

AIRGRAM

DEPARTMENT OF STATE

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TO - AID TO CIRCULAR A 1246  
PD-AA13-514-B1

FROM - WASHINGTON

SUBJECT - Soil Fertility PROP

REFERENCE -

- DISTRIBUTION
- ACTION
- LA 40
- INFO.
- AAID
- EXSEC
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Attached is the approved PROP for the Latin America Regional Program for Soil Fertility Improvement. This PROP is being distributed to all Latin America missions because it is an example of an excellent PROP. It is suggested that special attention be given to the preciseness with which objectives and targets have been formulated as well as the extent to which measureable output indicators have been employed. In addition, note should be taken of the quality and extensiveness of the services provided by the North Carolina State University Department of Soil Science.

Cableroom send to List L.

ROGERS

*[Handwritten signature]*

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1	1	1

DRAFTED BY	OFFICE	PHONE NO.	DATE	APPROVED BY
BBaker: new <i>[Signature]</i>	IA/OPNS	29882	5/21/70	IA/DP: JHeller
AID AND OTHER CLEARANCES				
IA/OPNS: AMHugher <i>[Signature]</i>	<del>DO/CCD/...</del>		A/AID: RHubble <i>[Signature]</i>	
IA/PCD/AI: JWalker <i>[Signature]</i>	UNCLASSIFIED CLASSIFICATION			

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A. I. D ADDRESSEE LISTS FOR REGIONAL AIRGRAMS AND TELEGRAMS. SEND TO:

<u>LIST L</u>	<u>LIST N</u>	<u>LIST R</u>	<u>LIST E</u>
7 ASUNCION	<del>7 AMMAN</del>	8 ACCRA	<del>12 BANGKOK</del>
15 BOGOTA	<del>13 ANKARA</del>	7 ADDIS ABABA	<del>8 DJAKARTA</del>
10 BUENOS AIRES	<del>2 BEIRUT</del>	5 DAKAR	<del>6 MANILA</del>
6 CARACAS	<del>3 COLOMBO</del>	5 DAR ES SALAAM	<del>3 RANGOON</del>
5 GEORGETOWN	<del>13 KABUL</del>	6 KAMPALA	<del>3 CAMR ZAMA/ RIO JAF</del>
9 GUATEMALA	<del>8 KATHMANDU</del>	8 KINSHASA	<del>15 SEOUL</del>
8 GUATEMALA ROCAP	<del>10 NEW DELHI</del>	10 LAGOS	<del>10 VIENTIANE</del>
8 KINGSTON	<del>18 RAWALPINDI</del>	3 LUSAKA	
10 LA PAZ		6 MOGADISCIO	
13 LIMA		10 MONROVIA	
10 MANAGUA		7 NAIROBI	
2 MEXICO		7 RABAT	
8 MONTEVIDEO		10 TUNIS	
10 PANAMA CITY			
10 QUITO			
14 RECIFE			
20 RIO DE JANEIRO			
9 SAN JOSE			
8 SAN SALVADOR			
10 SANTIAGO			
10 SANTO DOMINGO			
8 TEGUCIGALPA			

REVISED April 30, 1970

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PROJECT AUTHORIZATION

1. PROJECT NUMBER 598-13-120-001	3. COUNTRY L.A. REGIONAL	4. AUTHORIZATION NUMBER
2. PROJECT TITLE SOIL FERTILITY - 598-13-120-001		5. AUTHORIZATION DATE 3/71?
7. LIFE OF PROJECT		6. PROP DATED May 7, 1970

a. Number of Years of Funding: 5  
Starting FY 19 70, Terminal FY 19 74

b. Estimated Duration of Physical Work  
After Last Year of Funding (in Months): 6 to 12 months

FUNDING BY FISCAL YEAR (in U.S. \$ or \$ equivalent)	DOLLARS		P.L. 480 CCC + FREIGHT	LOCAL CURRENCY			
	GRANT	LOAN		Exchange Rate: \$1 =		HOST COUNTRY	
				U.S. OWNED			JOINTLY PROGRAMMED
Prior through Actual FY	348,611			GRANT	LOAN		2,200,000
Operational FY 71	318,200						1,500,000
Budget FY (72)	374,800						2,000,000
B + 1 FY (73)	401,800						2,250,000
B + 2 FY (74)	331,000						3,000,000
B + 3 FY							
All Subsequent FY's							
TOTAL	\$1,804,411						10,950,000

9. DESCRIBE SPECIAL FUNDING CONDITIONS OR RECOMMENDATIONS FOR IMPLEMENTATION, AND LIST KINDS AND QUANTITIES OF ANY P.L. 480 COMMODITIES

10. CONDITIONS OF APPROVAL OF PROJECT

PROP approved for the life of the project on May 21, 1970.

(Use continuation sheet if necessary)

11. Approved in substance for the life of the project as described in the PROP, subject to the conditions cited in Block 10 above, and the availability of funds. Detailed planning with cooperating country and drafting of implementation documents is authorized.

