

CLASSIFICATION
PROJECT EVALUATION SUMMARY (PES) - PAK/1

Report Symbol U-447

1. PROJECT TITLE Soil Families - Hawaii Current Contract (AID/ta-C-1108)	2. PROJECT NUMBER 931-0582.11	3. MISSION/AID/W OFFICE DS/AGR/TSWM
4. EVALUATION NUMBER (Enter the number maintained by the reporting unit e.g., Country or AID/W Administrative Code, Fiscal Year, Serial No. beginning with No. 1 each FY) <input type="checkbox"/> REGULAR EVALUATION <input checked="" type="checkbox"/> SPECIAL EVALUATION		

5. KEY PROJECT IMPLEMENTATION DATES A. First PRO-AG or Equivalent FY <u>74</u> B. Final Obligation Expected FY <u>82</u> C. Final Input Delivery FY <u>83</u>	6. ESTIMATED PROJECT FUNDING (includes yr extension mentioned below) A. Total \$ <u>6,288,000</u> B. U.S. \$ <u>6,288,000</u>	7. PERIOD COVERED BY EVALUATION From (month/yr.) <u>June, 1976</u> To (month/yr.) <u>March, 1979</u> Date of Evaluation Review <u>March 9-23, 1979</u>
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8. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR

A. List decisions and/or unresolved issues; cite those items needing further study. (NOTE: Mission decisions which anticipate AID/W or regional office action should specify type of document, e.g., airgram, SPAR, PIO, which will present detailed request.)	B. NAME OF OFFICER RESPONSIBLE FOR ACTION	C. DATE ACTION TO BE COMPLETED
<p>Extend the contract for three(3) years, from June 1980 to June 1983, to complete the scheduled scope of work and which will involve:</p> <ul style="list-style-type: none"> - Revised Project Statement - AID Review - RAC Review - Contract Office <p style="text-align: center; margin-top: 20px;"><i>BEST AVAILABLE COPY</i></p>	<p style="text-align: center;">Joint:</p> <ul style="list-style-type: none"> o Un. Hawaii (Dr. Silva) and o DS/AGR (Dr. Gill) o DS/PO/RES (Dr. Recheigle) o CM/COD/AN 	<ul style="list-style-type: none"> - 8/79 - 9/79 - 1/80 - 3/80

9. INVENTORY OF DOCUMENTS TO BE REVISED PER ABOVE DECISIONS <input checked="" type="checkbox"/> Project Paper <input type="checkbox"/> Implementation Plan e.g., CPI Network <input type="checkbox"/> Other (Specify) _____ <input type="checkbox"/> Financial Plan <input checked="" type="checkbox"/> PIO/T _____ <input type="checkbox"/> Logical Framework <input type="checkbox"/> PIO/C <input type="checkbox"/> Other (Specify) _____ <input type="checkbox"/> Project Agreement <input type="checkbox"/> PIO/P _____	10. ALTERNATIVE DECISIONS ON FUTURE OF PROJECT A. <input type="checkbox"/> Continue Project Without Change B. <input checked="" type="checkbox"/> Revise Project Design for 3 yrs extension <input type="checkbox"/> Change Implementation Plan C. <input type="checkbox"/> Discontinue Project
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11. PROJECT OFFICER AND HOST COUNTRY OR OTHER RANKING PARTICIPANTS AS APPROPRIATE (Names and Titles) T. Gill <i>DS/AGR</i> M. Mozynski, <i>DS/AGR</i> Jean F. Peterson Project Manager <i>9/5/79</i> Director, DS/AGR	12. Mission/AID/W Office Director Approval Signature Typed Name <u>Tony Babb</u> DAA/FN/DSB Date <u>6/15/79</u>
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13. SUMMARY: The project entitled, "Crop Production and Land Capabilities of a Network of Tropical Soils Families", (short title-Soil Families-Hawaii) more popularly known as the Benchmark Soils Project was established to determine scientifically the transferability of agro-production technology among tropical countries based on the U.S. system of Soil Taxonomy. The goal of the project is to hasten the process of agricultural development towards increased food production, better nutrition and general well being of the small farmers in the LDCs.

A contract was signed between AID and the University of Hawaii during May 74 to initiate the project. Since then a network of experimental sites have been installed in various areas of the world: first in Hawaii, then in the Philippines and later in Indonesia. The last ones are due to get started in Cameroon during Fall of 1979.

A project design workshop was held during 1974-before funding the project. A comprehensive review of the project was conducted during May 1976. Another on-site review and evaluation of the project by an independent panel was conducted recently- during March 1979. This project evaluation summary (PES) report is written as a result of this recent review. This panel visited sites in Hawaii, Indonesia, and the Philippines, and conferred with benchmark soils staffs at these sites, and with AID missions and country cooperators in Indonesia and in the Philippines.

The review panel was impressed by the high quality of experimental work, the quality and enthusiasm of the staffs, the efficient field organization, the cost effective operations, and the quality of the training and informational programs. The project has established outstanding working relationships, is enthusiastically supported by the Soil Research Institute (SRI) of Indonesia, and the Philippine Council for Agriculture and Resources Research (PCARR).

The review team concluded that the project is likely to meet its objectives and is making valuable contributions to the transfer of technology among countries of inter-tropical areas. It recommended that the contract be extended for an additional three years to fully realize the benefit from investments to date.

DS/AGR strongly concurs with the recommendations of the panel. It will discuss these recommendations and future disposition of the project with the contractor. The office will request the Agency to consider extending the project for additional three years (until June 1983).

14. EVALUATION METHODOLOGY: The purpose of this review was to assess the status and progress of the project in order to : (a) facilitate achievement of project objectives; (b) to assist DS/AGR in improved management of the project; and (c) to help AID in utilization of the project outputs for the benefit of the LDCs. In addition DS/AGR required recommendations for future programming with respect to this project.

A review panel consisting of Dr. Klaus Flach, Team Leader; Dr. John Ehrenreich; and Dr. Paul Giordano conducted during March 1979 an on-site review of the Soil Families Project in Indonesia, the Philippines and Hawaii. Dr. Flach is Assistant Administrator, Soil Survey, U.S. Department of Agriculture, Soil Conservation Service, Washington, D.C. Dr. Ehrenreich is Dean, College of Forestry, Wildlife, and Range Sciences, University of Idaho, Moscow, Idaho. He is also a member of Research Advisory Committee (RAC). Dr. Giordano is Research Soil Chemist, Division of Agricultural Development, Tennessee Valley Authority, Muscle Shoals, Alabama.

In addition, the panel was accompanied by Dr. James Silva, Principal Investigator for the Soil Family Project. After visits to the experimental sites the panel held discussions with respective personnel of the local national institutes (Soil Research Institute in Indonesia and the Philippine Council for Agriculture and Resources Research), USAID missions and the project staff. Dr. T.S. Gill, AID/W project manager joined the panel on the final day of the review on the campus of the University of Hawaii. A number of briefings were held that day for the panel by Dr. F. Cady, a consultant from Cornell University on statistical analysis of the data; Dr. B. Caguan on training component of the project; by Ms. C. Garver on project publications; by Dr. H. Ikawa on data bank and by Dr. G. Uehara and Mr. A. Hurdus on special studies related to the project.

The panel discussed the administration related matters of the project with the Assistant Dean of the College of Agriculture and the President of the University.

15. EXTERNAL FACTORS: As a result of close working relationships established between the project staff and the host countries (Indonesia and the Philippines) as well as the contributions made by these countries themselves, the impact of the project on independent research and country planning is very encouraging. The Director of the Soil Research Institute in Indonesia indicated that the concept of the project will be employed at several research centers around major crop production areas (upland rice, soybeans, corn and cassava). It was also suggested that identification and correction of soil management problems in sparsely populated sumatra may aid in transmigration from overcrowded Java. Mr. Walter Tappen, Chief Agricultural Development Officer from USAID/Jakarta considered the project as a showpiece for visitors. He was very pleased with the application of the transfer concept within Indonesia and the outstanding cooperation and interplay with the Soil Research Institute.

