DEVELOPMENT OF IMPROVED FARMING SYSTEMS

FOR SMALL FARM INCOME GENERATION

CATIE COUNTERPROPOSAL

May, 1974

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INTRODUCTORY STATEMENT

Since July 1973, the Tropical Crops and Soils Department of CATIE has concentrated its research activities on a central project entitled "Development of Agricultural Production Systems for the Tropics", which has similar objectives as the outreach project for "Development of Improved Farming Systems for Small Income Generation" that AID/W is interested to implement in the Central American Republics.

At present a staff of ten specialists in the fields of agronomy, plant physiology, plant pathology, horticulture, plant breeding, soil fertility and soil physics are working on a team basis in a field experiment in which 54 different production systems are tested. Beans, rice, maize, sweet potatoes and cassava are the selected crops comprising the experiment; they are arranged in treatments varying from monocultures to combinations of two, three, four and five crops, distributed in sequence or superimposed in varying degrees, depending on the degree of association between crops, and for the duration of one agricultural year. The basic goals of the project are: (a) to select alternatives of systems which will allow for considerable improvement in the income and the general well-being of the small farmer, (b) to make maximum use of hand labor, (c) to minimize the use of economical inputs, and (d) to optimize production in small pieces of land.

The experience and expertise gained already by CATIE's staff will be of great advantage and support for the AID/W proposed contract. CATIE's

specialists would complement and collaborate with contract personnel in the search of solutions for the common objective of the ungoing and proposed projects.

CATIE is pleased to present this counterproposal to the original AID/W Contract Proposal.

No major changes have been introduced to the text, except for a few deletions or additions which might help to clarify its presentation. The basic philosophy, objectives and methodological approach of the project fit exactly with those of CATIE's present project, giving this project the outreach approach that ours did not have.

Consequently, CATIE will conform,within the Tropical Crops and Soils Department, one single program on Farming Systems for Small Farmers, with two projects, namely:

1. The project presently carried out in the Tropical Crops and Soils Department.
2. The outreach project for Central America.

A project leader for the outreach project will be designated among the specialists paid by AID. He would be expected to coordinate all project activities with the policies and ongoing projects of CATIE, working with the Director and the Head of the Tropical Crops and Soils Department, as well as with the various Ministries of Agriculture. The staff members of the AID/CATIE project would individually be coordinated departamentally, insofar as their responsibilities were within CATIE and not in Ministries of Agriculture.

Therefore, a close relationship will be developed and maintained within the Program with the idea of conforming altogether a strong technical and operative unit working on a team approach basis.

Also consideration is given to the convenience of replacing two posts in the Systems Management unit by two other technicians which, based in our experience, are of vital importance: a weed control specialist and a soil microbiologist. Furthermore, the need of an entomologist from the beginning of the project is highly commended.

CATIE is confident that the changes suggested will meet with the approval of AID/W.

Finally, a delegate of CATIE has recently visited the countries considered in this project. In each country interviews were held with national agricultural officers and institutions involved in agricultural development programs. In general, the countries are most willing to participate in the project, since in everyone problems affecting the small farmer appear to be similar and, therefore, a project of this sort will tend to provide the means which might help to improve their general living conditions.

INTRODUCTION

One of the major problems associated with small farm production in Latin America is that the small farmer continues to employ the same production methods on a reduced cropping area which the large farmers employs on his large farm. If it is true that existing programs are not adequately reaching the small farmer, a new approach must be found to attack rural poverty. Unless we can achieve this, more ground will continue to be lost than progress made in alleviating the poverty gap.

For the purpose of the present proposal two groups of small farmers have been defined in Central America. These are, first, farmers with less than five hectares of cultivable land. In general they are subsistence farmers who sell little or no farm produce and have a severely limited cash income which restricts them to improve their low standard of living. The second group consists of family farms between five and twenty hectares in size. They have been characterized as "upwardly mobile" because, though their primary purpose is to sustain the farm family, whenever a harvest in excess of the family needs can be attained that excess is sold. Thus, if farm production becomes increased, the family's social well-being can correspondingly improve.

Farms under five hectares are estimated to comprise about 75% of the farms of Central America while farms between five and twenty hectares constitute another 10% of the total.

Perhaps never have the opportunities been better than now for the United States to assist large numbers of the most economically depressed farmers in Central America to improve their social well-being and to increase their incomes. This is because the ruling oligarchy has come to the realization that unless it stems the migration of rural farm workers to the cities there can be no chance for industry and for the developing services there to absorb the growing numbers of unemployed. In this regard AID has established a firm policy. Basically, this policy is summarized as follows:

1. The AID mandate is to extend its assistance to improving the social well-being of the poorest sector of the population.
2. AID's assistance should be that of the donor of last resource. Where development is likely to pay for itself and therefore a

third party may be induced to assume responsibility, such action should be encouraged.

