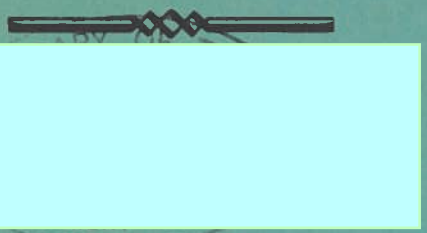
AID RESEARCH PROGRAM
IN
AGRICULTURE AND RURAL DEVELOPMENT

FY 1962-1967



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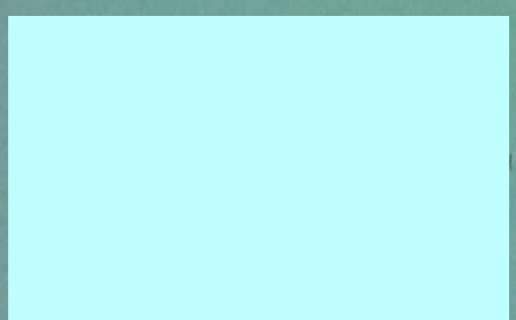

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D. C.

FOREWORD

Progress in agricultural development with maximum productivity of land, labor and capital is essential for the economic development of the low-income countries. In the more advanced countries such progress has been facilitated by the results of substantial and continuing research. A.I.D. considers research an essential element in its technical and economic assistance efforts and is currently expanding its research program.

This publication reflects the need for a wide range of natural and social science research in agriculture and rural development. Moreover, the potential contribution of research projects to the strengthening of the research and scientific capabilities of the developing countries are an important consideration in the development and selection of projects for A.I.D. sponsorship.

This publication is intended to serve three purposes: first, to describe agricultural research projects underway or under consideration by A.I.D.; second, to indicate research topics of particular interest to the Agency; and, third, to stimulate the development of proposals for additional projects with a potential maximum impact on the agricultural sector of the less-developed countries. Progress in this program, which will ultimately affect the future of millions of people in the less-developed world, will depend primarily on the quality of the research designs, the competence and dedication of the investigators, and the relevance of the projects to the problems confronting the foreign assistance program.

John D. Wilkes
Science Director

CONTENTS

The basic purpose of A.I.D. is to help less developed countries become well established free nations with sound economies necessary for political stablility and for the welfare and dignity of their people. A relatively small but very important part of the A.I.D. efforts involves research and analytical studies contracted in the area of agriculture and rural development. All of these projects are selected as integral parts of a broad program designed to contribute needed information of high priority which can (a) be applied directly to help several or all less developed countries, (b) be used to improve A.I.D. procedures or (c) serve as the basis for A.I.D. policy decisions. Projects are selected which do not duplicate the research and analytical efforts of other organizations such as the United Nations' FAO, other countries, or private foundations. These are fundamental criteria followed by the Office of Research and Analyses.

Although this publication describes projects customarily performed by Universities and Federal Agencies, it is not the intention to overlook the great contributions in research and analysis made by many U. S. commercial concerns. Indeed it is hoped that their interests in less developed countries will continue to expand and may include research of mutual value. Simultaneously the results of the A.I.D. research program often may encourage U. S. concerns to enlarge their business in less developed countries.

I. AUTHORIZATION TO DO RESEARCH

The Agency for International Development and its predecessor agencies sponsored relatively little research until the passage of the 1961 Foreign Assistance Act. Prior to that most of the U. S. agricultural officers were inexperienced in tropical agriculture, in the problems of traditional agriculture, and in assistance to developing countries. However, many of them helped initiate small research studies and several U.S. A.I.D. Missions supported research projects and institutions. Nevertheless, there was no concerted effort to solve the many problems and to develop the new materials and methods needed in an economic development program. The lack of research undoubtedly has been a major handicap to the A.I.D. agricultural and rural development program. This deficiency in the A.I.D. program has been corrected through the authority described next.

The U.S. Foreign Assistance Act of 1961, Title V - Development Research, Sec. 241. GENERAL AUTHORITY - authorized A.I.D. research as follows:

> "The President is authorized to use funds made available for this part to carry out programs of research into, and evaluation of, the process of economic development in less developed friendly countries and areas, into the factors affecting the relative success and costs of development activities, and into the means, techniques, and such other aspects of development assistance as he may determine, in order to render such assistance of increasing value and benefit."

Under this authorization A.I.D. initiated a research program in FY 1962 and expanded it somewhat in FY 1963 and 1964. The 1962 program included two projects on land reform, primarily in Latin America, that are concerned with agriculture and rural development. The second year's program included six

agricultural projects. In developing the 1963 program A.I.D. prepared a paper, "A.I.D. Research in Agriculture and Rural Development, FY 1962-1964." It included 15 suggested projects and a short section on priorities in agricultural and technical assistance programs in underdeveloped countries. The paper was sent to A.I.D. Missions, the U.S. Department of Agriculture, Land-Grant Universities, and several international agencies and foundations. The comments, suggestions, and proposals received were useful in developing the FY 1963 and 1964 programs. Of the 15 projects, six were started in FY 1963 and two in FY 1964, three were withdrawn, and four are under consideration for FY 1965.

This document is a revision and extension of the FY 1962-64 paper. Its basic objective is to advise the research community about the nature and scope of the A.I.D. Agricultural and Rural Development Research Program and to invite interested organizations to submit research projects for A.I.D. consideration. It undertakes to indicate the need for and returns from research, describe the research program, and give the procedures used in developing projects. It will be sent to all A.I.D. Missions and will be widely distributed to academic and research communities as a means of informing them of A.I.D. interest in such research. It will be an important source of material for A.I.D. agricultural and rural development projects for the next two or three years.

In this paper there is no sharp differentiation between agricultural and rural development research. Projects that are concerned with crop and livestock production are obviously considered agricultural. Those that are concerned with the development of institutions and markets have a substantial element of rural

as well as agricultural development. On the other hand, a project on the development and role of local government in rural areas is primarily concerned with rural development. Since it is easier to develop agricultural than rural development projects, increased attention may need to be given to the latter.

II. NEED FOR RESEARCH

In considering the need for research it will be useful to recognize two different but related needs. The first is that needed to increase the production and improve the quality and marketing of agricultural products, and the second is to improve the efficiency of institutional and government services, including technical assistance by A.I.D. and other agencies.

Almost every aspect of agriculture in the developing countries is different from agriculture in the United States and Europe. Soils, climate, crops, livestock, farms and farming systems, culture and institutions are all different. In the less developed countries some research has been conducted, but until recently it has been limited usually to export crops with little attention given to food crops, livestock, economics and the problems of the small farmer. The latter now demand attention.

The urgent and growing needs of the less developed countries for agricultural research will be met primarily by their own people and institutions, but they need help in getting started. To that end, A.I.D. and other agencies are assisting in the planning, initiation and execution of various agricultural research projects and also in training research staffs and institutions.

A.I.D. and other agencies have tried to help with agricultural and rural development in less developed countries without research data on which to base operational programs. For example, assistance has frequently included the introduction and use of our ideas, methods and materials without the research needed to adapt them to a new environment. Of necessity the expensive and time-consuming trial-and-error method was used sometimes, with considerable success. Progress, however, would certainly have been greater if there had been more research data on which to base these programs.

III. RETURNS FROM RESEARCH

The more developed countries of North America, Europe and Oceania have had substantial and expanding programs of agricultural research for nearly 100 years. They have had intensive programs for nearly 50 years which were linked closely with research in the physical and social sciences. The results have provided the basic materials, processes and methods that make possible the high productivity of agriculture in these countries. The new inputs arising from research are highly productive and, therefore, have made possible an increase in productivity of land, labor and capital. The return on investment in research has been high and the investment is steadily increasing. The rapid progress of Japan, with an agriculture quite different from that of the foregoing countries, is another illustration of the value of research for agricultural and rural development.

In the less developed nations research on export crops (rubber in Malaya, tea in Ceylon and India, cocoa in West Africa, bananas in Central America and sugar cane in several regions) has been rewarding. Research results have helped to increase the yield and quality of these crops just as research has increased the yield and quality of crops and livestock in the more developed countries.

There has been adequate agricultural research in Asia, Africa and Latin America to demonstrate its potential value. Just as in countries of the temperate zone, research in the tropics can lead to improved methods of soil and water management, produce superior disease-resistant varieties of food crops, devise better systems of farm management, improve methods of agricultural extension and rural development, result in better credit and marketing systems, and contribute to the solution of national problems related to agriculture in a developing economy.

IV. NATURE OF THE RESEARCH PROGRAM

Ten to 20 years of development assistance in three continents has served to identify many problems for which research is needed. To a limited extent research in agriculture has been an ingredient of country Mission programs, usually implemented by the A.I.D. staff. Contracts with U.S. colleges and universities to help establish comparable institutions in developing countries occasionally have included agricultural research projects. The U.S. Department of Agriculture also has been involved in the execution of experiments with crops and animals in several countries through Participating Agency Service Agreements

with A.I.D. and also with the use of P.L. 480 funds. These efforts and those of private organizations such as the Ford, Rockefeller, and Kellog Foundations have contributed much information which is applied to improve agriculture in developing nations. In addition the experiences gained are valuable in planning future research programs. These experiences were of special value at a Conference on International Rural Development sponsored jointly by the Agency for International Development, the U.S. Department of Agriculture, and the Association of State Universities and Land-Grant Colleges, held in Washington, D. C., July 27 and 28, 1964. Representatives of several private foundations also participated. The Conference considered mutual problems associated with our assistance to developing countries and summarized their deliberations with numerous recommendations which will influence agricultural research programs in developing countries supported by A.I.D. For example, it was recommended that long-range research projects be executed to obtain knowledge of the whole complex of factors which affect a country's development. In addition, the Conference emphasized that a research component in a technical assistance project should be regarded entirely appropriate and desirable. Such research should be coordinated with that funded by P.L. 480 grants, by the Foundations or other agencies, and by the host country. In this respect the projects sponsored by TCR/RA are designed to utilize the data and personnel of other research projects already established in less developed countries whenever this is possible and advantageous.

Another conference during the summer of 1964 was a six-week's intensive study on means to increase agricultural productivity in less developed countries. This seminar was conducted by the Center for International Studies at the Massachusetts Institute of Technology under the sponsorship of A.I.D. Approximately 40 outstanding authorities in the fields of natural, life, and social sciences made a critical examination of the key problems which are obstacles that retard increased agricultural productivity. They identified the major unsolved problems and recommended priority research studies necessary to overcome them. The results of this seminar also will considerably influence the future A.I.D. research program in agriculture.