In the Philippines the project is well supported by the Philippine Council for Agriculture and Resource Research (PCARR). The Council cosponsored a training session during 1977 on agro-technology transference for 42 participants from the Philippines, Brazil, Indonesia, Malaysia and Thailand. Another session is planned for 1979 with emphasis on Soil Taxonomy and directed mainly for soil survey agencies and agricultural planners. It is understood that the Philippine Bureau of Soils is requesting the Philippine government to implement a national program to classify the soils according to Soil Taxonomy to systematize transfer of agro-technology from one area to another. While USAID/Manila is not as much involved (for lack of staff) with the project as they would like to, yet it was complimentary of the project and its personnel.

16. INPUTS: There are no problems of consequences with regards to commodities, personnel or other inputs in terms of quality, quantity and timeliness. The panel was very impressed with the excellence in personnel ranging from the project leaders to the field workers and thought that the project was being executed effectively by highly competent managers and technically sound scientists. It was further stated by the panel that the funds appeared to be used judiciously with regard to vehicle purchases, field installations, and manpower utilization. The versatility and ingenuity of the field staff was exemplified on several occasions in the form of homemade drying ovens, storage sheds, offices etc. The panel also noted that the security of the field sites was excellent. The plots were either protected by fences or located on secure farms or experiment stations.

The panel commended the project for its active training component, a recommendation emphasized by the previous review team. The panel was impressed by the progress of the consulting statisticians. They are displaying a high degree of competence and innovation in developing the transfer model.

17. OUTPUTS: The progress of the actual outputs is pretty much on target when measured against projected outputs.

The network of three upland soils families which was needed to test the hypothesis of agro-technology transfer is complete except for operational work in Cameroon. Sites have been established and studies are being conducted in Hawaii, Indonesia and the Philippines. Memorandum of understanding has just been negotiated with Cameroon (ONAREST-Office National de la Recherche Scientifique et Technique) for site establishment and implementation of project experiments.

Various significant outputs are shown in the following four milestone event charts.

Milestone Event Charts

1. Completion of Soils Network

Soils	1975	1976	1977	1978	1979	1980
<u>Hydric Dystrandepts</u>						
Hawaii	Ⓢ — △ — Ⓒ					
Philippines	Ⓢ — △ — Ⓒ					
Indonesia	Ⓢ — △ — Ⓒ					
<u>Tropoctic Eustrustox</u>						
Hawaii - Molokai	Ⓢ ————— △ — Ⓒ					
- Waipio	Ⓢ ————— △ — Ⓒ					
<u>Ultisols</u>						
Philippines - BPI	Ⓢ ————— △ — Ⓒ					
- Site #2		Ⓢ —————				
- Site #3		Ⓢ —————				
Indonesia - Nakau	Ⓢ ————— △ — Ⓒ					
- BFM	Ⓢ ————— △ — Ⓒ					
- Buk	Ⓢ ————— △ — Ⓒ					
Cameroon	Ⓢ —————					

Ⓢ - Preliminary survey of potential sites △ - Long-term agreements negotiated and signed Ⓒ - Sites staffed, equipped and prepared

2. Test Hypothesis of Agrotechnology Transfer

	Initial Phase			Extension Phase I			Extension Phase II		
	1975	1976	1977	1978	1979	1980	1981	1982	1983
<u>HYDRIC</u>									
<u>DYSTRANDEPT</u>									
Hawaii Maize	Ⓢ — △ — △ — △ — △ — ① — △ — △ — ② — △ — ③								
Hawaii Soybeans	Ⓢ — △ — △ — △ — △ — ① — △ — △ — ② — △ — ③								
Phil Maize	Ⓢ — △ — △ — △ — △ — ① — △ — △ — ② — △ — ③								
Phil Soybeans	Ⓢ — △ — △ — △ — △ — ① — △ — △ — ② — △ — ③								
Indo Maize			Ⓢ — △ — △ — △ — ① — △ — △ — ② — △ — ③						
Indo Soybeans			Ⓢ — △ — △ — △ — ① — △ — △ — ② — △ — ③						
<u>TROPEPTIC</u>									
<u>EUTRUSTOX</u>									
Hawaii Maize				Ⓢ — △ — △ — ① — △ — △ — ② — △ — ③					
Hawaii Soybeans				Ⓢ — △ — △ — ① — △ — △ — ② — △ — ③					
<u>ULTISOLS</u>									
Phil Maize				Ⓢ — △ — △ — △ — △ — ① — △ — ②					
Indo Maize				Ⓢ — △ — △ — △ — △ — ① — △ — ②					
Africa Maize (Cameroon)					Ⓢ — △ — △ — △ — ① — △ — ②				

Ⓢ - Set up sites and install experiments ② - Test hypothesis across the network, 2nd approximation
 △ - Harvest experiments and collect data ③ - Test hypothesis across the network, 3rd approximation
 ① - Test hypothesis across the network, 1st approximation ④ - Terminated

3. Crop and Soil Management Experiments

	Initial Phase			Extension Phase I			Extension Phase II		
	1975	1976	1977	1978	1979	1980	1981	1982	1983
HYDRIC									
DYSTRANDEPTS									
Hawaii	Maize	Ⓢ △	△ △	△ △	① △ △	△ △	② △	③	
	Soybeans	Ⓢ △	△ △	①					
Phil	Maize	Ⓢ △	△ △	△ △	① △ △	△ △	② △	③	
	Soybeans	Ⓢ △	△ △	①					
Indo	Maize	Ⓢ △	△ △	△ △	① △ △	△ △	② △	③	
	Soybeans	Ⓢ △	Ⓢ △	①					
TROPEPTIC									
EUTRUSTOX									
Hawaii	Maize		Ⓢ △	△ △ △	△ △ △	① △ △	△ △	② △	③
ULTISOLS									
Phil	Maize			Ⓢ △	△ △ △	① △ △	① △ △	② △ △	③
Indo	Maize			Ⓢ △	△ △ △	① △ △	① △ △	② △ △	③
Africa	Maize				Ⓢ △ △	① △ △	① △ △	② △ △	③

- Ⓢ - Establish guidelines
- △ - Design and install experiments
- ① - Recommendations formulated - 1st approximation
- ② - Recommendations formulated - 2nd approximation
- ③ - Recommendations formulated - 3rd approximation
- ④ - Harvest experiments and collect data

4. Training and Utilization

	Initial Phase				Extension Phase			
	1974	1975	1976	1977	1978	1979	1980	1981
International Seminar	Ⓢ ₁	△	Ⓒ ₁	Ⓒ ₂	△	Ⓒ ₃		
Publish Reports	Ⓢ	△	△ △ △	△ △ △ △ △	△ △ △	△ △ △ △ △	△ △ △ △ △ △ △	△ △ △ △ △ △ △
Training Courses			Ⓢ ₁	Ⓒ ₁		Ⓢ ₂	Ⓒ ₂	Ⓒ ₃
Graduate Students			Ⓢ	△	△			Ⓒ

- International Seminars**
- Ⓢ₁ - Plan Hyderabad seminar
 - △ - Invite Participants
 - Ⓒ₁ - Hold Hyderabad seminar
 - Ⓢ₂ - Plan Transfer seminar
 - △ - Invite participants
 - Ⓒ₂ - Hold Transfer seminar

- Publish Reports**
- Ⓢ - Report on Workshop on Expt. Design
 - △ - Annual Reports and reports of annual mtg.
 - △ - Proceedings Workshop on Expt. Design
 - △ - Proceedings Hyderabad seminar
 - △ - Training materials
 - △ - Proceedings Transfer seminar
 - △ - Research articles
 - △ - Utilization materials
 - Ⓒ - Final report of Project

- Training Courses**
- Ⓒ₁ - Plan Agrotechnology Transfer course -Philippines
 - Ⓒ₂ - Conduct Agrotechnology Transfer course - Philippines
 - Ⓒ₃ - Plan international Agrotechnology Transfer course
 - Ⓒ₄ - Conduct international Agrotechnology Transfer course
 - Ⓒ₅ - Plan Agrotechnology Transfer workshop - Africa
 - Ⓒ₆ - Conduct Agrotechnology Transfer workshop - Africa

- Graduate Student Training**
- Ⓢ - Select first graduate student - Philippines
 - △ - Complete graduate student quota - Philippines and Indonesia
 - △ - Complete quota - Africa
 - Ⓒ - All graduate students graduated

18. PROJECT PURPOSE: This project's purpose is to determine scientifically the transferability of agro-production technology among tropical and subtropical countries. The transference hypothesis is based on U.S. Soil Taxonomy at the soil family level of classification.