3. Wherever possible the host government should be encouraged to pay for its development through long-term, low interest loans.
4. The Agency should stimulate the development of increased employment in the rural areas so as to stem the tide of mass immigration to the urban centers.
5. In agriculture this mandate has been interpreted as assisting the small farmer so that he may break out of his cycle of continuous poverty and enter into the national economy.

PROJECT DESCRIPTION

The project will be managed by means of a LA/DR regional contract with the Turrialba Institute of Tropical Agriculture now known as the Tropical Agricultural Research and Training Center (CATIE). This Center was chosen because it holds a superior reputation among the Central American Republics and because of the many services which it offers. In addition, it already possesses a strong Research Program on the Development of Agricultural Production Systems for Small Farmers in the Tropics. Finally, Dr. Richard Bradfield who developed some of the tropic's best programs on crop management while working in the Philippines at IRRI now serves on a Committee of Technical Advisors of CATIE.

Though project planning and certain basic research may be undertaken at Turrialba, the program is to be outreach in approach. Costa Rica is to be no more the beneficiary of the project operations than is any of the four other Central American Republics. To achieve this it is expected that each

cooperating country will initiate testing of comparative cropping systems on sites that have large concentrations of low income small landholders and which differ ecologically. This effort, plus the associated funding and support costs, well represent a large part of the cooperating countries contribution to this program.

CATIE, as the project's managing agency and the individual cooperating Central American countries as beneficiaries, are each expected to contribute greater inputs to their own activities during the four successive years under AID/W regional financing. As a result, it is anticipated that during future years, after AID phases out, the program should be able to continue on its own merit as a Central American common market program.

CATIE, under the AID contract proposes to establish two operational units at Turrialba; each is to be responsible for a different phase of the project program. These are: (1) A Production Systems Management, Agricultural Economics and Marketing Unit, and (2) an Agricultural Information Transfer Unit. The majority of AID/CATIE contract technicians will be stationed at Turrialba where they can avail themselves of CATIE facilities in the way of libraries, laboratories, research equipment, and associate staff. Three contract technicians will be stationed in the countries to assure effective operation of the project, especially at the initial phase. These technicians will operate under direct supervision of CATIE and in coordination with local AID/RDOs. All the technicians will be required to work throughout Central America, remaining in each country as long as their presence is necessary. It is understood that both units will develop an interrelated and interdisciplinary team work.

In the first year of operation the initial task of the CATIE task force, working in conjunction with the cooperating countries, will be to make a comprehensive survey of the local farming systems, socio-economic problems, and to establish criteria against which to judge the relevance of available data. Having done this, the organization can proceed with a systematic analysis of these data; this will yield, (a) a "first approximation" set of recommended farming systems, and (b) a first estimate of the quantitative needs for agronomic research, cost-return studies of production and marketing, and economic analysis which must be accomplished in order to reach the stated objective.

Some research activities could be promoted in those countries where facilities and conditions are favorable or either where some activities related to multiple cropping are already underway. These plans will be generated with the cooperation and agreement of the responsible action agencies of the participating countries.

The initial set of recommendations and all subsequent sets will be tested under field and in demonstration family units or small farms and evaluated by the cooperating countries. Information gaines through research will be utilized in subsequent sets of recommendations and research methodology will be refined annually and tested in demonstration family units in small farmer areas. Previously obtained experimental results and data obtained from field testing of recommendations will be used to accomplish this.

The introduction of <u>additional</u> crops, having a good nutritional and/or commercial value and suitable for interplanting in the traditional basic food crops, will be of major interest. Among those offering good possibilities are vegetables and small fruits. Other crops such as the medicinals, essential

oils, and the spices will be tested, as appropriate. Though these have quite limited markets, a large diversity of specialty crops spread among many small farmers could greatly increase rural incomes. Full use will be made of the feasibility studies already made in UNDP diversification projects in order to concentrate on new crops with the greatest potentialities.

The project will take advantage of the large amounts of research which has already been undertaken on corn and wheat (CIMMYT), rice (IRRI), and others like sorghum, cassava and grain legumes, for which agronomic practices leading to increased productivity have already been demonstrated. The program will tie into the international network of existing crop research institutions and thereby be in close contact with new information as it develops. Particularly close association will be maintained with the consortium of U.S. universities working in Soil and Water Management for Tropical and Sub-Tropical Climates and with the consortium of institutions undertaking research on fertilizer usage, and evaluation of soil fertility and soil physics.

Periodic meetings will be arranged and information exchanged between this program, the Farming Systems program of CIAT and any similar work performed at such other international centers as CIMMYT and CIT.

A. Production Systems Management and Economics and Marketing Unit

This unit will consist of an Agronomist, a Horticulturist, a Soil Scientist, a Crop Protection Specialist, an Economist and a Marketing Specialist during the first year of operation. For administrative reasons, one of these specialists will serve as Project Leader, directly accountable to AID for the management of the outreach project. The team will be completed by a Statistician, a Soils Microbiologist, an Agronomist for Weed Control, and part-time Agricultural Engineering and Nematology consultants the second and third years.

