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PROPOSAL FOR CONTINUING SUPPORT UNDER
THE AGENCY FOR INTERNATIONAL DEVELOPMENT
INSTITUTIONAL GRANTS PROGRAM

Applicant	:	The University of Hawaii Honolulu, Hawaii 9310129
Date	:	May 1976
Grant Title	:	Microbiology and Mineralogy of Tropical Soils
Amount and Term of Original Grant Plus Amendments	:	$581,415 for 6 years ending November 1, 1976 (AID/csd 2833)
Amount and Term of Proposal	:	$500,000 extended for two years
AID Sponsoring Technical Office	:	Technical Assistance Bureau Office of Agriculture

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I. DESCRIPTION OF THE PROBLEM

A 1971 survey[1] of 44 developing countries showed that the richest one-fifth of the people received 56 percent of the national income while the poorest three-fifths received only 26 percent. The plight of the developing country poor appears even worse when measured against the situation in the world's wealthy nations. This wide disparity in the distribution of wealth, rendered highly visible through mass media, threatens peaceful efforts to improve the quality of life of the disadvantaged.

The quality of life of the rural people of developing countries is inextricably bound to the quality and productivity of the land. Most of the developing countries occur in the tropics, where 1.6 billion hectares or about half of the world's potentially arable land exists. But by 1985, the distribution of arable land is projected to be 0.90 hectares per person for North America, 0.34 for Latin America and Africa and 0.17 for Asia.[2] The problem is to provide more food and a better life for more people on an unchanging land area with exhausted soils.

Food production technology is highly developed in the wealthy nations of the temperate region but this technology is not necessarily suited to the climate, soil and economics of tropical countries. The high input, high technology farming methods employed on large farms in developed nations rarely meet the needs of the LDC farmer who cultivates less than one or two hectares of land.

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[1]Adelman, I. and C. T. Morris. 1971 An Anatomy of Income Distribution in Developing Countries. Development Digest.

[2]Carter, H. O., J. G. Youde, and M. L. Peterson. Future land requirements to produce food for an expanding world population. Perspective on Prime Lands. Background paper for Seminar on Retention of Prime Lands, U.S. Dept. of Agriculture.

Increasing production to meet the increasing demand of an increasing population is not enough. To break the hold of poverty the farmers of the developing countries must produce more food more efficiently to increase real per capita income. Existing technology packages enable most small farmers to double yields, but the high cost of inputs needed to increase yields has discouraged widespread farmer acceptance of these packages. The rising cost of nitrogen and phosphorus fertilizers is a major contributing cause for the high cost of agricultural inputs.

The developing country farmer must be presented with practical ways to work around the problem of rising fertilizer costs. One way is to encourage farmers to employ farming methods which result in proliferation of soil microorganisms which can convert nitrogen from air into a form which can be utilized by plants. Another way is to foster practices which result in more efficient use of phosphorus fertilizers. Unfortunately studies on the causes of the ineffectiveness of phosphorus fertilizers and factors which restrict microbial conversion of atmospheric nitrogen to fertilizer nitrogen have been neglected because of low fertilizer prices. The days of low fertilizer prices are over and the forecast for the future is not bright.

Phosphorus deficiency is more serious in the tropics than elsewhere because red tropical soils contain minerals which "fix" and render unavailable to plants phosphorus fertilizer added to a soil. Moreover, the efficiency of microbial conversion of atmospheric nitrogen into forms useful to plants is markedly reduced in phosphorus deficient soils.

The grant title "Microbiology and Mineralogy of Tropical Soils" focuses on soil microbes and soil minerals which respectively control the delicate nitrogen and phosphorus balance in the food chain of the world's developing countries.

In LDCs, problem identification and analyses represent only one dimension of the multi-faceted development effort. Problem identification and analysis must be linked to an efficient information system to disseminate critical information quickly to LDCs. LDCs, in turn, must develop their training capacity so that continued dependence on outside assistance will come to a timely end.

In close consultation with AID and sister Consortium universities, the University of Hawaii has agreed to conduct state-of-the-art work on two key LDC food production constraints, namely, phosphorus unavailability in tropical soils and biological nitrogen fixation to increase protein production. These efforts will be closely linked to an information dissemination system for technology transfer and a training package for testing and use in LDCs.

II. DESCRIPTION OF GRANTEE

A. Commitment

By virtue of geography, climate and soil, the University of Hawaii's College of Tropical Agriculture is not only committed to long-term involvement in management of tropical soils, but to numerous aspects of food production and the maintenance of a healthy environment for human habitation in the tropics. Hawaii's multi-ethnic people and their recent arrival to America generate strong sympathy for the plight of peoples in developing countries.