Progress towards the End of Project Status Conditions is stated below:

- a) Soils network is established and operating in three areas- in Hawaii, the Philippines and Indonesia. The fourth and the last area will start operating during 1979.
- b) Results of the initial statistical tests of the transfer experiments indicate that the hypothesis of agrotechnology transfer from one location to another on the basis of soil family will very likely to be verified and that soil management practices and crop response can be predicted on that basis. Further approximations will be released in 1979 according to milestone events for this activity (see chart 2 under Output item 17).
- c) Management experiments which are related to the economic conditions of the local farmer and soil resources and classification will provide agricultural planners with alternatives in determining best land utilization for agriculture and food production. On one of the soil families these experiments have demonstrated for example: that one application of lime and phosphorus will be sufficient for several successive crops. For maize, nitrogen and phosphorus were limiting, while for soybeans, limiting factors were phosphorus, potassium and molybdenum.
- d) Soil interpretation and land classification: As a result of the project, U.S. Soil Taxonomy is becoming a unified system of soil classification. Worldwide acceptance of this classification system is a real possibility.
- e) Development of a viable worldwide network for technology transference: Numerous activities are in progress to affect this network. Half a dozen publications; a newsletter (quarterly); periodic reports; training workshops; symposiums; data bank model; an audience of 1000 people-worldwide; and working relationships with International Crop Research Centers, U.S. Institutions, USDA-SCS, FAO and the developing countries are all helping to make the network a reality.

19. PROJECT GOAL/SUBGOAL: 1) To reduce cost and accelerate agricultural planning and development in LDC's through agro-technology transfer. 2) To improve quality and quantity of food for LDC farmers in the tropics.

Indonesia and the Philippine agencies have either under way or in planning stage their own projects based on the concept of the "Benchmark Soils" project. Incountry training as well graduate level training in Hawaii is in progress. Many other (non project) countries have shown strong interest in the technology transfer concept. Other projects and institutions are sponsoring international workshops on Soil Taxonomy as a vehicle for technology transfer. Malaysia, Thailand, Sri Lanka and Brazil have taken part in such workshops. International Crop Research Centers view the concept as an aid to their outreach program.

Initial impact of the project on the LDCs is visible. It is positive and beneficial.

20. BENEFICIARIES: The initial beneficiaries are the governments and donor agencies. The project will provide a tool to these agencies to predict cost/benefit ratio for development of the various agricultural regions. It will caution them if there are deficiencies in technology to economically manage certain areas. The real beneficiaries will be LDC farmers. Gross soil/crop management technology will be made available to them to reduce their crop production risks. The farmers will not have to wait for the site specific technology to be produced sometimes in the future, at or near their place. The "Benchmark Soils" project concept will bring the technology, if it exists, from across the national borders or even the continents. They will not have to wait for 25-30 years before their today's problems are addressed.

21. UNPLANNED EFFECTS: The project as it has progressed in various countries has received an unusually warm reception from local government institutions as well as the AID Missions. Perhaps it speaks well for the concept of the project, its need in the LDCs; as well as the management of the project by - AID/W, University of Hawaii (contractor), and the local collaborators. The project has been allowed to evolve with flexibility to adjust to local situations. The key target is to prove the concept as soon as possible for the benefit of the LDCs. Limits to the activities are drawn by the budget.

Indonesian AID Mission considers the project as a show-piece for visitors. In other areas it is also praised.

22. LESSONS LEARNED: Even though this is plain common sense it is worth repeating that a project is sure to succeed if it fills an LDC need and the LDC nationals are treated with sensitivity and are actively encouraged to participate in project activities and/or to develop closely related/parallel activities. In the final analysis it comes down to problem identification, project development and project implementation (management). So simple to state yet so hard to accomplish. Project management in LDCs is an art simple and pure, but project development is a science just as true. Two must be combined to do the job.

23. SPECIAL COMMENTS OR REMARKS: DS/AGR has carefully reviewed the panel report on the research project entitled, "Crop Production and Land Capabilities of a Network of Tropical Soil Families". The office wishes to thank the panel for making a very objective study.

The office accepts the basic recommendations made by the panel on pages 5-7 of their report. (attached)

DS/AGR recommends to the Agency that the present contract be extended for an additional three years (until June 1983) to fully realize the benefit from investments to date.

DS/AGR will discuss with the contractor the panel report items listed A - M to strengthen project performance.

Attachments:

On-Site Review and Evaluation - Contract AID/ta-C-1108, April, 1979

DS/AGR/TSWM:TGill:am:6/4/79:EXT:58877

On-Site Review and Evaluation

RESEARCH ON AGROTECHNOLOGY TRANSFER IN THE TROPICS
BASED ON THE SOIL FAMILY

Hawaii Agricultural Experiment Station
College of Tropical Agriculture
University of Hawaii

Contract Number AID/ta-C-1108

March 1979

Review Conducted and Prepared
by
Klaus Flach, SCS/USDA
John Ehrenreich, University of Idaho
Paul M. Giordano, Tennessee Valley Authority

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ACKNOWLEDGEMENT

Gratitude is extended by the review team to the Benchmark Soils Project staff at the University of Hawaii for its assistance in planning and implementing the tour of experimental sites in Hawaii, Indonesia, and the Philippines. The team is also appreciative of the cooperation and courtesies extended by the Soils Research Institute (SRI) of Indonesia and the Philippine Council for Agriculture and Resources Research (PCARR) during visits in these countries.

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RESEARCH ON AGROTECHNOLOGY TRANSFER IN THE
TROPICS BASED ON THE SOIL FAMILY

I. INTRODUCTION

The panel which reviewed and evaluated the second phase of the Benchmark Soils Project consisted of the following:

Dr. Klaus W. Flach, Assistant Administrator, Soil Survey, U.S. Department of Agriculture, Soil Conservation Service, Washington, D.C. Dr. Flach served as team chairperson and is a specialist in soil taxonomy, the key element on which the project hypothesis is predicated.

Dr. John Ehrenreich, Dean, College of Forestry, Wildlife, and Range Sciences, University of Idaho, Moscow, Idaho. Dr. Ehrenreich is a member of RAC and has had experience on similar review teams.

Dr. Paul M. Giordano, Research Soil Chemist, Division of Agricultural Development, Tennessee Valley Authority, Muscle Shoals, Alabama. Dr. Giordano's specialty is in the area of soil fertility, with emphasis on micronutrient nutrition of crops.

The Benchmark Soils Project, entitled "Research on Agrotechnology Transfer in the Tropics Based on the Soil Family," has as a goal the following objectives:

1. To determine the transferability of agroproduction technology among tropical and subtropical countries.
2. To assist tropical countries in assessing the potential of upland areas for intensive cropping and soil management.
3. To demonstrate the value of soil classification in formulating agricultural development plans in selective areas.

