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

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.

CONTENTS

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 Kukaiau sites (Hydric Dystrandepts) 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 agro-technology transfer.

The panel traveled by car to Segunung, Java, visiting a Hydric Dystrandept 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 Dystrandepts 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 PCARR 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 headquaters 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 administrating the many projects. However, they were complimentary of the Benchmark effort.

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

Dr. T. J. 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 Dystrandepts will have adequate data. To test the transfer concept, additional data will be needed for the Tropeptic Eutrustox 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 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.

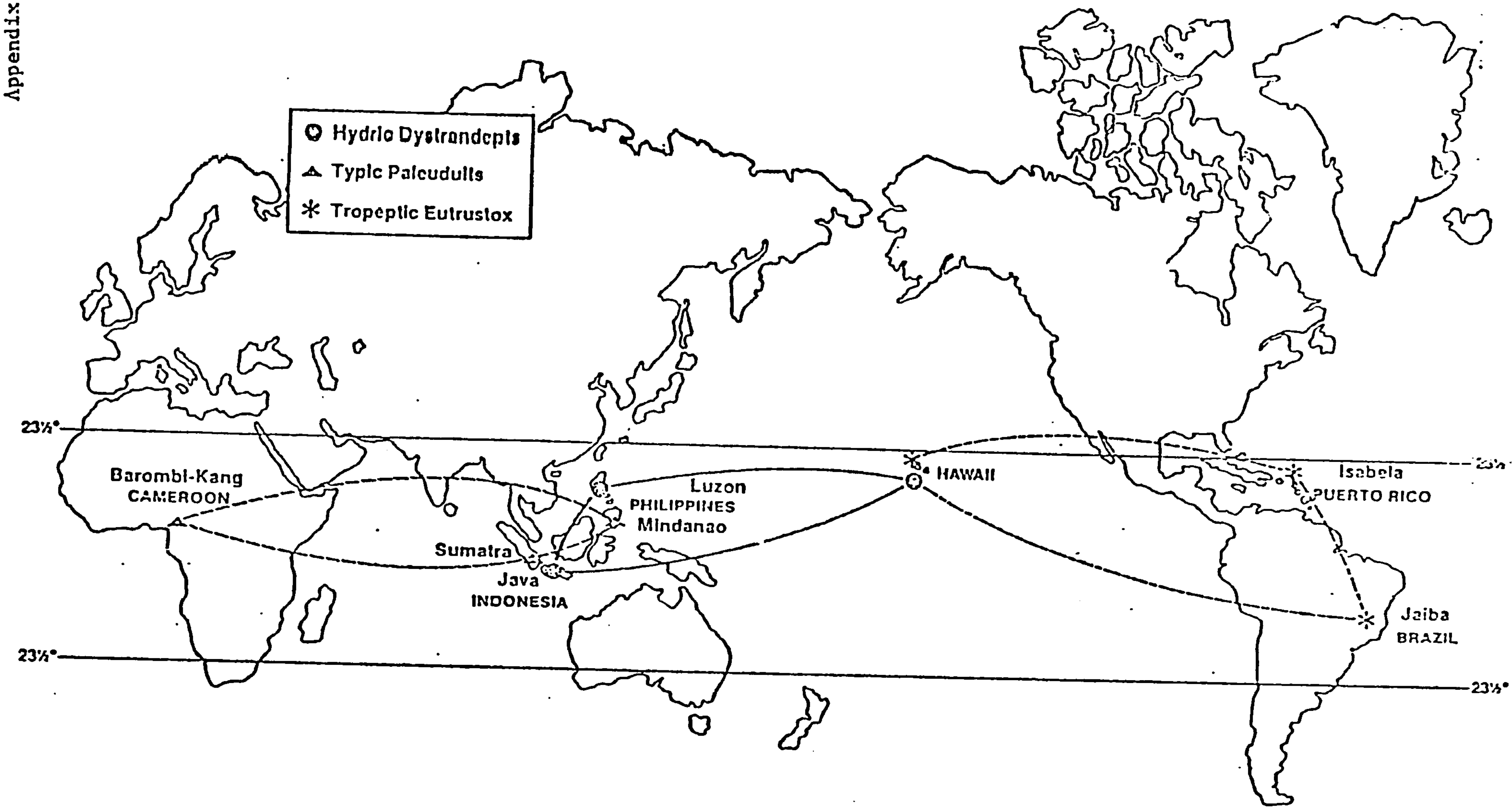
L. Philippine AID mission. Project support and interplay with AID in the Philippines has not been as effective as in Indonesia. Part of the reason lies in the fact that the Philippine mission has more agriculture-related centrally funded projects than other countries and insufficient staff to maintain 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.

Itinerary for AID On-Site Review

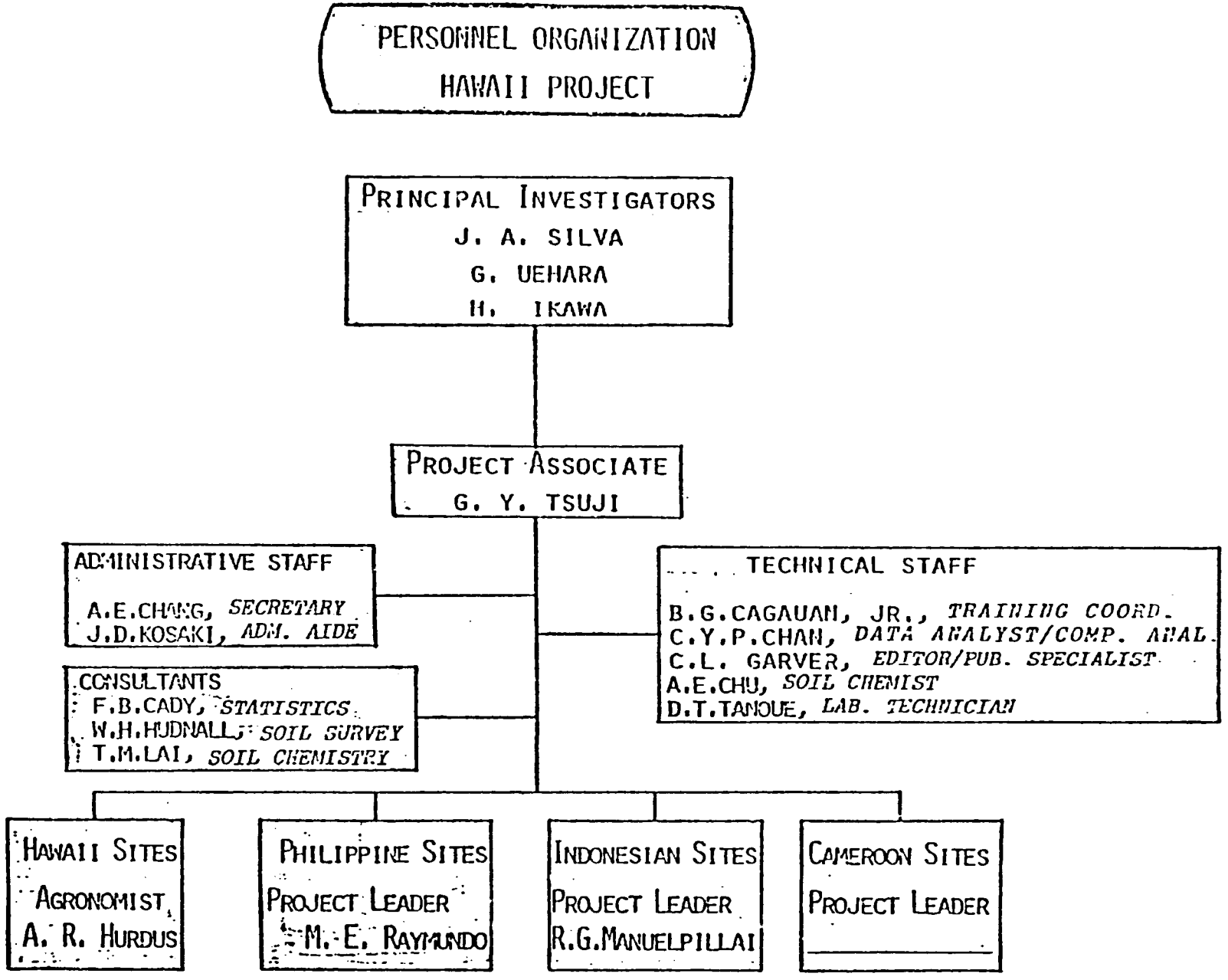
Date	Activity
March 8 Thursday	Honolulu
March 9 Friday	Honolulu - Molokai Depart 0700 - Arrive 0730 Travel: airport to Maunaloa - 20 minutes Meet at BSP field office in Maunaloa: 0815 - 0945 Field inspection: 0950 - 1100 Travel: Maunaloa to airport - 20 minutes Molokai - Kamuela (Waimea) Depart 1130 - Arrive 1245 Lunch: 1300 - 1400 (Waimea) Travel: Waimea to Kukaiau site - 25 minutes Site inspection: 1430 - 1545 Travel: Kukaiau to Mealani Farm - 15 minutes Leave Mealani: 1625 Kamuela - Honolulu Depart 1650 - Arrive 1820
Saturday/ Sunday	Honolulu - Tokyo (Narita) - Hong Kong Depart 1115 - Arrive 2035 (Sunday)
March 12 Monday	Hong Kong - Jakarta 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	Jakarta - Telukbetung 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 Telukbetung - Jakarta Depart 0830 - Arrive 0905 Meeting with USAID, SRI, and Bureau of Planning, 1300 - 1600, USAID

