joint research by U.S. and local specialists in the developing countries helps build that capacity as much as formal training, and helps direct the local scientific community to work on these relevant issues. Local involvement will also increase the possibility that research results will be used.

Some of the new knowledge must also be sought in the laboratories and facilities of advanced countries like the U.S. The search could usefully be accelerated not only by increased funding for research focused on these problems, but also by screening domestically-oriented research for potential development applications. In many instances, a modest add-on can provide a development orientation to a major domestically oriented endeavor.

The overall need therefore is for an R&D effort which draws upon the relative strengths of the U.S., but which places constant and primary attention on building the relevant capacity in the developing countries. Because most of the answers must be formed in the developing countries as well, IFTC estimates that about 75% of its funds will and should be spent in the developing countries.

THE NEED FOR TECHNOLOGICAL COOPERATION

Changes have been occurring in the Third World which call for a new system of technological cooperation to manage the R&D needed. Such a system should be characterized by active participation among interested parties in defining and planning the research and development program and in carrying out its agreed upon components. Several of the basic changes which encourage shifts toward a more collaborative mode in our technological relations with developing countries can be described as follows:

1. There now are well trained scientists and good facilities in some countries abroad, especially but not only in the so-called middle-tier countries, which can contribute well to the problem-solving effort focused on needs of the poor. While participating, these researchers would be further strengthened themselves through experience in the broader effort. Furthermore, participation in this type of R&D activity will help to turn such new facilities and researchers away from projects which would benefit only the few.
2. In some countries whose progress makes them no longer eligible for U.S. concessionary assistance there are very large populations still highly disadvantaged which compare in number to those in poor countries. On some form of cost-shared basis, technological cooperation to alleviate their problems of hunger, disease and unemployment as part of a broader international approach would fit well within U.S. humanitarian goals and national policy goals.
3. Some of the problems which are emerging as of great consequence to the U.S. and other advanced countries in the decade ahead can only be approached successfully if close technological ties are established on a broadly international basis. In many cases, the developing countries hold the key to success in these areas. Examples include energy problems and natural resource management, environmental maintenance issues, and population growth and migration problems. Over recent years, the importance of such issues to our own society has become apparent. In our own interest, we must seek new types of cooperative efforts to deal with them.

4. Research programs in such fields as aquaculture, new commercial and food plants for the tropics and semi-arid lands, plant genetics, and animal diseases require ties with researchers in different climates, soils, and coastal conditions. Often these ties need to be with countries which do not qualify for concessionary aid because the opportunities for advances in knowledge on these problems is very great there. Cooperative activity is the appropriate alternative to concessionary aid. Varying patterns based on sharing of costs and benefits are possible.
5. There has been growing resentment in developing countries toward researchers from abroad, or outsiders working on developing country problems, who have not formed cooperative ties locally and who have not seen the needs and advantages of working closely with local, well-trained scientists. This resentment is more widely evidenced today than ever before, particularly as the developing countries' own capacities increase.

These changes in the situation abroad call for a new cooperative pattern and a new approach to sustaining developing country progress and U.S. interest in the Third World. The building of long-term institutional relations for mutual gain, networking of scientists and institutions in pursuit of common goals, exchanges based on a sense of learning as well as teaching are becoming increasingly important. Other advanced countries are already trying such new modes of cooperation with acknowledged success. Canada, Sweden, Germany, and the Netherlands have all instituted separate entities for this purpose as part of their overall assistance efforts. Preparations for the U.N. Conference on Science and Technology for Development have tended to sharpen the arguments favoring such a new approach to international cooperation in relevant fields of science.

The Institute For Technological Cooperation is proposed in this context. It will provide a means of testing and developing new cooperative arrangements and pursuing an operational style which will serve well the longer term interests of the U.S. in its relations with Third World countries.

IV. DESCRIPTION OF IFTC

A. PURPOSE AND FUNCTIONS OF IFTC

In recognition of the experience described in the previous section, there is need for a new organization closely related to the Agency for International Development, and coordinated as part of our overall development assistance effort. The President has decided to propose a reorganization of the international development assistance program and both the A.I.D. and the Institute for Technological Cooperation will be administered within the new structure.

PRINCIPAL FUNCTIONS

The mission of the IFTC will be carried out through the following functions:

1. Capacity-Building. Work with developing countries to build up their research and development capacities. This will take different forms from one country to another, but the focus will be on strengthening real and practical problem-solving capacity.
2. Research and Development. Plan and support intermediate and long term research on critical development problems. The Institute will also be engaged in seeking and testing practical, workable new approaches to problems that particularly affect the lives of the majority of people in developing countries.
3. Building Cooperative Linkages. Foster linkages between scientific and technological communities of the Third World and those of the U.S. It will do this through exchange and support for joint research and problem-solving activity.

4. Marshalling U.S. Agency Efforts. Bring more harmonious planning and improved coordination among various U.S. public and private agencies whose research and development activities bear on development problems.
5. Facilitating U.S. Scientific and Technological Contribution. Assist U.S. scientific and technical institutions to direct more attention and be engaged more productively with developing countries in joint research, training, and other cooperative and mutually useful activities. Grants for joint research programs overseas, improved training of developing country students, and similar methods will be used.
6. Involving the Private Sector. Work with the private sector - business, labor, private organizations and groups - in order to improve the environment and process of technology transfer. Fruitful areas of such cooperation have been identified in the planning process and will begin in FY 80.

The IFTC mission, focused on science and technology, development of new knowledge and methods, and long-term programs aimed at problem-solving, can be carried out advantageously in an agency apart from the regular, country-focused bilateral aid program. The product of the IFTC will serve AID, but it will also contribute to the work of multilateral agencies and directly to developing countries.

SPECIAL CHARACTERISTICS

A number of characteristics illustrate the Institute's approach as planned and distinguish it from other elements of the U.S. development cooperation program.

- A focus on the R&D function. The IFTC will be the principal central research and new technology development agency within the development assistance community.

It will develop productive relations with R&D centers in various fields in the U.S. and abroad, both public and private.

- Direct involvement of experts from the developing countries. The IFTC plans to use specialists and experts from both the U.S. and developing countries at various levels of the Institute in Washington and abroad in planning, programming, and evaluation activities. Similar to that of the International Development Research Center in Canada, this practice opens up a new level of collaboration on a professional basis.
- Sustained attention to development problems by science and technology community. IFTC will bring a long-range perspective to the development process and to specific research and to creative application and delivery of science and technology information. Only in this way can some of the most difficult problems be addressed.
- Problem, not country, focus. The IFTC will focus on problem areas, not on country programs as such. Through systematic, sustained attention to important development problems that affect many regions, it will add strength to individual country's development programs, and to the work of AID, multilateral agencies, and financial institutions.
- Relationships with important "middle-tier" countries. IFTC's program will involve cooperative work on a cost-shared basis with middle-tier developing countries. In this respect it will attempt to build on the long-term investments of the U.S. aid program in such countries and to encourage their work on problems of importance in their own and in poorer countries. Many of these are countries where AID Missions have been terminated and where concessional aid arrangements are inappropriate. Many of these countries, like Mexico and Venezuela, are also ones with important natural resources and significant impact on the world's global economy, yet they are also still struggling with basic poverty issues.

- U.S. interests. The Institute program will concentrate on important current areas of U.S. assistance programs addressed to the worst aspects of poverty overseas, but will also include some attention to newer elements such as natural resource development and environmental planning, non-agricultural employment, urban problems, energy research, and related activities, which directly impinge upon U.S. economic and social interests. Some of these will be approached with countries abroad within a framework of cooperation for mutual benefit.
- Operating style. As a relatively small R&D agency, working closely with the private sector, the IFTC plans an operating style which will be supportive of direct institution-to-institution contacts and cooperation, collaborative and relatively uncomplicated. The style will reflect the need to relate closely to the various science and technology communities here and abroad whose participation will be vital to the success of the IFTC mission.

B. ORGANIZATION AND PROGRAMMING

The Institute will be organized for efficiency and prudent use of resources, and its structure and processes will also reflect a number of goals:

1. To maintain a distinctive program and method of operations essential to its basic purpose.
2. To involve developing country views and talents directly in the quest for solutions and alternative methods with which to address development bottlenecks.
3. To create a working environment which will attract, stimulate and hold the necessary scientific and technological talent of critical importance to the IFTC program.
4. To focus the attention of the staff directly on problems, thereby reinforcing the orientation toward the mission and set of tasks on the agenda of the IFTC.
5. To bring multi-disciplinary attention to complex development problems and to avoid viewing the development task too narrowly.

GENERAL DESCRIPTION

The Institute will operate as one of the semi-autonomous, parallel agencies which will be allied under the development assistance structure. The IFTC will be headed by a Director, appointed by the President. The basic operating unit will be the Problem Area Office. Each will be led by a Coordinator, a person of senior professional standing who will hold general responsibility for task accomplishment. He/she will be supported by a small staff and a variable number of scientific and technical specialists appropriate to the nature and size of the specific cluster of problems to be addressed.

Each Problem Area Office will plan and manage the Institute's approach to the specific, priority components of the problem. The Coordinator of each Office will be responsible for initiating and sustaining the programming process through which the IFTC will accomplish its goals. The process will involve widespread consultation, joint planning and coordinated action with expert communities in the U.S. and abroad. The Problem Area Office will administer grants and contracts in support of its share of IFTC programs.

FIELD OFFICES

The Institute will maintain offices overseas, usually on a regional basis. Within individual countries there will be IFTC supported activities under way in accordance with the planned approach to specific problem areas. IFTC supported consulting groups or experts will be present in some countries, but there will generally not be country-based "representational" offices.

The Field Offices will vary in size and composition from one region to another and over time, but at a minimum each will include an IFTC representative, a deputy, and support personnel who will usually be hired locally. Specialists may be assigned to Field Offices to assist with regional and specific project activities on a long or short term basis. During the first year, IFTC will establish five to seven regional offices. The organization, role and number of Field Offices should evolve as the Institute program becomes operative.

PERSONNEL

The personnel system of the Institute will essentially be managed internally. The career service will be patterned after that of the bilateral aid program, currently under study at the request of Congress.

However, IFTC will make maximum use of authorities such as the Intergovernmental Personnel Act and similiar arrangements to provide mobility and highly specialized talent.

The scientific and technical personnel in IFTC will be made up in large part of non-career specialists, in residence within the Institute for varying time periods and designated as Institute Fellows. IFTC will draw on specialists prepared to devote several years to the problems of development. They would include persons on temporary assignment from other agencies, on intergovernmental personnel agreements, on special contracts, from universities, private industry and from developing countries. From one-fourth to one-third would be from developing countries.

Each specialist would have a dual function. Each would be assigned to one or more Problem Area Offices to which he would devote the bulk of his time. In this capacity the Fellows would make a professional contribution to evolving strategy, to review and selection of specific programs designed to address a particular problem, and to meet advisory and consultative needs of the program, domestically or abroad.

The Fellows would also function together periodically as a multi-disciplinary body of experts, through which they would review and analyse a wide variety of programs and problems related to the purposes of the Institute and to the interrelationship of various IFTC activities.

COUNCIL AND EXTERNAL REVIEW

Institute Director and senior staff shall receive advice from a Council of up to 25 persons appointed by the President to include leaders in science and technology and in development programs drawn from U.S. universities, industry and other private sector organizations, and about one-third from developing countries. Up to five members of the Council may be officials of the United States Government, one of whom shall be the Secretary of State or his designee.

The Council should meet four times a year or more frequently as needed and as requested by the Director. Members will serve four year terms with the possibility of no more than two consecutive terms. A small secretariat in the office of the Director will provide staff support for the work of the Council.

The Institute Director would receive advice from the Council prior to decisions on matters involving broad policy or program change.

The IFTC will follow a system of external review within specific problem areas. The Program Coordinators in each problem area will compile and draw personnel from a list of qualified scientific and technological specialists who are knowledgeable about the problem area and/or developing country needs. The list should include a good percentage of developing country personnel. Review panels will be drawn from these lists and will be used to examine and advise on technical aspects of all new program and research proposals, and proposed renewals, which will be developed as part of the approach to the given problem areas.

AGENCY RELATIONSHIPS

Since the IFTC will be responsible for the central research activity for the development aid program, the Joint Research Committee, which operates under the Board for International Food and Agricultural Development (Title XII) within the AID structure, should become a part of the advisory structure for agricultural, food and nutrition programs of the new Institute. This realignment would be planned and put in effect as the overall development aid reorganization takes effect.

From the outset, the IFTC will maintain close ties with research developments in the U.S. which may have relevance to developing country needs.

It will work with other agencies - such as NSF, DOE, Agriculture, and HEW - to expand joint planning for their scientific and technological cooperation with developing countries. This will be done through a structured sub-committee process. The IFTC will exercise authority, as does AID, to finance inter-agency agreements with another department or a U.S. agency to carry out activities with developing countries.

PROGRAMMING PROCESS

The Institute program will consist of a variety of contractual and grant support arrangements focused sharply within broad problem areas. The problem areas will be approached in accordance with plans and strategies evolved in close consultation with developing countries.

At least 80 percent of the program funds available to the IFTC should be devoted to support of research and capacity-building related to important problem areas and be managed through the Problem Area Offices. The remaining 20 percent would be used to support policy studies, to encourage the process of technological cooperation which may transcend the specific problem focus of the Foundation, and to provide immediate support for new and creative unprogrammed opportunities.

The Field Offices would have the major responsibility for allocation of resources for general technological cooperation, essentially not within priority IFTC problem areas, and for supporting new potentially innovative opportunities in science and technology within developing countries. Although Field Offices will have an important role in programming processes related to the problem focus of IFTC, the main responsibility will rest within the Problem Area Offices, specifically created to plan and manage the Institute's approach to these major problem areas.

In its programming cycle, the Institute will take fully into account on-going activities of bilateral and multilateral development agency programs, work proceeding within specific developing countries either supported or unsupported by outside agencies, and the reports and documents which may relate to a given problem area. IFTC will draw on the Council as appropriate, the specialist group within the Institute, and the panel of reviewers and outside experts designated within a given problem area. Since developing country specialists will serve within IFTC, the views of developing country specialists and spokesmen will be heard internally and will be elicited externally through special meetings and workshops. Furthermore, various U.S. Government agencies, private sector expert groups and university and research institutions will play a role in various phases of IFTC programming.

Throughout the entire process one would expect attention to problem-solving, to new ways of meeting the problem, not just the development of research strategies. Thus, IFTC would be concerned with a range of activities pointing toward capacity-building, dissemination of new information and effective application of new methods. IFTC working closely with developing countries and aid personnel would bring new technology to the point of widespread applicability at which point it would move into regular aid channels or development programs.

V. PROGRAM DESCRIPTION

PROGRAM DESCRIPTION

A. SUMMARY

The Institute will concentrate its efforts on:

1. problems which directly affect the poor;
2. problems of shared interest between the United States and developing countries regarding better use of the world's resources.

The problem areas can usefully be divided along these lines, as a means of indicating the major concerns of IFTC. But the division is an imperfect one. Increasing agricultural productivity is of major importance for the rural poor; it is also intimately tied to practices that will help preserve the world supply of timber, and help protect other natural resources. Finding better technologies for use of renewable energy supplies helps alleviate international competition for conventional fuels; it also provides low-cost energy systems for the rural and urban poor. These interrelationships need to be kept in focus as the work is planned and implemented.

U.S. interests are also served in addressing both sets of problems. Efforts to develop less energy-intensive agricultural technologies for the poorer regions of the world have implications for U.S. agriculture. Research on the special disease problems of the tropics will provide insights in immunology and vaccine effectiveness that could be of value to our own health.

The Institute is specifically structured, with its multidisciplinary body of experts and cross-problem involvement of those experts, to highlight these interrelationships and encourage reinforcing work from one problem area to another.

In addition to the problem focus, IFTC will work to improve the process and mechanisms for technological collaboration between organizations and experts in

developed and developing countries with the aim of greater knowledge exchange, better problem analysis, and enlarging capacity for research in the developing countries. In summary, the Institute is based on the recognition of the shared interest of the U.S. and the Third World in the problems of development and the close relationships among these several problems which call for a new approach in addressing them.

PROBLEMS DIRECTLY AFFECTING THE POOR

Since 1973, the U.S. bilateral assistance program has been focused more directly on the problems of the poor, emphasizing food and nutrition, health and population, and education. The experience of these five years has revealed the limitation of technologies practiced in the advanced countries to accomplish this task. For example most of the rural poor live on marginally productive land, ill-suited for irrigation. Purchased inputs of fertilizer and pesticides which are an essential part of current advanced agricultural technologies are also beyond the means of many of the poorest farmers. Alternate technologies, however, have been little studied.