The present review evaluates the progress and accomplishments since 1976 when the second phase of the contract began. This document will address factors such as project design, personnel, management, strategy, cooperation and interplay with other agencies, associated training programs, publication, and information dissemination.

II. ON-SITE OBSERVATIONS

The panel, accompanied by Dr. James Silva, Principal Investigator for the Benchmark Project, and other University of Hawaii personnel, toured the Maunaloa site on Molokai (Tropeptic Eutrustox) and was briefed on the background, organization, and development of the study. During the initial phase of the transfer studies, phosphorus and lime were the variables selected to test the transfer concept. However, a lack of response to lime led to the selection of nitrogen as a replacement. Although soybeans was under investigation at the time, corn has become the sole test crop in the transfer and management experiments, mainly because of the nitrogen parameter.

Visits were also made to the Iole and Kukaiiau sites (Hydric Dystrandeps) on the big island of Hawaii. These were among the earliest experimental plots established in the network and have demonstrated a marked response to phosphorus but not lime. However, little response occurred beyond the first level of applied phosphorus due to an overestimation of phosphorus need by the Fox sorption method. Several consecutive corn crops have shown a significant residual carryover of phosphorus.

A conference took place in Bogor, Indonesia, at the Soil Research Institute (SRI) that included Dr. D. Muljadi and his staff, W. C. Tappan and S. H. Krashevski of the USAID mission in Indonesia, Benchmark personnel, and the review team. Dr. Muljadi described soil classification work being conducted in Indonesia and indicated that the concept of agrotechnology transfer will be employed at several research centers in surrounding areas of major crop production (upland rice, soybeans, corn, and cassava). It is also anticipated that identification and correction of soil management problems in sparsely populated Sumatra may aid in enticing transmigration from overcrowded Java. Walter Tappan, Chief Agricultural Development Officer from the USAID mission, praised the project highly and considers Benchmark to be the very best effort in Indonesia and a showpiece for visitors. He is very pleased with the application of the transfer concept within Indonesia and the outstanding cooperation and interplay with the SRI. A training course will be conducted in Indonesia in 1979 with emphasis on soil taxonomy and planning for agrotechnology transfer.

The panel traveled by car to Segunung, Java, visiting a Hydric Dystrandeps site located at a research station of the Horticultural Research Institute. Two Typic Paleudult sites were observed on the island of Sumatra. The latter soil family was the last selected, principally as a result of Indonesian interest. The Typic Paleudult network now includes a site in Davao City, Mindanao, as well as the Sumatra sites and a proposed study in Camaroon (an agreement was recently negotiated to include Camaroon in the Benchmark Soils Project.)

The last Hydric Dystrandeps to be viewed were in Naga City, Philippines. It was noted that a greater response to nitrogen than to phosphorus existed at the Philippine Union College site, probably a result of previous management. Furthermore, there was some evidence that potassium deficiency may be developing in a residual management experiment which is evaluating nitrogen, phosphorus, and potassium applications. It was suggested that cropping be restricted to seasons free of typhoons because of crop losses in previous years. Arrangement of crops to avoid the August-October period should minimize the hazard. The final site visited on the tour was the Typic Paleudult in Davao City at a Bureau of Plant Industry experiment station. This appeared to be a very well-managed site and a marked response to phosphorus and nitrogen was evident.

On the final day in the Philippines a meeting was scheduled at the headquarters of the Philippine Council for Agriculture and Resources Research (PCARR) in Los Banos. Although Bill McCluskey, Agricultural Officer from the USAID mission, was to attend, he did not participate because of other commitments in Manila. The purpose and organizational structure of PCAAR was explained to the review panel in a slide presentation. The agency, created in 1975, is

not designed to actively engage in research, but rather to systematically monitor the implementation of the national agricultural research program. The Benchmark program has been well supported by PCARR. Personnel from both groups appear to interact effectively and PCARR has provided office space for Benchmark in Los Banos. A training session, sponsored by Benchmark (Hawaii), Cornell, SEARCA, PCARR, UPLB, and the Bureau of Soils, was conducted in 1977 at Los Banos, with 42 participants from Brazil, Indonesia, Malaysia, Philippines, Thailand, and Puerto Rico. Another session is planned for 1979 with emphasis on soil taxonomy and directed mainly for soil survey agencies and agricultural planners.

Upon returning to Manila, USAID headquarters were visited. During the course of discussion it was brought to our attention that the Philippine mission was understaffed to provide the close interplay necessary for administering the many projects. However, they were complimentary of the Benchmark effort.

III. CONFERENCE ON PROJECT-RELATED AREAS AT BENCHMARK SOILS PROJECT HEADQUARTERS

Dr. T. S. Gill, Project Manager, AID/DS/AGR, joined the review team on the final day and a conference was held at the Benchmark Soils Project headquarters on the campus of the University of Hawaii. Dr. Foster Cady, consultant to the project from Cornell University, discussed the statistical treatment to be used for the transfer data. Preliminary evaluation of the prediction values appears quite promising, and Dr. Cady and Dr. Larry Nelson, consultant to the Puerto Rico project from North Carolina State University, are optimistic.

Dr. H. Ikawa briefed the panel on proposed training courses to be offered during 1979 in Indonesia and the Philippines. One of the principal goals is to train key personnel so that they will have the capability to train others in their respective countries. Although the main thrust of these sessions will be directed toward soil taxonomy, it was suggested by the review team that strong consideration be given to practical application of this information.

Mr. A. R. Hurdus, Field Operations Coordinator for the Hawaii sites, plans to study several parameters relating to the soil family as part of his doctoral research. There is indication that weed, insect, and disease problems may be stratified by soil family. For example, it has been observed on the Hydric Dystrandept sites in Indonesia and the Philippines that little incidence of downy mildew has occurred, even though the disease is prevalent and susceptible varieties of corn are being grown. A possible explanation is an unfavorable soil temperature regime (isothermic) for the pathogen.

Ms. C. L. Garver, Editor and Publication Specialist for Benchmark, commented on project-related publications printed to date and those in press, and presented a list of ideas for future publications. A forthcoming document entitled Benchmark Soil Data Bank will describe the function of the data bank, its purpose, and its ultimate utility in agrotechnology transfer.

The panel, accompanied by Drs. Gill, Silva, and Tsuji, visited with Dr. Matsuda, President of the University of Hawaii. President Matsuda has been a strong supporter of the Benchmark Project, providing for adequate personnel and excellent quarters on campus. Overall administrative support has improved since the last project review, when that panel recommended university correction of these inadequacies.

The meeting was brought to a conclusion with a detailed discussion of the commendations and recommendations of the review panel. Appreciation was expressed to Drs. Gill, Silva, Tsuji, and the other Benchmark staff for their cooperation, careful planning, and remarkable arrangement of a very tight schedule.

IV. COMMENDATIONS

The panel was very impressed with the excellence in personnel ranging from the project leaders to the field workers. The obvious esprit de corp observed throughout our tour and the quality of their research is strong testimony that the project is being executed effectively by highly competent managers and technically sound scientists. The effective use of flow charts depicting work schedules is very impressive and reflects the efficient organization at the field level. Recruitment of personnel has been outstanding, and funds appear to be used judiciously with regard to vehicle purchases, field installations, and manpower utilization. The versatility and ingenuity of the field staff was exemplified on several occasions in the form of homemade drying ovens, storage sheds, offices, etc. Also, the security of the field sites was excellent. Plots were either protected by fences as in Hawaii, or located on secure farms or experiment stations.

The project staff should be commended for their active training component, a recommendation emphasized by the previous review team. It was clear in both Indonesia and the Philippines that key personnel are in need of training in soil taxonomy and application and both countries are eager to participate.

The quality and quantity of informational material is excellent, and literature is being distributed widely. Requests for reports, reprints, and newsletters associated with the project indicate strong interest in the study.