March 16 Friday	Jakarta - Singapore Depart 0845 - Arrive 1045
March 17 Saturday	Singapore - Manila Depart 1250 - Arrive 1640
March 18 Sunday	Manila - Naga 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 Penafrancia Resorts
March 19 Monday	Leave hotel at 0730 for Naga - 30 minutes 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 Tuesday	Leave hotel at 0800 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 Wednesday	Meeting with PCARR, USAID, Bureau of Soils, and UPLB in Los Banos Travel to Manila
March 22 Thursday	Manila - Tokyo Depart 1320 - Arrive 1935 Tokyo - Honolulu Depart 2100 - Arrive 0830
March 23 Friday	Meeting with BSP staff, and panel summary

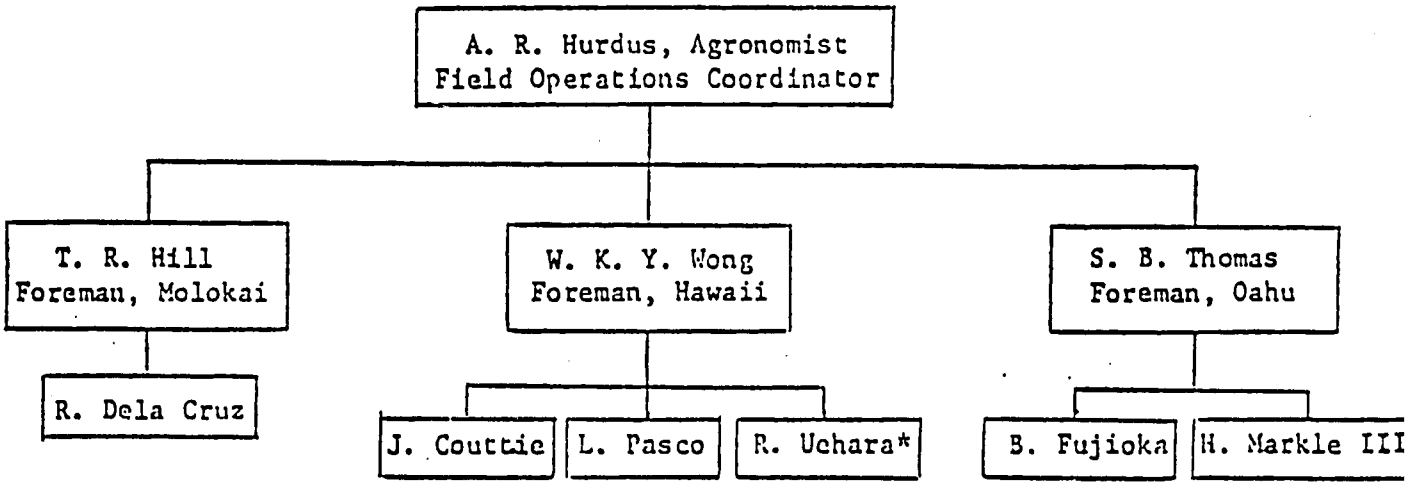

Hydric Dystrandepts
Typic Paleudults
Tropeptic Eutrustox
23½°
23½°
23½°
23½°
Barombi-Kang
CAMEROON
Sumatra
Java
INDONESIA
Luzon
PHILIPPINES
Mindanao
HAWAII
Isabela
PUERTO RICO
Jaiba
BRAZIL

NETWORK MAP

Appendix C


PERSONNEL ORGANIZATION
HAWAII PROJECT
PRINCIPAL INVESTIGATORS
J. A. SILVA
G. UEHARA
H. IKAWA
PROJECT ASSOCIATE
G. Y. TSUJI
ADMINISTRATIVE STAFF
A.E.CHANG, SECRETARY
J.D.KOSAKI, ADM. AIDE
TECHNICAL STAFF
B.G.CAGAUAN, JR., TRAINING COORD.
C.Y.P.CHAN, DATA ANALYST/COMP. ANAL.
C.L. GARVER, EDITOR/PUB. SPECIALIST
A.E.CHU, SOIL CHEMIST
D.T.TANOUE, LAB. TECHNICIAN
CONSULTANTS
F.B.CADY, STATISTICS
W.H.HUDNALL, SOIL SURVEY
T.M.LAI, SOIL CHEMISTRY
HAWAII SITES
AGRONOMIST
A. R. HURDUS
PHILIPPINE SITES
PROJECT LEADER
M. E. RAYMUNDO
INDONESIAN SITES
PROJECT LEADER
R.G.MANUELPILLAI
CAMEROON SITES
PROJECT LEADER

