A Reference Compilation of Science and Technology Official Development Assistance Furnished by A.I.D. for the Less Developed Countries (LDCs)

Prepared by
Agency for International Development (A.I.D.)
For The
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TABLE OF CONTENTS

INTRODUCTION

This research report, which summarizes Official Development Assistance (ODA) to Less Developed Countries (LDC's) by the Agency for International Development (A.I.D.), is intended to meet the needs of participants in the United Nations Conference on Science and Technology for Development.

A.I.D. OBJECTIVES

The material herein may be looked upon as a synthesis of A.I.D.'s economic assistance philosophy, which has, of necessity, been flexible in order to blend effectively with the dynamic trends of the past decades. Although bilateral assistance agreements are looked upon as instruments in furthering U.S. interests abroad, the humanitarian interests of the U.S. in the one quarter of the people of the world who must live on a sub-standard level is of equal importance. Consequently, emphasis on basic human needs emerges as a major consideration throughout these pages.

Past A.I.D. experience has shown that sophisticated technology is irrelevant in solving the problems of the LDC's. Hence, the dramatic shift to a light capital, labor-intensive approach is presently employed in science and technology applications.

This change to a "basic human needs" policy, with the support of the "New Directions" legislation, provides the impetus for a new era of economic assistance. Hopefully this will be an era highlighted by LDC perceptions that they are sharing fully and equitably in the world's economic progress.

CHAPTER 1

HEALTH, NUTRITION & POPULATION

Health Planning and Analysis

Closely linked to the basic human needs of the LDC's, A.I.D. focuses on integrated health, nutrition and family services at the community level. By providing clean water to rural areas, and by controlling tropical and parasitic diseases, notably malaria, A.I.D. combines local level improvements with long range health, nutrition, and population planning. The FY 79 A.I.D. budget reflects $148,4 million for health systems (compared to a $126 million request in FY 78). A.I.D. will continue to support integrated health delivery, health planning, potable water projects, and disease control.

Efforts to improve the efficient use and equitable distribution of health sector resources to LDC's are targeted to an A.I.D. funded health planning grant to Johns Hopkins University (JHU). This project trains economic and social planners to observe the relationship of health planning to overall economic development. All A.I.D. mission-financed projects stress the researching of new methods of planning and analysis in developing countries and continued improvement in management.

Health Sector Analysis Studies in Asia, the Near East, Africa and Latin America, are contributing to the improved planning of development projects. The Office of International Health of the Department of Health, Education, and Welfare (HEW) continues to provide advisory services in health planning to the four geographic areas. JHU, supported by grants from A.I.D. and elsewhere, provides a multidisciplinary institutional resource for education training and advisory services on health sector analysis, planning, and low cost health delivery systems. JHU has provided services to ten countries and has established direct collaboration with indigenous institutions in three LDC's. Since 1962, JHU has trained 225 senior health personnel from LDC's in special health planning courses. The University of Michigan has developed a full-year multidisciplinary course of health macro-planning, and researched alternative health technologies on child care and infant mortality. Demonstrations of various techniques for analyzing health policies are being tested in three

LDC's. Other participants in these health planning efforts are the Ford Foundation, the World Health Organization, and the Christian Medical Commission. In FY 79, JHU will continue short term training for a maximum of 20 LDC health planners each year. In addition, institutional contracts and a support agreement with OIH-DHEW will make available technical advisory services to approximately 10 developing countries in health sector analysis. The primary beneficiaries of this A.I.D. health planning effort are the LDC health ministries. This A.I.D. funded project is projected to spend $2 million in FY 79. Since its inception, 12 health sector assessments, and 7 health sector manuals have been completed, and 238 LDC planners have been trained.

MANAGEMENT

Cameroon is a typical example of the management of rural health programs in the LDC's. For several years, both the Cameroon government and A.I.D. have given primary attention to the development of rural health services in Cameroon. A.I.D.'s attention, usually reflected in small pilot projects or surveys, includes a significant contribution to the establishment of the University Center for Health Sciences. With this project, A.I.D. has made a substantial input by collaborating with an LDC in the development of a training program which is expected to produce, by 1983, 200 middle level health workers and 1,000 village level health workers each year. A.I.D. will also provide material and technical assistance to the further development of the system within which these health workers will function. The impact of this project is seen in the estimated 50% of the rural population which should be reached by trained personnel.

The significance of A.I.D.'s contribution to this effort is seen in the projected $15 million which is planned to be authorized for the project through its completion in FY 84.

Environmental Health

Malaria Control

Major health problems such as malnutrition, common infections, and overpopulation which confront the poor of the LDC's have been somewhat reduced through A.I.D.'s strategy of integrated village-based health care. Tropical or parasitic diseases, however, require additional intervention directed at eradication and control. Malaria remains a major target of A.I.D.'s efforts. This health

problem is plagued by increasing vector resistance to insecticides such as DDT. Until effective residual insecticides are developed, malaria eradication remains a complex problem demanding special efforts by many disciplines. The following areas summarize A.I.D.'s efforts to reduce the incidence of malaria, one of the most critical disease problems of the LDC's.

Technologies:

Vaccine Development

A collaborating network of nine malaria research institutions has been established to search for a malaria vaccine. A continuous malaria culture system has also been developed at Rockefeller University. This method has led to further progress towards the mass production of immunogenic material. The University of Hawaii has successfully immunized monkeys against human malaria, and research continues.

Source Reduction Technology

This area involves delineating endemic areas of malaria with a follow-up attack phase for spraying inhabited dwellings and a case detection system for treatment. A consolidation phase intensifies continuation of earlier surveillance and detection activities. The final maintenance phase investigates and treats on a less intensive scale in an effort to prevent the reintroduction of malaria. The emphasis shifted in 1972 to the development of new technologies, reducing dependence on DDT. For example, A.I.D. in collaboration with WHO is currently supporting Pakistan with a 5 year malaria control project, stressing these technologies.

Pesticides Development

Increasing vector resistance to insecticides magnifies this problem. Methods are being developed to maintain high potency in DDT and other insecticides. Progress has been made in new approaches to vector control (trapping natural pathogenic agents, sterilization or other genetic manipulation, biodegradable compounds).

Logistics and Management Systems

The complexity of the logistics and management systems related to malaria control is seen in the 18 countries currently assisted by A.I.D. in anti-malarial campaigns. Equipment and methods for storage, shipment and application

have been improved, and flexibility has been encouraged to permit rapid introduction of new technologies. A.I.D.'s assistance in Logistic and Management Systems was demonstrated in Nepal which quickly responded to the change in project emphasis from eradication to control. This resulted in 80% of the population being included within the consolidation phase.

Epidemiologic Intelligence

Epidemiology services develop evaluation techniques to control malaria in all national programs assisted by A.I.D. in the 18 participating countries. A.I.D.'s malaria control program in Indonesia, specifically in Java, Bali, and Madura, stresses continued epidemiological activity to assist the other elements of the campaign.

Biological Control

Considerable effort has been devoted to projects involving mosquito control. Complications continue to arise because of DDT resistance presently experienced in Central America, Pakistan, many parts of India, and other countries. Laboratory activity has been stepped up to cope with the inadequate supply of malaria vaccine. One A.I.D. project involved the improvement of laboratory facilities at New York University School of Medicine to produce a reliable supply of irradiated malaria sporozoites for use by a group of U.S. institutions working on development of human malaria vaccine.

Means of Technology Transfer (Implementation)

Training Programs

The training of malaria workers in program management is a key part of all A.I.D. malaria control programs. For example, A.I.D. has funded a Pakistan project characterized by extensive training and education of the population on the cause and prevention of malaria. The new programs shift emphasis from national to provincial activity. By training health workers to handle problems in rural areas, progress is being made towards elimination of all endemic diseases, including malaria.

Institution-Building

An example of A.I.D. assistance in this area is shown in a two-phased communicable disease control project in Haiti. This project emphasizes the increased institutional

capability of the National Malaria Eradication Service through structural reorganization, improved program management, and the training of the administrative staff.

Trypanosomiasis

Among the parasitic diseases, African sleeping sickness remains a very significant health problem. The disease is confined to tropical Africa in areas corresponding to the distribution of the tsetse fly; in some endemic regions, up to 30% of the population is affected. A.I.D. is involved in both bilateral and regional projects targeted at both research and practical countermeasures. The following summary reflects A.I.D.'s continuing attention to the control and eventual eradication of this health problem.

Technologies:

Vaccine Development

Through the International Laboratory for Research on Animal Diseases (ILRAD), A.I.D. supports research to prevent and control trypanosomiasis and other parasitic diseases which seriously affect the livestock industry in Africa. ILRAD is developing immunological procedures to control trypanosomiasis and, through the publishing of research findings, will assist other institutions in the application of results. The central approach of ILRAD will be to handle trypanosomiasis as a separate program designed to define and then conduct the research needed for the development of control procedures. Involved also is cooperative research with individual institutions in the form of causes, seminars, visiting lecturers and the development of an education resource library together with an information retrieval system. All concerned LDC ministries of agriculture will utilize the A.I.D. supported ILRAD research to upgrade the status of their respective countries in the control and eventual eradication of trypanosomiasis.

Source Reduction Technology

A.I.D. has based preventive measures on the knowledge of the local ecology of the vectors and infectious agents. Priority is given to: destruction of vector tsetse fly habitats by selective brush clearing along water courses or around villages, reduction of fly population by appropriate use of insecticides (DDT/Dieldrin), removal of people from fly-infested areas and their concentration into larger settlements, reduction of parasite population by survey of human population for infection, and subsequent

treatment of infected persons, and finally, by informing local populace on personal measures to protect against biting tsetse flies. An A.I.D. sector grant in Mali under the Sahel Development Program supports a series of discrete activities designed to identify areas unable to support livestock due to the tsetse fly. A.I.D. enhances communications with the nomadic herders through in-country training of leaders in all phases of tsetse fly control. It is estimated that A.I.D. assistance will make a measurable impact within 3 years.

Pesticides Development

A.I.D. assists in the reduction of the fly population through grants for research on hemoprotozoal diseases, with trypanosomiasis of key importance. This disease constitutes a major cause of low animal production and a consequent large reduction in potential animal protein food supply. An A.I.D. funded project at Texas A & M University includes determining ecological factors which contribute to perpetuation of vectors and hemoprotozoal organisms in nature. Emphasizing development of preventive pesticide measures, the project trains host country participants in methodology and organizes problem-oriented research. Research efforts are being concentrated on trypanosomiasis towards the goal of improving livestock production, quantity, and quality. Vector control experiments have been conducted, and a linkage with East Africa, the South Pacific and Australia has been established for the collection and dissemination of related research findings.

Logistics and Management Systems

The effectiveness of A.I.D. support systems is seen in the development of coordinated, highly trained teams for bush clearing and construction of tsetse fly control barriers. Team efforts in conjunction with aircraft equipped for spraying are making some progress towards fly eradication. Such teams also contribute to development projects within controlled areas such as construction of small water improvement works and feeder roads. An A.I.D. tsetse fly eradication loan to Tanzania combats endemic trypanosomiasis in the West Lake Region through the financing of equipment and supplies. With barriers now defined between infested and sprayed areas, progress is being made towards eventual fly eradication.

Biological Control

Economically and operationally feasible techniques

for biological control of tsetse flies is of continuing concern. A.I.D. strategy emphasizes support to the agricultural sector of LDC's with the ultimate direct beneficiaries being the semi-nomadic livestock herders and small farmers who rely on animals for power and food. The need is most obvious in Tanzania where sixty percent of the land area (205,000 sq miles) is infested with sleeping sickness. Since 1971 A.I.D., under an agreement with the U.S. Department of Agriculture, has funded a research project at Tanga, Tanzania, which successfully developed mass colonization, sterilization, and field release techniques for Glossina morsitans, the major species of tsetse in Tanzania. This activity, which terminates in FY 79, identified techniques which will work under controlled and supervised conditions. Extension until FY 83 of the work begun under this project will be necessary to complete the research on tsetse control by genetic manipulation and to refine release and eradication techniques which are economically replicable throughout Tanzania. Specifically, the new project will include (a.) continued monitoring of effectiveness of current field control methods; (b.) experimental application to another species, on Zanzibar; (c.) testing of artificial rearing techniques which would eliminate the necessity of maintaining large herds of host animals, and (d.) preparation of a long-range plan for country-wide tsetse control.

Means of Technology Transfer (Implementation)

Training Programs

In an effort to enable LDC's to manage their own trypanosomiasis programs, A.I.D. supports major training efforts through research grants to Texas A & M University and the International Laboratory for Research on Animal Diseases (ILRAD). Training programs in the form of lectures, courses and seminars are eventually disseminated to LDC's which are the beneficiaries of the A.I.D. funded projects. Under the A.I.D. sponsored Sahel Development Program, participant training in tsetse fly eradication and land use management has resulted in the opening of new lands to cattle production.

Institution Building

Bilateral assistance agreements help the LDC's to develop permanent institutions capable of effective problem solving. Through financial grants and technical assistance, A.I.D. has been assisting the Government of Mali which has created an organization for tsetse fly eradication. This has resulted in a communications capability which will assure continued upgrading of Mali government personnel.

Onchocerciasis- (River Blindness)

A.I.D. participates in a 20-year, multiple donor project in West Africa to reduce and control onchocerciasis, a chronic non-fatal disease which infects the skin and eyes. In some localities, almost all of the population is infected and associated blindness is prevalent. A.I.D. works with WHC, the executive agency for this multi-donor support project. With programs directed at the breeding sites of the female black-fly, Genus Simulium, the control program is now fully operational in the seven-country region along the fertile Volta River Basin. Approximately 10% of total costs, $6 million, will be contributed by A.I.D. for the initial six-year phase of the three-phase program. Tangible benefits are already being seen in the reduced incidence of river blindness in Upper Volta, Ghana, Ivory Coast, Togo, Dahomey, Niger and Mali.

The onchocerciasis control problem exemplifies the negative causal relationship between health and development. Although humanitarian considerations are important, with approximately one million cases of blindness in the program area, the primary justification for the program is economic. Over 65,000 sq km of relatively fertile river soil in the Volta River Basin remained unexploited due largely to the severity of onchocerciasis infestation. The impact of A.I.D. activity is seen in the spontaneous immigration of settlers along the White Volta River since the elimination of the disease-carrying black-fly. A.I.D., in accordance with its basic human needs policy, is organizing the resettlement program, and funds the agricultural development of resettled areas to the advantage of the rural farm people who remain the project beneficiaries.

Technologies:

Chemotherapy Development

The primary aim of the control project is to eliminate the serious eye lesions and other clinical manifestations of the disease. Chemotherapy plays a part in achieving this both by reducing the worm load of an individual to a level at which serious eye lesions no longer occur, and by reducing the microfilarial reservoir (female worm discharge) in the human population. Treated persons then cease to be a source of infection, and transmission of the disease by the black-fly is interrupted. Suppressive actions directed against the microfilariae alone are being conducted. However, chemotherapy directed against the adult worms themselves has a much more prolonged and

fundamental action in reducing microfilarial concentrations. Specific treatment with Diethylcarbamazine (Hetrazan) has proven useful but does cause severe reactions and does not kill adult worms. Suramin (naphuride, antrypol), available in the United States from the Center for Disease Control, Atlanta, Ga., kills the adult worms, leads to gradual disappearance of microfilariae, and is considered for treatment of persons in a highly infected population, but also causes severe reactions.

