

AID TEAM REPORT

**Comprehensive Review of
Institutional Development Grant**

211(d)

to

University of Hawaii

on

Tropical Soils

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AID TEAM REPORT

**SUBJECT: Comprehensive On-Site Review of 211(d)
Grant to the University of Hawaii on
Tropical Soils**

I. BACKGROUND

On January 8, 9 and 10, 1975, and AID intra-agency review team met with officials of the University of Hawaii to carry out a comprehensive review as required in Chapter 2 of the AID Grant Handbook. The team members consisted of: Herbert W. Dodge, Deputy Director, EA/TD, Leon F. Hesser, Acting Director, TA/AGR, Raymond E. Kitchell, TA/PM and team chairman, Princeton N. Lyman, Director, AFR/DS, and Frank Viets, Consultant and Soils Expert. Tejpal S. Gill, Grant Project Officer, TA/AGR, served as Executive Secretary to the team and Donald L. Plucknett, Chief of the Soils and Water Division, TA/AGR, participated as an observer. Key participants of the University of Hawaii included: Dr. Goro Uehara, Professor of Soils Physics and Mineralogy and Grant Program Director; Wallace G. Sanford, Chairman of the Department of Agronomy and Soils Science; Lester D. Swindale, Associate Director of the U. H. Experiment Station; C. P. Wilson, Dean, College of Tropical Agriculture; Kenneth Otagaki, Director, International Program and several associated faculty members.

The group was officially welcomed by Dean Wilson who traced the early development interest of the college beginning in Thailand, and the Dean's own previous personal involvement with the Kansas State contract in India. In the ensuing years, leadership at the University of Hawaii has changed and faculty support of involvement in the international dimension is now excellent. The watershed for the University, in terms of providing financial support to international activities, was a conference of experts held in May 1970 to advise the university on faculty, programs, facilities, potentials and so forth. At this point it was recommended that the University concentrate on an international tropical program. Hawaii's efforts received a favorable reception from AID, Ford and other

organizations and resulted in Hawaii's interest in and becoming a part of the tropical soils consortium.

The Dean expressed some reservations about the traditional institution-to-institution contracts and praised the 211(d) arrangement as allowing the university to build up relevant competence. While the faculty is still relatively small, the University has expertise which perhaps is not available elsewhere and probably has more man-years of tropical soils experience than any one else in the United States. He characterized the purpose of the 211(d) as being to develop competency in a selected field with the commitment and ability to respond to LDC requests. Calling this the "gut of the issue," Wilson stated that Hawaii was never quite clear as to just what AID wanted, who sends the signals and how to deliver under what terms. Does AID want us to concentrate on education and training, providing consultants, etc., and does AID have any program for delivery? Commenting on a recent meeting with Administrator Parker, the Dean said the Administrator's talk left many participants still hanging in the air as to just what AID plans to do in the future.

Dr. Hesser made a number of remarks, some of which responded to the questions raised by Dean Wilson, gave three specific observations involving the universities; (1) there is a growing recognition of the food problem and its complicated and comprehensive nature; (2) there is also a growing recognition of the importance of research in developing new technology. In his Rome speech, Secretary of State Kissinger stated that research had to triple from \$33 million currently to \$100 million by 1980 if which 25% would be channeled to agricultural international research centers and 75% to field and central research. To do this, the land grant agricultural colleges must be intimately involved. At the same time, the prospects of getting more staff to carry out these top-level mandates are poor and the present instruments available to the Agency have serious limitations. Some mention was made of the thinking going behind the proposed Title XII to the Foreign Assistance Act designed to get United States universities more effectively involved in planning research programs. He also discussed the problems as the Agency had with the 211(d) as a priority investment, given the tight funding situation.

Dr. Plucknett described what AID was trying to do with 211(d) grantee institutions in the tropical soil and water area now that the management of these grants has come under his division. He emphasized that the program was being opened up to encompass also dryland agriculture, including range management and briefly discussed the current portfolio of research projects and the changes being implemented with the water institutions and the Consortium for International Development (formerly CUSUSWASH).

The Chairman described the events which lead up to the recent issuance of Policy Determination 62 on the Institutional Grant Program and tried to set the review in prospective, including the purpose and expected results.

Dr. Swindale commented on Section 406 of the Food for Peace Act of 1966 in which funds are being budgeted by the Agricultural Research Service for tropical research and training centers. Two cooperative agreements have been executed with the University of Hawaii to develop a training methodology and bibliography services in tropical organisms and a Hawaiian Institute for Tropical Agriculture is on the drawing board. It includes a \$20 million package for an institute both in Hawaii and Puerto Rico plus a \$6 million grant program for other interested U.S. institutions. It is looked upon as a means to unlock land grant facilities funded under the Hatch Act and by state governments to work outside the United States. The College is also on the verge of completing an FAO/UNDP contract for consulting services to Western Samoa. It will include technical support services on selected commodities and advisory services on crop improvement and livestock.

The morning session ended with a presentation by the recently appointed Grant Project Director, Dr. Goro Uehara, who stated that he saw the 211(d) as part of a total program package for the University of Hawaii. The signals from AID over the last year have been clear and he is attempting to redirect Hawaiian activities to AID priorities and desired outputs.

II. DISCUSSION OF ISSUES

In accordance with the review guidelines, issues⁵ were developed by TA/AGR and written replies were prepared by the University of Hawaii which were amplified during the review itself in response to the interaction with the team members. The following summary of the issue discussion

is provided to give a flavor to such interactions and the major points discussed. (See Appendices A and B and UH replies).

Issue No. 1 - Inability to measure impact of grant on the institutional and knowledge base and the achievement of grant objectives

Given the vague nature of the original grant and the reporting to date, plus the fact that UH had considerable competence prior to the grant in the subject technical field, TA/AGR stated it was unable to measure or evaluate the competence of UH or the effect of the grant on the knowledge base.

Dr. Gill introduced this issue. He pointed out that given Hawaii's specialization and competence in tropical soils before the grant, it was difficult to measure how the grant had increased the knowledge and capacity of the institution.

Dr. Sanford replied that one of the contributions of the grant was to increase the University of Hawaii's confidence about its international capability. He recounted the events leading up to UH's proposal and some problems which developed between the master statement on the collaborating soils institutions and the individual grant statements. Receiving the grant, later the research contract and getting requests for services and for representation at IITA all increased Hawaii's sense that it had something to contribute, and enhanced its prestige so that it was in a position, i.e., called upon, to contribute.

Professor Uehara later emphasized the importance of travel funds in enabling UH faculty to test their experiences in Hawaii with those elsewhere and to verify the transferability of their experience and techniques. He concluded that the gaps in LDC approach (e.g., the outdated research in Brazil, the research emphasis on soil fertility when soils-water relationships were more important in Kenya) in many cases could be traced back to inadequate teaching and state-of-the-art work in this field.

Dr. Sanford asked how could you measure such factors as awareness and sophistication? Dr. Lyman replied that examples could be used. For example, Professor Uehara's intention to write a new textbook reflected an increased knowledge of the gaps in teaching on tropical soils. Here and elsewhere during the review, team members suggested

that relevant work, insights, research implications, etc., had not been reported by UH under the grant or had been reported in a fashion that gave no indication of their relationship to grant objectives.

Mr. Kitchell explained how 211(d) grants are now being evaluated: The purpose is stated "to build an institutional response capability of University X in subject Y as related to LDC problems." The actions which are hypothesized to produce or strengthen this capability usually involve increases in: education and training capacity, extending the knowledge base and research capability, advisory capacity, information systems, and linkages. Each of these can be measured. But the sum of achievements in these areas do not measure success in achieving the purpose itself. The purpose is achieved when, presumably as a result of these actions, the institution is utilized by AID, LDCs and the international community for its expertise.

For new grant, Mr. Kitchell pointed out, a statement of the state-of-the-art in the subject matter will be produced as a first priority, providing a baseline with which to measure increases in the knowledge base. For each of the other areas, it is important to measure both clearly and realistically. For example, in measuring Hawaii's increase in advisory capacity, should be made clear that if UH cannot take on long-term projects as in Tanzania, it can take on an increasing role in project design or other type of services.

There was then a review of the individual items under the operational plan of the original grant proposal. The senior staff member (Dr. Sanford) had been provided; one additional soils mineralogist had been added with 211(d) funds and another from other funds; 1½ FTE of additional soil technician time was funded; four visiting professorships had been funded under 211(d) prior to July -- two were now on-campus from non-211(d) funds; graduate students had been supported (see discussion below).

Mr. Kitchell pointed out that in the most recent annual report, a long list had been provided of persons who had received salary support under the grant. To measure how those these persons contributed to grant objectives, and to indicate a strategy for these expenditures, A.I.D. needed in addition (1) their field of specialty, (2) their response skills (keeping in mind Professor Uehara's presentation

earlier in the day on increased response capability), and (3) the relationship of salary support to objectives (e.g., support for one year in order to...). UH agreed to provide information on this. (Appendix B-3)

There was some discussion here of response capacity. Professor Uehara said that to pin down for AID the relevant response capacity that had been created, UH needed from AID an estimate of the skills, the field of specialty, and the time required for response over the next two years. Mr. Kitchell responded that it was difficult to predict with such accuracy, but AID could probably predict general skills needed and that provisions for certain total amounts of release time could be built into an extension/utilization grant. This point was deferred for later discussion under Issue No. 6.

Dr. Gill asked whether the 211(d) support for students and fellowships had been additive to what UH had previously been providing or was it substituted? Also, what was the contribution of the student support to the grant objectives? Professor Sanford responded that the number of students had been declining from a peak of 65 in 1967/68, and that the 211(d) funds had enabled UH to remain at a level of 45 or 50 rather than decline further. He felt the contribution of the 211(d) funds had been to the quality of work by graduate students, not quantity (the East-West Center had the major impact on quantity). Dr. Gill asked specifically for data on the LDC students -- the trend, number supported by 211(d) funds, etc. -- and UH agreed to provide this (See Appendix C).

In regard to grant objectives, graduate student support is related to increase in the knowledge base (through research), not to increases in education and training capacity. Dr. Gill asked that this be clarified in further reporting, including the contribution of the specific research they were working on to grant objectives.

Regarding increases in education and training capacity, UH cited improvement in the quality of courses being taught, which was hard to measure. Increase in enrollment was a reflection of that improvement, but that was not a valid measure as a general principle since other factors affected enrollment. Another measure was that 211(d) travel funds had enabled faculty members, such as Professor Jones, who were not specialists in tropical soils, to study Hawaii's experiment stations and to acquire the knowledge that enabled them to teach in this field.

In the morning session, Dr. Uehara gave a slide presentation on the "Impact of the 211(d) Grant on the Department of Agronomy and Soil Science" which is attached as Appendix B-2. In it, he notes that because the most productive lands in Hawaii are in sugar and pineapple and that since research thereon has been almost the exclusive preserve of the industry, UH has concentrated on the small farmer working on marginal a-land and growing diversified crops. As such, its "greater strength lies with helping the small farmers who work the poorest land." Perhaps the most critical impact is that "there is now a concensus among staff members that Hawaii's soil experience is largely applicable in the tropics, that soil survey interpretation for land use planning and soil physics research are deficient, and that state-of-the-art documentation of tropical soil science is urgently needed."

In summary, the specific items of the operational plan have been met. What was not clear from previous reports was how specific expenditures -- salaries, graduate student fellowships, etc. -- contributed to specific grant objectives such as increase i knowledge base, etc. The discussion illuminated several examples, though not evidence, of a planned strategy.

Issue No. 2 - Lack of progress in concentrating on problems relating to the biology of tropicals soils

Dr. Plucknett introduced the issue by stating that while satisfactory achievement in soil mineralogy is apparent, similar progress in soil biology had not been met. In its written reply to the issue, Hawaii stated,

"The term soil biology is as imprecise as soil mineralogy is precise. Hawaii has interpreted soil biology to mean nutrient-supply for crop production. Nutrient-supply is still too imprecise, and Hawaii has opted to concentrate on the two most limiting nutrients in tropical soils -- phosphorus and nitrogen. Two key staff members, Fox and Kanehire, are responsible for these subject matter areas. Fox's work on the relationship between soils solution phosphorus and biological response is the most reliable and widely used procedure for assassing phosphorus requirements of highly weathered tropicals soils. Kanehiro's work on the mineralization rate of organic nitrogen in soils dominated by amorphorus minerals is

is better known in the tropics than the U.S., even though Kanehiro and his students have published most of their findings in U.S. journals. Hawaii's program in soils microbiology is new and must await fuller development before its impact in the tropics will be felt. Evidence of this expertise can be found in the 1973-74 report."

In the discussion, Sanford and Uehara agreed that UH expertise in soil biology is at much lower level when compared with its competence in soil mineralogy but indicated that it is a relatively new field to UH which needs further development. While much interested in the subject area, they would like to see the field narrowed with a specific emphasis on soil microbiology. One of the 211(d) financed staff members, Bert Cook is a microbiologist but was side-tracked on other activity but can begin again, particularly since the Agency has expressed a keen interest in biological nitrogen fixation.

Dr. Plucknett summarized the knowledge base on biological nitrogen fixation, which is almost nil regarding the tropics. Acknowledging that UH's base in the field is very small, he projected that at least 8 to 10 U.S. agricultural microbiologists from several U.S. universities, are required. AID's interest in biological nitrogen fixation came to the fore because of the nitrogen cost which has recently quadrupled in many LDCs. New direction of technology would help to harvest atmospheric nitrogen, working with nature and at a low cost per unit. This effort would obviously require developing a board-based technology in the field. He indicated his intentions to provide this as a new focus to any extensions given to present grantees dealing with soils and crops. Dr. Viets pointed out that, at the present, consortium members were doing little if anything in this area. Dr. Hesser asked Hawaii if they would be interested in concentrating and expanding in this area and the answer was affirmative.

Dr. Lyman inquired whether UH would need a 211(d) grant for this purpose since they have been recently awarded a research contract with AID on biological nitrogen fixation. Dr. Gill pointed out that the grant would give them the flexibility they need to pursue important leads to various objectives which a contract cannot provide. Contracts are necessarily narrow in scope and while contract activity may provide leads, it does not permit resources to be used to explore their potentiality.

UH expressed a desire to develop some in-depth capabilities, particularly concerning tropical rhizobia, specific plans and non-symbiotic relationships.

Issue No. 3 - Apparent over-emphasis on use of grant funds for research and teaching, including staff and student support

In its written reply, the University of Hawaii stated the following:

"Hawaii has expended grant funds to release key staff members, from non-grant activity to work on grant related activities. For example, Sakai and Okazaki were hired with grant funds to allow Jones, our soil mineralogist to work on samples collected in Puerto Rico, Latin America and elsewhere. Tsuji was hired to work on soils physics so that Uehara could spend more time on soil mineralogy. In compliance with federal and state policy on equal opportunity employment, three women were hired under the grant. They are Mrs. Chang, Chu and Mapes. All three are capable scientists and we hope they will continue to serve UH in international programs. Mrs. Chu has been hired under the AID/Hawaii contract on Benchmark Soils. The original plan of the UH budget for the grant called for a total expenditure of \$372,095 over the five-year period for salaries and wages. This represented 74.4% of the budget. Actual expenditures on these items are expected to be \$378,715 or 75.7%. If you add supplies and equipment (\$38,526), this brings the grant total that we expected to expend on "research and teaching" to a total of 91.4% of the budget. However, it must be made clear that these funds should be considered off-set time to allow our permanent staff to develop response capabilities for AID."