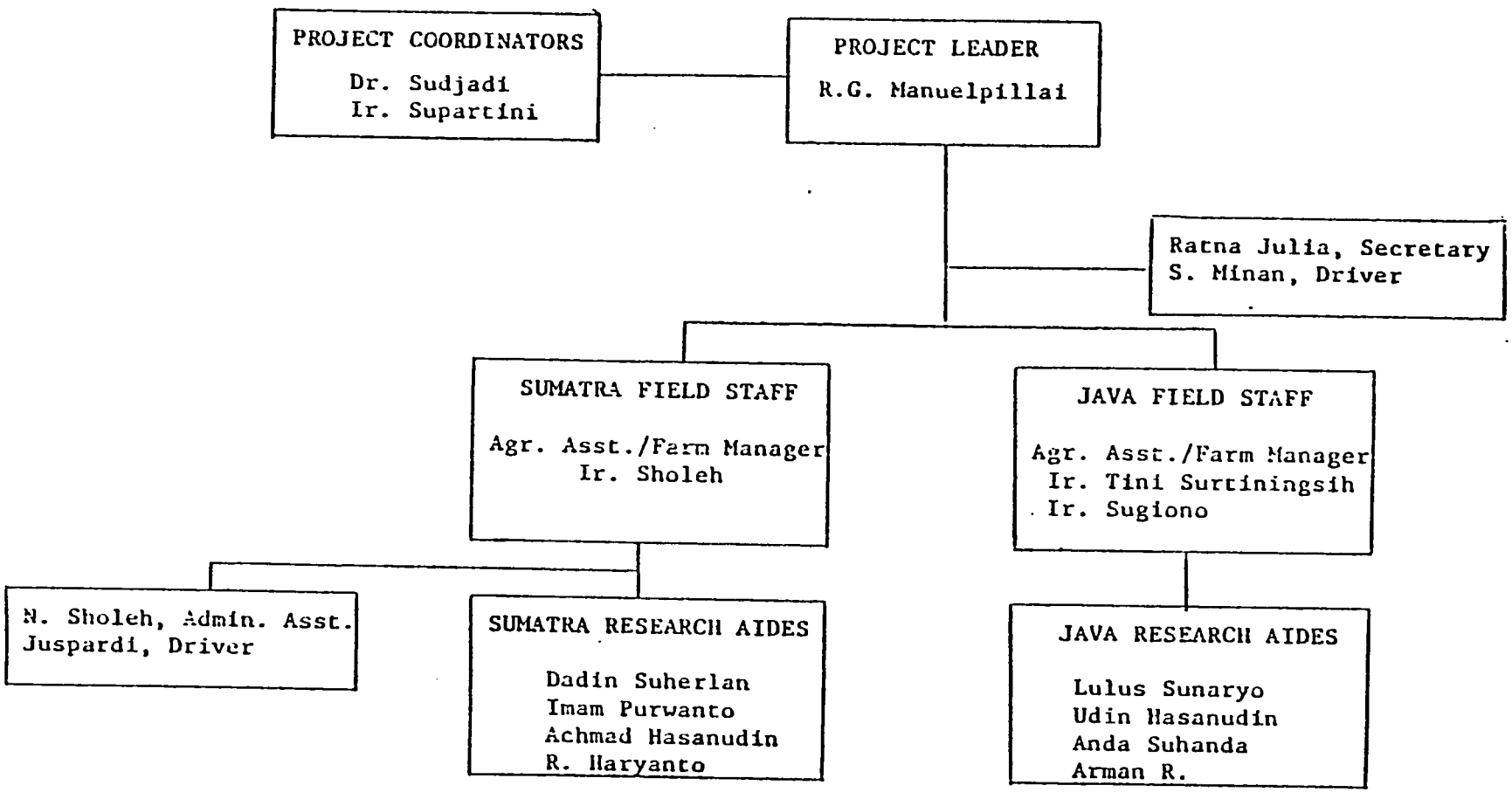
Hawaii Field Operations Organizational Set-Up



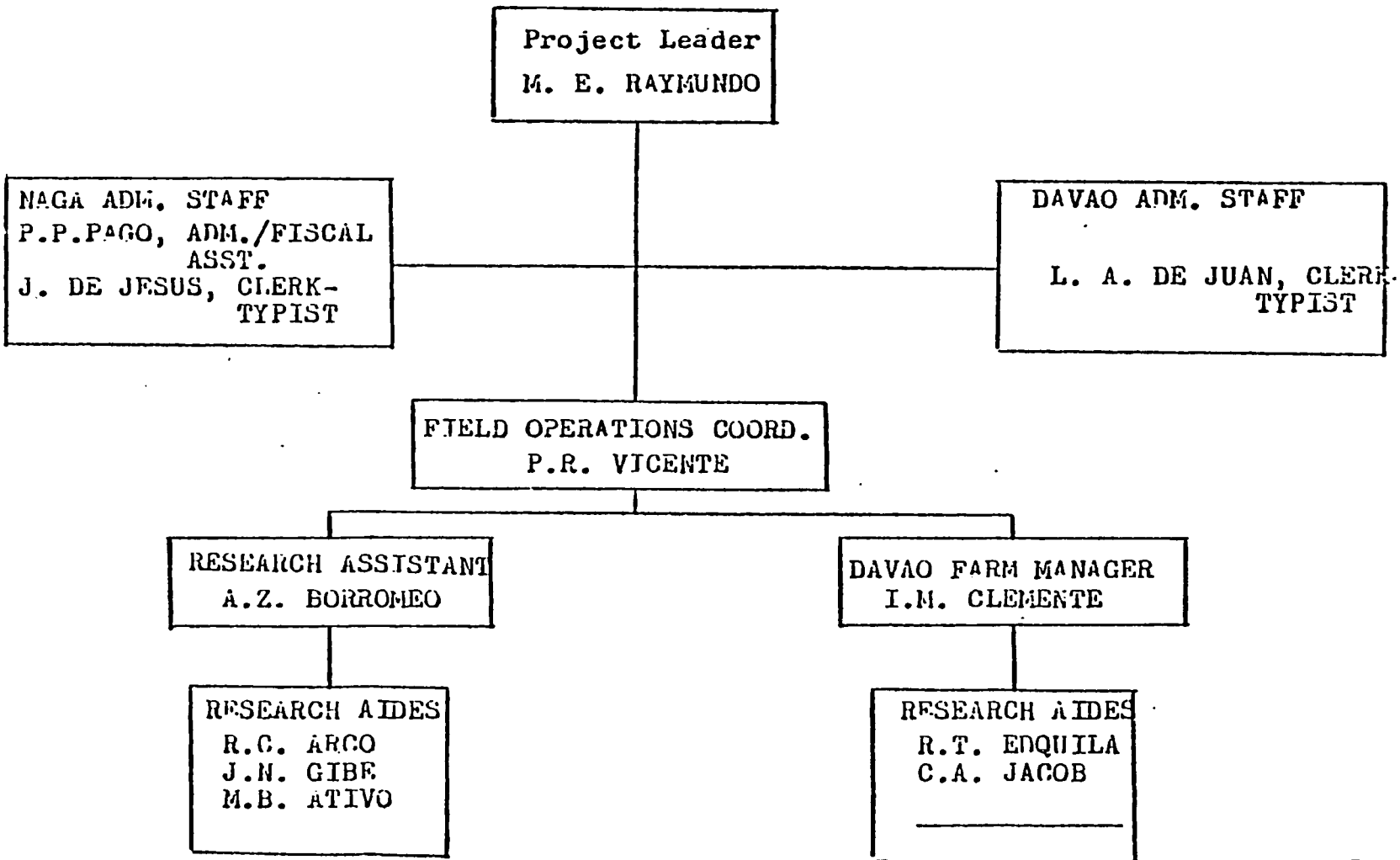
*Part Time

January 1979

INDONESIA FIELD OPERATIONS



PHILIPPINE FIELD OPERATIONS



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.