This unit, in close coordination with cooperating countries, will undertake research to determine crop production systems with best economic possibilities by which to obtain the following basic objectives: (1) the production of maximum quantities of food per unit area during each day of the growing season, (2) the extension of the growing season over the maximum number of days possible during the calendar year, (3) the use of new farming systems which are labor generating, and (4) the development of farming systems which make more economic use of inputs such as agro-chemicals, light, water, etc., in order to generate a maximum economical return which in turn may allow the farmer to improve present low standards of living.

Some of the types of research which the project may undertake are listed below; however, the research program need not be limited to these:

1. The study of crop association and rapid overlapping rotations by which a unit of land may be used more intensively at any one time and by which several crops may be accommodated in a growing season that normally produces only one. The association of leguminous with cereal and tuber crops, the intercropping of a second crop between a maturing first crop, and the investigation of crop varieties with foreshortened growing periods are several ramifications of this line of investigation. The different production systems should be designed to fit one or both of the following ecological conditions: humid tropics or tropics with alternate wet and dry regimes with or without irrigation.

2. The development and use of improved agronomic practices related to farming systems to better employ poorly productive soils and deforested land that is usually abandoned after one to three crops. Examples of this type of investigation would be the correction of soil fertility by the use

of slow release fertilizers, addition of organic matter, rotation of crops and pastures, and the planting of adaptable perennial crops. New, more deeply rooted crop varieties with lower requirements of fertilizers will be tested as will different cultural methods which can improve soil tilth, conservation of organic matter, and increase water retention. Better methods for controlling weeds will be explored also.

3. The attempt will be made to find cropping systems which may become the basis for home industries and thereby intensify family labor usage. Examples are the planting of mulberry and the rearing of silkworms for the silk industry, the production of food colorants such as annatto, the production of grapes and other tropical fruits and the production of wine, and the production of grain sorghum for the home manufacture of feed in order to rear swine.

4. Methods will be investigated to reduce the cost of land preparation and to facilitate soil and water conservation in association with specific cropping systems. This will include such practices as increasing plant populations to decrease weed pests and the intercropping of row crops with land cover crops to control costly erosion on steep slopes.

5. Integrated farming systems could be studied which would include such diversified types of management as crop production, combined with livestock and forest management, in order to conform to the watershed and conservation needs of the area.

6. The development and maintenance of benefit-cost ratio studies on the different crop management and agronomic practices used by farmers and prepared as a result of the research carried out. The evaluation of the cost of production of individual crops as now grown on typical small

farms with specific soil and climatic conditions. The comparison of the cost of purchased inputs, total expenditures and net gains on these farms as compared to those obtained first under experimental trial conditions and again under demonstration conditions on cooperating farms. It will be necessary to analyze the comparative costs of the different practices and to determine what input mixes if applied economically can earn the greatest real income for small farmers under different cropping conditions. At the end of each year's trials the Farm Economist together with the Program Director and the whole team will determine those cropping systems which will be demonstrated on cooperating small farms the following year.

7. **The development of cropping simulation models for field testing.**

The intent is that the model will be so devised that when the costs of inputs of a set of conditions are fed into a computer it should be feasible to estimate the probable earnings for any specific crop under four conditions: (a) on traditional small farms, (b) under experimental test conditions, (c) when demonstrated on selected farms, and (d) after acceptance under non-supervised conditions. After this information builds up it is expected that it will be possible to estimate the slippage in potential earnings between tested systems as developed on the experimental farm under supervised demonstration, and the system as it will be utilized without supervision on target farms.

A major effort will be the accumulation of base line information on sample forms. This information will serve as the basis against which to evaluate progress which may be made by the project in the improvement of creature conforts as well as in net earnings during future years.

8. The study of the demand for different crops in specific markets for the different Central American countries each month of the year. Also to correlate the market demand with the potential supply information available in order to optimize market efficiency of priority crops. Included in this type of market correlation studies would be an analysis of where specific crops are produced by region and country, yields obtained, time of harvest, quality produced, the cost of transportation, and the determination of the elasticity of demand in the various markets.

As quickly as possible the Marketing Specialist will also undertake to investigate the potential of foreign markets to receive specific non-traditional farm products from Central America and identify those countries from which these products might best be exported. He will work through his counterparts in the cooperating countries to determine the bottlenecks in expanding the markets for priority crops, in reducing farm-to-market losses, in determining storage requirements which would permit the distribution of these priority crops over a longer marketing season, and in exploring the potentials and needs of complementary family or larger agro-industries that will permit a better and more economic marketing of excess products. Also the possibilities of use of surplus products for agroindustry and to feed small animals should be studied.