While Hawaii is generally remembered for its successes with sugar and pineapple production, within the state, the College of Tropical Agriculture is noted for its work with small farmers. Most of the fresh agricultural commodities consumed in the state are grown on small farms on land unsuited for the heavily mechanized sugar and pineapple industries. The survival of Hawaii's small farmer depends on the research and extension efforts of the College. New

crops and proven management practices developed in Hawaii has wide application in the tropics and the College and University continue to provide information and services to tropical countries.

As the only state in the Union located in the tropics, Hawaii's research, training and extension activities have greater and more immediate relevance to the needs of developing countries, which are largely confined to the tropics and subtropics, than the parallel activities of sister Land Grant institutions on the continental United States. Thus, Hawaii's research, training and extension efforts dove-tail readily with priorities of LDCs and donor agencies committed to assisting developing countries. With the exception of the University of Puerto Rico, no other U.S. institution can better contribute to or gain from the success of an institutional development grant in tropical soils than the University of Hawaii. Hawaii's long history on phosphorus research and its strong interest in pasture management make it an ideal institution for SOTA efforts on these subjects for utilization in LDCs.

The University's commitment to work on LDC problems can be measured by its involvement with the following international projects or activities. They are:

1. ICRISAT seminar on "Uses of Soil Survey and Classification in Planning and Implementing Agricultural Development in the Tropics held in Hyderabad, India, January 1976.
2. AID/Hawaii contract on "Crop Production and Land Capabilities in a Network of Tropical Soil Families."
3. AID/Hawaii contract on "Maximizing Symbiotic Fixation of Nitrogen by Grain and Forage Legumes in the Tropics."
4. Preparation of textbook on soils of the tropics.
5. ARS-USDA/Hawaii contract on "Research and Information Retrieval Systems for Tropical Research and Training Centers in the United

States."

6. ARS-USDA/Hawaii contract on "Research Program in Tropical Root Crop Utilizing a Food Delivery Systems Approach."
7. UNDP-FAO/Hawaii Training Grant with Government of Western Samoa.
8. AID/Hawaii contract on "Systems Approach to Irrigation and Rice Production Planning in the Bicol River Basin (Philippines)."

To encourage and facilitate faculty participation in international programs and to coordinate the expanding activities from grants and contracts, the College of Tropical Agriculture has prepared a proposal to create an organizational unit named "The Hawaii Institute of Tropical Agriculture" (HITA). The proposal is currently being reviewed by the faculty, the university administration and the state government. HITA is Hawaii's most recent evidence of full commitment to the support of the 211(d) grant and its extension.

B. Accomplishment

The awarding of contracts and grants to the University by AID and other donor agencies not only reflects the institution's commitment to assisting LDCs, but also reflects a high level of achievement under the 211(d) grant, and a sense of donor assurance that Hawaii will continue to maintain a high level of performance in the future.

An important accomplishment under the grant was to turn the attention of 14 competent, motivated scientists from a local and regional focus to one of global perspective and awareness. What was lacking prior to the Grant was an awareness of LDC problems and conditions. LDCs are not technologically, socially, economically or politically static. By definition a developing country should be a changing one. Through the 211(d) grant the faculty acquired some measure of the moods, needs, and aspirations of LDC small farmers, technicians, and

decision makers, as well as an understanding of the U.S. role in each region. In the extended grant 10 additional faculty members will participate so that a total of 24 will work toward attainment of grant objectives.

In addition to an expanded awareness of developing country needs and priorities, the grant was used to expand hardware capacity to break new ground in tropical soil science and agriculture. Using seed money from the grant, the University tested and purchased a x-ray quantometer - an instrument capable of simultaneously analyzing a dozen nutrient elements in plant or soil samples, in a matter of minutes and with great accuracy.

The professional competence and hardware capacity developed under the previous grant are not only ready for utilization under the extended grant, but are already being used under contracts with AID and other donors.