This authorization is contingent upon timely completion of the self-help and other conditions listed in the PROP or attached thereto.

This authorization will be reviewed at such time as the objectives, scope and nature of the project and/or the magnitudes and scheduling of any inputs or outputs deviate so significantly from the project as originally authorized as to warrant submission of a new or revised PROP.

A.I.D. APPROVAL	CLEARANCES	DATE
SIGNATURE	LA/DR/AI, J.E. Walker <i>J.E. Walker</i>	3-4-71
	LA/DR/AI, D.R. Fiester <i>D.R. Fiester</i>	3-4-71
	LA/DR, B. Robinson	3-4-71
	LA/OPNS, W. Wren	3/4-71
	LA/DP, J. Heller <i>J. Heller</i>	3/4-71
AA	A/CONT	
TITLE	DATE	

*W. Wren*

Submission of Latin America Regional Program for Soil Fertility Improvement  
 PROP (Non-capital Project Paper)

M.O. 1025.1

COUNTRY: Regional (LA)

Submission Date: 70

Project Title: Soil Fertility

U.S. Obligation Span: 1/1/70 through 12/31/74

Physical Implementation Span: FY 1970 through FY 1975

Gross Life-of-Project Financial Requirements:

U.S. Dollars	\$ 1,659.0 thousands
Local equivalent	9,500.0
	<u>\$ 11,159.0</u>

Introduction: In June, 1963, A.I.D. signed a contract with North Carolina State University (NCSU), AID/csd-287 in which NCSU agreed to develop soil fertility evaluation programs in cooperating countries. Progress, particularly in Latin America, was made towards national systems of soil testing and the determination of fertilizer requirements in the countries that worked on this project. This contract expired December 31, 1969. As a result of discussions between technicians and administrators in A.I.D. and the University during August and September, 1969, it was decided to let the contract expire on schedule then replace it with two contracts. One of these contracts, signed with the Technical Assistance Bureau of A.I.D., to meet a need discovered as the original contract was implemented, would go much more deeply into technical research on tropical soils to develop additional data and information necessary for giving more accurate guidance to farmers on economic management practice to increase productivity and farm income. The other contract between the A.I.D. Latin American Bureau would continue the work in Latin America begun under the 1963 contract for the development of practical soil fertility programs. As a result of work done under AID/csd-287, a majority of the LA countries where there are A.I.D. Missions already have active programs of this type, in varying stages of development and need additional assistance before these programs can become self-supporting.

It is for the continuance of this work that this PROP and the project are being submitted.

Drafted by: DRFiester/JEWalker:tlp:st:5/7/70

Clearances:

LA/DP J. Heller

LA/OPNS A. Hughes

LA/DP R. Delaney

LA/CTR S. Heishman

PCD/IS L. Heilman

LA/PCDI R. Black

LA/DR L. Sleeper

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LATIN AMERICAN REGIONAL PROGRAM  
FOR SOIL FERTILITY IMPROVEMENT  
PROP

Summary Description:

Latin American agriculture has had difficulty in meeting its responsibility of providing adequate amounts of quality food to the areas' rapidly growing population. National goals for production of basic food crops and export products have more frequently been attained by increasing the area of land under cultivation than improving production methods using the new technology of more developed nations.

Of the estimated 1350 million acres of arable land in Latin America, approximately 400 million acres are currently in farms. Although more land is annually being brought into cultivation, per acre costs to open new land are increasing and greater reliance in the future must be placed on the improvement of crop production in areas that are presently under cultivation. Increased yields on these farms can only be secured when the supply of the 12 essential nutrients secured by plants from the soil are supplied in adequate amounts. All soils found in tropical regions of Latin America thus far have been found deficient in one or more plant nutrients--some are deficient in as many as six nutrients simultaneously--and all have responded favorably through improved plant growth and production when adequate amounts of chemical fertilizers have been applied properly in adequate amounts as the result of recommendations based on sound research.

Under A.I.D. Research Project csd-287, initiated in 1965, the North Carolina State College Department of Soil Science, initiated a program to analyze and correlate soil test data in Latin America in order to prepare hemisphere-wide soils maps and correlate laboratory results with soil type, crop species, yields, fertilizer response, economics of fertilizer use, etc. A preliminary survey indicated that soils laboratories in Latin America were inadequate to the task and that qualified technical personnel so limited in number as to make attainment of the initial research goal questionable. The inadequacy of research data required the initiation of a complete soil fertility program, including research on the analysis of tropical soils, design of new soil sampling procedures, development of mass analysis procedures and equipment, establishment of analysis/field response correlations, training of laboratory and field technical personnel, etc.