Wherever experience of a nature that can be of use to the project has been developed whether by the host country or by other foreign assistance activities, this project will seek close alliance with their work. This is particularly the case in regard to the FAO which has marketing experts in several of the Central American countries, the IBRD, and the IBD. Additional sources are the two TA/AGR contracts, one in grain storage with

Mississippi State University and the other a grain marketing contract with Kansas State. Particular emphasis will be placed on coordinating the project's marketing efforts with that of the IICA's Hemispheric Agricultural Marketing Program.

B. Agricultural Information Transfer Unit

This contract will provide one Agricultural Information Transfer Specialist with agricultural extension and sociological background, who will serve as a link between CATIE/AID program and the Extension, Credit and Education Services of cooperating countries. He will be responsible for organizing workshops, short courses, seminars, publications, filmstrips and other communication means to disseminate to extension workers, and in some instances to demonstration farmers, new systems which the project has tested and found reliable.

STATEMENT OF PROJECT INPUTS

In order to assist in achieving the stated project purpose, inputs will be contributed by AID through the mechanism of a contract with the CATIE in Turrialba, Costa Rica. However, the magnitude of all inputs required will be beyond the scope of the AID/W contract. Additional inputs will also be contributed by CATIE, by the cooperating countries and in some cases by AID Missions.

A. AID/W Inputs

1. The Production Systems Management and Agricultural Economics and Marketing Unit

a. Technical personnel services

The contract will provide thirty-five and one-half man years of key technical personnel to undertake a program of research in the participating Central American Republics. It will assume the cost of their personnel benefits and travel and per diem. Minor changes in this mix may be dictated by circumstances beyond the control of this office or the contractor.

Soil Microbiologist Inoculant and Residue Management	3	man years
Agronomist Crop Management	4	man years
Agronomist Soil and Water Conservation	3	man years
Horticulturist	4	man years
Agronomist Weed Control	3	man years
Entomologist	4	man years
Economist Cost-Benefit ratio	4	man years
Statistician Crop Statistics and System Analysis	4	man years
Marketing Specialist	4	man years
Consultants Agricultural Engineer and Nematologist, System Engineer	2½	man years
	35½	man years

b. Sub-professional personnel

The contract will provide the basic staff of sub-professional assistance including secretarial help, field assistants, field laborers, and

computer services required to backstop the technical personnel. Office and field supplies are also included.

$164,000

c. Participant training

The contract's primary contribution to participant training will be in-service training which each technician will extend to his counterparts. Third country training will be provided through short courses and conferences at the CATIE. U.S. long-term degree training will not be provided by this project. Short-term U.S. training will be provided as follows:

Intensive formal training (80 man months)	$ 20,000
In-service training (144 man months)	36,000
	$ 56,000

d. Commodities

It is anticipated that the biggest investment in commodities will be in vehicles for use of the technicians and for specialized farm equipment in CATIE and the different countries. Some office furniture will be required outside of Costa Rica but for Turrialba this will be a contribution of the CATIE.

9 vehicles	$ 27,000
Farm equipment	40,000
Office equipment	7,500
	$ 74,500

2. The Agricultural Information Transfer Unit

a. Technical personnel services

One specialist will be made available under the contract, from the beginning of the project. During the first year he will get all the information available on production systems that will be necessary for his training activities in the following years.

Information Transfer Specialist	$3\frac{1}{2}$ man years

b. Participant training

Farmer training and the preparation of extension agents to perform this training is the principal function of this unit.

The cost of participant training of counterpart extension agents at short courses and workshops will be contributed through the contract. Provision is also made for 1 week of in-country training for each farmer demonstrator on whose farm a demonstration is to be placed. The cost of farmer demonstrations and farmers' conferences where information on the new crop management systems will be disseminated will be the responsibility of each host government. The following contributions will be provided through the contract:

In-service training, short courses (120 man months)	$ 30,000
Farmer demonstration training (1 week per farmer, 1136 man weeks)	71,000
	$101,000

c. Commodities

None.

B. CATIE Inputs

The CATIE will provide office facilities for the technical specialists and for the sub-professional supporting staff contributed under the contract. It is expected that the IICA (Inter-American Institute of Agricultural Sciences) will make its library and reference services available to the project including the assistance of their communications media personnel.

The CATIE will also provide its classrooms and training facilities for holding short courses and conferences as these are available and in accord with the project program.

The CATIE has at present ten technical staff members, thirteen field assistants, 20 field workers and all the operational costs dedicated to do research in its project on Agricultural Production Systems, which represents an annual cost of approximately $295,000 (see Appendix A). The CATIE will also make available its technical staff working in this project to render technical assistance to the proposed AID/CATIE contract. Consultation trips by CATIE's technicians will be financed by the AID/CATIE contract. All results of the project will be made available for use in the outreach program.

The CATIE will both maintain the AID/CATIE contract account up to date and provide necessary financial records and reports required by the AID/W Contract Office. For this and for maintenance of the facilities offered for the operation of the contract, CATIE will charge a 15% overhead on total expenditures.

CATIE's obligation will be defined in the scope of work in the PIO/T.