Black Fly Control

In addition to extensive therapy programs for individuals, A.I.D. assistance is seen in chemical, biological and physical technologies which stress control and eradication of river blindness. Prior to instituting control measures, entomological and epidemiological base-line data is obtained by means of carefully planned and executed preliminary surveys. Thereafter, throughout the course of the control campaign, similar surveys are conducted to evaluate the effectiveness of the measures instituted. The operational phases of the campaign against river blindness are in some ways similar to the phases of the campaign against Malaria. With simultaneous ongoing research and practical control measures, A.I.D. programs function to interrupt disease transmission through identification of breeding sites and aerial spraying followed by entomological/epidemiological surveillance of treated areas to prevent reinfestation. Biodegradable insecticides such as Methoxychlor and Abate are applied, usually in rapidly running streams and artificial waterways which remain the breeding sites for the larvae.

Means of Technology Transfer

A.I.D. assistance during the initial six-year phase of this three-stage multi-donor program initiated in 1974 has radically decreased the incidence of river blindness in West Africa. Plans call for the major thrust of phase two to be realized through the Regional Onchocerciasis Area Planning (ROAP) Project. Organized to assist in the timely preparation of realistic, innovative plans, ROAP envisions the development of onchocerciasis-free zones to assure productivity and a reasonable standard of living for the rural poor. The third stage in this program provides for capital investments together with technical assistance necessary to implement development plans in selected treated areas. Total costs for basic development of these areas approximates $240-300 million, far beyond the financial capability of the participating African governments.

A.I.D. plans to allocate between $240-300 million for the development of the onchocerciasis-free zones over the next 15 years will exploit a valuable opportunity to develop and test innovative approaches to integrated rural development. Flexible programming mechanisms will hopefully emerge to facilitate A.I.D.'s response to requests from participating African governments for assistance programs, which emphasize the self-reliance of the LDC's as the key to more cooperative relationships.

Other Parasitic, Bacterial and Water-Borne Diseases

(Schistosomiasis - Cholera - Yellow Fever - Smallpox - Tuberculosis - Typhoid): A.I.D.'s assistance program reflects a continued emphasis on potentially endemic diseases which, if unchecked, will undermine the productivity of the LDC's and become the main cause of their poverty. The water-borne diseases of schistosomiasis (bilharzia), cholera, and typhoid point to unsanitary conditions and poor irrigation as major obstacles to a country's progress. An A.I.D. grant to Swaziland (GOS) recognized that bilharzia, infecting 150,000 individuals out of 550,000 was a primary deterrent to that country's development. A.I.D. provided an initial survey team and follow-up measures which involved expanded epidemiological capacities, disease control campaigns, engineering measures and health education procedures. Planning calls for the elimination of bilharzia within the next two decades with significant decrease in the incidence of other water-borne diseases. Begun in FY 79 and scheduled to continue until FY 83, this program has as its primary beneficiaries 420,000 people in areas most endangered by water-borne diseases. With a cost per beneficiary between seven and eight dollars, the total cost over the life of the project will approximate $3.2 million.

Cholera and Typhoid

These are preventable diseases but still remain a major cause of morbidity and death to children and adults, especially in the Kairouan Province of Tunisia. Stemming from a lack of potable water systems, cholera and typhoid debilitate the population and hinder the area's development. A.I.D., through technical assistance, was instrumental in halting the persistent spread of the seventh cholera pandemic which infected 50 countries, including many in Africa. With a case fatality rate of 40%, the disease posed a threat to the Caribbean islands and Latin America. A.I.D., in collaboration with WHO, assisted in the formulation of a long-range global strategy for cholera prevention, control

and surveillance. Through A.I.D. grants to WHO, an expanded cholera control program is now assessing the facilities of all threatened countries to determine the level of assistance required to strengthen surveillance and treatment facilities.

Smallpox and Measles

Both have been endemic in Africa and other less developed areas of the world due primarily to a lack of facilities, manpower and organization to permit a coordinated campaign of eradication. With an A.I.D. sponsored Communicable Disease Center in Central and West Africa (final cost $2.4 million), smallpox has been eradicated and measles curtailed in 20 West and Central African states. Ethiopia is the recipient of a $2 million A.I.D. grant to WHO for the last phase of the program, during which target susceptible populations are administered improved vaccines with advanced technology equipment. Improved strategies of surveillance/containment have made eradication possible without resorting to mass vaccinations. Ethiopian field personnel, augmented by WHO experts, execute programs which are administered by the Ethiopian Ministry of Public Health.

Infectious Tuberculosis

A preventable disease, it is still the most frequent cause of death in rural Bolivia. Capital assistance provided by A.I.D. extends regular low cost medical services to 85 rural communities through mobile health teams working with a network of rural health officers and volunteers in each community. The administration of these health education and medical services includes: hygiene and sanitation, nutrition and childcare, tuberculosis control and instruction to the populace through use of audio-visual, radiophonic and printed media. Cost/benefit analysis reveals substantial economic benefit in the low cost of early treatment and health maintenance as compared to emergency and long-term procedures during the period before A.I.D. programs were introduced.

A A tropical environment poses special disease hazards to the labor force during development projects and also during subsequent human migration to these areas. Through A.I.D. technical assistance, the hazards of yellow fever have virtually been eliminated. A.I.D. grants to Panama and contracts with the Gorgas Memorial Laboratory resulted in ecological studies on both the effect of malathion

aerial spraying and developmental projects. These project components included: location and movement of virus wave-front, numbers and types of disease samples and surveying of jungle fauna and flora. With results implemented worldwide, these studies are now a significant element in the planning of projects such as Hydroelectric/ Irrigation dams and major road building within tropical environments.

Primary Health Care

Integrated Health Care Delivery System

DEIDS

Technologies:

An integrated approach to the development of improved health, population and nutrition programs is seen in the special project "Development of Evaluation of Integrated Delivery Systems" (DEIDS). The DEIDS project aims to develop a system through which at least minimal services can be delivered to the majority of populations in rural areas, within the means of the country. Lack of an adequate delivery system has been a major impediment to date. Early attempts to establish high coverage, low cost health delivery projects in populations of limited size have been initiated in India, Thailand and other locations with relatively small population groups, and mainly addressed questions regarding the effectiveness of the mix of health services (including family planning and nutrition). From these preliminary results, larger models have been designed to test different health service combinations. However, the common approach has been to deliver through the public sector a broad array of curative and preventive services at levels either too expensive for national application or too dependent on external resources. Satisfactory coverage in rural areas has very rarely been achieved.

The original pilot program called for long-term experimental work in four representative LDC locations. Such an experiment had never been tried before with a large population base (500,000 or more) in such a manner that general conclusions on acceptability and affordability could be drawn.

In order to carry out a project of this nature and magnitude, new methods of project managemert were applied. The American Public Health Association (APHA) provides the intermediate management responsibility and marshals the necessary professional resources; (1) to undertake selection of countries for the project (phase I), (2) direct on-site project development and planning (phase II), and (3) to guide and monitor implementation (phase III).

A.I.D. missions were informed in 1972 of the DEIDS project proposal, the problems to be addressed, and A.I.D.'s potential input. Fifteen missions responded that their government counterparts had expressed an interest, and required a visit by the APHA in the country selection process.

These fifteen countries in Asia, Africa, and Latin America were visited and Ecuador, Thailand, Pakistan, and Nigeria were selected as potential DEIDS project areas. Concurrently with these phase I activities, the APHA completed a literature survey, initiated selective studies of various ongoing projects in this field, and visited a few project activities. The principal value of the literature search was to verify that there was no published experience data on any successful demonstrations of a wide-coverage, low-cost integrated system.

The DEIDS project has shown that development of an adequate delivery system must take into account the stage of development of the existing health system and the existing state of planning by the government, regardless of its efficiency. Until more efficient systems become possible, developing countries will continue in the low-efficiency patterns which make access to the majority of the populace a difficult task. Through the DEIDS project, A.I.D. is now aware that a national integrated delivery system must include simple subsidiary health facilities for curative and preventive care in areas beyond reasonable access to the few centrally located hospital facilities.

In Thailand, the country was already committed to a nationwide program of health center construction. DEIDS therefore became a part of the existing delivery system and was supportive of the existing system. The economy of the DEIDS program is seen in the training and utilization of the peripheral worker, unpaid volunteers, and indigenous workers. These groups will provide the linkage to the consumer at the end of the Thailand economic system.

In Ecuador the DEIDS program led to a less expensive infrastructure. Planned investments in health center construction, as well as expenses of maintaining and operating such centers, were significantly reduced. As regards utilization of volunteers, the ministry of health in Ecuador proposes to use auxiliary workers paid by the government for these outreach services.

From these various experiences, the DEIDS program furnished valuable experience for applying and developing the infrastructure within the ministries of the less developed countries. Applications such as these will be replicated throughout all of the less developed countries and will assure that the basic health needs of the populace will be satisfied.

MEDEX

A new approach to primary health care systems utilizing locally trained medical auxiliaries is seen in the MEDEX program. For FY 79, A.I.D. requested $148 million for programs of health delivery systems, environmental health, disease control and health planning. The MEDEX program exemplifies the use of these funds to achieve integrated health, nutrition and family planning services at the community level. The MEDEX program, exemplifying the new approach to primary health care delivery systems, involves eight developing countries. A.I.D. support of the MEDEX program is in line with the latest conceptual viewpoints on low cost health delivery systems. This emphasis on primary health care, fully accepted by the 150 member nations of the World Health Assembly, may be adopted for use by the majority of populations in other less developed countries at a cost which the less developed countries can support without prolonged external assistance.

Water and Sanitation

Ninety percent of the populations in developing countries lack access to potable water and sanitary waste disposal. When irrigation systems are installed, they are seldom designed to meet the potable water needs of local residents who, lacking alternatives, draw contaminated irrigation water. The United Nations Water Decade will begin in 1980; yet according to WHO the availability of potable water and proper sanitation in poor countries will continue to deteriorate without substantially increased commitments from donor countries.

A.I.D. attention to the clean water problem has been to focus on the availability of convenient water supplies in all rural areas of the LDC's and to improve the quality of the water used by the inhabitants for drinking, washing and bathing. In Pakistan, for example, WHO reports that 87% of the rural population lacks reasonable access to safe water. The government of Pakistan recognizes the severity of this problem and plans a major investment, with A.I.D. support, in a rural clean water supply and drainage program. A.I.D. assistance to the government of Pakistan is seen in the current Rural Clean Water Supply II (village water systems) program. A.I.D. is assisting in two very closely related projects: Rural Clean Water Supply I, emphasizing hand pumps; and Rural Clean Water Supply II, emphasizing village water systems. A total of $12 million is expected to be authorized for these two activities with $8 million for hand pumps and $4 million for village water systems. FY 79 program ($7 million) will finance the installation of new village water and drainage systems in rural Pakistan, as well as a program to train operators in the maintenance of pipe systems and other specialized water works equipment. Because of their low per capita cost for installation/maintenance, hand pumps are the preferred method for rural clean water supplies. However, in those areas where hand pumps are not feasible, A.I.D. will finance other schemes. The primary beneficiaries of this project are eight million rural inhabitants of small population centers or about 15% of the present rural population of Pakistan.

A.I.D. attempts to improve the maintenance and supply of sanitary sewage disposal systems is seen in the Eastern Caribbean where communities have unreliable or unprotected sources of water and unsanitary methods of waste disposal. These situations contribute significantly to the incidence of gastroenteritis, parasites, scabies, and other diseases, especially among children of the area, and create the potential for serious health problems. Working concurrently with the Pan American Health Organization (PAHO) and Canada, A.I.D. meets the existing needs of some of these LDC's.

Nutrition

Hundreds of millions of people partake of food which is so nutritionally inadequate that their health is seriously threatened or impaired. These malnutrition problems act as major deterrents to social and economic development in LDC's. Many of the nutrition improvement

projects in which A.I.D. participates and which show great promise, utilize an application of science and technology to mobilize the self-help resources of each country. These projects focus on increasing the capability of the LDC government to analyze, plan, execute and evaluate a national nutritional program.

Nutritional Planning and Policy Analysis

Nutritional Planning

Technologies:

In Honduras approximately 76% of children under five years of age in rural areas are malnourished and 41% of all registered deaths are children under five years of age. The Government of Honduras has been collaborating with A.I.D. since 1977 to assess the situation and develop a national plan. Activities which include an Income, Expenditure, and Food Consumption Survey; a National Nutritional Surveillance System; and efforts to introduce new, more nutritious foods into rural diets, promise benefits to 550,000 rural Hondurans. A similar project was established in El Salvador in FY 78.

A.I.D. assists the Government of the Philippines to strengthen its capacity to manage and coordinate programs to reach families directly in their homes, and to support a nutrition-oriented food production program in home, community, and school gardens. This project, begun in FY 79, will reduce the prevalence of severe and moderate malnutrition and lessen the requirements for external food aid 60% by 1984, according to expectations.

Coordination of Nutritional Planning with Other Sectors

Few countries incorporate nutritional factors in their agriculture, health, education or government programs. A continuing A.I.D. project of ten years standing has included field surveys for determining the extent of malnutrition and conducting nutrition monitoring programs in Nepal, Sri Lanka, Liberia, Togo, Lesotho, Cameroon, Sierra Leone, Egypt and Haiti. Such surveys are the initial step in developing a national nutrition strategy. Nutritional factors are being incorporated into the Lesotho agricultural sector analysis and nutritional planning

methodologies are being tested at the national level in Colombia. Under the same project, Harvard University has completed planning studies on the economic and nutritional impact of the fortification of wheat in Tunisia, corn in Guatemala and rice in Thailand. The results of these studies will be used as a guide in field implementation of cereal fortification programs.

A.I.D., working with other donors since 1978, is assisting the Government of Ghana to develop the capacity for, and demonstrate the utility of intersectional nutrition planning, as well as to develop practical, cost effective nutrition programs. This three-year project is intended to provide policy makers with approaches for improved planning and coordination of nutritional intervention, which consider the particular circumstances or varying production and dietary patterns of a country.

Means of Technology Transfer

Training Programs

Twenty-seven government nutrition centers in Haiti are supported by A.I.D. Production of nutrition education materials for distribution in 110 health institutions and training programs for nutrition workers are also supported. These programs, initiated in FY 76, will help to inform Haitian mothers of the best choice of available foods and in food preparation required for good health. By 1980, 3,600 severely malnourished children of under five years of age, together with their mothers, will have benefited.

Policy Analysis

Technologies:

Efforts are being directed towards the production of blended foods through the application of light capital technology in order to replace commodities now imported for child feeding programs. The result will be low-cost food fortification through identification of LDC indigenous crops and facilities which may be used. The U.S. Department of Agriculture (USDA) has demonstrated simple low-cost cooker extruder equipment for blending and preparing local foods in villages in Tanzania, Costa Rica, Sri Lanka, Guatemala, Kenya, the Philippines, and Indonesia. The University of North Carolina is developing a methodology to encourage the food use of whole soybeans by non-soybean eating cultures in Bolivia. Projects such as those exemplified here have been supported continuously by A.I.D. since 1969.

A.I.D. grant funds will finance technical assistance in carrying out special food improvement projects and program evaluation in Nicaragua. The project will help the Government of Nicaragua to improve national food habits and increase food availability. It has many components. Approximately 80% of the population will be touched by some program component by 1982.

Surveys indicate that 50% of Pakistan's population suffers from deficiencies in B vitamins and Iron. Beginning in 1978, a three-year A.I.D. project will seek to reduce these deficiencies by fortifying whole wheat flour milled in 98 national mills and distributed in ration shops. The sale of fortified wheat through ration shops in urban areas will improve the nutritional level of about 20 million Pakistanis with the most serious deficiencies.

A.I.D. technical assistance activities begun in FY 78 will benefit 2,000 rural families, which constitute 40% of the population of Burundi. Through development of small inland fishpond construction using self-help techniques and improved fishing methods, malnutrition and dietary deficiencies will be offset. Fish has proven to be an acceptable and needed supplement to the local diet and helps compensate for increasing population pressure on Burundi's limited land resources.