In health, a similar knowledge block exists. Parasite diseases, arising from unclean water and exposure to disease-bearing insects and snails, are an overwhelming drain on energy, life span, and productivity. No economic technologies presently exist for attacking these health problems in the conditions of the rural areas where the poor live. The extension of rural health services, without such better knowledge, will not solve the problems and may aggravate a sense of frustration.

Furthermore, the experience of developing countries, even those which have made significant progress in agricultural as well as overall growth, points up the pressing need for acceleration of non-agricultural employment if the poor are to have real opportunities for advancement. Growing unemployment is one of the most serious problems in the developing world, and one of the most politically explosive.

Middle-tier developing countries are facing especially critical problems in this regard, and many now have more than 50 percent of their population in the urban areas. The countries which have avoided this problem have done so through a combination of equitable agricultural growth and rapid increases in non-agricultural employment. Most developing countries, however, have had difficulty in finding the key to this combination, either because of poor policies, inappropriate technologies, or lack of industrial knowledge.

If the New Directions of U.S. assistance, emphasizing the needs of the poor, are going to succeed, an intensive effort must be made to develop the needed knowledge to address these problems. IFTC has selected the following program areas for this purpose:

- Increasing agricultural productivity and rural income, with special new emphasis on biological nitrogen fixation, greater photosynthetic efficiency, traditional food crops and farming systems for marginal lands, and other activities aimed at agricultural technologies of lower cost and greater usefulness to the poor.
- Controlling the most damaging infectious diseases, with special attention to the problems of water-borne and insect-borne diseases, e.g., to diarrhea which is the major cause of child mortality; to the development of lower cost treatments and more effective health services delivery; and to the potential in traditional medicines for more effective pharmaceuticals.
- Improving population programs, with expanded efforts to develop better contraceptive technology and new initiatives to understand the motivational factors affecting family size and their relationship to other factors.
- Improvement in developing countries' technological skills, with expanded collaboration in the development of science and technology policy, and new initiatives to improve the relevance of technical education received

in the U.S. by students from developing countries; to improve the teaching of science and math in formal and non-formal education systems in developing countries; and to understand more of learning problems which inhibit widespread technological innovation in both rural and urban areas.

- Productive growth of non-agricultural employment, with new initiatives to improve entrepreneurial management, industrial standards and research, and the capacity to develop and utilize suitable technologies in the developing countries.

A MORE EFFICIENT USE OF WORLD RESOURCES

One of the major changes of the last decade, which IFTC seeks to recognize in its choice of problems and style of operations, is the growth of interdependence of developed and developing countries in meeting several major challenges. The range and importance of such problems are growing: depletion of natural resources, environmental degradation, the decline in aquatic food supply, competition for conventional energy supplies, and the need for alternative energy sources.

IFTC has selected the following problem areas as directly relevant to these global concerns:

- Environmental Planning and Natural Resource Management, with expanded efforts to combat desertification; and with new initiatives in forestry, coastal zone management, pollution control and the improvement of skills for development of minerals and other non-renewable resources.
- Energy policy and alternative sources of supply, with new or expanded efforts to augment the efficiency of traditional energy supplies and ascertain the technical, social, and economic feasibility for solar, wind, water, bio-mass and other energy sources which will meet the demands of the rural and urban populations.

THE FY 80 PROGRAM

The first year of IFTC operations will involve a combination of new initiatives related to these problems and processes and absorption and redirection as appropriate of some ongoing projects from the Agency for International Development.

Only those AID projects which fit directly into IFTC's primary purpose, and which are consonant with the problem area approach, have been identified for transfer to IFTC. These were in large part the centrally-funded research projects which were directed primarily to the search for new knowledge or testing of technologies rather than the direct support of AID field missions in their ongoing programs. Also so identified were projects in fields of secondary emphasis and limited scope in AID, but which will be of major importance for IFTC because of IFTC's particular problem focus. Such projects are environmental planning, geological training, science policy programs, etc. A tentative list of such projects, as identified in the planning to date, is provided in Section VI.

The pace of transfer of these activities, and for other projects identified in future discussions between AID and IFTC, will be related to the pace of organization and staffing of IFTC. Project management will be transferred in an orderly fashion when IFTC staff are in place to assume the responsibilities.

The following sections describe in more detail the problem areas in which IFTC will concentrate, with special emphasis on the type of new initiatives IFTC will undertake. Illustrative projects are described within each problem area, indicating the opportunities for action in FY 80. Once IFTC management has been selected and is in place, the necessary arrangements can be made with developing countries and with appropriate institutions to allow final budgetary allocations among the problem areas and project arrangements.

V. PROGRAM DESCRIPTION

B. PROBLEM AREA DISCUSSION AND
ILLUSTRATIVE PROJECTS

1. INCREASING AGRICULTURAL PRODUCTIVITY AND RURAL INCOME

INTRODUCTION

Despite enormous international efforts over the past three decades, and significant progress in agriculture, food and rural development, major serious gaps--which can be dealt with in large part by cooperative research and development and R & D capacity building--exist between conditions today and the achievement of potential productivity among people in developing countries:

- * The availability of adequate food supplies for all people will be a continuing critical concern. In 1977, at the time of the publication of the National Academy of Sciences-National Research Council's World Food and Nutrition Study, it was estimated that between 450 million and 1 billion persons do not receive enough food. Agricultural scientists and extension personnel face the difficult task of increasing agricultural yields an average of 2.5 percent per year over the next 25 years if there is to be any appreciable improvement in average individual consumption.
- * Opportunities for rewarding and otherwise fulfilling employment will be short, especially for the unskilled and those living in poor areas. The International Labor Office in its 1976 report on Employment, Growth, and Basic Needs, estimates that in the mid-1970s there were nearly 300 million people unemployed and underemployed in the Third World.
- * Poverty, seen in inequalities in real income, will continue to be strongly associated with inequalities in the access to, and control of, economically productive tangible and intangible assets.
- * Depletion and degradation of natural resources is a growing threat if the capital and energy intensive technological strategies of the present continue over the long term.

BACKGROUND

The achievement of the intensive seed-fertilizer-water breakthroughs that produced the "Green Revolution" of the late 1960s, has been followed by less dramatic, but analogous, requirements for working out farming systems with other crops and poorer quality resources. The productive strength of the rural poor is conditioned by the availability of farm and non-farm technologies suited to their geographical, economic, and social circumstances. World-wide inflation, and especially the disproportionately rapid inflation in oil prices, has made petroleum based fertilizers and fuels and other purchased production inputs increasingly difficult to justify in economic terms. Environmental considerations have also raised concerns over increased reliance on agricultural chemicals.

The requisites for increasing available food supplies include improved farming systems, instruction for farmers in management, supplies of production inputs, and the availability of product markets. In addition, however, a transition must be fostered over the longer term, from an agricultural production strategy based on non-renewable resources to one based on renewable resources, largely by improving the understanding of certain biological processes and reducing the limitations which they place on crop and livestock productivity. Long term research and capacity building strategies are needed, some of whose effects must begin to be felt in the very near future.

The first recommendation of the NAS-NCR World Food and Nutrition Study, referred to previously, was for "expanded research efforts to improve food and nutrition policies, increase food availability, reduce poverty, and stabilize food supplies."

CURRENT EFFORTS

Agriculture, food and rural development constitute the primary areas of resource commitment (finances and professional expertise) in international economic development assistance. The World Bank has taken a leading role in identifying unmet basic human needs and in directing resources toward these and toward the provision of basic infrastructure. The Consultative Group on International Agricultural Research (CGIAR), in addition to the pioneering work in food grain production through the network of international centers, has given increasing attention to farming systems research, and a greater diversity of crop and livestock varieties. The Agency for International Development (A.I.D.), under its mandated focus on the needs of the poor majority in the rural areas of developing countries, devotes its principal resources to food and nutrition. The U.S. Department of Agriculture and other units of the Executive Branch have made their professional expertise available to A.I.D.

THE INSTITUTE'S PROGRAM

The Institute will concentrate on:

1. Increasing Rural Productivity to make available sufficient food to meet growth in population and purchasing power, by support of R&D and capacity building focused on:
 - a. Food production technology which can be adapted and introduced into developing countries by other organizations. IFTC will take over, as appropriate, management of the current A.I.D. research programs which support the International Agricultural Research Centers, work on major cereals, crop protection, fertilizer usage, post-harvest losses, and other aspects of technology which are important for increasing overall food availability.

- b. Multiple Cropping Farming Systems for areas not specifically suited to continuous cropping of food grains. During the initial year, the Institute will launch a program for the evaluation and promotion of underutilized plants as crops, beginning with the jojoba bean; and conduct intensive planning for similar activities involving guayule, winged bean and leucaena. Also, during the initial year, intensive planning will be conducted on 1) the institutional, social and economic aspects of current farming systems research at the international agricultural centers which have so far emphasized crop ecology; and 2) the building of national agricultural research systems, with particular emphasis on the communication and utilization of research results.
 - c. Biological Adjustments to Environmental Stress so as to help overcome production constraints due to extremes of temperature, moisture, pH, nutrient supply, insolation and the like. During the initial year, the Institute will conduct intensive planning on biological nitrogen fixation and photosynthetic and physiological efficiency.
2. Expanding Employment and Income Opportunities for the Rural Poor who have traditionally had little leverage in commanding the allocation of resources toward meeting their needs, such as for:

- a. Farming Systems on Marginal Lands which are adapted to food crops such as starchy roots and tubers and sago palm, whose consumption now connotes low social status. During the initial year, the Institute will launch a program for the analysis, design and adaptation of low cash input farming systems for "poor man's crops" which hold considerable potential for the relatively worse off poor in developing countries to provide increased food supplies for themselves despite difficult land conditions.
- b. More Equitable Asset Distribution which puts productive resources, especially land, more under the control of users. During the initial year, the Institute will undertake an intensive planning effort, based on the preparations for, and the outcome of, the July 1979 FAO World Conference on Agrarian Reform and Rural Development. This effort will focus on reallocations of the ability to exercise power in rural areas that might follow from the impact of public policies having to do with land use planning, rural zoning, taxation, and resource conservation; or more basic policies for health and education, and access to mass media.

PLANNED FY 1980 BUDGET

<u>Project Initiatives</u>	\$ 4.0 million
Evaluation and Promotion of Underutilized Plants (Project Initiative Phase) Farming Systems on Marginal Lands	
<u>Intensive Planning and Additional Projects</u>	1.0 million
Indirect Measures for Agrarian Reform Institutional Aspects of Farming Systems National Agricultural Research Information Use Systems Evaluation of Underutilized Plants (Supple- mental Projects Planning Phase) Biological Adjustments to Environmental Stress	
Total	\$ 5.0 million

INCREASING AGRICULTURAL PRODUCTIVITY AND RURAL INCOME
ILLUSTRATIVE PROJECT

Title: Evaluation and Promotion of Underutilized Plants

Purpose: To identify and evaluate the potential of selected known, but underutilized plants as crops which could meet important development objectives pertaining to human and other resource utilization and conservation, improved nutrition, employment and income generation, equitable distribution of developmental benefits, foreign exchange earning or saving.

Background: Largely through initiatives in the National Academy of Sciences (NAS), currently underutilized plants such as jojoba, guayule, winged bean and leucaena have been identified as among those having potential for development as crops economically cultivated by significant numbers of people, to meet demands in markets for food, and industrial products.

I. FY 1980 Project Initiative: Jojoba

Jojoba (Simmondsia chinensis) is a low-standing shrub that grows wild on the North American continent in the arid areas of northwestern Mexico, and southern Arizona and California. Its nuts are harvested by hand from the wild by poor desert Indians in Mexico and the U.S. Its principal product is an oil, nearly identical with sperm oil, that is used as a specialized lubricant in machinery operating at high temperatures and pressures, as a component of cosmetics such as shampoos and skin lotions, and in a number of other significant potential uses in the pharmaceutical and other industries. The oil may also be used in the form of a wax with outstanding hardness properties. Upon processing, the jojoba nuts yield about half their weight in oil and about half as a meal with attractive nutrient content.

Hand picking rates are high, resulting in a cost of the oil estimated at about \$11 per kilogram. It has been estimated that if as many as 100,000 hectares of commercial, machine pickable, plantations of jojoba could be established in various parts of the world's arid areas, the price of the oil might drop to \$2 per kilogram and support a \$250 million industry, meeting a world demand estimated at 127,000 metric tons of jojoba oil. Success could reduce the hunting pressure on whales.

A principal obstacle in jojoba development is the 5 to 10 years it takes to bring a productive stand of jojoba to profitable status. Plantations have been established in Israel, and test plantings have been undertaken in the U.S. The U.S. Departments of Interior, Agriculture and Commerce are modestly active in jojoba research and development. A number of other countries have also taken a research interest in the crop or in its products.

The FY 1980 Program: The IFTC will pick up on momentum already achieved in jojoba research and development. The crop ecology and economics of test plantations in the U.S. and Mexico will be studied, along with the institutional and agribusiness requirements of plantation management by poor desert Indian groups on their own behalf. In order to deal with the problems of propagation and genetic selection for such a slow-growing crop, 1) a seed bank will be developed for seeds collected from stands throughout the world; and 2) greenhouse trials will be expanded for vegetative propagation of jojoba from cuttings from mature plants (in the wild or on plantations) that show desirable characteristics. Researcher exchanges will be supported for LDC scientists to participate in U.S. greenhouse propagation technology, with a view to establishing similar vegetative propagation undertakings in selected developing countries in subsequent years.

Studies of the agro-geography of jojoba will be undertaken on a global scale to 1) analyze the ecological niches in which jojoba exists in the wild; 2) estimate the potential expansion into similar ecological zones where jojoba does not currently exist; and 3) give particular attention to the institutional and economic factors that may determine whether or not poor people living in arid zones will be able to benefit significantly from the introduction of jojoba. Research workshops will be held to follow up on international conferences held in 1972 and 1976 (as well as other technical and scientific exchanges), and to expand consideration from biochemical and industrial research and development to include field agronomy and plantation management, and marketing. Economic studies will be undertaken of the economics of the oil in industrial and cosmetic uses. Research and development studies will be undertaken of the economics and technology of changes in oil extraction processes, and the utilization of by-products (with improved detoxification).

II. FY 1980 Intensive Planning Activities: Guayule, Winged Bean, Leucaena

- A. Guayule: (Parthenium argentatum) grows in environments similar to those for jojoba. Upon extractive processing of the entire shrub, it yields a latex similar to that obtained from the rubber tree (Hevea brasiliensis) and the final product is also similar to rubber obtained by synthetic processes. Despite general unfamiliarity with guayule, it has been a minor but significant source of commercial natural rubber for 40 years. Growing world demand for rubber from all sources suggests that guayule may have good long term market prospects in view of 1) the rapid inflation in petroleum prices, affecting the cost of synthetic rubber feedstock; 2) the ability of guayule to be grown on lands unsuited to most other crops.

Significant benefits to poor people, living in arid areas adapted to guayule production, could be realized, especially if they could take an active part in the management and operation not only of the guayule plantings but also in the initial processing and marketing of the latex. Based on the report on guayule prepared by the NAS in 1977, planning during 1980 will give particular attention to genetics, physiology, plantation management (including general agronomy, dry-land farming, and harvesting), processing, product development, and by-product utilization in the U.S., Mexico, and other countries adapted ecologically, economically and institutionally to guayule rubber production.

- B. Winged Bean: Despite its role as a minor backyard crop in mainland and insular Southeast Asia, South India, Sri Lanka, and Papua New Guinea, little research has been done on the winged bean (Psophocarpus tetragonolobus). This is largely due to the priority emphasis given to food grains in international research, and to the importance of the soybean among leguminous crops being adapted to the tropics. The winged bean has the advantage of almost total edibility (the green pods, mature dried beans, leaves, flowers, shoots, and the relatively well developed tubers). It has the disadvantage that the known varieties require staking for cultivation, and the pods mature at different times and must be hand picked at intervals. The winged bean is also an "unknown", whose positive characteristics are not familiar in international agricultural scientific circles. According to a report on the winged bean, completed by the NAS in 1975, a coordinated effort to collect winged bean seed types from its present range, and to have these varieties tested comparatively throughout the humid tropics, would begin to build up a body of knowledge about its adaptability and range of characteristics. Higher yields, self-supporting plants are among valuable traits to be sought.

Its role in farming systems as a commercial crop for local markets, and as a soil restorative also deserves study. Another line of inquiry would be to evaluate which aspects of soybean technology (genetic improvement product development) have parallels for winged bean. Finally, a special effort to communicate existing knowledge about winged bean by diverse forms of publication and demonstration testing may stimulate valuable interest in research participation by scientists from developing countries where the winged bean is poorly understood.