Results from this first phase of the soil fertility program have resulted in (1) development of twenty new mass analysis instruments resulting in the increase of soil samples analyzed from 32,000 in 1965 to 165,000 in 1968. The thirty laboratories cooperating in this program are now capable of analyzing up to 200 samples daily; (2) development of a new method of interpreting soil analysis for phosphorous and potash which indicates probable economic farm response to fertilizer application; (3) preparation of a series of soil maps based upon a restricted list of nutrient deficiencies affecting food crop production

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production; (4) evaluation of pot and field tests for ascertaining major nutrient element deficiencies and their correction on tropical crops grown under humid conditions and (5) the training of an increasing number of research and laboratory personnel in the procedures of improved plant nutrition.

While conducting this program and developing valuable cooperative efforts with Latin American counterparts in 14 countries, the studies and support to farmers have evolved an increasing number of critical technical questions. These problems will require more intense research than is possible at present when other efforts are also required to expand the applicability of known information and procedures in support of greater economic production of food crops by the hemisphere's better farmers. As a result of discussions held in July, 1969, it has been agreed that the research aspects of the program will be supported and financed through the new Technical Assistance Bureau and the applied Technical Assistance and training aspects of the International Soil Testing Program (ISTP) would be supported by the Latin American Bureau.

Under the Technical Assistance portion of this program, financed by the Latin American Bureau, the International Soil Testing Program will support A.I.D.'s field missions and local governments in improving the use of modern technology in plant nutrition at the producer level. The objective of the technical assistance soil fertility evaluation program is to increase economic yields of crops through the use of fertilizers, lime and other soil amendments. To achieve this objective all phases of soil fertility evaluation and improvement must be operative within the cooperating countries.

The technical assistance soil fertility evaluation program involves demonstration, education and service activities. These activities must be coordinated, support national production goals in the cooperating countries and provide a basis for unifying research, farmer training, and private sector marketing of fertilizer materials efficiently and effectively. Local governments must assume leadership in this effort if they are to keep pace with modern technology and serve their farmers in the ever increasing responsible manner. This project is intended to work largely with agricultural leaders, Ministries of agriculture, educational institutions at the vocational, undergraduate and graduate levels and with commercial companies. The specific activities undertaken for increasing agricultural production through this soil fertility program are: (1) to identify nutrient major and minor element deficiencies and diagnose problems of adverse soil conditions, such as acidity, alkalinity and salinity.

(2) To devise, initiate and conduct cooperative programs within the developing countries for the recommendation of methods of correcting soil nutrient deficiencies and adverse soil conditions affecting economic farm production.

(3) To establish, maintain and improve soil fertility evaluation procedures, including establishment of laboratories, design of laboratory equipment, establishment of analytical procedures, working out sampling

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techniques, conducting correlation studies, making fertilizer recommendations and organizing educational activities in support of national food crop and export production goals.

(4) To test and introduce techniques to stimulate adaptation of proper fertilizer and lime use (or other soil amendments) by farmers.

(5) To develop summaries of soil analysis data and other soil fertility evaluation information for guidance of governments, the private sector, commercial fertilizer companies and farm operators in the proper requirements, distribution and marketing of fertilizer materials, lime and other soil amendments.

Specific soil fertility programs will be developed in cooperation with A.I.D. food and agriculture officers and local ministries of agriculture in support of local national major and minor crop production goals. These programs to be implemented in collaboration with NCSU regional field representatives, and will be carried out as a planned, time-phased action program supporting A.I.D., IDB and World Bank Capital development production programs. Activities which identify and make recommendation on soil areas in support of national colonization and resettlement programs will also be developed as required on a case by case basis.

This project will require increased cooperating country economic and administrative support to laboratories, employment of additional technical personnel and training of extension and development promotion agents. The cooperative project at the end of 1975, expects to have completed correlation studies for phosphorous, potash, acidity, secondary elements and micro-nutrients on all major cultivated soils of each participating country. Field trials in the five year period will include an estimated 80 locations per laboratory and a minimum of 500 field demonstrations per country. Training sessions are estimated to require four technical seminars at Raleigh, North Carolina, 17 regional meetings for extension and demonstration personnel and a minimum of 15 country short courses per laboratory.

The program projects that by 1975, yields on farms using ISTP recommendations should increase by 100% over present production levels. In addition, the profit from expenditures for fertilizers will increase from \$1.50/\$1.00 at present to \$3.00 for each \$1.00 invested. Total fertilizer consumption in the cooperating countries are expected to increase by 50% in five years.

This program will provide a nucleus administrative-technical support staff at Raleigh, North Carolina and <sup>subject to the availability of funds</sup> up to six regional field advisors to be located in strategic Latin American countries. Each regional advisor will provide coordination and program guidance to two or more countries with the exception of the advisor located in Brazil. The Raleigh technical staff will provide technical support to countries not directly the responsibility of the regional field advisors and will support the regional advisors in the execution of their own programs where required. It is expected that A.I.D. field missions

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and local governments may also employ full time field advisors separate from but closely coordinated with the program herein proposed from North Carolina State College.

