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ON-SITE REVIEW AND EVALUATION
Benchmark Soils Research Project

Department of Agronomy and Soils
College of Agricultural Sciences
University of Puerto Rico - Mayagüez

Contract No. AID/ta-c-1158

March 1977

Report Prepared by

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FOREWORD

The Review Panel appreciates the assistance of the University of Puerto Rico Benchmark Soils Research Project research team in Puerto Rico and in Brazil, personnel of the Servicio Nacional de Levantamento e Conservação de Solos (SNLCS) of the Empresa Brasileira de Pesquisa Agropecuaria (EMBRAPA), and personnel of the Empresa de Pesquisa Agropecuaria de Minas Gerais (EPAMIG) in collecting the information needed for this report. The many courtesies provided, and the careful preparations and arrangements made for the Review are greatly appreciated.

TABLE OF CONTENTS

	<u>Page</u>
I. Introduction	4
II. On-site Review: Field Trips, Meetings	7
III. Project Design and Operation	12
IV. Institutional Relationships	14
V. Training	15
VI. Commendations	16
VII. Recommendations	17
VIII. References	20
IX. Appendicies	

LIST OF APPENDICES

- A. Review Panel Schedule
- B. Review Outline - Benchmark Soils Research Project
- C. International Seminar on Uses of Soil Survey and Classification
in Planning and Implementing Agricultural Development in the
Tropics - excerpts from program.

ON-SITE REVIEW AND EVALUATION
BENCHMARK SOILS RESEARCH PROJECT
UNIVERSITY OF PUERTO RICO

Department of Agronomy and Soils
College of Agricultural Sciences
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I. INTRODUCTION

A Review Panel consisting of William M. Johnson, Team Leader; R. Dudal; and J. Robert Moffett conducted an on-site review, with related conferences, of the Benchmark Soils Research Project in Brazil and Puerto Rico in February 1977. Mr. Johnson is Deputy Administrator, Soil Conservation Service, U. S. Department of Agriculture, where he has charge of Technical Services (including Soil Survey and Field Services). Dr. Dudal is Director, Land and Water Development Division of the Food and Agriculture Organization of the United Nations, in Rome, Italy. Mr. Moffett is Food and Agriculture Officer, USAID, in La Paz, Bolivia.

In addition, Dr. Tejpal Gill, Senior Program Manager, TAB/AGR, USAID, the Project Monitor, accompanied the Review Panel throughout the entire review in Brazil and Puerto Rico. The Project Principal Investigator, Dr. Fred Beinroth, also participated in the field conference and all of the on-site review activities both in Brazil and Puerto Rico.

The Review Panel and Drs. Gill and Beinroth assembled in Rio de Janeiro on Sunday, 13 February 1977. An entry conference was held, during which there was discussion of the objectives of the review, the review outline, and plans for the field excursion in Brazil.

The review party met with EMBRAPA officials at the headquarters of the Serviço Nacional de Levantamento e Conservação de Solos (SNLCS) in Rio de Janeiro.

The review party travelled northward to Jaíba, accompanied by scientific workers of SNLCS and the State of Minas Gerais. The on-site review was conducted on and near the agricultural experiment station operated by the Empresa de Pesquisa Agropecuária de Minas Gerais (EPAMIG). A representative of the Federal University at Viçosa participated in the review, as did the Benchmark Soils Research Project Leader for Brazil Sites, Mr. Chris Seubert. In addition, ongoing research at two nearby research stations was reviewed and discussed with resident scientists. A technical seminar which included discussion of the Project design and objectives was held at EPAMIG headquarters in Belo Horizonte.

The review party next travelled on to Mayagüez, Puerto Rico. One day was spent examining the Project office and laboratory facilities at the University of Puerto Rico and in field review of experimental sites at the Isabela Agricultural Experiment Substation. Another day was devoted to discussions of project design, operations, and results with the principal investigator and project agronomist and in writing parts of the review report.

The review concluded with a discussion of findings and recommendations with the University of Puerto Rico staff in Mayagüez. The Panel assessed the Project design, status, progress, accomplishments and management. Recommendations were made on many aspects of the current and future project activities.

PROJECT TITLE

The full title of the project is "Crop Production and Land Capability of Benchmark Soils of Latin America." Throughout this report it will be referred to as the Benchmark Soils Project.