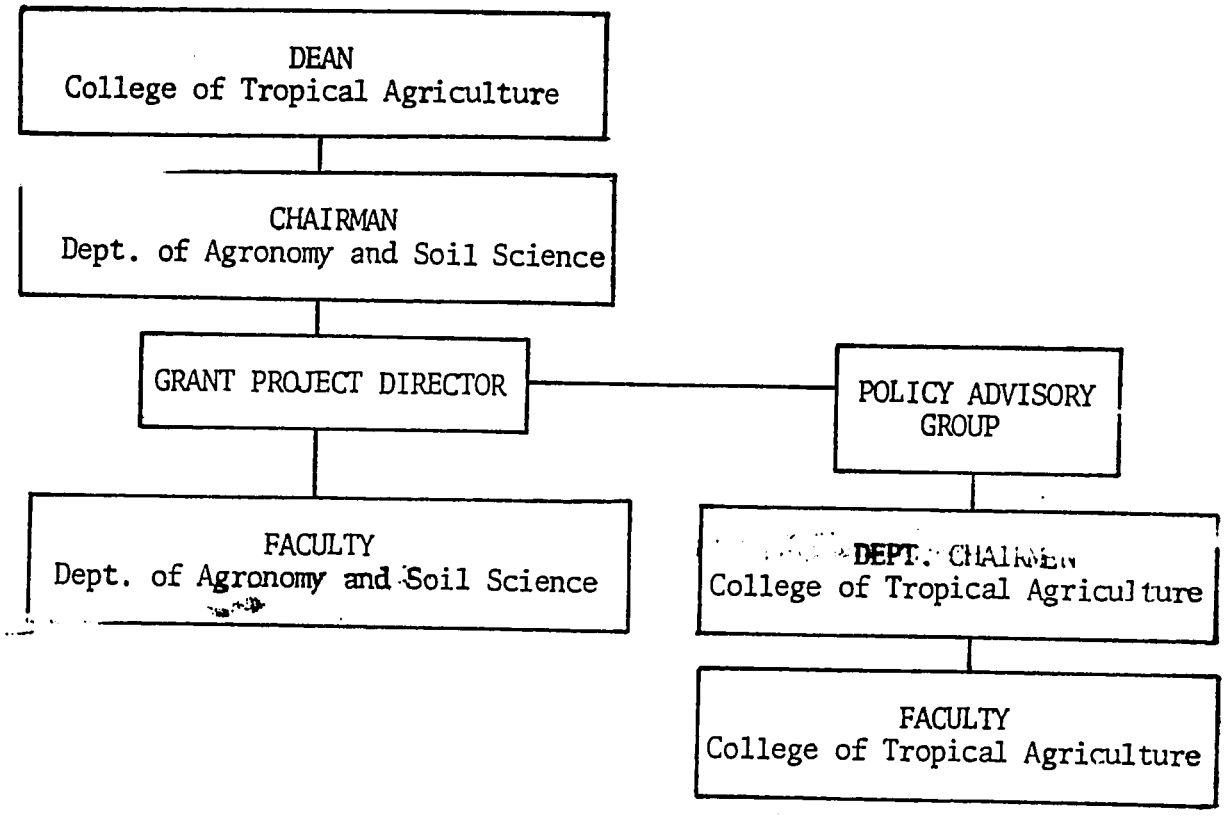
C. Administration of the Grant

The Grant Project Director (GPD) will administer the University of Hawaii 211(d) program and is responsible for insuring that the grant objectives are met. He will administer the grant funds through the University accounting office.

A Policy Advisory Group (PAG) will be created to assist the Grant Project Director achieve better coordination of 211(d) activities with existing grants and contracts and to generate greater interdepartmental involvement and awareness in attaining grant purpose and objectives. The Policy Advisory Group will be chaired by the Director of International Program and the Grant Project Director will serve as Executive Secretary. Other members of the group will include the chairman of the Department of Agronomy and Soil Science and all principal investigators of grants and contracts dealing with food production and processing in developing countries.

Figure 1

211(d) Grant Administrative Chart



A critical assumption in grant administration centers around the creation of the Hawaii Institute of Tropical Agriculture (see Commitment). If the establishment of HITA is approved by the university administration, grant administration is expected to be linked to HITA instead of Policy Advisory Group. Under HITA, the College of Tropical Agriculture will be able to mobilize multidisciplinary groups, including special competences developed under the 211(d) grant to solve larger problems in developing countries.

III. PURPOSE, OBJECTIVES, AND ACTIVITIES

A. Purpose

The general purpose of the University of Hawaii 211(d) grant revision and extension is to capitalize on the response capability developed under the previous grant and to sustain this capability at the University to assist developing countries overcome food production constraints related to soil mineralogy and to develop new competence in the field of microbiology and biological nitrogen fixation.

The grant purpose focuses on selected soil-related problem areas relevant to LDC conditions. These areas have been selected to coincide with the broader sector goals of AID. In addition to enabling the University to focus on soil management technology, the grant is designed to utilize four accessory outputs for the specific purposes of (1) expediting information transfer to LDCs; (2) updating and strengthening LDC training capacity; (3) facilitating use of the University's advisory capacity and (4) developing new linkages with organizations committed to assisting LDCs.

B. Major Objectives/Outputs

The expected outputs generated by the grant are grouped under the following categories:

I. Expanded knowledge base

a. Primary institutional responsibility

1) state-of-the-art work on phosphorus unavailability in tropical soils with North Carolina State.