The panel was impressed by the progress of the consulting statisticians. They are displaying a high degree of competence and innovation in developing the transfer model which is imperative for the success of the project.

The close working relationships established between the Hawaii group and host countries and the contributions by these countries is commendable. As mentioned earlier, the impact of Benchmark on independent research in Indonesia by the SRI is very encouraging. Also, the strong support by the AID mission has been a valuable asset to the project. Accordingly, cooperation with PCARR in the Philippines has been essential to the progress of Benchmark in that country. Benchmark has been publicized in the Philippines through radio broadcasts of educational programs.

V. RECOMMENDATIONS

Inasmuch as the Benchmark Soils Project is making good progress toward achieving agrotechnology transfer, has in place a qualified and dedicated team of workers, has established good working relations with host countries, and has strong support of USAID missions, the review panel recommends that the contract be extended for an additional three years to fully realize the benefit from investments to date.

The Benchmark Soils Project sites represent a unique collection of well-documented experimental sites. Establishment of sites has been expensive, but maintenance is relatively inexpensive. By the end of the current contract period, only the Hydric Dystrandeps will have adequate data. To test the transfer concept, additional data will be needed for the Tropeptic Eustrtox and the Typic Paleudult sites. Hence, adequate funding for continued operation of existing sites and for preparing documents recommended in this report will be needed. Since the Puerto Rico project is closely related to the Hawaii project and will be up for renewal in December 1980, the panel feels that continuation of both contracts is necessary to complete the network and accrue sufficient data for the three soil families. Any cutback in funding should not be at the expense of existing transfer studies, but rather a restriction in new management startups.

The review team submits the following recommendations based upon observations and discussions during the project evaluation:

- A. Development of a testable hypothesis. The purpose of the project is to test the hypothesis that agrotechnology can be transferred within the same soil family. The validity of this statement cannot be tested unless objective criteria are established, that:
 1. Restriction of transfer to a given family results in a prediction equation that is more precise than a prediction equation for randomly selected soils.
 2. Since experimental data for randomly selected soils are not available, the hypothesis may be simplified to test that prediction equations for sites of one family are more precise than a single prediction equation for all sites.
 3. The project in its current configuration is testing the hypothesis that N and P response is transferrable.
- B. Factors in the prediction equation. In view of the large between-site variation, the prediction equation will be the key for testing the hypothesis. The equation should emphasize factors that can be used to define mappable phases of families such as soil temperature, radiation, soil mineralogy, and distinguish these factors clearly from management-related factors including surface soil pH (after liming) and P and K test results.

- C. Laboratory data. The failure of the Fox method for soil P in this project should be documented. The use of the Fox test for technology transfer had been one of the underlying assumptions of the project. Its failure introduces a strong element of methods research and the review team recommends intensive efforts in this area to maximize the ultimate utility of the project. Similarly, values for extractable acidity are not consistent with others reported in the literature, and perhaps samples should be sent to the National Soil Survey Laboratory in Lincoln, Nebraska, for crosschecking.
- D. Benchmark data bank and soil technology. One of the most useful products of the project will be a data bank system that can serve as the basis for a general system involving many available fertility experiments in tropical areas. Hence, the data system should be described in detail in a special Benchmark report. In addition, a handbook on agrotechnology transfer should be developed describing in detail techniques for statistical treatment, plot design, meteorological measurements, etc. Such information will be extremely useful, especially in countries like Indonesia and the Philippines which will be actively engaged in this research.
- E. Communication among project leaders and managers. The Benchmark Soils Project is the first fully coordinated international study of its kind. Coordination and strict conformity of experimental procedures are essential. Country project leaders (Hawaii, Puerto Rico, Brazil, Indonesia, the Philippines, and Camaroon) should assemble at least once a year to exchange experiences and discuss mutual problems and successes.
- F. Improvement of Benchmark visibility. Although Benchmark is doing an excellent job of publicizing its work through leaflets and progress reports of a semitechnical nature, certain aspects of the research should be prepared for publication in scientific journals. Publication will give the project needed exposure in the scientific community and should result in feedback to the project team. Some of the topics that would be of interest include:
1. Limitations of the Fox method for estimating P requirement in low-P soils.
 2. Multiple extraction of P by the Truog method to predict P response.
 3. Statistical treatment of the transfer hypothesis.
 4. Usefulness of expressing differences in bulk density in applying soil test results.

The review panel also suggests that project exposure at a national or international meeting in the form of a workshop or symposium would be valuable. Emphasis should be on the transfer concept and the experimental statistical model.

- G. Broadening of training component. The training sessions planned for 1979 are well conceived with respect to taxonomy of soils. However, the review team recommends that they be broadened to include:
1. Procedures for testing and updating Soil Taxonomy.
 2. Establishing phases of soil families to reflect specific countries.
 3. The use of soil taxonomy in a soil survey program indicating the design and naming of map units and the development of interpretation.
- H. Management experiments. Soil management experiments are an integral part of the Benchmark effort. Successful experiments could become part of the transfer technology if properly designed and executed. For greatest efficiency, management experiments should be under strict Hawaii control and, if relevant, should be repeated in several locations within the soil family network. At this stage in the project, however, emphasis should be placed on transfer studies unless funds and time are available for new management experiments.
- I. Plant tissue analyses. The panel recommends that plant tissue analyses be conducted if a response to a plant nutrient is in doubt. This would be especially appropriate on residual management experiments.
- J. Documentation of criteria in site selection. Due to logistic constraints, the sites selected are not a random sample of the soil families included in the project. Some of the sites, particularly the Paleudult sites, are marginal for the taxon. Objectives and constraints of site selection should be carefully documented in future Benchmark publications.
- K. Relocation of Philippine project leader. Because of the difficulty in scheduling transportation between experimental sites, it is recommended that the Philippine project leader transfer from Davao City to Los Banos. In addition, this move will locate Dr. Raymundo in closer proximity to PCARR and the Bureau of Soils. Offices are already provided by PCARR at its headquarters in Los Banos.
- L. Philippine AID mission. Project support and interplay with AID in the Philippines has not been as effective as in Indonesia. Part of the reason lies in the fact that the Philippine mission has more agriculture-related centrally funded projects than other countries and insufficient staff to maintain close contact with each project. The panel recommends that the staffing workload of the AID mission in the Philippines be adjusted to provide for optimum interaction with centrally funded projects.
- M. Need for additional consultants. During the closing stages of Benchmark, it may be desirable to contract additional consultants capable of supplying expertise in areas not presently covered by the project team. These areas could include additional statistical, agronomic, and soil taxonomy assistance as data is generated and interpretation commences.

SUMMARY

Research on Agrotechnology Transfer of the Tropics Based on the Soil Family

Contract Number AID/ta-C-1108

A panel consisting of Dr. Klaus W. Flach, Assistant Administrator for Soil Survey, U.S. Department of Agriculture, Soil Conservation Service, as chairman; Dr. John Ehrenreich, Dean, College of Forestry, Wildlife, and Range Sciences, University of Idaho; and Dr. Paul M. Giordano, Research Soil Chemist, Division of Agricultural Development, Tennessee Valley Authority, reviewed the project between March 8 and March 23, 1979.

The objectives of the project are:

1. To determine the transferability of agroproduction technology among tropical and subtropical countries.
2. To assist tropical countries in assessing the potential of upland areas for intensive cropping and soil management.
3. To demonstrate the value of soil classification in formulating agricultural development plans in selective areas.

The panel visited sites in Hawaii, Indonesia, and the Philippines, and conferred with benchmark soils staffs at these sites, and with ADI mission staffs, and country cooperators in Indonesia and in the Philippines.

The review panel was impressed by the high quality of experimental work, the quality and enthusiasm of the staffs, the efficient field organization, the cost effective operations, and the quality of the training and informational programs. The project has established outstanding working relationships, is enthusiastically supported by the Soil Research Institute (SRI) of Indonesia, and the Philippine Council for Agriculture and Resources Research (PCARR).