Research and Education

Research to develop nutritional alternatives is a continuing program which A.I.D. and other donors have supported since 1970. Blindness can result from vitamin A deficiency in very young children. A.I.D. funded an evaluation of vitamin A fortification of sugar in Guatemala which proved the procedure effective. As a result, Panama, El Salvador and Honduras plan to promulgate laws which require the fortification of sugar with vitamin A. A field demonstration in the Philippines will evaluate use of vitamin A fortified mono-sodium glutamate (MSG), widely used as a condiment in Asia. A program in Indonesia is examining vitamin A deficiency and identifying and evaluating intervention programs.

The necessary equipment has been provided to Guyana to establish an adequate Nutritional Research Institute and Laboratory. In a three-year project, the institute will carry out in-depth research on locally grown produce to determine their nutritive values.

Rural Infrastructure

A.I.D. and other donors have financed a project in Rwanda, since 1975, to provide the technical guidance and storage facilities necessary to enable the Rwandan Government to carry out a price stabilization program intended to dampen the wide price fluctuations in the country's food markets. As the wide seasonal price fluctuations are eased, the country's farmers and consumers will benefit.

Population

The rapid growth of population can defeat efforts to improve the lives of those living at or near subsistance levels. Although birth rates have begun to decline in some developing countries, death rates have declined even more. The resultant net increase has the potential to approximately double LDC's population in 30 years. Therefore any substantial improvements in living standards in developing countries depend on further birth rate decline.

A.I.D. sponsored programs for reducing fertility in developing countries are tailored to the particular economy, social structure and development program. The programs must be, and are, further refined in countries with disparate regions, cultures, or administrative problems. With A.I.D. assistance, birth rates in some countries have begun to fall over the past decade. Population stability--zero growth--would require that about 75% practice family planning, as opposed to some 20% who now do so.

Technologies:

Family Planning and Socio Economic Studies

Continuing support, begun in 1967, has been provided to the United Nations fund for Population Activities (UNFPA). This support, which is expected eventually to exceed $204 million, enabled UNFPA to coordinate family planning and programming, promote awareness of population problems, and extend multilateral assistance to LDC's to effectively deal with their population problems. UNFPA programs will impact in 106 countries. In another study funded by A.I.D. since FY 77, the University of Chicago will identify the factors which inhibit practice of both family planing and the local training of personnel in such countries as Egypt, Pakistan, Nigeria, and Sudan.

Coordination of Population Planning with Other Sections

A.I.D. has strengthened population programs by relating them to other components of development assistance. A.I.D. provides funds to U.S. experts and organizations in collaborative studies with developing countries to seek a better understanding of the relationships between development programs and policies in such areas as health, rural development, education, and the role of women on the one hand, and fertility and population growth on the other.

Developing country officials who design and administer national development policies directed towards improving the health and well-being of the poor will benefit from a program begun in FY 78, designed to produce high quality demographic information on birth and death levels and trends. Countries participating include Indonesia, Kenya, and Thailand.

The Sahel Development Program is planned to design, implement and evaluate a demonstration rural health system. This system can be adopted by the government of Mali, for example, to introduce regular access to basic health services, including family planning, for some 350,000 villagers.

Means of Technology Transfer

Training Programs

Both in-country and U.S. training programs are supported. The Johns Hopkins Program for International Education in Gynecology and Obstetrics (JHPIEGO) will train 3,200 physicians from 79 countries in reproductive health. Studies show that this knowledge and technology, which includes maternal and infant care, infertility, high-risk pregnancy and voluntary sterilization, is later integrated into LDC medical schools and teaching hospitals.

A.I.D. is assisting the government of Swaziland to design and implement training programs for nurses and other health workers, and to design and establish hospital and rural health services administrative support systems. The entire nation of 550,000, eighty-five percent of whom live outside urban areas, will benefit.

Tanzania has received A.I.D. assistance in manpower training and material for child health aides since 1973. By 1982 it is estimated that 90% of the population will be within 10 kilometers of clinics established under the program.

Other programs will provide training for 1,600 traditional birth attendants, 18,000 midwives, 25,000 public health nurses, and 1,500 family planning training officers in several countries.

Institution Building

A.I.D. has sponsored the Center for Population Activities (CEFPA) efforts to develop family planning administrators since FY 77. Many of these administrators occupy key positions in their home countries- including Kenya, Ghana, Tanzania, Botswana, Sudan, Nigeria, Togo, Liberia, Nepal, Bangladesh, Pakistan, Thailand and Indonesia. CEFPA sponsors conferences to generate greater understanding and support for effective population policies and programs among these LDC leaders with primary emphasis given to countries that have weak commitments to population planning. Approximately 50 conferences will be conducted for 2,600 participants.

Since 1972, an A.I.D. funded project of the American Home Economics Association in 20 LDC's resulted in 50 in-country and regional workshops for home economists, plus 18 leadership programs involving 230 home economics leaders from 28 LDC's. This participation deeply involved LDC home economists in the provision of family planning information, education and services. Major actions in this program have, or will, take place in Korea, Thailand, the Philippines, Jamaica, Panama, Ghana, Nepal, Sierra Leone, Egypt, Bangladesh, Pakistan, Indonesia, Colombia, and the Gambia. The home economists involved in these programs are expected to eventually reach a total of 6,500,000 persons.

Information Dissemination Systems

Prior to 1972, family planning administrators lacked easy access to research in contraceptive technology and authoritative information on new modes of delivering services. A.I.D. projects, since then, have built a large library and computerized data base of 60,000 items. Reports are now printed in English, French, Spanish, Portugese and Arabic and mailed to recipients in 118 countries. Swahili, Hindi, and Chinese reports will be added. These reports are widely used by physicians, workers and policymakers around the world.

A.I.D. has provided support since 1968 to the Pathfinder Fund, a Boston-based non-profit organization, to initiate and encourage family planning programs worldwide. Since that time, Pathfinder has conducted over 800 projects in 85 countries. Pathfinder projects are often grants averaging $30-35,000 to LDC institutions to provide access to comprehensive family planning information and services for the rural and urban poor in geographic areas and to population groups not previously or adequately served by government or other donor programs. Approximately 2,500,000 persons will be served by this project.

Technical Assistance

Resource sets which can be used to explain side-effects, immediate and long range benefits and to dispel rumors and inaccuracies will be provided under an A.I.D. grant to George Washington University. These prototype sets include booklets, films, audio tapes, charts, posters, sound/slide sets, and utilization guides. They are designed to fill a void which exists in information which is comprehensible to the average individual and can be adapted and mass produced in specific LDC's or regions.

Industry-Building

A.I.D.'s efforts in the area of population planning are mainly directed toward extending family planning services, expanding fertility research, and developing country population strategies. However, A.I.D. also devotes some resources to industry-building efforts in this functional area. A.I.D. seeks to develop private sector contraceptive production and distribution or "retail sales" systems.

In Indonesia, for example, the Oral Contraceptive Loan program is being used in part to increase the production of contraceptives by local manufacturers from 10.0 million to 216 million monthly cycles between FY 1977 and FY 1984. In Bangladesh, A.I.D. programs have resulted in approved pills and condoms being sold over the counter in 30,000 small shops. In FY 1978, national sales of contraceptives began in El Salvador, Ghana, Nepal, and Tunisia. In addition, marketing of contraceptives was introduced in Sri Lanka and Jamaica.

In general, the centrally-funded Contraceptive Retail Sales (CRS) program is designed to interest the commercial sectors in developing countries to make contraceptives available at an affordable, subsidized price to urban and rural poor on a nationwide basis. Cost-effective distribution systems for contraceptives have been developed in the countries already involved. In FY 1979, new projects were started in the Caribbean Common Market and two other developing nations.

Fertility Control:

Methods

Sterilization

An integral part of health and family planning program is voluntary sterilization for reproductive age couples who already have their desired number of children. A.I.D. supports the International Project of the Association for Voluntary Sterilization (IPAVS). Since 1972 IPAVS has assisted 20 countries; helped to develop nationwide training programs in the Philippines, Thailand, Korea, Pakistan, Indonesia, El Salvador, Tunisia and Guatemala; convened two large international conferences; and supported the development of 20 national associations for voluntary sterilization and the formation of a world federation of these associations.

Fertility

Comparative clinical trials on the safety and efficacy of seven fertility control methods under local conditions using local clinicians are conducted by the International Fertility Research Programs (IFRP), funded partially by A.I.D. National fertility research programs which have the capability to conduct their own research studies have been established in Bangladesh, Colombia, India, Indonesia, and the Sudan.

The World Fertility Survey (WFS) began in response to the need for high quality data on human fertility. Support of this project has provided the data needed to describe recent trends as well as to institutionalize the capabilities for conducting studies in 36 developing countries. The data will be used by LDC governments for economic and social planning, as well as management and evaluation of family planning programs.

A project to develop and institutionalize the capability to conduct contraceptive prevalence studies will be initiated and conducted in Jamaica, Costa Rica, Colombia, and Kenya. This will provide a continuous flow of family planning data to the respective governments upon which to assess program progress and define strategies for program improvement.

Demographic

Demographic policy is wholly or partially controlled by central planning organizations in 80% of LDC's. The demographic expertise of planning units is strengthened through training workshops and services conducted to foster skills. Host countries have included Peru, Colombia, Honduras, Egypt, and the Sudan.

Evaluation of the family planning program effectiveness has been completed in Colombia, and similar analyses are in progress in Costa Rica, Indonesia, and Thailand. Such evaluations are planned for implementation in six more LDC's. These evaluations are utilized to fortify population policy commitments and formulate program strategy.

A project to improve the reliability and timeliness of statistics produced by vital registration systems and to implement model systems has been underway since FY 76. Methodological and/or procedural innovations will increase the value of vital statistics for social research or measuring population change in countries adopting them. Analyses of vital registration systems have been completed for Mexico, Honduras, Jamaica, Thailand and the Philippines.

Manuals, seminars, and presentations to be conducted under a program begun in FY 78 have the potential for resolving many of the vexing problems of census taking and should increase the availability of timely, relevant and reliable census data. During the 1980 census period (1975-1984), most developing countries will be in the process of conducting a census.

CHAPTER 2

ENERGY AND NATURAL RESOURCES

Many LDC's simply cannot afford conventional energy resources necessary for their economic growth. All LDC's, therefore, have been forced to reexamine their use of energy, to assess patterns of supply, to project future demand, and to evaluate plans for national energy use in the future. With the exception of a few oil producing countries, the developing countries cannot match the rich nations in the competition for oil. There is as yet no program for developing alternative sources of energy to satisfy the needs of the LDC's. By assisting the LDC's in the development of non-fossil fuels, we contribute to their sound economic development.

Energy Crisis

Most developing countries face an energy crisis. The principal source of energy, imported petroleum, has skyrocketed in cost. LDC's seldom have sufficient capital either to import or to develop conventional sources of energy. But there are opportunities, particularly in rural areas, to develop non-conventional, renewable energy resources. A.I.D. is attempting to develop such resources, particularly for the rural poor.

A.I.D.'s energy program consists of LDC energy training, planning and management. A.I.D. supports research efforts and demonstrations of renewable energy technologies applicable to local conditions and helps build institutions in host countries to use these technologies. A.I.D. is also continuing its efforts in rural electricity distribution, and has supported a National Academy of Sciences study on the state of the art in solar energy and an Arthur D. Little report on alternative energy sources for LDC's. A.I.D. has financed small projects to examine the feasibility of applying various renewable energy technologies such as solar cookers, solar drying and methane generation.

Nuclear Energy Assistance

The International Atomic Energy Agency Operational Program is designed to promote and carry out international programs of nuclear technical assistance within IAEA safeguards. The Operational Program enables the Agency

to achieve the objectives defined in its Statute by providing (a) technical assistance to developing countries to promote peaceful uses of atomic energy; (b) a mechanism for disbursing additional U.S. voluntary contributions for strengthening Agency safeguards. Priorities for this project are nuclear engineering and technology, application of radioisotopes in agriculture and medicine, and prospecting, mining and processing of nuclear materials.

A.I.D. is funding this program in FY 79 with $12 million, with approximately one half of this amount going for technical assistance. The remainder of the financial aid will be for safeguards and related non-proliferation activities. Congressional action will determine the annual A.I.D. contribution. In 1978 the U.S. cash contribution was 25% of the target of $7 million. Other major cash contributions to the Agency's technical assistance program were USSR- 14.8%, Japan- 9.3%, FRG- 8.3% and France- 6.07%.

The project beneficiaries will include farmers who benefit from radioisotope techniques in agriculture; electricity consumers, and the sick who also benefit from radioisotope treatment.

Rural Energy Problems

A.I.D. is concerned with helping the developing countries identify and resolve energy problems, particularly rural energy problems. A.I.D. financed inputs of $3.5 million for the rural poor center around four inter-related elements: (1) studies of energy needs in development; (2) efforts to strengthen LDC's abilities to analyze needs and manage energy programs; (3) field demonstrations of appropriate energy technologies; and (4) technical advice and support to A.I.D. missions. The focus of these elements is on the energy needs and resources of the poor.

For example, in Senegal a project begun in 1977, promising energy technologies for use in the food system, has been completed. In Nepal, 15 technicians were trained in methane generation from animal wastes and prototype units were constructed in four locations. Prototype solar cookers were developed for field testing in Haiti, and a field demonstration of solar cells to power water pumps and grain grinders was initiated in Upper Volta.

Training programs have been instituted to teach decision makers in 110 developing countries to assess energy/management problems in their national policy formulation. The Department of Energy and other contractors are

augmenting A.I.D.'s ability to respond to A.I.D. mission requests for technical advisory services. The World Bank and specialized UN agencies are promoting energy awareness and are involved in the reduction of duplication in energy management efforts. In FY 1979 technical advice to A.I.D. missions on energy problems is being expanded. Field tests, demonstrations and feasibility studies of appropriate energy technologies will continue. A method to analyze national energy needs will be selected from each A.I.D. assisted geographic region.

Natural Resources

A.I.D. has greatly improved Natural Resource Assessment and Management within the LDC's. Many LDC's are now capable of assessing the location and nature of their natural resources, and for determining how these resources can best be developed. These include extractive resources such as minerals and clays and renewable resources of water, soil, and forests. A.I.D. projects focus on faster, cheaper, and more effective techniques for identifying and appraising natural resources, and improving techniques for the management of natural resource development such as integrated land use planning, conservation of renewable resources, and pollution abatement and control. Particular attention is paid to the protection of the environment.

A rural land reclamation project in Mauritania, with a $2.0 million input by A.I.D., has the purpose of assisting the government of Mauritania (GOM) in the management and conservation of water resources. The project plans to simultaneously develop methods of agricultural production and to extend them to farmers. The focus of this assistance by A.I.D. is to teach GOM technicians how to build dams more effectively and instruct the farmers how to maintain them and use the water rationally. A separate aspect of the project concerns the construction of two water retention structures which are designed to recharge two aquifers. Water-use plans will also be devised. Five thousand farmers will hopefully expand their fields under cultivation.

Another project in Mauritania plans to survey renewable resources and implement pilot projects in an integrated program of resources management and conservation. Through satellite imaging, resources can be assessed to determine deterioration. Methods will be tested at four pilot projects in the Sixth Region for sand dune stabilization, natural revegetation, forest management and range management. A.I.D.'s financial input amounts to $1.3 million which will

assist 180,000 people in the Sixth Region to benefit directly from the vegetation, forest products, and fodder and water developed at the project sites.

The Bakel Irrigated Perimeters Project in Senegal encourages farmer-managed irrigated crop production by introducing farmers to irrigation technology. The project will provide 1,800 hectares of new irrigated farm land and involve over 35,000 people. Finally, a regional multi-donor Crop and Harvest Protection Project will contribute $70 million towards a major attack on food crop pests and reduce post-harvest crop losses.