2) state-of-the-art work on biological nitrogen fixation in tropical forage and pasture legumes, with Cornell, North Carolina State and Puerto Rico cooperating

b. Secondary responsiblity

1) state-of-the-art work on modifying Soil Taxonomy for the tropics with University of Puerto Rico

2) state-of-the-art work on evaluation of soil resource inventories in LDCs with Cornell University

3) state-of-the-art work on delivery systems of technology for small farmers with Prairie View A & M University

4) state-of-the-art work on rhizobium strain selection, inoculant production, delivery and use with Cornell and North Carolina State University

5) state-of-the-art work on characterization of soil and crop nitrogen with Cornell University

6) state-of-the-art work on exploiting biological nitrogen fixation in grain legumes with the University of Puerto Rico

II. Information capacity

a. Linking of University of Hawaii bibliographic information retrieval system to CID information system and strengthening of the Hawaii system to include a tropical soil data base

b. Expansion and utilization of an existing soil data bank to include soil survey data of LDC experiment stations and international

centers for management, interpretation, and transfer to LDCs with Cornell and Puerto Rico cooperating.

III. Education and training

Modifying and testing audio-tutorial teaching techniques for tropical soil science for use in LDC institutions.

IV. Advisory capacity

a. Release time for faculty to respond to LDC requests for technical assistance

b. Consulting time for emergency situations where expertise is needed on short notice

c. Faculty-AID contact to advise Grantee institution of AID goals and priorities, and to update AID as to Grantee capabilities

V. Linkages and network

a. Provide opprotunities for visiting scientist to identify new priorities and to generate new and strengthen established linkages to facilitate technical assistance

b. Cooperate with University of Arizona on state-of-the-art effort on soil erosion

c. Enable consortium scientists to share key developments in state-of-the-art studies, identify knowledge gaps and avoid duplication of effort.

Expanded Knowledge Base

Two of the most limiting nutrient elements on land tilled by the small farmer are nitrogen and phosphorus.

A major state-of-the-art (SOTA) undertaking by Hawaii will be "Phosphorus Unavailability in Soils of the Tropics." Phosphorus is a major limiting nutrient

in tropical soils. This element is not only seriously deficient in most small farmer fields, but stands as a constraint in the development of a large portion of the potentially arable lands of the tropics. It is a developmental constraint because so much of it is needed to bring oxidic tropical soils into full production.

The SOTA on phosphorus unavailability will summarize current knowledge, the efforts required to overcome the problem, and whether the efforts are socially desirable, politically acceptable and/or economically feasible. These and other SOTA reports prepared by Hawaii and sister consortium universities will enable international donor agencies to make critical decisions on ways to utilize scarce resources to overcome development constraints. A global inventory of the phosphorus problem will be worked out jointly with the University of Puerto Rico through its SOTA on Soil Classification. North Carolina State will be consulted on the effect of soil acidity and liming on phosphorus unavailability, and Prairie View A & M University will utilize Hawaii's SOTA to test its delivery system designed for the small farmer. The final SOTA report should have important implications to small farmer welfare and the future development of potentially arable lands in the tropics.

Hawaii will undertake a second major SOTA effort relating to microbiology and biological nitrogen fixation. Unlike the SOTA on phosphorus unavailability which is designed to utilize competence developed in the previous grant, the SOTA on microbiology and biological nitrogen fixation is designed to develop new competence in a neglected field. Until the impact of a diminishing petroleum source was painfully demonstrated to the world during the recent energy crisis, there was general belief that chemically fixed nitrogen would supply nitrogen needs for the world's major crops. The world now knows better and is seeking an alternative source of nitrogen. The answer points to biological

nitrogen fixation by soil microbes, an inexpensive and potentially limitless source of nitrogen.

In cooperation with Cornell University, North Carolina State University and the University of Puerto Rico, Hawaii will prepare a SOTA on biological nitrogen fixation in forage and pasture legumes to ascertain the extent to which inexpensive nitrogen sources can be increased. The importance of nitrogen for protein production, the high cost of fertilizer nitrogen, and the severity of protein deficiency make this SOTA effort particularly relevant to small farmer needs.

Information Capacity

An expanded knowledge base serves no useful purpose unless it reaches and is utilized where it is needed. By the same token no knowledge base can be expanded if existing knowledge cannot be retrieved and analyzed.

The University two years ago undertook to examine the question of information transfer for research and training through a cooperative agreement with the Agricultural Research Service of the U.S. Department of Agriculture to test how existing knowledge can be uncovered through modern means and transmitted for utilization in research and training. The agreement is based on Section 406 of the Food-for-Peace Act (PL-808) of 1966.