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Moscow, Idaho 83843

April 23, 1979

Dr. Klaus Flach
Assistant Administrator
Soil Conservation Service
P.O. Box 2890
Washington, D.C. 20013

Dear Klaus:

Re: Report of Review Panel for Benchmark Soils Project

The final report of the review panel which you recently submitted to Dean Peterson reflects, in general, the concensus of the discussions you, Paul Giordano and I had before leaving Hawaii. There is, however, on point with which I disagree, and a few points to which I would like to add emphasis.

I do not feel that it is necessary to have additional consultants, particularly in the statistical area, as indicated in paragraph M on page seven. Dr. Foster Cody, Dr. Larry Nelson and other statisticians with whom they have consulted, e. g. Dr. Woods, are as we agreed particularly well qualified to work on this project since they are very experienced and particularly well qualified in relation to soils experiments. Also, since the statistical procedures will be presented at international meetings and published prior to the final report, there will be ample opportunity for their colleagues to react to the new procedures being used in this research.

On page 6, paragraph F, I would like to emphasize the need to publish on the statistical approach developed for this project. The approach is unique for this type of experiment and could be one of the significant scientific contributions resulting from this effort.

On page 3, paragraph 5, it could also be mentioned that Mr. David Harris, a PhD candidate at the University of Hawaii, is conducting a complementary study in most of the field sites which is funded by International Fertilizer Center at Muscle Shoals, Alabama. I was quite impressed with Mr. Harris' work and what it can add to the basis of transfer information.

On page 4, last paragraph, it could be emphasized that not only is there excellent cooperation with the SRI in Indonesia and PCARR in Philippines, but these agencies are as a result of Benchmark instigating or planning similar studies of their own. Also, both agencies are putting very substantial dollar funding into direct support of the Benchmark Project as well as the contribution of facilities, transportation, etc.

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

Appendix E. Budget for Life of the Contract

Appendix E. Budget for Life of the Contract

CONTRACT BUDGET AND LIFE-OF-PROJECT COST ESTIMATE

	INITIAL PHASE		1ST EXTENSION PHASE		PROPOSED EXTENSION PHASE						TOTAL EST'D LIFE OF PROJECT RESEARCH COST	
	Work Months	Est. Costs FY 1976-77	Work Months	Est. Costs FY 1978-80	Work Months	Est. Costs FY 1981	Work Months	Est. Costs FY 1982	Work Months	Est. Costs FY 1983	Work Months	Est. Costs
INPUTS												
Salaries and Wages	669	405,830	1,188	1,282,050	336	453,050	336	466,200	318	468,950	2,847	3,076,080
Fringe Benefits		32,269		203,918		117,100		126,200		130,290		609,777
Consultants		8,800		59,700		25,000		25,000		25,000		143,500
Equipment, Supplies & Services		403,270		600,720		200,800		191,500		156,300		1,552,590
Vehicles		35,500				0		0		0		35,500
Freight Costs		29,000		86,850		33,000		31,000		11,000		190,950
Travel and Subsistence		76,190		335,355		110,000		86,460		82,210		690,215
Publications		30,800		34,250		37,300		52,000		44,500		198,850
Indirect Costs		160,613		502,011		121,350		124,000		123,300		1,031,274
TOTAL COSTS BY INPUTS	669	1,182,272	1,188	3,104,854	336	1,097,600	336	1,102,360	318	1,041,550	2,847	7,528,636
OUTPUTS												
Objective #1 To determine scientifically the transferability of agroproduction technology among tropical and subtropical countries			517.8	1,344,649	126	355,380	126	362,570	118.8	350,868	888.6	2,413,467
Objective #2 To assist tropical countries in assessing the potential of upland areas for intensive cropping and intensive soil management			374.4	704,157	102	248,815	102	253,996	97.2	236,468	675.6	1,443,436
Objective #3 To demonstrate the value of soil and land classification in formulating agricultural development plans in selected areas			169.8	545,289	58.8	226,805	58.8	233,405	52.8	216,494	340.2	1,221,988
Administration and Coordination			126	510,759	49.2	266,605	49.2	252,389	49.2	237,720	273.6	1,267,473
TOTAL COSTS BY OUTPUTS	669	1,182,272	1,188	3,104,854	336	1,097,600	336	1,102,360	318	1,041,550	2,178	6,346,364

ESTIMATED BUDGET SUMMARY BY YEARS AND TOTALS
NON-CONTRACT AND CONTRACT FUNDS

Description	Fiscal Year 81	Fiscal Year 82	Fiscal Year 83	Total
NON-CONTRACT FUNDS:				
University of Hawaii				
Salaries	54,410	58,650	63,340	176,400
Analytical Support	10,000	7,500	2,500	20,000
Philippine Council for Agriculture and Resources Research	12,000	13,000	13,000	38,000
Soil Research Institute, Indonesia	73,000	75,000	77,000	225,000
FAO Soil Resources Project, Cameroon	10,000	10,700	11,770	32,470
Total Non-Contract Funds	155,610	160,550	163,810	479,970
CONTRACT FUNDS:				
Direct Costs				
Salaries	453,050	466,200	468,950	1,388,200
Fringe Benefits	117,100	126,200	130,290	373,590
Consultants	25,000	25,000	25,000	75,000
Travel and Subsistence	110,000	86,460	82,210	278,670
Freight	33,000	31,000	11,000	75,000
Equipment, Supplies and Services	200,800	191,500	156,300	548,600
Publications	37,300	52,000	44,500	133,800
Total Direct Costs	976,250	978,360	918,250	2,872,860
Indirect Costs[2]	121,350	124,000	123,300	368,650
Total Contract Funds	1,097,600	1,102,360	1,041,550	3,241,510

[2] Indirect costs based on 31.3% of salaries for Manoa-campus personnel, 17.5% of salaries of off-campus personnel.

ANALYSIS OF DIRECT COSTS FOR PROJECT EXTENSION

Description	FY 1981 Months	FY 1981 Costs	FY 1982 Months	FY 1982 Costs	FY 1983 Months	FY 1983 Costs	Total
SALARIES							
U.S.							
Project Manager	12	28,700	12	30,700	12	32,900	92,300
Training Coordinator	12	24,100	12	25,800	12	27,600	77,500
Editor	12	19,300	12	20,600	12	22,100	62,000
Statistician/Programmer	12	15,750	12	16,850	12	18,000	50,600
Agronomist	12	17,700	12	18,900	12	20,200	56,800
Administrative Aid	12	13,400	12	14,300	12	15,300	43,000
Administrative Assistant	12	14,350	12	15,400	12	16,450	46,200
Lab Analyst	12	20,450	12	21,900	12	23,400	65,750
Lab Technician	12	11,050	12	11,800	12	12,650	35,500
Agricultural Technician	36	34,800	36	37,250	36	39,850	111,900
Assistant Ag. Technician	60	52,300	60	55,900	60	59,800	168,000
Graduate Assistants	42	44,950	42	48,100	24	29,400	122,450
Casual Hire	48	36,000	48	38,500	48	41,200	115,700
Student Help (hourly)		45,000		29,700		31,800	106,500
Research Associate	6	6,800	6	7,300			14,100
FOREIGN							
Project Leader, Philippine	12	22,900	12	24,500	12	26,200	73,600
Project Leader, Indonesia	12	25,600	12	27,400	12	29,300	82,300
Project Leader, Cameroon	12	19,900	12	21,300	12	22,800	64,000
Subtotal - Salaries		453,050		466,200		468,950	1,388,200
FRINGE BENEFITS							
Regular		74,410		79,600		79,190	233,200
DBA		9,000		9,600		10,400	29,000
Allowances		33,690		37,000		40,700	111,390
Subtotal - Fringe Benefits		117,100		126,200		130,290	373,590
EQUIPMENT, SUPPLIES, SERVICES, AND RENTALS							
Office/Lab Equipment		10,150		2,000			12,150
Field Equipment		15,350		5,900			21,250
Office/Lab Supplies		19,660		16,500		14,460	50,620
Field Supplies		43,640		38,500		28,240	110,380
Services and Rentals		112,000		128,600		113,600	354,200
Subtotal - Equipment, Supplies, Services and Rentals		200,800		191,500		156,300	548,600
CONSULTANTS		25,000		25,000		25,000	75,000