A.I.D. under this project will provide salaries, administrative costs and demonstration equipment and vehicles for U.S. personnel. The costs of cooperating country laboratories, facilities, personnel, vehicles, educational supplies and demonstration requirements will be supplied by the local government. It is expected that total combined cooperating country local cost expenditures will be in excess of five times the U.S. investment. The cost of the project from January, 1970 to December, 1975, is as follows:

- Budget Approximation -  
 North Carolina Soil Fertility Contract  
 with Latin American Bureau

	<u>1970</u>	<u>1971</u>
1. Salaries	\$129,900	\$137,576
2. Allowances	21,489	20,100
3. Travel and Transportation	30,038	28,100
4. Other Direct Costs	39,470	40,019
5. Overhead	44,563	47,070
6. Equipment and Vehicles	<u>6,500</u>	<u>6,500</u>
	Total \$ 271,960	\$ 279,365
5 year life of project:		
(\$ Thousands)	1970	272.0
	1971	279.4
	1972	374.8
	1973	401.8
	1974	<u>331.0</u>
	TOTAL	\$ 1,659.0

## 2. THE SETTING

Agricultural production of food crops has, during the decade of the Alliance . Progress, been able to increase at a rate only slightly above the hemisphere's population growth rate. As the population explosion continues above 3% per year, the numbers of people which must be fed will increase dramatically. While the total population in Latin America is estimated to be 280 million people in 1970, the expected population in 1980 will be above 360 million.

In addition to the need for an accelerated rate of food production the increased population will also increase demand for work opportunities since by 1980 the already existing population will consist of over 50% of the total population under 25 years of age. Increased demand for work and food is creating a need for expanding work opportunities and broader based equity in the total income of the rural sector. At the same time migration pressures to urban centers are increasing the urgency for means of creating greater numbers of work opportunities in rural areas in order to reduce the flow of people to cities in search of work for which these immigrants are inadequately trained.

In rural Latin America there is not, at this time, a general restriction on the availability of land. Though soil surveys are incomplete, it is estimated that a total of 1,350 million acres of a total land area in the hemisphere of 3700 million acres is arable. At the present time, approximately 425 million acres are in farms. Of this total area in farms only about 175 million acres is planted to crops.

A part of the future expansion of agricultural production throughout the hemisphere will during the next decade result from incorporating new acreage into the total in order to satisfy work opportunities. Since the new areas to be incorporated into national economies lie beyond the present infrastructure and farther from existing population centers, costs of habilitating these new lands are increasing rapidly. Most of the virgin soils of tropical regions are deficient in one or more of the nutrient elements and must be properly fertilized and limed when brought under cultivation in order to produce optimum crop yields. In most countries it has already become evident that it is less expensive to intensify production on existing farms than to increase production through the incorporation of new areas into production. A study conducted by the International Development Bank estimates that during the next ten years some 75 million acres of new land will be opened to cultivation.

On areas presently in farms, it is well known that production using existing conditions falls far short of potential and well below levels for similar crops produced in more advanced countries. Research conducted in various Latin American countries and documented in technical literature indicates that use of known modern production methods can increase production of food crops by over 500% in many areas over present national production levels.

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A major element in this increase is found in the improvement of existing levels of plant nutrients available in tropical soils.

In order for plants to grow well and produce abundant crops, a total of twelve chemical elements are required from the soil and four additional essential elements are secured by plants from the air. These elements are required in different amounts hence their classification into major and minor elements. They must all be available in the soil at the required concentration and balance during the plants' growth cycle or reduced growth and harvest will result. Under tropical conditions of high rainfall, temperature and diverse soil type, limitation in the availability of at least one essential element has been found in almost every tropical soil tested to date.

Not only have deficiencies been found in each country in the hemisphere but deficiencies within a single soil type have also been found to vary. A wide range of conditions, below and above the critical level for fertilizer responses have been found for all soil types. Thus, without an analysis, a farmer cannot tell the nutrient needs of his crops. The following table summarizes the percentage of cultivated soils needing either phosphorus or potash.

<u>Region</u>	<u>Needing Phosphate %</u>	<u>Needing Potash %</u>
1. Coastal area (east) Brazil	50-75	30-40
2. EAST slope of Andes and interior Brazil	75-100	50-75
3. Andean range (Sierra)	50-75	25-50
4. Pacific Coastal soils South America	30-60	0-30
5. Central America Caribbean Coast	75-100	40-60
6. Central America Altiplano range (mountains)	40-60	20-35
7. Central America Pacific Coast	40-60	0-30

The International Soil Testing Program, which was initiated by North Carolina State University, has been working in close cooperation with over ten Latin American countries. Under this program, laboratories for the mass analysis of soil samples for research and commercial service purposes were organized, a corps of local technicians trained, and correlations between crop response to fertilization on major soil types and laboratory (CONTD.)