- C. Leucaena (Leucaena Leucocephala) is a rapidly growing tropical legume which has a number of varieties that have underutilized potential as a nutritious livestock forage, soil stabilizer on slopes, source of lumber and firewood, means of rapid reforestation, and a green manure. Since it is a legume, it also has the property of enhancing the available nitrogen in soils by fixing atmospheric nitrogen in root nodules in forms that can be used by plants. Because the plant is not yet widely understood, research could productively be performed through international cooperation, on all its principal uses so as to enhance its productivity and help systematize the management of the different strains. In addition, the limitation of the leucaena varieties to the lowlands of the humid tropics restricts its range. There are also problems of potential toxicity if leucaena makes up too great an amount of animal diets. Planning will concentrate on setting priorities in leucaena research and evaluating the specific interests of scientists in different countries where leucaena production holds promise.

INCREASING AGRICULTURAL PRODUCTIVITY AND RURAL INCOME
ILLUSTRATIVE PROJECT

Title: Farming Systems on Marginal Lands

Purpose: To develop a methodology for systems of farming research on marginal lands where relatively poorer farmers live and to develop a network of relevant research undertakings.

Background: There has been a tendency in international agricultural research selectively to emphasize major food crops such as wheat, maize, and rice, which are grown on the relatively more productive agricultural land resources. These crops are among those which hold greatest promise of generating the growing increases in food supplies needed to keep up with changes in demand for food due to population growth, changes in consumer incomes, and related factors. The better land resources tend to be in the hands of relatively better off farmers (who are nonetheless "poor" by objective analytical standards used in international agricultural development programs). One outcome of this general situation is that the crops grown by the relatively poorer farmers who, by-and-large, work with marginal and sub-marginal land resources (such as starchy root crops, sago palm, sheep and goats) have received less research attention than the more prestigious food grains. However, in recent years, increasing attention has been given to white potatoes, sweet potatoes, and cassava. But yams, taro and its relatives; and sago palms have received little attention. The tropical adaptation of sweet potato and white potato have received only slightly more attention. The improvement of sheep and goats for pastoral people in arid and semi-arid areas has also been neglected until recently.

In recognition of the increasing pressure on the ability to produce food, the American Society of Agronomy, the Crop Science Society of America, and the Soil Science Society of America jointly published, in 1978, a compendium on Crop Tolerance to Suboptimal Land Conditions. The contributors to this publication recognize that it will be increasingly important to use marginal lands more effectively, even if the output from these resources may be consumed almost entirely within the localities where they are produced. Recent work supported by the Rodale Press in Emmaus, Pennsylvania has built on work in farming systems analysis conducted by the international agricultural research centers under the CGIAR to point out that truly subsistence farmers have been largely by-passed by the work of these centers; and that such very small farmers make up a significantly large proportion of the world's rural population in developing areas. The studies sponsored by the Rodale Press ask whether or not it will be possible to work out "low cash flow technologies" for poorer farmers who are not in a position to accept the high cash flows of present farming systems research, and food grains research, aimed at generating marketable surpluses on a commercial basis.

The FY 1980 Program

Following the leads in the two lines of study cited above, IFTC will launch farming systems methodology studies across a broad front of situations facing cultivators on marginal lands (which may be marginal for a variety of reasons such as poor physical resources, uneconomical size of holding, remote location, etc.) who are, for all intents and purposes subsisting on their output and without a marketable surplus.

- A. Technologies for infertile tropical wetlands: starchy roots and tubers have been grown for generations on lands which more productive and desired crops cannot tolerate. IFTC will conduct agro-geographical studies of the extent of starchy root and tuber cultivation in tropical wetlands, the management technologies used, the number and economic status of the populations involved, and the present and potential capacity of scientific institutions in developing countries, the U.S., and in the international agricultural research system to participate in farming systems research for subsistence farmers on infertile tropical wetlands. Design work will begin, in cooperation with a selection of participating institutions, on methodologies for farming systems research studies that will work out the pertinent crop ecologies, management practices and internal economics, and the institutional and cultural aspects that condition these systems.
- B. Technologies for stabilization of shifting cultivation on tropical highlands: Population pressures are cutting sharply into the ability of slash-and-burn highland cultivators to continue the long fallow practices of the past. Instead of clearing forest plots every 15 or 20 years, and abandoning them to regrowth in a shifting cycle, farmers in the highlands are having to return more frequently, before the fragile fertility of these forest soils has had a chance to be restored. IFTC will conduct methodology studies on the development of farming systems that may involve tree-cropping with extensive row cropping or livestock management in forms of agro-forestry that require minimal (if any) purchased inputs. Agro-ecological cropping studies will be combined with cultural anthropology studies to develop a data base of present and potential systems in highland areas.

Estimations will be made of the scientific institutions in LDCs and in the U.S. and the international agricultural network which have, or could develop, a capacity for participation in the design and testing of the farming system methodology for highland agriculture.

- C. Technologies for very small farmers in commercializing areas: These farmers live on uneconomically-sized holdings where technology is being promoted to produce marketable surpluses. Although part-time farming is the primary option for such farmers (and their total income potential is dependent on the development of alternative income sources), there are intensive homestead planting technologies, from kitchen gardens of enormous diversity, animal care, and tree crops which can provide significant income in real terms and make use of under-employed labor. Much of this technology could also be adapted to relatively larger farmers' households. IFTC will launch data gathering studies of homestead plantings and animal confinement practices among very small farmers and others in their communities. Systems design methodologies will be undertaken with selected participating institutions in LDCs, the U.S. and the international network.

INCREASING AGRICULTURAL PRODUCTIVITY AND RURAL INCOME
ILLUSTRATIVE PROJECT

Title: Indirect Measures for Agrarian Reform

Purpose: To evaluate the impact on stable controlled access to cultivable land by small farmers arising from public policies for such matters as regional land use planning, rural zoning, taxation, resource conservation, and the subsidization of farming inputs; as well as public education, public health and access to mass media.

Background: Land reform (involving the most significant tangible "asset" in agricultural development) has long been a target of attention. Successes in post World War II Japan and Taiwan have sustained optimism that formal land reforms could be implemented elsewhere. Interest in land reform stimulated the holding of the A.I.D. Spring 1970 Review. Concepts were expanded and differentiated to include agrarian reform and rural development, in recognition of the breadth of technical and institutional factors that affect the security of equitable rights to land use, and the effective exercise of those rights. The Agricultural Development Policy of A.I.D. gives emphasis to problems of asset distribution, with specific concern for the redistribution of ownership to cultivators. The Food and Agriculture Organization of the UN is sponsoring a World Conference on Agrarian Reform and Rural Development in July 1979 to take up an extensive agenda of issues facing individual countries and the entire developing world.

FY 1980 Intensive Planning

IFTC will undertake intensive planning of long term policy impact and design studies in cooperation with LDC institutions and U.S. and international organizations.

Since most potential cooperating countries and institutions will be involved, in one way or another in the 1979 FAO Conference, IFTC will track the documentation being prepared for the Conference on a current basis, and launch its FY 1980 intensive planning on the basis of this documentation and the deliberations of the 1979 Conference. During FY 1980 data will be obtained on public policies in LDCs having to do with land use planning, resource conservation, rural zoning, the subsidization of production inputs for desirably organized and managed farming; and for education, health, and mass media policies as well. Cooperative arrangements will be entered into for the joint planning, and subsequent implementation, of policy model design, data development, and testing that will, in time, assist LDC policy makers simulate the short and intermediate term effects of policy options whose objectives, at least in part, are to ensure the cultivation rights of farmers who are, at present, non-owners of the land they operate.

INCREASING AGRICULTURAL PRODUCTIVITY AND RURAL INCOME
ILLUSTRATIVE PROJECT

Title: Institutional Aspects of Farming Systems

Purpose: To design and implement methodologies which will consider economic, institutional, and social factors which affect the systems of farming among small cultivators in developing countries.

Background: Farming systems research is undertaken principally by about four or five of the international agricultural research centers associated with the CGIAR. A recent survey conducted of this research indicates that since the initiation of farming systems research in the early 1970s, most, if not all, of the work has dealt with considerations of crop ecology (that is crop-environment and crop-crop relationships of a bio-physical nature).

However, it is now generally recognized that systems of farming are conditioned by patterns of ownership of productive resources, the ascription of economic roles by sex, lineage, or other status, and similar considerations.

FY 1980 Intensive Planning

IFTC will undertake intensive planning, on a cooperative basis, of studies which will supplement the farming systems research currently being undertaken at the international agricultural research centers, with data on the assignment, learning, and implementation of economic roles within rural households; on the institutions which regulate farming activities, provide supporting inputs and services, and process and distribute farm output; and on the cultural values which condition economic decisions and farming patterns in these systems. Planning will take into account published and on-going work in the applied social sciences related to this topic.

INCREASING AGRICULTURAL PRODUCTIVITY AND RURAL INCOME
ILLUSTRATIVE PROJECT

Title: National Agricultural Research Information Use Systems

Purpose: To build or otherwise support organizations and procedures which will undertake agricultural research relevant to priority development needs in developing countries in a manner that will link research on farmers' fields with their economic and social needs and context, as part of a system including local research stations, and national research and extension establishments tied in with the international community of agricultural science and technology. Special emphasis will be given to developing and promoting research information for utilization in indigenous agriculture.

Background: The historical development of the international agricultural research centers under the CGIAR emphasized on-station development, selection and testing of germ plasm and agronomic technology. These research centers have long recognized the slow pace at which center findings were being picked up within developing countries. This led, in part, to the development of more active outreach programs by the centers, and the training of increasing numbers of developing country personnel. This also, in part, stimulated the proposal of an International Service for National Agricultural Research (ISNAR) which was approved by the CGIAR at the 1978 meetings in November. It should, however, be pointed out that the developments to date within the CGIAR system have emphasized the development of an adaptive research capacity within developing countries.

FY 1980 Intensive Planning

IFTC will, in cooperation with CGIAR and ISNAR authorities, and other relevant interests, plan an IFTC role in building national agricultural research and research information use capacities. Emphasis will be placed on the development of information centers and communication procedures and networks.

Techniques will be developed that place farmers and other potential users of information into a more direct relationship with those institutions that plan, support, and undertake research. IFTC will also stress means for building utilization plans into the design of research programs.

INCREASING AGRICULTURAL PRODUCTIVITY AND RURAL INCOME
ILLUSTRATIVE PROJECT

Title: Biological Adjustments to Environmental Stress

Purpose: To help overcome agricultural production constraints due to environmental conditions

Background: Scientists and farmers have extended the geographical range of commercially valuable crops by infrastructure development and farm management practices that mitigated constraining environmental conditions. Irrigation and drainage facilities and water management overcame drought and flooding; fertilizers overcame shortages of natural plant nutrients; and so forth. In time, plant breeders incorporated pest resistance into the genetic make-up of crops and reduced the need for chemicals to control insects, diseases and the like. Breeders also were able to combine genetic material for tolerance to heat, cold, sunlight or shade, soil toxins and other hazards into valuable plants and animals. In another vein, plant scientists have enhanced the natural capacity of leguminous plants to fix atmospheric nitrogen in their root zones via the agency of microbes existing in association with them. In concept, it is possible that further work may make it possible for plants such as cereal grains to fix atmospheric nitrogen. Similarly, it may be possible to enhance the physiological capacity of plants to make more efficient use of available water and plant nutrients, and even sunlight than they now do. Most such work is generally regarded as highly speculative in its concepts, and the pertinent research techniques have not been fully developed, in many cases.

FY 80 Intensive Planning

IFTC will facilitate exchange of information and an assessment of current methodologies regarding biological nitrogen fixation (including that in cereal grasses), water and nutrient uptake and assimilation physiology, and photosynthetic efficiency. In this process, IFTC will seek a carefully coordinated and well-planned international effort in these fields of research, as a basis for IFTC research support in FY 81. The work will have to be collaborative, with fundamental conceptual work and progress on techniques of research design undertaken at U.S. institutions with necessary facilities; and selection of plants, adaptive work, and user analysis done in developing countries.

2. IMPROVING HEALTH CONDITIONS IN DEVELOPING AREAS

INTRODUCTION

The health problems of the poor receive but a tiny fraction of the world's health research budget. As a result, diseases continue to ravage the developing countries affecting life, work, education - indeed survival.

Marked improvements can be expected from:

- Control of specific diseases. In more developed countries only about 10% of deaths are due to infectious diseases, whereas in developing countries over 40% are caused by infections.

Measles kills some one-and-a-half million children each year, according to the U.S. Center for Disease Control, with almost all of these deaths occurring in the poorer nations. Schistosomiasis affects roughly 200 million people, debilitating many and shortening life expectancy.

- Access to effective health care. According to a recent report of the National Academy of Sciences, only 10% of people in many developing countries have access to effective medical services. Small projects have shown that infant mortality can rapidly be reduced by half with appropriate personnel and methods. Yet some rural health delivery systems have become too costly to maintain or have failed to have the expected impact. Careful evaluation of these projects is needed so that the most cost-effective methods can be most efficiently shared.

- Better sanitation and water supplies. Diarrheal diseases are a major cause of death and disability in all places with poor sanitation and water supplies, accounting for a quarter to a half of the child deaths reported in a recent study by the Pan American Health Organization.

Clean drinking water could result in the eradication of dracunculosis which incapacitates up to 30% of the labor force throughout the critical planting season in parts of Africa and India. The World Health Organization found that improved water and sewerage in the Philippines cut the incidence of cholera by 70%. Yet technologies for clean water and sewerage in rural areas, where most of the poor live, are either non-existent or prohibitively expensive. A solution must be found.

BACKGROUND

Better technologies are required to control diseases, and to provide health care, better sanitation, and adequate supplies of safe water. A sustained program of research in collaboration with developing country investigators will bring significant improvements and build local capacities to deal with the health problems of those countries.

Protection of health, as an end in itself and as a means to enhance productivity, is limited in the developing countries by:

- a. Inadequate methods to prevent or treat many important diseases. Vaccination against tuberculosis, for example, which is 80% effective in the British Isles, was reported by the Director of the World Health Organization to be of little value in India, where chemotherapy was also found of limited worth.

The Dean of the London School of Tropical Medicine and Hygiene recently reported that tuberculosis killed over a third of a million Indians last year. TB also still kills more Americans than any other identifiable bacterial disease.

- b. The lack of appropriate facilities and personnel to control diseases for which there are specific, proven, measures. Measles vaccination is highly effective, for instance, yet a million-and-a-half children died from measles last year for lack of an adequate cold-chain and delivery system. The Center for Diarrheal Disease Research in Bangladesh, in research funded largely by the U.S., has demonstrated that deaths from cholera and diarrhea in general can be cheaply prevented with simple procedures and training. The avoidable disability and deaths will continue, however, in the absence of a primary health infrastructure to care for the needs of the poor in developing countries.
- c. Poor environmental sanitation and water supplies, qualitatively and quantitatively. This is a major health problem even in such a relatively affluent city as Sao Paulo, Brazil, where a quarter of the population is without potable water and over 60% without sewerage. Simple transfer of existing technology has been repeatedly found ineffective for villages and rural areas; clean water systems are not maintained and privies are used for other than their intended purpose. Health education and cultural and motivational studies must accompany the introduction of appropriate technologies, and these should be developed or adapted by residents of the respective region.
- d. The lack of appropriate health standards and programs for rapidly urbanizing and industrial societies. The needs in occupational health and safety in developing countries have received very little attention, despite the very rapid urbanization rate, and create real cause for concern.

CURRENT EFFORTS

In addition to the attempts by the individual countries, to solve their health problems, there are major efforts underway by multilateral and bilateral agencies. The World Health Organization, for instance, has initiated a Special Program for Tropical Disease Research and Training, focusing on six major diseases (malaria, leishmaniasis, filariasis, trypanosomiasis, schistosomiasis, and leprosy). The Rockefeller Foundation is reviving its attention to this set of problems and the Clark Foundation continues its interest in schistosomiasis. The U.S. Agency for International Development is helping many of the poorest nations to provide primary health care through lower-cost delivery systems. It also contributes importantly to the construction of water systems. The World Bank has a long record of loans for water supplies, and has become active more recently in other parts of the health sector because of its recognition of the role of health in promoting economic development.

THE INSTITUTE'S PROGRAM

IFTC will undertake initiatives related to gaps in attention to the health problems of the developing countries:

- Tuberculosis control. One of the major causes of death and disability among the working age population, TB is currently receiving too little attention. Evidence of failure of the standard vaccine and of chemotherapy in the developing countries adds to the crisis character of this problem.
- Vaccine improvements. Like TB, polio vaccine is often ineffective in some developing countries' environment. Measles vaccine cannot withstand the heat of the tropics. Work is needed on the cause of these failures, on the relationship of nutrition to vaccine effectiveness, and on improved vaccines.

- Water and sanitation technology. Low-cost, culturally acceptable water and sanitation technology has great potential for major health impact. Years of failure in this field require a careful look at past experience as well as at those cases of success such as urban China.
- Primary health care evaluation and improvements. A careful assessment of the costs and benefits of different approaches and of the various technologies being extended to the population through primary health delivery systems.
- Occupational health. As more workers live in urban areas, and as industry expands in the developing countries, the problems of occupational health, safety, and sanitation become more important. Furthermore, workers and the work place may provide important avenues for improving general health through health education programs, vaccinations and medicine distribution, and better sanitation practices in the work place. Labor groups may be interested in playing a major part in such programs.