Description	FY 1981 Months	FY 1981 Costs	FY 1982 Months	FY 1982 Costs	FY 1983 Months	FY 1983 Costs	Total
TRAVEL AND SUBSISTENCE							
Coordination Meeting		17,950		15,760		16,860	50,570
Seminars and Workshops		17,465		1,870		1,985	21,320
Consultant Travel		4,675		6,610		2,850	14,135
Graduate Students		6,685		1,310		4,010	12,005
Inspection and Training		31,600		27,530		20,970	80,100
In-country travel		31,625		33,380		35,535	100,540
Subtotal - Travel & Subsistence		110,000		86,460		82,210	278,670
FREIGHT COSTS		33,000		31,000		11,000	75,000
PUBLICATIONS		37,300		52,000		44,500	133,800
TOTAL DIRECT COSTS		976,250		978,360		918,250	2,872,860

APPENDIX F

"Crop Production and Land Capabilities of a Network of Tropical Soil Families"

Evaluation Plan

In addition to regular management reviews for the purpose of monitoring implementation, DS/AGR will sponsor evaluations which will look at the quality of outputs, test project assumptions, and measure progress toward stated objectives and the project purpose. These evaluations will occur at key points in the life of the project. At present these key points are expected to occur:

Time	Type of Evaluation	Cost
Spring 1981	In-house Review, AID/W, using DS/AGR staff, other AID personnel and not more than 2 consultants (12 consultant days)	$3,500
Spring 1982	Comprehensive Field Review (Philippines, Indonesia, Cameroon and Hawaii) using IDS/AGR staff, 1 regional bureau technician and 2 consultants (80 consultant days)	$24,000
Summer 1983	Terminal Evaluation, AID/W, using DS/AGR staff, plus 2 consultants (12 consultant days)	$4,000
	Evaluation Budget	$31,500
	Contingencies	3,500
	Total	$35,000

The first evaluation will assess the viability of the methodologies being employed in the project, management of inputs and outputs, and the adequacy of efforts towards improving information diffusion and an international soil network with a view to finding project design strengths and weaknesses.

The second evaluation will be a comprehensive field review and encompass the same efforts as the first plus assessing in the Philippines, Indonesia and Cameroon the quality of the work being performed, the data gathered and the overall project impact experienced. The rationale for the evaluation is to measure, or to make a judgement of, progress toward achievement of objectives and end-of-project status.

The terminal evaluation will sum up project experience, highlight scientific and technical information gained through the project and its applicability to the needs of developing countries, the effective-

ness of the project in obtaining its stated purpose, and its potential impact (i.e. benefits) on poor people at some specified point in the future. Particular attention should be to diffusion of project research information and ways of maintaining research network channels.

Perspective Beyond Project Completion

Coordination and cooperation at national and international level is vital to the effective transfer of agroproduction technology. For various parties the incentive for accepting the concept of the project and for collaboration, is the aim to shorten the expensive and time consuming process of making site-specific experiments all over the world to determine optimum practices.

There are a number of elements which must be considered if the project concept is to be utilized successfully. The implications of the project are far reaching. It will affect developing nations, donor agencies and various institutions over a long period and will require a great deal of resource committment on their part. To know these implications in as detail as practical, AID sponsored a workshop at ICRISAT during October 1978. The workshop brought together world leaders in soil science and agricultural development planning, representatives from the World Bank and the United Nations, the Consortium of U.S. Universities on Tropical Soils, several of the International Centers, USDA-SCS, several LDCs and AID representatives. While the proceedings of the workshop are not yet published, the attached information that was extracted from the workshop discussions suggests the type of activities and networking which will be required for successful agro-technology transference for the developing countries.

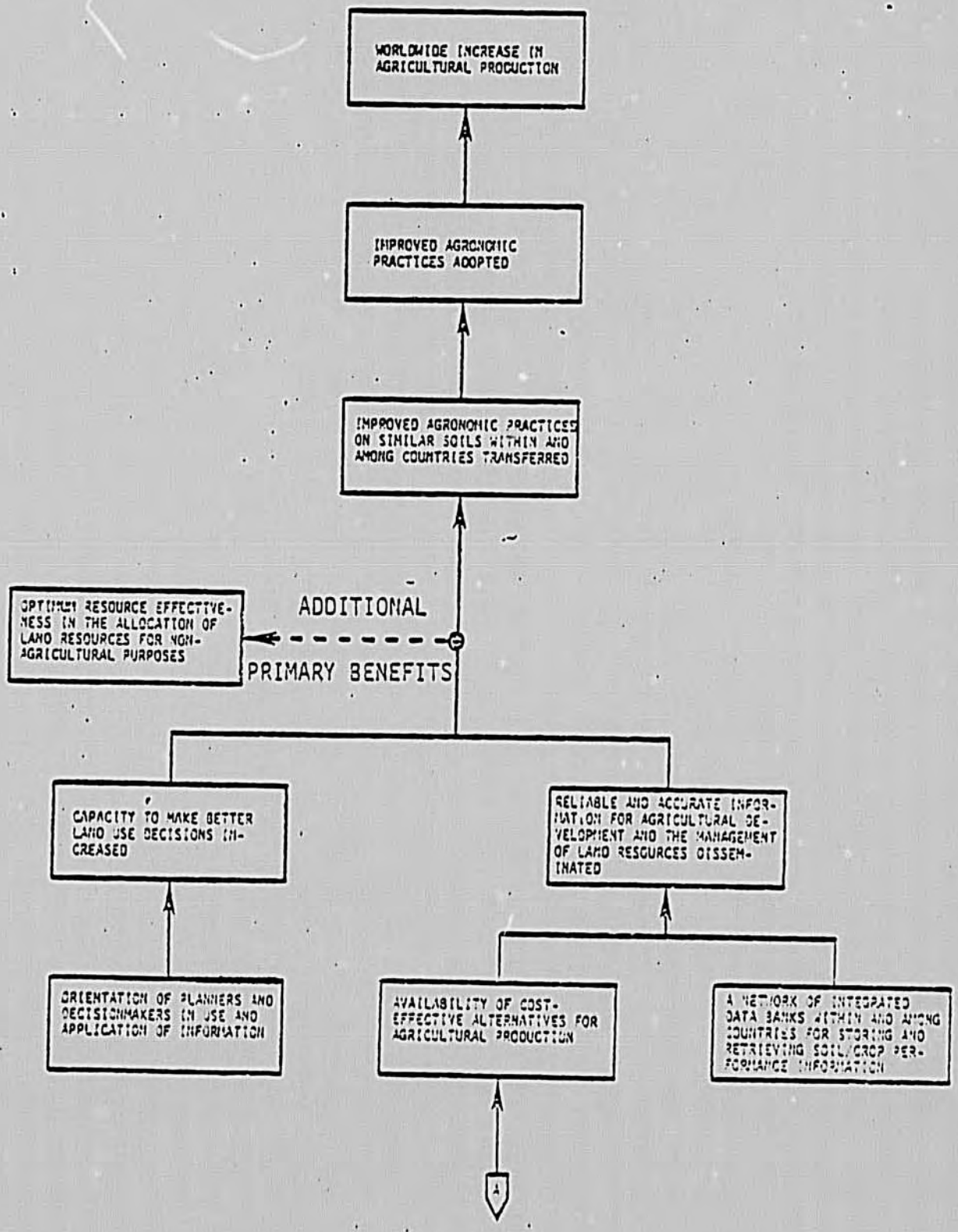
During September 1979, AID initiated a PASA arrangement with U.S. Department of Agriculture, Soil Conservation Service to provide technical assistance in the subject areas of land use, technology transference and improvement of soil classification system for the tropics. For FY 1981 AID is considering a project to establish a model international benchmark soil network including a data bank. The network will consist of about 100 international and national agricultural research centers and serve as a training center for gathering and disseminating information. It will help establish standardized procedures for national and regional networks and data banks.