The review team made recommendations in the following areas:

- a. Strengthening the statistical evaluation and documentation of the project.
- b. Documentating difficulties and constraints of analytical methods and the need for limited tissue analyses.
- c. Increasing emphasis on the documentation of the data bank and benchmark technology.
- d. Strengthening the technical visibility of the project and certain aspects of the training program.
- e. Strengthening certain managerial aspects of the project such as

regular meetings of project leaders, interaction with country USAID missions, additional consultants, tighter control of management experiments and relocation of one of the project leaders.

The review panel concluded that the project is likely to meet its objectives and is making valuable contributions to the transfer of technology among countries of inter-tropical areas. Experimental data available at the expiration of the current contract (September 1980) will be insufficient to test the transfer hypothesis for two of the three soil families included in the project. Hence, an extension of the project for another three year period, possibly at a slightly reduced level, is recommended.

Itinerary for AID On-Site Review

Date	Activity
March 8 Thursday	<u>Honolulu</u>
March 9 Friday	<u>Honolulu - Molokai</u> Depart 0700 - Arrive 0730 Travel: airport to Maunaloa - 20 minutes Meet at BSP field office in Maunaloa: 0815 - 0945 Field inspection: 0950 - 1100 Travel: Maunaloa to airport - 20 minutes <u>Molokai - Kamuela (Waimea)</u> Depart 1130 - Arrive 1245 Lunch: 1300 - 1400 (Waimea) Travel: Waimea to Kukaiiau site - 25 minutes Site inspection: 1430 - 1545 Travel: Kukaiiau to Mealani Farm - 15 minutes Leave Mealani: 1625 <u>Kamuela - Honolulu</u> Depart 1650 - Arrive 1820
Saturday/ Sunday	<u>Honolulu - Tokyo (Narita) - Hong Kong</u> Depart 1115 - Arrive 2035 (Sunday)
March 12 Monday	<u>Hong Kong - Jakarta</u> Depart 1500 - Arrive 1830 Jakarta to Bogor by vehicle, 1.5 hours; distance - 60 km
March 13 Tuesday	Meeting at Soil Research Institute with Dr. D. Muljadi and staff: 0900 - 1200 Lunch: Bogor, 1230 - 1330 Travel: Bogor to LPHS (Segunung); travel by car - 1 hour (1345 - 1445) Site visit: 1445 - 1700 Travel: Segunung to Jakarta, 1700 - 1900
March 14 Wednesday	<u>Jakarta - Telukbetung</u> Depart 0730 - Arrive 0805 Road travel: Telukbetung to Nakau, 2.5 hours (0825 - 1100) Site visit: Nakau, 1100 - 1300 Lunch: 1300 - 1400 Travel: Nakau to BPMD - 30 minutes Site visit: BPMD, 1430 - 1530 Travel: BPMD to Telukbetung - 3 hours (1530 - 1830)
March 15 Thursday	Leave hotel at 0700; travel time to airport - 30 minutes <u>Telukbetung - Jakarta</u> Depart 0830 - Arrive 0905 Meeting with USAID, SRI, and Bureau of Planning, 1300 - 1600, USAID

BEST AVAILABLE COPY

March 16 Jakarta - Singapore
 Friday Depart 0845 - Arrive 1045

March 17 Singapore - Manila
 Saturday Depart 1250 - Arrive 1640

March 18 Manila - Naga
 Sunday Depart 0915 - Arrive 1010
 Land travel by pickup truck, asphalt and gravel road
 Airport to Palestina: 1030 - 1100
 Site visit: Palestina, 1100 - 1200
 Palestina to Naga: 1200 - 1230
 Lunch in Naga: 1245 - 1330
 Naga to hotel: 1330 - 1400
 Hotel to PUC: 1430 - 1445
 Site visit: PUC, 1445 - 1700
 Dinner at Penafancia Resorts

March 19 Leave hotel at 0730 for Naga - 30 minutes
 Monday Visit Naga office and staff: 0800 - 0830
 Visit PCARR Infrastructure Buildings: 0900 - 0945
 Travel to airport - 10 minutes

Naga - Manila
 Depart 1035 - Arrive 1110

Manila - Davao
 Depart 1630 - Arrive 1810

March 20 Leave hotel at 0800
 Tuesday Visit city office: 0815 - 0845
 Travel by car/truck on paved road to primary site at Bago
 Oshiro (15 km, 30 minutes)
 Site visit: Bago Oshiro, 0915 - 1145
 Lunch: 1200 - 1300

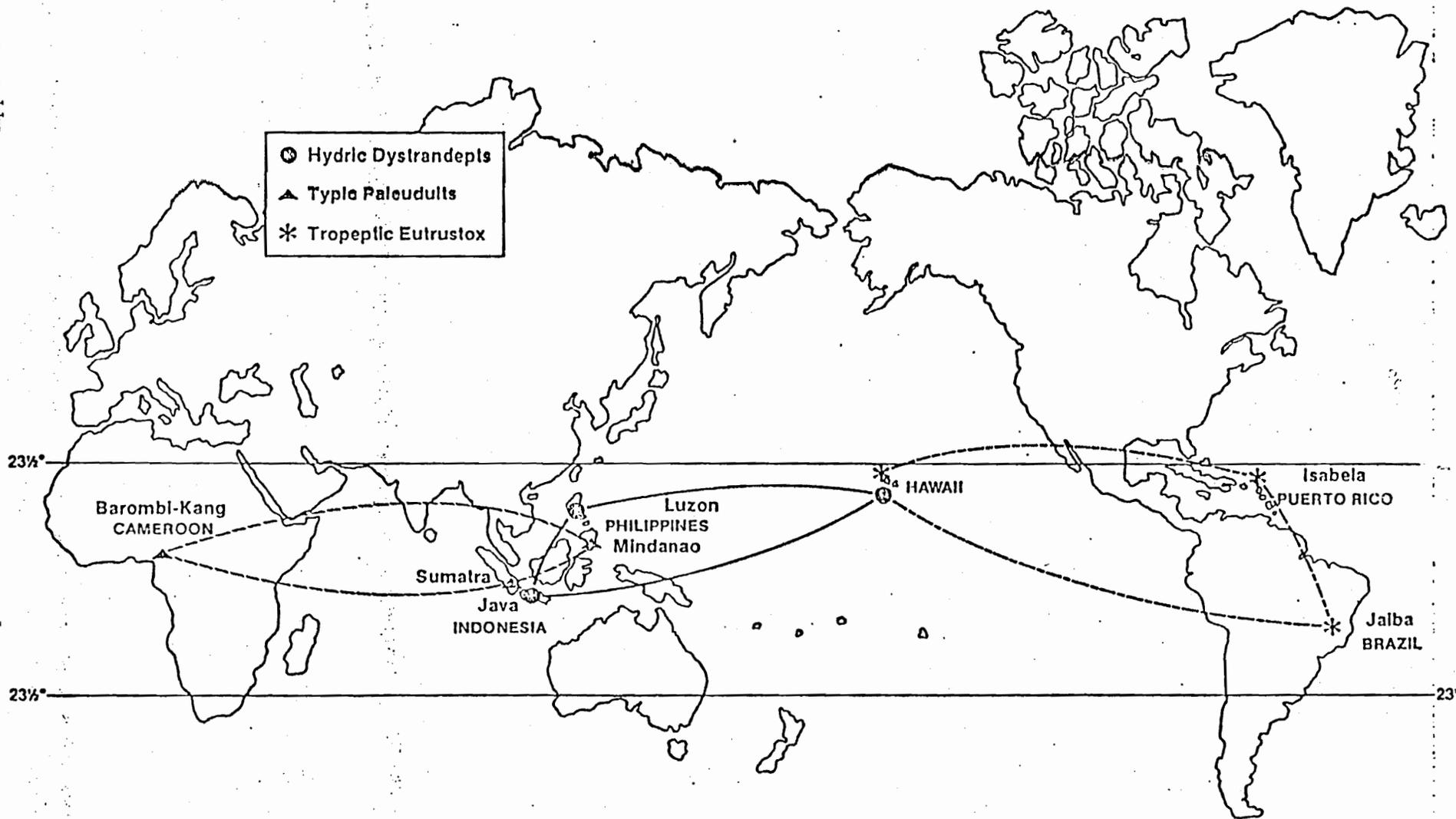
Depart Davao at 1440
 Arrive Manila at 1620
 Travel to Los Banos by car