PLANNED FY 1980 BUDGET

Project Initiatives	\$2.3 million
TB control	
Vaccine Improvements	
Sanitation Technology	
Intensive Planning Activities	\$0.7 million
Primary Health Care Evaluation	
Occupational Health	
Total	\$3.0 million

IMPROVING HEALTH

Illustrative Project

Title: Techniques for Controlling Tuberculosis

Purpose: To accelerate tuberculosis control in developing countries through the development of more effective immunization, better treatment, simpler case detection, and more efficient program management.

Background: Tuberculosis, according to the Center for Disease Control, causes more deaths throughout the world than any other notifiable infectious disease. This is true, too, for the United States where it accounts for a quarter of the deaths from infectious and parasitic diseases and several thousand die each year.

The disease, especially in poorer regions, often disables young adults keeping them from productive work for long periods and burdening the limited health resources.

Remarkable declines in the prevalence of TB occurred in the industrially advanced nations during the past century. Early progress was evidently largely due to steady improvements in housing, with less crowding, and in nutrition. The rate of decline was accelerated in the U.S. during the past 30 years by specific anti-bacterial treatments. In some other countries, immunizations with BCG vaccine also contributed to declines.

While it would be unethical to wait for socio-economic progress to control TB in a country like India where it kills a third of a million people annually, the Director General of the World Health Organization has concluded from a large scale, long-term study there that very little benefit was gained from either BCG immunization or chemotherapy. Clearly, the reasons for these failures must be identified and efforts made to correct them.

FY 80 Project Initiative: Building on the fundamental research bases provided by such agencies as the National Institutes of Health and the universities, the IFTC will work collaboratively with bio-medical specialists in developing countries to provide:

- a. more effective immunization through
 - 1. determining the factors responsible for BCG failure in certain areas (e.g., genetic differences, nutritional status, concurrent infections, vaccine instability)
 - 2. evaluating alternative immunologic agents (various strains of BCG, non-BCG mycobacteria)
 - 3. establishing the optimum age for immunization
- b. better treatment through
 - 1. more rapidly bactericidal drugs
 - 2. mono-specific sensitive skin tests
- c. more efficient program management through
 - 1. extended use of auxiliary personnel for immunization, case detection, treatment, and surveillance for compliance
 - 2. establishing the doses and schedules for optimum benefit to cost ratios

The result of these collaborative efforts is expected to be better control of tuberculosis and also the development of enhanced capabilities in developing countries for microbiology, immunology, pharmacology, epidemiology, and health services management. Because TB is still an important cause of death, disability, and economic loss in the U.S., and because studies of tuberculosis have implications for other bio-medical areas, especially in the burgeoning science of immunology with promising health benefits, the knowledge generated would be helpful at home as well as in the developing countries.

IMPROVING HEALTH

Illustrative Project

Title: Primary Health Care

Purpose: To provide state-of-the-art guidelines for the design and management of primary health care programs; to test modifications of current models to improve effectiveness and reduce costs; and to train health officials from other areas in programs selected for their excellence.

Background: Many of the health problems in developing countries, among them leading causes of death, such as measles which kills more than a million children each year, can be prevented or treated by currently available means. Unfortunately, as few as 10% of the population in some developing countries has access to such attention. The limitation of health resources is aggravated often by their concentration on sophisticated modern medical facilities and specialists for an urban elite. The health needs of the urban majority and the rural population remain unmet.

Many projects have been carried out by local governments, private groups, and the U.S. Agency for International Development in order to expand health care coverage in developing countries at affordable costs. Emphasis is being given to the more common afflictions, such as the diarrheas, to prevention, to hygiene and nutrition education, family planning, and to the use of less highly trained personnel - by one calculation, 20 health auxiliaries can be trained for meeting rural health needs for the cost of educating one physician. Furthermore, once trained, the M.D. would be unlikely to dedicate himself to the problems of the rural poor.

Since the purpose of the projects has been the provision of services, they generally lack the data needed to calculate their impact and their costs.

In the exceptional cases where this information is reasonably well known, and the population served was of adequate size to warrant measurements, infant mortality was found susceptible of a rapid reduction by one-third or one-half at investments deemed to be affordable by national standards. Other indices also improved proportionately.

In the fall of 1978, the World Health Organization and the United Nations Children's Fund co-sponsored a conference on Primary Health Care with the 140 signatories, including the U.S., concurring in their support for the goal of "Health for All by the Year 2000". This ambitious objective will require great modification of health planning at national and local levels and the development, testing, and dissemination of the appropriate technologies.

FY 80 Project Initiative: The IFTC will undertake a systematic evaluation of existing projects for comparative analyses of the relative benefits and costs of their components. On the basis of the results, guidance will be provided for establishing or improving primary health care services. Demonstration projects will be undertaken in collaboration with officials of developing countries to test and evaluate ways to achieve further improvements. Where programs have demonstrated their cost-effectiveness, interested officials from other areas - neighboring communities or foreign countries, including the U.S. - will be provided fellowships to learn techniques which might be applicable or adapted for use in projects in their own communities.

The IFTC will maintain a continually updated record of progress in the provision of, and tests on, primary health care to disseminate information on state-of-the-art technology and to limit the replication of inefficient methods.

3. IMPROVING POPULATION PROGRAMS

INTRODUCTION

Population growth - in some countries at rates well over 3% each year - has vitiated or even nullified many of the benefits expected from efforts begun under the Point Four program, announced by President Truman thirty years ago. The population in developing countries has more than doubled in that time - to over three billion - and the proportion of people who live in developing regions has increased to about 75% of the world's total. Over five million more are added each month.

Clearly, developmental objectives and basic human needs can be more rapidly and effectively met if birth rates are sharply reduced. This requires better means of controlling fertility for couples who are motivated to limit family size, and the identification of factors (governmental policies, educational efforts, health conditions, etc.) which may directly or indirectly serve to enhance motivation among other couples.

BACKGROUND

Over the past twenty years progressive recognition of the need to slow down growth rates has led to notable successes in certain parts of Asia (e.g., Hong Kong, Indonesia, Korea, the People's Republic of China, Singapore, and Taiwan) and Latin America (Chile, Colombia, Costa Rica). These successes have been facilitated by appropriate access to knowledge and methods, by leadership, social pressures, and socio-economic and health improvements. In most of the remainder of those continents, however, and throughout Africa, birth rates have remained high.

CURRENT EFFORTS

The World Bank, the United Nations, the Agency for International Development, the National Institutes of Health, agencies of other governments, voluntary organizations, and industry are investing millions of dollars to improve existing technology and to develop new methods of fertility control. All of the present methods have associated problems of efficacy, safety, reversibility, or acceptability for many people. More work must be done to provide means that are effective, cheap, safe, and acceptable.

It has been shown that funding levels for the requisite work may actually have declined in the recent past - if inflation is taken into account - even though newly acquired understandings of reproductive biology should be followed up to develop a wider range of better methods.

The National Institutes of Health and university investigators have developed much basic knowledge which has long-term applicability. The Agency for International Development has focused its investigations on methods expected to be ready for clinical testing within a year or two and its operational funds on distribution systems for existing methods. There is a major gap relating to longer term adaptive and applied research and in particular to the contribution of developing country scientists and doctors in this process in order to develop technologies with wider acceptance abroad.

While considerable work has also been done on factors affecting motivation, a better understanding is required so that policies conducive to fertility control can be implemented.

THE INSTITUTE'S PROGRAM

The Institute will concentrate on:

1. Contraceptive Development

- a. Through collaboration with selected developing country institutions. The Chinese, for example, have initiated promising approaches relatively unexplored by American investigators. Also, a number of specialists in fertility control, highly trained in the U.S., are now back in their countries of origin where they could help develop better, or more locally appropriate, methods.
- b. Through a worldwide inventory of potential methods.
- c. Through greater emphasis on pursuing leads emerging from basic bio-medical research.

2. Efforts to Enhance Motivation for family planning through study of public policy (directly and indirectly bearing on birth decision) and socio-cultural differences between populations with different degrees of success in controlling fertility.

PLANNED FY 1980 BUDGET

Project Initiatives	\$2.0 million
Contraceptive Development	
Intensive Planning Activities	\$0.5 million
Motivational Enhancement	
Total	\$2.5 million

IMPROVING POPULATION PROGRAMS

Illustrative Project

Title: Contraceptive Improvements

Purpose: To develop and adapt contraceptive methods which are effective, safe, cheap, and locally acceptable for diverse populations in developing countries.

Background: Contraceptive technology has advanced greatly in recent years yet the most effective means may not be acceptable in many populations because of concern for side effects of varying severity, costs, irreversibility, and the need for sustained high motivation. Existing methods may be appropriately modified to correct some problems and new approaches may have to be developed to overcome others. In either case, much of the work should be carried out in developing countries to make the findings most appropriate to local needs and to strengthen capacities there for continuing improvements in their population programs.

A recent comprehensive survey of contraceptive developments found that the new knowledge of reproductive processes gained through fundamental research in recent years has not been followed up adequately for contraceptive application. Funding for this may actually have declined when inflation is taken into account. Private foundations supporting contraceptive development have had their resources eroded by inflation. In the private sector, according to pharmaceutical spokesmen at a recent Conference at the National Academy of Sciences, industry is reluctant to commit itself to the millions of dollars for the research and development and to the many years needed to meet the more stringent new federal requirements, especially since patent rights could be near expiration by the time the product could be marketed.

However, along with the discovery of new knowledge, new professionals in the developing countries have been prepared in reproductive biology. Many of these have had advanced training in the U.S. and have now returned to their countries of origin where they could work to adapt existing techniques or devise new ones appropriate to the local needs and cultures. Some promising leads are also being explored in developing countries, such as those on male contraception in the People's Republic of China. Greater exchange of information and of specialists would be mutually beneficial to the U.S. and to the developing countries.

FY 1980 Project Initiative: The IFTC will identify especially talented and well-trained specialists in developing countries for collaborative efforts to adapt or devise contraceptive methods most appropriate for local conditions. While giving priority to activities with the prospect of prompt results, it will also encourage the exploration of promising leads with anticipated applications some years hence. Traditional methods with evidence of efficacy in the developing countries will also be evaluated. The IFTC will work, too, through contracts and other mechanisms, to encourage a greater participation of the pharmaceutical industry's resources toward the improvement of currently available methods and the development of new ones.

As part of this program, the IFTC will work with behavioral scientists in developing countries where family planning practice is limited in order to identify the constraining factors so that these can be countered by appropriate contraceptive designs where feasible.

4. NUTRITIONAL IMPROVEMENT

INTRODUCTION

The quantity of food and its quality are frequently deficient in developing countries. The Commission on World Hunger estimated that:

half a billion people do not get enough to eat

ten million deaths are attributed each year to malnutrition.

Capacities to learn, to work, and to resist disease are affected. Although malnutrition was listed as the cause of infant death in generally less than 10% of cases studied by the Pan American Health Organization in Latin America (a relatively better off part of the developing world), it was an underlying or associated cause in a third of deaths in some places and in three of every four deaths from measles. Cost-effective and culturally acceptable strategies to protect and improve nutritional status of women and workers as well as children must be devised in order to meet basic human needs and to achieve development objectives.

BACKGROUND

Meeting nutritional requirements as a basic human need and as a means of promoting development in efficient ways for maximum impact has received too little attention. Neither the massive shipments of grain to developing countries to meet emergencies nor the more limited programs targetted to reach specific populations (e.g., pregnant or nursing mothers, school children, workers) has been adequately evaluated for effect and efficiency.

High on the list of priorities in the National Academy of Sciences' recent report was the evaluation of such intervention programs. In one careful study by the World Bank, it was demonstrated that correcting iron deficiency in anemic workers increased their productivity by 19% at a benefit cost ratio of 280 to 1. More such analyses are needed so that planning can become more rational. We also should know much more about how governmental policies directly and indirectly affect how much and what types of food different sectors of their population have to eat.

CURRENT EFFORTS

While there are many efforts, often large-scale, by national and international agencies to increase supplies of food in the developing countries, too little is being done on measuring the costs and benefits of nutritional intervention programs whether targetted supplementation of diets, food subsidies, food fortification, or other. Furthermore, authoritative guidelines and state-of-the-art information on how to design and manage these programs are needed.

THE INSTITUTE'S PROGRAM

In FY 1980 the Institute will begin to develop an information and evaluation center to receive and disseminate information on nutritional intervention programs. This information will be evaluated in collaboration with experts from the developing countries so that state-of-the-art guidance can be provided and so that demonstration projects to improve the best of current strategies can be designed and tested. The needed techniques for evaluating nutritional programs within the complex of intervening economic, health, and cultural factors will be devised and progressively improved. An intensive preparatory effort will also be made to measure the effects of alternative governmental policies.

PLANNED FY 1980 BUDGET

Intensive Planning Activities

\$1.0 million

Evaluation of Nutritional
Interventions

Policy Evaluation

5. STRENGTHENING INDIGENOUS SCIENCE AND TECHNOLOGY CAPACITY

INTRODUCTION

One theme common to the statements prepared by developing countries for the 1979 UN Conference on Science and Technology for Development is the desire to strengthen indigenous scientific and technological capacity to analyze and cope with development problems. The ability is one of the objectives of every society, but it is a long-range objective involving basic changes in institutions, policies, technologies and human behavior.

IFTC will be concerned with two aspects of this development process which transcend the specific sectoral problem areas:

- National planning, policy-making, organization and management related to scientific and technological research and training;
- Learning related to science and technology.

These two broad concerns are the bookends of the problem-solving processes; at the one end is the national institutional and policy framework within which specific problem-solving efforts occur, and at the other is the individual, the primary unit of change and development.

BACKGROUND

Experience has shown that the attempt to transfer U.S. or other industrialized country-institutions to developing countries often has unsatisfactory results. What often happens is that we transfer form rather than content; with the result that unfocused research institutes, irrelevant training and education, and damaging policies often flow from these efforts. The disappointing results of many national efforts to improve scientific and technological infrastructure exemplify this problem. Yet there are also striking successes such as the Korea Institute of Science and Technology. National policies and programs

seem to do best when they are fitted to both growth and equity goals, address the critical issues of education and training, and when they link research to the productive sectors.

The other side of the coin from building national infrastructure is development with respect to the individual, also a long-range process involving generations.

The adoption of new technology requires changes in individual behavior. In a modernizing country, technology associated with a given occupation is likely to change many times in the lifetime of a worker. The ability to change, to continue learning in adulthood, is thus indispensable.

One of the best known means of preparing a person for continuing change is to offer a good grounding in science and mathematics. These subjects comprise the basic tools required by individuals for functioning productively in a changing society, but achievement levels in these subjects in most developing countries are depressingly low. Technical training is another field of direct relevance to technological change where, as in science and mathematics teaching, efforts to date have not yielded anticipated returns. Developing countries need to devise new approaches to planning and organizing such programs.

Other important elements of a country's capacity which are little understood include the contribution of formal education and specialized training to successful performance of entrepreneurs, craftsmen, and farmers, as well as scientists; and the impact of technological change on people: their aspirations, attitudes, values and beliefs. Pathbreaking work by Professor Inkeles and his associates offers an entree to these subjects, but much remains to be learned about such adaptations. Countries facing rapid modernization, like Iran, can find these adaptations to be painful and often explosive.

In addition to working on learning problems in developing countries, the IFTC will be concerned with the quality and relevance of technical training and education offered to students from developing countries at U.S. institutions.

Many of the most highly trained scientists and engineers in developing countries were trained in the U.S., and this will continue to be the case for years to come. American training programs are, however, designed to prepare people for work in a highly industrialized society. Course curricula need to be reviewed to see in what ways they might be supplemented or adapted to make them more relevant to students who will work in developing countries.

CURRENT EFFORTS

AID, with the cooperation of the National Science Foundation and the National Academy of Sciences, has been active in recent years in conducting policy research and collaborating with developing countries to tailor science and technology policies to country-specific situations. This program will be assumed by the IFTC.

Earlier, mostly in the 1960s, AID supported science and math teaching programs with assistance from NSF. These programs had some success, but there has been little follow-on support to the current developing country experts who now lead these programs and who are anxious to undertake improvements based on long experience.

THE INSTITUTE'S PROGRAM

1. In the organization and policy sphere, the IFTC will support policy development and in some cases prototype policy centers evaluating technological choices, and technological training and education. It will promote evaluation of the functioning of national scientific research councils, and organizational alternatives for national technical training systems. Comparative research will be useful in identifying and analyzing successful organizational and policy measures in developing countries and making this information widely available. The IFTC will also facilitate the access of developing countries to U.S. experience in agencies such as the National Academy of Sciences and to individual experts.