C. Mission Inputs

The individual USAID Missions will be expected to backstop the contract specialists whenever these are working in a particular country. To the extent the USAID Missions are able, and are disposed to do so, they will provide legistic support to these men. When a Mission believes it advantageous it may also participate in furthering the project through the use of grant funds to provide the short-term services of a U.S. consultant or to make available a particular commodity needed by the project.

The USAID Missions will, to the maximum extent possible, assist their host governments in the utilization of AID agricultural development loans to further the interest of the project and to help finance the purchase of commodities such as vehicles required by local personnel in project operations, farm machinery, or other equipment which might not be available under their standard government appropriations.

At such times as a Mission believes it advantageous to train a local technician through long-term participant training in the U.S. in order that he may fill a more responsible position in the project, it may use its participant training funds to do so, or it may be provided through the mechanism of AID/Agricultural Development Loans.

RATIONALE

This project proposes a new modus operandi by which to bring increased well-being and an improved earning capacity to the "small farmer" in Central America. Ever since AID/W established the mandate to direct its efforts in agricultural development towards the small farm, there has been considerable debate as to exactly who the small farmer is to whom the mandate refers. The

debate may be justified on two grounds. First, most of Central America's farmers partake very little in the national economies of their respective countries and therefore can not be reached through the traditional types of rural development projects. Second, if AID assistance in food production is to have its greatest payoff, the small farm is a poor risk, in fact the larger the farms assisted the greater is the probability of increasing their incomes. If we follow these lines of reasoning, however, approximately 80% of the farms of the region will never be reached and in terms of increasing the GNP there would be a basis for justifying this.

It has already been estimated that about 75% of the farms of Central America are subsistence farms which do not significantly partake in the national economy. Another 10% of the farms of the region have been considered to be upwardly mobile farms, produce from which intermittently reaches the market as favorable markets and family needs dictate. It is this 85% of the farms of Central America, the subsistence farmer and the upwardly mobile farmer whose development this project attempts to advance.

The present project approaches the problem of small farmers by a program of research which will seek to find ways of increasing farm profits upon selection of a mix of high return commodities and maximizing total yields per area for a maximum number of growing season days. Included in it is a program of economic study to determine those farming systems and those crops which can earn the small farmer his best income and which will have the greatest market demand. Finally included in the program is an information transfer and education effort by which to teach large number of target farmers how they may use the new systems which have been developed through training trainees and developing national formal and informal training networks.

There is little precedent in Latin America on which to base the probabilities of success of this approach. An article by Richard Bradfield titled "Training Agronomists for Increasing Food Production in the Humid Tropics" and published as special publication #15 of the American Society of Agronomy, describes several cropping systems by which food production may be increased as much as five times on rice lands. A report "Project Adelante" of studies done in 1968-70 as a joint effort by AID and the Nicaraguan Ministry of Agriculture with two contractors - Agriculture Industries, Inc. and Uniconsult, Inc., covers cost return studies of 25 crops and their comparative advantages in Nicaragua with California. It shows that many of these crops, though not now commercially grown, can be produced by family labor on small farms in Central America at well below U.S. costs. A special report from the Rockefeller Foundation titled "Reaching the Developing World's Small Farmers" indicates that the Puebla project, a Mexican prototype program, has achieved certain success in both moving the subsistence farmer into the upwardly mobile group and in establishing the upwardly mobile farmer firmly on the market economy.

Some research activities in multiple cropping are already underway in El Salvador and in Costa Rica, aside of recent publications related to the subject, namely a Bibliography on Agricultural Systems for the Tropics issued by IICA-CIDIA in February, 1974, and the final report on the Conference on Multiple Cropping held at Turrialba, Costa Rica in February 1974.

The problem which traditional programs of rural development for the most part have had are that when successful they generally reached the middle class and larger farmer. Whenever such programs have been aimed below these groups the risk of failure was correspondingly increased. AID's

experience in rural development assistance has shown that its efforts, such as farm production cooperatives and small farmer credit to marginal farmers, for the most part have not survived except in those cases where they were heavily subsidized and so able to absorb the losses. The results of our AID sponsored crop improvement programs, the AID sponsored soil testing and evaluation programs and our water management research have no doubt likewise had least effect on the small farm. It has been the middle and upper class farmer who could best afford to adopt them. And what about extension assistance? Their failing has been that they have left less than desired lasting results except in those few cases where a significant new innovation was introduced which materially increased the small farmer's income and so made the innovation really worthwhile or where national price policies and market demands have significantly increased farmer returns increasing his interest and reducing the risks of using new technology.

The problem can be simply stated. As farm size diminishes, a greater proportion of farms are found in the subsistence class. The subsistence farmer follows a system which has an inherently low degree of risk built into it. This is basically insurance and the costs of this are low but predictable yields of basic food crops, and low return to labor and capital. These farmers can not excessively gamble their existence against potential increases in cash income, and the failure of traditional programs to reach them is directly attributable to this fact. The primary objective of this program is to develop farming systems which, through the production of <u>additional</u> crops can generate a significant increase in net farm income without increasing the economic risk, thus endangering the survival of the farm family.