A.I.D. is now prepared to support systematic research studies in both agriculture and rural development. Projects should be concerned primarily with the solution of problems which are of fundamental importance to the development of several countries within a region, or perhaps of world-wide significance. In some cases it should be possible to establish a Regional Center involving the cooperation of several countries. (For example, this type of arrangement has been developed for the execution of a AID/USDA project for improvement of the major cereal crops in Africa. One Center for West Africa nations has been established in Nigeria and a second Center for East Africa is in Kenya.) As far as possible projects will be conducted in cooperation with established research institutions in the developing countries. Often these will consist of colleges or national institutions comparable to the U.S. Department of Agriculture. Almost always provisions should be included for on-the-job technical training of host country personnel through their participation in the research program. This method of developing human resources is an important part of

research projects because it contributes in the training of local scientists who can continue research efforts after U.S. support is reduced or withdrawn.

V. PROCEDURES FOR DEVELOPING RESEARCH PROJECTS

From the first A.I.D. has utilized both internal and external resources to develop an agricultural and rural development research program. It has drawn on its experienced staff to indicate major problems and to help design research projects for their solution. All country Missions have been invited to suggest research projects and many have been proposed by them. A.I.D. has also invited research proposals from the U.S. Department of Agriculture, the Land-Grant Universities, international agencies, private research organizations and foundations. Participating Agency Service Agreements (PASA's) with the U. S. Department of Agriculture are usually prepared jointly by the Office of Technical Cooperation and Research of A.I.D. and the International Agricultural Development Service (IADS) of the U.S.D.A. Most of the colleges and universities involved in agricultural research are represented in the International Rural Development Office (IRD) of the Association of State Universities and Land-Grant Colleges, which has offices in Washington, D. C. Many institutions of higher learning have a campus office devoted to international programs. Colleges and universities may find it advisable to submit global or regional research proposals through IRD of their Association, although thus far most research proposals have been made directly to AID/TCR/RA. Either procedure is satisfactory with A.I.D. 1/

1/ Many universities and colleges have contracts with A.I.D. to help an individual country. Such contracts usually are not negotiated with TCR/RA.

Any qualified organization may present a proposal for A.I.D. support of a research project. Ordinarily it will be found most convenient to submit initial proposals informally by conversation or by letter describing the nature of the problem, the research procedures intended to solve it, the time estimated to be required, and the financial support probably necessary. This type of general information supplied to the Office of Research and Analysis of AID/TCR usually will be sufficient for the Rural and Community Development Service staff to determine whether further detailed development of a formal proposal is warranted.

A formal proposal is prepared according to a prescribed format of considerable detail following correspondence and consultations between the A.I.D. staff and the organization. A formal proposal should be submitted to the Science Director of AID/TCR/RA whereupon it will be critically examined and evaluated:

First - by an A.I.D. Agricultural Research Advisory Committee;

Second - by a panel of specialists, frequently in a meeting with the proposer and the A.I.D. staff;

Third - by A.I.D. Missions in countries where the research may be performed to determine the degree of interest and possible support of both the Missions and the host countries.

Following the above steps, a decision is made by A.I.D. whether to proceed toward implementation of the proposed project. Each selected project project is submitted to an A.I.D. Research Advisory Committee, consisting of eminent scientists outside of A.I.D., who advise the Administrator on the soundness of each proposal. If the Committee recommends that the project be

undertaken it may be approved by the Science Director and the Administrator of A.I.D. If approved, a contract is prepared by the A.I.D. Contracting Services Division and negotiated with the organization or institution.

The development, financing and monitoring of all projects is the responsibility of AID/TCR/RA. A member of the staff is designated project monitor and thereafter he is the primary contact between A.I.D. and the contractor. However, all legal matters are handled by the A.I.D. contract office.

A.I.D. assumes major responsibilities for assisting the research contractor, especially when the research is to be conducted in less developed countries. Most of this assistance is provided by one or more of the regional bureaus in AID/Washington and by the US AID Missions in the developing countries.

The developing countries in which the research is conducted customarily make substantial contributions of physical resources, funds and personnel to support the project. The nature of their contribution is usually decided during the course of the development of the project and is formalized before the work is started.

Many projects are of interest to other regional or international agencies and provisions are made for their cooperation or to keep them informed of progress.

VI. TWELVE RESEARCH PROJECTS DEVELOPED DURING FY 1962-64

In the first three years the following 12 projects were approved and presently are in various stages of operation or development. They are grouped according to six major subject areas and each project is described briefly on the indicated pages.

PROJECT NUMBER A-1

Title: The nutritional status of soils in Latin America.

Contractor: North Carolina State of the University of North Carolina at Raleigh.

Problem: Latin America is confronted with the task of doubling agricultural output in the next 20 years in order to increase the per capita food supply. The increased output must be attained primarily by increased yields on land now in crops. The increased yields can be obtained only when the supply of plant nutrients is adequate. This is generally accomplished by applying chemical fertilizers containing one or more of the major nutrient elements and using other good soil management practices. Soil testing results are necessary for developing such practices. Summaries of good soil tests, likewise, are an excellent source of information on the fertility status of soils and their fertilizer requirements, especially when compiled into standard soils reconnaissance reports. Improved soil testing programs are needed in all of the countries of Latin America.

Objectives: To document the nutritional status of soils and fertilizer requirements for increased crop production in the countries of Latin America; to help cooperating governments and agencies develop and maintain improved soil-testing services, fertilizer trials and demonstration programs; to promote in each region the standardization of methods of soil sampling, analysis and interpretation of results; to assist and encourage countries to provide the necessary fertilizer (NPK and minor elements), lime and soil amendments for increased crop production.

Plan of Work: Latin America will be divided into regions, usually with three or more countries comprising a region. A soil scientist trained in soil fertility and soil testing will be assigned to work in each region.

The project will operate in two phases. The first phase will be a survey by the regional scientist to ascertain what is being done at present (equipment, procedures, etc.) and to compile the information that is available. After the survey is completed a study will be made of the different phases of soil testing that need improvement. Information gathered will be made available to all of the countries. Summaries of soil tests will be made as soon as adequate information is acquired.

In the second phase, the characteristics of the major soil types in each country (especially with respect to nitrogen, phosphorus, potash, and minor elements as well as acidity and salinity) will be determined and correlated with climatic and ecological survey results, and with the results of field fertilizer trials. These reports will be published as completed.

Progress: A visit has been made by the project director to most of the countries in Central and South America to acquaint them with the program and to ascertain their interest. All countries contacted expressed interest in the program and a wish to cooperate. Six regions have been established in these areas. Soil scientists have been hired to work in four of the regions and reported in their areas during the summer of 1964 after participation in a training program. A questionnaire relative to soil testing and plant tissue analyses was prepared for their use.

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PROJECT NUMBER B-1

Title: The improvement of grain legume production in the Near East and South Asia.

Contractor: Agricultural Research Service of the U.S. Department of Agriculture.

Problem: In these areas the optimum level of human nutrition is considerably below standard, particularly in regard to protein. Protein can best be supplied by additional consumption of grain legumes which, in turn, will depend upon increased production. At present yields of grain legumes are quite low because of inferior varieties; lack of fertilizers; poor crop, soil and water management practices; and inadequate control of insects and diseases.

Objectives: To increase production per unit area of grain legumes for all areas of the Near East and Asian regions in which they are grown. More specifically to: Assemble germ plasm; coordinate regional testing programs and develop a seed multiplication system; coordinate regional testing programs and develop a seed multiplication system; coordinate existing and develop new breeding programs; identify important disease and insect pests and measures for control; and determine soil and crop management practices to increase yields.

Plan of Work: Two regional centers will be established from which research will be conducted on plant breeding, pathology, entomology and soil and crop management. At each center there will be scientists in each of the four disciplines.

The breeding phases will involve collection of grain legumes and their classification as to plant and seed characters, length of growing season, etc., and testing of the most promising in regional trials. Breeding programs will be developed to intensify and combine desirable characters, with both short time and long time objectives in mind. A seed multiplication plan will be prepared.

Plant pathology will include surveys of diseases to determine their relative importance, identifying and studying causal organisms, developing control measures by breeding for resistance, by treatment with fungicides, and by cultural modifications.

Research on entomology will include surveys of insect pests, studies of the biology, ecology, and habits of specific insects, virus vector studies, and control through breeding, insecticides, attractants or biological control methods.

Soil and crop management research will include cropping sequence, time and rate of planting in relation to fertilizer practices, irrigation practices, soil moisture conservation, salinity problems, laboratory studies on soils, seed inoculants, seedbed preparation and fertilizer placement.

Training of nationals will be accomplished by having trainees work with the staff.

Progress: One regional center has been established in Tehran following negotiations and agreements made with Iran as of May 1964. The Project Leader has arrived in Iran and recruiting is underway for a plant breeder, a pathologist, an agronomist, and an entomologist.

Negotiations to establish a second regional center in India are underway and are expected to be completed soon.

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PROJECT NUMBER B-2

Title: The development and use of improved varieties of the major cereal crops in Africa.

Contractor: Agricultural Research Service of the U.S. Department of Agriculture.

Problem: Sorghum, millet and maize are the predominant cereal crops in Africa. It has been estimated that over 55 million people on that continent derive over half of their caloric intake from sorghum. About 90 per cent of the cultivation of sorghum and millet is carried out in the tropical areas where these grains occupy marginal soils less suited to other crops. Maize is grown most extensively outside the tropics. Within the tropics, however, maize tends to be concentrated in areas having lower production hazards than is true for sorghum and millet.

Economic improvement in Africa requires a substantial increase in food production which will only be possible when proper attention is given to varietal improvement, disease and insect control and the development of adequate cultural and management practices related to the major crops. Since Africa is especially deficient in personnel trained to carry out such projects, there is a real need to train research workers and technicians. There is need also to develop a more adequate system of cooperation and coordination among different countries.

Objectives: To coordinate existing and initiate new breeding programs for the development of improved varieties or hybrids of sorghum, millet and maize;

to determine the important diseases which affect these crops and to develop appropriate control measures;

to identify and determine the geographical distribution and severity of the principal insect pests and to determine the resistance or tolerance of species and varieties of sorghum, millet and maize to the important insect pests;

to determine soil management factors which will contribute toward maximum production of the three crops.

There is a need for two levels of training; "in service" training which can be provided by the professional staff at the Research Centers, and formal graduate training of selected qualified nationals at institutions in the United States or other countries. This project will be directly concerned only with the first.