In Niger, A.I.D.'s $800,000 assists the GOM in the preparation of a 20-year plan for the rehabilitation and protection of the country's soils, water and natural vegetation.

The recent drought has greatly accelerated the process of desert creation, the impoverishment of the useable land surface and the reduction of the natural food supply. The GON and A.I.D. have prepared a preliminary project document which covers an initial two-year phase for activities designed to: (a) establish a basic resource inventory, (b) establish a resource planning unit within the Niger Forestry Services, (NFS) (c) design and begin creation of "model sites", (d) sensitize Niger's technical agencies, as well as the general population, to the work required. The beneficiary of all efforts by A.I.D. will be the NFS and Niger's farmers and herders.

A.I.D.'s $600 thousand effort to deal with environmental degradation will assist the Government of the Gambia (GOTG) in its reforestation program. The intent is to increase forested areas while also providing firewood and charcoal at reasonable prices.

The GOTG wishes to expand its modest on-going afforestation program; to undertake tests of exotic species for economic use in Gambian conditions, and to protect designated forest preserves. The project will use an integrated approach involving coordination with efforts of other agriculturally related development, namely agricultural extension, crop protection, soil/water utilization and management, and livestock husbandry. The direct beneficiaries will be the rural and urban consumers who will be assured of a stable, long-term supply of wood, fuel and charcoal at reasonable prices. Long term benefits will be derived by the country itself, to the extent that reliance on imports of logs and sawn timber is reduced and the environment is protected.

CHAPTER 3

EMPLOYMENT, TRADE AND INDUSTRIALIZATION

Access to Technology and Increased Industrialization

Science and technology play an important role in the employment and growth of industrialization and trade in developing countries. Developing nations seek both better access to technology and increased industrialization as a means of reducing dependency and thus improving their economic and political status. These nations wish to participate in an increased amount of industrial research and development, in order to create technologies well suited to their own environments. A.I.D. has supported projects alone and with other donors in developing countries around the world. The projects, typified by many of those detailed here, were initiated with a goal of establishing, in each country, a state of increased self-sufficiency.

Research and Development

Unemployment

Unemployment in Jamaica remains at very high levels. A.I.D. is working with the Jamaican National Planning Agency and five Jamaican ministries, to investigate the country's training needs. The project will take three years and will be completed in 1981. It will indirectly benefit the entire Jamaican population through its input into the human resource development component of the national Five Year Plan. It will focus on those people in the lower socio-economic levels.

Research and Development Grants

In a continuing program, begun in 1973, with a current cost of over two million dollars, A.I.D. finances research and development grants and contracts. Stanford University's prototype program using radio instruction has been adopted in Nicaragua. Projects in Tunisia, Nicaragua and the Philippines are showing how radio can be used to teach mothers to fortify weaning foods and combat often-fatal infant diarrhea. Evaluation of two-way radio support for health workers has been completed in Guatemala, Nicaragua and other countries. NASA, with A.I.D., has experimented with the use of satellite communications to share resources among several campuses of the University of the West Indies.

A center designed to train research specialists/ technicians to administer a development program for small and medium size industries in Northeast Brazil was assisted by A.I.D. from 1970 through 1974 at a cost of over $5 million. Those trained are knowledgeable in new techniques, markets, raw materials, site location, planning, capital acquisition and management. All these efforts are oriented towards initiating new industries and expanding those presently in existence.

In a similar project in Ecuador, feasibility and market studies for new industries complemented a plan to increase production and lower costs. Artisan industries and artisan parks were also developed. The market research served as a focal point and catalyst for mobilization of private capital, both domestic and foreign, and filled the need for financial assistance to Ecuador's small industry. In another project, A.I.D. assisted the Brazilian National Industrial Apprenticeship Service to collect and analyze statistics relating to present and future industrial manpower needs in order to improve and expand their training programs with industry growth.

The industrial research activities of the Central American Research Institute (ICAITI), which performs technical and economic analyses of broad range activities of interest to the food industry, was upgraded in a project supported by A.I.D. from 1971 to 1973. The project strengthened the technical, managerial, planning and marketing capabilities of the food technology department of ICAITI together with local food technology industries in that area.

Demonstration of a Technology

Radio Broadcast Projects

An A.I.D. project has been under way since 1977 to create the capacity to provide in-service rural teacher training through radio broadcasts in Nepal. This project will benefit approximately 12,500 people, or over one-half of Nepal's primary school teachers who have not received formal training. The 5-year project of radio broadcasts, supplemented by brief residence instruction periods, offers the most reasonable cost/benefit solution to Nepal's teacher training shortfall. The project will ultimately provide qualitative improvements in primary education which will have an impact on families and rural communities in Nepal.

Radio education programs for primary, and some secondary level, students in Jamaica have begun on a pilot basis. Begun in FY 78, this program will produce radio lessons, a manual for radio instruction and special instructors trained in the development of radio education programs and instructional techniques by 1981. It will eventually benefit 5,000 students in Jamaica and the Eastern Caribbean islands.

Job Training

Since 1972 a program to create, demonstrate, and institutionalize a skills training program for disadvantaged school dropouts has been underway in Nigeria, Ghana, Kenya, Ethiopia, Zambia, Togo, Sierra Leone, Liberia, the Gambia, and Lesotho. By 1983, 19,000 youths will have been trained in auto mechanics, secretarial skills, carpentry, plumbing, masonry, animal husbandry, farm technology, electrical construction and small business management, at a cost of over $15 million.

Teak and Rubber Production

In a ten-year program, from 1962 to 1972, A.I.D. supported a teak industry expansion project in Burma. Improved equipment and procedures were used to produce high-quality timber yield increases. New sawmills were constructed and installed and the result was the exportation of higher cost grades of teak.

Natural rubber production, using modern techniques and high plant yielding material, is the most profitable use for much of the rain forest of southern Nigeria, due to the ideal climate and soil in over 1.25 million acres. From 1961 through 1969, A.I.D. assisted Nigerian authorities in improving all phases of the natural rubber industry. Research technicians tested and developed new methods for processing rubber and intercropping techniques; production advisors encouraged the organization of cooperatives for production and processing, provided in-service training to extension staff, expanded the number and size of nurseries, and published and distributed advisory circulars to convey the latest developments in the industry.

Accounting and Finance Improvement

A uniform accounting plan, applicable to the management of all state economic enterprises in Turkey was demonstrated

in pilot commercial industries during a 1970-1975 project. The plan comprises basic accounting principles/practices and budgeting/reporting systems, modernizing the finance and accounting divisions of the enterprises. Wide implementation of the plan effected profitability return on invested capital, cost control, and improved financial comparability among the state economic enterprises.

A 1974 project in Colombia demonstrated that funds made available through the Popular Finance Corporation could, through reloan, overcome such small industry development obstacles as institutional credit, raw materials shortages requiring deposits/licenses, and introduction of production and marketing technologies. This experience with new industries, cooperatives, labor intensive and geographically isolated industries demonstrates to traditionally conservative Colombian financial institutions that they can afford to lend funds to clients who normally would be unable to compete for scarce credit.

Through an Entente African Enterprises Loan funded by A.I.D., funds are sub-loaned to African entrepreneurs to start or expand businesses. The loans reach a broadly diverse group of persons since this money was used where other credit sources were excluded. A high percentage of these loans are used for working capital, suggesting that the commercial banking system may be induced to provide this credit if the experiment is self-perpetuating through repayment of loans.

Technology Transfer

Vocational Training

In a four-year program begun in 1978, two vocational projects for training middle and lower level skilled workers have been established in Liberia. The program has been designed to upgrade the curriculum, staff, and facilities at Booker T. Washington Agricultural and Industrial Institute. It will also seek to improve a Liberian Government Ministry of Labor apprenticeship program.

Non-formal vocational education directed at increasing the productivity of disadvantaged rural Thailanders through agricultural training and diversification of job skills, is scheduled in a three-year program ending in 1982. This

project will expand and improve instructional programs, provide equipment for non-formal vocational education centers and extend these services through mobile extension units, a field course, and demonstrations.

A project to identify skill shortages in occupational sectors which are critical to development and to provide vocational training to fill these voids is underway in Haiti. $3 million dollars will be provided by 1982, when the project concludes. Supporting programs are provided by United Nations Development Program (UNDP), France, and the International Bank for Reconstruction and Development (IBRD). The project will provide Haiti with an improved supply of vocationally trained craftsmen in key areas, who will contribute to the completion of development projects or who will establish themselves in small private businesses.

In Morocco, a three-year project to help meet the training needs of the industrial and commercial sectors and provide productive employment for young men and women who drop out of the formal academic system each year is underway with the National Office for Vocational Training (NOVT). By 1982 the Office plans to expand its 30 centers (with a present annual capacity of 6,000 trainees) to accommodate 25,000 trainees per year. The project will be upgraded by the increased productivity of the trainees contributing to Morocco's economic development. This project is closely related to, and partly originates from a project oriented towards developing pilot training facilities to train Moroccan women in industrial and commercial skills. In that program 300 women will be trained by 1981 in the pilot program. If the pilot project is successful, many more will be trained.

Technical Training

In a five-year program, A.I.D., jointly with WHO, will establish an Asia Regional Malaria Training Center. The center facilities, staff, and curriculum are designed to meet the manpower requirements of the Asian region in combating malaria and other vector borne diseases. The planned regional center will sponsor and encourage applied, operational workshop research and training activities in coordination with national pilot programs. The planned center will meet the need for advanced specialized training.

A.I.D., with host countries and other donors, is sponsoring a program to establish a technology transfer system for the public and private sectors in Central America. Small and medium-size industrial firms in all business sectors throughout Central America will benefit from the 1,200 contracts over the four-year life of the project, begun in 1976.

In Haiti, a National Technical Center will be financed which will include curriculum development, training of Haitian faculty, construction and procurement of commodities, at a cost of nearly $3 million. This will meet Haiti's need for an institution which provides engineering training at the para-professional level. The center is expected to train 100 engineering technicians per year, qualified to work in such priority areas as erosion control, soil construction and maintenance, rural sanitation and building construction. The project is expected to complete its work in 1983.

An A.I.D. sponsored program from 1973 through 1977 enabled Georgia Technical Research Institute to provide cooperative linkages with institutions in the Philippines, Brazil and Nigeria, to provide technical assistance to small industry and encourage adoption of appropriate technologies.

Latin American access to scientific and technical information and patents resulting from U.S. Government investment in research and development was improved by a 1977 A.I.D. project, supported by the Department of Commerce. Such access to U.S. held technology will permit Latin America to adapt such technology to provide for economic growth and improved social conditions, better use of human resources, increased employment, and to encourage domestic production.

Institution Building

Adult & Community Education: Bilingual Training

In Guatemala a high drop-out rate exists among Indian children due to Spanish language inadequacy. The Government of Guatemala is supporting an ongoing Spanish language training program with A.I.D. support. The program includes bilingual teacher training, development of materials in two major Indian languages, and the incorporation of new methods and schedules within the Ministry of Education's system of Spanish language training. The three-year program will benefit approximately 19,000 Guatemalans by 1981.

Another similar project provides assistance in Bolivia. The project will introduce a bilingual curriculum of Quechua and Spanish for the classroom, as well as teaching other skills. New textbooks and teaching materials will

also be furnished. The project will be a model for extending the results over those parts of Bolivia where Spanish is not the principal language.

Continued Educational Programs

In the Dominican Republic, a four year A.I.D. project begun in 1976 is providing support to the Dominican Institute for Integral Education (IDEI), a private non-profit organization. This project is designed to provide an opportunity for socially and economically deprived adults to receive an education. Home study, together with teacher supervised review sessions, brings the subject matter to an estimated 90,000 students, who are mainly unskilled workers, rural people, and household servants. Over one-half of the participants are women.

A.I.D. is also helping the Government of Nicaragua to expand and improve its capacity to provide educational services to the rural poor in the highlands area. This broad-based program contains several innovative features, one of which is radio-based teaching techniques to extend the outreach of formal and adult educational programs to 1,400 isolated rural communities. The Rural Education Development Program (REDP) is designed to benefit approximately 260,000 rural poor by 1982.

Technical assistance in planning and evaluating non-formal educational programs has been provided to more than 30 countries in a continuing project begun in 1973. Activities are designed to impart new knowledge, modify attitudes, and add to the skills of urban and rural people who are not served by formal schools. Many groups have previously been bypassed, including women and out-of-school youth. Alternative delivery modes are developed and tested and information dissemination services are expanded. The developing countries' capacity is being nurtured through grants such as that to the Kabul University Research Center in Afghanistan. New approaches to practical education have been tested in Ghana, Thailand, and other countries. These programs result in the increased capability and capacity of institutions in LDC's to provide relevant education to adults and out-of-school youth.

Professional Scientific and Managerial Education

Education Staff

In a three-year program, begun in 1978, the capacity

of the Lifetime Education Center of the University of Zaire to train and support those who design, implement, and manage nonformal education activities will be expanded. This project will help to transform the national educational system, currently modeled on a classical system of education, to enhance the capability to provide specific job related pre-employment training for Zairians at all levels.

Over 2,000 scholarships for University professors in Latin America and Caribbean institutions have been provided by the A.I.D.-supported Latin America Scholarship Program of American Universities (LASPAU) in the 5-year period ending in 1978.

In Bolivia, a five-year project has improved functional efficiency in the Ministry of Education and prepared the institutional base at the national and departmental levels for reform of rural education. The project, when completed, will have cost over $2.2 million, in addition to Bolivian contributions, and will eventually benefit over one million youths by providing them a more relevant educational system.

Government Staff

A three-year program begun in FY 78 will assist the Government of Zaire Planning Service to implement coordinated personnel training programs in project planning and management. This project will train Zairians at all levels to help plan and carry out development programs. By the end of the project, approximately 270 Zairian development planning and management personnel will have been trained.

The Government of Nepal will be assisted in development administration by a program designed to improve project planning, decision making, evaluation and implementation capabilities. Over the four-year life of the program, begun in FY 79, approximately 450 Nepalese Government personnel engaged in planning, managing and evaluating rural oriented development activities will have been trained.

In Pakistan, A.I.D.-trained key federal and provincial technicians, with upgraded technical and managerial expertise design, implement, and evaluate priority social and economic development programs. The training is conducted in the U.S. and other countries under a 5-year program begun in FY 78. This program provides needed augmentation to the country's capacity to train technicians and managers.

Latin American public sector managers and technicians, who plan and implement programs with impact on the poor, have also been trained under A.I.D. sponsored projects. Beginning in FY 79, a project to offer programs from non-academic through Master level will be carried out by the Latin American Scholarship Program of American Universities (LASPAU) and other U.S. and Latin American institutions. By 1983, 500 persons who will help to resolve development problems will have been trained in short and long term programs. Also, twelve to fourteen Latin American institutions will be strengthened and capable of providing training in development-related areas.

A.I.D. has provided assistance to the Government of Haiti to help improve Haitian public administration. The technical advisory services, training, commodities, and other essentials involved will help to develop the capacity for management analysis, organizational reform, and administrator training. The Canadian government is involved in a supporting program.

A project similar to those described above has been underway since 1978 to introduce modern management and administrative techniques into ministries and other agencies in Morocco. The project provides university-level training in the U.S. for Moroccan officials in positions involving projects which benefit Morocco's poor. Approximately 180 middle level managers will be trained by 1983 at a cost of $2 million.

In the Yemen Arab Republic, development of an initial government capacity in human resources planning has been continued to strengthen the government's ability to plan and manage developmental programs. Since 1973, graduate, undergraduate and short-term non-degree programs of training in key technical and managerial fields have been supported. The program will also serve to build an institutional capability within the government to identify training needs, establish priorities, select candidates and establish follow-up procedures. By 1986, when the project will be completed, A.I.D. will have spent over $15 million. Scholarships and training are also provided by other donors including the UNDP and the USSR.