The opening discussion was on how the direct support for faculty and students would build competency and, in these terms, what would be there when the grant ended? It was suggested that, for example, the proposed textbook on soils and certain technical bulletins would have been good items for grant support.

Dr. Uehara responded that Hawaii probably had the best knowledge base on tropical soils anywhere, but that what was lacking was confidence by University of Hawaii staff as to the applicability of that knowledge elsewhere in the tropics. He stressed that research on the grant was focused on testing that knowledge base on tropical soils elsewhere. The first focus on the research was Puerto Rico, like Hawaii, a member of the tropical soils consortium. A number of staff members undertook cooperative, comparative studies of Hawaiian and Puerto Rican soils in regard to soil taxonomy, soil mineralogy, soil chemistry, soil fertility, and soil physics. Similar soils were identified, analyzed and compared. A series of joint Hawaii/Puerto Rico publications have resulted, including an entire issue of "Geoderma" which is devoted to the results of these joint studies. Also Dr. Robert Fox, Dr. R. Jones, and other staff members have compared soils of Colombia, Brazil, Central America, Nigeria and other countries in testing the knowledge base.

Essentially, the results are these: oxisols, utisols, and other highly weathered tropical soils are quite different from temperate zone soils. They differ significantly in that temperate zone soils have a constant surface electrical charge (permanent charge) while most tropical soils have a constant surface potential (pH - dependent charge). Thus for tropical soils, as the pH changes, the electrical charge also varies and the soil particles can be positive, negative, or even neutral in charge, depending upon acidity or alkalinity of the soil. This difference means that tropical soils will behave very differently as regards fertilizer use, liming, soil water holding characteristics, etc. Dr. Uehara stressed that the Puerto Rican studies confirmed the consistency and reliability of University of Hawaii's previous experience and knowledge.

Mr. Kitchell asked whether a research strategy had been followed. At first, UH just assumed that doing research on Hawaiian soils was going to help and then tried to see if its knowledge base applied elsewhere -

first in Puerto Rico. An unstated strategy, implicitly understood by the staff, was to ascertain the applicability of the Hawaiian experience to the tropics as a whole. Dr. Sanford explained further that he had handled most of the decisions regarding the grant, and in fact, no real research strategy had developed. A grant committee operated in the beginning, but did not really function there-after. The former grant director stated that his main purpose was to use the funds to get additional staff involved. While he agreed, in retrospect, that more effective approaches could have been developed, nevertheless, by accident or otherwise, a good program did develop. (See Appendix D on research breakthroughs)

The role of graduate students in research was questioned. Dr. Uehara answered that graduate students are the basic research arm of professors. Most of the graduate students in the department come from LDCs. Mr. Kitchell questioned use of grant funds to support macadamia and papaya nutritional research, crops which are not of much use to LDCs. Dr. Sanford replied that the plants were only "mechanisms" to answer questions regarding boron/manganese relationships in tropical soils and plants, a point not explained in the annual report. The question of applicability of University of Hawaii research to LDC small farm problems was also raised. Dr. Uehara replied that because the sugarcane and pineapple industries of Hawaii had taken the best land and, additionally, had their own private research institutions, the University was mandated to work with diversified agriculture (small farmers) on marginal or submarginal lands. Therefore, the department has always worked with problem soils of the tropics, and had gained tremendous experience in managing such difficult soils and lands. The concept of agro-technology transfer for the tropics has also emerged as a major effort stimulated by the grant.

Dr. Viets asked when state-of-the-art studies should or could start. Dr. Uehara answered that Hawaii should not do state-of-the-art studies alone, that wider involvement is needed, and that such cooperation should be a major consortium activity. He suggested that there should be a "Handbook 60" for tropical soils (referring to the popular book on managing saline soils prepared by the USDA-ARS Salinity Laboratory in California; Handbook 60 is used world wide as the bible for saline or alkaline soils) with emphasis on publishing what was already known.

Dr. Gill raised the question of research priorities and how one can decide what to work on. He added that AID wants universities to travel to LDCs to see problems in the field. It was generally agreed by the Review Team members that purposeful travel is the desire of TA/AGR, Regional Bureaus and the missions. Mr. Kitchell stressed that linkages must be planned for, and that AID will assist and plan for critical linkages, including funding if necessary.

Dr. Richard Green asked that AID needs and strategies be communicated to working members of the Department, not just to the administrators. The staff did not get a full feeling of what was needed. He asked AID to help universities focus on team research in key problem areas of the tropics, an approach that would greatly increase faculty interest and participation.

Issue No. 4 - Impact of accelerated or premature expenditure of grant funds on institutional response capabilities

In explaining this issue, TA/AGR stated that during the 45 months of the 60 months grant life, UH has used about \$480,000 - approximately 90% of the \$500,000 grant award. The issue suggests presumed deleterious effects on grant capacity and competence due to premature expenditures of the schedule for funds.

In its written reply, Hawaii stated:

"A valid criticism. Grant momentum, has not been lost. Fox is now on leave in IITA and the Department has gained three scientists who are in Hawaii on leave. All three scientists are here as a result on Hawaii's increased competence in mineralogy and biology. One scientist is from France, another from Senegal, and a third from Michigan. A fourth scientist died last summer in drowning accident. There is every indication that Hawaii's involvement with 211(d) has given it increased stature and that 211(d) programs continues to flourish even without funds."

It was obvious that grant expenditures had not been planned or controlled effectively and that consortium and related activity is being constrained. The impact is lessen and even if the grant were not expended, all staff would be taken care of by the university

with the possible exception of one. The situation was aggravated by the absence of the former Grant Project Director on sabbatical leave, but the new Grant Project Director assured the team that (a) money would be available from the university to fill the gap until a decision is made on the request for a grant extension and (b) that future expenditures of grant funds would be carefully planned and controlled.

The conversation then shifted to the need for an AID strategy with Dr. Otagaki pleading for a continuing dialogue such as was taken place in this review. When the sessions reconvened the next morning, and before moving to issue No. 5, there was some discussion on what the research content and emphasis should be for Hawaii in the future. Dr. Uehara suggested that it should be mineralogy and microbiology and that selling the job had to be done on the theory that different functions are involved in tropical versus temperate soils (See Appendix D regarding the pH/Dependent charge of tropical soils). Microbiology is a limiting factor, he continued, with soil physics being the principal link with CUSUSWASH. It is necessary to get the physicists, chemists, and microbiologists together within a state-of-the-art focus and analysis on such subjects as soil fertility and its relationship to temperature, the humid tropics where the major constraints is fertilizer, and arid soil where water is the major constraint.

Issue No. 5 - The value of the "consortium" and/or systems approach to tropical soil knowledge base and the optimum role of UH

In the explanation of this issue, TA/AGR wrote that "noting that the geographical location and interest of member institutions of the consortium and the Agency desire that the consortium play an important role in building a viable worldwide network on tropical soils, and recognize systems and interdisciplinary approaches to solving LDC problems, it seems there is a little uneasiness about the subject matter within AID and the consortium members."

In its written reply, Hawaii stated:

"Hawaii fully concurs with AID's desire to create a viable worldwide network on tropical soils. The uneasiness about the network stems from uncertainties

concerning network center location, its form, size and function. In view of these uncertainties, several consortium members have submitted proposals outlining their preception of the center and the network. Predictably, each institution recommends that the center be located on its premises. This situation should have never been allowed to happen for the competing institutions have become ~~adversaries~~. The handling of the network question has done irreparable harm to the consortium. AID and the consortium ~~should have anticipated this situation~~. It is not too late to enter into new discussions to rectify this situation."

In the beginning, the association was informal with not much attention given to areas of specialization. The worldwide networking concept introduced a new element which confused the consortium approach. At a meeting in Cali, Columbia, Dr. Omer Kelley, former Director of TA/AGR, called for the development of a worldwide network on tropical soils which was interpreted by some of the consortium institutions as calling for an international soils research center to be established at one of the participating U.S. universities. In addition, while each agreement had a speciality or emphasis, there were no joint objectives developed in the original grant statements.

Discussion at the Dean and Executive Committee level heretofore has concentrated mostly on location and structure of a "center" and only recently has AID succeeded in shifted attention to purpose. At a meeting last December of the Consortium in Ithaca, NCSU again proposed establishing an international tropical soils center but with the purpose of providing a response capability for identifying and evaluating soil problems relating to food production in the tropics and to recommend remedial management practices. Willingness to work together was expressed, including an agreement on a potential division of labor and fields of concentration (See Appendix E). The "international" center concept was apparently discarded with the focus now being on establishing a U.S. resource center for tropical soils with emphasis on utilization of the competencies built up in the several 211(d) soils institutions. The minutes, however, do not reflect a great deal of discussion, understanding, or agreement on the on the concept and directed focus of the state-

of-the-art approach.

Dr. Uehara expressed his own opinion that the consortium to be effective, had to be problem or subject-oriented and not organized by disciplines. Dr. Plucknett suggested that any revised 211(d) extensions should direct work toward pre-identified problems. Dr. Viets expressed the opinion that the original division of labor was completely erroneous. It was only at the North Carolina State review that the concept of response capability began to be understood. He suggested perhaps the need for a geographic focus in addition to a subject or problem orientation and, at any rate, consortium institutions need to be given a specific job to do because, as to this date, there has been very little done in the area of analysis, data collection and synthesis.

Dr. Swindale said that both Hawaii and Puerto Rico originally opposed the consortium concept but he now agrees that it did get the five universities working together. Hawaii has made a major contribution to the consortium in terms of Plucknett, Uehara and other staff members and Cornell has also contributed, particularly in terms of faculty exchanges. In the last twelve months the problem has been confusion over organization and direction. AID should concentrate on what it needs and ask the consortium to do it. The idea has not yet reached sufficient maturity or consensus that the universities are ready to propose a collective coordinated and integrated extension as apparently is being done with the water grants. AID must decide what it wants to strengthen and what it wants to utilize. Swindale also said that the benchmark soils research project will stimulate a worldwide network more than anything else the agency or the institutions can do by themselves.

Issue No. 6 - Future direction and involvement

This issue was devised to give Hawaii the opportunity, given the competence developed to date, to state its rationale and need for grant extension.

(a) Present and future availability of response capability for utilization purposes

In terms of the needs of LDCs, the response capability of the universities will be small - Hawaii stated in its written reply to this sub-issue. The question which

needs to be answered is how to use this capability. A cadre of 50 scientists (10 per institution), already heavily committed to university programs, can bearly began to solve the serious soils-related problems facing LDCs. What the universities and consortium should do is not necessarily to respond directly to LDC problems, but to develop means to render technical assistance effective. The university and the consortium can do so by preparing state-of-the-art reports related to soil science in the tropics. No group is better suited to respond to this manner than the consortium universities on soils of the tropics.

Dr. Sanford mentioned that there are two points which require clarification -- first, the need for pinpointing areas of response capability and, second, provision of a mechanism to provide release time for their staff members. He asked whether 211(d) funds can provide that mechanism? Dr. Swindale pointed out that sometimes it is scary to visualize AID's demands on the institutions. He inquired whether AID funds could be made available to UH to hire people in areas important to them and, in turn, to provide AID the equivalent time of professional talent it needs.

Mr. Kitchell replied that he fully supports the "release time" concept. One way is to get the staff member(s) involved in problem-oriented, state-of-the-art activity. A pre-determined number of man-months can be funded for consultation services to AID and research, with the latter activity dependent upon the time not used for the former. Another way is to bring on a junior staff member under the grant, not only to build additional capability but to provide a substitute to the university when a senior member goes to the field on a short-term assignment. Regarding the suggestion of hiring a man unrelated to the subject field to provide release time for another person needed by AID, Kitchell cautioned that there may be a legal question here which needs to be explored but did not reject the concept out-of-hand.

Dr. Swindale expressed his concern about need or demand projections. How accurate can the Agency be in terms of stating to UH the man-years of services it desires? Mr. Lyman asked whether UH was, or should be, interested in TDY consulting services at all? He mentioned the availability of services from various consulting firms. He thought perhaps an individual from UH can be picked up by a consulting firm thus not requiring direct UH

involvement in TDY work. Dr. Otagaki responded that, while UH allows its faculty to do consulting jobs, it does not pay the faculty for the period. Dr. Swindale added that the State stops pension contribution and fringe benefits for the consulting period. They both favored a sustenance or retainer mechanism to provide services such as writing papers, arranging seminars, short-term consultation, etc.

(b) UH and AID's projection of potential demands for its services in LDCs

The University wrote here that sustained demand for its services will depend on new positions created to provide such services, thus assuring UH's capacity to respond expeditiously without crippling its own programs. AID and UH administrators should discuss mechanisms by which this sustained responsiveness can be developed.

There was a brief discussion on what is meant by utilization of institutional capabilities. Kitchell mentioned: state-of-the-art analyses; making the technology applicable in LDCs; ability to train LDC people without putting them through Ph.D. courses; making the information available to LDCs through systemizing, computerizing, etc.

Dr. Sanford responded that regarding training they can perhaps manage it with the audio-visual system already developed for use in Hawaii. They also have the ability to run the information down. Referring to information utilization and technology acceptance in LDCs, Dr. Uehara illustrated the problem by saying that it is easy to take the horse to water but it is sometimes hard to make him drink. He pointed out that there is a great deal of difference among people regarding receptivity to change. He raised the question regarding development of entrepreneurship among LDC people -- how should it be done since it is basically a cultural problem?

Dr. Lyman suggested that perhaps what is needed is some sort of a package in which the subject matter is translated into useable form, e.g., the application of fertilizer. The problem may not always be the cultural constraint. In most LDCs, resistance against risk-taking is inherent.

Dr. Swindale asked whether AID considers outreach as research or utilization. Dr. Lyman indicated that outreach is both of these, because new knowledge is continuously coming back to the institutions as it is going out to the LDCs. He defined utilization as when

transfer is taking place in collaboration with LDC institutions.

Mr. Kitchell raised a question for UH regarding their present workload. He stated that perhaps the mix of two research contracts and short-term consultation is all that the University can and wants to handle. Further, that without other outreach activities, perhaps a 211(d) grant won't be of much use.

Dr. Lyman stated that it is extremely important that the Agency be made aware of the implications of the utilization of research results. This should be considered as a most critical phase in AID vs. UH relationships and should be built into UH's research. He suggested that the Consortium on Tropical Soils can serve a very useful purpose if it paid attention to this point. Dr. Uehara responded that the Consortium can do that.

Dr. Swindale asked how can the LDCs be made aware of their deficiencies in a particular subject matter. Lyman responded that if the "pay-off" to LDCs is kept in mind, you can encourage their people to things. It would involve reviewing the kinds of systems they need to develop, paying special attention to the implications of the various systems. Kitchell added that making technology relevant, particularly to the small farmer, is very important. AID is very conscious of this -- now more than ever before. Institutions must appreciate the service angle as the basic rationale for AID grants. Utilization is a broad term but the test is an activity's contribution to solving LDC problems.

Dr. Plucknett asked UH to help point out the institutional constraints and opportunities. Kitchell asked AID team members as to what kind of service demand they envision. Swindale interjected that AID better hold it to about 2 man-years and added that a mix in maintaining capability and strengthening utilization would be most desirable in a grant extension/revision.