An ends-means analysis of this project reveals a tenuous linkage between the Purpose and the Goal. Acceptance of the argument that achieving the project purpose will lead to reaching project goals involves accepting some sizable risks. These are shown in the logical framework matrix but should also be considered as separate issues.

First, there are assumptions about cooperating countries. Will they seriously undertake the program of social and economic reforms which are needed? What political power rests with the institutions which are profiting under the existing situation? Do these countries have the technical and professional people which must be dedicated to this task if it is to succeed? How good are the extension, credit and marketing services? Do those services of each cooperating country have the logistical capability needed to implement the program?

Second, there are technical questions at issue. Is 'swidden agriculture' one of the problems? Years of effort have been expended on this problem and the end is not yet in sight. What is the elasticity of the markets for the potential additional crop production? Are production inputs available in sufficient quantity and at a cost which allows productive use? Is the marketing infrastructure capable of handling an increased farm output at a price which is profitable for the farmer?

The questions of cooperating country commitment and capability have been addressed separately; the report concerning these questions is shown in Appendix B. Those questions of a technical nature are generally more difficult to resolve. Wherever the target groups are geographically placed in a community of commercial farm enterprises, no problems of getting

production inputs or in marketing outputs should be encountered by the farmer. But, wherever these farms comprise the bulk of farms in an area there has been no incentive for the business community to develop the communications and marketing infrastructure we may expect to encounter problems for some time. This program will, in time, offer the required incentive and the problem may then be self-solving.

No doubt there are a number of programs other than the present proposal which could also directly attack the problem of the farmer not now included in the commercial economy. It would be possible to heavily tax the large farmer so as to provide special services to assist the target group. One might provide them special inputs free such as fertilizers and improved seed so as to increase their production. Programs could be devised which would subsidize the small farmer's harvest, for example paying a bonus price for a special product which only he would be licensed to grow. This would force him to buy his food in the market. Finally, the government could confiscate large tracts of land, work them as communal farms, and hire as salaried laborers the farmers who would be displaced.

The difficulty with such so-called solutions is that they either cost more than any government can afford, or else they deprive the persons they are supposed to help of their liberties.

The present proposal differs from previous AID rural development projects first because unlike cooperative development, small farm credit loans or crop development projects in the past, it aims at a well-defined group of farm families and it attacks their problems by a multifaceted approach. Second, it differs from AID's previously approved crop research activities in

that it approaches the means of increasing crop yields from a systematical basis rather than from either a commodity basis, i.e. corn, wheat, or soybean development or from a project approach such as fertilizer usage, or soil and water management alone. The approach was chosen because it probably offers the best present opportunity to assist in solving the problems of small farmers.

NARRATIVE STATEMENT

Described above is a proposal for a $1.6 million dollar contract with the Tropical Agricultural Research and Training Center (CATIE) which can provide the information required to confront many of the basic problems which have prevented the generation of higher farm incomes and increased employment on small farms in Latin America. Envisioned is a four-year research effort which focuses on a systems approach to the intensive production of food crops coordinated with an in-depth economic study of the production of these crops and the markets where they may best be placed. AID has been a major donor to the core budgets of the International Agricultural Research Centers. Our contribution to eight such centers is anticipated to be close to 7 million dollars in FY 1974. The excellent quality of research in wheat, corn, and rice that these centers have accomplished in developing improved varieties and in the formulation of crop input packages for increased yield is well-known. Until now, the Centers have tended to concentrate largely on a commodity or product basis. This proposed contract, in contrast, proposes to widen the investigative framework to include regional and national analyses of the potential impact of new or improved farming systems by which small units of land may be used to produce their maximum capacity of food, feed, and animal

products during the greatest number of days possible throughout the year. It proposes to study and evaluate these systems comparatively in terms of economic returns to small farmers, increased employment opportunities, and the potential of placing the products produced on both domestic and foreign markets. To accomplish this proposal it will be necessary to collect national and micro data on site and to involve respective national economic and plant science research personnel in the analysis of both country and regional data.

Throughout a major part of the tropics there is a distinct wet and dry season. During the wet season crops are grown and the rural population is for the most part gainfully employed. During the dry season, except where irrigation projects have been developed, most farm land is unproductive and the lack of rural employment alternatives often becomes so acute as to be the cause of serious political turmoil. A major method by which to alleviate this situation would be to determine new methods and techniques by which land can be maintained in production for more than a single annual harvest. This may entail the use of irrigation facilities in some instances, the production of drought resistant crops in others or perhaps better methods of land and water utilization. An economic systems approach to farming is implied.