In a five-year project, A.I.D. support to African, Asian and Latin American countries helped develop solutions to the problem of organizing the labor markets, providing optimum economic utilization of the labor force, ensuring an equitable share of economic growth and developing jobs

for the working population. From 1968 through 1971 an A.I.D. project assisted the Department of Labor of the Government of Thailand to expand their employment service offices and improve vocational guidance and testing techniques. Data was compiled and analyzed for development of a national manpower policy. Legislation for labor relations and working conditions was drafted. A safety program for non-manufacturing establishments was instituted. A workman's compensation fund law was enacted and implementation plans were developed. Other donors included the UNDP and the International Labor Organization. (ILO)

Labor Organization

A project, ongoing since 1969, with an anticipated cost of $23 million by 1980, has as its purpose an increase in the social and economic well being of the urban and rural workers in Asia and the Middle East through the establishment of free and democratic labor unions. Recent project activities have assisted unions in the Philippines, Turkey, Fiji, Indonesia, South Korea, and Sri Lanka. In addition to the development of educational facilities, cooperatives and health care programs, the project has trained approximately 56,300 union leaders, as well as the rank and file, in arbitration, functions of shop stewards and related matters.

In Latin America and the Caribbean a similar project is being carried out to strengthen free and independent democratic labor movements. Approximately 375,000 trade unionists have attended training courses in their countries. Advanced training has been provided to about 2,900 trade union leaders at the American Institute for Free Labor Department (AIFLD) facility in the U.S. In the U.S., academic training has been provided to 220 potential leaders. Within a broad framework of human rights, particular emphasis has been placed on advancing the rights of the free trade unions and the individual rights of their members. The program is being carried out through national initiatives in 13 countries including two sub-regional programs, a regional Agrarian Union Development program, a union-to-union program and from assistance by the Inter-American Regional Workers Organization and by advanced training in the United States. This continuing project has been in effect since 1962 with an annual cost currently of nearly $7 million.

Women

Many A.I.D. sponsored projects, programs, and activities tend to integrate women into the national economics of their countries, thus improving their status

and assisting the total development effort. A.I.D. established a Women in Development (WID) Office in 1974. The function of the WID Office is to provide central policy and program guidance throughout A.I.D., in coordination with other bureaus and offices. The WID Office exists to assist, encourage, report and evaluate Agency efforts to integrate women as planners, experts and beneficiaries in A.I.D. sponsored programs.

A.I.D. Projects Focusing on Women

A two-year program is underway to design and test educational media programs to prepare and train women from low-income families in Latin America and to increase their potential as contributing members of society. The results will help A.I.D. and women's groups to design and test a media program that is both utilitarian and culturally acceptable, and which can be used with minimal adaptation in most Latin American countries. The project will be completed in 1980.

In Nicaragua, a project designed to train women for increasingly responsible roles in positions of leadership in community organizations and in rural development programs was supported by A.I.D. and the Government of Nicaragua. The two-year project benefited approximately 3,450 women.

A project to train 100,000 Moroccan women from all provinces will be conducted at the National Training Center and 300 women's training centers by 1981 at a cost of $2 million. This project is designed to attack the extremely high illiteracy rate among Moroccan women.

Service or Maintenance

The University of Connecticut financed by A.I.D., is providing advisory services and conducting training programs which will provide Nepalese education specialists with supplemental training in educational planning and program administration skills. This 4-year program, which began in 1976, is contributing to improvements in conducting and administering educational programs in rural communications.

In the Philippines, a 5-year program is designed to increase the number of trained government manpower resources in selected disciplines relating to the Philippines' development priorities. By 1983, when the project will have been completed, 75 government officials who possess the leadership and authority to translate economic theory and social perspectives into the resolution of basic developmental problems will have been trained. The Philippine

Department of Education and Culture will benefit under a 3-year program ending in 1981 to help provide educational materials, production, and support costs for educational support programmers for 300 rural villages. The programs, which will cost $4.25 million, will focus on basic community education efforts and will benefit a broad segment of the poor majority.

An A.I.D. project in Bolivia will consolidate twenty-five teachers colleges into six and provide special teacher training programs. Twenty professors, 200 rural school teachers, and 8,500 rural teacher training college students will participate. Curriculum development, teaching materials development, and improvement of training administration will also result from the project. Over the five years of the program ending in 1982, approximately one million rural Bolivians will benefit indirectly from these efforts.

The rural poor of the Dominican Republic will benefit from a four-year, $5 million project of assistance to their government, coupled with their own government's funding and UNICEF donations. By 1982, the project will upgrade education planning, train additional teachers, prepare and produce primary educational materials, remodel existing primary schools and construct additional schools. This project will assist the Dominican Government in meeting its goal of providing at least four years of basic education to rural children. In a very similar program begun in 1979 over $4 million will be loaned to the Government of El Salvador to finance a three year program for expansion and improvement of the primary schools.

In Afghanistan, A.I.D., the World Food Program and UNICEF support an effort to improve the Government's capacity to build and make rural primary schools operational. By 1982, 240 new school complexes are expected to be operational at a cost of over $7 million. The buildings will serve approximately 5,000,000 children over their expected 50 year lifetime.

A project to improve the quality of science education at Sana University in the Yemen Arab Republic will directly benefit future Yemen science graduates from that country's only post-secondary educational institution. A.I.D. will provide two full-time curriculum specialists until 1984. In order to make the science curriculum more responsive to the needs of Yemen and reflect appropriate modern knowledge and techniques, geology, rural electrification, desalinization, solar energy use, water resources and agriculture will be stressed. The project will cost

$3.5 million during its five-year life. A.I.D. is also sponsoring a project during the same period which should benefit 200,000 rural school children by contributing to an improved teacher training program in the ministry of education. This project is also supported by UNESCO and the Peace Corps.

A.I.D. supports the American University of Beirut in a continuing project currently costing over $3 million annually. Additional support is also received from other donors. The University is an educational service center addressing the development needs of the countries in its area. It assists participating countries to meet their human resource needs by providing undergraduate and graduate training. Approximately four hundred academic participants per year are financed under the project to pursue programs in agriculture, business administration, education, engineering, nursing, public administration and public health.

CHAPTER 4

FOOD, CLIMATE, SOIL AND WATER

Introduction

Food is the primary concern of most people in LDC's. Recent studies of trends estimate that by 1985 net food grain deficits will become much worse in developing countries. A.I.D. assistance provides projects which promote small-farmer self-help in order to increase his productivity and income. These funds are used to provide fertilizer, seeds, credit, small scale irrigation and farm-to-market roads; develop and transfer technologies for small crop and animal producers; assist rural community development, and encourage the development of small-scale rural industry. Most developing countries have a large number of small producers who are not as attractive risks to financial institutions as are larger producers. Consequently, despite the efficiency and industry of small farmers they often have high costs, receive low prices for their produce and have little incentive to expand production. For this reason, A.I.D. supports the organization of cooperatives, farmers associations, or similar groups.

Economics of Agriculture and Rural Area Development

Consequences of Technology Change in Agriculture

Technologies:

The Interior of the sparsely populated, rugged, semi-arid land now known as the territory of the Afars and Issas remains unaffected by 135 years of colonial rule. The basic nomadic existence of the rural population is unchanged, but the people face substantial food deficits, which have traditionally been met either by European imports or by food brought overland on camels from Ethiopia and Somalia. Independence and internal and external conflicts disrupted these patterns. The new government faced fundamental problems including lack of trained manpower in both technical and administrative areas, lack of information regarding soils and water, and lack of necessary equipment. There was no resident economist, no agricultural or livestock instruction in the schools, no experimental station, no land tenure law, no water law, no experience with surface water impoundment or irrigation, and very little available foreign agricultural technical expertise. An A.I.D. project was begun in 1978 to concentrate initially on testing soils and water, experimental trials of crops and agronomic practices, and academic and in-country training for the limited professional staff. The project will eventually encompass those areas indicated by the initial study. The goal of the program, by 1983, is to identify the potential for increased food production and establish an agricultural planning unit and an agricultural station for adaptive research.

A manpower development division has been established in the Ghanaian Ministry of Agriculture. Annual regional management seminars have been conducted and two Agricultural Administration diploma programs have been developed and initiated, all under a $1.9 million seven-year A.I.D. project begun in 1975. The Ministry of Agriculture of Ghana has been given assistance in developing a self-sustaining indigenous management and planning capability which will lead to improved allocation and utilization of agricultural sector resources.

A.I.D. also assists the 21-country African Cooperative Savings and Credit Association (ACOSCA) in the development of the credit union movement and in pilot agricultural

production credit programs for small farmers who are members of credit unions. A.I.D. assists through Credit Union National Association, Inc. (CUNA), which provides specialists and operational support to ACOSCA's headquarters in Kenya, and branch activities in Cameroon and Lesotho for small farmer pilot credit programs. Funds are also provided for seminars and training programs conducted elsewhere in Africa. The project began in 1976 and will cost over $1.2 million by 1980.

Under a continuing A.I.D. project, with a current cost of over $3.2 million per year, various other studies continue to be conducted. For example, studies of the rural poor in Haiti and Guyana were initiated to determine the potential benefits of assistance initiatives in agricultural research and reforestation. Other studies were conducted in areas which benefit the poor, such as education assessment in Costa Rica and agriculture, health, and education surveys in other countries.

Means of Technology Transfer

The historical usage of ineffective techniques and lack of technical information on soils, climate and crop options are major impediments to progress for the small farmers who constitute 60% of Bolivia's population and contribute only 15% of the annual gross national product. In the vast northern and eastern lowlands where about 900,000 people reside in a 600,000 square kilometer area, characterized by extremely varied climatic and soil conditions, these problems are particularly acute. A five-year project begun in 1976 will develop small farm production models and promote appropriate technology, research and extension. The project will also test culturally acceptable improvements in traditional production practices. About 25,000 families living in the project area will benefit from project activities. Also, a large number of farmers are expected to immigrate with the opening of the roads from La Paz, Cochabamba and Santa Cruz.

The Government of Nepal has selected the Tapati Zone for special attention in a project designed to bring modest growth and benefits to the population in remote rural areas. This project will address various developmental problems in a cross-sectoral integrated approach. It is designed to increase effective demand for local food production, provide income to the thousands of small farmers on the steeper mountain slopes, assist Nepal with land tenure and water rights problems, and increase national response to local initiatives. Two thousand agricultural assistants

will be trained and 4,000 full-time and 8,000 part-time off-farm jobs will be created as part of the project. A.I.D. will contribute $17.5 million to this project between 1979 and 1983. Other donors include the United Nations Children's Fund, World Food Program Food-For-Work Projects, the World Bank and the Government of India.

A continuing project, begun in 1973, with a current cost of $2.7 million, is aimed at providing project design, review, evaluation and training services in agricultural management to field missions and LDC officials. Seminars, workshops, and conferences are funded to bring together experts in improved technology who will benefit small farmers and other high priority target groups. Highly qualified technicians and experts are provided for short-term assistance to A.I.D. field missions and to LDC's, to assist in development activities. Communications network activities develop new ways to utilize advance communications and technical information systems for LDC development programs.

Approximately 85% of Ethiopia's population consists of peasant farmers, most of whom live in the crowded highland regions. Overpopulation has increased the number of farms and decreased farm size. Coupled with erosion and soil depletion, many farm families cannot support themselves, and continued overcrowding generates unemployment. A five-year A.I.D. project will assist the Government of Ethiopia to reduce unemployment, improve agricultural production, and increase the net per-capita income of the rural poor, by resettling very poor farm families in a formerly under-utilized area. The project will cost $4 million by completion in 1982.

In 1978, a project was established in Somalia to integrate agricultural research, training and an extension system responsive to the needs of farmers and herdsmen and supportive of national agricultural development programs. Previous agricultural development projects undertaken by the Government of Somalia were handicapped by the lack of adequate institutions and trained personnel to support production projects. The $20 million, eight-year program will renovate and strengthen agricultural stations in the principal agricultural regions of the country, establish and upgrade training institutions to train extension workers, farm managers, agricultural service technicians and teachers in these institutions, expand and improve agricultural extension and farmer programs, and provide training and demonstration in improved farm management and livestock practices.

The small farmers of Guinea will eventually benefit from a six-year A.I.D. project to train extension agents. This expansion of the pool of trained agricultural manpower is important to the agricultural production of the country. The $7.4 million project will strengthen the agricultural research capability at the National Agricultural Research Institute at Foulaya, develop infrastructure of the Faculty of Agronomy at Faranah, and create a Research/ Demonstration Farm complex at Tindo.

A project, begun in Liberia in 1978, will make more effective use of the resources of the Central Agricultural Experiment Station at Suakoko. It will provide an institutional support for the crop research work initiated under the multi-donor funded integrated rural development activities in Lofa and Bong Counties. Improved technology will also be generated for the newly established Ministry of Agriculture regional extension/training centers. The project will strengthen the country's adaptive crop and soils management research capability by 1983 at a cost of over $3.4 million. Other donors, including UNDP/FAO, support this project.

Agricultural Sector Policy Analysis and Planning Technologies:

A project in Zaire aims to upgrade the planning and management capability of that country's Department of Agriculture (DOA). Technicians provided by Belgium, France and FAO who work in the DOA, complement the A.I.D. project. The project, which began in 1979, will train over 700 enumerators, 11 computer technicians, and 25 advanced statisticians to staff a functional data processing unit by 1983 at a cost of $3.5 million.

A.I.D. is engaged in a $4.2 million, six-year program of agricultural planning which will eventually benefit the entire rural population of Botswana. The project will provide immediate rural developmental planning needs while an indigenous economic and analytic capability to plan and program responses to rural sector needs is established. Botswana's government is committed to thorough planning as a means of expediting development in the rural sector. Shortages of skilled manpower and the sheer magnitude of the technical problems, require careful planning to assure best use of the nation's limited resources. This project, begun in 1978, through academic education and in-service on-the-job training, will produce a cadre of trained,

experienced Botswana agricultural planning specialists.

In a project very similar to the one described above, the Government of the Cameroon will be assisted in a $2.5 million project to conduct initial surveys of agricultural statistical data, evaluate the status of rural development projects, and review planned projects. The Government's Ministries of Agriculture and Livestock are faced with problems of conception, design, implementation and management of development programs in the agriculture sector. When the project began, these ministries did not have the capability to contribute effectively to the planning process. This six-year project which ends in 1984 will also develop the human resources and data required to establish integrated planning for the agricultural and rural development sectors.

A.I.D. is engaged in a project begun in Ethiopia in FY 79 to assist in upgrading essential analytical skills and techniques of planners within the Ministry of Agriculture, (MOA) to prepare, evaluate and coordinate agriculture/rural development projects. The project will also help create a data collection system and coordinate MOA programs. By 1982 the project will have cost $2 million.

In Indonesia, the Bogor Agricultural University (IPB) is the cornerstone of efforts to increase the quality and quantity of qualified agricultural manpower. IPB, with the assistance of the University of Wisconsin, is performing preliminary work towards the preparation of a Master Development Plan which would establish it as a first-class agricultural university. Separate projects to upgrade other agriculture training institutions are planned which will draw on the improved facilities and trained staff at IPB as a resource. The $5 million A.I.D. project, to be completed in 1984, is supporting IPB to produce graduate curricula and programs in the fields of agronomy, food processing, agriculture mechanics, and forestry and fisheries. A central library essential for graduate study, trained faculty, and a completed library-general classroom core building are also included. Other donors providing assistance to IPB are the Ford Foundation, the British Overseas Council, and the Agricultural Development Council. Also in Indonesia, a four-year, $4 million project to be completed by FY 82 supports an Association of Eastern Island Universities in their role in the development of Kalimantan, Sulawesi, Maluku, and Irian Java. By 1982, A.I.D. will have provided each member university with an assigned role commensurate with its capabilities, a staff

development plan, one-tenth of its project-related staff trained to an M.A. or Ph.D. level, and a developed curriculum and graduate program. This project is expected to assist significantly in increasing the productivity of the eastern region farmers and fishermen. The project is also supported by the Asian Development Bank, Australia and the Ford Foundation.