Dr. Gill stated that a consortium approach is needed to mount planning teams for land utilization. The current research projects will generate additional demand for training, consultation, etc. Demand can be created at anytime, the problem is not to generate more than we can handle. Lyman suggested the need for a broader type of response capability in Africa, one on conceptualization and design.

He stressed the need to continue work on key problems while making available a certain number of man-years of service.

Kitchell explained the importance of linkages with LDC institutions to facilitate utilization. Uehara mentioned that linkages with individuals in the various institutions is easy and will be created. Kitchell, Dodge and Lyman discussed levels and types of linkages required to serve country, region, and central bureau needs.

(c) Grant supported activities that are, or will be, assumed by UH or funded from other sources

Dr. Uehara responded that the activities which will be assumed by UH will include: (a) multi-element soil and biological material analysis program; (b) soil data storage and retrieval system; and (c) new courses and the training facilities. He added that if the grant is terminated what will suffer most will be the global perspective, international activities, and availability of faculty members for international programs. The international emphasis would necessarily, gradually atrophy.

(d) Perception of UH for end-of-grant status

In its written reply, Hawaii stated that "U.S. and other developed countries support of tropical agriculture is far from adequate to meet LDC needs. So long as there is a U.S. commitment to assist LDCs, some means to keep technology current is needed. There is no better way to do this than through 211(d) grants to U.S. universities similarly committed to improving quality of life in LDCs. The problem soils of the tropics remain one of the major constraints in the development of LDCs."

There was a considerable discussion between AID and UH members regarding what is meant by end-of-the-grant status. UH felt that some sort of a sustaining grant is essential to serve U.S. commitments to assist LDCs. It was further added that a research contract is no substitute to the flexibility and services a grant can provide to the Agency. The tropics is a changing state and UH will have to continue to visit them, something which can't be done on State funds. Only five out of 50 land-grant universities have this focus. Hawaii for

obvious reasons will continue to be involved with tropical soils but its response capability to AID and others will be considerably decreased and more dependent upon individuals and ad hoc work.

- (e) Salient points of the proposal for grant extension, e.g., purpose, need, activities contemplated, relation to other AID funded activities, relationship to the "consortium" structure, etc.

UH stated emphatically that the signal from AID is clear and that they concur that documentation of the state-of-the-art and tropical soil science is urgently needed. UH proposes to meet these needs in two ways: (1) create an international soils utilization data bank and (2) prepare state-of-the-art handbook on soils science tailored for the tropics.

The International Soil Utilization Data Bank will be use-oriented, open-ended and can be enlarged to accommodate new uses and updated as the need arises. It represents a permanent, reusable record of technical assistance. This information system will continue to function long after the consortium ceases to exist. The state-of-the-art handbook will indicate whether currently used soil parameters have the same meaning in the temperate region and the tropics. If parameters have different meanings they will be reinterpreted for use in the tropics. It is Hawaii's desire to utilize the entire consortium talent to meet the stated objectives.

There was some discussion about the decisions reached at the aforementioned Ithaca meeting. As a result, all institutions are in the process of reconsidering the type of proposal they wish to make to AID regarding extension. Finally, there was discussion on Hawaii's role in taking the leadership in developing and coordinating an institutional development approach to microbiology with emphasis on nitrogen fixation.

III. FINDINGS AND CONCLUSIONS

Performance to date and achievement of grant purpose

Notwithstanding: (1) a grant agreement which is typically vague in describing the type and magnitude of institutional competence to be developed and/or strengthened at the University of Hawaii' (2) poor reporting which has often failed to present or explain facts which are

important to AID; and (3) the difficulty of distinguishing between the achievements made under the 211(d) grant and those made under other sources of funds such as AID contracts, State and Hatch funds - it was the unqualified conclusion of the review team that the University of Hawaii has made very substantial progress in building institutional capability to work with LDCs on problems of management and food production on tropical soils. In fact, their progress has undoubtedly been the best of all the institutions with similar grants.

To a significant extent, this capability comes naturally because of their tropical site and accessibility to the kinds of climate, soils, and crops characteristic of much of the tropics. Because research on plantation crops such as pineapple and sugar cane has been done with private institutions in Hawaii, the University has had to cater to small farmers and work with problem soils i.e., with the kind of crops more characteristic of subsistence farming in the LDC tropics. In a legalistic approach to evaluating accomplishments in terms of the grant agreement, UH has carried out every stipulated commitment in their operational plan. Of more significance to the team, however, was their statement that they saw as the major purpose of the grant, the testing and internationalizing of their prior competence which, without a doubt, has been accomplished.

UH has an excellent and dedicated staff that has grown under the 211(d) grant. Research and teaching has gained a momentum that will hopefully continue into the indefinite future. However, disappointing progress was made in the area of soil biology, an area which Hawaii accepted. This lack of progress can be attributed to several factors: (1) soil biology is a very broad field being neglected by most U.S. institutions; (2) it is only recently that AID, with its interest in symbiotic nitrogen fixation, has shown any concern regarding Hawaii's specific competence in this area; and (3) the former grant director apparently did not foresee the importance that would be attributed to this discipline as heighthemed by the recent energy and food crises.

It was evident that the strategy for the use of 211(d) funds on salary and student support, at least for the three years, was largely of the "seat of the pants" variety. Notwithstanding this fact, there have been some remarkable breakthroughs and successes, most notably the development of an effective means to analyze and

and overcome P fixation in soils and the development of the pH-dependent charge theory regarding tropical soils. In addition, the 211(d) grant spawned the preliminary work which has lead to a major research project on the transfer of agro-technology through use of a worldwide soils taxonomy system.

Strengths and weaknesses

Comparatively speaking and in terms of results, the University of Hawaii's performance to date has been outstanding. However, there are both strengths and weaknesses in its programs which must be stated and recognized when considering the need and rationale, if any, for continued support.

The strong part of the Hawaiian program are:

(1) Soil mineralogy

This program is the strongest and has made the most notable contribution of any in the world, in the opinion of the team's technical expert. There is even some question if Hawaii's competence has not exceeded present needs of most LDCs. However, if further new knowledge in mineralogy and its relation to the behavior of fertilizers can assist in the classification of soils from the various parts of the tropics which can be translated into productivity indexes, then further research on mineralogy should not be discouraged.

(2) Water retention

Hawaii is the only one of the four institutions thus far reviewed (University of Puerto Rico still remains) that is giving sufficient attention to precipitations, water retention properties of soils, and soil water storage capacity in relation to crop and forage production.

(3) Soil fertility

The research on phosphate absorption by soils and the concentration needed in the soil solution, the research on silitate and its relation to yield and phosphate availability, and the measurement of charge on soil particles in relation to pH and its significance to nutrient movement is excellent. Although much of this research is further development of principles established over two decades ago, its application to management of

tropical soils is highly commendable.

(4) Extrapolation

Hawaii is making use of soils from Puerto Rico, Latin America and the Pacific islands to determine whether their reactions to nutrients and water holding properties are similar or different. Such information is badly needed for the extrapolation of research results among locations and countries. This desire on the part of UH to make such correlations is highly commendable. This kind of information is needed for the preparation of state-of-the-art papers, otherwise such papers simply become anthologies.

From a technical viewpoint, the most serious weakness in the University of Hawaii program concerns soil biology. There are good reasons to believe that Hawaii has given only token attention to this assignment. Since it is the only grant institution of the five with biology as an objective, this is serious from the attaining of a systems approach. Much of the work on nitrification, ammonia absorption by clays, herbicide degradation and retention, and even the work on residue decomposition has been mostly chemistry and manipulation of the physical parameters. Whether there was anything alive in the system was known only by implication. Hawaii should not be faulted too seriously on this point as it merely reflects the sorry state of soil biology research in the world. Most of such research is being done with chemical techniques with very little work being done on identification of organisms, the effects of one on another, and the effects of plant residues, root exudates and root detritus on the bacteria and fungi in the soil. Such relations are important in crops grown in mixed culture or in crop sequences. Little attention is also being paid to soil anthropods, including termites, in the management and genesis of tropical soils. A better definition of the problems and concentration on certain aspects of them, particularly survival of pathogens in a non-chemical world, is badly needed. The AID contract on N fixation by legumes is only a small part of the picture. UH now has a soil micro-biologist, but his work has been confined to N fixation by non-symbiotic organisms and to herbicide degradation.

In the non-technical areas, there are certain serious limitations regarding past UH performance and future use. First and foremost is the limitation of staff resources. In terms of microbiology, for example, there is only one

man. Dr. Swindale is also outstanding but is probably fully occupied in the new "benchmark soils" research contract. The degree of the international interest on the remaining staff was not clear at the time of the review, although in Attachment B-3, the University of Hawaii has specified (at team request) the response capability that is currently available, by specialty and function - an impressive listing given the relatively small size of the faculty.

In respect to interdepartmental cooperation, the integration of the program to the goals (i.e., purpose) obtainable under the grant appeared to show some weakness and it was evident that there has not always been effective faculty participation in decisions on grant policy, priorities, and fund allocations. At least until the award of benchmark soils research contract, there also did not appear to be any systematic plan of linkages with LDCs and international centers.

A very serious weakness in the past has been, particularly in the eyes of regional bureau representatives on the team, the University of Hawaii's reluctance to identify and report problems of relevance to AID and the LDCs. The University should be taking on as one of its tasks, identifying the relevance of their research to LDC food and development needs, e.g., the problems that their research suggest in on-going or planned food programs, and the importance of new and different technology transfers to the LDCs. Rather than wait for AID to ask, it was strongly suggested that, - as part of their on-campus (or travel) work under the grant - UH probe the approaches now being pursued in humid tropics, semi-arid tropics, etc., and flag to AID the importance of pH - dependency, nitrogen fixation, fertilizer strategies legume varieties, etc., to those programs. In other words, UH - under the grant - should be constantly studying and communicating the relevance of its work to AID, e.g., the potential use of stylo legumes in the Sahel-Sudano, and the weakness in Kenya's soil research program.

Hawaii, as with its sister consortium institutions, has not given sufficient attention to how technology, i.e., new techniques, research findings, management practices, etc., can be transferred more rapidly to the LDCs. This could include, for example, new problem-oriented teaching practices, new information storage and retrieval systems, new networking approaches. Right at the University of Hawaii a whole new approach to the shorter-term and more problem-oriented training

and upgrading of medical workers is going on (MEDEX) with applicability perhaps to other professions. Right now there is in the Hawaii/Puerto Rico "benchmark" soils research contract and the ARS-sponsored work on soil information systems, the germ of a system of rapid technology transfer that could revolutionize the way LDC workers are trained, equipped and operate. Yet hardly anyone seems to be focusing on this potential and Dr. Lyman suggested that perhaps some interaction between MEDEX, the agricultural universities, and the Stanford University program on communications should take place, focusing on rapid transfer of technology to key agricultural services (extensions, research workers, etc.).

Finally, if universities are not able to operate long-term, overseas, operational programs, they should focus on sharpening their capacity to help design and provide professional backstopping to such projects. The University of Hawaii stated its willingness to do this but the team saw no indication they have thought through (a) how a national research system might be developed in the 1970's to take account of both new technology and the international networks, and (b) how much time, and of what kind, should universities give to backstopping, i.e., what is their best contribution - research design, training of key officials of the LDC system, on-site review and evaluation of visits, etc.?

Grant Management

The premature exhaustion of grant funds is a pretty clear indicator that there have been past problems in grant management. While research results have been gratifying, there has been no articulated grant strategy on research and the support of graduate students, at least a strategy which is understood and communicated to all staff members. Up until the last year, there has apparently been little discussion of program priorities either within the department and with other interested departments in the College of Tropical Agriculture, with other sister institutions in the soils consortium, or with AID. It is obvious to all concerned, including the University itself, that there is a need for fuller participation of the faculty in the decisions regarding the grant priorities and expenditures and a greater effort on the part of the Grant Program Director to control activities in terms of their contribution to the grant "purpose". There was evidence that this is now and will continue to be the case.

Finally, the reporting by Hawaii has been less than brilliant. In the discussions of issues, there were many examples of progress and results which were impressive but had not been included in annual reports or were presented in such a way that the lay audience could not understand their significance or contribution to an overall strategy. The review session itself and, hopefully, subsequent professional dialogues with AID, will help increase the effectiveness of future reporting.

New grant focus

The University of Hawaii should continue its concern with soil mineralogy. During the review, Dr. Uehara expressed the view that some tropical soils are so low in nutrients, notably phosphate, and have such fixation capacities that they should never be developed unless means are found to block the fixation with cheap chemicals or if plants can be found that can grow with very low solution concentrations. The principle that certain soils should never be agriculturally developed is not new but the restraints have usually been physical or climatic. Temperate zone men have always believed that any soil fertility can be solved with fertilizers and lime, providing water and physical properties were satisfactory. In new Zealand, the tussock grassland soils were acidic, low in phosphate, and had high fixation capacities. The New Zealanders found it economical to reclaim these soils using as much as a ton of super-phosphate per acre. The returns in grass and clover for sheep are sufficient to pay for this high initial investment. However, this may not be true for the tropics having certain kinds of soils.

This suggests a two-pronged approach: Delineate such soils using the chemical techniques associated with soil classification and soil fertility analysis. After the delineation, either leave such soils in native vegetation or select species and variants within species that get along with either minimum fertilizer application or none. Too little attention has been paid to low fertility levels in selecting adapted crops for developing regions or in plant breeding programs. Tropical legumes appeared to get along with much lower levels of nutrition than temperate ones. In the breeding programs for corn, sorghum and millet in Africa, most of the emphasis has been on varieties that do well at high or moderate levels of applied fertilizers. In all types of research, much more attention should be given to plants that do well

at the low end of the soil fertility spectrum. One possible focused use of UH staff would be, at the request of AID bureaus and missions, to make quick inventories of the nutrient status of LDC areas suggested for agricultural development.

The original emphasis on soil biology should be redefined in terms of microbiology with initial emphasis on nitrogen fixation. In strengthening its competence in this area, UH should seek working relationships with other U.S. microbiologists and not necessarily limited to the current consortium institutions. While it is apparently not necessary in the case of Hawaii, at least for the record it should be stated that their response capability should be honed in terms of serving the small LDC farmer and recognizing the technological, energy, and other constraints operating upon him. A major need now is the summarization and interpretation of the vast amount of tropical experimentation already carried out to determine what fits known principles and what does not, and what can be translated into management and cultural practices appropriate to food problems facing the LDCs.

Role of the Consortium

A great deal of effort and time has been invested by the five grantee institutions over the past year and one-half in planning a "super-structure" for the consortium without giving much thought to what the purpose of such an organization would be and what it can do for the universities, AID and the LDCs that the institutions are not now doing either individually or in an informal and loose cooperative association. Even the discussions last December at Ithaca on terms of grant extension and new foci seemed shallow on the purpose side, although there is growing evidence that members, particularly Cornell and North Carolina State, are beginning to take seriously the message TAB has been repeating regarding the need for state-of-the-art work, and the development of response capabilities needed by AID and the LDCs.