Until recently it was common to compare the yields of a crop like maize grown in the U.S. with those of the same crop grown on a tropical soil using traditional cultural practices. These comparisons proved so unfavorable that the conclusion became widely accepted that tropical soils possess a limited production potential. In the last few years a considerable pool of knowledge has been developed to indicate that ample quantities of food can be grown on many of the tropical soils formerly rated as sub-marginal where tested

soil amendments are applied together with recommended production practices. By multiple cropping these soils have on several occasions produced more total yield during a 12-month period than in temperate climates in those cases when it was possible to control the available water and make good use of both the land and light. A major need today is to determine practical cropping systems which make best use of the resources available, and which can earn a fair profit for considerable numbers of small farm operators. Finally, adaptive research is required to determine the areas where these systems may best be employed.

The small farmer has long been neglected in most tropical and sub-tropical countries. This has been particularly true in Latin America. The local governments until recently have been principally interested in the traditional export crops such as sugar, coffee, cacao, and fibers. These are, for the most part, "colonial" crops and as such were grown on large plantations. Only during the last few years have most of these governments begun to be interested in expanding production of the food crops and then their intention was to find foreign markets on which these could be placed. This too has brought out serious marketing and pricing problems because many of the Latin American countries have tried to place their foodstuffs on the same external markets, principally the U.S. Urgently needed, and a focus of this contract, is thorough research of the comparative advantages of each country's crop mix, so that it might be determined which cropping systems and which food crops might best be used in a country, given economic and political constraints.

As information resulting from project activities becomes available, it should be possible by a program of extension education to change the farming

practices of ever increasing numbers of small farmers in Latin America from the extensive type farming now largely practiced to new intensive farming methods. It can mean increased food for the growing population and, in most instances, increased labor utilization. Until now the funds for research of this nature have been very limited.

It is believed a new approach has been proposed in the present document which can achieve a measurable social and economic benefit for the largest most depressed group of Latin America's rural laborers. These are the small farmers whom AID/W is anxious to motivate but who we have largely not been able to reach because they exist almost entirely without partaking in the national economy.

The program is one which when once established in a rural community should pick up momentum and demonstrate a need to be continued by the participating country. As more farmers are enabled to increase the quantity and quality of their food production so that they can sell an increased volume of farm produce on the market, they will be able to buy a correspondingly increased quantity of consumer goods and thereby stimulate the gross national product. More immediately, however, as each new community becomes commercially oriented it will be more readily accessible to other development assistance. Cooperative development and rural credit programs will assume an importance they could not have had before and their chances of success to hasten the development of the rural sectors as a whole will be strengthened.

PROVISIONAL FOUR YEAR BUDGET

(Thousands)

	1st Year	2nd Year	3rd Year	4th Year	Total
PROFESSIONAL PERSONNEL					
Production Systems Management, Agricultural Economics and Marketing					
Horticulturist, Group Leader	23	23	24	24	94
Agronomist, Crop Management	20	20	21	21	82
Agronomist, Weed Control	-	20	20	21	61
Soil Scientist, Soil and Water Conservation	20	20	21	21	82
Soil Scientist, Microbiology	-	20	20	21	61
Entomologist, Crop Defense	20	20	21	21	82
Consultants, Agricultural Engineering & Nematology	10	10	10	-	30
Economist, Crop-Benefit Ratio	20	20	21	21	82
Statistician, Crop Statistics	-	20	21	21	62
Marketing Specialist	20	20	21	21	82
Agricultural Information Transfer					
Information Transfer Specialist	12	20	21	21	74
	145	213	221	213	792
SUB-PROFESSIONAL PERSONNEL					
Secretary, bilingual	3	3	3	4	13
Secretary, bilingual	4	4	4	5	17
Field assistants	24	24	25	25	98
Field laborers	12	12	12	12	48
Subtotal, Personnel	188	256	265	259	968

(cont.)

	1st Year	2nd Year	3rd Year	4th Year	Total
TRAVEL AND PER DIEM	22	24	24	24	94
COMMODITIES	43	30	30	20	124
COMPUTER COSTS	8	10	10	10	38
OTHER COSTS	5	5	5	5	20
Accumulative Total	266	325	334	318	1,243
EXTENSION AND PARTICIPANT TRAINING					
Intensive formal training	5	5	5	5	20
In-service training	6	20	20	20	66
Farmer demonstrations	1	15	25	30	71
Subtotal, Education	12	40	50	55	157
TOTAL	278	365	384	373	1,400
Overhead, 15%	42	55	57	56	210
GRAND TOTAL	320	420	441	429	1,610

EXPLANATION OF COST ESTIMATES FOR FIRST YEAR OF OPERATION

ANALYSIS OF COST PROPOSAL

	Net salary	Retirement	Insurance	Home leave	Recruitment & Repatriation	Allowances (Family and Education)	Total
PROFESSIONAL PERSONNEL							
Production Systems Management, Agricultural Economics and Marketing							
Horticulturist, Group Leader	16,490	3,242	200	550	650	1,900	23,032
Agronomist, Crop Mgt.	14,670	2,772	200	750	650	2,200	21,242
Soil Scientist, Soil and Water Conservation	13,942	2,615	200	750	650	2,200	20,357
Entomologist	13,942	2,615	200	750	650	2,200	20,357
Economist, Cost-Benefit	14,670	2,772	200	750	650	2,200	21,242
Marketing Specialist	14,670	2,772	200	750	650	2,200	21,242
Extension Specialist ($\frac{1}{2}$)	7,335	1,307	100	550	650	1,900	11,992
Consultants							10,000
Subtotal							$149,464

(cont.)