A continuing project, begun in 1970, applies the tools of remote sensing to natural resource assessment and management. A.I.D. also provides U.S. expertise in management of arid and semi-arid lands. Through a combination of demonstrations, grants and training, A.I.D. has assisted in establishment of census boundaries in Kenya, in identifying the extent of new lands being colonized in eastern Bolivia and established a small-scale, digital image-processing system being used to monitor rice acreage in Sri Lanka. A.I.D. has also assessed the potential of the Aguaje tree in Peru as a fuel resource, established a Regional Remote Sensing Training and User Assistance Facility in Nairobi, Kenya and satellite technology applications in Morocco for targeting potential mineral areas, mapping snow pack in the Atlas Mountains for water runoff predictions, and mapping coastal erosion, and has developed an agricultural census for Tunisia using satellite imagery to improve agricultural surveys. The project has produced trained image analysts, land use and natural resource maps, agricultural yield, acreage, and estimated production statistics, population censuses, and an operating regional remote sensing center. The project currently costs $2.4 million annually.

A.I.D. is working with the Government of Jamaica to provide an improved statistical and analytical base for the formulation of agricultural policy and the design and evaluation of rural-oriented projects. The government of Jamaica (GOJ) has taken initial steps to organize the collection, processing, and analysis of agricultural information, and attempts are being made to broaden the capabilities of the staff of the Agricultural Planning Unit. The five-year project will have cost $2.5 million by 1983.

Means of Technology Transfer

Support for the Regional Remote Sensing Training and User Assistance facility in Kenya has been provided under a separate six-year aid project begun in 1977. This project is aimed at providing data which will be useful in locating sources of water, identifying arable land and

finding new transportation routes. An agreement in surveying and mapping has been reached with the Nairobi Regional Center for Services of the Economic Commission for Africa to locate this facility at the Center's headquarters and to share personnel and equipment. The resource surveys will utilize aircraft photography as well as satellite data. The Regional Center's estimated annual budget is borne by five east and southern African countries. Negotiations are under way with other prospective participants. Equipment and support has been provided by Switzerland, Holland, West Germany, Sweden, and Finland.

In Costa Rica a pilot project will provide an opportunity to demonstrate to the host country and other countries of the hemisphere, over the four-year life of the project, the operational utility of aircraft and satellite remote-sensory technology for agricultural map statistics, cartographic and resource mapping, hydrological surveys, and environmental analysis. Remote sensory specialists will be trained for the possible development of a local or regional capability for photo and imagery interpretation to be used in natural resources and land use planning and analysis by 1981.

The majority of Cameroon's population earn their livelihood from cattle and goats in the northern Sahelian region, from shifting patterns of agriculture in the western and central highlands, and from the harvest of forest products in the southern rain forests. To develop sound resource plans, Cameroon needs basic information concerning the nature, extent and condition of its physical resources. It also needs a continuing ability to up-date and monitor resource exploitation as development proceeds. A four-year project begun in 1979 will provide a more accurate knowledge of the natural resource base. Satellite imagery, obtained through the LANDSAT program, will provide the foundation for the development of a continuing Cameroonian resource inventory program.

Haiti's overall growth in the first five years of the 1970's was hindered by the poor performance of the agricultural sector. A four-year, $2.2 million project to develop Haiti's institutional capability to increase agricultural production was initiated in 1978. This project is designed to establish an analytical and agricultural production reporting capacity within the existing statistical service of the Ministry of Agriculture.

Existing socio-economic data in Bolivia is severely limited and of varying quality. There has been no

agricultural census since 1951, and only one national survey since that time. These defects can hinder effective resource allocation and program evaluation for both Bolivian and external donors. A project begun in 1978 has provided technical assistance in the fields of credit recipient analysis consumption, and traditional agricultural practices. This project will improve sector management by focusing on socio-economic data inadequacies. The project will cost $918,000 by 1981.

Farming Systems and Appropriate Technology

Technologies:

One of the basic problems faced by the institutions involved in attempts to improve the productivity of small farmers of the Caribbean region is the difficulty of disseminating knowledge, and promoting the use of new technologies, crops, seeds, fertilizers and pesticides, and in overcoming poor farming practices and lack of credit and other supporting services. Pilot delivery systems in several islands will be developed in a 5-year $1.1 million project begun in 1979. The systems consist of a nucleus demonstration farm, managed by an agricultural scientist, serving satellite farm units. These farms will serve as applied research demonstration centers and will provide training and supervision to the participating farmers and assure provision of necessary credit.

Means of Technology Transfer

A five-year agricultural training and technology transfer project is under way in Tunisia to develop a cadre of agricultural experts with skills necessary for the expansion of services and research support for Tunisia's farmers. The achievement of agricultural sector goals is hindered by a number of critical technical and manpower constraints. These include insufficient skilled manpower and resources directed to research and agronomic experimentation, the need for a technological package adapted to small and medium-size farm units, and an inadequately trained cadre of experts in the specialized fields of agriculture, forestry, hydraulics and fisheries. This $1.8 million project is designed to help the Tunisian Government meet these specialized training and research needs by 1982.

In Guyana, where rice is a principal source of foreign exchange, 20,000 farmers engaged in rice cultivation will benefit from an A.I.D. project begun in 1978. The project

will construct three new badly needed regional rice drying and grain storage centers in rice producing areas, and reconstruct a rice packaging and marketing plant by 1983. Other donors are involved in related projects.

The Government of Indonesia's efforts to improve the economic and social well-being of the poor are assisted by an A.I.D. program established in 1979 which will provide over $25 million in assistance by 1982. Ultimately, up to 2,000 rural works subprojects will be completed in 1,000 to 1,500 of the poorest sub-districts in Indonesia. Approximately 580,000 laborers will be employed in the work with up to 20 million people benefiting directly or indirectly from the completed subprojects, largely dealing with the rural infrastructure.

Crop Production Technologies, Post Harvest Food Losses and Pest Management

Cereal Grain Improvement

Technologies:

A project designed to improve the Government of Guatemala's capability to develop, screen, and introduce new and/or improved crop varieties, cultivation systems and crop mixes while putting presently available improved farming techniques into practice was begun by A.I.D. in 1975. With continued support, Guatemala's Institute of Agricultural Science and Technology (ICTA) has instituted a program of adaptive research and field testing for basic grains and subtropical vegetables designed to increase the yield and nutritional value of these food crops. ICTA serves a target group of 2.3 million persons. It has produced high-yielding corn seed, improved sorghum and bean seed, and agricultural practices have been developed and demonstrated to farmers and extension service personnel. The project should be completed by 1980 at a cost of over $1.7 million.

Means of Technology Transfer

Sorghum and millet are grown on more than 75% of the cultivated land in the Yemen Arab Republic. Adaptive varietal and cultivation system research has been undertaken and trials conducted on farmers' fields. Almost all of Yemen's 840,000 farm families will benefit from this A.I.D. supported six-year, $3.3 million project by 1981.

Cereal Protein Improvement

Technologies:

Methodologies for Improved Varieties of Cereal Grains

A.I.D. has encouraged increases in farm production through the development and extension of improved food crops in a continuing project currently funded at $2.3 million per year. The project, begun in 1966, has contributed to other programs. These have included training in seed technology, improvement of wheat cultures by utilizing winter and spring hybridization programs, improved protein quality, drought tolerance and disease resistance in barley, grain yield and quality of pearl millet for semi-arid areas, and increased tropical production of beans and cowpeas. Other donors also support the project.

Research in Pakistan has been assisted by a ten-year project begun in 1969. Over $9.6 million has been spent on research programs and support activities to establish a coordinated nationawide agricultural research program. Research efforts under this project have resulted in the implementation of three A.I.D.-supported projects: Water Management, Dryland Agriculture Development, and Village Level Food Processing. Project activities have also led to the initiation of national coordinated research programs for wheat, corn, sorghum, millet, rice, forage, and oilseeds, with testing at provincial research institutions, universities, and in farmers' fields. A 1,500 acre National Agricultural Research Center is being constructed and staffed to supplement research done by provincial institutions.

Means of Technology Transfer

In the Philippines, a $10 million, 5-year project begun in 1979 will help to increase the national agricultural research capabilities and related outreach activities. This project is designed to enable the Philippine Government to achieve food self-sufficiency, improved nutrition, and conservation of natural resources. An estimated 3.75 million people will benefit from this program.

Soybeans and Grain Legumes

Technologies:

In numerous other worldwide projects of a similar nature, A.I.D. is supporting research and development as

indicated by the local situation. These projects are exemplified by an $8.4 million project to help develop a Tanzanian capacity to plan, organize, and administer an agricultural research system for grain and legume crops.

Means of Technology Transfer

In a six-year project in north Cameroon, varieties of peanuts and sorghum will be identified, 200 extension agents trained, two warehouses constructed, 1,450 tons of seeds produced and 200,000 farms will eventually use the improved seeds to plant approximately 1.1 million acres of these crops. The project will have cost $1.6 million by 1981.

Pest and Hazard Management

Technologies:

In Central America and the southern part of South America, a regional field unit will be established to serve as an adaptive research and outreach point to develop and extend vertebrate pest control technology to national agencies in these areas. The Denver Wildlife Research Center of the U.S. Department of the Interior has developed the basic vertebrate control technology which can be used to substantially reduce food crop losses in Latin America through cooperative adaptive trials. A.I.D. supports these efforts in a three-year project.

Means of Technology Transfer

In LDC's, preharvest food losses due to pests are estimated to range from 10% to 80%. A.I.D. has supported a project since 1966, with a current annual cost of nearly $2.3 million, to increase the quantity and quality of food available to small farmers in LDC's by reducing pest losses through integrated pest and pesticide management programs. The project utilizes a two-pronged, interrelated approach consisting of basic and applied research on pests and their associated parasites and predators, and short-term technical assistance to LDC's. The project consists of control of rats in the Philippines and Thailand, control of grain eating birds in the Sudan, and rootknot nematode control research in 60 countries. The potential for increasing availability of basic food crops by up to 40% is inherent in this project. Training has been provided to 1,600 pest control managers and technicians in LDC's. Similar programs are funded by FAO, the United Kingdom, France, and West Germany.

Post Harvest Food Losses

Technologies:

Post harvest food losses may approximate current world food shortages. Grain losses are estimated at over 10% of current production, and perishable food losses are considerably higher. A.I.D. supports efforts to reduce these losses. The University of Missouri has undertaken a research program to develop varieties of maize which are resistant or immune to aflatoxins. The National Academy of Sciences is attempting to determine the types and degree of world-wide food losses. Kansas State University (KSU) provides technical information and assistance to 56 countries in food grain storage, drying, handling, processing and marketing. Canada, the Netherlands, the FAO and other donors support related programs.

Means of Technology Transfer

In the Yemen Arab Republic a project was begun in 1979 to develop appropriate technologies in improved food storage and processing for use in rural households. Significant improvement in household food storage is possible, where estimates of losses run as high as 25%. This project is designed to identify village/farm problems which might impede development of appropriate technology, and will develop and introduce tools to increase the productivity of peasants and small farmers, and evaluate and test other appropriate technologies at the village level. The project will focus on institutionalizing an ongoing village technology research and development effort. Recommended technologies can then be turned over to the private sector. A.I.D. will contribute $1.6 million by 1981. Other donors include the Netherlands, United Kingdom and Federal Republic of Germany.

Agribusiness

Agribusiness and Seed Industry Technology

Technologies:

Two fully operational seed multiplication farms in Tanzania will be supplemented by development of two additional farms by 1982. The farms are situated in four different ecological zones to produce foundation and certified seeds which are purchased by the Tanzanian Seed Company for distribution to small farmers through a national food production program. A seed production

agronomist has been provided to assist the local government of Zanzibar Island to develop its seed multiplication and production programs. A.I.D. will provide more than $9.5 million to this project. IBRD supports a complementary food and cash crop production program.

The lack of participation of the traditional farming sector in the cash economy is a major obstacle to the full development and improvement of the Liberian rural poor. Lack of capital has been a primary impediment, since the subsistence farmer has almost no cash reserves. Assistance is provided to the Agriculture and Cooperative Development Bank in Liberia to enable this institution to provide credit to rural individuals and organizations, mobilize rural savings, provide technical assistance and training in rural enterprise, and conduct research on agricultural credit. This million dollar project will benefit 150,000 farm families between 1979 and 1983.

In Paraguay, a marketing planning project will cost nearly one million dollars in the 1979-82 period. It will increase efficiency and reduce costs of crop marketing, and will conduct an analysis of marketing problems and design comprehensive programs to overcome them. This project will be the basis for future policies, programs, and facilities that will have a direct impact on small farmers.

Other than through friends, relatives, and landlords, little or no rural credit has been available to the vast majority of Pakistani farmers with less than 25 acres, nearly 90% of the total.

The Government of Pakistan recognizes that the rural agricultural sector is the key to the nation's economic development, and requires an effective rural credit system. In 1979, Pakistan, working with A.I.D., began to expand available credit resources to establish the institutional framework within which low-income farmers and small businesses servicing agriculture will have access to credit. This project, which is estimated to cost $90 million by 1984, will provide substantially increased credit funds for the use of at least 200,000 low income farmers using institutional credit. Effective low-cost credit delivery systems will be developed that will expand low-income farmer access to credit.

Means of Technology Transfer

A continuing project was initiated in 1977 specifically

to stimulate private and governmental organizations to develop and disseminate new appropriate technologies for utilization in LDC's. This program, administered by A. T. International, a Washington, D.C. non-profit corporation, serves to foster LDC national policies which will permit the use of more appropriate technologies. Areas addressed include: improved information and communications systems among the organizations and individuals working with appropriate technology, support of specific appropriate technology projects including assistance to LDC research units and small businesses for activities related to farm machinery, alternative energy, and health services, and training and education programs in support of appropriate technology development and utilization. This project has a current cost of $3.3 million per year.

In Haiti, the construction of experimental coffee washing centers, the establishment of locally-controlled co-ops, the development of these cooperatives into a parallel marketing network, and the construction of a national coffee processing center, are financed by a project begun in 1977. It is designed to increase local participation, open new competitive marketing opportunities, stimulate production, and increase the return to the farmer. This network of producer-owned coffee marketing cooperatives will bring the small producer a higher return for his investments in land, labor, and capital. This $6.1 million project will benefit 12,000 coffee producers by 1982.

Over 14,000 farmers in Swaziland will benefit from an A.I.D. project begun in 1976 which focuses on providing skills and training to strengthen existing rural service institutions. By working with the Central Cooperative Union, to which all registered cooperatives belong, benefits will accrue to the small farmer. The total project cost will be $2.7 million by 1981.

In Jamaica, multipurpose collection points will be developed in the small towns. Extension technical services will be made available to small farmers, applications and payments for credit processed, farm supplies distributed, produce collected, sorted, stored, and transhipped. Approximately 100 of these collection points will be constructed over the life of the project. The 400,000 persons living on farms of less than 5 acres will be the primary beneficiaries of this project. A.I.D. assistance of $16 million over two years, along with participation of the IDB, will help in the project development.

A substantial potential exists for assistance to small farmers in the Cameroon through upgrading the capacity of agricultural cooperatives so that they more effectively meet the marketing, production and credit needs of small farmers. In a six-year, $2.8 million project begun in 1979, A.I.D. will assist the Department of Cooperatives in training its own and local cooperative employees. This project will enable the Cameroonian Government to further develop comprehensive marketing, consumption and credit cooperatives.