The team agrees whole-heartedly with Dr. Uehara's statement that, to be effective, the consortium has to be problem or subject oriented; in other words, to make it work they need things to do with more input from the AID side. While it is to be hoped that the universities will take more of an initiative in proposing problems and subjects for state-of-the-art analysis, TA/AGR can not afford to wait anymore for this to happen, particularly since such activity will presumably be the quid pro quo for any grant extensions and revisions while cooperative efforts,

particularly at the technical level, should be continued and facilitated through contracts, grants, or any other mechanism, the team agrees with Dr. Swindale, namely, that the concept of an organized approach has not yet reached sufficient maturity or consensus to warrant any further formalization and organizational staffing investment. Rather each proposed grant extension should be considered on its individual merits and, assuming they call for a state-of-the-art or similar work that will necessitate cooperative and problem-oriented work, there is a real possibility that by the end of another two years circumstances may develop so that (a) the universities have a more concrete proposal to make which will serve both AID and themselves and (b) AID would be willing to make a contribution or investment in some kind of a resource base or similar arrangement. At that time, all concerned will also have better feeling of whether the new institutional foci agreed upon at Ithaca add up to a workable and systematic approach.

Since the on-site review and the Ithaca meeting, at a joint meeting of both the soils and water consortia following the Soils and Water Workshop held in Washington on January of this year, there was further discussion regarding areas and priorities for study. Any grant proposals for extension must involve getting the best technical people together to: (1) delineate more clearly the problems and discipline lines; and (2) to develop the subjects, and personnel who carry out some agreed-upon number of state-of-the-art studies. With this done, AID will then be in a position to make a judgment as to what to do but, in the final analysis, the selection will be with AID.

Basis for extension

Except in the area of microbiology, there does not appear to be much of a rationale to continue institution building at UH in a generalized way. On the other hand, the team does believe that it is important to keep the faculty involved and concerned with the problems of LDCs, to make it more aware of AID's needs, and to facilitate the utilization of this competence including the availability of faculty for special assignments appropriate to university functions and expertise.

The University of Hawaii is of particular interest to the East Asian Bureau but its growing competence in the area of tropical soils makes its knowledge of world-wide concern. Loss of grant support at this time would

interfere with their capacity to provide AID with professional expertise for short-term assignments and to do the correlation and interpretation of tropical literature and practices on soils needed for the preparation and review of state-of-the-art papers. Any grant extension should provide for a pre-determined amount of release time for consultation, preparation of state-of-the-art papers and any other activities or products which AID requires. The release time not used for consultation should be used to accelerate the rate of review and state-of-the-art production.

The term "state-of-the-art" should be defined to encompass a keenly analytical review of the knowledge accumulated by research and practice on either a narrow or broad subject, setting forth the established principles, how and where they can be used, and identifying the gaps and knowledge needing research for establishment of better principles and means of utilization. The output should not be a recipe book but rather a guide on how to diagnose and solve a problem with the emphasis on simplicity and economy. This concept is perhaps most succinctly illustrated in a paper prepared by Dr. Frank Viets for the recent Soils and Water Workshop and which is attached as Appendix F. The concept is dynamic in that it provides a strategy for the utilization of research and other resources in the application of knowledge (extension, education, delivery systems) as to what should and what should not be delivered. From this analysis should come products in the terms of publications, manuals, workshops, etc., which will be of high use to LDCs and donor agencies. Suggested topics included in his paper which would involve the University of Hawaii are phosphate requirements and fertilizer reactions with tropical soils (in cooperation with Cornell and North Carolina State), and water availability, retention and flow in acid tropical soils.

Any grant extension should also be used to focus on the problem of information dissemination and knowledge transfer, particularly back to the using offices in the regional bureaus and overseas missions. The problems and possibilities for regional bureaus are set-forth in a memorandum from Princeton Lyman to Donald S. Brown attached as Appendix G. In this memorandum, Dr. Lyman points out not only the need but the potential for much rapid information transfers to the LDCs through, among

other things, computerized and technical transfer systems now being developed, at least in a preliminary fashion, in AID funded research contracts and grants. At the same time AID itself must continue to seek ways and means to dialogue more effectively with Hawaii and other collaborating universities so that they are aware of our needs and limitations.

With the "soils benchmark" and the "nitrogen fixation" research projects and the proposed work on problem-oriented state-of-the-art, most of UH's competence- at least in terms of faculty involvement- will be fully committed. The state-of-the-art will provide the flexibility for a rapid response to mission requests, i.e., such continuing work can be used as kind of a retainer fee to provide staff with enough flexibility from domestic commitments to be reasonably available on call for short-term assignments. The team accepts the University of Hawaii's estimate of two-man years per year as being sufficient, although this should be negotiated depending upon the other elements included in the final proposal. For example, the question of linkages must be reviewed. It is probable with the linkages to be developed in the research contracts that additional linkages for state-of-the-art will be minimal, if required at all. However formal and purposeful linkages with one or more international agricultural research institute should be considered.

In summary, only five of the fifty Land Grant universities in the United States have a tropical soils focus and Hawaii is perhaps the most outstanding institution. They are fully committed to the international dimensions of their work and are the most willing of the consortium members reviewed so far to rethink its program and its association with TA/AGR in light of AID's new program and evaluation emphases. At least for the next two years, some means is necessary to keep technology current and staff involved, particularly in the areas of AID priorities. Additional 211(d) grant support along the lines suggested above should provide AID and LDCs with useful products at minimal cost while at the same time providing the most effective instrument for sustaining a viable response capability in a ready state of utilization.

IV. RECOMMENDATIONS

The following summary recommendations to TA/AGR management should be considered within the framework of the findings and conclusions developed above and expanded upon in several of the appendices.

1. A two-year extension and revision of the present 211(d) grant to the University of Hawaii should be processed under the following terms and conditions:

- a) The purpose of the grant should change the emphasis from development of institutional competence to focused and sustained utilization (as detailed below) in the solution of problems focusing on the small LDC farmer.
- b) Grant focus to continue a concern with soil mineralogy but in terms of utilization not competence-building. Concern with soil biology should be redefined as microbiology with emphasis on nitrogen fixation-including, if necessary, the building or strengthening of institutional response capability. In the latter case, there should be a clear specification of (1) what competence is needed, (2) how it will be expanded and/or strengthened; and (3) the relationship of the new competence to grant purpose and AID's objectives, e.g., increased food production.
- c) UH to develop and articulate a research strategy related to grant purpose in consultation with its own faculty, other interested institutions, and AID. It should include the selection, in cooperation if possible with other soils consortium members and acceptable to AID, of problems/subjects for concentrated effort and which exploit the strengths of Hawaii's competence base.
- d) Objectives or outputs of grant-financed activity to include state-of-the-art work, establishment of an international

soils utilization data bank, participation in problem-oriented workshops with LDCs and international research centers, and the production of publications, textbooks, manuals, handbooks, "how-to-do-it" bulletins, etc., useful to the transfer of knowledge.

- e) Funds be made available to provide at least 2 MY equivalents of faculty release time for quick response in a retainer mode. When not needed for responding to field or central office request, funds be used to sustain capacity in active utilization by accelerating state-of-the-art and similar work.

2. Assurances should be obtained from UH that recent improvement in grant management will be continued including:

- a) Closer control over the programming, allocation and use of grant funds in terms of grant purpose and agreed-upon strategies.
- b) Increased inter and intra-department participation (with AID inputs as appropriate) in establishing grant policy, priorities, strategy, and similar decisions.
- c) Increased attention to identifying the relevance of research findings to LDC needs and more initiative in flagging the importance of such results to AID central bureaus and field missions.
- d) Related to (c) above, better reporting of activities, events, findings, progress, problems, etc., in a manner useful to AID and understood by non-technicians and busy administrators.

3. TA/AGR, in negotiating and discussing terms and conditions with UH, should also take the following actions:

- a) Explore how grant and other AID-financed activity can or should be tied into the proposed Hawaiian Institute for Tropical

Agriculture to be financed from funds which may be available from the ARS under Section 406 of the Food and Peact Action of 1966 and its effect, if any, for continuing 211(d) grant support.

- b) Indicate clearly what AID wants in the terms of problem-orientation, state-of-art subjects, and specific response capabilities, e.g., project design, professional backstopping of operational projects, and special training for selected LDC audiences.
- c) Ascertain UH and regional bureau interest in making quick inventories of the nutrient status of LDC areas planned for agricultural development.
- d) Exercise caution in programming additional contract work to UH in tropical soils without first assuring itself that such work will not stretch existing capacities to the extent that current work or quick response capacity will suffer.
- e) Determine if a programmed and specialized linkage with one or more specified international and national agriculture research centers would be useful to the achievement of grant purpose.

4. Grant funds should not be made available at this time for any consortium superstructure or resource center, although the need, purpose and form should be reviewed again after joint experience has been gained in state-of-the-art studies, problem-oriented activity, etc.

5. The proposals of the soils consortium members for grant extensions should be considered on their individual merits. However, where appropriate and useful, grant terms should encourage and facilitate - including flexibility to use grant funds - joint endeavors, particularly at the technical level. Examples include:

- . state-of-the-art work
- . design of an integrated soils data bank

- **field training**
- **designing and/or participating in problem-focused workshops**
- **research**

ISSUES PAPER

University of Hawaii
Comprehensive Review - (211(d) Grant
January 8-10, 1975

The central objective of the grant to the University of Hawaii (UH) is to strengthen in a coordinated effort U.S. institutional competence in soil science of the tropics for teaching, research, technical assistance and consultation for increasing food and fiber production in the developing countries. UH was to concentrate on the problems relating to the biology and mineralogy of tropical soils and their impact on the physical and chemical properties of the soils and the nutrient-supply for crop production.

Before setting forth some general and specific issues regarding the grant, in all fairness and candor it must be stated that TA/AGR believes that the College of Tropical Agriculture, University of Hawaii, is endowed with highly favorable features that make it an outstanding resource to serve the Agency's objectives in the developing world. The Agency has nothing but praise for the help it has received from UH staff in its overseas program. Even on short notice, the University has accommodated requests for assistance and provided its best personnel to do the job. UH's staff has also generated excellent research programs for the Agency. In view of TA/AGR, the commitment of the University to the international community is commendable indeed.

The issues raised hereunder relate primarily to the management and accomplishments of the grant and UH's future direction and involvement with AID and the developing countries. These issues are based on the Agency's understanding and impressions of the omission or commission in the grant activities and of a sum total of the institutional capability due to the grant as it corresponds to the LDC needs and the problem area. In as far as the present grant review is concerned only those issues where inadequacy was noted or discussion is desired are mentioned. Issues on non-problem areas are not raised.

The issues must be considered in the context of level of tangible achievements (output for impact) vis-a-vis funds spent and not in enumeration of activities or resources used (inputs). They have been prepared in consultation with TAB Grants Coordinator and are within the requirements of comprehensive review included in Grant Handbook 13, App. 2C, and in consideration of the Agency policies recently established by the Administrator in PD-62 (referred document provided).

While these issues will be used by the panel chairman to structure the review, they do not preclude other issues which the panel and UH may wish to raise during the review period.

Issue 1 - Inability to measure impact of grant on the institutional and knowledge base and the achievement of the grant objectives:

Given the vague nature of the original grant and the reporting to date, plus the fact that UH had considerable prior-to-grant competence in

subject technical field we are unable to measure or evaluate competence of UH or the effect of the grant on the knowledge base.

Issue 2 - Lack in progress in concentrating on problem relating to the biology of tropical soils:

While satisfactory achievement in soil mineralogy is apparent it appears that similar progress in soil biology has not been made.

Issue 3 - Apparent overemphasis on use of grant funds for research and teaching including staff and student support:

In terms of new competence we are unable to see significant beneficial effects of the large amount of grant funds (approximately 95%) which UH expended on research and teaching (which included 50 to 100% support of: staff - 3 to 12 individuals and graduate students - 4 to 18 individuals).

Issue 4 - Impact of accelerated or premature expenditure of grant funds on institutional response capabilities:

During 45 months of 60 months grant life UH had used about \$480,000 -- approximately 95% of the \$500,000 grant funds. The issue suggests presumed deleterious effects on grant capacity and competence due to premature expenditure of the schedule for funds.

Issue 5 - The value of the 'Consortium' and/or systems approach to tropical soil knowledge base and the optimum role of UH:

Noting the geographical location and interests of the member institutions of the Consortium and the Agency's desire that: the Consortium play an important role in building a viable worldwide network on tropical soils, and recognize systems and interdisciplinary approach to solving LDC problems, it seems there is a little uneasiness about the subject matter within AID and the Consortium members.

Issue 6 - Future direction and involvement:

In view of UH's competence, to date, and its stated intention for grant extension, an explanation of the following items will be in order:

(a) Present and future availability of response capability for utilization purposes.

(b) UH and AID's projection on potential demands for its services in LDCs.

(c) Grant supported activities that are, or will be, assumed by UH or funded from other sources.

(d) Perception of UH for an end of the grant status.

(e) Salient points of the proposal for grant extension e.g., purpose, need, activities contemplated, relation to other AID-funded activities, relationship to the 'Consortium' structure, etc.

University of Hawaii
Comprehensive Review - 211(d) Grant
January 8-9, 1975

Issue 1 - Inability to measure impact of grant on the institutional and knowledge base and the achievement of the grant objectives:

The difficulty of measuring or evaluating competence of the University of Hawaii or the effect of the grant on the knowledge base is in large part related to the difficulty of separating grant from institutional objectives. By virtue of climate and soil geography, grant and institutional objective become indistinguishable. The effectiveness of the grant can be measured in terms of its impact outside the state. Examples of extra-state impact will be presented during the review.

Issue 2 - Lack in progress in concentrating on problem relating to the biology of tropical soils:

The term soil biology is as imprecise as soil mineralogy is precise. Hawaii has interpreted soil biology to mean nutrient-supply for crop production. Nutrient-supply is still too imprecise, and Hawaii has opted to concentrate on the two most limiting nutrients in tropical soils--phosphorus and nitrogen. Two key staff members, Fox and Kanehiro are responsible for these subject matter areas. Fox's work on the relationship between soil solution phosphorus and biological response is the most reliable and widely used procedure for assessing phosphorus requirement of highly weathered tropical soils. Kanehiro's work on the mineralization rate of organic nitrogen in soils dominated by amorphous minerals is better known in the tropics than in the US even though Kanehiro and his students have published most of their findings in U.S. Journals.

Hawaii's program in soil microbiology is new and must await fuller development before its impact in the tropics will be felt. Evidence of this new expertise can be found in the 1973-74 Annual Report.

<u>Page</u>	<u>Paragraph</u>	<u>Subject</u>
C-6	1	Research on non-symbiotic nitrogen fixation.
"	2	Isolation and degradation of pesticides in tropical soils.
C-12	1&2	Nitrogen transformation and denitrification studies in tropical soils.
C-13	1	Incorporation of organic matter into the soil and rates of decomposition
C-14	2	Effect of liming on nodulation and nitrogen fixation of several legumes.

Issue 3 - Apparent overemphasis on use of grant funds for research and teaching including staff and student support:

Hawaii has expended grant funds to release key staff members from non-grant activities to work on grant related activities.

For example, Sakai and Okazaki were hired with grant funds to allow Jones, our soil mineralogist, to work on samples collected in Puerto Rico, Latin America and elsewhere.

Tsuji was hired to work on soil physics so that Uehara could spend more time on soil mineralogy.

In compliance with Federal and state policies on equal opportunity employment, three women were hired under the grant. They are Mrs. Chan, Chu and Hapes. All three are capable scientists and we hope they will continue to serve UH in International programs. Mrs. Chu has been hired under AID-Hawaii contract on Benchmark soils.