March 21 Meeting with PCARR, USAID, Bureau of Soils, and UPLB
 Wednesday in Los Banos
 Travel to Manila

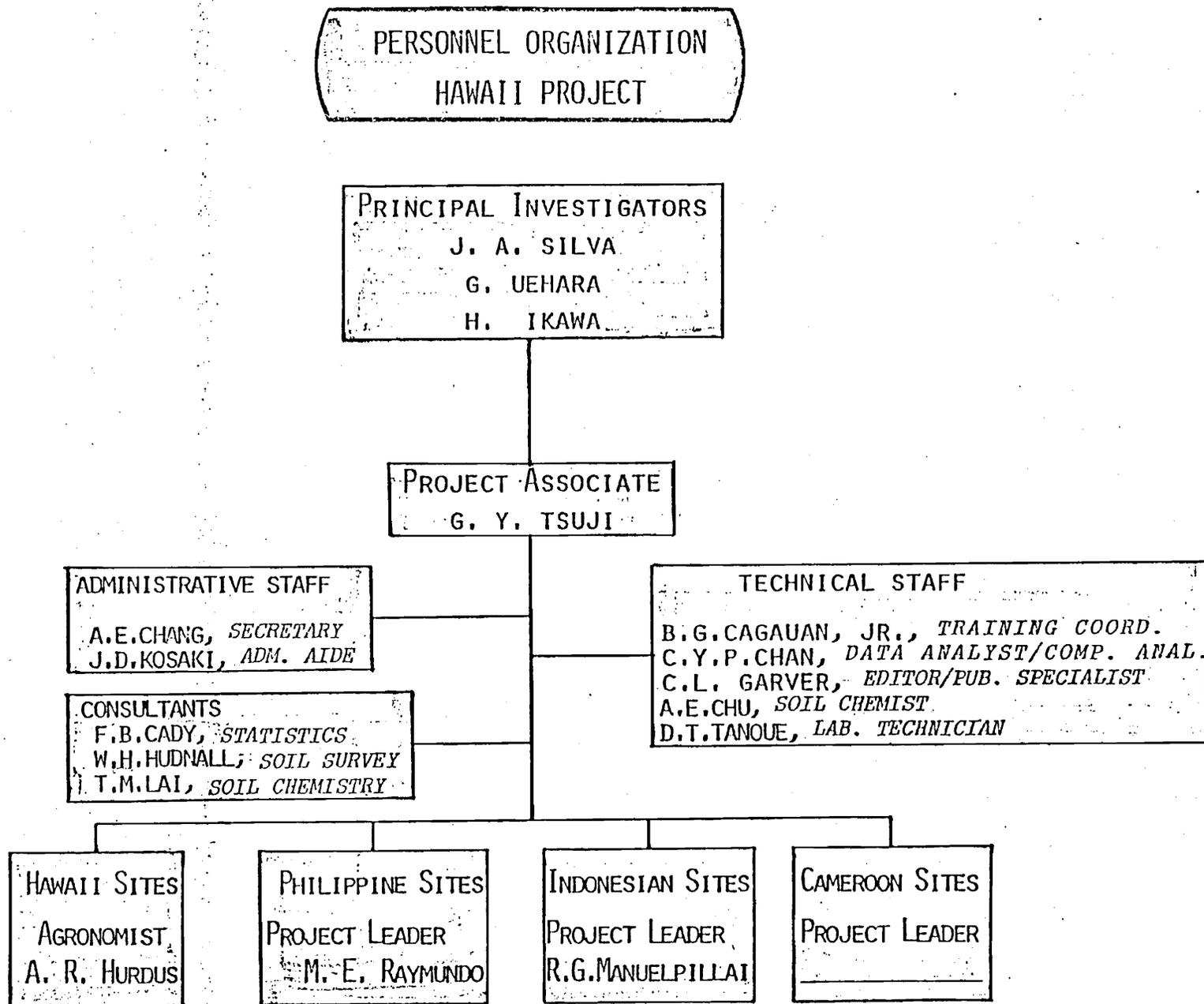
March 22 Manila - Tokyo
 Thursday Depart 1320 - Arrive 1935

Tokyo - Honolulu
 Depart 2100 - Arrive 0830

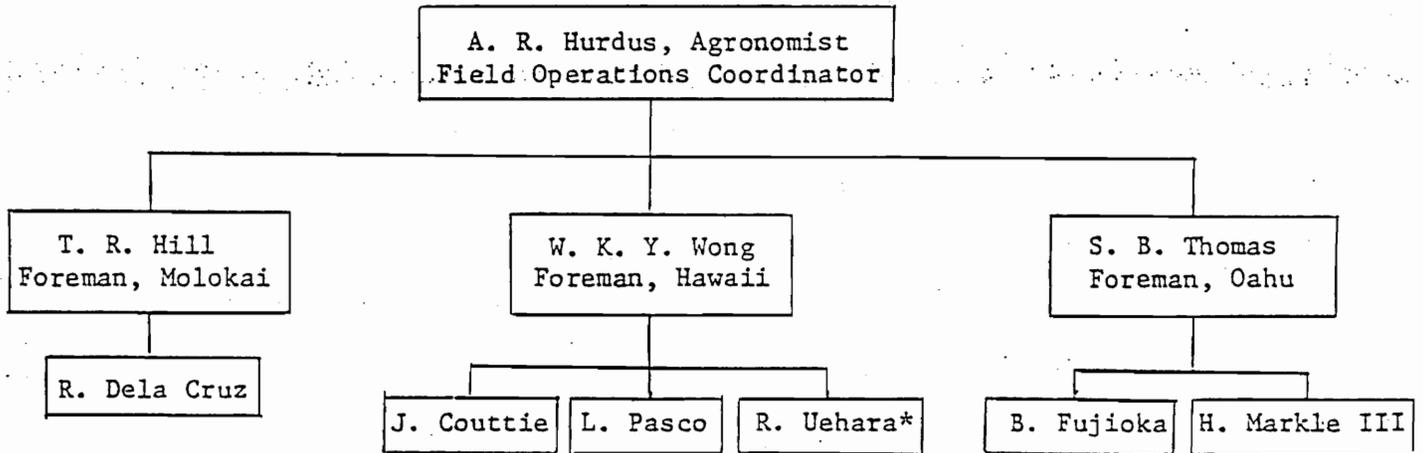
March 23 Meeting with BSP staff, and panel summary
 Friday