Plan of Work: Two main Research Centers will be established: One at Ahmadu Bella University, Zaria, Nigeria and the second at the Government Experiment Station, Serere, Uganda. Satellite stations for maize will be located at Ibadan, Nigeria and Kitale, Kenya and for entomology at Bombey, Senegal. The main Centers will have a professional staff of three men: A geneticist, a production agronomist and an entomologist or a pathologist. Each scientist will conduct research in his own specialty and in addition will consult and cooperate with his colleagues and counterparts at each station and in other countries of the region concerning regional tests or problems of local importance.

Progress: This project was agreed upon by A.I.D. and USDA in April 1963. Agreements have been signed with the Commission for Coordination of Technical Assistance (CCTA) representing several nations in central Africa and the East African Common Services Organization (EACSO) representing several eastern nations. These agreements will foster the regional cooperation desired and their early execution is anticipated. Three scientists reported to Africa during the summer of 1964 where they have initiated experiments. Additional professional staff members will join them in 1965.

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PROJECT NUMBER C-1

Title: Research on the sterility method of tsetse fly control or eradication.

Contractor: Agricultural Research Service of the U.S. Department of Agriculture.

Problem: Tsetse flies, as vectors of trypanosomiasis in livestock and man, represent a major obstacle to the economic development of vast areas of Africa. Progress has been made in developing methods of controlling or eradicating tsetse flies through the use of insecticides, by removal of vegetation, or by game destruction, but they have not been fully effective. These methods also are costly and may have undesirable indirect effects. For these reasons it is worthwhile to investigate biological control methods, especially the male sterility method that has been successfully used in the United States for the control of the screw worm in cattle as well as other insects.

Objectives: The project will endeavor to determine if the sterility method of insect control, developed and applied successfully by the U. S. Department of Agriculture for the eradication or control of certain insects, can be adapted to the control of one or more species of tsetse flies. This feasibility study is concerned with (a) laboratory studies to evaluate promising chemosterilants against the tsetse fly, Glossina morsitans, and possibly other species and (b) field studies on the development of mass-rearing procedures for tsetse flies.

Plan of Work: This research project is headquartered in Salisbury, Southern Rhodesia, in cooperation with the Agricultural Research Council of Central Africa (ARCCA). Laboratory studies will be made to determine the effects of chemosterilants on the tsetse fly, with reference to sterility and mating competitiveness of the flies. The ecology of the fly in its natural habitat, including normal behavior, reproduction, survival, and preferred pupation and resting sites in relation to natural environmental conditions will also be studied. In addition, experiments to simulate conditions for mass-rearing the insect in the laboratory or the field will be performed.

Progress: Three scientists made trips to Africa where they conferred and planned the research project with personnel of the ARCCA and other experts on trypanosomiasis in Africa. A cooperative agreement between ARS/USDA and ARCCA was negotiated and approved November 29, 1963.

Two scientists arrived in Salisbury in December 1963 and laboratory facilities were immediately made available to them. They have developed rearing and handling techniques and initiated tests with Glossina morsitans for chemosterilant testing. Encouraging tests have shown that complete sterility may be induced in males of G. morsitans by exposures to residues of the chemosterilants tepa a/ and metapa. b/ A suitable test site has been selected and research on the mass production phase of the project will be initiated utilizing livestock purchased for this purpose. Ecological studies are also underway.

a/ tris (1-aziridinyl) phosphine oxide

b/ tris (2-methyl-1-aziridinyl) phosphine oxide

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PROJECT NUMBER D-1

Title: The development of vegetable protein food technology for the developing countries.

Contractor: Agricultural Research Service of the U.S. Department of Agriculture.

Problem: A dietary deficiency in protein, especially in children 1-5 years of age, is recognized to be one of the major nutritional problems of the developing countries. The major oilseeds (cottonseed, peanuts, and soybeans) are produced in all regions of the world, yet they are processed for human food to only a very limited extent. The widespread availability of oilseed proteins not used for human food in areas of severe food deficit is in itself strong evidence of the need for improved processing technology.

In Africa and certain Latin American countries, private enterprise has attempted to fill the need with only partial success due to various difficulties that have been encountered.

Objective: The objective of the project is to develop processes which can be adapted by these countries so that indigenous protein sources can be made available for food at a price consumers can afford.

Plan of Work: Research to attain this objective encompasses chemical and engineering studies in process development, and the development of food formulations and combinations that will make the products acceptable in the manifold cultural situations where they are needed.

This work can be effectively undertaken in the laboratories of the Agricultural Research Service, USDA. Here the experience of over 20 years of study of these materials can be applied immediately. The essential data can be obtained rapidly in these large, competently staffed and well equipped laboratories. The technology developed from these data will then be prepared in a wide range of production scales so that process requirements, equipment needed, and cost estimates for any particular situation can be made. Similarly, the information on food formulations, home preparation and food use will be developed within the framework of dietary patterns, facilities, and economic status of groups in different areas and countries.

The participation of trainees from developing countries in all phases of the work will be valuable to its progress and essential to the successful operation of the processes and use of the products in their home lands. These technicians will be obtained by UNICEF or other interested agencies.

PROJECT NUMBER E-1

Title: Land Tenure Center research and training program.

Contractor: University of Wisconsin

Problem: It is well known that land tenure is related to agricultural productivity, economic development, and social change. Many other factors also are involved, including kinds of land tenure, property and local taxes, regional organizations and social institutions. The precise relations, however, as they pertain to Latin America are not known. This information is much needed not only for those developing countries that contemplate changes in land tenure but also by A.I.D. in developing its assistance programs for these countries.

Objectives: The primary objective of this study is to obtain reliable information relating to land tenure in Latin America, especially as to types of land tenure, social institutions and regional institutions that might assist in land tenure reform and all other relevant matters. A second objective is to increase the number of land tenure and agrarian reform professional personnel in Latin America and the United States by the training of graduate students involved in this project.

Plan of Work: The study is conducted by the Land Tenure Center of the University of Wisconsin in cooperation with inter-American organizations such as CIDA, (Inter-American Committee for Agricultural Development), Latin American universities and other agencies or institutions.

The methodology of the research and training program is primarily one of systematic data collection and analysis through 50 on-going and planned projects or studies in seven Latin American countries, including Central America. These individual projects conform to the criteria of a program design formulated and administered Land Tenure Center Advisory Committee. Program operations are carried on through cooperative activities centered at four Latin American educational and research institutions. The work of these field research project centers is coordinated and supplemented by the Land Tenure Center staff, the Advisory Committee and the Library and research resources at the Madison, Wisconsin campus. Program operations are manned by a basic professional and administrative complement of approximately 60 persons. Additional personnel is drawn from Research Specialist trainees who are learning by doing research, the staff of

cooperating Latin and Inter-American institutions, local nationals retained by the contractor for field interview work and Research Fellows financed by other than contract funds.

Progress: As a part of this study, bibliographies and glossaries of Latin America and nearly 10,000 library references have been collected; four discussion papers to date have been completed and papers on special topics including legislation and agrarian law in Latin America, agricultural development in Bolivia, and a colonization study in Costa Rica are in process or have been completed.

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PROJECT NUMBER E-2

Title: Land tenure and land reform in Puerto Rico.

Contractor: Economic Research Service of the U.S. Department of Agriculture.

Problem: This project is focused upon the economic effects of land reform measures carried out in Puerto Rico under the Land Law of 1941 which provides for the enforcement of the "500-acre provision" of the Organic Act of 1900, wherein artificial persons were prohibited from owning more than 500 acres. The law provided for the creation of an Agency — the Land Authority — empowered to acquire land illegally held and to operate or dispose of land thus acquired.

Since its creation in 1941, the Land Authority has had major changes in its functions. Originally charged with carrying out all phases of the Land Law and Land reclamation, it now limits its activities to commercial and developmental responsibilities.

The programs for distributing land as homesites to agricultural laborers and as family farms were transferred to another agency, the Social Programs Administration, which now operates within the Commonwealth Department of Agriculture. The Land Authority was, and continues to be a separate agency with limited ties to the Commonwealth Department of Agriculture.

The Land Law was a forerunner of the large body of legislation and economic development measures now known as "Operation Bootstrap", in which the primary emphasis has been on encouraging industrial and business growth, with limited attention to agriculture. The agricultural sector has grown slowly in relation to other sectors and the contribution of land reform measures, if any, to total economic growth is not known.

Objectives: To identify and evaluate land tenure problems in Puerto Rico; to analyze the effect of land tenure reform measures on the tenure structure and on the productivity of agriculture, levels of income of rural people, and patterns of land use; and to evaluate techniques developed for the acquisition, disposition, and management of land in terms of their suitability for current and future land policy. An additional area of research has as its objective the measurement of growth in labor productivity, by sector, for the period covered by Operation Bootstrap.

Plan of Work: Separable segments of the research on experiences under the Land Law of 1941 are as follows: (a) A selective review of economic, institutional, and legal factors underlying development of the tenure system of Puerto Rico leading up to the passage of the Land Law of 1941 and events immediately preceding the act; (b) review of the land policy of Puerto Rico following passage of the 1941 law with attention to changes in the institutional and economic environment and the recent implementation of the law; (c) analysis of resource productivity on proportional-profit farms for the period 1950-1962; and (d) analysis of the financial structure of the Land Authority and the extent and sources of its capital formation.

These segments are considered separately mainly for operating convenience. Reports are being prepared for each segment, and a final report will be prepared in which all segments will be utilized.

Another area of research is the application of growth model analysis to the Puerto Rican economy. This analysis delineates productivity changes in different sectors and provides a framework within which changes in the sugar-producing sector can be viewed.

Progress: The growth model analysis has been completed and accepted for publication in Economic Development and Cultural Change and is expected to appear early in 1965. In addition (a) manuscripts on the historical development of the pre-1930-41 tenure system on land policy under the 1941 law and progress and changes in the implementation of the 1941 law are partially completed, (b) first results of the productivity analysis of proportional-profit farms have been obtained and are being evaluated. A manuscript reporting these results is in preparation. The analysis of changes in the financial structure and total capital formation of the Land Authority has been delayed pending receipt of financial summaries from the Land Authority.

PROJECT NUMBER E-3

Title: An analysis of factors associated with differences and changes in agricultural production in the less developed countries.

Contractor: Economic Research Service of the U.S. Department of Agriculture.