PROJECT OBJECTIVES

- (1) To correlate food crop yields on a network of tropical benchmark soils.
- (2) To determine scientifically the transferability of agroproduction technology among tropical countries.

PURPOSE OF 1977 ON-SITE PROJECT REVIEW

The purpose of the review was to assess the status and progress of the research in order to (a) facilitate the achievement of Project objectives; (b) to assist TAB/AGR in improved management of the Project, and (c) to help AID in utilization of the Project outputs for the benefit of LDC's. In addition, TAB/AGR required recommendations for future programming in respect to this project. With these objectives in mind, the Panel prepared a review outline in advance of the field trip (See Appendix B).

REFERENCE DOCUMENTS

Dr. Gill provided background papers to all the Panel members prior to the beginning of the review. These documents are:

- a. The original AID Project Statement approved May 10, 1973.
- b. Project review report - RIGC (4/23/76).
- c. Copy of the RAC minutes of May 9-10, 1973, dealing with the Project.

- d. Copy of Benchmark Soils Project Report No. 1 on experimental designs for predicting crop productivity.
- e. Project Scope of Work statement (undated).
- g.-f. Project progress reports June 1975 and June 1976.
- h. Copy of paper on soil classification and the transfer of soil management experience by Beinroth and Spain.
- i. Copy of Project agreement between EPAMIG and the University of Puerto Rico - Mayagüez.
- j. Copy of Project design paper, January 1976.
- k. Copy of minutes of RAC review of Soil Families Project (U.H.) and Benchmark Soils Project (UPR), 23 March 1976.
- l. Copy of memorandum of agreement between University of Hawaii and University of Puerto Rico.
- m. Copy of University of Hawaii Annual Report of the Benchmark Soils Project, 1975-1976.

II. ON-SITE REVIEW: Itinerary, Field Trips, Meetings

A. Brazil

Panel arrived Rio de Janeiro Sunday, 13 February 1977 and departed Rio de Janeiro Friday, 18 February 1977.

The Panel and Drs. Beinroth and Gill held an orientation and planning meeting on 13 February.

The review party (Panel plus Drs. Gill and Beinroth) visited Brazil's national soil survey headquarters in Rio de Janeiro. They talked with Dr. Marcello Camargo, Soil Classification Officer, and Mr. Luzberto Acha', Soil Survey Officer, about the progress in soil survey in Brazil. They also discussed EMBRAPA's interest in the Benchmark Soils Project. The soil survey organization, SNLCS, is not engaged in agronomic research and therefore has not assigned anyone to the Project up to now. Dr. Camargo said, though, that the administration of SNLCS is thinking of detailing a scientist to the Project so as to become more directly involved. SNLCS officials expressed particular interest in the use of Project outputs and their extension to the less-known parts of Brazil. They expressed an awareness of the support that a successful benchmark soils project would lend to the national and state soil survey programs. Mr. Acha' was assigned to accompany the review party to Minas Gerais and to provide expert counsel on the soils and geology. Mr. Acha' is thoroughly familiar with the soil resources of Minas Gerais, having been in charge of soil surveys of several areas there for many years. Following the conference at SNLCS headquarters, Dr. Camargo guided the review party on a field excursion in the environs of Rio de Janeiro to get an overview of soils, geology, vegetation, topography, and land-use problems.

The review party then travelled by air and ground to Janaúba, in northern Minas Gerais. They were joined there by Chris Seubert, Brazil Project Leader; Dr. Mauro Resende, Professor of Soils at Viçosa Federal University; and Derli Prudente Santana, Executive Officer of EPAMIG. The Director of EPAMIG's Corutuba Agricultural Experiment Station guided the review party on a tour of the Station, which provided a preview of the common crops and of soil and crop management problems in areas of sandy alluvial soils of this region.

The review party next moved to Jaíba, headquarters for the Project in Brazil. The Project office and laboratory were seen, and the administrative assistant and staff technicians introduced. The party travelled a few miles to the Project primary experimental site on EPAMIG's Jaíba Agricultural Experiment Station. Experimental plots reviewed and discussed here were the following:

1. Maize transfer experiment, planted October 1976, drip-irrigated.
2. Maize variety experiment, drip-irrigated (5 varieties).
3. Brazil National Maize Variety trials, 36 varieties, non-irrigated.