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analysis of major elements (nitrogen, phosphorus and potash) and calcium, magnesium and several minor elements begun. There are now established cooperating soil testing laboratories in Brazil (18 in operation), Paraguay (1), Bolivia (1), Peru (1), Ecuador (1), Venezuela (1), Costa Rica (1), Nicaragua (1), Honduras (1), El Salvador (1), Guatemala (1) and Mexico (1). These facilities though varied in their capacity to provide farmers with a complete set of fertilizer recommendations for all crops due to the paucity of local research have nevertheless demonstrated at the local level their effectiveness in predicting the most effective rates of fertilizer applications for plant growth on a variety of crops.

Results to date have demonstrated yield increases with proper nutrition of over 500% of corn in Guatemala, 400% on wheat in Bolivia, and 100% on vegetable crops in Peru. Farmer profits have also materially increased through use of proper fertilization. Return on investment from fertilizer application on various crops have increased from a ratio of \$1.50 per \$1.00 spent in some cases to over \$8.00 per \$1.00 spent for fertilizer. In a recent unpublished economic study in Colombia, inadequate use of soil fertility analysis by farmers have been shown to result in excessive expenditures for unrequired fertilizer materials of over \$12 million annually. In most countries in Latin America while fertilizer consumption has increased from 0.956 million tons of plant nutrients in 1960-61 to 2.197 million tons in 1967-68, most basic food crops and many export crops are still either using inadequate amounts of fertilizer or none whatsoever.

With increased emphasis on sector analyses, sector lending, increased emphasis on the production of food crops, greater research making new highly fertilizer responsive crop varieties available, there is a rapidly growing realization that soil fertility programs are a valuable tool for the attainment of national production goals. There is, however, a serious need to expand the capability of existing laboratories to analyze all essential plant nutrients, improve correlations between analysis and field response to fertilizer, utilize the increasing array of research results on plant nutrition and the training of laboratory, field technicians, farmers and private sector fertilizer sales personnel on all aspects of soil fertility. A.I.D. missions and national governments are increasingly considering this the key operational tool for attaining improved productivity and economic efficiency in the agricultural sector during the next decade.

### 3. Strategy and Program Goals

The Latin American Bureau through this Technical Assistance Program in Soil Fertility will continue to encourage and support accelerated Latin American national efforts to promote farm producers to use modern methods of production. Specifically, increased emphasis and coordination will be given to:

A. Improving local laboratory facilities to expeditiously handle large volumes of soil samples and analyze all major and minor essential plant nutrients with subsequent recommendations for fertilizer application;

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B. Rapidly increasing the effectiveness of extension and crop promotion agents of local governments and their private sector in assisting increased production of basic food crops and export products to meet national goals;

C. Supporting in the identification and mapping for soil fertility purposes of new areas for agricultural production for expanded land reform programs as requested;

D. Rapidly incorporating research findings on plant nutrition and methods of fertilizer application into the production system of all levels of farm operation;

E. Providing training to laboratory analysts, extension agents, production specialists, credit agents and farm groups on all phases of soil fertility management;

F. Training private sector fertilizer sales personnel as required in modern methods of fertilizer use and sales procedures in cooperation with T.V.A.

G. Establish a Latin American organization that will assume the responsibility for collecting, testing and distributing control samples for use in the cooperating laboratories.

The Latin American Bureau through this project, will provide a new focus to national efforts for meeting agricultural production goals through improved fertilization whether financed by local institutions or international agencies. The ISTP will work directly with and support agricultural sector, program, fertilizer loans in order that farm operators will use the most appropriate formulas and amounts of locally deficient nutrient elements for the attainment of maximum economic benefits.

This project is viewed as the key element in making operational U.S. and local government research programs in plant nutrition. The laboratory analysis of soil samples resulting from correlation work with pot tests and field trials will allow the projection of recommendations beyond areas in which specific field research can be undertaken. It will allow rapid training of local personnel in order that national government ministries of agriculture can assume their full responsibility in financing and utilizing this tool for production throughout each country in Latin America. It is expected that as a result of this effort supported by private sector fertilizer companies, an improvement of approximately 100% can be secured in five years in the effectiveness of funds expended for fertilizer purchase and that total fertilizer consumption in Latin America will increase by 100%.

As local laboratories, technical personnel and farmers utilize this facility and as research results become operational, it is expected that the soil fertility program will become an integral part of the educational process of assisting farmers utilizing bank loans for fertilizer. It is concluded that loans for agricultural production should not only be a credit service to Latin American countries but should insist on farmers utilizing the best production technology locally available. The Soil Fertility Program will,

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in most countries within three years, be able to provide soil analysis and fertilizer recommendations of a quality as to ensure farm operators by over 75% that funds they spend for fertilizer materials will be based on the most guaranteeable basis of success.

In certain countries in Latin America, it is expected that sector loans will require additional concentration on soil fertility programs to an extent that the NCSU regional agents will not be able to provide. It is therefore expected that in those cases, A.I.D. Missions and local governments cooperating in this program may request by separately financed loan and grant projects, full-time U.S. personnel to work at the national level. NCSU has agreed that it will also assist in training U.S. personnel on methodology, equipment, educational procedures, demonstration techniques and such other methods as may be employed in this program for maximum benefit of local programs.