Problem: Improvement in the performance of agriculture is essential for economic growth in most underdeveloped countries. Agriculture usually accounts for 50 to 80 per cent of the people gainfully employed and for 30 to 50 per cent of the gross national product in these countries. Low levels of agricultural productivity limit growth in other sectors of the national economy. Progress in expanding agricultural output and in improving agricultural productivity varies widely among countries. For example, annual increases in agricultural production have averaged five per cent or more in Mexico, Greece, and Japan in recent years; in Pakistan and Chile expansion has hardly kept pace with population growth. The reasons for these wide differences are not well known. Such information is needed as a basis for determining which factors should be given primary attention in technical or economic assistance efforts and for determining further research needs on the problems of improving agricultural production.

Project Objectives and Description: The project has several specific objectives, including the following to: (a) Review and analyze available data relating to rates of change in agricultural output, resource use, productivity, and technology for individual countries and the main regions of the world since 1940; (b) identify principal factors associated with variations in rates of increase in agricultural productivity among countries and regions of the world; (c) provide A.I.D. with basic analyses useful for developing improved technical and economic assistance programs; and (d) suggest adjustments in national agricultural development plans that could effectively increase agricultural output and productivity.

Plan of Work: Phase A, covering work during the first 18 months will be a comparative analysis for 25 less developed countries of yearly changes and long term trends in agricultural output and productivity and of the technological, economic, and institutional conditions associated with these differences.

Phase B, covering research during the remainder of the project, will consist of intensive studies in two or three countries in each A.I.D. region of the technological, economic, and institutional bases of their agricultural progress with particular emphasis upon examining the major conclusions drawn from the international comparisons made in Phase A.

US AID Missions in study countries are cooperating by supplying data, information, and consultation in Phase A of the project. In Phase B, US AID Missions and foreign government research institutions will cooperate with ERS economists stationed in 10 to 12 study countries in carrying out detailed studies of factors affecting agricultural output and productivity. Phase B studies were initiated late in FY 1964 (earlier than planned at outset of project) in Taiwan and Greece to make information available about experience of these rapidly developing countries for use by US AID Missions in other countries as soon as possible. Other Phase B study countries have not finally been selected. Foreign government research institutions are expected to contribute research facilities and personnel to the studies, but amounts will vary among countries.

Progress: Comparative analysis of country data covering population growth, national output and income, agricultural production, agricultural inputs, agricultural productivity levels and changes, and structural organization of agricultural production and marketing is being completed for the 25 study countries included in Phase A. Analysis is underway for the study countries of factors associated with changes and differences in levels of agricultural output and productivity. These factors include adequacy of adapted technology, agricultural education and technology, cultural conditions and attitudes, land and water resources, tenure and credit arrangements, prices and marketing conditions for farm products, prices and supplies of production requisites, capital formation and savings, complementary industrial development and political organization and public administration problems. Results thus far have been summarized in two semi-annual reports and also partially reported in the following four papers: How the United States Improved Its Agriculture, The Mechanics of Agricultural Productivity and Economic Growth, The Role of Agricultural Productivity in Economic Development, and Foundations for Agrarian Development. The last paper listed was presented at the CENTO Conference on Agricultural Development in Tehran, Iran during September 1963.

PROJECT NUMBER E-4

Title: The administration of technical assistance with special reference to Agriculture.

Contractor: Syracuse University.

Problem: Various agencies, including A.I.D., FAO, the Rockefeller and Ford Foundations, and others are engaged in providing technical assistance to agriculture, and are believed to do so in various ways. Some appear to have been more effective than others or more effective in some situations than in others. It would appear that a critical analysis of the factors involved in giving assistance would identify weaknesses and indicate ways in which assistance could be made more effective. It is believed that a critical study of technical assistance in agriculture may provide useful insight into other areas and eventually permit generalized conclusions with very broad application. A.I.D. needs this kind of information in relation to its own activities.

Objectives: The principal objective of this study is to appraise current practices in the administration of technical assistance by A.I.D., FAO, the various foundations and other agencies and to analyze critically the various factors believed to be or likely to be responsible for success or failure.

Plan of Work: This study will proceed by gathering comparable data relating to the operation of technical assistance programs by A.I.D., FAO, the Ford and Rockefeller Foundations and others in various countries. The different factors and methods of procedures followed in each case will be identified and evaluated. Major areas of research so far identified include: (a) Administrative techniques and criteria used in selecting projects, (b) the project review process, (c) administrative arrangements for institution building, (d) recruitment, selection and employment conditions for technical personnel, and (e) the specific administrative arrangements to accomplish particular objectives.

Progress: An extensive review of the literature has been made of employment practices in technical assistance programs, and a study of institutional factors that affect technical projects will be completed by the fall of 1964. Several other studies have been initiated including an analysis of interviews by the Technical Assistance Study Group, made available to Syracuse University by A.I.D., the comparative roles of community

development and agricultural extension programs, the relation of agricultural education to manpower needs of the developing countries, the administration of education projects in the field of agriculture, and two case studies — one on the problem of land salinization in West Pakistan and the other on the record of the AID/University of Nebraska contract in Turkey.

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PROJECT NUMBER E-5

Title: An analysis of programs for the development of agricultural credit institutions and services.

Contractor: Ohio State University.

Problem: Essential components of an agricultural development program are effective institutions and systems for furnishing agricultural credit. The less developed countries have not had effective agricultural credit services. Many programs for developing agricultural credit services in these countries have been initiated with technical assistance from the United States, other countries and international agencies. The success of these programs has varied from complete failure to substantial improvement in credit services.

Many problems exist in the development of credit services such as capital inadequacies, repayment difficulties, related programs, managerial assistance, credit costs, and serving the needs of a large number of farmers. A substantial fund of experience and knowledge has accumulated from the agricultural credit development programs in many countries. This information needs to be assembled, analyzed, and made useful for agricultural credit development programs in the future. Models for agricultural credit development programs should be formulated.

Objectives: The primary objectives of the study are to: Develop valid directions for the establishment and operation of permanent and effective institutions and systems for providing agricultural credit in developing countries, (b) develop guidelines for technical and economic assistance programs in agricultural credit, and (c) formulate models for the development of agricultural credit systems and services within various countries.

Plan of Work: The program of work falls more or less naturally into three phases, each requiring about one year.

Phase A: All available data, reports, and studies of agricultural credit development in less developed countries in the world will be assembled and analyzed.

Phase B: Case studies will be made in three countries of Latin America. Those problems which have not been studied, or which have not been studied sufficiently, will be researched intensively.

Phase C: The data previously collected will be analyzed and summarized as comprehensive reports useful to A.I.D. and others engaged in programs of agricultural credit development.

Progress: The Contract staff has developed a detailed outline of the components of agricultural credit to guide them in their acquisition of data and related information. The Project Leader visited the agricultural credit offices of FAO in Rome and made useful contacts leading to sources of pertinent data. Other team members established numerous contacts with offices and agencies in Washington, D. C. where they have obtained considerable information to be analyzed.

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PROJECT NUMBER E-6

Title: Accelerating the adoption of agricultural innovations.

Contractor: Michigan State University

Problem: If agricultural production is to catch up and keep pace with the world population expansion, a much more rapid diffusion and adoption of farm technology must occur. The research investment in the discovery and development of improved agricultural practices may be wasted unless such practices are effectively communicated to and adopted by farmers. Hundreds of studies have examined the diffusion and adoption of farm practices in the U.S., but only about 25 investigations have explored this topic in developing societies. While many of the North American findings may be applicable in other countries, it is generally recognized that unique factors are associated with the adoption of new farm ideas in traditional cultures. Some U.S. findings may not hold true and others may require considerable modification.

Objectives: The present study is designed to investigate the diffusion and adoption of agricultural innovations under a range of social and economic conditions in developing nations. Specific objectives will include: (a) Identification of agricultural innovators and opinion leaders, and a determination of their distinctive social and economic characteristics, communication behavior, attitudes and values, so that change agents can more effectively introduce innovations in villages and communities through them; (b) identification of the role and influence of various communication channels and techniques such as mass media, opinion leaders, personal contacts, and demonstration projects in the farm-practice adoption process; (c) the response to various communication and economic incentives (such as credit); (d) identification of the influence of presently existing price incentives, credit, land tenure, marketing practices, and other economic factors on the adoption of new agricultural ideas; (e) development of improved research methods for study of the diffusion and adoption of farm innovations in traditional societies; (f) training of both U.S. and non-U.S. social researchers in methods of study design, data-gathering and analysis for future investigation of the diffusion and adoption of farm innovations in developing societies; and (g) building of institutional structures for diffusion-adoption research and action programs in the participating countries so that self-stimulated research and action programs will continue after this research effort has been completed.

Plan of Work: The initial four-year study consists of three major phases:

Phase A, an analysis of the success or failure of programs of change in agricultural production in 50 to 80 villages in each of three developing countries. The unit of analysis is the village, and the data will be secured both from secondary sources and through interviews with village leaders.

Phase B, an analysis of data obtained mainly through personal interviews with farmers living in a selected number of villages in each of three developing countries. The unit of analysis in this phase will be the farm family. In certain villages, these Phase B interviews will constitute a baseline for Phase C.

Phase C, certain incentives for adoption of practices may be introduced in selected villages and the effectiveness of these incentives will be evaluated through observations and follow-up interviews.

Three major cultural areas of the world will be included in the study design: Africa, Asia and Latin America. Countries chosen from these continents may be representative of a continuum ranging from basic tribal social and economic organizations to nationally-planned programs in developing countries, and to countries strongly under the sphere of Western cultural influence. Conduct of the study in three distinctive cultural areas, widely different than the United States, should provide valuable insight and understanding for program administrators concerned with global aspects of increasing agricultural production.

Progress: Initial staffing and planning is under way but the project is so recent that no results are available as yet.

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PROJECT NUMBER F-1

Title: Intensive study conference on means to increase agricultural productivity in underdeveloped countries.

Contractor: Massachusetts Institute of Technology.

Problem: It is of critical importance to A.I.D. to determine the reasons why many programs designed to increase agricultural productivity have had little success and also to formulate more effective ways of increasing agricultural productivity.

Objectives: To provide A.I.D.: (a) A critical examination of the problem of how to increase agricultural productivity in the less developed countries; (b) identification and definition of the key obstacles to increasing productivity; (c) proposed research designs that will suggest ways to overcome these obstacles; and (d) recommendations for the necessary measures to be taken where it becomes clear that the knowledge is already available to deal with some of the problems.

Plan of Work: A conference of approximately 40 authorities in natural, life, and social sciences will conduct intensive studies on the problem while living and working together for six weeks under the leadership provided by the Center for International Studies of M.I.T. Approximately 10 to 15 of the conferees will be from international organizations or citizens of foreign countries. In addition a number of special consultants will be invited to participate for brief periods. The deliberations of the conference will be well documented with a final report including or summarizing important topics, conclusions and recommendations.