The original plan of the UH budget for the Grant called for a total expenditure of \$372,095 over the five year period for salaries and wages (see Exhibit A attached). This represents 74.4 percent of the budget. Actual expenditures (unaudited) on these items are expected to be \$378,715 or 75.7 percent. If you add supplies and equipment (\$38,526), this brings the grand total that we expect to expend on "research and teaching" to a total of 91.4 percent of the budget. However, it must be made clear that these funds should be considered offset time to allow our permanent staff to develop response capabilities for AID.

Issue 4 - Impact of accelerated or premature expenditure of grant funds on institutional response capabilities:

A valid criticism. Grant momentum however, has not been lost. Fox is now on leave in IITA and the Department has gained three scientist who are in Hawaii on leave. All three scientists are here as a result of Hawaii's increased competence in mineralogy and biology. One scientist is from France (Kha-Nguyen) another from Senegal (Christian Perie) and a third from Michigan (Bernie Kenezek). A fourth scientist (Anderson) died last summer in a drowning accident. There is every indication that Hawaii's involvement with 211(d) has given it increased stature and the 211(d) program continues to flourish even without funds.

Issue 5 - The value of the 'Consortium' and/or systems approach to tropical soil knowledge base and the optimum role of UH:

Hawaii fully concurs with AID's desire to create a viable worldwide network on tropical soils. The uneasiness about the network stems from uncertainties concerning network center location, its form, size and function. In view of these uncertainties several Consortium members have submitted proposals outlining their perception of the Center and the network. Predictably each institution recommends that the Center be located on its premises. This situation should never have been allowed to happen for the competing institutions have become adversaries. The handling of the network question has done irreparable harm to the Consortium. AID and the Consortium should have anticipated this situation. It is not too late to enter into new discussions to rectify the situation.

Issue 6 - Future direction and involvement:

In view of UH's competence, to date, and its stated intention for grant extension, an explanation of the following items will be in order:

(a) Present and future availability of response capability for utilization purposes.

In terms of the needs of LDC's, the response capability of this University will be small. The question of how best to use this capability needs to be answered. A cadre of 50 scientist (10 per institution) already heavily committed to University programs can barely begin to solve the serious soil-related problems facing LDC's.

What the University and Consortium should do is not necessarily to respond directly to LDC problems, but to develop means to render technical assistance effective. This University and the Consortium can do so by preparing state-of-the-arts reports related to soil science in the tropics. No group is better suited to respond in this manner than the Consortium Universities on Soil of the Tropics.

(b) UH and AID's projection on potential demands for its services in LDCs. Sustained demand for UH's service will depend on new positions created to provide such service, and thus assuring UH's capacity to respond expeditiously without crippling its own program. AID and UH administrators should discuss mechanisms by which this sustained responsiveness can be developed.

(c) Grant supported activities that are, or will be assumed by UH or funded from other sources.

The following are grant supported activities that will be assumed by UH.

1. Multi-element soil and biological materials analysis program developed and supported in part by grant funds.
2. Soil Data storage and retrieval system which will eventually be a part of a worldwide information system for agriculture.

(d) Perception of UH for an end of the grant status.

US and other developed country support of tropical agriculture is far from adequate to meet LDC needs. So long as there is a US commitment to assist LDC's, some means to keep technology current is needed. There is no better way to do this than through 211(d) grants to US Universities similarly committed to improving quality of life in LDC's. The problem soils of the tropics remain one of the major constraints to the development of LDC's.

(e) Salient points of the proposal for grant extension e.g., purpose, need, activities contemplated, relation to other AID-Funded activities, relationship to the 'Consortium' structure, etc.

The signal from AID is clear and UH concurs that documentation of the state-of-the-arts in tropical soil science is urgently needed. UH proposes to meet these needs in two ways:

1. Create an international soil utilization data bank, and
2. Prepare a state-of-the-arts handbook on soil science tailored for the tropics.

The international soil utilization data bank is use-oriented, it is open-ended and can be enlarged to accommodate new uses, and it may be updated as the need arises. It represents a permanent, re-usable record of technical assistance. This information system would continue to function long after the Consortium ceases to exist.

The state-of-the-arts handbook will indicate whether currently used soil parameters have the same meaning in the temperate region and the tropics. If parameters have different meanings they will be re-interpreted for use in the tropics.

While leadership in meeting new grant objectives will be Hawaii's responsibility, it is the intent to utilize the entire Consortium talent to meet the stated objectives.

ON

DEPARTMENT OF AGRONOMY & SOIL SCIENCE

1. Knowledge Base

A. Possibly Best Developed Knowledge Base In Tropics

In 1935 seven University of Hawaii and Hawaiian Sugar Planter's Association scientists prepared the first state-of-the-art document on Hawaiian soils. The scientists were H. S. Palmer, Geologist; F. E. Hance, Chemist; H. A. Wadsworth, Soil Scientist; O. N. Allen, Microbiologist; R. J. Borden and W. W. G. Moir, Agriculturists; and O. C. Magistad, Director of the Hawaii Agricultural Experiment Station. The state-of-the-art document was titled "Handbook of Hawaiian Soils."

Since publication of that Handbook, the knowledge base of Hawaii's soils has increased by several orders of magnitude. In the late 30's and early 40's Lyman Dean and G. Donald Sherman brought with them the newest soil techniques to Hawaii. G. Donald Sherman led the soils program for some 25 years. In his research and teaching Dr. Sherman emphasized the need to develop new principles to understand and manage tropical soils.

The creation of the East-West Center in 1960 added another dimension to the soils program. It gave the program depth in staff. Graduate students from LDC's arrived in large numbers to study soil science. A new Ph.D. program in Agronomy was created to augment the Ph.D. program in soil science initiated in the 30's. Staffing, student enrollment, and support for research peaked at about the time 211-d appeared on the scene.

B. Uncertain Applicability Of Knowledge Base To Small Farmers In LDC'S

The most productive lands in Hawaii are in sugar and pineapple. Research for sugar and pineapple is carried out by industry. The small Hawaiian farmer generally works marginal land and grows diversified crops. He depends on the University for help. The University's greatest strength lies with helping small farmers who work the poorest land.

The unstated strategy, implicitly understood by the staff, was to ascertain the applicability of the Hawaiian experience to the tropics as a whole. This strategy did not originate with the Department's involvement with 211-d, but was, and still is, the strategy of the College's International program.

If research conducted in Hawaii is relevant to Latin America, Africa, and Tropical Asia, then research conducted in Latin America, Africa, and Tropical Asia must be relevant to Hawaii. The concept of Agrotechnology transfer throughout the tropics emerged as a major effort under 211-d. A test of this concept has been made possible through a AID-UII contract. The concept of Agrotechnology

transfer immediately points to the need for information transfer. How can Hawaii benefit from knowledge base scattered throughout the tropics and visa versa? The staff kept this thought in mind as it travelled in Asia, Africa and Latin America. There is now a consensus among staff members that Hawaii's soil experience is largely applicable in the tropics, that soil survey interpretation for land use planning and soil physics research are deficient, and that state-of-the-art documentation of tropical soil science is urgently needed.

In short 211-d helped the Department to evaluate strength and weakness of the knowledge base in Hawaii and elsewhere, to identify priorities for research and development based on our evaluation of the knowledge base, and generated the interest to document and disseminate the state-of-the-art through a worldwide information system.

2. Information System

A. Hawaii's Preception Of Information Systems

An information system is not merely a means to store and retrieve data, but a means to organize our knowledge base for purposes of utilization. Such a system has been developed by the staff of the Soil Conservation Service of USDA in a document entitled "Soil Taxonomy." It represents the state-of-the-art in the truest sense. Much of Hawaii's knowledge base is incorporated in Soil Taxonomy. While this knowledge can be used for soil management, the management practices are not explicitly stated -- they are implied and must be interpreted from the taxonomy.

Under 211-d, the staff has searched for ways to develop information systems which are more explicit in their directions for soil management. The development of such a system can be one of the activities in the grant extension.

B. Hawaii's Future Role In Developing Information System

Under a grant from United States Agricultural Research Service, the Department is currently testing and developing an information system which will have access to most of the major agricultural information systems in the world. The organized soil knowledge base developed under the 211-d grant will become part of this worldwide information system.

3. Advisory Capacity

A. Nature Of Service

(Self-explanatory)

B. Capacity To Serve

a. Pre-211-d

Before Hawaii's involvement with 211-d, this University had two (2) proven individuals with international advisory capacity. They are L. D. Swindale, an D. L. Plucknett. Dr. Swindale served for two years with FAO in Rome, and Dr. Plucknett is in his second year with AID-Washington.

b. New Capacity

Under 211-d, an equivalent of six individuals have developed advisory capacity. Some like Fox and Kanehiro have developed near full capacity and others including Dela Pena, El-Swaify, Green, Ikawa, Jones, Koch, Silva, Tamimi, Uehara, and Whitney have yet to develop full advisory capacity.

Other individuals hired under the grant such as Chang, Chu, Mapes, Okazaki, and Tsuji might be included in this group. These individuals have and will continue to serve as backstop personnel to fill voids created by staff on 211-d activity outside the State. All five individuals named above are competent scientists, but with the exception of Tsuji and Mapes will probably not travel to LDC's in an advisory capacity.

4. Research Capacity

The items described below are those which have direct relevance to the 211-d grant.

A. Increased Capacity To Accommodate Large Numbers Of Samples And Data

a. X-ray Quantometer

This instrument enables the Department to respond quickly to staff in advisory roles requesting soil and plant analysis.

b. Soil Data Storage And Retrieval System

This system initially designed to handle data for the State has been enlarged to accommodate all samples collected by staff travelling in the tropics. This information system is the heart of the knowledge base for information transfer.

B. New Capacity

a. and b.

The electron microprobe and scanning electron microscope were acquired with University and 211-d funds. This gives the Department and University research capacity it did not possess. It enables the program to break new ground in soil mineralogy and microbiological research.

c. Microbiology

This is a new program. It requires continued 211-d support for accelerated development.

5. Training Capacity

A. Department

(See Attachment A for 5-year summary of Department's graduate output.)

A strong graduate program is an essential part of a viable research program. Young graduate students, trained in the most modern methods, come to the program with fresh, uncluttered minds.

The most productive scientists in the Department are those who work with graduate students. As a conservative estimate, the research capacity of this Department would be reduced to half its current output if the graduate program were ended. Graduate programs remain the most efficient method for doing research in Universities.

B. Consortium

Consortium sponsored seminars and workshops have been a major factor contributing to the response capability of University staff. The seminar in Africa (IITA) and Latin America (CIAT) enabled staff to meet other scientists and observe LDC problems firsthand. The ICRISAT seminar in India will do the same.

The teaching and mineralogy workshops held in Hawaii for consortium staff is continuing to have an impact. Dr. Henry Foth of Michigan State University who was invited to attend the teaching workshop credits his Hawaii colleagues for assisting him develop a section on tropical soils in his textbook. Mineralogical instrumentation and method in the consortium have been upgraded to accommodate special features of tropical soils. These workshops enabled scientists from sister institutions to see tropical soils and reach consensus on the state of our knowledge base. In the 211-d extensions, more meetings of this type involving consortium scientists should be encouraged.

C. International

The ICRISAT seminar on "Uses of Soil Survey and Classification in Planning and Implementing Agricultural Development in the Tropics" revolves around the concept of Agrotechnology transfer and the need to utilize soil classification as an information system for planning. It developed as a direct consequence of Hawaii's capacity to identify LDC priority problems.

6. Linkages and Networks

A. Informal

Travel in connection with 211-d activities has enabled department staff to develop relationships with scientists from International Centers and LDC's. Visiting scientists supported by grant funds also links Hawaii to LDC's.

B. Formal

a. Local

The Department receives graduate student support from the East-West Center. The majority of East-West Center students enrolled in the Department are from Asian LDC's.

Four Hawaiian Sugar Planter's Association and Pineapple Research Institute scientists serve as affiliate graduate faculty in the Department.

network branch stations in the State provides students and staff with space for tropical soils research. A wide range of soil and climate is covered in the branch station system.

b. National

Hawaii's association with sister Consortium Universities has these advantages:

1. The consortium can handle problems too large for any one institution
2. Sister institutions learn from each other and as a consequence application of results occur more quickly;
3. Duplication of effort is avoided;
4. Scientists find involvement with other individuals from the Consortium, with similar interests and goals, stimulating;
5. Consortium membership creates a spirit of competition and encourages higher performance;
6. The Consortium provides increased opportunity for concentrating resources at locations where there is a high potential for significant progress.

The University has formal ties with the Federal Agricultural Research Service, and Soil Conservation Service. These agencies look to Hawaii for development of expertise in tropical soils.

The University is actively engaged in Regional research with members of the Western States. This group consisting of scientists involved in soil and water research met in Hawaii January 14-17, 1975.

C. International

Excellent ad hoc linkages between the Consortium and International Centers and LDC's have been developed. These linkages were largely developed through joint sponsorship of International seminars at IITA and CIAT. Another seminar is forthcoming at ICRISAT. In addition new linkages are being developed with LDC's through AID-University contracts. It may very well be that linkages and networks are being developed at just the right pace.

ADDITIONAL INFORMATION
211(d) Review
University of Hawaii
Department of Agronomy and Soil Science

I. STAFF INVOLVEMENT AND RESPONSE SKILLS

<u>Name</u>	<u>Rank</u>	<u>Field of Specialty</u>	<u>Response Skill*</u>
Fox, R. L.	Professor	Soil Phosphorus	A, B, C, E
Kanehiro, Y.	Professor	Soil Nitrogen	A, B, C, E
De La Pena, R.	Asst. Prof.	Soil Management	A, E
El-Swaify, S.	Assoc. Prof.	Soil Salinity, Erosion	A, B
Green, R.	Professor	Herbicide	A, B
Ikawa, H.	Assoc. Prof.	Classification	D, E
Jones, R.	Assoc. Prof.	Mineralogy	A, E
Koch, B.	Asst. Prof.	Biochemistry, Microbiology	A, B
Silva, J.	Assoc. Prof.	Experimental Design Fertility	A, B, C
Tamimi, Y.	Assoc. Prof.	Soil Management	A, B, C
Uehara, G.	Professor	Soil Physics	A, D
Watanabe, R.	Asst. Prof.	Soil Testing	A
Whitney, S.	Assoc. Prof.	Soil Management	A, B, C, E

-
- * A - Problem Identification
 B - Problem Analysis
 C - Project Design
 D - Resource Evaluation and Planning
 E - Training

II. RELATIONSHIP OF SALARY SPENT TO ACHIEVEMENT OF GRANT OBJECTIVES

There are two ways to involve faculty in 211(d) grant activities. The first approach is to hire new staff to work on grant objectives. While this seems to be a reasonable approach, the expertise and experience gained through grant activities reside in untenured staff hired on soft money. Unfortunately, after grant termination, and under tight budget situations, the first staff members to be released would be the newly hired, untenured staff.

The second approach, which is more difficult to justify, but which serves the interest of the granting agency and the grantee institution is to hire new personnel to work on the local problem to release selected, promising tenured faculty to work on grant objectives. This arrangement ensures permanent retention of response capability in the grantee institution.

The faculty member released from his local responsibilities travels, acquires new skills, and develops new ideas. Good ideas must be tested. Good ideas are tested by good graduate students working under the supervision of faculty. Graduate student research remains the least expensive way to transform ideas into real practices. The training element is a major spin-off of this graduate program. In a good graduate program the faculty learns more from student research than the student

himself.