This information system is now operational, and under the extended grant will provide the bibliographic information retrieval service for use in SOTA studies and will serve as Hawaii's nerve center for information dissemination.

Hawaii will also make a major effort to expand an existing SOIL DATA BANK to include soil data from U.S. experimental sites in LDCs, LDC experiment stations, and international centers. The SOIL DATA BANK is being developed as part of a cooperative agreement between the Soil Conservation Service of USDA and the University of Hawaii.

The main grant related function of the bank will be to store, retrieve, and interpret soil data for agricultural use in LDCs. The University of Puerto Rico will contribute data to the SOIL DATA BANK.

The SOIL DATA BANK will be added to the data bases of the Hawaii Information System and the Hawaii Information System will in turn be linked to the Consortium for International Development (CID) Information Network. Through this linkage the Consortium on Soils of the Tropics (COST) and CID will have access to soil and water data bases. This experiment in information systems linkage is expected to markedly improve the response capability of the two Consortia.

Education and Training Capacity

It is true that COST has a better global picture of LDC soil problems and conditions than the LDCs themselves. This global perspective is useful for technology transfer among LDCs and is largely an outgrowth of 211(d) activities by COST in LDCs.

Over the last five years Hawaii has organized and preserved this experience in an audio-tutorial unit prepared for students enrolled in an introductory course in tropical soil science.

Hawaii will modify and translate the audio-tutorial unit for testing in LDCs. The tapes will be translated for use in the Philippines and Indonesia. Teachers of soil science from these countries will be asked to comment on the suitability of the unit for local use and make suggestions for improvement.

Soil topics which will be tested as, a) soil acidity and liming, b) soil moisture, c) soil erosion, d) soil fertility, e) phosphorus unavailability, and f) biological nitrogen fixation. Every effort will be made to select LDC institutions working closely with the University of Hawaii on AID/U.H. contracts.

Through the AID/U.H. research contract on the "Benchmark Soil Project" the University has developed close linkages with a number of small LDC educational institutions. Through AID/Washington and the U.S. Mission, Hawaii will enter into collaborative educational efforts with these LDC institutions.

Advisory Capacity

To have the required flexibility to respond quickly and adequately to requests for technical assistance, the University will make available faculty members from a variety of appropriate disciplines related to soil management and land use in the tropics.

Two full-time faculty positions will be filled to make possible release of tenured staff to respond to LDC needs. Approximately 20 tenured faculty members will be working toward grant objectives. It is estimated that each faculty member will spend an average of 10 percent time on grant activities or an equivalent to 4 man-years over a two-year period.

To maximize subject field utilization in LDCs the University will spend at least 2 man months per year with AID/Washington to be advised on AID priorities and to update Bureaus on the University's capability and commitment to work on LDC problems.

Linkages and Network

The grant activities are structured so that strong linkages with a network of domestic, multilateral, and LDC organizations will develop naturally. The SOTA efforts, for example, are not merely Hawaii efforts but international efforts to analyze LDC bottlenecks and constraints. Organizations and scientists from developed and developing regions will contribute to SOTA studies.

The Information System will be linked to CID's Information Network, and the SOIL DATA BANK will link COST and CID to LDC experiment stations and

international centers.

The output on Education and Training is structured to form close working linkages with selected LDC institutions.

Finally, one subcategory under the output on Advisory Capacity ensures close linkages between Hawaii and the various Bureaus in Washington to insure effective utilization of Hawaii's response capability.

C. Critical Assumptions

A principal critical assumption is that AID will work closely with the University in carrying out the mutually agreed upon grant objectives. This cooperation will include, but not be limited to, supplementary funding from AID/W for AID/W and USAID approved projects that utilize University competence, but do not fall within the funding and planning of the 211(d) grant. The assumption is made that AID will respond in a timely manner in the funding of approved activities.

It is also assumed that AID will assist the University to make appropriate contacts in LDCs, international centers, and elsewhere in efforts involving advisory services, research projects, training programs, seminars and other activities.

Other critical assumptions include:

1) AID will assist the University in the funding and distribution of agreed upon publications resulting from grant activities. Thus limited funds are provided for publications in the grant extension.
2) The other universiites involved in COST and CID will cooperate in providing personnel and other assistance in the attainment of grant objectives.
3) The University cooperating with COST, CID, and other organizations, will plan state-of-the-art analyses on soil phosphorus and biological

nitrogen fixation, and that based on the first approximation to SOTAs, additional funding will be forthcoming on state-of-the-art analyses not specified in the grant and which are mutually recognized by AID and the cooperating universities as being of high priority.