2. In the field of learning, initial emphasis will be placed on technical training and science and mathematics teaching at the primary and secondary levels. Support for existing science and mathematics teaching centers in developing regions will be available. Opportunities will be examined for collaborative research on factors influencing differential responses of individuals and social groups to technological opportunities and as a means of anticipating the impact of technological change on individual attitudes, values, and beliefs. Managerial techniques which are more sensitive to indigenous social and cultural factors will be the subject of careful examination.
3. Regarding U.S. training of developing country scientists and engineers, the Institute, in cooperation with NSF and the National Academy of Engineering, will examine alternative training programs and will support development of experimental curricula of more practical utility for development work.
4. The role of women requires special attention. Women are important participants in all aspects of the developing of capacity, but their opportunities need to be expanded through special efforts. Also, women could be adversely affected by some technological changes, e.g., the introduction of processes which deprive them of traditional market opportunities. This factor must be built into policy-level analysis as well as in the attention to all aspects of education.

PLANNED FY 1980 BUDGET

Project Initiatives \$1.5 million

Science and Mathematics
Education

Improved Training Programs for
Developing Country Students
in the U.S.

Intensive Planning Activities \$0.5 million

National Planning, Policy Making
Organization and Management

Human Response to
Technological Change

Total \$2.0 million

be on the processes and products of science and technology that are appropriate to the local situation. Such problem-solving activities would assist students to develop the decision-making and design skills that are as important as factual knowledge to practicing engineers, technicians, scientists, and managers.

Efforts also need to be made to devise effective pre-service and in-service teacher training programs to acquaint primary and secondary school teachers with the instructional techniques central to the new course materials. In addition, mechanisms need to be explored to expand the variety of low-cost instructional materials available to science and mathematics teachers, through the development of local centers for manufacturing simple science apparatus and through the design of instructional materials that can be easily improvised by teachers from locally available raw or recycled materials. The National Science Foundation science and mathematics course improvement efforts which took place during the past two decades have had a considerable impact on the pre-college education in other countries, both advanced and less-developed. However, in recent years the level of funding available for course development work has dwindled, as has support for teacher training projects and the development of local centers for the production of instructional materials and apparatus. A need now exists to support the development of local capacities in these areas and to assist local centers with the design of course materials appropriate to the specifics of the local culture and environment.

FY 1980 Project Initiative: The Institute will work with existing regional and national centers for science and mathematics education to:

1. Strengthen local capacities to design science and mathematics course materials which focus on the development of critical thinking and problem-solving skills, and which emphasize the processes and products of technology appropriate to the local situation.

2. Assist developing countries teacher-training institutions with the design and implementation of pace-setting pre-service and in-service programs to demonstrate that teachers can make effective use of the new course materials.
3. Assist with the development of institutions for the local manufacture of science and mathematics instructional materials and apparatus.
4. Stimulate the development of innovative techniques for the development of scientific literacy through non-formal educational opportunities, such as rural education and community development programs, innovative radio and television programming, and the expansion of science and technology centers.

FY 80 Project Initiative: During FY 1980, IFTC will work with developing country educational centers:

1. Reappraising the effectiveness of alternative approaches to science and mathematics course development, teacher-training, and materials production in the developing countries. Special attention will be given to the problems of large-scale course improvement efforts at the primary level.
2. Undertaking studies of the effects of learning experiences with specific course materials and of approaches to the problem-solving and decision-making skills of students.
3. Supporting the local production of simple apparatus and other instructional materials appropriate to local conditions of learning.

STRENGTHENING INDIGENOUS SCIENCE AND TECHNOLOGY CAPACITY

Illustrative Project

Title: Human Response to Technological Change

Purpose: To increase understanding of the processes of human adaptation to technological change.

Background: Development is generally viewed in terms of technological change and economic growth, but the process demands fundamental adjustments on the part of the people who experience it. These adjustments may involve changes in family structure, social identification, relationship to the state, and in individual attitudes, values, and beliefs. Development planners and policy-makers typically focus on individuals only in terms of formal education and occupational training, but changes in these skills may be less profound than the other adjustments a person must make.

The importance of these factors is evident when one considers that recent events in Iran simply cannot be understood without considering the stress put on society and its members by rapid technological and economic change.

Among the themes with particular relevance to development policy-making are:

- the impact of the home and other pre-school environments on learning readiness at school age;
- the sources of successful behavior related to technological innovation;
- the impact of technological change, and occupational environments, on individual aspirations, attitudes, values and beliefs.

FY 80 Intensive Planning Activities: In FY 80, the Institute will consult extensively with educators and leaders in developing countries and undertake a discriminating review of the relevant literature in order to initiate research and experimental programs in collaboration with scholars from developing countries in FY 81.

6. IMPROVED PROCESSES OF TECHNOLOGICAL COOPERATION

INTRODUCTION

Several processes of broad significance will be supported by IFTC:

- Policy studies relating to technology introduction, transfer, and adaptation; these will be designed to facilitate private as well as public interchange of technology.
- Improved mechanisms for bilateral and multilateral scientific and technological cooperation. These will facilitate identification of critical problems and of the skills and technologies that can be shared for mutual benefit.

BACKGROUND

Many of the problems in technological transfer and adaptation arise from poor policies regarding domestic market development, foreign exchange, or sector goals in agriculture, industry, transportation and communications. Also, rhetoric has often substituted for analysis in looking at the opportunities as well as obstacles for improved technological cooperation through the private sector. There is need for developing and developed countries to examine these more thoroughly, through the medium of joint policy analyses, investigations and experimentation. Such policy studies could lead to improved domestic market development, greater use by developing countries of available "public" technology, and more effective collaboration through private investment and trade. Cooperation with U.S. private industry, labor, and other interested groups will be an important part of IFTC's work in this regard.

A second joint process of importance to both the U.S. and the developing countries is that of technological exchange and cooperation. There is a large body of increasingly sophisticated talent in developing countries which lacks access to U.S. scientific and technological information and innovations. This limits their potential contribution to their own society's development. It is particularly unfortunate where there is no follow-on to earlier U.S.-supported programs of training, fellowships and institution building, for such follow-up would sustain the quality and momentum of these countries' expertise. It is also the point where the U.S. would, itself, have a great deal to gain. For some of these countries are now deeply engaged in developing new technologies in energy, food and industry that could be of value in our country.

A related problem is the lack of support for indigenous research by developing country specialists. Often such specialists lack even small grants to pursue lines of inquiry that have local relevance. The IDRC of Canada, as well as private foundations in the U.S., have found that such small grants have great pay-off. The U.S., however, has no mechanism to help support such research on a significant scale. Many of the persons trained in the U.S. are thus cut off from professional encouragement and support when they return.

CURRENT EFFORTS

Joint commissions and bilateral science agreements have proliferated in recent years in recognition of the mutual value of such cooperation. However, there are no special funding mechanisms linked to these agreements. As a result, many of the proposals that arise from these agreements wither away for lack of support, and the agreements lose their substantive as well as foreign policy value. This has been one of the problems in the agreement with Mexico concluded several years ago.

NAS, NSF, and other U.S. agencies engage in forms of international cooperation, but usually only if supported by AID. Otherwise, their programs are linked to basic research or particular domestic U.S. concerns. AID has funded some programs of collaboration, but has no mechanism for follow-on support in those countries where AID has phased out its regular program.

THE INSTITUTE'S PROGRAMS

The Institute will sponsor studies in the U.S. and in developing countries to add knowledge about the development process as it relates to technological choice and adaptation. It will help to strengthen policy analysis capabilities abroad and will undertake joint studies with developing countries. Information and modest support to encourage closer, sustained links between U.S. and developing country institutions as well as among developing countries will be provided.

IFTC will establish mechanisms for reviewing and providing partial financing for a number of approved joint programs between the U.S. and developing country specialist groups. The criteria for such programs will be that they (a) address a problem of relevance to the poor, and/or (b) address a problem of mutual concern to developed and developing countries, and/or (c) provide for improvement in the experience and opportunities for developing country specialists in their own countries. IFTC will also establish mechanisms to support researchers directly in developing countries and will encourage governments to provide more such support for locally relevant activities.

The collaborative activities will extend to institutions and scientific and technical fields generally, not just those within the problem areas singled out by IFTC. The funding pattern will vary according to the economic status of the developing country, but joint financing will be required for all programs except in the case of the poorest countries. IFTC will develop some of these programs and special capacity-building efforts as a follow-up to the UN Science and Technology for Development Conference scheduled to be held in Vienna in August 1979.

PLANNED FY 1980 BUDGET

\$ 3.0 million

7. COMMUNICATIONS AND INFORMATION SYSTEMS

INTRODUCTION

Rapid communication and reliable information handling systems are vital to the functioning of modern society. Improving media and data processing capabilities must be a necessary adjunct to building national capacity for understanding and dealing with problems. Communication and information systems are essential to a wide range of development tasks, including the following:

- gathering and processing data on prices, outputs, transfers, etc. in order to make sensible policy decisions;
- tapping sources of scientific and technical information in other countries;
- disseminating information on improved productive practices, health measures, etc. to the local population;
- coordinating the functions of government;
- educating people in school and out;
- disseminating information on the policies of government.

Despite a veritable explosion in technology for these purposes in developed countries, the adaptations to the developing countries, especially to the needs of the majority, have been quite limited. Overcoming the obstacles to better use of such technology could have impact in every sector of development.

BACKGROUND

Technological advance in the fields of communications, information gathering and information handling have been tremendous in the industrialized countries in recent decades. Satellites, computers, microfilm, and many other advances have enormously increased the ready availability of information. The potential benefit to developing countries from these advances would seem to be enormous, but, as with other technologies, the fact that they were developed for advanced country purposes creates difficulties in their transfer. In some cases, use of advanced communications and information systems can widen the gap between the modern and traditional sectors of developing countries.

In the case of radio, for example, a proliferation of broadcasting has occurred as transistors lowered the costs and increased access to radio reception. But the upsurge of media use has often been prompted by political or commercial motives and the results have not necessarily advanced the development process.

The technological frontier is advancing so rapidly, however, that communications may be the only major factor in the development process with a declining future cost curve. Lower costs related to mass media may in the long run offer the best chance of providing the information necessary to improve the lives of the people outside the major cities in developing countries. It may also offer the best chance of keeping them outside the major cities, by helping to make rural life more attractive.

For the development potential of this technology to be attained, more attention is needed to adaptive research and experimentation with effective media applications.

Modern technology in the fields of communications and information is very expensive, and the political and economic interests involved are powerful, so the IFTC will need to exercise caution in deciding what it can realistically try to accomplish.

CURRENT EFFORTS

The use of radio for development purposes, including AID supported projects in mathematics teaching in Nicaraguan schools and informing farmers and their families in Guatemala, has recently demonstrated new potential for the contribution of media to the rural poor. The requirements of successful media projects are becoming better understood.

Major donor programs encompass field experiments and applications of media, as well as policy and cost studies at the sectoral and project levels. The development banks fund telecommunications infrastructure investments, although largely on commercial (rather than "basic needs") criteria.

UNESCO has stressed national communications policy-making. AID has recently begun a six-year initiative to test the utility of satellite communications to rural basic needs-oriented development.

THE INSTITUTE'S PROGRAM

Initially, an intensive planning effort will be undertaken to identify strategies for increasing the contribution of communications and information technology to development. Planning activities will focus on the following areas:

1. Mass media applications constitute the most heavily researched area to date. Basic principles for structuring a successful project are known, as are practical methods for planning, message design, pre-testing, evaluation and administration of media. IFTC activities will ensure that this knowledge is effectively disseminated and utilized by those undertaking new projects.

2. Specialized information services are increasingly available to developing countries through catalogues and mailing systems and even remote computer terminals. However, there are serious questions regarding the conditions under which such information is really used, or can really be useful. In order to ensure that developing country needs and conditions are adequately considered, mechanisms for filtering information and for incorporating particular information needs should be developed. Experience with developing countries' use of existing systems should also be studied. This subject will be discussed at the UN Conference on Science and Technology for Development and specific project ideas will emerge from those discussions.
3. Appropriate hardware for use in arid and tropical environments by users from non-technological cultures is an important subject for R&D. Adaptation of technologies ranging from audio cassette recorders and small radio transmitters to simple printing presses and locally producible paper should be probed. Use of pictorial rather than language instruction should be promoted for non-literate populations and multi-lingual situations. R&D now underway concerning larger technologies, such as satellites, ground stations, and micro-processor-based equipment should also be followed and assessed.
4. Delivery systems have not been effective in developing countries. New approaches to training, use of media, and other elements are urgently needed to move known technology to the users. IFTC will initiate special efforts to analyze problems and promote improvements.
5. New information infrastructures are on the horizon. New generations of satellites and new digital techniques may allow for integrated development of post, telephone, broadcasting and data communications. However, such technologies are not yet operational even in the industrial countries. In view of the particular constraints existing in developing countries, different investment alternatives (from the technologically conservative to the most adventurous) must be assessed very critically, under different assumptions regarding future cost curves and equipment availability and reliability.

6. Policy research becomes extremely important, as major technological options are considered, and as political leaders require national communications policies. Methods for conducting policy-oriented research need further development. Investigation of the developmental impacts of entertainment and information media and of the telephone are of great importance to developing countries in guiding future investments by governments.

PLANNED FY 1980 BUDGET

Project Initiatives \$1.0 million

Projects in cooperation with the AID communication satellite initiative, especially regarding development of lower-cost technology for disseminating programs to the populace.

Intensive Planning Activities \$1.0 million

Specialized Information Systems
Mass Media Applications
Communications Policy Research

Total \$2.0 million

COMMUNICATIONS AND INFORMATION

Illustrative Project

Title: Specialized Information Services.

Purpose: To examine the means to improve the utility of modern information systems for development purposes.

Background: Information gathering and handling technology has advanced spectacularly in recent years as a result of the development of computers, satellites and electronic data processing systems. The potential value to developing countries of the extensive data bases which have been amassed to make use of the new technologies would seem to be very great. High expectations also surround potential application of remote sensing data (particularly from LANDSAT) and of computer software packages.

However, these technologies are extremely difficult to use successfully even in developed countries. To make these technologies productive, there must be large institutional users with relatively stable and competent operations which have very specific problems to solve, and adequate resources with which to solve them. Most developing countries may lack this institutional base of users. They may also be plagued by rather basic technical problems, such as unstable power supplies, lack of spare parts, etc.

In addition, the manpower demands of operating specialized information services may exceed the capacities of many smaller or poorer countries.

Even if these constraints are circumvented, the results could be disappointing. To the extent that these problems can be surmounted, urban, modern institutions may be the major beneficiaries. Thus, specialized information services could widen the gap between traditional and modern sectors, unless vigorous efforts are undertaken to tailor the technology to the needs of development. There is a pressing need to examine the means by which governments and other institutions seeking to improve the conditions of the poor can use these services.

FY 80 Intensive Planning Activities: IFTC will, in collaboration with developing countries, undertake an in-depth analysis of the conditions under which information systems can be effectively employed for development purposes. The results of this analysis will be considered at a workshop of information users and information scientists. Growing out of the workshop will be a plan for pilot information projects in selected fields for implementation in FY 81 and thereafter.

COMMUNICATIONS AND INFORMATION

Illustrative Project

Title: Mass media applications.

Purpose: To determine the factors which can impede the success of mass media in supporting development projects, and to stimulate better performance in the future.

Background: Despite the explosive growth of mass media in developing countries, there have been relatively few successful applications of media to development problems. For every successful Latin American "radio school" or African "health campaign" a larger number of projects has produced disappointing results due to:

- the difficulty of establishing mutual understanding between professional communicators and substantive specialists in the various fields;
- bureaucratic rivalries and jurisdictional disputes;
- organizational and managerial deficiencies, and
- inadequate understanding of the needs and characteristics of the target audience.

In recent years, however, a number of projects have achieved more promising results, such as Senegal's Rural Education Radio, the Dominican Republic's Radio Santa Maria, and Ecuador's Radio Mensaje. Each of these projects has featured rural people expressing themselves on the air in order to stimulate "bottom-up" development.

Another type of project, such as the AID-funded Village Education Project in Guatemala and the Radio Mathematics Project in Nicaragua, has concentrated on professional design and testing of development messages -- in the first case on farming practices, in the second case on elementary arithmetic.

Both these approaches to programming, combined with the accumulating experience regarding the management and evaluation of media projects, suggest that better performance can be obtained than was the case just a few years ago. The importance of this work is underscored by the fact that vast rural and poor populations now have access to the media, especially radio. A small increase in the quantity and quality of development applications of media could have a great payoff for agriculture, health, and education.