4. Maize management experiments; 3 each density x spacing x variety; 4 replications; drip-irrigated.
5. Soybean transfer experiment, planted November 1976, drip-irrigated.
6. INTSOY soybean variety trails, 16 varieties, drip-irrigated.

The experimental work here is well organized and implemented. Growing crop plots are clearly delineated and well tended. Ample records are kept. The Brazil project leader is thoroughly familiar with details of the Project objectives, design, organization, and operation, and is clearly in command of the work. He is capable in all aspects of Project operations, including the operation and maintenance of equipment, supervision of technical staff, and interpretation of experimental results.

A large, deep pit alongside the maize transfer plot enabled the review party to examine and study the profile of the soil on which these experiments are being conducted. This extraordinary pit makes possible an evaluation of both vertical and lateral variability in soil characteristics, distribution of plant roots, and distribution of soil moisture. The soil has been tentatively classified as Tropeptic Eutrustox, clayey, kaolinitic, isohyperthermic family.

Project Personnel at Jaíba:

Project Leader - Chris Seubert

Administrative Assistant - Carol Seubert

One office/laboratory assistant

Three technicians (local high-school graduates)

Five WAE field laborers

EPAMIG provides administrative services, including transport of things, telephone, mail, loan of vehicles, fertilizer. EPAMIG does not provide any personnel, except occasional emergency field assistance.

Between Jaíba and the Experiment Station where the Project plots are located is a new colonization project being developed and supervised by Rural Minas, an agency of state government. The review party noted a considerable range in crop thriftiness and attention to soil management from field to field on the colonists' holdings.

A proposed secondary site was examined and discussed. This site, off the Experiment Station but rather near, appears to duplicate rather well the soil aspects of the primary site. A question was raised about its close proximity for a comparison of technology transfer.

The review party had a chance to visit the San Francisco River irrigation project, just under construction. This project is to irrigate 100,000 ha. when completed. The main canal, a portion of which has been built, will have a capacity of 80 cu.m./second.

Another nearby agricultural experiment station of EPAMIG was visited next. This station, Centro de Experimentos, Pesquisa Treinamento de Irrigante Experimental (CEPTIE) is devoted primarily to fruit and truck crops, such as papaya, fig, mint, tomato, and beans.

Before leaving the Jaíba area another field excursion provided opportunity to view the wood-gathering, charcoal cooking local industry. Also, a laterite pit was seen, where hardened plinthite is mined for use as road metal. Several contrasting kinds of local soils were also seen and discussed.

After leaving Jaíba, the field party drove to the city of Montes Claros, then flew to Belo Horizonte, capital of Minas Gerais and the headquarters of EPAMIG. Here the party met Mr. Navarete, the FAO officer from Brasilia, and Frank Campbell, AID Program Officer from Brasilia.

The President of EPAMIG, Dr. Helvecio Saturnino, arranged a formal seminar for discussion of the Project and related matters. About 35 EPAMIG employees and several guests met with the field review party for three hours. Dr. Beinroth explained the objectives and design of the Project. The Review Panel discussed the principle of technology transfer based on soil classification and soil surveys. Dr. Dudal talked about world food production potential, the problems of agricultural development in LDC's, and the use of Project output in guiding crop production in remote areas. Following the seminar, the review party participated in a luncheon meeting with Dr. Saturnino, Paulo Caldeira Brant, Associate Secretary of Agriculture of Minas Gerais, and the EPAMIG scientists who participated in the on-site review.

After completion of the conferences at Belo Horizonte, the review party flew to Rio de Janeiro and on the evening of Friday, 18 February, embarked for Puerto Rico via Miami.

On Saturday, 19 February, the team transited Miami and San Juan and continued to Mayagüez.

A planning conference was held in Mayagüez on Sunday, 20 February. The Review Panel and Dr. Gill participated. On-site review findings in Brazil were discussed and plans made for preparation of the review report.

Monday, 21 February, was devoted mainly to field work. The review party visited Project Offices and laboratories at the Mayagüez Campus of the University of Puerto Rico. Besides Dr. Beinroth, the following Project personnel were present: Dr. G. L. Spain, Sr. Agronomist; L. C. Sarmiento, Chemist; José Badillo, Associate Agronomist; L. Calduch, Research Assistant; and S. P. Nightengale, Assistant Agronomist.