Alternative approaches to achieving project goals to those presented in this proposal would require separate technical assistance projects in each of the cooperating countries. This would necessitate an estimated minimum U.S. staff totaling over twenty-five technicians and would not allow the advantages of the development of uniform laboratory methods, benefits of scale in the development of laboratory equipment, exchange of research results on soil experimentation between countries and regional training opportunities afforded by this proposed program. It is believed that this program, handled in a uniform manner throughout the hemisphere will allow greater international cooperation among recipient nations, promote the exchange of experience, observations and new approaches between technical personnel of the several ministries of agriculture and create a hemispheric spirit of collaboration between personnel and ministries of agriculture. Separately supported soil fertility programs in each of the Latin American countries would also probably limit the ability of national planning agencies in utilizing this program as a key tool for meeting rural production goals.

At the local level the cooperating country National Soil Fertility Coordinating Committee will assist in designing the soil fertility program with the cooperation of the regional advisor of NCSU, and the local soil fertility team of the public and the private sectors. Approval of the action program finally proposed for each country will be secured from the Ministry of Agriculture. It is expected that as the National Soil Fertility Coordinating Committee focuses its efforts on the attainment of national production goals, it will effectively quantify and through educational, service, demonstration and publication activities to stimulate food and export crop production. Factor of pertinent limitations to fertilizer use, including weather, undesirable legislation, costs of marketing, improvement of formulas, utilization of low input analysis fertilizer materials being produced by IFA and other institutions, as well as any other factors affecting concrete utilization of fertilizers by producers will be covered

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out annually. As legislative, credit, and other restrictions are identified, these will be suggested to the Ministries of Agriculture and Food and Ag Officers in A.I.D. in each country for solution. Assistance will be provided where required in the drafting of technical aspects of legislation and such other actions as may be required to eliminate pertinent restrictions to fertilizer use.

As previously noted, this technical assistance program will serve as the hub for a utilization of national university, Ministry of Agriculture, A.I.D. and other local research programs for improvement of plant nutrition in Latin America. Annual meetings of all research personnel will be promoted within each country to the extent feasible. Results from A.I.D. research programs supported by the technical assistance bureau will be adapted into laboratory, extension and demonstration aspects of this program. Conversely, as new nutritional problems are identified in the cooperating countries by this operations level program, suggestions will be made to local and international research projects and their personnel to undertake the solution of these priority problems.

In addition to the fertilizer use goal targets mentioned above, it is expected that at the end of this program there will be a minimum of thirty-five soil fertility analytical laboratories operating in Latin America which are capable of analyzing soil and plant tissue for all major and minor essential elements and make effective recommendations of fertilizer requirements for all major soil types on corn, rice, beans, sorghum, wheat and a minimum of three export crops in each cooperating country. Local laboratory personnel will be trained in the use of all equipment and the most modern analytical interpretation and recommendation procedures available. Soil fertility agents will also assist in the training of members of cooperatives and conduct short courses for extension agents, agricultural bank representatives, private sector fertilizer sales agents, production associations and others in all phases of soil fertility and how it fits into the technological input package for given cropping situations.

This program is an extension of and supports A.I.D.'s general policy determination number 41 of November 27, 1968, on Fertilizer, which establishes this Agency's support to the manufacture, research and utilization of fertilizer elements in order to provide adequate diets to the peoples of the developing world.

4. Targets and Course of Action.

A. Targets. The conditions and needs differ from one country to another and even within a country the needs will vary from one year to another. The generalised targets for all of the cooperating countries are presented below; however, more specific targets will be prepared for each country.

4.	Number of soil samples to be tested per \$1,000 invested in fertilizers and lime				
	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1975</u>
	0.5	1.0	1.5	2.0	

CONTINUATION

a. (contd.)                      Number of dollars invested in fertilizers and lime per soil sample analyzed

	<u>1970</u>	<u>1971</u>	<u>1973</u>	<u>1975</u>
	\$2,000	\$1,000	\$750	\$500

b. Fertilizer use -            Increase from 1970 through 1975 - total 5-year period 100 per cent

    Lime use                -            Increase from 1970 through 1975 - total 5-year period 100 per cent

c. Obtaining representative soil samples.

                                    Sample impact drives and impact programs

	<u>1970</u>	<u>1971</u>	<u>1973</u>	<u>1975</u>
Each country	1	1	2	2

d. Laboratories. All cooperating countries to have at least one laboratory equipped and staffed with adequately trained personnel to analyze and report results on.

100 per day	1970
150 per day	1971
200 per day	1973
300 per day	1975

This will reduce the cost per determination by more than 100 per cent over costs involved in analyzing less than 50 samples per day.

e. New procedures and techniques. All cooperating labs to test for:

- By 1970                      Phosphorus, exchangeable potassium, pH, conductivity for saline conditions
- By 1971                      Exchangeable acidity (neutral salt), exchangeable calcium and magnesium (largely atomic absorption), sodium for saline or alkali conditions (flame photometer)
- By 1973                      Non-exchangeable potassium in addition to exchangeable K; special soil conditions such as copper toxicity

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e. By 1975 Micronutrients, zinc, manganese, copper, iron

f. Correlation studies within each cooperating country.