FY 80 Intensive Planning Activities: IFTC will sponsor, in collaboration with research centers in developing countries and possibly the East-West Center Communication Institute, a comparative study of projects employing mass media for the benefit of rural populations. Results will be discussed in a workshop of people from representative projects, from communications policy making positions in developing countries and from international funding agencies. The outcomes will include practical guidelines for planning funding and implementing effective media programs, and orientation for subsequent IFTC activities in this area.

COMMUNICATIONS AND INFORMATION

Illustrative Project

Title: Communications Policy Research.

Purpose: To survey, summarize, and advance the state of the art of policy-oriented communication research in the developing world.

Background: Most investments and operational budgets for communications in the developing world are and will continue to be made by governments. As a result, government communications policies assume an importance not ascribed to them in the United States, where the trend is towards deregulation of an overwhelmingly private media system.

UNESCO and some academic bodies have focused upon the importance of policy-oriented research as a basis for national communications policy-making. A recent volume from the East-West Center Communication Institute, however, stressed how few effective methodologies have been developed and how little good policy-oriented research has been done.

Although the impact of developmental applications of media has been relatively well studied, the impact of non-developmental communications (entertainment, news, and the telephone) have not been investigated from a policy perspective. These may have greater impact on peoples' attitudes, knowledge and behavior than the relatively minor uses of media for development purposes.

Policy-makers also face increasingly complex choices of investments within the communications field because of the rapid rate of technological advance. They need to be cognizant not only of existing options, but of alternatives which will be available in the foreseeable future.

The rapid advance of satellite technology may make unnecessary the costly installation of micro-wave networks to cover a country. Micro-miniaturization may soon offer planners the option of placing affordable ground stations in relatively remote locations. Digitization promises to permit the combination of telephone traffic with data, text, radio and television transmission.

Most of these technologies, however, are not yet operational even in the developed world, with its reservoir of financial and technical resources, and, they are being shaped with the major markets of the world in mind. Therefore, the potential for "leap-frogging" in communications and information needs careful analysis.

Another set of policy questions involves the trade-off between investments in communications and in other infrastructures such as transportation, water supply or electrification. Some communications scholars believe that investments in the field generally receive too low a priority because the impact of media on human social as well as productive behavior is underestimated.

FY 80 Intensive Planning Activities: In order to confront these issues, IFTC will begin by financing state of the art studies covering the major policy questions outlined above. In addition to available research results, existing methodologies for conducting policy-oriented research in communications will be summarized and discussed.

The resulting statement will be submitted to the scrutiny of a workshop involving policy-makers, academics, and industry representatives. Recommendations for IFTC activities in subsequent years will grow out of the shortcomings and gaps in knowledge identified in the workshop.

8. ENERGY PLANNING AND NEW ENERGY SUPPLIES

INTRODUCTION

Developed and developing countries share the world's energy problems, and solutions must evolve from a collaborative approach to their resolution. The energy problems are twofold:

- the economic costs imposed by increasing oil prices, with continued depletion and shortage of supply forecast in the next two decades;
- the escalating environmental degradation and poverty caused by increasing demand for traditional fuels such as firewood, dung, and crop residues.

The U.S. is concerned with continued access to oil supplies to meet our growing oil deficit, and over the longer term we seek an increase in world energy supplies, increasingly from renewable energy sources, while decreasing the risks of nuclear proliferation. The developing countries, many of which no longer receive AID assistance, will play a critical role in meeting world energy needs. Mexico, Brazil, Venezuela, and Nigeria are obvious examples. The U.S. needs programs which respond to the requirements of these countries in the energy field in support of our national policies.

BACKGROUND

Traditional fuels - firewood, dung, biomass - supply over one-half of the world's people with energy for cooking and heating, at a pace which is now outstripping regrowth capacity. Forests are being denuded, dung diverted from agricultural fertilizer to home fuel. At the same time energy demands in the developing countries are growing to meet modernization plans for agriculture and industry and for rural electrification. Developing countries must have the capacity to undertake more effective energy analysis and planning strategies that recognize the link between energy and development. They must make the best use of their existing energy resources, both conventional and renewable and develop alternative energy systems where existing fossil fuels are inadequate.

CURRENT PROGRAMS

AID is mounting a major program in renewable energy, focused on the basic human needs of rural people in AID-recipient countries. This is an operational effort to train people, build developing country institutions and demonstrate the economic, technical, and social feasibility of alternative energy systems. AID does not finance intermediate research or assessments.

DOE energy programs emphasize the domestic benefits of its energy programs which center research programs on the sometimes unique energy problems and scale of need facing the U.S.

The World Bank has recently approved a program to expand oil, natural gas, and coal production based on studies which indicate that as many as 55 oil importing developing countries have economically viable deposits.

President Carter joined with other Heads of State at the Bonn Economic Summit in July, 1978, for an intensified effort to bring into use renewable energy technologies in developing countries. The U.S. programs emerging from that process will form a major part of the U.S. energy program in the North/South discussions of energy, which will take place in the 1979 U.N. Conference on Science and Technology for Development, and the newly approved 1981 U.N. Conference on New and Renewable Sources of Energy.

THE INSTITUTE'S PROGRAM

- Collaborative Research. Developing countries such as Mexico, Brazil, and India desire a real partnership between their own and U.S. scientists in working on problems from which the U.S. has much to learn (e.g., gasohol in Brazil). Collaborative research programs can expand the understanding of energy problems in a future where oil is no longer cheap and where experience in developing countries could have positive spin-off for U.S. domestic needs.

ENERGY PLANNING AND NEW ENERGY SUPPLIES

Illustrative Project

Title: Analysis of Centralized Energy Systems

Purpose: To develop alternative approaches to meeting expanding energy demands in the developing countries.

Background: Energy decisions play a dramatic and pervasive role in economic development. One of the most significant decisions is whether to extend the central power grid. Previously there was an obvious trend toward extension of a grid, but today's technology may provide alternatives.

Countries are finding that the escalating fossil fuel prices have impaired their ability to generate electricity centrally. Consequently, there is need for more complete understanding of the advantages and disadvantages of centralized power systems as well as the relationship between these systems and the various levels of economic development.

FY 1980 Project Initiative: IFTC plans a research program involving scientists of both developing and developed countries that will focus attention on generic grid/non-grid questions. Typical development scenarios can be designed to demonstrate the grid/non-grid alternatives associated with common types of agricultural and industrial growth found in developing countries.

IFTC can play a unique role with this type of long-term problem analysis by providing the basic research needed by developing countries as well as the World Bank, DOE, and AID. The special relationship of IFTC with more advanced developing countries such as India, would provide an operational as well as a theoretical basis for this work.

ENERGY PLANNING AND NEW ENERGY SUPPLIES

Illustrative Project

Title: Technology Assessment of Rural Energy Systems

Purpose: To test the economic and technical feasibility of introducing and expanding alternative energy technologies in the rural areas.

Background: The energy needs of the rural poor will not be met unless low-cost technologies are found, because conventional grid systems tend to be economic only in areas of considerable commercial or industrial activity. Many of the "low-cost" technologies which are being introduced in rural areas today, however, are proving less effective than expected. Methane gas devices in India have cost-benefit and maintenance problems; solar pumps are not yet competitive with diesel; biomass programs often compete with the need for livestock feed.

Extensive research on new technologies such as coal, oil shale and solar all have applicability for developing countries, depending on their resource endowments. Over the next decade, developed and developing countries alike will be undertaking extensive research and demonstration of such technologies to determine their potential. A significant portion of that research should be directed to rural needs. Substantial funds can be saved if a thoughtful analysis is carried out prior to major investments in demonstration programs of new technologies.

FY 80 Project Initiative: IFTC plans to review technologies currently being investigated and to link researchers and sponsors of demonstration projects to compare findings on current and projected technical, economic, and social characteristics. Comparisons will be made of how the technologies match the needs of developing countries, and of cost, environmental, and social impacts. The developing countries themselves in collaboration with IFTC will identify needs to which the technologies can be addressed.

ENERGY PLANNING AND NEW ENERGY SUPPLIES

Illustrative Project

Title: Energy Supplies for Urban Areas

Purpose: To explore alternatives for the resolution of the increasing urban energy problems in developing countries.

Background: The escalating rural to urban migration has created severe urban energy deficiencies. The urbanization process has seen the world move from a 5% urban population in 1776, to 30% in 1950, 40% in 1975, and a projected 50% by the year 2000. Unless developing countries implement effective urban energy policies, they will find productive capacity severely limited, and many of the urban poor unable to obtain energy to meet their basic human needs.

Developing countries must carefully consider the resource mix to meet their energy needs. If developing countries rely only on conventional electrification or oil-based systems, they would short-change the urban poor because of rising costs of such systems. Alternatively, they would demand a much larger share of the world's petroleum resources. Present net exporters could become net importers.

The energy systems of urban centers in developing countries are already outmoded and overstrained. Existing systems were built to meet demands of a colonial system, prior to the rapid population growth, and industrial/commercial expansion of the post-colonial periods. The systems have been patched haphazardly to cope with present demands, but the problems remain which include:

- Major breakdowns in the system, with frequent electrical blackouts and brownouts. Low electric power reliability means back-up systems are essential, but also means lower economic returns than with a reliable energy system.

- Limited services for the urban poor because of high costs of conventional energy systems. Adequate heating, sanitation, and minimum lighting are unavailable to many slum residents.
- Pollution and congestion. Unclean air and massive traffic congestion are frequent occurrences with attendant undocumented but very real economic and social costs. Examples are Bangkok, Lagos, Teheran, Sao Paulo, and Mexico City.
- Inefficient use of resources. The haphazard nature of the energy systems leads to wasting precious resources in chaotic transportation, in industry, and for household use. There is tremendous potential return from conservation of oil and traditional fuels.

FY 80 Project Initiative: IFTC will initiate collaborative analyses of the urban energy problems, combining the best skills of the U.S. scientific community with problem solvers from the developing countries. Problem areas include:

- Research and development of low-cost systems that meet the basic human needs of the urban poor. Combining health, heating, and other considerations, new technologies may prove exceptionally valuable in congested urban settings.
- Information exchange. Recognition of the special energy problems of urban areas is growing. IFTC will promote exchange of information and collaborative work among developing countries themselves to spread knowledge of effective techniques.

W/10/80/1000A

9. ENVIRONMENTAL PROTECTION AND NATURAL RESOURCE MANAGEMENT

INTRODUCTION

Environmental concerns were once considered a "luxury problem" of the developed countries. Now they are recognized as harboring a major crisis for the developing countries and for the natural resources of the entire world.

- Forest area is shrinking throughout Africa, Asia, and Latin America; the annual forest loss is estimated at 17 million hectares. Major exporters like Malaysia and the Philippines now face depletion of their forests in another 12-20 years.
- Soil erosion, caused by deforestation, poor conservation practices, and unplanned development, is silting dams, destroying agricultural productivity, and causing famine. In Ethiopia, scene of major famine in recent years, the loss of topsoil is estimated at one billion MT a year, equivalent to 60,000 hectares one foot deep.
- Fish production is declining unexpectedly just as the world is looking more to aquaculture for its protein supply. Thailand's once rich gulf is no longer able to produce, as a result of pollution, sending Thai fishermen as far away as the coasts of Africa to make their catches.
- In Europe and the U.S., the natural resources imported from the tropics are threatened by poor management and environmental degradation, leading to higher prices and potential scarcity.

BACKGROUND

The growth of population, the spread of agriculture, the search for fuel, and the unexpected adverse affects of modernization have combined to threaten the great natural resources of the developing world. Exporters are becoming importers; Brazil, with the great resources of the Amazon, is a net importer of forest products.

Lack of management tools further hampers sound development of these resources. There have been few comprehensive natural resource assessments. Less than half the world's forests have been surveyed, and even fewer more than once to monitor change. New technologies exist to facilitate assessments, such as remote sensing, but developing countries lack the skills and facilities to make full use of them.

Natural resource management represents an area of mutual concern and benefit to the developing and developed world. Preservation and proper exploration of these resources are the lifeblood of the Third World's economic potential. They are also vital to the commercial and industrial operations of the developed countries. Yet this has been an area often of confrontation rather than cooperation. A development approach, producing the skills for self-reliance, growth, and international collaboration on a basis of equality, is surely needed.

CURRENT EFFORTS

International efforts in environment and natural resource management have been stepped up in recent years as the problems have become more apparent. Under U.N. sponsorship, the Stockholm Conference on the Environment was held in 1972, conferences on Water and Desertification were held in 1977, a conference on renewable energy resources will be held in 1981.

These and other fora have led to new programs in forestry, control of desertification, coastal zone protection, and environmental planning. For example, nineteen West African countries are being brought together under UNEP auspices to protect the West Africa coastal zone. The Governments of Kenya, Zaire, Indonesia, Nigeria, Philippines, Guyana, and Guatemala have begun explicit environmental planning programs.

Yet the links between developed and developing countries in these areas are weak. Programs to utilize remote sensing and other satellite technology for resource management are spasmodic and lack an international framework as exists in the communications field. No U.S. assistance programs focus significantly on natural resources unrelated to food and agriculture; no U.S. agency has a clear mandate to link developing countries into U.S. domestic programs aimed at preserving and protecting the world's resources.

THE INSTITUTE'S PROGRAM

IFTC will concentrate on:

- forestry, including research on fast-growing species, more efficient uses of wood for fuel, and reforestation program development.
- coastal zone protection, including linking developing countries into NOAA's program in this field, joint research with coastal neighbors such as Mexico, and aquaculture development in cooperation with universities and industry.
- expanded use of U.S. remote sensing capabilities including related data analysis and utilization techniques, collaborative training programs in data interpretation, and integrated survey/management programs.

- environmental planning, including soil conservation, pollution control, reforestation, sound natural resource development.

PLANNED FY 1980 PROGRAM

Project Initiatives	\$ 1.0 million
Forestry Resources	
Intensive Planning Activities	\$ 1.4 million
Natural Resource Assessments	
Coastal Zone Protection and Development	
Pollution Control	
Total	\$ 2.4 million

ENVIRONMENTAL PLANNING AND NATURAL RESOURCE MANAGEMENT

Illustrative Project

Title: Forestry Resources

Purpose: To evaluate current forest and woodlot management practices and to assist local institutions to better allocate and preserve this resource important as fuel, as raw material for construction and craft industries, and as a major element of environmental preservation.

Background: Remarkably little is known about the ecology of tropical forests, the economic value of their plant and animal species, or their role in regional and global climate. Unless tropical deforestation is soon halted, the forests may be virtually destroyed early in the next century. We are already seeing the impact of their diminution; shortages of wood products and fuel, erosion of soil and silting of water systems vital to the production of food and power, and the loss of plant and animal species. Forestry administration, when it has existed, has tended to concentrate on large area woodlands serving national interests. This is obviously important but increasingly the interaction between rural inhabitants and the forest resource is seen as key to better utilization.

Tropical forests have received less attention than other resources in the past but international concern has grown rapidly in recent years. In February, 1978, the World Bank released a policy paper giving higher priority to the protection, conservation, and wise use of forests. FAO, UNESCO, UNEP, and the OAS have instituted forestry activities as have a number of donor countries. An AID FY 1980 program, "LDC Forest Resources", proposed for transfer to IFTC, undertakes necessary capacity-building for developing countries. Recent conferences include:

"Research in Forest Economics and Forest Policy", Resources for the Future January, 1977, "U.S. Strategy Conference on Tropical Deforestation", Department of State and AID June, 1978, and "8th World Forestry Conference", Jakarta, Indonesia, October, 1978. Among the recommendations were that greater attention be paid to the role of forests and wood products in rural economies.

FY 1980 Project Initiative: Among topics requiring greater attention are: (1) rates of rural forest loss and projected environmental and economic consequences; (2) current relative priorities for rural and urban wood consumption; (3) changes in traditional methods of allocating the forest and woodlot resources; and (4) new or improved forms of local resource management. To address these issues, IFTC will initiate research analysis on tropical, temperate, and arid forestry in from four to six developing countries. U.S. and indigenous institutions will collaboratively investigate the factors and organizations influencing resource allocation, conservation of wood-based fuels, silvicultural policies for the commercially exploited and rapidly depleting tropical hardwoods, integrated forestry and agricultural production, and the economics of rural forest production. Special attention will be given to evaluating reforestation programs supported by the World Food Program and others to determine the most effective approaches. Linkages between and comparative analysis among cooperating country programs would lead to recommendations for improved development and management of rural forest resources. The results of this work would be of direct benefit to AID, the IBRD, and other donors as well as the developing countries, and could have substantial long-term benefit for the U.S.

ENVIRONMENTAL PLANNING AND NATURAL RESOURCE MANAGEMENT

Illustrative Project

Title: Natural Resource Assessment

Purpose: To improve developing country skills in the survey, inventory, and utilization planning of natural resources.