Progress: The conference was held as planned during the period of June 29 through August 7, 1964 at the Endicott House in Dedham, Massachusetts. Under the leadership of the Director of the Center, the Conference proceeded in three phases. Phase A included briefings on the recent and present states of agriculture, research, action programs and critical factors. During Phase B the conferees separated into small working groups to make intensive studies of the problem areas determined to be critical in Phase A. In Phase C the small working groups presented their reports to the entire conference where their conclusions, proposals and recommendations were subjected to debate. A conference editor and secretarial staff attended to the preparation of interim reports and copies of the final report of the conference are expected to be furnished A.I.D. by the end of 1964.

VII. TWENTY-ONE PROPOSED PROJECTS FOR THE FY 1965-67 RESEARCH PROGRAM

The FY 1965-67 Research Program will include a continuation of most of the preceding projects. It is anticipated, however, that there will be funds for expansion of the program. This will afford an opportunity for projects on a few subjects that are not adequately covered in the current program. Consideration, therefore, will be given to additional projects of high priority.

The following suggested projects are listed and briefly described on the page indicated. At this stage they are simply suggestions advanced by A.I.D. country Missions, the A.I.D. Research Staff or by colleagues in the research community. They have been selected from a large number of suggestions and serve to indicate the type of projects A.I.D. is prepared to consider financing during the next three years. We do not, however, propose to limit ourselves to these particular projects and will welcome other suggestions and proposals from the research community.

PROJECT NUMBER A-1

Title: Desalinization and salt control research on agricultural soils of arid regions.

Problem: The soils of arid or semi-arid regions usually contain a greater salt content than soils in areas of higher rainfall. When the arid or semi-arid soils are irrigated regularly the salts tend to move upward as the moisture evaporates from the surface. This situation often is accentuated by a relatively high water table associated with irrigation canals and reservoirs. Consequently irrigation of these soils almost always is accompanied by an accumulation of salts which becomes increasingly concentrated. When the concentration becomes high customary crops no longer grow well, if at all. Generally the condition develops gradually with decreasing yields over a period of years until it is no longer profitable to plant the land. At this stage the land is abandoned as useless and constitutes a serious loss to the country. For example, in West Pakistan about 70,000 acres of irrigated land is abandoned each year because of salt accumulation.

Objective: This project should include both laboratory and field experiments designed to learn how to avoid and/or correct salt accumulations in the irrigated soils of arid and semi-arid regions. The study should take full advantage of existing research on the problem and place considerable emphasis on field experiments in the Near East particularly.

Plan of Work: Research evidence already available should be the basis for the design of laboratory experiments, lysimeter tests, and field trials. Since the soils and crops vary in different areas it is probable that the studies should be conducted in more than one country. Comparisons of crops, the amount and frequency of irrigation, and "flushing out" salts might be important parts of the project. In addition, the practical possibility of inactivating accumulated salts by chemical treatments or overcoming the problem, at least partially, by breeding salt-tolerant varieties may be worthy of exploration. It is anticipated that at least 10 years of research might be required to solve the problem.

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PROJECT NUMBER A-2

Title: Costs and returns from different cropping and farm management systems under irrigation in Asia.

Problem: In many of the irrigated districts of Asia, especially in the Near East and Far East, crop production methods are very inefficient. Continuous use of a single crop is the rule and the use of water is often inefficient. There is little information regarding costs and probable returns from the use of irrigation, especially if multiple cropping were practiced.

Objective: To compare the costs and returns from growing single and multiple crops using irrigation applied by different methods.

Plan of Work: This study proposes an experimental approach in which different crops, cropping systems, methods of irrigation, quantities of water, time of application of water, and soil management systems are compared with respect to costs and returns. Single, double, and triple cropping and the use of green manures, commercial fertilizers and pertinent cultural methods will be compared. The study will be supplemented by a study of irrigation and cropping systems on farms in the same areas.

The experiments and other studies will be conducted in cooperation with foreign agencies preferably in areas where U.S. agricultural colleges or universities are now at work. The work will be coordinated with similar studies now under way in Turkey, Pakistan, and other countries.

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PROJECT NUMBER B-1

Title: Improvement of vegetables in Southeast Asia.

Problem: In Southeast Asia (Burma, Thailand, Malaya, Cambodia, Laos, South Vietnam, the Philippines, Taiwan and Indonesia) vegetables and fruits constitute only three per cent of the caloric value of the typical diets. The greater part of this, possibly two per cent, is vegetables. The intake of both is about 66 calories per day compared with 83 in Japan and 210 in the United States. It is evident that by modern standards of nutrition substantially greater supplies of vegetables with higher nutritive content would be desirable. Information on yields of vegetables in the area is scanty. In Thailand, which is reasonably typical of the region, yields are relatively low, two tons per acre as compared with 5.5 tons for the United States).

Objective: To improve the production and nutritive quality of vegetables in Southeast Asia.

Plan of Work: It is proposed to establish one or two research stations in representative districts of Southeast Asia for a study of vegetable production and improvement. The principal specific projects will be (a) the introduction, and improvement of varieties by selection and breeding; (b) the improvement of cultural practices including the use of commercial fertilizers; (c) the control of insect, disease, and weed pests by the use of pesticides and the breeding of resistant varieties so far as appropriate and feasible; and (d) the training of nationals in applied research with vegetable crops and for teaching improved methods of vegetable production.

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PROJECT NUMBER B-2

Title: Improvement of grain legume production in Africa.

Problem: A research project designed to improve grain legume production in the Near East, Far East and South Asia regions has been initiated by A.I.D. and is now being developed. A similar project is needed for Africa. In these latter countries vegetable proteins are needed to supplement the diet, and grain legumes appear to be the most promising. About seven million acres of dry beans, peas, chick peas, and lentils are grown in Africa but yields are very low and total production is much less than adequate.

With superior varieties and improved cultural methods, including the use of commercial fertilizers, and better control of insect, disease and weed pests, both acreage and production per acre could be markedly increased. There are some 15 to 20 grain legume species and numerous varieties but only a few have been tried in Africa.

Objective: The principal objective of this study is to discover or breed new higher yielding superior varieties of grain legumes adapted for Africa and to develop more effective cultural methods.

Plan of Work: Species and varieties of grain legumes from various countries will be collected at one point and, together with indigenous varieties, grown in preliminary small-plot trials to eliminate those that clearly are not adapted. The more promising, together with breeding selections, will be grown in more extensive varietal trials in all countries in which they appear to be adapted. Yield and quality characteristics and resistance to insects, diseases and weather hazards will be determined so far as possible. This work will be accompanied or followed by cultural experiments and measures to control pests.

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PROJECT NUMBER B-3

Title: Improvement in production and use of forage crops in Latin America.

Problem: Latin America, with about twice as many cattle as the United States, produces only two-thirds as much meat, no more than one-tenth as much milk and butter and one-fifth as much cheese. No doubt there are many reasons for the low level of production, of which lack of adequate quantities and quality of forage crops are among the more important. The two situations are not strictly comparable, for the principal reason that most of the cattle of Latin America are produced on ranges and relatively few are finished in a feed lot. Ranges are frequently over-grazed, eroded, and over-run with poor quality annual grasses and weeds. In some areas, such as the Amazon Valley, there are long periods of flooding and at other times prolonged droughts during which hay, silage, or other preserved feed must be provided. In some areas cattle, especially dairy cows, are raised mostly on cultivated pastures supplemented with other feeds much as in the United States. There is a great need for improved legumes and grasses both for replanting depleted ranges and also for cultivated pastures, hay and silage.

Objectives: To develop superior varieties of legumes and grasses adapted to the climates and soils of Latin America and to improve the methods of growing them.

Plan of Work: The project visualizes comparative tests of all species and varieties of major forage crop legumes and grasses at two regional centers, one tropical or sub-tropical and the other in temperate zone Latin America. In each case the tests will be performed at an established experiment station in cooperation with FAO, the Rockefeller Foundation, and/or IBEC and Latin American governments. They will first be grown in simple small-plot experiments to eliminate those obviously not adapted and later in more extensive variety test plantings for comparison of yields and chemical composition at different stages of growth. The more promising forage crops will be included in feeding trials with livestock.

Resistance to diseases and insect pests will be noted at every opportunity beginning with the preliminary trials. Also the response of each species and variety to extreme temperatures, other weather hazards, and to length of day will be determined so far as possible. Such information, combined with relative yields and nutritive values, will often permit fairly reliable predictions as to areas and conditions where specific species and varieties can best be grown. Special trials will be conducted to determine the response of the more important varieties to commercial fertilizers and improved cultural practices.

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PROJECT NUMBER B-4

Title: Chemisterilants for noxious wild birds.

Problem: Wild birds, such as rice birds in the Far East and the quelea bird in Africa, cause heavy crop losses in many countries in the tropics and sub-tropics. Numerous methods for controlling them, including noise makers, repellants, and shooting have been used with little success. In general these methods are also expensive.

It was observed several years ago that chickens fed grain previously treated with arasan produce sterile eggs and since then numerous chemisterilants have been discovered that sterilize males, females, or both and have no other seriously deleterious effects. Hence it seems reasonable to assume that one or more could be used to reduce the population or even eradicate noxious wild birds, much as has been done for screw worms in cattle and is being done experimentally with coyotes, rats, and mice.

Objective: The primary objective of this study is to devise effective and practical methods for reducing the population of noxious birds by causing them to prouduce sterile eggs as a result of ingesting chemisterilants.

Plan of Work: It appears that this project could be carried out most expeditiously in two phases, A and B.

Phase A would include laboratory-type experiments, probably done in the United States, designed to identify useful bird chemosterilants, the dosage required, and characteristics such as whether they: (a) Sterilize males, females or both, (b) effect growth or vigor, (c) are effective permanently or temporarily, (d) would have a deleterious effect on humans who may eat treated birds, and (e) have problems in handling, such as being poisonous.

Phase B would extend the study to a foreign area, for example with the quelea bird in Africa, preferably in cooperation with some existing research organization. This phase would include a study of mating, feeding, nesting and migratory habits as well as specific effects of the more promising sterilants. Practical application of the results would need be developed.

USDA and the Wildlife Service of the Department of the Interior have experimented with the effect of chemisterilants on birds. Therefore, it is predicted that this research should be conducted in cooperation with both organizations.

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PROJECT NUMBER B-5

Title: Measures to increase agricultural productivity in wet rice regions.