<u>Potted plant studies</u>	<u>1970</u>	<u>1971</u>	<u>1975</u>
Major cultivated soil types P & K	10 soils	20 soils	complete all major cultivated soils
(acid soils)lime requirement + Ca & Mg	10 soils	20 soils	complete all major cultivated soils
Micronutrients Zn, Fe, Cu, Mn	0	10 soils	30 soils

<u>Field trials</u>	<u>1970</u>	<u>1971</u>	<u>1975</u>
N-P-K - 1 crop (per year)	5	10	20
Liming (where needed)	2	5	10
Micronutrients (where needed)	0	3	5

g. To develop a computer system for data processing of correlation data from both potted plant and field trials and to develop a computer bank of retrieval information from correlation experiments conducted around the world. This information will be available to research workers in various countries of the world.

h. Preparation of guide sheets for making fertilizer and lime recommendations, based on soil analysis.

All cooperating labs

New by 1970

Revise and upgrade

Each year after 1970

i. Demonstrations on fertilizer and lime use.

Each cooperating country - at least

(Total in)	<u>1970</u>	<u>1971</u>	<u>1973</u>	<u>1975</u>
N-P-K	10	20	50	100
Lime (acid soils)	5	10	20	25
Micronutrients (where needed)	0	5	10	10

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## j. Preparation of visual and audio aids.

(total by)	<u>1970</u>	<u>1971</u>	<u>1973</u>	<u>1975</u>
Regional slide sets	1	2	3	4
Radio tapes per country	5	10	10	15

Soil sample library. Collect and catalog representative soil samples from field and potted plant studies in the cooperating countries with the corresponding response data that was obtained on these soils. The library of soil samples can then be used to develop and test new analytical procedures.

## k. Training courses and seminars.

	<u>1970</u>	<u>1971</u>	<u>1973</u>	<u>1975</u>
Local	2	4	4	6
Regional	1	2	2	3
Raleigh	0	1	1	1

## l. Colonization areas within cooperating countries.

-- Presample representative areas and determine fertilizer and lime needs

-- Conduct demonstrations on fertilizer and lime use as needed

## m. Publications

1970	1 bulletin-- <u>Apparatus and Techniques for Laboratory Analyses</u>
1971	2 bulletins-- <u>Nitrogen Requirements for Corn, Wheat and Rice</u>
	1 special bulletin--cooperative between countries, <u>Liming Acid Soils</u>
	1 bulletin-- <u>Conducting Potted Plant Studies</u>
	1 bulletin-- <u>Correlation Data from Field Trials Around the World (summarized by computer)</u>
	1 bulletin-- <u>Economic Use of Fertilizers</u>

(Contd.)

m. Publications (Contd.)

1972 and thereafter

1 new bulletin or revision of bulletin 1--Correlation Studies

Country, special and technical bulletins as data and information become available

n. Preparation of soil test summaries.

Continue to assemble soil test information gathered by the cooperating laboratories. Summarize and prepare maps as desirable.

o. Soil analysis for fertilizer and lime credit(loans).

	<u>1970</u>	<u>1971</u>	<u>1975</u>
Fertilizer; % of agricultural credit loans covered by soil fertility analysis	25	40	60
Lime; % of agricultural credit loans covered by soil fertility analysis	25	50	75

B. Course of Action.

The USAID assistance to the Soil Fertility Program will be provided through a contractual arrangement with the North Carolina State University. Under this agreement, within the Latin America Bureau technical support and guidance of the Agency will be provided by the Agro-Industrial Development Division of the Office of Development Resources of the L.A. Bureau. (Continued)

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The North Carolina State University Soils Department will provide under the contract for a small nucleus administrative-operational staff at Raleigh, North Carolina to direct operations, provide technical liaison with the research program of NCSU, Cornell University, TVA and others and such field and laboratory technical and other support as is required under the program.

By the end of FY 1972 field support for the program will be provided to cooperating countries by six regional field areas. When the project is fully staffed these regions will be established as follows:

<u>Region</u>	<u>Countries</u>
1	Guatemala, El Salvador, Honduras
2	Panama, Costa Rica, Nicaragua
3	Ecuador, Colombia, Guyana
4	Bolivia, Paraguay, Uruguay
5	Brazil
6	Dominican Republic, Argentina, Chile, Peru (by consultation from Raleigh, as required)

Regional agents, except for region six will be stationed in the first country listed. In region six where no formal program is contemplated, technical support will be provided from the Central Office staff located at Raleigh though other regional officers may be detailed to solve specific problems as required.