NETWORK MAP



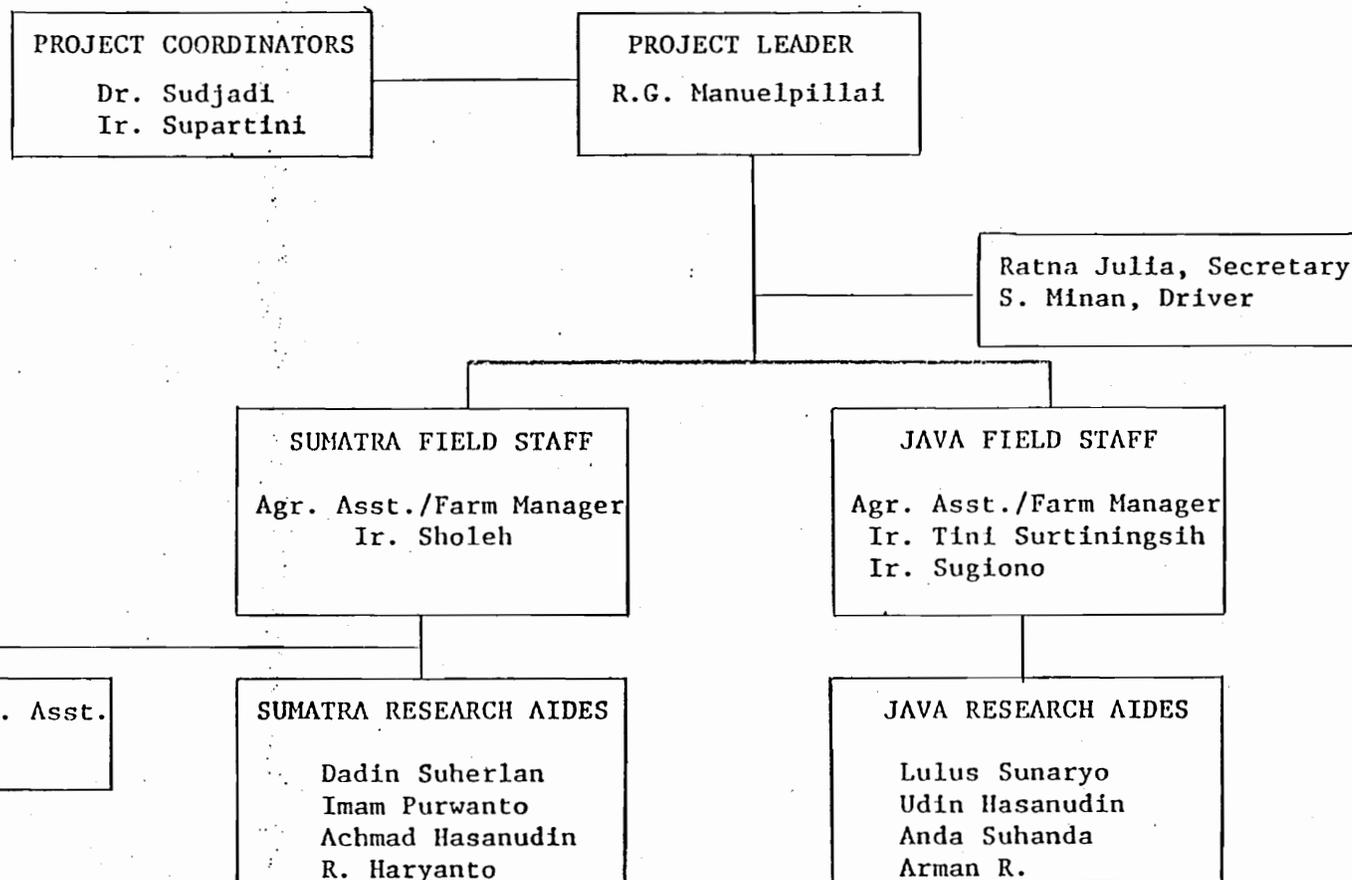
Hawaii Field Operations Organizational Set-Up



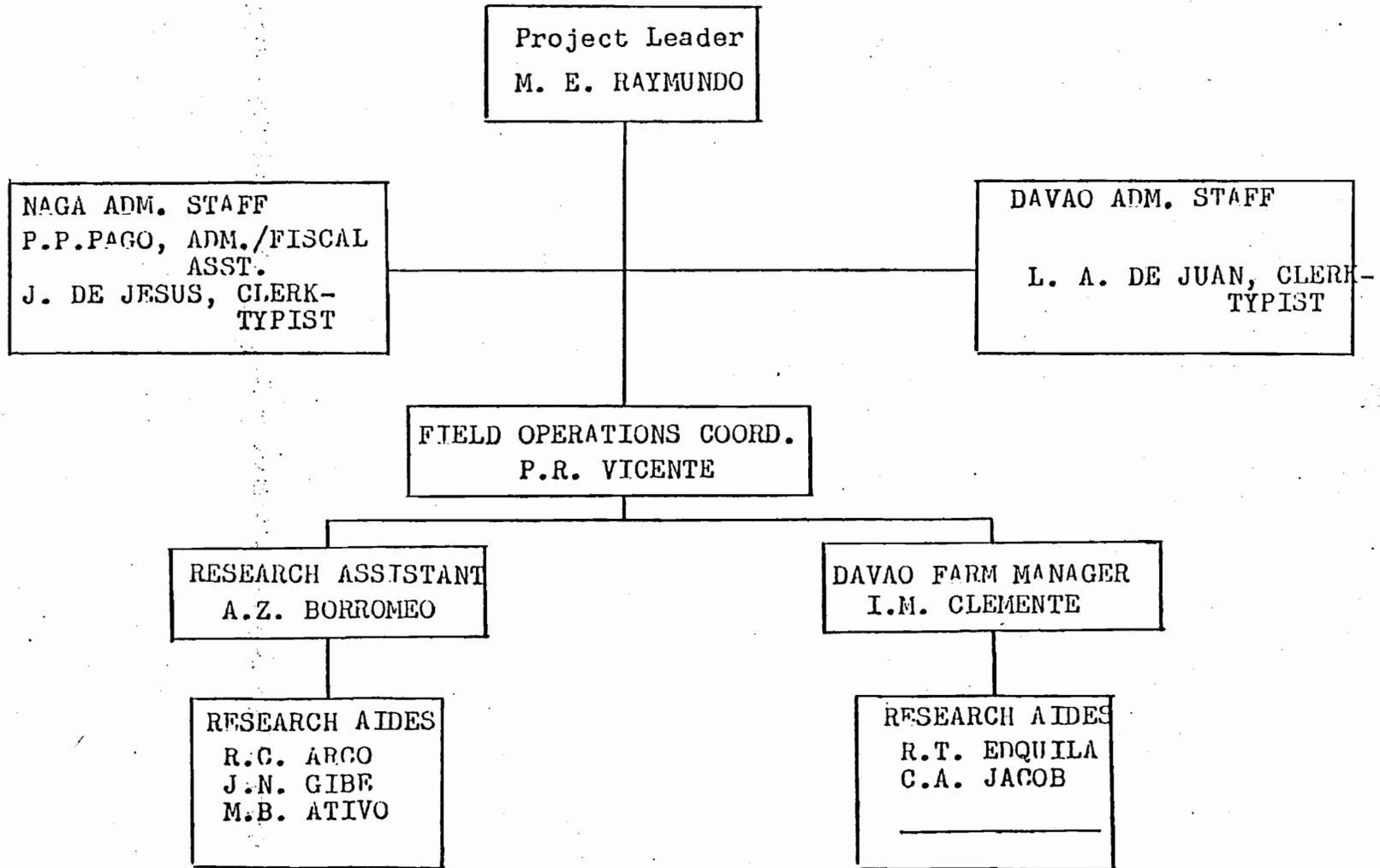
*Part Time

January 1979

INDONESIA FIELD OPERATIONS



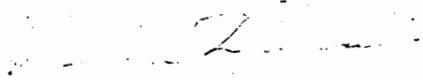
PHILIPPINE FIELD OPERATIONS



Dr. Klaus Flach
April 23, 1979
Page 2

Klaus, it was a real pleasure to work with you and Paul on this review panel, as well as with Dr. Silva and the Benchmark personnel. I think we all agreed that Dr. Gill has also done an excellent job of project management.

Sincerely,


John H. Ehrenreich
Dean

JHE:ms

cc: Dr. Paul Giordano
Dr. T. S. Gill
Dr. Dean Peterson
Dr. James Silva