To achieve grant objectives, grant funds were used for salary in four ways. There were:

1. hire temporary staff to release permanent staff to work on grant objectives;
2. pay graduate students to work with faculty on grant objectives;
3. invite visting scholars; and
4. pay salary of clerical staff.

This dispropotionate use of grant funds for salary (75.7%) also indicates that a large portion of the operating cost for testing new ideas, both in the laboratory and field was borne by the grantee institution. In addition, several major research instruments obtained to upgrade the institution's response capability were purchaced with state funds. The 211(d) grant gave this department the flexibility to do what it had to do to develop a viable response capability.

III. STRATEGY FOR ACHIEVING GRANT OBJECTIVES

The Grantee institution's strategy was simple. It was to test the application of Hawaii's knowledge base to the tropics as a whole. Hawaii's focus was in the area of mineralogy and biology. Mineralogy was treated as the causative factor for biological effects. This cause and effect relationship, already well established in Hawaii, needed to be observed and studied in other parts of the tropics.

Greater faculty confidence to apply our knowledge base
Hawaii was the main outcome of this strategy. Mineralogy is part
of soil classification and soil classification is the rational
means to transfer knowledge base from one region to another.

SUMMARY SHEET**Ph.D. GRADUATES****DEPARTMENT OF AGRONOMY & SOIL SCIENCE****1969 - 1974**

TOTAL GRADUATES	31
NUMBER RETURNING TO TROPICS	23
U. S.	2
NEW ZEALAND	2
KOREA	1
POST DOCTORAL	3

III. A. 7. Data of Students (Ch. 7)
Ph.D. Candidates 1969 to 1974

(1)	(2)	(3)	(4)	(5)	(6)
Year Degree Awarded (1969-74)	Year Admitted into Program	Name of Student	Name of Adviser	Title of Dissertation (Resulting Publications)	Initial or Present Position - Employer
1969	1966	Abuzaid, Mohammed O.	D. Bartholomew	Root Properties of Sugarcane (<u>Saccharum officinarum</u>) in Relation to	Sugar Research Center, Guncid, Sudan
1969	1965	Adlan, Hassan A.	D. Plucknett	Effect of pH, Silicon and Phosphorus Treatments on Growth and Yield of Papaya (<u>Carica Papaya L.</u>)	Ministry of Agriculture, Gebel Marra Project, Zalingee, Sudan
1969	1966	Atkinson, Ian A. E.	L. Swindale	Rates of Ecosystem Development on Some Hawaiian Lava Flows	Soils Bureau, DSIR, Lower Hutt, New Zealand
1969	1965	Briones, Angelina M.	Y. Kanehiro	Nature and Distribution of Organic Nitrogen in Tropical Soils	University of Philippines
1969	1965	Briones, Aurelio A.	G. Uehara	Physics of Drained Paddy Soils	University of Philippines
1969	1966	Cagauan, Bernardino G.	G. Uehara	Solute Dispersion in Selected Tropical Soils	Philippines
1969	1966	Englerth, Edward	W. Sanford	Nitrogen Nutrition of the Pineapple Plant, <u>Ananas comosus (L.) Merr.</u> , Soil Nitrogen Status, and Dynamics of the Reniform Nematode Population, <u>Rotylenchus reniformis</u> Linford and Oliveira, in Relation to the Form of Nitrogen Fertilizer, Soil Acidity and Fumigation	Environmental Protection Agency, South Dakota
1969	1965	Roy, Animesh	R. Fox	Phosphorus-Silicon Interactions in Soils and Plants	Bangladesh Rice Research Institute, Dacca

III. A. 7. Data on Students (Chart 7)
Ph.D. Candidates 1969 to 1974

(1)	(2)	(3)	(4)	(5)	(6)
Year Degree Awarded (1969-74)	Year Admitted into Program	Name of Student	Name of Adviser	Title of Dissertation (Resulting Publications)	Initial or Present Position - Employer
1970	1965	Misra, Mahesh	R. Fox	Influence of Liming and K Fertilization on the Nutrition of Sugarcane and <u>Desmodium</u> Species	Jawahar Lal Nehru Agric. University, India
1970	1962	Obien, Santiago R.	R. Green	Degradation of Atrazine and Related Triazines in Hawaiian Soils	<i>Philippines</i>
1970	1967	Schroth, Charles L.	G. Uehara	Analysis and Prediction of the Properties of Western Samoa Soils	Dept. of Health, Juneau,
1970	1966	Yaibuathes, Nuanchavee	H. Ikawa	An Investigation of Tropical Histosols in Hawaii	Dept. of Land Development Bangkok, Thailand

III. A. 7. Data on Students (Chart 7)
Ph.D. Candidates 1969 to 1974

(1)	(2)	(3)	(4)	(5)	(6)
IR No. and Date 1974	Year Admitted into Program	Name of Student	Name of Advisor	Title of Dissertation (Resulting Publications)	Initial or Present Position - Employer
71	1966	Bruce, Romeo C.	H. Ikawa	A Study of the Relationship Between Soil and Quantitative Terrain Factors	University of Philippines
71	1969	Juang, Tzo-chuan	G. Uehara	Soil-Plant Relations in the Mineral Nutrition of Sugarcane with Special Reference to Zinc and Related Ele- ments	Taiwan Sugar Experiment Station
71	1968	Oldeman, Leonard	G. Uehara	Analysis of Sugarcane Production in Relation to Climate, Soil and Management	Dutch Technical Assistance Team Indonesia
71	1966	Soundararajan, S. S.	R. Fox	Sorbed and Solution Phosphorus and Their Relationship to Crop Response	Rurukura Research Station, New Zealand
71	1967	Thiagalasingam, Kandiah	J. Silva	Effects of Calcium Silicate on Yield and Nutrient Uptake and Mechanism of Silicon Transport in Plants	School of Biological Sciences Penang, Malaysia

III. A. 7. Data on Students (Chart 7)
Ph.D. Candidates 1969 to 1974

(1)	(2)	(3)	(4)	(5)	(6)
Year Admitted into Program	Year Admitted into Program	Name of Student	Name of Adviser	Title of Dissertation (Resulting Publications)	Initial or Present Position - Employer
372	1969	Connelly, Paul R.	D. Bartholomew	The Effects of Thermoperiod on the Carbon Dioxide Uptake and Compensation Point of the Pineapple Plant, <u>Ananas comosus</u> (L.) Merr	Agronomist, Del Monte Corp., Philippines
372	1970	Ezumah, Humphrey C.	D. Plucknett	The Growth and Development of Taro <u>Colocasia esculenta</u> (L.) Schott, in Relation to Selected Cultural Management Practices	International Institute of Tropical Agriculture, Nigeria
972	1967	Goswami, Kishore P.	R. Green	Fate of Ametryne in Soil, Nutrient Solution - Sugarcane and Soil - Sugarcane systems	Punjab Agric. University, India
972	1970	Nangju, Dimyati	D. Plucknett	Seed Pelleting as an Approach to Herbicide Selectivity in Direct Seeded Rice	International Institute of Tropical Agriculture, Nigeria
972	1970	Nicholls, Douglas	D. Plucknett	The Distribution and Movement of Tropical Pasture and Weed Species in Relation to Environment	Division of Tropical Agriculture - CSIRO, Brisbane, Australia
972	1970	Sin, Han Poong	P. Rotar	Gene Action in the Inheritance of Agronomic Traits in Intervarietal Diallel Crosses and Relative Importance of Gene Effect for Quantitative Characters in <u>Zea Mays</u> L.	KOREA
972	1969	Sinawong, Somsri	S. El-Swaify	Cation Exchange Equilibria in Irrigated Tropical Soils	Land Development Dept., Bangkok Thailand

III. A. 7. Data on students (Chart 7)
Ph.D. Candidates 1969 to 1974

(1)	(2)	(3)	(4)	(5)	(6)
Year Degree Awarded (69-74)	Year Admitted into Program	Name of Student	Name of Adviser	Title of Dissertation (Resulting Publications)	Initial or Present Position - Employer
973	1967	Dangler, Edgar W.	S. El-Swaify	Comparative Rheological Behavior of Suspended Clays with Varying Ionic Composition	Post-doctoral, University of Hawaii
973	1970	Escalada, Rodolfo G.	D. Plucknett	Tillering and Ratoon Cropping of Grain Sorghum (<u>Sorghum bicolor</u> (L.) Moench)	Post-doctoral, University of Hawaii
973	1967	Ravoof, Abdul	W. Sanford	Effects of Root Temperatures and Nitrogen Carriers on Nutrient Uptake, Growth and Composition of Pineapple Plants <u>Ananas comosus</u> (L.) Merr	University of Malaysia, Kuala Lumpur, Malaysia

III. A. 7. Data on Students (Chart 7)
Ph.D. Candidates 1969 to 1974

(1)	(2)	(3)	(4)	(5)	(6)
Year Degree Awarded (1969-74)	Year Admitted into Program	Name of Student	Name of Adviser	Title of Dissertation (Resulting Publications)	Initial or Present Position - Employer
1974	1969	Balusubramanian, Vethaiya	Y. Kanehiro	Adsorption, Denitrification and Movement of Applied Ammonium and Nitrate in Hawaiian Soils	University of Nigeria
1974	1971	Hirumburana. Niwat	W. Sanford	Inorganic Nutrition of Papaya (<i>Carica papaya</i> L.) and Macadamia (<i>Macadamia ternifolia</i> F. Muell)	Chieng Mei University, Thailand
1974	1967	Khalid, Rashid	J. Silva	Residual Effect of Calcium Silicate on the Movement and Availability of Nutrients in Tropical Soils	Post-doctoral, Louisiana State University
1974	1972	Stoop, Willem	R. Fox	Interaction Between Phosphate Adsorption and Cation Adsorption by Soil and Implications for Plant Nutrition	Dutch Technical Assistance Team Indonesia

The department of Agronomy and Soil Science's Graduate Program plans for the next six-year period will follow closely the changes of emphasis discussed within the six-year research plan. This will mean that Graduate Faculty Activities within the Areas of Concentration listed previously (III - C) will shift to meet the more current trends and associated problems. With renewed concern for world food production and limited fertilizer supplies it is anticipated that the areas of Crop Breeding, Genetics, and Cytology, Crop Production and Management, and of Soil Fertility and Plant Nutrition acquire new vigor and thus attract a larger number of graduate trainees and degree candidates. With continuing concerns for agricultural effects on the quality of our environment and for improved management of limited water supplies for effective agriculture, it is anticipated that more training will be required in, and more graduate students attracted to, the area of Soil and Water Management and Conservation. A new course offering by the department in this area is anticipated.

New emphasis on field research and training is beginning to take shape and is expected to grow stronger. This would allow an advantageous utilization of departmental personnel and facilities at the Hawaii, Maui, and Kauai Agricultural Branch stations.

Appendix D

Breakthroughs at University of Hawaii helped by the 211(d) Grant

The University of Hawaii had considerable competence in tropical soils when the grant was made. However, some very significant breakthroughs in tropical soils science were made or furthered considerably through grant activities. Some of these are as follows:

1. Phosphorus absorption isotherms (P).

Phosphorus has been a major problem in tropical soils for many years, mainly because tropical soils "fix" (tie up in forms which are unavailable to plants) large amounts of expensive P fertilizers after application to the soil. Such high P "fixation" causes low crop yields. For many years scientists have attempted to find a means to analyze soils and to find a way to assess soil P and to covercome P fixation. Dr. Robert Fox began working in 1967 to find an improved soil P analysis test. He came up with a new approach -- P sorption isotherms -- which is a way of determining how P is present in the soil solution (water) of various soils; this is the P which plants can obtain. This new method works very well for tropical soils and relates especially well with plant uptake of P. Dr. Fox has used the technique for many soils from Latin America,

Africa and Asia. Grant funds were used to verify the usefulness of the technique in other tropical areas. The method has been adopted widely in the tropics as the standard means of assessing soil P availability or problems.

2. Variably charged soils (pH-dependent charge)
of the tropics

During the 1950's and 60's, soil chemists of the Department had known that certain Hawaiian soils did not behave at all like temperate soils as reported in the scientific literature. Higher amounts of anion fertilizers (phosphates, sulfates, molybdates, etc.) were required in these soils to obtain plant responses than in temperate soils. Also, when massive applications of lime were applied to certain soils, expected changes in pH did not occur; rather, very small changes in pH occurred even with applications of 30 tons/acre or more!

Dr. Uehara began studying and reflecting on these anomalies. He and his students began to postulate the pH dependent charge theory for most tropical soils. They looked at research results in previous studies over the years. All agreed with the new concept. Further research under the 211(d) grant verified the new theory in Hawaii. But the real payoff came when Dr. Uehara was able to travel to other tropical areas and to Cornell and North Carolina on

sabbatical leave. He found that their research data also verified his theory and that the new concept had worldwide application.

3. Water relations of tropical soils (Field Capacity).

Field capacity (FC) is the amount of water left in a soil after water is applied and free drainage has occurred. In temperate zone soils water at FC is held at a tension of 1/3 bar. In tropical soils (for example in Hawaii and Brazil) FC is 0.1 bar. This is work that Dr. Uehara and his students have worked out and verified on the 211(d) research program.

4. Other breakthroughs which could be mentioned include (a) use of the X-ray quantometer, a machine designed for mining technology, for soil and plant research for the first time, (b) new understanding of water movement in tropical soils, (c) classification of Hawaii soils in the U.S. Soil Taxonomy, the FAO system and the French System, so management and technology transfers can be made on a scientific comparative basis.

UNIVERSITY OF PUERTO RICO
MAYAGUEZ, PUERTO RICO-00708

FEB 3 1975

FACULTY OF AGRICULTURE
DEPARTMENT OF AGRONOMY

PROJECT FOR THE DEVELOPMENT OF
EXCELLENCE IN THE TEACHING AND
RESEARCH IN TROPICAL SOILS 211 (D)

January 27, 1975

MEMORANDUM

TO Participants of the Executive
Committee Meeting of the 211(d)
University Consortium on Soils
of the Tropics.

FROM F. H. Beinroth *F. H. Beinroth*
Secretary, Executive Committee

Enclosed is the draft of the minutes of the Fall Executive
Committee Meeting held at Cornell University in Ithaca, N. Y.,
on December 15-18, 1974. This document intends to summarize
17 hours of deliberations and is, therefore, rather lengthy.

Please advise me of any corrections, additions or deletions
you would like to make. I would appreciate receiving your com-
ments by February 14, 1975.

Ms. Merrily Lee of Cornell University, provided transcripts
of the discussions held at the meeting. Her valuable assistance
is gratefully acknowledged.

Enclosure

FHB/lv

UNIVERSITY CONSORTIUM ON SOILS OF THE TROPICS
MINUTES OF THE FALL EXECUTIVE COMMITTEE MEETING

Ithaca, N. Y., December 15-18, 1974

PARTICIPANTS

Executive Committee

Chancellor R. Pietri Oms, University of Puerto Rico (Outgoing Chairman)
Dr. P. A. Sánchez, North Carolina State University (Incoming Chairman)
Dr. F. H. Beinroth, University of Puerto Rico
Dr. J. B. Collins, Prairie View A & M University
Dr. M. Drosdoff, Cornell University
Dr. J. I. Kirkwood, Prairie View A & M University
Dr. G. Uehara, University of Hawaii

Council of Deans

Director E. B. Oyer, Cornell University
Dean J. A. Rigney, North Carolina State University

Other Consortium Representatives

Dr. R. Abrams, University of Puerto Rico
Dr. R. W. Arnold, Cornell University
Dr. E. A. Brams, Prairie View A & M University
Dr. M. G. Cline, Cornell University
Ms. M. Lee, Cornell University
Dr. C. B. McCants, North Carolina State University
Dr. M. J. Wright, Cornell University

AID Representatives

Dr. T. S. Gill
Dr. D. L. Plucknett

CUSUSWASH Representatives

Dr. E. V. Richardson, Colorado State University
Dr. E. L. Smith, University of Arizona

IFDC Representative

Dr. E. C. Doll

MONDAY, DECEMBER 16, 1974

Chairman Pietri called the meeting to order at 8:45 AM. Dr. Oyer welcomed the visitors to Cornell University. Dr. Wright described the impact of the 211(d) grant on teaching and research activities at Cornell University.