4) Projects terminated in LDCs as a result of political or governmental action will not be considered as a university failure if the agreed upon project objectives were being met prior to such action.

5) Appropriate officials of the Regional Bureaus and local missions will cooperate and actively assist in the attainment of grant objectives requiring activities in LDCs.

6) AID will work jointly with the University in developing funding for continuation of the activities currently supported by the 211(d) program after the grant has terminated in 1978, assuming both parties agree that such continuation is appropriate. Such a joint effort will be initiated early enough in the 2-year extension period to provide a smooth and planned transition from the extended grant to the new funding mode.

IV. UTILIZATION

A list of expected grant products, their probable impact in LDCs, and the follow-up required of AID and the grantee to ensure product utilization is provided in Table I.

In addition to the products, the grant generates an institutional response capability which enables the University to meet requests for technical assistance. A list of selected faculty members along with their specializations and advisory capacity is given in Table II. This response capability can be

tapped in accordance with University rules and regulation and within University manpower constraints. AID instruments under which an assignment might be requested and the lead time needed for University approval are summarized in Table III.

The grant purpose is achieved when finished products and a response capability are generated. Their utilization is aimed for attainment of higher sector goals of AID and the international community.

V. EVALUATION AND REPORTING

At the end of the first year of this grant the sponsoring technical office will conduct an on-site review of progress with particular emphasis on actual and potential utilization. Information will be developed on how the grant has been used to sustain and focus a viable institutional response capability for use by LDCs, other donors and AID. Representation from other AID offices will be included, particularly those interested in using the grantee's services, plus outside consultants, if necessary. The worksheets and workplans developed in preparing this grant plus the annual report and other pertinent documents will be used as guidelines in evaluating progress.

A principal issue at this review will be the additional work and funding required, if any, to complete the state-of-the-art work on designated subjects/problems in accordance with both the progress to date and current AID priorities.

The review will also determine what progress has been made by the grantee toward making its institutional response capabilities in the area of international development self-sustaining at such time as the grant expires.

The University will submit an annual report to the Grant Project Office upon completion of the first year's work - or other mutually agreed period -

comprising a concise statement of accomplishments in terms of output indicators, together with recommendations and conclusions based on experience and results in accordance with published reporting guidelines. Plans for the remaining grant period and beyond will also be discussed.

Within three months after the expiration of the grant, a final report will be prepared and submitted to the Grant Project Office. It will include a summary statement of major accomplishments under the grant in terms of each of the targeted outputs.

VI. SPECIAL TERMS AND CONDITIONS

Role of Women

The University will arrange, whenever feasible, for participation of women in operating capacities in grant activities, e.g., in the technical staffs to be utilized in the institution's several areas of response capability. These actions would serve to demonstrate the role of women to the LDCs.

Environmental Impact

The state-of-the-art studies to be carried out under the proposed grant revision/extension, will not in themselves have an impact on the environment, but such studies may disclose potentially adverse consequences of given lines of field activity that can then be guarded against. The foreseeable consequences ought to have positive environmental impacts, which would be gained through better appreciation of the value of soils, their high production potential when properly managed and knowledge of the ease with which this potential can be irreversibly lost through mismanagement. Preservation of a balanced and productive ecological system will become a way of life when proper soil management and resource preservation become synonymous with a higher standard of living and a better way of life. The general effect of the grant

should be to enhance AID's capacity to help LDCs make sound environmental decisions regarding land and water resource planning and agricultural expansion.

Alternative Funding and University Contributions

The University continues to seek supplementary funding complementary to and in support of Grant related goals. Hawaii is currently engaged in activities related to increasing world food production as stipulated in Section 406 of the Food-for-Peace Act of 1966.

The Hawaii strategy for integrating, organizing and utilizing its response capability should prepare this institution for new sources of funding. An amendment to the International Development and Food Assistance Act of 1975 (TITLE XII) presents such a possibility, and the Hawaii experience with the 211(d) grant gives it an opportunity to develop a model for Land Grant Institution involvement with international development and food production in LDCs.

In support of the grant, the University will provide the following:

1) Faculty competence
2) Space, equipment, and services for students and faculty working to attain grant objectives
3) Library and computer science facilities
4) Administrative and technical supervision by department heads, directors and deans

In addition, the University will waive indirect cost charges which are normally set at 46 percent of salaries and wages. This contribution amounts to approximately $150,000 during the term of the grant extension. The total University contribution towards the grant is estimated to be $430,000.