The party examined the soil profile at the type location of Matanzas Clay. Enroute to the Isabela Substation, observations were made of indigenous vegetation, crops, and cropping patterns, physiographic features, and land use.

A general tour was made of the Isabela Substation. The soil pit and sample site of Coto soil was examined and discussed in detail. The visual contrast with the Jaiba soil is obvious. The Coto exhibited rather wide cracks, extending to the soil surface. Clay skins are distinct in Coto at a depth of less than 1 meter. The Jaiba soil showed neither cracks nor clay skins. Vegetation on and around the Isabela site is evergreen whereas Jaiba is characterized by deciduous vegetation. Finally, bananas and sugarcane grow well without irrigation at Isabela, but not at Jaiba. There was discussion of the classification of the Coto soil.

Corn and soybean transfer experiments at the primary site were discussed and evaluated.

Corn and soybean transfer experiments were examined and discussed at the Coto secondary site; also on the Isabela Substation.

Following the on-site review, Mr. Badillo presented a slide show of crops at various stages of growth and with different treatments. There was discussion of the irrigation technique being used and of some of the irrigation problems experienced. The downy mildew problem of soybeans was noted, but no solution other than resistant varieties was offered.

Corn fertilization was discussed, particularly the question of fertilizer placement.

The Panel assembled with Dr. Gill at the University of Puerto Rico on Tuesday, 22 February. Findings of the on-site review were discussed. Dr. Beinroth and Dr. Spain joined the Panel and discussed project operations and problems. Then Dr. Gill outlined AID/W concerns about the Project. The Panel then continued the Project evaluation discussion by itself.

Panel members spent the remainder of the day writing portions of the report.

The report writing continued on the morning of Wednesday, 23 February. An exit conference was held about midmorning. The Dean of Agriculture, Dr. L. A. Mejía-Mattei, welcomed the Panel and gave a brief introduction. Director of Agronomy and Soils, Dr. Raul Abrams, represented the administration during most of the conference. Besides Dr. Gill and the Review Panel, the Puerto Rico Project scientific staff were all present. The procedure followed during the review was explained. Significant findings were briefly discussed. Then the parts of the report on commendations and recommendations were read, discussed, and accepted by the Project's Principal Investigator.

Following the exist conference, the Panel Chairman departed for Washington. Other members of the Panel departed Mayagüez on the following day.

III. PROJECT DESIGN AND OPERATION

A. Present Design

Experimental sites for corn and soybeans have been set up at Jaíba (Brazil) and Isabela (Puerto Rico) on Tropeptic Eustrustox, clayey, kaolinitic, isohyperthermic family. In both locations primary sites are in operation, and a secondary site is also planted at Isabela. Up to now, the work has essentially focussed on transfer experiments, with soil fertility trials designed to generate the data necessary to test the transferability hypothesis. On all sites trickle irrigation is employed in order to ensure comparability of results with regard to moisture conditions. The design of the trials is the 5^2 partial factorial modification by Escobar (1) with 5 levels of P and K each with 13 of the 25 possible treatment combinations and 2 control treatments. Each of the 15 treatments is being replicated thrice. Except for the complete control, blanket applications for all plots consist of 200 kg N and a package of trace elements (Mg, Zn, B, Mo). The layout of the trials and the organization of the project are set out in more detail in two reports prepared by F. H. Beinroth (2) and G. L. Spain (3).

B. Findings

1. Although the soils at the Jaíba and Isabela sites are classified in a same family of the Tropeptic Eustrustox, it appears that a number of their characteristics vary rather widely so that the transferability of experimental results between these sites may prove difficult. Whereas Jaíba is located in typically ustic moisture regime (annual rainfall 700 mm) the Isabela site tends toward udic conditions (annual rainfall 1720 mm) (reflected by deciduous and evergreen natural vegetation respectively). The Jaíba soil has a thick (over 2 meters) oxic horizon which is eutrophic in the upper part, but the Isabela soil is characterized by a thin (45 cm) oxic horizon which in places is dystrophic in its upper part. It furthermore appears that the Isabela site as such suffers from heterogeneity which could jeopardize the interpretation of results. No data were available to the panel on the Eustrustox sites in Hawaii.
2. Both sites are trickle irrigated, but it is difficult to ascertain how much water is actually being used and at which average soil moisture condition the experiments are being conducted. No data were available to the Panel on the water quality and composition. No control plots have been laid out for nonirrigated crops.
3. The fertilizer materials used at Jaíba are ammonium sulphate and single superphosphate. At Isabela applications were made of urea and triple superphosphate.