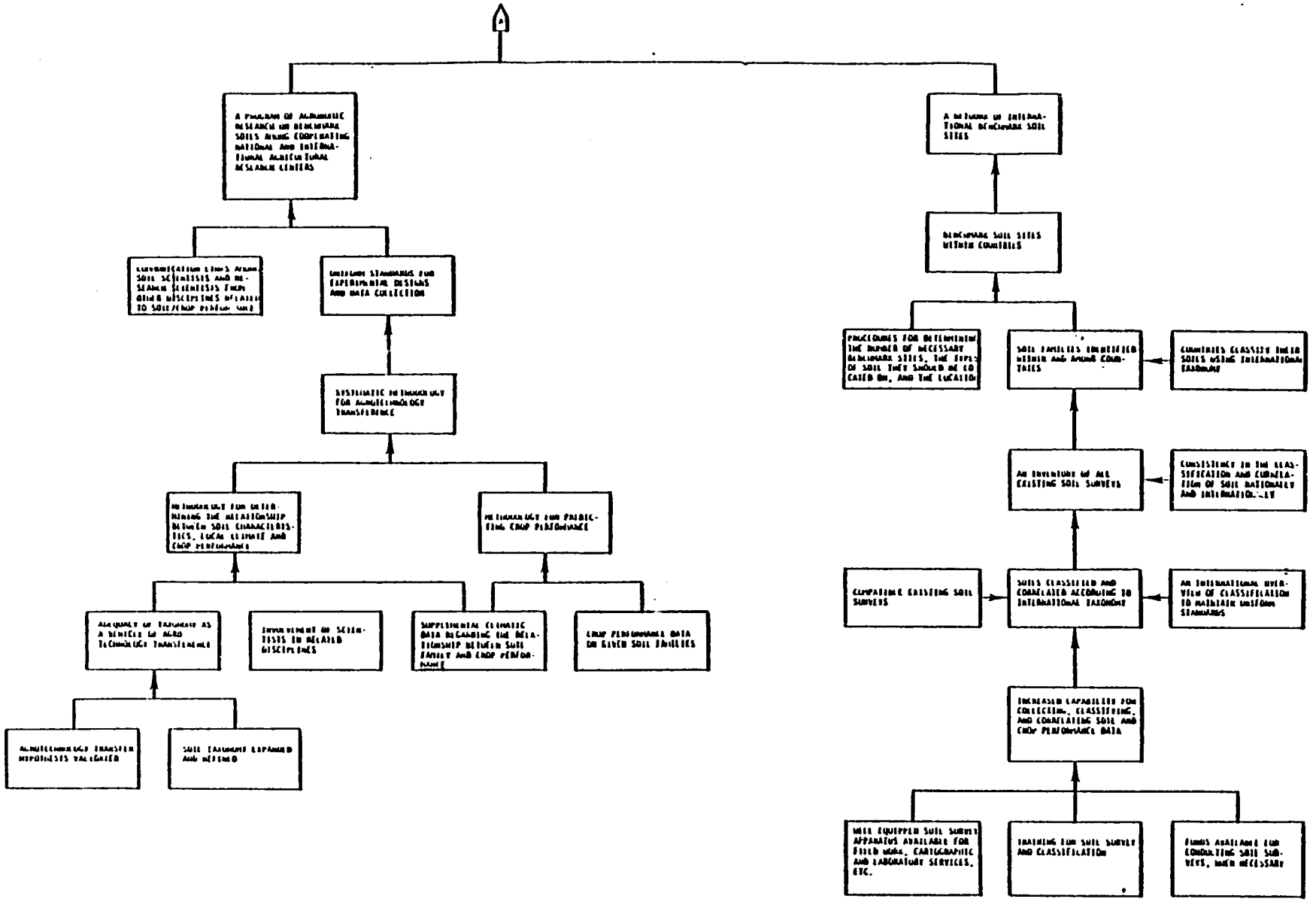
AID will continue as far as possible, follow-up activities to encourage project concept utilization. It is envisioned that the developing countries will commit considerable resources in the future for land use planning and agro-technology transfer.

Plans on Transfer of Benchmark Sites after Project Completion

The benchmark sites will be transferred to the collaborating countries at the conclusion of the project. These sites will form a nucleus of a national network of benchmark sites to be funded and managed by the countries themselves. Before its end, the project would have trained LDC staff to continue studies on these and other national benchmark sites in each of the collaborating countries. These countries have shown strong interest to become a part of an emerging international network of benchmark sites to exchange information on agro-technology.

OBJECTIVE TREE: AGROTECHNOLOGY TRANSFERENCE





PCI 7/78

GROUP 1

LOGICAL FRAMEWORK FOR SUMMARIZING PROJECT DESIGN

Est. Project Completion Date _____

Date of this Summary _____

Project Title: Internationalization of Soil Taxonomy

DEVELOPMENT HYPOTHESES

MANAGEABLE INTEREST

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program Goal: The broader objective to which this project contributes: Increased us of Soil Taxonomy for agro-technology transfer in developing countries	Measures of Goal Achievement: Number of countries that adopt Soil Taxonomy as a basis for agro-technology transfer and land evaluation; support by development agencies for internationalization of Soil Taxonomy.	Country records on agro-technology transfer and development of land resources; statements by development agencies.	Concerning long term value of program/project: Adequacy of Soil Taxonomy for agro-technology transfer; effective communication between soil scientists and planners.
If Purpose, Then Goal Project Purpose: Further development and promotion of Soil Taxonomy for wider international application, especially in developing countries	Conditions that will indicate purpose has been achieved: End of project status. Applicability of Soil Taxonomy in developing countries with special reference to soils in tropical and sub-tropical areas; critical mass of countries initiate classification of land resources in terms of Soil Taxonomy.	Published amendments to Soil Taxonomy; translations of Soil Taxonomy; distribution of Soil Taxonomy; soil survey reports and land evaluation projects	Affecting purpose-to-goal link: Continuing SCS support for internationalization of Soil Taxonomy; recognition by developing countries of the value of Soil Taxonomy for agro-technology transfer.
If Outputs, Then Purpose Outputs: Refinement of Soil Taxonomy; quality control of the application of Soil Taxonomy in participating countries (international correlation); training in the sue of Soil Taxonomy.	Magnitude of Outputs necessary and sufficient to achieve purpose. Activities of international committees on improvements of Soil Taxonomy; international correlation through on-site verification and international workshops; training workshop of use of Soil Taxonomy.	Committee reports; correlator's reports on country missions; reports on workshops; number of soil scientists trained in Soil Taxonomy	Affecting output to purpose link: Cooperation of participating countries, establishment of an international soil correlation entity.
If Input, Then Outputs Inputs: Activities and Types of Resources Establishment of an Office for International Soil Classification and Correlation (ISCC)	Level of Effort/Expenditure for each activity. 3 Soil Correlators Clerical and secretarial staff Consultants Support for workshops Operational expenditures	COST ESTIMATES $350,000 per year	Affecting input-to output link: Financial support for the establishment of ISCC; availability of qualified personnel.