The minutes of the previous meeting were read by Dr. Sanchez and approved. The participants expressed their appreciation for the well prepared and detailed minutes. The agenda was discussed and it was decided to hold the discussion on status of future 211(d) grants and the Consortium members' plans on Monday morning and to postpone discussion of the SCS bibliography, the Tropical Agronomy Field Course and the ICRISAT Seminar until Tuesday.

The induction of new grant directors at three member institutions was announced. These are: Dr. Uehara, University of Hawaii; Dr. Collins, Prairie View A & M University; and Dr. Beinroth, University of Puerto Rico. Cornell University will announce its new grant director during spring 1975.

Election of a new Chairman and Secretary

Dr. Kirkwood nominated Dr. Sanchez as Chairman of the Executive Committee; Dr. Uehara nominated Dr. Beinroth as Secretary. Dr. Gill moved nominations close and officers were elected as nominated.

Report on Status of Publication of the Proceedings of the Cali Seminar

Dr. Sánchez reported that the publication will be delayed because the editor, Dr. Elemer Bornemisza, has had unexpected difficulties. The revised manuscripts in English and Spanish will be sent to the printers in January. It is anticipated that the publication should be ready for distribution in mid-1975. The special grant from AID to conduct the Seminar and to cover publication costs has been extended to June 1975.

Report on the Directory of Tropical Soil Scientists

Dr. Brams reported that there are now some 300 entries in the directory and explained how they are computer processed. Dr. Drosdoff indicated that questionnaires were sent to all Latin American Institutions and that Dr. Charreau was enlisted to assist regarding African institutions. Asian scientists are still not adequately represented but Dr. Dudal promised to provide a listing of Asian institutions which will then be canvassed.

There was considerable discussion on the nature and format of the directory, the difficulty of selecting and evaluating scientists, the delicate matter of incompleteness, and the kind of publication. Dr. Brams requested a decision as to how Prairie View should proceed and Drs. Drosdoff and Sanchez suggested that a preliminary publication with the data now available be prepared in mimeographed form to serve as a basis of further discussion and to generate reaction from Consortium members and AID. It was agreed that Prairie View prepare this initial document for circulation at the next Executive Committee Meeting.

Dr. Gill expressed the need and value of such a directory to AID, as evidenced by a similar directory compiled for crop sciences. He also indicated that AID could publish the final document.

Report on Workshop on Research Information Networking

Dr. Drosdoff reported on this Workshop held in Washington, D. C., on October 24-25, 1975. The purpose of the Workshop was to explore among AID and its contractors and grantees how to improve the impact of centrally funded research and 211(d) grants in the LDCs through more effective information management. A summary report on this workshop with action recommendations may be obtained from AID's Office of Research and Institutional Grants.

Subsequent discussion showed that information generation should be separated from information dissemination. University-type research generally has to undergo a distillation process, needs to be integrated with related knowledge and translated into action programs for quick pay-off.

At this time incoming Chairman Dr. Sanchez assumed his duties and thanked Chancellor Pietri on behalf of the Executive Committee for serving two years as its chairman.

Status of Future of 211(d) Grants

Dr. Plucknett briefly reviewed recent developments in AID with particular emphasis on 211(d) grants. He mentioned that the Policy Determination for the Institutional Grants Program has been completed and approved. The importance of the 211(d) program, which was close to being scrapped, has been reaffirmed but funding will be difficult to obtain. Major policy changes include a utilization-oriented approach and greater involvement of Mission Directors.

Dr. Plucknett announced that Oregon State University has been awarded a 211(d) grant entitled "Foliar Nutrient Utilization and Conservation

in the Winter Rainfall Areas of the Tropics". He further stated that RAC has approved a project on N-fixation to be carried out at the University of Hawaii and that the International Fertilizer Development Center was set up at TVA.

Dr. Gill indicated that this meeting is crucial to AID as it should generate specific ideas about future Consortium activities and a mechanism to effectively utilize Consortium resources. At this point AID is concerned mainly with future rather than past activities and expects the Consortium to devise a viable network system with operative linkages with IFDC, CUSUSWASH and other institutions.

Consortium Members' Plans for Revision of 211(d) Proposals and Coordination of Proposals

Dr. Gill advised the use of the proposal by Oregon State University as a model for appropriate form and substance. Proposals should focus on development of response capability and emphasize the state-of-the-art reviews. Dr. Gill indicated that the schedule for submitting proposals is tight and that Cornell University, North Carolina State University and Prairie View A & M University should submit proposals in the next 6-8 weeks.

Dr. Plucknett briefly described the history and development of CUSUSWASH. He mentioned that the individual grants of this consortium have primary objectives, which are the original topics, and secondary objectives that relate to the primary objectives of the other member institutions. AID favors this approach and considers the individual grants as a package--the water management chain.

Dr. Drosdoff inquired about feed-back from AID regarding the Comprehensive Reviews. Dr. Gill replied that there exist internal reports by the review panels which contain what transpired at the reviews and the panels' recommendations. AID will communicate the outcome of the reviews to Cornell University, NC State University and Prairie View A & M University by January or February 1975.

Discussion began on the subject matter areas and the coordination of proposals. Tentative agreement was reached concerning each institution's area of concentration. In-depth discussion of this item was deferred to Wednesday morning.

Future of Consortium

Dr. Sanchez opened the afternoon session by inviting the AID representatives to comment on the kind of Consortium structure to be envisaged

for the future. Drs. Gill and Plucknett replied that the type of structure is of secondary importance as long as it is strongly utilization-oriented and produces the outputs desired by AID. These are in the areas of 1) problem identification and analysis, 2) advisory services and consultants, 3) project design and evaluation, and 4) resource evaluation and planning.

The overall objective of the Consortium was discussed and several titles were proposed. The title "Mobilizing Tropical Soils Knowledge for Increased Food Production" suggested by Dr. Plucknett met with general agreement. Further discussion of this subject was postponed until Wednesday.

Dr. Sanchez distributed copies of a Proposal by North Carolina State University for Establishing an International Tropical Soils Network Center and discussed the salient points of its scope and organization. The proposal calls for the establishment of a Center as a joint activity of the Consortium located at one of the member institutions. The Center would be governed by an Administrative Board and its activities coordinated by an Executive Committee composed of members of the five institutions. The staff at the headquarters would consist of a Director, Administrative Assistant and clerical staff. Two Associate Directors would be housed at other institutions.

Ensuing discussion indicated that the proposal was, in principle, acceptable to all participants. Drs. Drosdoff and Gill commented that the scope outlined appears to be too broad and that it should be scaled down. Further discussion was deferred to Wednesday.

Report on SCS Bibliography

Dr. Cline reviewed the background and approach of this information and retrieval system. Dr. Drosdoff reported that Dr. Orvedal has submitted a copy of the first phase of the project comprising the African countries located north of the equator and south of the Sahara. Phase two which includes the tropical countries south of the equator is expected to be completed by February 1975. The total cost for compiling and publishing the bibliography for all tropical regions was originally estimated to amount to \$ 10 - 12,000. Due to markedly increased printing costs and because more man-hours are required than anticipated, a more realistic figure would be \$ 20,000. Dr. Drosdoff inquired how Cornell University should proceed in light of the increase in cost.

Dr. Plucknett remarked that AID can probably provide the additional funds needed and indicated that the bibliography could be printed in by AID, preferably in several sections. Dr. Drosdoff reported that Cornell

University has to date spent \$5,500; namely \$1,000 for the feasibility study, \$500 for the sample copy and \$4,000 for the African countries. Estimated dates of completion for Latin America are: tropical South America, September 30, 1975; Central America and West Indies, March 31, 1976. The estimated cost for the Latin American section is \$5,500. The total cost for the bibliography excluding the Asian . . section thus amounts to \$11,000 or \$2,200 for each institution.

It was agreed that Cornell University should proceed with the preparation of the bibliography. Cornell University, NC State University, Prairie View and Puerto Rico committed themselves to contribute \$2,200 toward the total cost. Dr. Uehara indicated that the University of Hawaii is experiencing financial difficulties.

Dr. Sanchez announced that Dr. Cline has retired and thanked him on behalf of the Consortium for the prominent role he played in and his valuable contributions to the Consortium program. Dr. Sanchez also informed the group that Dr. Drosdoff has been honored with the International Service in Agronomy Award.

TUESDAY, DECEMBER 17, 1974

Status of International Fertilizer Development Center and Discussion of Collaboration with U. S. Institutions Involved in Tropical Soils

Dr. Doll described the organization and main program thrusts of TVA. In recent years the demand for TVA's assistance abroad has steadily increased. This demand could not always be met in part because TVA's legal set-up imposes restrictions regarding international involvement. For this reason and with support from AID the International Fertilizer Development Center was established at TVA. IFDC is governed by a Board of Directors under the general policy guidance provided by the Consultative Group on International Agricultural Research. IFDC will not be engaged in agronomic research but will work closely with existing international centers. Dr. Doll felt that there would be no conflict with the activities of the proposed Consortium Center, rather they would complement each other.

Dr. Doll added that TVA publications are available at no cost from:

Technical Library
National Fertilizer Development Center
TVA
Muscle Shoals, Alabama 35 680

Dr. Sanchez opened the discussion on the kind of relationship the Consortium could have with IFDC. Dr. Gill stated that AID would expect a close relationship and the development of a viable linkage. Dr. Doll indicated that IFDC is prepared to work closely with the Consortium on an informal or formal basis. The kind of arrangement would mainly depend upon the Consortium but the relationship can be as close as the Consortium wants it to be. Inasmuch as IFDC is still in its formative stage, Dr. Doll could make no firm commitment at this time.

It was agreed that the Consortium and IFDC keep each other informed on their respective activities and collaborate on technical matters on an informal basis. Dr. Sanchez suggested that IFDC be invited to Consortium activities and that a formal relationship be discussed at a propitious time in the near future.

Proposal for an International Seminar on Soil and Water Management for Erosion Control

Dr. Smith informed the group of CUSUSWASH's intent to hold this seminar in an LDC. At this time plans are still very tentative but the substance will be practical rather than theoretical and will center on problem-solving aspects. The seminar should create awareness of the seriousness of soil erosion in LDCs, show how to evaluate erosion problems and their consequences, and indicate the techniques for erosion control. The audience is expected to include administrators, planners and scientists from LDCs in addition to invited scientists from the U. S. Date, location and duration are still subject to discussion. Dr. Smith indicated that CUSUSWASH would welcome the Consortium's cooperation.

It was agreed that this would be a good opportunity to initiate closer cooperation with CUSUSWASH. Dr. Sanchez observed that at least 18 months of planning and preparation are needed. He further cautioned about mushrooming groups and that a careful balance should be maintained between LDC and US participants. There should also be no conflict with other Consortium activities. Dr. Richardson indicated that the seminar could be held as late as June 1977. Dr. Gill suggested Haiti as a possible location because of serious erosion problems there and its accessibility.

It was the consensus to co-sponsor the seminar. Dr. Kirkwood was designated to take the leadership for the Consortium and will attend the CUSUSWASH Meeting to be held in Riverside, California, in January 1975.

Report and Discussion on the Tropical Agronomy Field Course for 1975

Dr. Uehara stated that the field course cannot be presented in 1975. Dr. Sanchez pointed out that the Consortium has assumed the responsibility of holding this course upon a request from the International Agronomy Division of the American Society of Agronomy. The Consortium's inability to fulfill its commitment would constitute a loss of face. Dr. Doll mentioned that there would be a conflict with the 1975 ASA Meeting which is also scheduled for summer. Dr. Gill considered the planned field course to be a marginal grant activity and Dr. Plucknett felt that the time and effort would better be expended on state-of-the-art-reviews.

After discussion on whether the course should be postponed or cancelled, all Consortium institutions except Cornell University voted to scrap the course.

Report on Plans for the 1976 ICRISAT Seminar

Dr. Uehara reported that the plans for the seminar on "Uses of Soil Survey and Classification in Planning and Implementing Agricultural Development in the Tropics" to be held at ICRISAT at Hyderabad, India, in January 1976 proceed satisfactorily and on schedule. The Steering Committee will meet in Hawaii probably in early 1975.

Dr. Gill indicated that there is considerable support in the Agency for this seminar and that it will be funded partially in FY75 and the remainder in FY 76.

Report on Future Tropical Soils Institutes

Dr. Uehara recommended that the first workshop should relate to soil classification and that it should be held in either the Philippines or Indonesia no earlier than six months after the ICRISAT Seminar. It was agreed that the Consortium Center will assume the responsibility of organizing this workshop. The University of Hawaii agreed to accept the responsibility should the Center not have materialized by that time.

Brief Reports on Status of Soils Research Projects of Consortium Members

Drs. Uehara, Beinroth, Drosdoff and Sanchez summarized status and results of AID-supported soils research conducted by their respective

universities. The ensuing discussion allowed exchange of ideas and suggestions.

Proposal for a Seminar on Savanna Soils

Dr. Collins reported that Prairie View is investigating the possibility of organizing a seminar on savanna soils at an international center either in South America or Africa. Dr. Gill informed the group that he has received a proposal for a seminar on "Savanna Soils of the Sub-Humid and Semi-Arid Regions of Africa and their Management" from Dr. H. B. Obeng, Ghana. This seminar is to be held in Accra in November 1975.

Dr. Gill indicated that AID would like to see the Consortium's active participation in this activity with respect to presentation of papers, identification of individuals to be invited and support of participants. It was agreed that Drs. Collins and Drosdoff further investigate the Ghana seminar and the Consortium's involvement.

At 4:30 PM Dr. Cline conducted a tour of Bradfield Hall and showed the facilities of Cornell University's Department of Agronomy.

WEDNESDAY, DECEMBER 18, 1974

Continuation of Discussion of the Future of the Consortium and its Operations

Discussion was resumed on the subject matter area of each institution and their coordination. Dr. Gill indicated that no details are required at this time but that the areas of concentration should be clarified and identified. Subject matter areas were delineated, titles developed and primary, secondary and ultimate objectives established. The results of the discussion were condensed into a table which is presented as Attachment A.

Dr. Gill mentioned that the basis for extending the grants will be the action statements and recommendations that emerged from the Comprehensive Reviews. No definite timetable exists for submission of extension/revision statements but TA/AGR will advise the institutions regarding actions and the format to be used.

Dr. Sanchez reopened the discussion on the Tropical Soils Resource Center. Dr. Gill stated that the funding of a new grant for this center would take a long time whereas funding through a Basic Ordering Agreement could be obtained within three months. Dr. Gill also pointed out that for funding under BOA the utilization aspect is essential and that the proposal

should provide for short and long-term services in addition to the development of the knowledge base.