A five-year project to develop low-cost alternative agricultural and agro-industrial technologies has been underway in Peru since 1978. The project addresses problems of low productivity, under-employment, and unsuitable marketing arrangements. This project will help develop Government of Peru institutional capability to test new employment and income generating technologies, with particular emphasis on the needs of the rural poor. Included are: development of low-cost farm implements, demonstration plots for double cropping on different types of soil, experimentation in tanning and production of furs and skins, creation of products derived from maguey cactus, simple technologies to improve post-harvest storage, preservation, and processing of perishables produced in rural areas, improvement of ceramics technology, small scale artisan textile technologies, improved utilization of natural energies, including wind, water, temperature differences and solar, and low-cost construction materials for use in rural shelters and sanitation facilities. A.I.D. will contribute over $1.2 million by 1982. Other donors include Switzerland and the International Potato Center.

By 1983 over $13.9 million in assistance will have been provided which will result in land development related farming systems, improved maintenance and repair of heavy equipment, range rehabilitation and improved management, and functioning Government institutions to carry out land development in Swaziland. A.I.D. and other donors are supporting the six-year project to promote the transformation of traditional agriculture from subsistence to semi-commercial farming, to raise incomes and create more opportunities for gainful employment among the rural population. By supporting the Rural Development Area Program the project will assist the Government of Swaziland to expand the consolidation of land use, construct physical infrastructure, strengthen basic extension services and increase marketing of cash crops started under earlier rural development efforts.

Fisheries and Aquaculture

Aquaculture

Technologies:

In Bangladesh, fish could be an important food supplement for the undernourished population as well as a source of income for rural families. A project to increase inland fish production by upgrading fish extension activities and creating 25 fish seed multiplication farms is supported by A.I.D. The project design is intended to assure that the major beneficiaries will be the rural poor. A.I.D. will contribute over $4.5 million to the project over five years ending in 1984. Other donors include the Asian Development Bank, UNICEF, the World Food Program, Canada, the United Nations Development Program, FAO, Norway, Denmark, and the United Kingdom.

Means of Technology Transfer

The average catch, per unit, of Indonesian fisheries was half that of the Southeast Asian country's marine fisheries. Fish ponds were small, with yields among the lowest in the region. Working with the Government of Indonesia, A.I.D. will contribute $1.5 million over four year to upgrade offshore and inland fisheries. The project is intended to increase both the quantity, quality and variety of food fish available to poor consumers and provide employment for low-income ocean and fresh water fish producers. By 1981 a pilot iceplant will be built, a fishery management system created and staffed with trained personnel, three demonstration floating fish cages built, and an improved hatchery established together with up to five fresh-water shrimp research stations.

Traditional fishermen and the general population will benefit from a project to assist the Government of Zaire to revitalize a local fishing cooperative in Uvira by introducing improved fishing techniques and improving services to its members. The increased fish catch will contribute to increasing the amount of protein available for people serviced by the cooperative's market systems by 1980.

Small Scale Fisheries

Technologies:

Jamaica does not produce enough foodstuffs to supply

domestic needs and suffers from high unemployment and low income. Fish are an important item in the diet, but have been imported at the rate of 18 pounds per person each year. Although marine fisheries could be expanded, they do not offer sufficient potential to fill current or expected demand. In a three-year project begun in FY 79, A.I.D. will provide $4 million to initiate a pilot program to develop 60 acres of research and demonstration facilities for freshwater fish production.

Means of Technology Transfer

Ten thousand tons of fish are expected to be produced by 1982, benefiting 58,000 members of low income rural Philippine families through improved nutrition and increased income. The project will extend fresh-water fisheries technology production and management advisory services, laboratory equipment and supplies, and technical and extensive training to 10,000 low income farmers.

Livestock Production

Livestock Feed Supply

Technologies:

A.I.D. is assisting the government of the Cameroon to improve livestock forage production in a seven-year project to demonstrate the feasibility of implementing a series of technical practices intensifying livestock production in a pilot zone of sufficient size. The project is one of six developed by a joint U.S. and French study team.

Means of Technology Transfer

Over-stocking has reduced the forage production of Morocco's approximately 30 million acres of rangeland. Yet, even as the range deteriorates, more animals are being crowded onto the land to meet the demands of a rapidly increasing population. A.I.D. has undertaken a project designed to strengthen the Moroccan Government's ability to organize and conduct research in range management and to implement sound range improvement programs. By 1984, the $2 million project will result in the development of improved range forage species, introduction of improved range management techniques, use of effective livestock management practices, training of Moroccan professionals and technicians in range research and development, and implementation of a functional range development program. FAO also supports this project.

Animal Health

Technologies:

Semi-Nomadic Masai livestock herders are responding positively to technical innovations introduced by the government of Tanzania. A rural training center opened in FY 77 provides outreach to the Masai. The program of the center will be expanded to include livestock disease control. The project, begun in 1970, will conclude in 1980.

Means of Technology Transfer

The project in Cameroon, described earlier, also supports the establishment of animal health posts. Approximately 150,000 animals are expected to use the transient centers, over 1.5 million vaccinations and 250,000 treatments are planned by project end in 1984.

Livestock Production Systems

Technologies:

A practical crop and livestock project is under way in Lesotho. The project aims to develop within the Ministry of Agriculture an ability to carry on necessary research in the future and to convince small farmers of the advantages of implementing methods validated by research results. This $8.2 million project will affect a majority of the 187,000 agriculture sector households of Lesotho through increased income due to adoption of more productive farm enterprise mixes. Over the six-year life of the project, ending in 1983, it is expected that significant progress will be made in implementing integrated farming systems adapted to the needs of small farmers for higher output.

Means of Technology Transfer

Tunisian farmers and agents are being introduced to new hay and pasture crops, cultivation systems, and crop/livestock management systems. Confined grazing, selective breeding, internal/external pest control and other techniques are upgrading their technical competence and skills through the demonstration/performance method. A network of on-farm demonstrations are being established using tested agronomic and livestock management technology developed in Tunisia during recent years. Autumn and spring planted forages are being demonstrated under rainfed

and irrigated conditions in livestock raising regions of 14 provinces. The five-year project is designed to develop a Tunisian Government capability to reach the small livestock farmer with modern technology in forage production, feed utilization and livestock management. An estimated 100,000 farmers in 14 provinces will benefit from 328 cattlefeeding and 3,600 forage seed production demonstrations by 1981.

SOIL

Tropical Soils

Technologies:

In Liberia the government will be assisted in developing the central Agricultural Experiment Station at Suakoko. Improved technology will benefit the traditional subsistance agriculture section where the harsh climate and poor soils preclude a transition from slash-and-burn methods to new crops and better farming systems. Other donors also support this six-year project begun in 1978.

Means of Technology Transfer

Until recently there were no professional conservationists in Lesotho. Eight U.S. conservationists have been assigned to initiate and maintain this process while Lesotho personnel receive the academic, technical and practical training required to staff a soil conservation service. The project will develop and institutionalize a national conservation service within the Ministry of Agriculture to incorporate sound land use and water management principles into Lesotho's national agricultural development effort. The seven-year project will be completed in 1981 at a cost of $3.2 million.

Biological Nitrogen Fixation

Use of Reliable Inoculants

Technologies:

With support from A.I.D., the University of Hawaii has studied soil microbiology, with emphasis on nitrogen fixation. This effort assists application of accumulated new technology to LDC needs.

Means of Technology Transfer

The University of Puerto Rico is supported by A.I.D. in efforts to assist in establishing a number of locations in cooperation with local research institutions. Workshops and seminars will be held for training staff, reviewing progress and disseminating information.

Fertilizer

Production

Technologies:

Nineteen A.I.D.-supported experiments conducted in four countries demonstrated the use of sulfur-coated rea and ground rock phosphate between 1973 and 1975. Countries involved include the Philippines, Thailand, Pakistan and Nigeria. This improved fertilizer production will help developing countries where soils are inherently deficient or exhausted by years of exploitative farming without replacement of nutrients.

Means of Technology Transfer

A.I.D. assisted a farmers fertilizer cooperative in India between 1971 and 1975. Farm facilities were erected: a 910 ton per day ammonia plant, a 1,200 ton per day urea plant, and an 1,820 ton diammonium phosphate plant. The products are distributed through the Indian Agricultural Co-ops. This A.I.D. project cost over $19.5 million.

Marketing

Technologies:

In an A.I.D.-supported project costing $19 million in Afghanistan from 1972 to 1976, a system was established to include the warehousing, transportation and sale of fertilizer to wholesalers.

Means of Transfer

During 1977, fertilizer use in Bangladesh increased dramatically. In the next several years, until Bangladesh develops a reliable capacity to produce urea domestically, the country will have an increasing need for fertilizer imports and must be able to plan for them systematically on a multi-year basis. Bangladesh therefore needs assistance in making adequate quantities of fertilizer available throughout the countryside in amounts and locations appropriate to small cultivators. A.I.D. began the three-year project in 1978 to improve the distribution system for fertilizer in Bangladesh, which will produce 130,000 tons of needed warehouse capacity and 300,000 tons annual bulk handling capacity. The project will cost over $59 million when completed. Saudi Arabia and the United Kingdom are also donors.

Use

Technologies:

Over 8,000 dryland farmers of five northern provinces of Tunisia who are generally in the lowest third of the income scale in rural Tunisia will benefit from an A.I.D.-supported project designed to provide the credit necessary to give these farmers access to production inputs and new technology. Production inputs are estimated at 19,000 metric tons (MT) of seeds, 68,000 MT of fertilizers, and 1.2 million hours of mechanized services. From 1978 to 1981, over $20 million in assistance will be provided for the supervised credit program. Sweden supports a similar activity in a contiguous area.

Means of Transfer

In a significant departure from what was done in the past in Bangladesh, where water projects have focused primarily on flood control, water and related land resource study will be combined to develop recommendations for low cost, high yield combinations of flood control, drainage, and irrigation techniques, new seed varieties, and fertilizer and cultivation techniques. A six-year $2.5 million project in one region of Bangladesh will introduce and test optimum combinations of water use, agricultural inputs and cultivation practices. This integrated approach will use irrigation and agriculture extension services to improve crop and farm water management. Assistance will be provided to Bangladesh institutions to implement the recommendations of the study in key areas of one zone. Technical assistance will also be provided to the Bangladesh institutions cooperating in the project. In the project areas, farm families will benefit from the addition of second and third annual crops as a result of land brought under irrigation. Due to the extension of new technology, increased yields will be obtained. The increased production is also expected to increase the demand for labor.

Water Management

Water Management

By giving technical, material, and financial assistance to the Helmand/Arghandab Valley Authority (HAVA) to plan and implement drainage construction in Afghanistan, 22,400 families will benefit from a 1977-1980 project in which A.I.D. will provide over $20 million to reduce salinity and waterlogging in 130 square kilometers of farm land, thereby increasing agricultural productivity, income, and employment of small-scale farmers and farm laborers in the Helmand Valley, by the construction of 1,538 km of main and farm drains. An information program will also be in effect, as will an effective equipment maintenance and supply program.

Means of Technology Transfer

By 1984, irrigation for 16,000 hectares will permit double cropping of rice land to increase productivity and income of 560,000 farmers in the Citanduy River Basin of Indonesia. A.I.D. will provide $18 million in assistance for flood prevention, upper watershed management, and erosion and siltation control initiated in 1979. Upper watershed restoration will eventually be completed in over 12,000 hectares.

One of the world's largest and most complex irrigation systems serves 30 million acres of farmland drawing water from the Indus River and its four major tributaries in Pakistan. Project activities include design of land leveling implements, land leveling, improvement of irrigation watercourses, institution building, and improvement of crop and water management practices. At least 65,000 low-income farm families will benefit from this seven-year, $21.8 million A.I.D. project by 1981.

A demonstration project will increase Jamaican agricultural production on small hillside farms in the Pindras River and Two Meetings watersheds, control soil erosion in the watersheds, thereby establishing an agricultural base for the future and increasing the supply of water for both agricultural and household purposes, and strengthen the institutional capability of the Ministry of Agriculture through these activities. The demonstration project seeks to raise the standard of living in areas by increasing the productivity of hillside farms and providing

the farmers access to improved housing, electrification, and potable water. By controlling erosion, the project will also preserve the productivity of the land, allowing future productivity to be maintained at the higher level. The project serves in addition as a research and training vehicle for the Ministry of Agriculture. A.I.D. will provide $15 million in assistance. Other donors involved in related activities include IDB, IBRD, and UNDP/FAO.

Rainfed

Technologies:

An A.I.D. project assists Haiti in designing and executing agricultural development projects involving farmers in mountain areas which preserve the fragile resource base in these areas. Haitian hill farmers, with a per capita annual income of $80, will benefit directly through an improved standard of living and by being provided with the means of maintaining that standard of living in future years. Farmers in the valleys below the treated watershed areas will benefit from the decreased flooding of their fields and siltation of irrigation works. During the period 1979-83 over $7.1 million will be spent to make major improvements to 2,000 hectares of watershed.

Means of Technology Transfer

A small-scale irrigation project in the Philippines will result in an increase in farm income,an increase in rural employment opportunities, an increase in local participation in development, and will organize and train farmers to operate and maintain self-owned irrigation systems. This loan and grant project supports the Farm Systems Development Corporation (FSDC) at the national level and Irrigator's Service Association (ISA's) at the village level. ISA's comprising 50 to 75 farmers and averaging 100 hectares in size serve as centers of information, skills development, training, and other cooperative endeavors geared toward increasing the income and productivity of their members. FSDC has organized 405 ISA's and installed pumpsets in 262 irrigation systems with a design area of 30,470 hectares. The $18 million six-year project began in 1976.

The government of Sri Lanka intends to open up new irrigated lands, and to invest in five existing irrigated areas. The 14,300 acre Samanthural project is one of the areas where further investment could increase rice production by as much as 35%. The A.I.D. project is

designed to create improved on-farm land and water management practices and the availability of a full range of services and farm inputs to the farmer. These include agricultural extension, credit, fertilizer, and marketing facilities. This project will cost $3 million by 1983. The United Kingdom is involved in two similar agricultural intensification projects.

International Research Organizations

The International Agricultural Research Centers (IARCs) undertake research on widespread problems. This research complements related LDC national research programs and research by developed country institutions. A.I.D. has assisted the IARC's along with numerous other donors, by means of a project begun in 1968 to the IARC's. The Consultative Group on International Agricultural Research (CGIAR) reviews the work of the centers, provides policy guidance, and coordinates financial support. A.I.D. has supported CGIAR efforts which are successfully encouraging the IARC's to focus more sharply on the problems of small farmers. As technical centers, the IARC's often work with A.I.D. missions and developing countries on activities specific to that country. IARC's are located in the Philippines, Mexico, Nigeria, Colombia, Peru, India, Kenya, Ethiopia, and Iran. The activities of other similar centers located in Liberia, Italy and Taiwan are also supported. The IARC's produce new techniques especially suitable for use by small farmers for increased crop and livestock production which benefit farmers worldwide. A.I.D.'s annual contribution is currently over $26.5 million. Canada, the Federal Republic of Germany, the United Kingdom, Japan, Belgium, Australia and Sweden also provide major support to these important organizations.

CHAPTER 5

URBANIZATION, TRANSPORTATION AND COMMUNICATION

Introduction

Urbanization

Urbanization is an important dimension of economic and social progress in the less developed countries. There is a trend towards urbanization, even though the rate and scale of it vary by country and especially by geographical region. It is estimated that Latin America is more than 50% urbanized, whereas Africa, the least urbanized of the four geographical regions, is urbanizing at the fastest rate. Although most people in these countries are not now doing so, by the year 2000 an estimated 40% of the population in developing countries will be living in urban areas. A.I.D. has a continuing task to promote strategies which will satisfy the enormous demands for shelter, water, sanitation, education, health care, transportation, and communications.