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NO. 77

PCI 220

AEU
GROUP 3
26 October 1978

LOGICAL FRAMEWORK FOR SUMMARIZING PROJECT DESIGN

Year One: $1.6m + 10% inflation ± equipment + infrastru
Years Two to Five: = Year One + 10% inflation + 20% ann

Project Title: Network and Sample County (Phil) Program-- A five year program (1981-1985)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program Goal The broader objective to which this project contributes: Increase in the availability of reliable and accurate information for agricultural development and the management of soil resources.	**Measures of Goal Achievement:** Incremental production of units of information flowing into national planning and decision units.	Reports by national planners and random site inspections	**Concerning long term value of program/project:** National commitment to utilize available agro-technology as a basis for rural/agricultural development.
Project Purpose: Increased capability within participating countries in the systematic collection and interpretation of soil and performance data.	**Conditions that will indicate purpose has been achieved: End of project status.** Existence of an institutional capability including access to decision making process.	National reports plus independent examination by "Network Advisotry Group".	**Affecting purpose to goal link:** Production of data on soils and performance at levels sufficient in numbers and quality on timely basis to permit meaningful interpretative work.
Outputs: 1. Increased and accelerated capacity to make better land use decisions. 2. Land use evaluations are available in adequate numbers and distributed for optimal impact. 3. Methodology for predicting crop performance data.	**Magnitude of Outputs necessary and sufficient to achieve purpose.** Volume of data collected and interpreted.	Review of statistics and reports.	**Affecting output-to-purpose link:** Quality of decisions will depend on quality of data and political will to act on land use recommendations.
Inputs: Activities and Types of Resources 1. Strengthen network units to perform duties: collect, classify, interpret. 2. Establish mechanism for network information exchange. 3. Develop inventory of individuals skilled in soil interpretation.	**Level of Effort/Expenditure for each activity.** (1) 1. Soil/performance data bank system ($25,000 p.a. + 3 person years + equipment per country). 2. Communications and display system. ($200,000 + 2-3 person years + equipment and operational expense per country. 3. Full time Program Manager and a Standing Advisory Group ($250,000 p.a.) 4. Workshops, consultants, travel ($500,000 p.a.) for network ($150,000 p.a. + 20% year increment) - for National System.	1. Expenditure reports 2. Manpower reports 3. Annual reports 4. Audits	**Affecting input-to-output link:** (Current status of network units) 1. Manpower availability and mobility 2. Adequate timely budgeting. 3. International network is operational. (1) All estimates subject to 10% inflationary increase.

DEVELOPMENT HYPOTHESES
If Purpose, Then Goal
If Outputs, Then Purpose
If Inputs, Then Outputs
MANAGEABLE INTEREST

PCI 72-8

GROUP 4

LOGICAL FRAMEWORK FOR SUMMARIZING PROJECT DESIGN

Est. Project Completion Date _____

Date of this Summary _____

Project Title: _____

DEVELOPMENT HYPOTHESES

MANAGEABLE INTEREST

	NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
If Purpose, Then Goal	Program Goal: The broader objective to which this project contributes:	Measures of Goal Achievement:		Concerning long term value of program/project:
If Outputs, Then Purpose	Project Purpose: The establishment of an international benchmark soils network based on the activities of national and international research centers and recommendations on minimum performance data.	Conditions that will indicate purpose has been achieved: End of project status. International and National Data Banks established. International and National governing boards established. Responsible person identified at each cooperating agency.		Affecting purpose-to-goal link:
If Inputs, Then Outputs	Outputs: 1. Commitment of IARC's, NARC's and International Agencies. 2. Structure for Governing Board. 3. Establishing standards and procedures for data management. 4. Minimum standards for experimental designs and performance data collection 5. Commitment by national and international bodies to provide assistance to national and international centers.	Magnitude of Outputs necessary and sufficient to achieve purpose. 1. 7 agreements singed with IARC's and 7 agreements signed with NARC's. 2. Bylaws established. 3. Guidelines established. 4. Standards established. 5. Agreements signed.	Documents available	Affecting output-to-purpose link: Willingness of Centers and IARC's to cooperate. Availability of national and international resources. Qualified staff available. Soil taxonomy made adequate for inter tropical areas.
	Inputs: Activities and Types of Resources 1. Negotiate with IARC's, NARC's and International Agencies. 2. Develop standards for experimental designs and data collection. 3. Develop procedures and standards for data banks. 4. Develop staffing plans. 5. Develop procedures to correlate classification systems.	Level of Effort/Expenditure for each activity. See Appendix 6. Planning conferences and workshops. 7. Training Courses (International and regional)		Affecting input-to-output link: 1. S.T. funding and organization is the responsibility of another troika. 2. IARC's and NARC's will cover costs of running experiments. 3. Regional Coordination will be provided by IARC's.

PCI 72 8

GROUP 5

LOGICAL FRAMEWORK FOR SUMMARIZING PROJECT DESIGN

Est. Project Completion Date _____

Date of this Summary _____

Project Title: _____

DEVELOPMENT HYPOTHESES

MANAGEABLE INTEREST

	NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
If Purpose, Then Goal	Program Goal. The broader objective to which this project contributes:	Measures of Goal Achievement:		Concerning long term value of program/project:
If Outputs, Then Purpose	Project Purpose: A systematic methodology for agro-technology transference developed for use in participating countries.	Conditions that will indicate purpose has been achieved: End of project status.	1. Technology transferred. 2. Technology implemented. 3. Network expanded. 4. Performance data collected	Affecting purpose-to-goal link: Agro-technology available to be transferred. Similarly classified soils identified.
If Inputs, Then Outputs	Outputs: 1. Coordinating body established. 2. Sufficient network stations estd. 3. Support services assured. 4. Effective information system developed. 5. Mechanism for economic analysis established. 6. Training package sufficient for establishing, maintaining and strengthening a network developed	Magnitude of Outputs necessary and sufficient to achieve purpose. 1. Coordination meeting convened. 2. Site preparation and selection initiated. 3. Information dissemination and training start.	1. Annual review reported. 2. Committee reports printed. 3. Technical reports published. 4. Personnel trained. 5. Scientific, private, and public sector informed.	Affecting output-to-purpose link: 1. Qualified individuals from agencies and institutions identified. 2. Sufficient number of stations available. 3. Support facilities exist. 4. Skilled personnel required.
	Inputs: Activities and Types of Resources 1. Network sites identified. 2. Areas of training identified. 3. Infrastructure for services and information system established.	Level of Effort/Expenditure for each activity. Coordinating body: Training consultants Support for training workshop Support for communication systems.		Affecting input-to-output link: Financial assistance provided. Government interest exists.