	Net salary	Insurance	Total
SUB-PROFESSIONAL PERSONNEL			
Bilingual secretary	3,237	647	3,884
Bilingual secretary	2,993	598	3,591
Field assistants (3)	3,640 ea.	582 ea.	12,666
Field assistants (4)	2,460 ea.	394 ea.	11,416
Field laborers (14)	863 ea.		12,091
Subtotal			43,648
TRAVEL AND PER DIEM			
International travel (40 round trips at approximately $120/trip			4,800
Per diems, 2 months x 8 technicians (480 days x $25 average)			12,000
Local travel (Costa Rica), Professional and Subprofessional (420 days x $5 per day)			2,100
Professional international travel for information exchange between CATIE and AID/W staff			
Travel			2,000
Per diems			1,200
Subtotal			22,100

	Total
COMMODITIES	
Office and laboratory supplies	3,500
Field materials and agrochemicals	4,000
Publications, books and journals	3,500
Vehicles (6)	18,000
Small farm machinery	10,000
Office and laboratory equipment	4,000
Subtotal	43,000
COMPUTER COSTS	8,000
OTHER COSTS	5,000
EXTENSION EDUCATION	
Intensive formal training 6 trainees x 3 months (18 man months)	4,500
In-service training 12 trainees (18 man months)	4,500
Farmer demonstration training in Agricultural Development Programs and selected farmers 16 trainees (1 man weeks)	1,000

(cont.)

	Total
Travel - 15 participants, $120 ea. average	1,800
Subtotal	11,800
TOTAL	279,391
Overhead - 15% on total expenditures	46,747
GRAND TOTAL	$358,400

APPENDIX A

CATIE'S ANNUAL BUDGET FOR THE PRODUCTION SYSTEMS PROJECT

		Total
PROFESSIONAL PERSONNEL		
Plant Breeder, Head	25,730	
Soil Scientist, Soil fertility	21,805	
Soil Scientist, Soil physics, plant-water relations	18,212	
Plant Breeder, Crops specialist	20,893	
Plant Pathologist	17,217	
Plant Physiologist, Production	19,483	
Plant Physiologist, Photosynthesis	14,485	
Cytogeneticist	26,419	
Horticulturist	16,968	
Agronomist, Crop management	9,706	
		190,918
SUB-PROFESSIONAL PERSONNEL		
Executive Secretary	5,467	
Bilingual Secretary	2,520	
Secretary	2,384	
Field assistants (13)	32,356	
Field laborers (20)	23,083	
		65,810

		Total
TRAVEL		
Travel and Per Diem	2,207	
Local transportation	5,200	
		7,407
COMMODITIES		
Field materials	10,200	
Laboratory materials	5,600	
Supplies and services	8,618	
		24,418
OTHER COSTS		
Maintenance	3,200	
Miscellaneous	3,198	
		6,398
GRAND TOTAL		294,951

APPENDIX B

ANTICIPATED CONTRIBUTION FROM COOPERATING COUNTRIES

PERSONNEL SERVICES

Each host government participating in the project will be expected to provide one or two capable specialists to work with the subject matter specialists hired under the AID/CATIE contract. Also it should allow other agricultural specialists assigned to other country projects to devote part-time services to the research trials underlaid in the AID/CATIE project.

TRAINING

Host governments will be responsible for the training costs of any additional counterpart specialists which they may consider necessary for the advancement of project activities in their particular countries.

COMMODITIES

Host governments will be responsible for the allocation of vehicles required to transport their technicians assigned to this project. They will contribute farm equipment utilized in their agricultural research experimental trials, the major part of the seed, biochemicals, and of the field labor needed to set these trials up. Each government will provide the land on which the research trials in that country will be run.

The individual countries will provide the farm machinery which their agricultural extension agents require to set up their cropping systems and agricultural practice demonstrations on small farms.

The individual government will provide all training materials required for the training of farmers in the new methods and techniques devised by the project as well as all the operational costs involved in farmers' training conferences.

OTHER COSTS

The individual governments will be responsible for all costs of their personnel including all salaries and benefits. They will continue to pay these salaries and benefits when such employees are assigned for special participant training. These governments will also pay for all travel and per diem of their employees assigned to the project and the cost of the fuel and the maintenance of the vehicles these employees utilize in the project program.

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