OUTPUT BUDGET SUMMARY

	Total	U.H.* Contributions	AID Contributions
Output No. 1 Expanded Knowledge			
1. Phosphorus unavailability/ Mineralogy	190,800	76,200	114,600
2. Biological nitrogen fixation/ Microbiology	210,060	68,000	142,060
Output No. II Information Capacity			
1. Storage, retrieval, analysis, dissemination and linkage	47,200	17,500	29,700
2. Soil data bank	69,080	27,000	42,080
Output No. III Education and Training Capacity	45,445	10,685	34,760
Output No. IV Advisory Capacity	102,650	17,500	85,150
Output No. V Linkages and Networks	115,250	63,600	51,650
Total	780,485	280,485	500,000

*Approximately 40% state funded

INPUT BUDGET SUMMARY

	1st yr.	2nd yr.	Total
Salaries	114,000	200,950	314,950
Consultants	8,950	9,000	17,950
Travel	45,000	46,000	91,000
Per diem	14,000	14,700	28,700
Library	1,500	800	2,300
Computer	3,250	3,000	6,250
Supplies and Equipment	20,000	12,450	32,450
Publication	500	3,500	4,000
Others	1,200	1,200	2,400
Total	208,400	291,600	500,000

Table 1. Grant Product Utilization

OUTPUT/PRODUCTS	IMPACT		FOLLOW-UP							
				BY DONORS			IN LDCs			
	UTILIZATION	NON-UTILIZATION	ACTIVITY	Who	Scope	Source of Funding	Who	When	Where	Scope
1. SOTA document on phosphorus unavailability in tropical soils. An analysis of existing experience and knowledge on management of fertilizer phosphorus in soils of tropical developing countries.	1. a. Increased economy of food production. b. Better quality foods for small farmer family.	1. a. Non-utilization of extensive areas of potentially productive lands. b. Inefficient use of manpower and agricultural inputs.	1. Publication and distribution of SOTA document.	Univ. of Hawaii	3,000 copies	TAB/AG	USAID/LDC	1-2 yrs after end of grant	LDCs in tropics	500 agr. extension service offices, research stations, universities in LDCs.
2. SOTA document on biological nitrogen fixation in forage and pasture legumes in the tropics.	2. a. High protein diet for small farmer family. b. Reduced cost of nitrogen fertilizer. c. Increased animal production for food and foreign exchange.	2. a. Increased dependence on natural gas for manufacture of nitrogen fertilizer. b. Poor health and irreversible damage to young from protein deficiency.	2. Publication and distribution of SOTA document.	Univ. of Hawaii	3,000 copies	TAB/AG	USAID/LDC	1-2 yrs after end of grant	LDCs in tropics	500 agr. extension service offices, research stations, universities in LDCs.

Table 1. Grant Product Utilization (cont'd)

	IMPACT		FOLLOW-UP							
				BY DONORS			IN LDCs			
OUTPUT/PRODUCTS	UTILIZATION	NON-UTILIZATION	ACTIVITY	Who	Scope	Source of Funding	Who	When	Where	Scope
3. Information Capacity An information storage, retrieval and dissemination system with a SOIL DATA BANK as a data base for agrotechnology transfer to and among LDCs.	3. a. Elimination of duplication of research effort among LDCs. b. Immediate application of new breakthroughs in agricultural technology.	3. a. Widening gap in food production between rich and poor countries. b. Improper use of technology and high cost of measures to correct error.	Maintenance and updating of information system, provide post-grant current awareness service, and feed SOIL DATA BANK with new advances in agricultural technology.	Univ. of Hawaii, COST CID	as necessary	AID, other donor agencies	University of Hawaii/ AID, USAID/LDC other donors	End of grant	Tropical developing countries	Univ. of Hawaii/ AID contract involvement in LDCs.
4. Education and Training Capacity An audio-tutorial teaching package in soil science designed for undergraduate students in institutions of higher learning in LDCs.	4. a. Improve quality of agricultural education in LDC. b. Create human resource base for self-reliance in technical assistance and national development.	4. a. Continued dependence on donor countries for technical assistance. b. Lack of properly trained personnel to fill decision making position.	Mass produce audio-tutorial package and train LDC teachers to maintain and upgrade package.	Univ. of Hawaii	10 units* 15 units	USAID	USAID/LDC Univ. of Hawaii/ AID	End of grant	Philippines, Indonesia	50-75 students, 1 teacher 75-100 students, 1 teacher

*Audio-tutorial package consisting of 10-12 slide sets (visual) and recorded tapes per unit

Table 1. Grant Product Utilization (Cont'd)