Background: Productive management of natural resources is an interest of both developed and developing countries. The U.S. relies almost totally on import supply for thirteen minerals. Developing countries are an important source for these and projections indicate growing U.S. dependence on developing country mineral, timber and other resources in coming decades. At the same time, developing countries are concerned about their ability to manage exploration, investments and contracts, potential for local processing, and planning for resource exploitation. The developing countries obtain major export earnings from minerals and natural resources. Water is the key to agricultural production, hydro-electric generation, and better health. Wood is a primary source of fuel as well as construction material. It is necessary to increase developing country skills and to provide more accurate assessments of present resources of vegetation, land use, water, geology and minerals, and human and animal populations. The information should be organized to be of value to planners with provision for periodic and systematic updating. Resource assessment is an essential precursor to rational resource management so vital to meeting the needs of the world's expanding population.

AID programs touch on several of these concerns but only tangentially. Programs addressing the protection and exploitation of natural resources of commercial interest to the U.S. are not directly part of AID's focus. Recent legislation directs OPIC to participate in developing country mineral exploration where it is in the U.S. interest.

The World Bank has increased support for mineral projects in the past several years, most recently in regard to oil. Efforts to address natural resource assessment in a comprehensive fashion however are lacking, particularly the development of developing country technical and management capacity.

During the 1970s, the U.S. has actively pursued remote sensing especially through LANDSAT. AID bilateral and regional programs have provided for developing country training and acquisition of remote sensing data. This effort needs expansion to broaden both the number of developing countries able to benefit from this U.S. technology and the skill levels for interpretation and utilization necessary for application of remote sensing to resource assessment needs.

FY 1980 Intensive Planning Activities: IFTC can help in several, if not all, of these concerns. It can particularly assist in improving developing country capacity to map, inventory and value resources, to manage renewable resources for sustained production, and to evaluate commercial resource development options. Technologies for mapping and assessment are available in combinations of remote sensing, field study, local investigation, and advanced forms of data analysis. An institutional base is in place in a number of developing countries with which cooperative programs can be initiated. IFTC can facilitate collaboration between U.S. agencies, e.g., NASA, USGS, and NOAA, U.S. institutions, and developing country institutions in programs of mutual interest. IFTC would in FY 1980 undertake detailed planning for a multi-country program of resource assessment to be implemented in FY 1981 and years following.

ENVIRONMENTAL PLANNING AND NATURAL RESOURCE MANAGEMENT

Illustrative Project

Title: Coastal Zone Protection and Development

Purpose: To perform training, research, and information exchange on coastal zone problems important to developing countries.

Background: It has been estimated that upwards of three-quarters of the world's population live in or within reasonable proximity to a coastal zone region. The coastline, tributary river basins, and tidal areas are an important economic and food resource to most developing countries since coastal zones are among the biologically most productive regions on earth, particularly the estuaries. Coastal zone management is a broad-based concept requiring inputs from many perspectives; fishing, shipping and transport, foreign and domestic tourism, mining (including petroleum extraction), manufacturing, forestry, agriculture, and settlement. Thus, coastal zone protection and development combine elements of environmental management on the one hand and physical and regional analysis on the other. Other complexities are involved. With the exception of a few long coastline nations such as Brazil, Argentina, or India, most coastal issues involve cooperation among several governments. UNEP, for example, is currently working to bring together nineteen nations for a collaborative project to protect the marine environment and coastal area of West Africa. Differences exist between and within countries on national economic priorities, emphasis on environmental quality, awareness of potential interactions and long-range impacts of various coastal zone activities, and the costs of coastal zone protection which are sometimes perceived to outweigh at least the short-term benefits.

Under the Coastal Zone Management Act of 1972, states are being encouraged, in cooperation with the federal government, to develop and implement management programs to achieve wise use of land and water in the coastal zone including wet-lands, reefs and barrier islands, shell fish and fishing areas, and marine related industries. Although the Act has domestic focus, the experience being acquired through its implementation by NOAA's Office of Coastal Zone Management is in many instances relevant to problems faced by other coastal countries, the contiguous coastlines of Mexico and the U.S. being a special case in point. The 1976 Sea Grant Program Act authorized an International Cooperation Assistance Program to enhance marine research and development capabilities of developing countries and to promote the international exchange of information and data on marine resources. Grants have been made to U.S. universities to work with developing country institutions. The initial emphasis has been on education and training. NOAA's Environmental Data and Information Service maintains five centers all with international data holdings. Particularly relevant in this regard is the National Oceanographic Data Center (NODC) which has the world's largest collection of oceanographic information. NODC has special responsibilities to the UNESCO Inter-Governmental Oceanographic Commission and is the data repository for the joint research program in the Caribbean region. UNEP supports several regional research programs on coastal zone management. NSF-administered bilateral science agreements with developing and developed countries involve joint research projects some of which relate to coastal zone problems. The Inter-Governmental Maritime Consultative Organization provides developed and developing nations with technical consultation on environmental aspects of marine transport.

Despite laudable efforts, the developing countries are not equipped to properly manage their coastal resources. Deficits include, lack of coordinated and effective planning/regulation of shore-line activities, insufficient trained staff and facilities for coastal management, and lack of legislation conferring authority to coastal zone agencies.

FY 1980 Intensive Planning Activities: A review of institutions, research, project activity, and publications relevant to coastal zone management is under way. Although the topic is of high priority, the complexity and broad scope of the problems have led to a decision to undertake additional planning before proceeding to project implementation. A working conference of international specialists will be convened early in FY 1980 to help establish IFTC priorities in coastal zone management. The research topics, institutional development, information exchange, and linkages delineated by the conference will, in FY 1980, form the basis for detailed project design activities by IFTC in cooperation with participant countries.

ENVIRONMENTAL PLANNING AND NATURAL RESOURCE MANAGEMENT

Illustrative Project

Title: Pollution Control

Purpose: To provide assistance in structuring environmentally sound alternatives for processes of economic and social development.

Background: Pollution in developing countries has both urban and rural origins. Urban growth has been much faster than the provision of urban services. Many cities and towns have the dubious distinction of combining the environmental ills of industrial economies - water, air, and noise pollution - with those of the non-industrialized world - lack of sanitation, disease, and hunger. In the countryside, efforts to increase food production have led to unwise application of fertilizer and pesticides with attendant concerns about impact on biological systems, plant, animal, and human. Population pressures on the land have resulted in land-use patterns leading to erosion, silting, and desertification. These environmental consequences can often offset the development benefits being sought.

The environmental problem also has become global. The volume and types of pollutants being discharged have moved beyond the stage where pollution was a local or national concern. Today we find pollutants being transported by atmospheric circulation hundreds and thousands of miles from their sources, across international boundaries. Subsequent wash-out as "acid rain" over downwind countries can have severe effects on crops, forests, wildlife, and, possibly human populations. The problem is compounded by the fact that the cumulative environmental impact of today's actions will not be known with certainty for years. Understanding is needed on environmental safeguards which can be mounted in the face of uncertainty, methodologies for early detection of potential threats, and forms of collaborative actions which are economically sound and equitable.

The list of environmental activities has rapidly grown. UNEP serves as the focal point for environmental protection within the U.N. The U.N. Specialized Agencies virtually all have environmental programs. Over 70 countries have national environmental agencies. The EPA and CEQ have provided U.S. leadership in the many aspects of pollution control and environmental protection. There exist numbers of environmental agreements, treaties, and conventions. Continued U.S. leadership is needed along with research and development directed to the special pollution problems of the developing world.

FY 1980 Intensive Planning Activities: IFTC will concentrate its planning on programs to seek and develop low-cost technological solutions compatible with local resources and conditions in developing countries. A second important line of project definition will be methods of planning and analysis to detect and define pollution hazards associated with planned development programs, rural and urban.

10. NON-AGRICULTURAL EMPLOYMENT

INTRODUCTION

Unemployment in developing countries is reaching crisis proportions. It has been described as the most immediate "population" problem, because the work force for the year 2000 has already been born.

- Latin American countries will need to create five million new jobs per year just to stay even with growth in the work force.
- Some developing countries are experiencing unemployment rates as high as 40%; the marginally employed fraction is equally great.
- Urbanization is taking place more rapidly in Africa than any other continent; Latin America is more than half urban.

The problem of unemployment derives from many factors including misdirected policies and development strategies, lack of management skills, inappropriate selection of technologies, and lack of internal market development to which local industry can be directed.

BACKGROUND

In the early 1970s, the ILO began a series of studies related to growth and employment. The studies revealed that some of the more successful developing countries, e.g., Colombia, Kenya, had achieved respectable rates of growth but were faced with alarming rates of unemployment. The studies found that the unemployment problem was in some ways a direct result of certain growth policies which had led to islands of industrial and agricultural modernization amidst a large unincorporated population of generally unskilled workers.

Furthermore, the modernization process has stimulated a rapid process of urbanization demanding greater focus on non-agricultural employment. Indeed, few developing countries have been able to meet the growing employment demands of their populations.

The problem needs to be addressed from several directions. Non-agricultural employment in the rural areas can grow if agricultural technology that is introduced is such that it provides local jobs for delivery, operation, repair and manufacture of equipment and supplies. Sometimes policy choices are significant, e.g., to allow fertilizer distribution to be done through local private or cooperative outlets rather than by the extension service, as was done experimentally in Lesotho. Research and development of locally producible implements is also helpful. In addition, public works can add to both agricultural infrastructure and employment in rural areas.

Industry and services are the key to significant urban employment. However, without policies and programs to expand internal markets, these sectors have limited growth potential. Moreover, the choice of technologies in these sectors can have major impact on the level of employment achieved.

IFTC is not a capital assistance agency and will not engage in development of specific industries. However, a gap in present U.S. Government programs is in mobilization and utilization of skills in the U.S. private sector to help developing countries overcome specific problems. In addition, there is need to link investments in agricultural research and technology to consideration of employment, as IFTC will do, and in helping developing countries undertake policy and program analyses relating technology choice to employment.

CURRENT EFFORTS

The bulk of UNIDO activities are in the form of advisory services and short-term training, whereas the development banks have concentrated on large, capital consuming projects.

Both IBRD and IADB have, however, in recent years initiated trial projects in the smaller enterprise area. IDRC of Canada has experimented with industrial extension and technical information services for the small entrepreneur in Southeast Asia. AID has few programs now in these sectors. There is some support for developing country access to the National Technical Information Service, a continuing program of small-scale entrepreneurial support in West Africa, and studies of rural enterprise in Asia. There is, however, increasing AID concern with off-farm employment in rural development strategies. AT International is moving to help expand the use of locally manufactured technologies.

THE INSTITUTE'S PROGRAM

The Institute will focus on the following:

1. Private sector assistance. A gap in present U.S. Government programs is in mobilization and utilization of skills in the U.S. private sector communities to help developing countries overcome specific problems. The Institute will facilitate programs of management training, cooperative industry assistance and use of retired U.S. businessmen and other experts to help developing countries improve their domestic industries.
2. Standards. The Institute will assist developing countries in the improvements of standards for measurement, and specifications and definitions of products and processes. Standardization is a supporting technology, pervasive throughout science, industry, commerce, and trade. Unfortunately, it has been little recognized in developing countries in its importance for quality control, improved commerce, and more equitable internal distribution of products.

3. Small Enterprises. Work is needed to expand existing forms of non-farm employment through upgrading of skills and/or adaptation of technological techniques. Indigenous capital saving technology in metal working, textiles, wood-working and the like may respond to activities to upgrade their quality and develop local and distant markets. Technoserve is one of the private organizations that has pioneered in this effort. AT International (ATI) is set up to help expand the use of locally manufactured technologies. IFTC will support development and expansion of skills for these purposes, and the research for adaptation of techniques that would be appropriate for rural use. In some cases, ATI might be the executing agent for IFTC grants for research and development in developing countries.
4. Farm-related Employment. Rural public works, agricultural policies, and selection and adaptation of technology will all be areas where the Institute will promote developing country policy studies and analysis of program alternatives. Programs supported by IFTC in agricultural research, energy supplies, forestry, and other problem areas will also be undertaken with attention to employment opportunities and implications.
5. Urban Technology. The urban environment is diverse as are the technological options for positive change. The National Research Council in a recent study has supported the potential role for technology and modern skills in alleviating the plight of the urban poor. The Institute can help in developing these options, especially in areas such as transportation and construction technologies, and the opportunities for labor-intensive service industries. However, the Institute sees careful investigation and planning as prerequisites to programs.

PLANNED FY 1980 BUDGET

Project Initiatives	\$ 1.5 million
Management Skills Standards Improvement	
Intensive Planning Activities	\$.6 million
Sister Industry Program Small Enterprise Development Urban Technology	
Total	\$ 2.1 million

NON-AGRICULTURAL EMPLOYMENT

Illustrative Projects

Title: Management Skills

Purpose: IFTC plans a program for management training involving collaboration with the U.S. private sector. The purpose of the program is to link developing country technology institutions to productive enterprises, to trigger more effective diagnosis of needs and technological search by developing country firms, and to develop more extensive materials and processes for training and manpower development.

Background: The shortage of managerial talent has been repeatedly cited as one of the principal obstacles to the productive application of technology in developing countries. U.S. industrial experts rank the need for management development above research and other technological skills for better use of commercially available technology. According to a recent study by the Fund for Multinational Management Education, "The gap that exists between the average developing country firm and what it should be to effectively plan and acquire technology is so great that almost any program that intends to promote technology must first begin by building an internal capability at the managerial level." Country papers prepared for UNCSTD give management high priority in most sectors including rural development. There is also need for approaches to the development of managers which blend modern techniques with culturally-conditioned, interpersonal behavior patterns. This is essential to the creation of significant indigenous managerial capacity over time. American industry has experience in many countries with cross-cultural management systems and excels in the application of technology for gain.

FY 1980 Project Initiative: A program under discussion with the U.S. private sector would involve the use of managers and technicians from local subsidiaries of American firms operating in developing countries in assisting non-competitive small and medium local businesses to diagnose managerial and technology-related problems and therefore to assist them in beginning technology planning activities. The same corporate individuals would also participate in ongoing training programs at local technical institutions.

These practical demonstrations, combined with the knowledge from the corporate background and work experience, of the experts would be used to develop instructional material for local training institutions participating in the program. Where required, a U.S. institution could assist in the preparation of case material in instructional format for both short-term training and formal education in the developing countries.

NON-AGRICULTURAL EMPLOYMENT

Illustrative Project

Title: Standards Improvement

Purpose: To strengthen developing country capacities for the measurement and specification essential to commerce and technological advance.

Background: Standardization includes two distinct topics: (1) the definitions, artifacts, and methods needed to ensure accurate, compatible, world-wide measurements, and (2) the written specifications and definitions needed to describe the properties and behavior of products and processes. Both are necessary for industrial, agricultural, and social development, but until recently they have not been widely recognized as necessary for progress by developing countries to the same extent as economic, financial, educational, and other infrastructure requirements. Standardization is a supporting technology, pervasive throughout science, industry, commerce, and trade which can provide support to engineering, to mining, to food and nutrition, to environmental control and energy supply, to housing, transportation, communication, and medical services. For developing countries, standardization can be key to entry into world markets and to progress in many fields.

FY 1980 Project Initiative: The Institute can, in FY 1980, structure an initial program with four elements:

1. Instruction on Weights and Measures Control in Retail Markets

All countries accept a governmental responsibility to ensure equity in the marketplace. The fifty states of the Union perform this function well and are happy to show to specialists from abroad the way they operate their weights and measures services.

State weights and measures officials would be asked to participate in a two-week program of instruction for selected officials from abroad with similar responsibilities, scheduled in conjunction with the U.S. National Conference on Weights and Measures. This organization, comprised of state weights and measures officials, meets once a year to enable the participants to interact with each other, with the instrument industry, and with scientists developing relevant new techniques.

2. Surveys of Standardization and Measurement Services for Development

Standardization and measurement surveys would be conducted by international teams of up to ten specialists in fields selected by the host country. The team would work with local personnel to identify the needs of industry and government for measurement and standardization services and to stimulate awareness of the benefits of standards and measurement services provided by nationally managed capabilities and facilities. A report written at the end of each survey would describe the conditions found in governmental and industrial organizations and recommend methods for establishing self-reliant programs in standardization in order to benefit development.

3. Procurement and Maintenance of Laboratory Instruments

One of the difficulties in sustaining a technical program in a developing country is that the complex instrumentation obtained from the more developed countries frequently either does not perform as intended or soon fails in service. The causes of failure are diverse; experiments by Hughes Aircraft, NBS, DRI, and others have indicated that the probability of success in the use of instruments in developing countries can be greatly increased. The Institute could obtain the services of trade associations like the Scientific Apparatus Maker's Association or U.S. companies for the purpose of assisting developing countries to improve their systems for procurement and maintenance of laboratory instrumentation.