Countries with the highest percentage of urbanization have the greatest life expectancy, the highest literacy rate, the largest school enrollment, the highest newspaper circulation, the most favorable ratio of doctors to population, the highest caloric and protein intake, and the highest per capita income. Of special concern to A.I.D. is the wide variation between the poor and the affluent. A.I.D.'s basic human needs strategy of development implies concentration upon the very poorest people; it is a broad and sound basis for effective development.

Broad focus - Aid the Poor

To meet basic needs requires an acceleration of LDC growth rates by focusing greater attention to the production of goods and services for the poor. The "basic human needs" approach requires a fuller use of abundant human resources, greater incomes for the poor in order to generate demand for basic goods and services, and greater political and social participation by the deprived.

It has sometimes been assumed that rapid growth may be incompatible in the short run with greater employment or the reduction of poverty and inequality, and that developing countries must go through the historical sequence of "growth now, justice later." This need not be

the case. Labor-intensive development programs can generate significant economic growth. Taiwan and Korea--two major LDC "success stories"--relied upon highly productive labor forces to push growth in an export-led development path. But sick and malnourished people cannot work effectively. The provision of adequate food, minimal health services and elementary education can make poor people more productive. Such investments in "human capital" are an essential part of our development strategy.

Thus, when we talk about meeting basic human needs we are not talking about an international welfare program. We are talking about giving the poor a chance to improve their standard of living by their own efforts--involving the poor as an "engine of growth." We are talking about giving them the opportunity and the means to rise above those extreme poverty levels that degrade and brutalize human existence.

Urban Poverty

Although the majority of the poor in developing nations are in rural areas, there is widespread poverty in urban areas. Indeed, whereas urban growth rates are double national growth rates, generally speaking, the growth rates among the urban poor are double urban growth rates. In many cities in the developing world, the urban poor comprise the largest segment of the population. This is a consequence of natural increase as well as of rural-urban migration. Rural and urban poverty are linked. Lack of opportunity in the countryside characteristically has the effect of driving the rural poor off the land into the city slums. This results in increased social and economic burdens on municipalities for additional services such as water, sewerage, and health facilities. The development of small urban centers outside the major cities can act as a catalyst for rural development, by providing a location for small scale industry and marketplaces for agricultural products. The objectives of A.I.D.'s urban development program are to understand and guide the processes of urban and regional growth and development; to enhance the contribution of urban centers to rural, regional, and national development, and to help create urban environments in which people will have the opportunity to address and overcome problems of poverty.

A.I.D. Technical Assistance

A.I.D. assistance in the urban sector has been in the

form of capital development loans and technical assistance grants. Loans have helped to provide facilities and services, such as water and sewerage systems, public transportation and housing. Technical assistance grants have aided in the improvement and the extension of health and education services and in financing research and development activities designed to increase planning capability, the ability to define and direct efforts towards poverty groups and poverty areas, and the competence to deal with the spatial aspects of development.

Alarmed by the unprecedented rate of urbanization and the increasing number of urban poor, A.I.D.'s relatively new urban development program has concentrated on the urban-rural linkage. Special attention has been devoted to the regional dimensions of national development. The program of activities stresses employment generation, improved urban planning, finance and management, and access to basic services. The focus of activity ranges from exploring urban-rural linkages in the Philippines to developing a planning process in Nicaragua, to identifying poverty groups and their developmental potential in Costa Rica. This program of selected and probing research and development and field demonstration activities expended nearly $2 million in FY 79.

Programs are also being developed to create jobs and increase incomes of households and small scale enterprises. Other programs help support self-sustained development, including the creation of local financial institutions, the development of planning capacity, and the design and use of appropriate production methods and other technologies.

Current projects will assist in the training and placement of unemployed urban workers in Costa Rica, in expanding small community projects in Peru and an inter-regional effort in Latin America, Asia, and Africa. All efforts are to assess and improve the contribution of urban centers to rural development. In FY 79 the program includes projects in agricultural development in Honduras and secondary urban centers in Latin America.

Since 1976, A.I.D. has fostered a policy for Urbanization and the Urban Poor which established an overall strategy of assisting the poor with A.I.D. programs. For example, in Israel a $25 million housing guaranty program was authorized for the purchase of new housing and renovation of existing substandard units for low-income

families. In Jamaica, a $15 million loan to the Jamaican Mortgage Bank was authorized for tenement upgrading, squatter settlement improvement, and rural home improvement in Kingston and other areas. Future programs will show a primary focus on the rural areas and on the rural poor addressed in the light of national development goals and policies through specific analysis of host country circumstances.

In addition, A.I.D. will continue its Housing Guaranty Program, which guarantees repayment of loans from private U.S. lenders to housing institutions in developing countries. A.I.D.'s goal in the shelter sector is to assist LDC's to develop the institutional, technological, and financial capacity to provide shelter under reasonable conditions for all levels of society, with emphasis on government actions to meet the needs of the poor. Housing programs are being designed to assist families earning below the median income.

The impact of A.I.D. programs for the LDC's becomes more significant as unemployment and urbanization increase in the developing countries. Urban populations will increase by about 50% in the 1970s. At the start of the decade, they constituted 54% of the population in Latin America, 38% in East Asia, 22% in Africa, and 14% in South Asia. As these shifts continue, the need for policies and technologies which increase productive employment in the urban industrial and service sectors as well as in the rural sector will expand.

Transportation

Transportation facilities within the LDC's support goals in other sectors. For instance, agriculture, trade, urban activities, depend on the availability of transportation services. Recognizing the needs of the rural farmers, A.I.D. works to provide the basic infrastructure needed by the LDC's to provide road transport in the rural areas.

Bangladesh

In Bangladesh, for example, A.I.D. furnishes substantial grants to construct and improve rural roads which link small farms to markets and provides access to government and private services in selected project areas.

The Bangladesh Government (BDG) has selected 100 counties for inclusion in an intensive rural works program. Labor-intensive methods will be employed to create the infrastructure necessary to increase the production and

marketing of agriculture commodities. Bangladesh has only 4,200 miles of roads, thus making the construction of additional transportation facilities a priority. The need for roads to further such activities as health and family planning services, makes U.S. assistance a key component for further developmental progress. Tremendous flooding escalates construction costs and makes the elevation of bridges and culverts necessary. Therefore, A.I.D. focuses on strengthening the planning, design and management capabilities of the Rural Works Program staff together with actual road construction in some 20 countries. Not only the Bangladesh Government contribution to this project, which amounts to $10 million, but the World Bank and the Asian Development Bank donors' contribution to the rural works program, will significantly aid the small producers and rural poor of Bangladesh.

Philippines

In the Philippines, A.I.D.'s efforts totaling $7.5 million in the construction of transportation facilities for the rural poor, has provided greater access to rural service centers and market towns for the rural poor.

Poor in road networks, the Philippines, through extensive A.I.D. training in the provinces has seen to the completion of 300 kms of roads and 3,000 meters of bridging. The target for Rural Roads I is 500 kms of roads and 5,000 meters of bridges. Through efforts by the Asian Development Bank (constructing up to 850 kms of feeder roads in Mindanao starting in 1978), and the World Bank through a $15 million outlay, including a USAID/DLGCD system for implementation, the increased participation of rural families in the national economy, together with transportation costs savings is ensured.

In Tanzania, A.I.D. input of $2.7 million supports a decentralizing rural roads construction and maintenance capability and expands and helps rehabilitate the rural road network in the Dodoma, Singida, and Kilimanjaro regions. With donor assistance, the Government of Tanzania is attempting to provide road service to some 8,000 villagers in order to keep pace with other development projects. Eventual upgrading of central management competence and the estimated $5 million for the life of the project from IBRD, West German and British donors should assist in raising the $70 per annum per capita income of the poorest regions of Tanzania.

A.I.D.-financed inputs in Panama, consisting of technical assistance, training, and road construction costs, amounts to $10 million. The objective is the development of an all-weather access road network on a national scale that will reduce transportation costs and make vital services more accessible to Panama's small farmers. Development of the rural sector, through the establishment of an extensive primary and secondary road network, is currently aiding isolated areas to partake in the advantages of an urban linkage. Complementing A.I.D. efforts will be Panamanian contributions of $5.0 million and I D B. financing of almost $30 million in feeder roads and all-weather highways throughout the country.

In Haiti, the emphasis revolves around the expansion and strengthening of the National Highway Maintenance Service in order to keep the nation's road network usable through routine maintenance and rehabilitation. Small farmers will be the direct beneficiaries, in terms of increased revenues, by A.I.D.'s $600,000 efforts. A joint effort of the Government of Haiti ($8.7 million through FY 80), the I D B , UNDP and France should improve SEPRRN facilities.

In Ethiopia, A.I.D. inputs of over $6 million in the construction of low-cost minimum standard rural roads, will push decentralization of rural roads construction and maintenance to provincial offices. 2.5 million rural dwellers will be affected by the Government of Ethiopia's $8.0 million assistance and the International Development Association's $6.5 million support. Through this concentrated short and long term A.I.D. commodity and construction input, the rural agriculturalists, pastoralists, and cottage industry producers, together with their dependents, will benefit.

Guyana is an excellent example of the necessity to support the strengthening and expansion of the feeder road component. Rice production has doubled in the last ten years, and is about to double again through major irrigation and flood control development in the next ten years. Roads are the key link in the rice production chain due to the spoilage factor that revolves around the movement of crops to drying facilities. Road transport of goods is curtailed by poor all-weather facilities. Focusing on the installation of major rebuild workshop equipment, the construction of a new soils and materials laboratory, and training supervisors, foremen and mechanics, A.I.D. and other donors (World Bank, Caribbean Development Bank, and

the Inter-American Development Bank) will eventually benefit 10,000 farm families.

Communication

In most developing countries, basic communication and media services are woefully inadequate, and are an obvious factor in the income disparity between rich and poor.

Modern communication and information technologies now make it possible to shift part of the communications burden from the transportation sector. Improved communications can now help break down rural isolation and promote better education and health care, changes in urban design, and more dispersed regional settlement. Recent reductions in costs and improvements in performance indicate that improved communications technologies could become a major new force in development.

The potential economic justification of telecommunications for the delivery of technical assistance and information to rural villages is indicated by the high cost and limited effectiveness of current procedures: one-third of the roads serving India's half million villages have no surfacing and are generally impassable when it rains. Thousands of villages are served only by footpaths and animal tracks. Agricultural extension workers, literacy workers, and other technical assistance personnel traveling by Jeep or by bicycle can visit only a few villages a week, and their help is highly intermittent. The use of radio, telephone, television, and other methods of communication, however, can provide complete coverage and continuous service almost immediately, without awaiting the long and costly process of building all-weather roads, providing vehicles, and training the large number of extension workers required when information is transported rather than delivered electronically.

Modern communication technologies can also offer new opportunities for the delivery of higher education in developing countries. In most of these countries, the greatest obstacle is a lack of adequately trained teachers. Institutions trying to staff new programs typically have two alternatives: attract foreign academicians to temporary visiting faculty appointments, and/or send their own nationals abroad for training. With the advent of expanded communication facilities, such as those discussed in this report, other alternatives for teacher assistance and instructional support to educational institutions are now possible.

Communication Satellite Systems

Communications satellite systems which can broadcast television (or radio) signals directly to community receivers have become a reality. The first demonstrations of this capability occurred in 1974 and 1975, in the United States, covering a variety of health, educational and telecommunications applications. In August 1975, India started its demonstrations of satellite TV aimed at agricultural and other development objectives in several thousand of its villages. Early in 1976, Canada and the United States began a second-generation series of development experiments on the Canadian Technology Satellite and in mid-1976, the ATS-6 satellite (Applications Technology Satellite-6) returned from India to the Western Hemisphere for more possible demonstrations. Meanwhile, operational, nationwide, communications satellite applications are being firmly planned by Brazil, Indonesia, Iran and others. One of the attractions of this technology is the ability of a satellite to transmit to (and receive from) the most remote, rural areas at about the same cost as to the more developed urban centers.

A.I.D. formulated a project to produce an information paper on the future plans of the LDC's for the use of satellites. This research included the collection of data relating to Brazil, Indonesia, Iran and Zaire, as well as Japan. Indonesia and Japan were viewed in the light of plans relating not only to in-country use, but with special reference to those satellites possibly providing service to Malaysia, the Philippines, Thailand and other parts of South-East Asia. The nine-component study is of particular interest to A.I.D.'s LDC constituency as an information base relating to the costs of satellite technology. A.I.D. has played a continuing role in the development of satellite systems. In 1974, A.I.D. participated in a week-long symposium to kick off planning for Indonesia's satellite. A.I.D. contributed to sending a delegate to UNESCO's Conference on Satellites South of the Sahara and in the Arab States Region; funded a staff consultant for a UN meeting in Geneva on direct broadcast satellites; participated actively in the State Department-sponsored Airline House conferences on satellite development.

At present, A.I.D. is involved in a technical assistance project in Indonesia which is satellite-related with, a study from M.I.T. on data transmission by satellites, with a special focus on agricultural research networks. All A.I.D. projects are designed to enable A.I.D. to serve its LDC constituents, in response both to their questions and

their needs, with sophisticated information about the potential of satellite technology.

Rural Telecommunications

Further telecommunications experiments will be carried out in a number of countries, including the United States. Different mixes of technology and different types of services (health, education, agriculture, etc.) will be the subjects of experiments committed to evaluating their projects and sharing the results with other United Nations member countries. A.I.D.'s proposed program to use the Syncom IV satellite for experiments in rural communications has been recommended as an excellent vehicle for these programs. The Syncom IV experiments, planned over the years 1980-87, will cover countries in the Caribbean, Andes, and Sahel regions. This coverage will demonstrate what modern science and technology can do to bridge the communications barriers of water, mountains, and deserts. The United States has built up strong technical resources and can collaborate with developing countries in these regions in working out the critical problems of software and supporting local service systems.

Conclusion

Experience has demonstrated that comparatively little United States technology can be transferred to LDC's without significant adaptation. The LDC's are aware of the need for technologies which fit their factor endowments and absorptive capacities. Stress is being placed on innovation to develop more appropriate technologies and on devising policies and institutions which permit developing countries to make better technological choices.

Science and Technology

A.I.D.'s use of U.S. science and technology has generally followed the main lines of its program. Extensive use has been made of American science and technology in agriculture, health, and family planning. Substantial programs of research and development in these areas have been launched by the Agency. A.I.D. draws heavily on U.S. talent in the social sciences and on engineering firms concerned with construction of economic infrastructure. More attention is now being focused on other biological and engineering sciences including the physical sciences, with an ongoing thrust to strengthen the application of science and technology in all major programs.

Modern science and technology are the underpinnings of productivity and quality of life in the industrialized world. A.I.D., however, must adapt this technology to the economic, social, and technical conditions of the LDC's if they are to serve LDC development needs effectively and sensibly. With the strengthening of the scientific and technical competence of the LDC's, efforts must also be made to modify the LDC's economic and social policies so as to encourage appropriate technological choices and the continued growth of indigenous, innovative capabilities. Otherwise, for example, complex and high-cost modern equipment designed for industrial countries and totally inappropriate for LDC's at the present stage of their development, might replace low-cost labor and lead to more unemployment, longer foreign debts, and difficult equipment maintenance problems in the LDC's. A.I.D.'s actions therefore facilitate and support the LDC's adoption of policies which are more appropriate to their circumstances, the urgency of which is becoming more apparent with the growth of population, urbanization, pollution, and unemployment in both rural and urban areas.

INDEX