Problem: In many Asian countries where the rainfall is adequate for production of paddy rice an annual increase in food production of five per cent or more is necessary to meet the demand associated with a modest rate of economic growth. The actual rates of increase in productivity are only about half that required. Little additional cropland is available and production increases are also low because of slow changes in the traditional methods of farming and water management.

Objectives: To determine: (a) What measures need to be taken to alter the physical, economic, organizational, and knowledge environment to attain a more rapid agricultural development in the wet rice region, and (b) how to cause these measures to be adapted in those countries.

Plan of Work: To accomplish the objectives, a plan of research and analysis must be devised to coordinate work on the following inter-related measures which would bring about increased agricultural productivity:

(a) Economic incentives;

(b) Use of fertilizer and other improved practices;

(c) Multiple cropping and water management;

(d) Improved organization for agricultural development;

(e) Land tenure.

PROJECT NUMBER C-1

Title: Influence of management practices and nutrition levels on performance of livestock and poultry in hot and humid climates.

Problem: It is well known that most kinds and breeds of temperate zone livestock do not thrive well in hot and humid climates. Evidence from studies in the U.S. and other countries have shown that amelioration of the environment is economically feasible and that in tropical climates efficiency of performance can be markedly enhanced through rather simple modifications of environment. It has also been shown that nutrition and disease resistance or control are importantly related to the ability of livestock to grow and produce in such climates.

Objective: To determine the effect of environmental influences, especially hot temperatures and high humidity, on the performance of livestock and poultry; and to evaluate management practices and nutrition levels as they affect the performance of livestock and poultry under hot and humid conditions.

Plan of Work: The proposed studies will include a comparison of rates of growth and production of cattle, swine, and poultry in several different environments, especially various combinations of temperature and humidity. This will include an evaluation of (a) temperature of the drinking water; (b) shelters of various heights, spaces per animal degree of enclosures and roofing materials; (c) comparison of zero grazing with pasturing during hot weather; (d) the use of various cooling devices such as evaporative coolers; (e) variations in energy sources in the ration and in the form of the feed, such as chopped versus long-cut; (f) management practices affecting disease and parasite incidence; (g) management systems as they affect reproduction; and (h) the use of hormone therapy when necessary to restore normal reproduction functions in females. Existing research data on livestock and poultry studied in environmental control chambers should be applied in the design of practical experiments to be conducted in tropical countries.

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PROJECT NUMBER D-1

Title: A comparison of farm power requirements in Asia.

Problem: Most of the farm power used in Asia is provided by cattle, caribou, water buffaloes, man, and in some countries (Japan) by horses. In most cases the power is not sufficient to prepare the soil properly for crops, which probably is one reason for the relatively low yields in many Asian countries. Power is also needed to pump water for irrigation, threshing grain, transportation to market and other uses. Power requirements will increase as agriculture becomes more intensive, particularly if it includes multiple cropping as seems likely in some areas. The question, therefore, arises as to how these power requirements are to be met.

Currently the energy for farm power is provided by feed produced on the farm. In many cases the feed supply is inadequate and a substantial increase is needed. This addition, plus the food needed by a growing population, seems remote. A possible alternative is to use tractors and gasoline motors that derive their energy from petroleum products. Their use would require capital investment and also a cash outlay for operations, but at the same time would release land for the production of additional human food.

Objectives:

To determine the current and future (1975) power requirements of representative Asian farms and areas; to determine the current adequacy of power on Asian farms; to estimate current and future feed requirements if adequate power is to be provided by animals; to estimate the area that could be shifted from feed to food production if power were provided by tractors, gasoline engines, or electric motors; and to estimate the comparative capital investments and operating costs of animal versus mechanical power on Asia farms.

Plan of Work:

It is expected that this tudy would require (a) an accurate determination of the power (HP) per acre needed to prepare and cultivate the soil and to harvest and thresh the crop, (b) an estimate of the number of animals that must be kept on hand to provide the needed power, (c) the costs of producing their feed, including the use of land, (d) the cost of the animals, and (e) the estimated purchase costs and the costs of operating and maintaining tractors or mechanical motors and the associated equipment.

Costs of preparing soil with a tractor should be compared with preparation by animals. The study should also include a comparison of costs of different sizes of small tractors together with estimates of the most suitable sizes for different sized farms. The possible uses of tractors for pumping water, threshing, and transportation should be explored.

The initial phase of this study would require an examination of literature and other sources of information, including the farm equipment industry of the United States, Europe, Japan, Taiwan, and other Asian countries. There probably are some important deficiencies of data. An arrangement would then be made with interested governments and institutions for such field studies as would be needed.

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PROJECT NUMBER D-2

Title: The influence of mechanization on productivity of land.

Problem: In underdeveloped countries there usually is not a shortage of labor in agriculture as there is in United States. Here our farmers are necessarily highly mechanized in order to obtain the greatest productivity with the least possible labor. A problem in underdeveloped countries is that in many instances farmers are unable to prepare seedbeds sufficiently fast for second and third crops following the harvest of rice or some other major crop. It appears obvious that the reason is because their methods of seedbed preparation utilize inadequate power in the form of oxen or water buffaloes. For a similar reason such farmers are also unable to incorporate adequate amounts of organic matter in the soil. Consequently, although an important factor which limits their total productivity may be inadequate mechanization, there is also a lack of sound evidence concerning the influence of mechanization itself on productivity.

Objectives: The objectives of this project would be to determine the problems described above more precisely and then conduct well designed studies for measuring the influence of mechanization on productivity. Comparison of the sociological and economical effects of mechanization of farmers in less developed countries may be included as a secondary objective of this project.

Plan of Work: It would be expected that a team comprised of agricultural engineers, an agronomist, and an agricultural economist would determine the information needed to fulfill the objectives and then apply themselves to the collection of data in various underdeveloped countries. Although some field experiments might need to be executed, it is anticipated that much information could be obtained from existing farms and experiment stations in many of the less developed countries. Close cooperation with host country agricultural institutions and A.I.D. Missions would be required.

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PROJECT NUMBER E-1

Title: An analysis of agricultural education and research programs abroad largely implemented by University contracts.

Problem: A.I.D. has actively encouraged the development of institutions for the less developed countries. Such institutions are considered essential for the continued development of a nation's agriculture. Land-Grant Colleges and universities of the United States through their research education and extension services have contributed substantially to American agriculture. A.I.D., therefore, called on the Land-Grant institutions to carry out the major portion of its agricultural education and research programs abroad. This was done by contracts between A.I.D. and the Land-Grant universities.

Current contracts between A.I.D. and Land-Grant institutions for the promotion of agricultural education, research and extension, as of December 31, 1963, totaled more than 50 million dollars, involving 17 countries and 21 institutions. The contracts have been in force for various periods; one since June 1952 and several for six years or more. Since the development of these institutions constitutes an important part of the A.I.D. program, it is desirable to analyze the programs to determine the reasons for variations in their success.

Objectives:

The objectives of the project in each country are to determine as critically and as objectively as possible: (a) The adequacy of the planning of each phase of the program; (b) the appropriateness of the methods that were used in providing and using American assistance; (c) the problems that were encountered and how they were resolved; (d) the influence of the program on agricultural education, research and extension in the cooperating countries; (e) the influence of the program on the participating American universities; (f) the principal policy and operational problems currently associated with the program; (g) coordination and cooperation between Land-Grant contractors and other agencies (FAO, Ford and Rockefeller Foundations, and others) active in the area; (h) appraisal of the adaptability of the program and methods to other countries; and (i) development of guidelines and recommendations related to a continuation of the program.

Plan of Work: Within six months the Contractor will develop a detailed plan of work for the analysis to include: (a) More detailed objectives, (b) schedules of information needed from all agencies and institutions involved in University contracts with A.I.D.; (c) determination of how to obtain the information; (d) modes of analysis to be applied; (e) preliminary selection of University contracts in foreign countries to be studied; (f) tentative selection of individuals to obtain the information; (g) a time schedule for execution of the plans; (h) a budget; and (i) proposed methods for publication of results and analysis. Based upon the plans submitted from this initial study, A.I.D. will consider contracting their implementation to complete the analysis.

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PROJECT NUMBER E-2

Title: A study of the distribution and marketing of fertilizers in various countries.

Problem: An expanding use of commercial fertilizers undoubtedly offers the most promising opportunity to increase crop yields in the developing countries in the immediate and near future. The value of and need for fertilizers are quite generally recognized in these countries; in fact consumption has been increasing at the rate of about 15 per cent per year.

Two factors that tend to restrict increased use of fertilizers are (a) the method of distribution and marketing, and (b) the relative prices of fertilizer and crop products. Such problems are common to most developing countries and are a characteristic of underdevelopment. These problems have been solved in several different ways by the more developed countries and in recent times by a few of the underdeveloped countries. If the experience of these countries could be analyzed and made available to the less developed countries, it would enable them to develop improved methods for the distribution and marketing of fertilizers.

In developed countries private industry often handles the distribution and marketing of fertilizers under regulations established by the governments. Private industry, domestic and foreign, has been reluctant to undertake fertilizer production in developing countries due to uncertainties regarding marketing and distribution systems and the returns from their investment. A clarification of national policy regarding these matters might encourage greater investments from the private sector in local fertilizer production.

Objectives: The basic objective of this proposed study is to analyze the methods used in a number of countries that have had successful experience in distributing and selling fertilizers, and to make the data available to developing countries. The more specific objectives are: (a) To assemble information on the methods and costs of marketing and distributing fertilizers; (b) to assemble data relating to the farm cost of fertilizers and the farm price of crop products in developed and less developed countries; and (c) to suggest improved methods for the distribution and sale of fertilizers in the less developed countries.

Plan of Work: By review of literature and by personal observation, a study will be made of the fertilizer distribution systems in Europe, of which there are several kinds, in certain Asian (Japan, Taiwan) and Latin American (Mexico) countries where reasonably satisfactory distribution systems have been developed, and also in representative less developed countries where such systems are needed but have not been developed.

Some of the factors to be considered in the more advanced countries are: (a) The use of cooperatives; (b) the relative importance of private and government corporations in fertilizer distribution; (c) retail outlets; (d) transportation; (e) storage; and (f) costs of each transaction in the distribution chain. These same factors, so far as they exist, would be studied in the underdeveloped countries but more attention would be devoted to identifying breaks in the continuity of the distribution system and possible means of correction.

An important feature of the study, especially in the less developed countries, would be comparative data on the farm prices of fertilizers and of crops produced from fertilized land. Such data, when used in connection with agronomic data on crop response to fertilizer, would indicate the returns that might be expected from investments in fertilizers.

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PROJECT NUMBER E-3

Title: Farm marketing research in tropical Africa.