4. On the basis of the yield results already available at Isabela, it is not yet possible to evaluate a trend in the responses to different levels of P and K. It appears, however, that K is not a limiting factor in these soils and the question was raised if the testing of different levels of K should not be replaced by experimentation with N as a second variable.
5. Variety trials have shown that the "best adapted varieties" used for the experiments are not necessarily the highest yielding ones, the reason being that project consultants in plant breeding had advised against using commercial varieties of which the genetic composition is not well known.

IV. INSTITUTIONAL RELATIONSHIPS

In the course of Project implementation, linkages have been established with a number of institutions and are summarized and described in a report prepared for the Panel by Beinroth (2). In the course of the Panel's review trip, however, it was possible only to investigate and discuss effects of the relationships involving the related Brazilian entities, including the local USAID Mission.

Findings

1. Excellent cooperation to the Project is being provided by the principal Brazilian cooperating entity, Empresa de Pesquisa Agropecuaria de Minas Gerais (EPAMIG). Both the administrative staff as well as the technical staff of this entity demonstrated a very high level of interest in and knowledge of the Project and have been very supportive of the site activities being conducted there. This support has included the assignment of two vehicles and housing, laboratory and storage facilities as well as a broad range of administrative support. This interest and support appeared to be based on a genuine acknowledgement of the potential embodied in the hypothesis under investigation and the value it would have for agricultural planning and development in the Brazilian context.
2. Despite the limited size of the USAID Mission in Brazil, it has been and continues to be very supportive of Project activities there. The Mission's Program Officer, Mr. Frank Campbell, met with the Panel and attended a related Project seminar with Brazilian counterparts held in Belo Horizonte. In addition to basic administrative support related to visas of the Project personnel, assistance with customs clearances, etc., the Mission has also been providing needed logistic support in the form of household furnishing and under current plans, the transfer of a grant-in-aid vehicle to EPAMIG for Project support. In view of the phasing-out being planned for this Mission, it is anticipated that increased administrative support will be provided by EPAMIG. However, it would only be prudent to assume that a part of this vacuum will have to be shouldered by the UPR Project administration.
3. Given the stage of Project implementation and results achieved to date, the Panel sees no immediate need for developing specific linkages with AID Missions not directly related to field site activities. Nevertheless, the potential value of the transfer mechanism being tested herein is considered to warrant a parallel effort by the Project leadership to sensitize agricultural planners and soil scientists in the LDC's to the potential of this Project and keep them apprised of the related developments.

V. TRAINING

The major activities in this Project up until the present are those of planning, designing, staffing, installing, and implementing the research. The educational aspects have been reflected in learning while working on the Project and in training new professionals and technicians as they come on board. As EPAMIG and SNLCS personnel are associated with the Project, they will gain an understanding of the technology transfer rationale and of the experimental design and procedures. The Project has no specified training component. Until Project results have been collected, verified, and analyzed, training of outside scientists and technicians is not feasible.

VI. COMMENDATIONS

1. The Project Principal Investigator is commended for excellent planning, preparation, and arrangements for the on-site review.
2. The Project leadership is commended for developing a clear linkage between this Project and the UPR 211-d soil classification grant (AID/csd-2857) resulting in benefits to both.
3. The Project leadership is commended for the close working relationship between the University of Puerto Rico and the University of Hawaii, especially in respect to centralized processing of experimental data.
4. The Project leadership is commended for organizing a soil classification conference to be held in Brazil in June 1977, which should result in substantial advances in the classification of soils of the tropics.
5. EMBRAPA, the Brazilian national agency in charge of agricultural research and EPAMIG, the Project collaborator in the state of Minas Gerais, are commended for their foresight into the potential of the Project, their support of this research, and their own advances in soil classification and survey activities.
6. The AID Mission, Brazil, is commended for its interest in the Project and its assistance in providing logistical support.