OUTPUT/PRODUCTS	IMPACT			FOLLOW-UP						
				BY DONORS			IN LDCs			
	UTILIZATION	NON-UTILIZATION	ACTIVITY	Who	Scope	Source of Funding	Who	When	Where	Scope
5. Advisory Capacity A means to enable faculty of grantee institution to work on food production problems relevant to LDC conditions.	5. a. Competence of faculty mobilized to solve priority LDC problems. b. Faculty, informed on LDC problems and conditions, ready and willing to serve in best interest of donor agency and LDCs.	5. a. AID capacity to provide technical assistance weakened b. Inexperienced personnel selected to provide technical assistance.	5. AID/Univ. of Hawaii contracts, GTS, retainership, personal services contract, consultant time, basic ordering agreement, and agreement with other donor agencies.	Univ. of Hawaii, COST	Variable	Contracting agent	Univ. of Hawaii/ donor agency/ LDC	Immediately	Recipient country	Tropics
6. Linkages and Networks A means to facilitate and coordinate institutional activities with total international effort	6. a. Reduces duplication of effort. b. Pinpoints centers of excellence in selected fields. c. Identifies sources of information and generates basis for cooperative effort. d. Identifies weaknesses in sector planning.	6. a. Increases cost and reduces effectiveness of donor efforts b. Sustains provincialism in national planning c. Delays development process	6. Create international network on agricultural science	All countries committed to technical assistance	40-50 centers of excellence throughout world	FAO, AID, others	LDCs, Int'l. donor agencies	1-2 yrs after grant	World-wide	World wide

University of Hawaii Faculty Competence for Utilization in Technical Assistance

	NAME	SPECIALTY	ADVISORY CAPACITY
1.	L. R. Ahuja	Physics, Water Management	1, 2, 3, 5
2.	D. P. Bartholomew	Crop Physiology, Climatology	1, 2, 3
3.	E. W. Dangler	Soil Chemistry, Soil Erosion	1, 2, 3
✓ 4.	R. de la Pena	Soil Fertility, Soil Management	1, 2, 4
5.	P. C. Ekern	Soil Physics, Climatology	1, 2, 3, 5
✓ 6.	S. El-Swaify	Soil Chemistry, Soil Erosion	1, 2, 3, 5
✓ 7.	R. L. Fox	Soil Fertility, Soil Chemistry	1, 2, 3, 5
✓ 8.	R. E. Green	Soil Physics, Pesticide, Soil Management	1, 2, 3, 5
✓ 9.	H. Ikawa	Soil Classification, Mineralogy	1, 2, 3, 5
✓ 10.	R. C. Jones	Soil Mineralogy	1, 2, 3
✓ 11.	Y. Kanehiro	Soil Chemistry, Soil Fertility	1, 2, 3, 5
✓ 12.	B. L. Koch	Soil Microbiology, Biochemistry	1, 2, 3
13.	W. W. McCall	Soil Fertility, Soil Management	1, 2, 3, 5
14.	E. Okazaki	Soil Chemistry, Tissue Testing	1, 2, 4
✓ 15.	P. P. Rotar	Information System, Breeding	1, 2, 3, 5
✓ 16.	W. G. Sanford	Mineral Nutrition, Crop Physiology	1, 2, 3, 5
✓ 17.	J. A. Silva	Statistics, Soil Fertility	1, 2, 3, 5
✓ 18.	L. D. Swindale	Soil Classification, Mineralogy	1, 2, 3, 5
✓ 19.	Y. Tamimi	Soil Fertility, Soil Management	1, 2, 3, 5
✓ 20.	G. Y. Tsuji	Soil Physics, Water Management	1, 2, 3
✓ 21.	J. R. Thompson	Crop Management, Breeding	1, 2, 4, 5
✓ 22.	G. Uehara	Soil Physics	1, 2
✓ 23.	R. T. Watanabe	Soil Testing, Soil Management	1, 2, 4
✓ 24.	A. S. Whitney	Nitrogen Fixation, Soil Management	1, 2, 4, 5

1. Problem identification and analysis
2. Project design and evaluation
3. Education and training
4. Extension
5. Resource inventory and planning

Table III. Mechanisms for Utilizing University Response Capability

Mechanism for Tapping Resource	Type and Length of Assignment	Minimum Lead-Time
1. Retainership*	TDY, up to one month	2 weeks
2. General Technical Service Contract (GTS)	TDY, 1-12 months	1-6 months
3. Personal Service Contract	TDY, 1-2 months TDY, 6-12 months	1-2 months 6-9 months
4. AID-hired Consultant	TDY, 1-2 months	1-2 months
5. Research Contract	Long term, 3-5 years	1 year
6. Mini-Research Contract	Short term, 18 months	3-4 months
7. Basic Ordering Agreement for Task Orders	Variable	2 weeks

*For example, release time of experts under this grant, or additional services provided for/or under other contracts