Problem: Very little is known about the internal movements of agricultural products, both crops and livestock, for consumption within Africa and this problem is receiving little attention. Such information is essential if efficient low cost marketing methods are to be developed. The information is needed not only in the interests of individual African countries but also by A.I.D. in developing plans for research in marketing methods in Africa and other countries.

Objective: To determine how agricultural products intended for consumption within Africa are marketed, and how these methods may be improved.

Plan of Work: It is proposed that a two-man team consisting of an American farm marketing specialist and a national of an African country spend about 14 months observing marketing practices, interviewing traders, producers, marketing officials, and transporters in an attempt to obtain definite information regarding quality, bulking, packaging, preservation, storage, and prices of agricultural products, and of contracts, traders margins, restraints on trade, weights and measures, quality standards, market grades, fees, taxes, pricing procedures and all other pertinent matters relating to marketing in at least three African countries. The team would be alert to imperfections in the marketing system which could be corrected by local, state or national governments, market authorities, or by trade associations.

It has been considered that this study might be accomplished by adding staff members to the AID/University contract teams presently working in Nigeria, Sierra Leone and Uganda. If this approach were used a coordinator would be required to supervise and manage the project.

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PROJECT NUMBER E-4

Title: Farm marketing research in the Near East.

Problem: The problem is similar to the preceding E-3 project described for Africa except that the study is to be made in the Near East. The specific problems are somewhat different, of course, because of different economic, social, and cultural conditions.

Objective: To determine how agricultural products intended for internal consumption in the Near East are marketed and how these methods may be improved.

Plan of Work: Plans for this project have not been developed.

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PROJECT NUMBER E-5

Title: An analysis of extension-type programs in developing countries.

Problem: Extension-type educational programs in the countries have varied in success but the exact reasons are not known. Since there is an urgent need to increase production in most of these countries, and since extension-education has principally been relied upon to bring this about, it is essential that the reasons for variations in success be identified and so far as possible measured. The information is needed not only for the benefit of each participating country but also by A.I.D. in relation to planning its own future programs.

Objective: To identify and, so far as possible, to measure the relative importance of various factors that determine success and failure in extension-type educational programs in developing countries.

Plan of Work: It is proposed that survey teams comprised of three to five members, each competent in a certain extension activity, be sent to two countries in each of the four A.I.D. regions to study extension methods in those countries. Only those countries that have had the benefits of extension-education programs for several years will be included, and of these about half will have been highly successful and about half less successful. It is recognized that variations in success may be due to factors related to the extension program itself or to the fact that recommended practices technically sound in the U.S. were not applicable to the economic and social conditions of less developed countries.

The survey teams will attempt to record and evaluate changes in levels of food production, levels of living among rural people, and improvements in literacy and educational levels since extension programs were begun. They will also attempt to identify and measure those factors responsible for success or failure, and to develop criteria for assessing different factors such as: (a) Cultural level of the country as regards literacy, educational level, attitude toward new ideas, prejudices, etc.; (b) number of personnel, and training and experience of extension personnel; (c) the technical and practical soundness of proposed improvement programs in relation to cultural levels and as seen in retrospect; (d) attitudes of local and higher government officials regarding extension activities; and (e) markets and prices.

A project committee will be appointed with the duty to outline in more detail precisely what the survey teams will do. The committee may be composed of A.I.D. and U.S.D.A. staff members and Land-Grant university faculty members with interest and experience in overseas educational programs and having competence in evaluating such programs.

Countries in which these studies will be conducted will be selected on the basis of: (a) Being typical of the region; (b) including relatively new and old type extension programs; (c) either highly effective or less effective programs; (d) cultural differences believed to be favorable or unfavorable to changes in agricultural production methods; and (e) willingness of the government officials to cooperate.

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PROJECT NUMBER E-6

Title: The analysis of factors affecting the development of cooperatives in Africa, the Near East-South Asia, and the Far East.

Problem: There is a great lack of knowledge concerning the problems faced by cooperatives in developing areas, and of the benefits and limitations to be expected in different situations. Since cooperatives are being used increasingly to promote economic and social development in many of these areas, a systematic research program is needed to determine the factors which affect the development and successful operation of cooperatives.

Objective: To determine the need for cooperatives and to make an analysis of the factors that affect the establishment, growth, and success of cooperatives in developing countries.

Plan of Work: It is proposed that a team will conduct a 9-month case study of the marketing situation, especially with reference to the need for cooperatives and factors likely to affect their success, in one country in each of the three major areas. This main study may be preceded by a 3-month planning and preliminary investigation, including a general survey of the main areas. The purpose of this survey will be to delineate the marketing problems in each area and to select the particular countries in which case studies would be conducted. The case studies in each country will be such as to indicate clearly and specifically: The current status of cooperatives; the need and opportunity for cooperatives; the kind of cooperative structure including membership, volume of business and legal arrangements; the actual and potential benefits to be derived from cooperatives; principal problems and possible solutions; and the availability of trained personnel and training centers.

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PROJECT NUMBER E-7

Title: The potential of forage-livestock enterprises on non-cultivable lands in the developing countries.

Problem: In many parts of developing nations traditional agriculture has focused on crop production. Livestock production has been a peripheral activity based mostly on scavenging and limited use of available crop by-products. In many areas livestock production has been limited by the low-producing capacity of animals, the prevalence of diseases, limitations of quantity and quality of feed available, and low levels of other management practices. With increased knowledge of disease control, higher producing animals and improved methods of livestock feeding and forage production, there appear to be encouraging possibilities for greatly increasing livestock production. Hilly areas not suited to the tillage of crops may have considerable potential for increased livestock production. As yet, however, limited information is available of either the physical or economic potential for increasing livestock production in tropical countries.

Objectives:

Major objectives are: (a) To determine costs and returns of different forage-livestock systems on non-cultivable lands in less developed countries; (b) to determine how such enterprises might be integrated into the current farming systems; (c) to identify areas that offer considerable physical and economic potential for increased livestock production programs that might be conducted in those areas.

Plan of Work: Countries would be studied to determine those areas where significant increases in livestock production are possible. In selected areas, information would be collected on improved practices relative to livestock production. Data would be compiled on the costs of these inputs and practices and on the increased output associated with their use. Enterprise analysis of costs and returns would be made of alternative forage-livestock systems in the respective areas with regard to existing patterns of farming. Analysis would be made of the adjustments necessary to incorporate such forage-livestock systems into the general farm systems now prevailing. Recommendations would be made for areas offering the greatest potential for increasing livestock production and for means by which these potentials could be realized. Taiwan, Ghana, Venezuela and Chile are examples of countries where such potentials may exist.

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PROJECT NUMBER E-8

Title: How educational, technical, financial, and other services to increase farm production can be most effectively combined and organized for farmers in specified situations.

Problem: Many of the problems of increasing productivity and improving levels of living in the less developed countries have their source in two general conditions that usually prevail: (a) Lack of adequate working and overhead capital; and (b) lack of modern technologically oriented knowledge and receptivity toward innovation on the part of the people.

Efforts to rectify these conditions are dependent on expanding and improving the agricultural service facilities. The following services are needed: (a) Research to provide an expanding fund of more precise knowledge; (b) agencies to provide the most effective means for transmitting knowledge and information to the people; (c) credit facilities to support adoption of new technology; and (d) provision for marketing and cooperative services.

Favorable results from effective efforts in any of these services may be hindered by inadequacy in one or more of the others. Hence the effective combination of these services, or integration one with another, is generally considered to provide a better basis for favorable results. It is the overall organization involved in the association and integration of these various services, rather than the internal organization of each separately, on which this study will focus. The intent is to examine critically the effectiveness of various combinations and types of extension, technical assistance, credit, marketing and cooperative undertakings on increasing agricultural production.

Objectives: The objectives are: (a) To identify and describe in a definitive manner the various loose-knit or tight-structured combinations, associations and integration that characterize the overall organization of the different services into a "package program" in the various countries. (It is hoped that representative cases which vary from the almost completely autonomous separation of services to a rather high degree of combination and association can be isolated and described in detail as well as the various means by which they are combined.); (b) to analyze and evaluate the relative success of the different approaches in improving agricultural production and to determine the conditions that affected their success; and (c) to interpret and translate the results into sound policy and program guides for future efforts toward inducing growth of agriculture in less developed countries.

Plan of Work: There are a large number of countries in which several types of organization of service agencies exist. Since it is not feasible to include all such countries in the study, it seems best to choose a number of "representative" countries and study their programs in considerable detail.

Factors that should be considered in selecting the countries for study are: The number and kind of the relevant services being conducted in the country; a sufficient period of experience in conducting such services so that their results are reliable; the availability of the necessary data to evaluate both the experience and results of the programs; and being typical of the different means and extent of combinations and integration between the various services. They should be distributed as equally as possible among the different regions, and the willingness of the agencies working in the countries to cooperate on the project also should be considered in their selection.

The study in each selected country should be made by a team comprised of men highly competent in (a) organization and administration of land-grant institutions, (b) agricultural extension education, (c) agricultural credit facilities and programs, (d) agricultural research programs, (e) agricultural marketing and (f) cooperative marketing. Experience in both natural and social sciences should be represented on the team.

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PROJECT NUMBER E-9

Title: The effect of improved marketing and storage systems on farm and consumer prices.

Problem: In some developing countries there are extraordinarily large annual, seasonal, and geographic fluctuations in prices. These fluctuations are often charged to monopolistic manipulations. However, there is usually little information available either to support this charge or to refute it. Transportation, storage, lack of marketing information, and government restrictions may be major causes of price fluctuations. Because of the effects of economic growth on rapidly increasing retail food consumption, rapid changes in marketing and storage systems are necessary to link consumers and producers, and to minimize geographic fluctuations in prices. A properly functioning price and marketing system is essential for the efficient distribution of products, specialization of production, and the allocation of resources. The expectation of more stable prices can greatly increase farmers' incentives and consequently result in higher agricultural production.

Objectives: The study will be directed to evaluating the effects of various marketing and storage systems on the behavior of prices at both the consumer and farm levels with the aim of providing guide lines to the organization of marketing systems conducive to economic development.

Plan of Work: The studies of marketing and storage systems and their effect on prices should focus on the problem from the standpoint of the conduct and performance of individual firms and the industry as a whole. The study might initially focus on selected grain marketing and storage systems in selected countries at different stages of economic growth.

In this context attention should probably first be devoted to the measurement and analysis of geographic annual and seasonal variations in prices and the factors affecting these fluctuations. The next step should be to analyze the functioning of the marketing systems, the costs of making improvements in marketing, transportation, and storage systems, and the effects of these improvements on reducing price fluctuations and marketing margins.