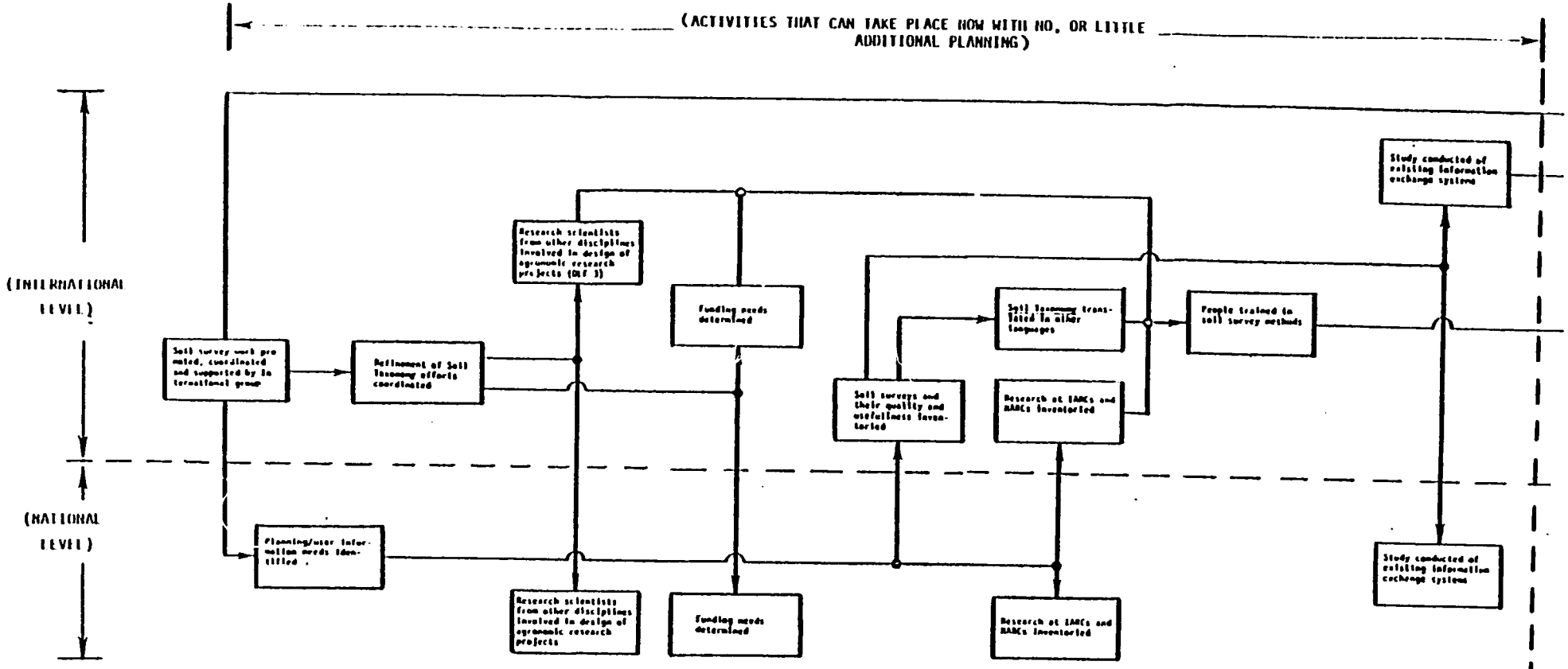

Figure A-9

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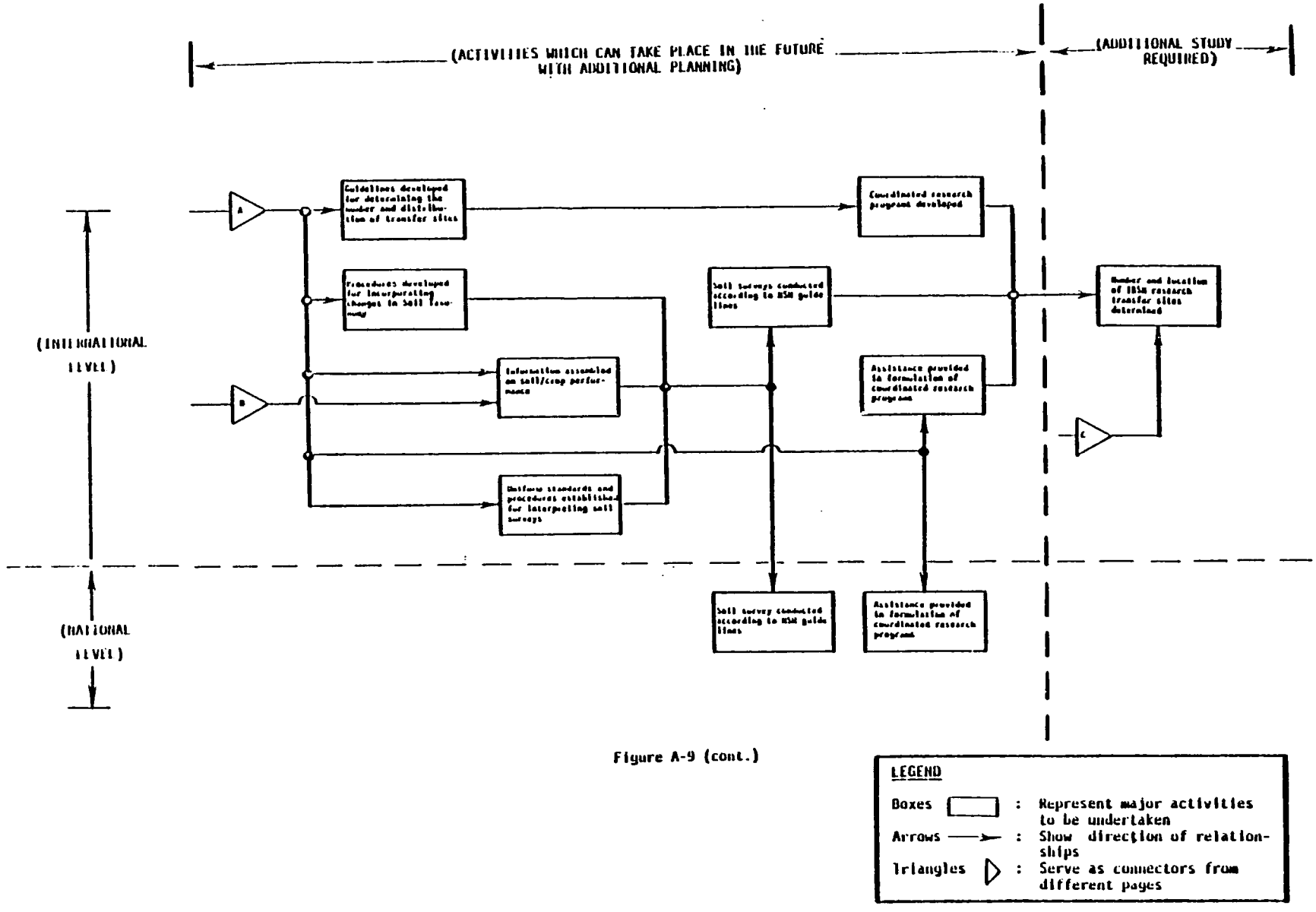

Figure A-9 (cont.)