VII. RECOMMENDATIONS

A. On Management and Administration.

The Panel recommends:

1. That the Project be extended for another three years in order to realize its objectives.
2. That the University of Puerto Rico strengthen its support of the Project, particularly in logistics, administrative services, and allocation of space. (The ongoing assistance and support of the Project by the AID Mission is appreciated, but this assistance must end when the Mission is phased out.)
3. That emphasis be given in future activities to consolidation of the experimental work, including especially the implementation of secondary sites, the operation of management experiments, and the establishment of another site in Brazil.
4. That close attention be given to scientific and technical management of the experimental work in field and laboratory at all sites in both countries so as to ensure maximum accuracy, reliability, and comparability of experimental results.
5. That an on-site workshop be held about mid-1978 to disseminate Project results and to promote awareness of the value of soil classification for technology transfer.
6. That a continuing effort be maintained by the contractor to keep appropriate LDC institutions and scientists, as well as related interested and potential donor and assistance agencies, informed of the Project and developments therein in order to set the stage for utilization of affirmative Project results.
7. That national institutions be encouraged to become involved in Project operations to the greatest possible extent so as to facilitate logistic support and to ensure a long term continuation of the research and trials even after AID support is terminated.

8. That headquarters staff and space be enlarged by addition of the following:

A. Additional staff

- 1 Project Administrative Officer
- 1 Bilingual executive secretary

B. Additional rooms

- 3 Offices
- 1 Storage room

Project operations currently suffer from delays caused by the necessity for scientific personnel to spend excessive time on procurement, fiscal, and personnel matters. The present secretarial staff is weak in English, making for delays and inefficiency in communications. Present headquarters staff is crowded. That situation added to the proposed increase of two people underlines the need for more offices.

B. On Project Design.

9. Taking into account the work already carried out, it is recommended that the experimental program in the existing sites be pursued and that an eighth site be added, preferably in Brazil, in order to meet the statistical requirements. Considering its range of variability, the Tropeptic Eustrtox may not be the most appropriate subgroup on which to test transferability of agrotechnology at the family level.
10. The Panel recommends that the Project's geographic extent not be enlarged to Africa and/or Sri Lanka.
11. It is recommended that management experiments on levels of irrigation and fertility be added, at least on primary sites. It is noted that large areas of Eustrtox are not likely to be irrigated.
12. It is recommended that consideration be given to deleting K and using P and N as the variables in transfer experiments. It was noted that K does not appear to be a limiting factor in plant nutrition on the soils under study. It is recognized that the University of Hawaii investigators would have to agree to this same alteration in the design of their Soil Families Research Project.

13. In order to ensure maximum comparability of experiments at all the sites it is recommended that:
 - irrigation be uniform both in amount and method of application. (Continuation of drip irrigation is recommended.)
 - fertilizer materials applied be the same
 - irrigation water be analyzed and its composition be taken into account in interpretation of experimental results
 - variety trails include the different varieties used in the transfer experiments at all three locations (Hawaii, Puerto Rico and Brazil).
 - the determination of phosphorus application by the phosphate sorption isotherm method (4) be checked by assessing actual phosphorus levels in the soil following fertilizer application.
14. In order to take maximum advantage of available experience it is recommended that farm practices and results of experiment stations on the same kinds of soils near the Project sites be recorded and fed into the data processing system.
15. As the Project proceeds, it is recommended that first priority be given to consolidating the ongoing transfer experiments on primary and secondary sites with special emphasis on ensuring full comparability (see Rec. 13). In addition, management experiments should be added for irrigation and fertility. Extension activities under the Project should await a positive outcome of these experiments and the economic evaluation of recommended inputs.
16. It is recommended that work not be initiated on a second soil family at this time. The Panel considered extension of the Project to include a second family, preferably of Vertisols in Central and South America and Puerto Rico. Linkages with Vertisols in Hawaii and Africa might then be developed. Extension of the Project on Oxisols or Ultisols is not recommended.

VIII. REFERENCES

- (1) Silva, J. A. and Beinroth, F. H., 1975. Report of the Workshop on Experimental Designs for Predicting Crop Productivity with Environmental and Departmental Paper 26. Hawaii Agr. Exp. Sta., Col. of Trop. Agr. Univ. of Hawaii.
- (2) Beinroth, F. H., 1977. Progress and Planning Review, Benchmark Soils Project. Univ. of Puerto Rico.
- (3) Spain, G. L. 1977. Report on Field Research, Benchmark Soils Project. Univ. of Puerto Rico.
- (4) Fox, R. L. and Kamprath, E. J., 1970. Phosphate Sorption Isotherms for Evaluating the Phosphate Requirements of Soils. SSSA Proceedings Vol. 34, No. 5.