Dr. Sanchez felt that eventually the Center should be a Consortium affair but that it appears to be expedient to initially proceed through a BOA to get the Center going. He suggested the following actions: 1) NC State prepares a revised proposal, 2) NC State circulates this proposal to Consortium members for approval, additions or corrections, 3) NC State submits proposal to AID for funding under a BOA, and 4) each Consortium university commits itself to support the Center and includes this in its extension/revision proposal.

Dr. Uehara moved that the Consortium proposes to establish a Tropical Soils Resource Center through a Basic Ordering Agreement. Dr. Sanchez amended the motion to read "The Executive Committee Authorizes North Carolina State University to propose the establishment of a Tropical Soils Resource Center on behalf of the Consortium under a Basic Ordering Agreement with AID". Dr. Kirkwood seconded the motion and it was carried as amended.

(At this time the Secretary had to leave. The remainder of the minutes are summarized from the notes taken by Ms. Lee.)

Dr. Cline suggested that the primary objective of the Center should be item (3) on page 6 of the NC State proposal, namely "To serve as a focal point for AID and other donors seeking qualified scientists for specific functions and for developing countries requesting such assistance".

Dr. Gill pointed out that the proposal for the Center should include the scope of work, a plan of work, personnel, and a skeletal budget for establishing the Center structure. Additional funding would be available for seminars.

Dr. Cline felt that one director could handle the business of the Center provided he has competent administrative and secretarial staff. Regarding the director's salary, the fringe benefits usually offered by universities should be considered; if these are not available, compensation through higher salary would have to be made.

Dr. Sanchez restated that NC State will draft the proposal for the Center and circulate it among Consortium universities who should revise and return the proposal within two weeks. The cost per university to be included in the budgets of the extension/revision proposals is estimated at \$20,000 annually. This will provide the Center with an annual budget of \$100,000.

Additional Items - Executive Committee Meeting, Spring 1975

The next Executive Committee Meeting will be held in Hawaii after May 15, 1975. It was decided to invite a representative from CUSUSWASH to this meeting for consultation concerning the structure of the Tropical Soils Resource Center

The meeting was adjourned at 12:40 PM.

Respectfully submitted,

A handwritten signature in cursive script, reading "F. H. Beinroth".

**F. H. Beinroth, Secretary
Executive Committee**

Consortium Title: MOBILIZING TROPICAL SOILS KNOWLEDGE FOR INCREASED FOOD PRODUCTION**Consortium Objective: To develop, sustain and utilize the response capability for identifying and evaluating soil problems related to food production in the tropics and to recommend remedial management practices****Expected Outputs in Primary Subject Matter Areas:**

1. Knowledge base
2. Training capacity
3. Research capacity
4. Advisory capacity
5. Linkages and networks

<u>Institution</u>	<u>Primary Objective</u>	<u>Secondary Objective</u>	<u>Ultimate Objective</u>
Cornell University	Soil Resource Inventory	Soil-water relations Biological N-fixation	Alternative Management systems for given soil use
Univ. of Hawaii	Soil Mineralogy and Biology	Soil physics & chemistry Biological N-fixation	Relate soil mineralogy and biology to management systems
NC State University	Soil Fertility	Soil physics Biological N-fixation	Soil fertility related to management systems
Univ. of Puerto Rico	Soil Classification and Geography	Soil characterization	Soil potential for management systems
Prairie View A & M Univ.	Delivery Systems for Soil Technology	Savanna/Prairie eco-systems	Adapting soil management systems for delivery

"State-of-the-art" Paper

A. What is a "state-of-the-art" paper?

As used here a "state-of-the-art" paper is a keenly analytical review of the knowledge accumulated by research and practice on either a narrow or broad subject setting forth the established principles, how and where they can be used, and identifying the gaps in knowledge needing research for establishment of better principles. If there is no practical or economic solution to the problem for a specific area or soil, alternatives should be suggested. Some conventional "reviews" meet these standards, but most do not. It should not be an anthology, a telephone book of abstracts, and should not attempt to cite all of the accumulated literature. Emphasis must be on the principles and how they can be applied. It is not a recipe book, but rather a guide on how to diagnose and solve a problem with the emphasis on simplicity and economy.

B. What is its purpose?

It serves several useful purposes in research for and in application of knowledge. For the one, or ones, who prepare the paper, preparation forces them to critically examine the literature, distill out the principles, and crystalize new and researchable hypothesis. For other researchers not involved in the paper's preparation but working in the area, it gives an authoritative background as to what needs investigating. Far too much research is undertaken without a critical review of the literature beforehand with the result that enormous amounts of research.

efforts are wasted: investigations of problems already solved or impertinent problems. For guidance of research where principles have been established, but their application is being tested, the "state-of-the-art" paper should offer a guide for testing these principles with a minimum of effort, cost, and time.

In application of knowledge (extension, education, delivery systems) "state-of-the-art" papers are the guide as to what should be and what should not be delivered. This is an important point. Such information on soil and water management developed in temperate climates with temperate-zone cropping systems cannot be extended and to do so is dangerous. "State-of-the-art" papers targeted at LDC problems and to soils in the tropics are particularly important to what can be and should be extended.

C. When, how, who?

"State-of-the-art" papers should be written when there is a definite need and someone or ones with the ability available to write them. Since the emphasis is on critical analysis of accumulated knowledge, time for preparation might well take 1 to 2 years of part time work. The greater the experience and accumulated knowledge of the writers, theoretically less the time required. From the standpoint of TA/AGR negotiations for "state-of-the-art" papers might well be a part of 211(d) grants and research contracts. More expensive modes, where expertise is not otherwise available is through special contracts with institu-

tions and consultants. Since the emphasis is on critical analyses and quality, authors must be carefully screened as to ability. Authorship can be single or multiple up to 2 or 3, but committee preparation usually lacks depth and individual responsibility clearly needed for analytical thinking. All manuscripts should be critically reviewed by peer scientists for adequacy, accuracy and logic of interpretation and within AID for applicability.

In negotiations with authors and institutions as part of grants and contracts, AID should solicit their viewpoints on needs and subject matter for subsequent determinations of competence and sufficient enthusiasm to give the writing high priority.

The objective in publication should be wide availability at reasonable cost for a period of 5-10 years. AID might consider publishing a numbered series through GPO. Other alternatives are review series such as *Advances in Agronomy* or experiment station bulletins, but such alternatives are definitely less desirable.

The style and language should be as simple as possible commensurate with adequate communication of the subject matter. The audience should be regarded as scientists having no specialized training in the subject matter, writers preparing more popular educational reading material, and scientifically trained staff of LDCs and their institutions.

D. How would "state-of-the-art" papers help food production in LDCs?

First, in LDCs they would supply authoritative sources of information

to teachers and students of soils at the university level wherein tropical soils is a neglected subject, to scientists conducting research pertinent to LDC production problems, and to persons writing educational materials for use in LDCs. For example, now there is no authoritative guide to the behavior of phosphate applied to tropical soils and the needs and response of tropical crops to phosphate application.

Second, and probably more important, such papers would be an invaluable guide, almost a textbook, for guidance of scientists in LDCs in their research and educational programs. Of course they would need to make adaptations for their situations, but they would have at hand the best scientific or theoretical knowledge on the subject for their guidance.

E. What subjects would be covered?

Subject matter can range from very narrow to very broad depending on needs and availability and competence of writers. No attempt should be made to cover all subjects pertinent to increasing food production in LDCs. By the time the last ones are written the first ones will be outdated. Overlap between subjects should be minimized, but cannot and should not be avoided. Nature and the production problems related to its variations and limitations were not put in neat little boxes. Subject matter should not be directed at a single country or several adjunct countries, but should be written for world-wide application to similar soils, climates and problems. The extent of applicability

should be stated insofar as known from the world literature, soil maps, climatic data, etc.

F. What subject can be suggested now for the soil and water area in tropical and subtropical soils?

As suggested, subject matter development must be a continuing endeavor based on (1) need, and (2) availability of competence for critical review and exposition. Opportunities offered by future grants and contracts should not be overlooked.

Completion of reviews of 211(d) grants in tropical soils suggests that now is the time for "state-of-the-art" papers in several areas. Some of these could have been prepared during the duration of the grants, but neither AID nor the grantees showed much initiative.

Suggested topics are:

1. Soil acidity, its interpretation and adjustment in oxisols and ultisols. Reviews by E. Kamprath of North Carolina and by R. Pearson (working with Puerto Rico and assistance of Cornell grant) may be taking care of this topic.

2. Phosphate requirements and fertilizer reactions with tropical soils. Suggested authors are: R. L. Fox, U. of Hawaii; D. L. Bouldin of Cornell, and possibly Kamprath of North Carolina.

3. Water availability, retention and flow in acid tropical soils. Suggested authors are G. Uehara,

4. Soil mapping, classification and concepts of grouping of similar tropical soils as to productivity and management requirements.

Suggested authors F. Beinroth, Igawa, L. Swindale.

5. Alternatives in cropping, and cultural systems on tropical soils.

6. Aluminum toxicity: its nature, correction and avoidance.

7. Soil management problems of tropical grasslands.

For institutions with 211(d) tropical soils grants seeking extensions in a utilization mode, authors could be expected to work on "state-of-the-art" papers when they are not involved in special consulting for AID, LDCs and international centers. As a condition for consideration of extension of grants, these institutions could and should be asked to prepare their own list of topics and indicate willingness to participate. This should be a collaborative effort among them. Any suggestions that institutions make either individually or collectively must be carefully screened as to competence of the suggested authors in order to avoid later embarrassing situations--an unsatisfactory effort and manuscript that will not pass review.

FViets, Cons.
TA/AGR, 2/20/75

January 16, 1975

Appendix G

INFORMATION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR FOR AFRICA

THRU: AA/AFR, Donald S. Brown

FROM: AFR/DS, Princeton Lyman
/s/ Princeton Lyman

**SUBJECT: Review of the University of Hawaii's 211(d) Grant in
Tropical Soils: Relevance to Africa Programs**

As you know, this is the second review in which I have participated with TAB on tropical soils, having chaired the Cornell review last spring. These reviews suggest that we in the Africa Bureau need both (a) to learn how better to tap the university community and (b) to suggest more actively to it the kinds of contributions they could make to the LDCs.

Under Ray Mitchell's leadership, TAB is working hard to sharpen the focus and usefulness of the 211(d) instrument and to create a stronger link between the R&D planning in TAB and the utilization of R&D expertise through the Regional Bureaus. By contrast to Cornell last spring, the University of Hawaii was much more ready to consider ways of making its expertise more directly relevant to AID's concerns, and to extend its native tropical soils knowledge outward. Whereas Cornell saw its greatest contribution in turning out Ph.D's in the "grand manner", the University of Hawaii is conscious of special characteristics and problems of tropical soils and of the need to develop new approaches to teaching and research relevant to the LDCs.

Having said that, it is clear that more and more universities today are not interested in taking on long-term programs of direct technical assistance or institution building overseas. The situation in Tanzania last year, when the University of Hawaii advised on the design of a program but refused to take on the project itself, was discussed at length. By and large, state universities see their ability to take on such efforts restricted by (a) shortage of skilled staff, (b) greater pressure from state legislatures to focus largely on state needs, and (c) unwillingness to become "hiring halls" (as AID criticized them for doing) when they can't spare their own staffs. Rather than criticize the universities for this, we need to learn how to tap into the new knowledge they are building and to gain their skill in program design, even as we find (or fashion) other instruments for project implementation. (AID needs to note, as our DI staffs decline, that universities will not be the ones to pick up the gap in overseas project management and implementation).

I was struck in this review by the knowledge that is being developed on the campus but not flowing into LDC program considerations -- not only AID's but others. The University of Hawaii staff, in travelling to LDCs, found such things as (a) research being carried on in Brazil that had been done in Hawaii 20 years earlier, (b) research on soil fertility, per se, being carried forward ritualistically in Kenya when water (soil physics) was the major constraint in the soils there, and noons working on that, and (c) insufficient, perhaps even inaccurate, understanding of tropical soils characteristics in even the major teaching and research institutions to which many LDC students went for training. I found, at Hawaii's research station on Maui, experiments in planting stilo (a perennial legume that serves both as feed and soil replenishment) which has been very successful in Australia's northern regions multiplying cattle production (it can be aerial seeded) and which apparently would be adaptable to the Sahel-Sudano region, but except for an FAC experiment in the higher rainfall region of the Sudano area, no active work was going on in the Sahel to use this to replenish overgrazed areas (imagine the potential if it could aerial seeded over large areas).

While these are individual examples, the more fundamental problem is that there is not sufficient focus on how the tremendous store of knowledge (and that being added each day) can be transferred more rapidly to the LDCs. Traditional teaching and trickle down systems will not do; they only guarantee that the LDCs will become farther behind relatively as they seek to apply traditional methods of analysis and research adaptation. Yet, there is potential for much more dramatic breakthroughs. In the field of tropical soils, there are thousands of types, and sub-species, and related to each a body of research and experience. ~~None~~ yet has undertaken to systematize all of this and make it computer-compatible for easy, worldwide access. There are beginnings in this direction. USDA is working on the final stages of a worldwide soil classification system, and is financing in Hawaii an experiment in research and data storage and retrieval. AID is sponsoring research by Hawaii and Puerto Rico on the transferability of experience from similar soil types in one region to those in another (there will be one research site in Africa).

→ But ~~none~~ is yet looking ahead to how this might change the whole way LDC agricultural research systems are trained and organized. Look ahead and imagine a system, perhaps only 10 years hence, when an LDC technician would have a computer terminal in his station that would allow him to type in the characteristics of the soil type, climate and water conditions on which he was working and get back in minutes the type, sub-type and other relevant categorization of the soil; the principal experiments and results done on that type of soil; and the particular further tests that would be most relevant. With the knowledge existing available, the miniaturization and lowering cost of computer hardware, and new systems of information storage, this is not at all far-fetched. But to make it a reality (it

would take a very different and much more active approach to developing technical transfer systems and designing LDC research networks than is even being contemplated by the universities today] -- e.g., Cornell found this concept "interesting" but still felt the best thing they could do was train LDC scientists to be able to analyze each of their several thousand soil types when they saw them, i.e., to work from scratch; good for the scientist, terrible for the progress of the LDC. This approach will never link the LDCs actively into the worldwide research community.

[Africa Bureau, along with others, should work with TAB to urge universities to focus more on this relevance and transfer factor, and -- in the area they should know best -- think how to change radically the training and deployment of LDC scientists and technicians.] Given Mr. Parker's interest in the use of modern systems and automatic data equipment to solve LDC problems, along with AID's interest in expanding agricultural research in response to the world food problem, this could be a major focus for AID.

Finally, I am concerned that AFR has not moved fast enough to develop agricultural research capacity in Africa. I believe this should be a major focus in the next year. Donald Plucknett, an excellent agricultural scientist with TAB on an IPA arrangement, is prepared to devote some time to working with us on this in the coming year. I think we should capitalize on his skill, and his links to the research system worldwide. Dennis Conroy and I have discussed how we might organize for this special effort in Africa, and we will be coming to you subsequently on specific recommendations.

Attached is a copy of my recommendations to TAB on the University of Hawaii review.

Attachment a/s

cc: AA/AFR, L. Hobson
AFR/DS, S. Klein
AFR/DS, A. Gayoso
AFR/RA, D. Conroy
AFR/RA, W. Leake
TA/AGR, L. Hesser
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