It is unlikely that the kinds of data required for this study will be available from secondary sources. Collection of both time series and cross-sectional price data will be required in most cases. Micro-studies to test the hypothesis of the efficiency of present and alternative marketing and storage systems in relation to the performance of prices will require field studies in depth.

In this research, focus would be on the improvements in the marketing systems which might be made to help stabilize the prices received by farmers. Estimates of the costs required to make the necessary changes would be included. The study would concentrate particularly on self-liquidating and low-cost activities of Government, other institutions, and individuals which would reduce seasonal and geographical fluctuations.

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PROJECT NUMBER E-10

Title: The development and role of local self-government in rural areas.

Problem: Impetus for many of the things that account for the development of economically advanced democratic nations has come predominantly from local areas, states, and regions rather than from the central government. This has been particularly true in the United States where for many generations provisions for education, health, roads and other important social overhead investments were left largely to county and local areas. Under these conditions, counties and smaller political subdivisions played a key role in mobilizing capital, labor and technical skills to build their own schools, farm-to-market roads, hospitals, drainage and irrigation systems, and other infrastructure features. They were able to do these things with a minimum of cash costs. Citizens were permitted to contribute labor in lieu of taxes for the building of roads. Individual families often made volunteer contributions of labor, cash, timber and other items to build their schools.

Rural people in most less developed countries, however, lack extensive experience in local self-direction at community levels. Instead, many have lived so long under foreign domination or within semi-feudal and rigidly structured class systems that the idea of an individual and local self-directed community and area organization never occurs to them. This makes it necessary in less developed countries for national governments to assume an unduly large part of the burden for their economic development, using inexperienced leadership and generally inadequate administrative guidance at national levels.

Objectives: The objectives are: (a) To determine for selected countries at local levels the political structure and how it functions with particular reference to sources of political leadership, to the nature and source or basis of its powers, and to its role in social and economic affairs; (b) to identify promising ways of broadening participation of local people in the sponsorship, planning and execution of economic development activities of kinds requiring a formally structured organization with taxation, police and other governmental powers; and (c) to evaluate these alternatives, taking cognizance of the broader political and social structures within which they have to be developed.

Plan of Work: Development of these objectives will require careful selection and delineation of the geographic areas to be studied. It will be necessary to ascertain basic features of the national and state, or provincial, governments within which the selected areas lie and the nature of the powers

reserved and delegated by national and state governments to smaller geographic and political areas. Areas will also be selected for the possibility of developing more extensive local self-governments.

Careful study will be made of the involvements of the various socio-economic classes of people in local group and political decision-making processes and of recent changes in such participation. Attempts will be made to ascertain the major factors underlying observed changes in governmental processes and to assess the significance of these factors as tools for developing local self-government.

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PROJECT NUMBER E-11

Title: Projected world supply and demand for selected internationally traded agricultural products.

Problem: Many of the less developed countries have placed or are placing major emphasis on increasing production and exports of tropical products. Little attention has been given to prospective rates of growth in world supply and demand for these products. An evaluation of these prospects is needed to guide agricultural development emphasis in the less developed countries.

National development plans to expand production and exports of certain crops are doomed to failure if the world demand for these commodities fails to grow or grows at a much slower rate than the supply. What is needed is a more realistic balancing of national efforts to increase production with demand potentials, both domestic and foreign. A determination of how future demand potentials in the developed countries will affect agricultural trade potentials is especially important from the standpoint of deciding what policies and programs are required to increase agricultural and general economic growth. Research is needed to appraise prospective world agricultural production, prospective competition among countries exporting agricultural products, and expected levels of consumption in all countries at different stages of economic growth.

Results of this project are needed to complement the present market development research of ERS which is designed to determine (a) the fundamental relationships between trade and development; (b) supply and demand conditions for temperate zone commodities; and (c) factors affecting agricultural productivity in developing countries. It would also complement the studies of FAO and the United Nations relating to trade and development.

Objectives: The objectives are to determine the prospective imbalances in the supply and demand of internationally traded tropical export products (such as sugar, coffee, cocoa, and rubber) that would emerge with continued world economic growth so that national programs to promote growth through increased production and trade in less developed countries can be made more consistent with projected world supply, demand and price situations. This research will also be concerned with an evaluation of program alternatives and policies, other than international commodity agreements, that might be used to promote economic development in the less developed countries. A determination of the interrelationship between trade and development will be a continuing objective.

Plan of Work: The research will be carried out in several stages, as follows:

(a) The probable demand for selected agricultural products by 1970 and 1975 will be determined for a selected group of countries at different stages of economic development.

(b) The production and prospective supply of selected agricultural commodities in principal producing countries, the changes and growth in domestic supply and demand, and the implication of these changes will be estimated for 1970 and 1975.

(c) The nature and magnitude of the imbalances in the world supply and demand of these selected agricultural commodities will be determined and related to the production and trade potentials of these commodities.

(d) Meetings will be held with experts on economic growth and international trade at appropriate times within A.I.D. and the USDA to discuss problems, research methods, analytical techniques, and their general application to trade and economic development problems.

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PROJECT NUMBER E-12

Title: Criteria for determining farm size in land settlement and land reform projects.

Problem: In the past in Japan, Taiwan, Vietnam, and other countries, A.I.D. has been asked to endorse and to assist land reform and land settlement projects. A fundamental question in such programs is the size of farms that should be encouraged. Although this is an exceedingly difficult question, it may be possible to establish through research certain principles which would help A.I.D. in deciding a proposed residual or reform program that will be economically satisfactory.

Objective: To develop sound criteria to decide on the size of farms to be encouraged for those countries which have insufficient land to supply the demand for land ownership adequately.

Plan of Work: The project would involve three interrelated phases: (a) Analysis of factor supplies, prices, productivity, and pressure for land; (b) measurement and analysis of levels of productivity and returns obtained from different sizes of farms for selected types of farming adapted to widely prevalent physical and economic conditions; and (c) analysis of the extent to which technology can be incorporated into small farms to increase production and the external costs required to provide intra-farm services necessary for efficient operations.

The first phase would involve analysis of the present and prospective numbers of people engaged in agriculture, the prevalent returns, and the marginal productivity of labor in agricultural production.

In the second phase the analysis of variations in productivity and returns by size of farm should provide insights as to the capacity of different sizes of farms to adopt improved technology as well as the relative returns from the scarce factors of land and non-farm capital. Special attention in this analysis will need to be devoted to the extent which these returns are influenced by institutions providing critical services to individual farmers. In the third phase, budgets of production income areas under different institutional arrangements should be analyzed.

The total of both social and private costs associated with establishing farms of various sizes will be investigated. Social costs are: (a) A function of alternative income opportunities, both non-farm and from agriculture; and (b) the costs of absorbing a large number of rural migrants in urban situations compared to the costs of providing social services

in rural areas.

The work will be carried out in such a way that consideration can be given to two factors not explicitly included in the objectives, but which are important in determining correct patterns of farm size. These are (a) the advantages and disadvantages of colonization programs versus programs to redistribute already settled land as a means of making land available to the landless, and (b) the development of programs having sufficient flexibility to ensure that farm size does not become fixed and institutionalized but can vary with changing economic and technological conditions.

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VIII. ADDITIONAL TITLES SUGGESTING POSSIBLE RESEARCH PROJECTS

A. The influence of the administration of water delivery on the productivity of irrigation agriculture. (In many instances the distribution of irrigation water in developing countries is controlled by a government agency often comprised primarily of engineers. Quite commonly farmers complain that they are unable to obtain irrigation water at the optimum times or in sufficient volume. The problem appears to be of administrative nature and may be worthy of investigation to determine if it has major significance on crop production.)

B. Costs of marketing and the relative efficiency of alternative types of marketing agencies. (In many under-developed countries the marketing of agricultural products occurs in rather primitive ways of by systems which appear unnecessarily complicated and expensive. The prices which the farmers receive are excessively low in comparison with the world market prices. A well planned study should result in recommendations to improve efficiency in marketing and also the prices paid to farmers.)

C. A study of actual tenancy arrangements in different areas and the sharing of inputs, outputs and managerial decisions. (There is considerable variation in the arrangements followed between tenant farmers and land owners in different under-developed countries. A study of these situations could supply information on the most equitable arrangements which would contribute toward improved agricultural development.)

D. Study of actual lending terms, the extent of monopoly in credit, the risk element, and the costs of collection. (In many underdeveloped countries the above elements involved in credit for farmers are not precisely known. In lieu of exact information various assumptions are made which influence planning of agricultural credit facilities. It would be logical to devise credit facilities on the basis of sound information when possible.)

E. An Analysis of settlement projects in Asia, Africa and Latin America. (In all of these regions there have been different kinds of projects in which relatively large land areas have been made available for hundreds or thousands of farmers. The success of these ventures has varied so that an analysis of comparison could supply useful information to correct less successful settlements and to guide the development of new ones.)

F. Research on methods to protect tropical crops from pests. (Most modern methods to protect crops from pests utilize the application of chemical sprays or dusts with large and expensive special machinery. The typical farmer in under-developed countries cannot afford such machinery. This and related problems may warrant research specific for such farmers.)

G. Research on the control or eradication of weed plants in irrigation reservoirs. (Many reservoirs in under-developed nations are relatively shallow and soon become heavily infested with weed plants. Consequently the quantity of water they will contain decreases markedly, particularly with accumulations of partially decomposed plants. Water plants also are associated with certain snails which are alternate hosts for the worm causing schistosomiasis.)

H. Research on the eradication of snails which are carriers of schistosomiasis (bilharzia). (This very serious disease of humans is said to be spreading in the tropics, especially among farmers using irrigation water. The snail is a necessary alternate host for the schistosome worm. Eradication of snails from irrigation reservoirs and canals could eliminate the disease.)

I. Research to induce flowering and seed production of superior bamboos. (There are great areas in the tropics and sub-tropics where many bamboo species flourish, often on marginal soils. Propagation of bamboo almost always must be done by expensive division of clump stumps or by rooting of stem cuttings. Valuable species flower at long intervals, sometimes more than 100 years. Reproduction by seed could lead to widespread cultivation of superior species and subsequent industrial uses of bamboo for paper and many other products.)

J. Research to improve the production and distribution of tropical and sub-tropical fruits. (The coconut, banana, date, olive, citrus species and several others are important world crops. There are numerous other tropical and sub-tropical fruits and nuts which might become of great importance if research were performed to improve their production and to determine appropriate methods for shipping and distribution.)

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