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4. Certified Standard Reference Materials

Standard Reference Materials (SRM's) are substances whose composition and properties have been accurately measured and certified to be within certain ranges by NBS. They thus make it possible for laboratories in developing countries to make reliable physical and chemical measurements for selection of raw materials, control of production, and characterization of products at a cost far less than if the laboratory carried out its own absolute calibrations. There is need to disseminate information to developing nations on the usefulness and potential benefits of SRM's. The activity might include the preparation (and translation) of appropriate textbooks, illustrative case histories, and analysis of current and potential usage of SRM's in selected countries. The provision of SRM's and initial assistance in their use would follow.

NON-AGRICULTURAL EMPLOYMENT

Illustrative Project

Title: Cooperative Industries

Purpose: To facilitate access of developing country firms to U.S. industrial skills through cooperative ventures.

Background: A research project carried out for the Department of State by Arthur D. Little, Inc. (ADL) during 1977 and 1978 tested the feasibility, at a preliminary level, of a possible new U.S. initiative in the field of international technology transfer. The activities considered aimed at broadening the channels through which practical technologies are made available to developing country business firms by stimulating the active involvement of small- and medium-sized U.S. businesses in transferring such technologies in cooperative ventures.

The ADL study confirmed that there was an opportunity to broaden firm-to-firm technology transfer and established the functional requirements for an activity that would contribute to broadening the existing channels of transfer. An independent study for the Department of State by FINTER, a Chilean consulting organization, confirmed the appeal of the firm-to-firm approach to medium-sized industry managers interviewed in five countries in Latin America.

FY 1980 Intensive Planning Activities: Although many of these functions are now being carried out by a wide-range of organizations, no organization is performing them all in an integrated, purposeful way to take advantage of the underutilized small- and medium-sized firm resource in facilitating technological change. Minority firms may be an especially valuable resource in such a program. Further study and development work is required, however, before IFTC can take definitive decisions on creating a new activity for this purpose.

NON-AGRICULTURAL EMPLOYMENT

Illustrative Project

Title: Small Enterprise Development

Purpose: To assist the development, growth, and employment potential of developing country small enterprise.

Background: The developing world has a high proportion of small family businesses that employ only a handful of people. In aggregate, these micro-enterprises represent a major opportunity for increased employment and, no less than large industry, can benefit from more productive technologies. Equally important to the growth of micro-enterprise in developing countries are improved linkages with supply sources, markets and credit systems. Capital saving, employment generating technologies and practices can have great impact on small industries in rural and urban settings alike.

Past efforts to improve small industries in developing countries have had limited impact. The reasons are varied. The small entrepreneur is not always eager to avail himself of assistance. Lack of trust, unavailability of complementary resources, resistance to innovation, and inadequate follow up are often cited as barriers. The numerous micro-enterprise technical assistance and extension services which have had success seem not to have expanded and become part of the institutional fabric. Government policies and cultural patterns have constrained the diffusion of information and the proliferation of workable assistance mechanisms and, too often the duration of support has been unrealistically short. If small industries are to have the desired role in employment generation and economic development, new approaches are needed.

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FY 80 Intensive Planning: Many donors are in the process of assessing or re-assessing their position vis a vis micro-enterprise. AT International, OPIC, AID, and the World Bank, for example, are seeking to structure relevant programs. Some PVOs are examining prior experiences in efforts to better characterize program elements essential to success. As noted, Technoserve has played an important role in this field. IFTC proposes a program of analysis and planning in FY 80 complementary to activities of other agencies. The Institute will focus on studies to identify questions and problems confronting small industry assistance which can provide the basis for research and demonstration programs, and which can lead to expanded support from several sources for private activity in this important employment-generating activity. Developing country participation in planning is a vital part of this initial formulation step.

NON-AGRICULTURAL EMPLOYMENT

Illustrative Project

Title: Urban Technology

Purpose: To identify and apply technologies appropriate to developing world urban problems.

Background: Urban poverty is as ubiquitous as rural poverty in the developing countries and the urban share of national populations in these countries is projected to reach 41% world-wide by the year 2000. Many developing countries, especially in Latin America, are at a point where half or more of the population is urban. Africa, though having a relatively low urban population now, has the fastest urbanization rate of any continent. The urban populations in both Africa and Latin America have been projected to approach 75% in twenty years. Among the results are serious urban unemployment, growing shanty towns, and totally inadequate social and sanitary services.

Rural and urban development should proceed apace, with increases in rural income creating new demand for urban based production while urban expansion increases demand for food and rural products. That this has not happened is due in part to the marginal productivity of the urban poor. The development banks have stepped up loans for slum improvement, sites and services, and assistance to small urban enterprises. A major AID effort has been the Housing Guaranty Program. The World Bank has undertaken an urban research program directed to the social, economic, and demographic aspects of the city. Nonetheless, urban problems continue to grow and intensify.

FY 1980 Intensive Planning Activities: The urban environment is diverse as are the technological options for positive change. The National Research Council in a recent study has supported the potential role for technology and modern skills in alleviating the plight of the urban poor. The Institute can help in developing these options, especially in areas such as transportation and construction technologies, and the opportunities for labor-intensive service industries. However, the Institute sees careful investigation and planning as prerequisite to programs.

The Institute would more thoroughly develop its role in this area during FY 1980 through: An in-depth review of the resources and programs now being devoted by others to these problems; the assessment of technological approaches relevant to critical urban problems; and the development of a strategy and program proposals for implementation in FY 1981.

VI. SPECIAL CONCERNS

VI. SPECIAL CONCERNS

A. WHY A SEMI-AUTONOMOUS INSTITUTE?

The Institute For Technological Cooperation is to be a semi-autonomous agency operating in alliance with AID and other elements of the development program, all of which will be responsible to the new International Development Cooperation Administration. The IFTC will provide the longer term research and development base for the overall development program, both bilateral and multilateral. To do this well, the Institute must relate easily to the other aid programs, particularly AID, but operate independently. The reasons for separation are found within the experience of AID and, secondly, the important gains to be achieved through the type of separation planned.

AID EXPERIENCE

Studies of the foreign aid program, from the mid-1960s to as recently as 1977, have concluded that the longer term problem-solving programs and sustained efforts at building scientific and technological capacity in developing countries should be separated out from the other functions of the bilateral assistance program.

Experience and analysis show that the mission to be performed by the Institute For Technological Cooperation and that carried out by AID are different enough to place much different demands on organization and process. To be done well, the IFTC assignment calls for different personnel, a longer time frame, a different programming process, an alternate system of evaluation and a set of relationships quite different from those of AID.

- The personnel needed for the successful R&D effort can best be drawn from the science and technology communities, public and private, and must be well versed in advanced research methodologies and knowledge of their fields. They should view their career line as relating to research and its application. Those in the IFTC must be able to work well with these communities both domestic and foreign, be supportive of their efforts and create an atmosphere attractive to them.

- The R&D program should set goals in the multi-year time frame needed to achieve the research goals. The new varieties of wheat developed by the Rockefeller Foundation in Mexico took two decades to bring to widespread use.
- The programming process of the IFTC must reflect an ability to move in a rapid and flexible manner which permits taking advantage of the promising new development, at home or abroad, which may lead to a line of trials or adaptations. Such flexibility is difficult to attain in a large agency with multiple important demands based on a series of country program commitments.
- The IFTC will establish the type of evaluative system directly appropriate to its mission. Such a system calls for tests of relevance in program goals and design, monitoring of actual applications, and analysis of the value of the product. Experience has shown that research designed, directed, and evaluated in this way has provided a high return on investment.
- The relationships needed for the IFTC involve close ties to the S&T communities abroad and in this country. Ties should evolve directly with individuals and public and private institutions and should be less channeled through governmental procedures abroad. It is particularly important to work closely with institutions abroad which are devoted to developing and testing technologies which address basic human needs.

Over the years, AID has tried to maintain an added problem-solving focus and management within its larger, country-oriented system. As a result, AID has been able to sponsor some significant long-term research programs and contribute to others initiated by international organizations.

However, the leadership of AID over the years has confirmed the serious difficulty in meeting the special requirements imposed by the important functions identified for IFTC, given the pressures of a large operating agency pursuing important bilateral program goals. This is evidenced by:

- Operational demands upon AID's technical experts. Inevitably, field missions demand the services of the best of AID's technicians to help solve immediate problems. This is healthy for AID's field work, and a needed service. But it draws away talent from the intermediate and long-term problem-solving function, thus diluting its effectiveness.
- The decline in scientific and technical specialists. In recent years, the number of specialists within AID has declined. The priority given to country-specific programs places longer-term research in a secondary role and one result has been difficulty in hiring and retaining technologically qualified personnel.
- Contract procedures. AID's standard form of agreements can be administered by developing country governments with which AID works directly, but not always by other developing country institutions which would be in the forefront of R&D activities. AID has tried to establish separate, flexible procedures for such purposes, but this presents administrative difficulties and small research activities overseas may be cancelled.

AID's experience parallels that of the private sector. Business enterprises find it necessary to "shield" their R&D activities from the immediate demands of current operations. Bell Laboratories and Exxon Research are prominent examples of this practice. As the history of the Bell Laboratories demonstrates, this shielding need not make R&D esoteric or divorced from the demands of the appliers or beneficiaries. Rather it enables that function to focus on more fundamental problems and to develop technological adaptations that have major commercial and practical implications.

The IFTC, as part of the new International Development Cooperation Administration, provides this type of "shielded" effort, while being closely coordinated with AID and the other assistance program agencies.

ROLE OF THE IFTC

The proposed Institute For Technological Cooperation reflects the AID experience and, furthermore, is based on an appraisal of the advantages which can be gained through the type of organizational separation planned. Through the IFTC, as proposed, the overall U.S. development assistance effort can gain these advantages:

1. Productive Balance of Relevance and Independence. While IFTC will operate in a semi-autonomous fashion, it will be close enough to AID to ensure that its work will be relevant and used by AID in its programs. A number of operational features will ensure this, including the fact that both agencies will be responsible to the head of the International Development Cooperation Administration.
2. Broadened Application. IFTC will be in a better position to contribute beyond AID, i.e., directly to developing country programs and to the work of multilateral agencies and others engaged in development. It will work closely with them, not just with AID. The need for new, usable technology is clearly evident in development programs generally, in those under multilateral bank auspices, UNDP, etc.
3. Involvement of S&T Communities. As a smaller, sharply focused agency, the IFTC can establish an operating style and atmosphere which will be more attractive to S&T communities, thus bringing to bear much needed new talent on pervasive development problems. It offers the opportunity to engage scientists in meeting needs abroad in ways not achieved in the past.

4. Collaborative Approach. The IFTC can establish a new collaborative approach to problem-solving which is in keeping with the present context within which U.S. relations with Third World countries can progress productively. There is ample evidence of the need for a new pattern of cooperation, particularly among countries such as Mexico, Turkey, Nigeria, and Venezuela which have more advanced S&T communities. Such countries offer situations in which we can share both costs and benefits of working together. They reject the donor-donee relationship and insist on a more equal status. IFTC offers a means of trying such new cooperative arrangements with middle-tier countries and others.
5. Basic Human Needs Plus Other Problems. The basic human needs emphasis will be at the center of IFTC efforts as they are of priority within AID programs. But IFTC is planned to go beyond and to devote a larger share of its program to problems more recently identified by Congress: energy, natural resource management and environmental planning, non-agricultural employment, problems of rapidly urbanizing societies. IFTC will permit more attention to issues of global maintenance such as those which loom so large in the decade ahead without deflecting the overall aid program from its New Directions priorities.
6. Appropriate Operating Style. The IFTC will be able to establish an evaluative process and operating procedures designed to be efficient for its specific mission. For example, its external review process, emphasis on use of non-career specialists, and use of developing country personnel as Institute Fellows and on the IFTC Advisory Council will add to Institute effectiveness and credibility. These innovations would be difficult if not impossible within the confines of a large, on-going agency.
7. Private Sector Involvement. Through its role as catalyst, IFTC can involve private sector industries and organizations more directly in activities abroad suited to their broader interests and the needs in developing countries. They have evidenced an interest in playing a more important role and have much in science and technology to offer.

8. Response to UNCSTD Dialogue. The Institute can serve as an important response to the widespread, intense interest in the application of science and technology more effectively to development needs. This lively interest applies to technology at all levels. In this regard, the IFTC initiative fits well within the North-South dialogue leading up to and including the U.N. Conference on Science and Technology for Development in August, 1979. It offers an apparent and very real answer to some of the important issues of UNCSTD.
9. Added Dimension to Domestic R&D. IFTC functions include bringing greater harmony to current U.S. agency R&D activity having a bearing on developing countries. Under the new Department of State Title V mandate, and within an IDCA structure, the IFTC would devise means to add a relatively low-cost overseas dimension to major on-going research programs. This would be a large asset for the development effort and would also provide gains in some cases to the fulfillment of domestic agency goals.
10. Added Perspective in Foreign Aid Policy. Finally, the IFTC focus on problem-solving will add strength to the country and regional focus of aid programming generally. It will provide an added and important perspective within the IDCA policy making framework.

To sum up, experience indicates that the mission of IFTC could not be well performed as an integral part of AID; and there are positive gains in the proposed coordinated, but separate relationship. The proposal for the Institute represents an opportunity to respond to the more complex character of our relationships with the Third World. It proposes a style of operation that emphasizes the application of scientific excellence to important problems and a new type of joint effort with developing country experts.

B. CRITERIA FOR TRANSFER OF PROJECTS FROM THE
AGENCY FOR INTERNATIONAL DEVELOPMENT

The IFTC program, within the reorganized foreign aid structure, will augment the efforts of AID and other development agencies. The Institute is to provide a "critical mass" of scientific and technological effort to focus on relevant problems. On-going research and development projects in AID which meet certain criteria are to be transferred to IFTC during FY 1980.

To determine projects appropriate for transfer, the staff of the IFTC Planning Office and AID have carefully reviewed AID's portfolio of current research related projects as well as new activities proposed for initial funding in 1980. Also reviewed were AID activities directly relevant to improved processes of scientific and technological cooperation which directly relate to the IFTC mission. On this basis, the activities listed below were identified as appropriate for transfer. (It is possible that some additional activities will be transferred based upon mutual agreement between AID and the Institute.)

The following criteria were used:

1. The activity supports intermediate or long-term research related to a significant development problem.
2. The activity is intended to develop a new approach or new knowledge application of existing knowledge or technology. (In this regard, AID will continue to fund a number of activities intended to support AID mission efforts to design and implement projects.)
3. The activity has broad regional or worldwide significance. Country specific research efforts currently financed through mission and regional bureau budgets are not included in the list of items proposed for transfer to IFTC.

4. There is sound reason to expect that the activity will be underway for a substantial period of time, i.e., we do not propose to transfer activities that are near termination.
5. The activity relates to scientific and technological development in subject matters of primary concern to IFTC's mission and broader geographic focus.

The timing of the transfer in each case will depend on project specific factors involving design and implementation of the activity.

ACTIVITIES PLANNED FOR TRANSFER
DURING FISCAL YEAR 1980
(\$ THOUSANDS)

<u>Project Title</u>	<u>Proposed FY 1980 Obligation</u>
International Agriculture Research Centers	\$29,600
Livestock Production--Collaborative Research Support Program, Small Ruminants	1,500
Fertilizer Development--International Fertilizer Development Center	4,000
Fisheries and Aquaculture--Collaborative Research Support Program in Fisheries	1,750
Soil Management--Collaborative Research Support Program in Soils	2,000
Cereal Grains--Collaborative Research on Sorghum and Millet	2,500
Cereal Grains--Spring and Winter Wheat Crosses	400
Cereal Grains--Seed and Plant Material Supply	150
Grain Legumes--Collaborative Research Support Program on Beans and Cowpeas	3,000
Grain Legumes--Collaborative Research Support Program, Planning Grant for Peanuts	250
Grain Legumes--Improved Varieties of Soybeans	700
Reducing Post Harvest Food Losses--Collaborative Research Support Program Planning Grant	250
Biological Nitrogen Fixation--Symbiotic Nitrogen Fixation by Tropical Legumes	800

Biological Nitrogen Fixation--World Rhizobium Collection Center	150
Functional Implications of Malnutrition	1,750
Tropical Diseases--Malaria Research Network	2,276
Tropical Diseases--Special Program for Tropical Disease Research and Training	4,000
Tropical Diseases--International Center for Diarrheal Disease Research	1,900
Study of Side Effects and Mechanism of Prostaglandins	260
Program for Applied Research on Fertility Regulation	1,500
Simplified Techniques of Fertility Control	510
Biomedical Research	240
Man and the Biosphere	1,350
Developing Country Forest Resources	750
Scientific Institution for Development	500
Science Policy, Planning and Management	1,000
Desertification	1,000
Transfer of Industrial Technology	500
Energy Programs--Specific Activities not yet Designated	2,000
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Total	\$66,586

The activities are listed for tentative transfer. Not all projects would be transferred at the beginning of the year and the final list of transfers may differ somewhat from the listing shown above.