In each cooperating country assistance will be provided through the local A.I.D. Mission under the specific direction of the Food and Agriculture Officer. Locally the program will function under the Ministry of Agriculture unless locally inappropriate. Each National Soil Fertility Program will function through a nationally established coordinating committee which will include as appropriate one member each of the National Planning Office, the Ministry of Agriculture, the College of Agriculture, the extension service, the private fertilizer sales agencies, credit institutions and the land reform institute. Other representatives can be proposed to the committee as appropriate. The NCSU Regional Soils Advisor will serve as Advisor to the National Committee.

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The National Committee will, using national production goals established by the government, establish a coordinated public and private sector action program. Central to the entire effort will be the soil analytical laboratories supported by extension, production and fertilizer sales agents working in cooperation with local research personnel of the government and local vocational and university soils departments. The essential technical elements to be included in the national program will include:

1. Soil sampling, including training in methods of collecting, tools for sample collection, packaging, shipping, etc.

2. Laboratory Maintenance and Improvement, including training of laboratory personnel, development of equipment, supervision of laboratory operations, establishment of analytical methods, preparation and verification of control samples, analysis of soil and foliar samples for major and minor elements, ph. organic matter and neutral salt exchangeable acidity. Nitrogen requirement will be established on the basis of crop needs.

Each cooperating laboratory will be supplied by the project with special NCSU newly designed equipment (designed by AID/csd-287) including (1) 3 unit dispenser, (2) diluter and sampler, (3) new type multiple analysis trays, (4) sample changer for photometer, (5) stirrer, (6) soil crusher, (7) ph machine.

The local government will supply all commercially available laboratory equipment including atomic absorption units, photometer, ph meters, etc.

3. Interpretation of Laboratory Analysis through the establishment of appropriate correlation between field data and laboratory results, development of farmer report forms, and other sources.

4. Recommendation of applications, including rates, types of fertilizer materials to be applied, method of application, timing of application, etc., establishment of recommendations will depend upon research results previously developed under csd-287 and research conclusions developed under similar conditions locally or in other countries. Where required, verification of results will be undertaken under this program by local Ministry of Agriculture personnel and included as a part of the national program.

5. Educational follow-up will be provided to local leaders on methods of conducting training meetings for farmers on the use of information gained from the Soil Fertility Program, including working with fertilizer companies. As required, assistance will be given to agricultural leaders and commercial distributors on the logistics of fertilizer distribution based upon soil test summaries.

6. Demonstration programs will be organized with local agency, private sector and farmer support. Location of demonstrations will depend

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upon production targets for the area and the extent of local and national support. Suitable publicity activities via radio, television, signs and other methods will be incorporated into this phase of the program as desirable.

The national program proposal will include local costs for personnel, transportation, chemicals and equipment for laboratory, field and other needs as well as training facilities, office and laboratory space, secretarial assistance, etc. to be supplied by the local government as well as the pertinent A.I.D. contributions. Approval of the proposal will be secured from appropriate local authorities and the A.I.D. Mission at least three months before initiation of the program in January of the succeeding year. Cooperative educational and field demonstration requirements may be supplied by farmers, schools, cooperatives, private fertilizer companies, etc. These local costs and non-governmental contributions to the program will be included as a local contribution in the approved action program prepared by the Soil Fertility Coordinating Committee.

The USAID Regional Soil Fertility Contract will provide all costs and support of the contractors personnel, international and local transportation, secretarial and administrative support to the program and unusual secretarial support required for special national and regional meetings and similar activities. Office space and normal secretarial support for field regional advisors will be supplied by the local government of the country in which the advisor is permanently located.

The North Carolina State University will prepare an annual technical report and a semi-annual administrative report to A.I.D. The annual technical report will summarize the total activities conducted by NCSU as well as local governments in support of each national program and a general summary of the total program activities. Emphasis will be placed upon quantifying effective results, numbers of people trained, analysis per \$1,000.00 of fertilizer purchased in the country, etc. A separate section of each report will describe pertinent technical problems encountered and means taken to secure research cooperation by other A.I.D. contractors or local research agencies.

The work plan for each cooperative program for the next calendar<sup>year</sup> will be submitted to AID/W annually with a general summary of the proposed total program by November 1 of each preceding year to implementation accompanied by an appropriate budget and adequate justification as required by all other A.I.D. contracts.

At least once every two years the National Soil Fertility Coordinating Committee will undertake a complete review of the program and conduct a detailed evaluation of progress, problems, effectiveness of individual activities, etc. A formal report of this study recommending action required to solve obstacles to progress, quantifiable results and national monetary contributions will be published. (Continued)

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Attachments

Tech. Bul. No. 2

Evaluation of Soil Fertility in Latin America:  
Soil Testing-Plant Analyses - 1965.Tech. Bul. No. 6  
(draft copy)Evaluation of Soil Fertility in Latin America -  
1965-1969.

Questionnaires

Examples of Questionnaires by countries with reports  
on the present status of soil fertility programs  
and future activities:

- a. Paraguay
- b. Ecuador
- c. Nicaragua or Guatemala

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