This report respectfully submitted this 31st day of March 1977
in Washington, D. C.

William J. Sullivan

[Signature]

J. Robert Moffitt

REVIEW PANEL SCHEDULE

Sunday	13 Feb	Panel assemble in Rio de Janeiro
		1600 Review planning and orientation meeting: Panel, Gill, Beinroth
Monday	14 Feb	0900 Meeting at Servicio Nacional de Levantamento e Conservacao de Solos, EMBRAPA
		1100 Field trip in Guanabara area
Tuesday	15 Feb	0605 Lv Rio de Janeiro, VP #036
		0645 Ar Belo Horizonte
		1025 Lv Belo Horizonte, NE #
		1130 Ar Montes Claros
		1330 Lv Montes Claros by vehicle
		1640 Ar Janaúba - Visit Gorutuba Agricultural Experiment Station
Wednesday	16 Feb	0730 Lv Janaúba by vehicle
		0855 Ar Jaíba.- Visit Project Office and Laboratory. Field trip to visit experimental sites and nearby features, including San Francisco River Irrigation Project and Jaíba Colonization Project.
Thursday	17 Feb.	0710 Lv Jaíba by vehicle - Visit charcoal operation, Laterite pit, and soil profiles
		1230 Ar Janaúba
		1345 Lv Janaúba
		1645 Ar Montes Claros
		1900 Lv Montes Claros, NE#
		2010 Ar Belo Horizonte
Friday	18 Feb	0830 Seminar at EPAMIG headquarters, Belo Horizonte
		1230 Luncheon with EPAMIG Officials and Associate Secretary of Agriculture
		1915 Lv Belo Horizonte, Varig #455
		2020 Ar Rio de Janeiro
		2300 Lv Rio de Janeiro, PA #440
Saturday	19 Feb	0525 Ar Miami
		0930 Lv Miami EA #915
		1250 Ar San Juan
		1410 Lv San Juan PQ #
		1440 Ar Mayaguez

Sunday	20 Feb	1000	Review report planning meeting
Monday	21 Feb	0900	Visit Project facilities on UPR - Mayagüez campus
		1030	Lv Mayaguez by vehicle for tour of Isabela Substation and on-site review of experimental sites.
		1800	Return to Mayagüez
Tuesday	22 Feb	0740	Review Panel meeting with Project Principal Investigator and Senior Agronomist.
		1300	Write report
Wednesday	23 Feb	0745	Write report
		0900	Exit conference. Review findings, commendations, and recommendations with Project Staff and UPR Administration
		1045	Adjourn

REVIEW OUTLINE

SOIL FAMILIES RESEARCH PROJECT

January 1977

- I. General Conditions and Objectives, Problems, and Needs.
- II. Previous Reviews, Audits, Meetings, and Trip Reports.
- III. Management.
 - A. Plans of Operation
Adequacy, progress, use.
 - B. Work Organization
Planning and scheduling; productivity.
Progress in reaching milestone events.
 - C. Administrative Services
Contracting; equipment management; procurement.
 - D. Budgeting
Operating budgets: currency, adequacy, relevancy to plans.
Planning budgets: future adjustments.
 - E. Personnel
Organization and staffing, adequacy; balance.
Supervision.
Training program.
- IV. Project Design.
 - A. Present Design
Adequacy.
 - B. Proposed Project Design Changes
 - C. Methodology of Verifying Success of Technology Transfer
Statistical models.
Technical guides and on-site testing.
- V. Project Operations.
 - A. Progress on Site Selection and Installation of Equipment
 - B. Progress on Soil Survey Phases
Soil classification and identification of experimental areas.
Field and laboratory characterization of representative pedons.
 - C. Progress on Crop Experiments

D. Progress on Soil Interpretations
Assistance to LDC's in land-use planning.
Relationship to Hawaii Benchmark Soils Project.

E. Status of Extension to Other Countries

F. Status of Model Development at University of Kentucky

VI. Relations to AID Missions in LDC's.

Linkage with mission-funded and LDC-funded research.
Possibility of network approach, using existing tropical research stations around the world.
Relation of AID country missions to centrally funded research projects such as this.

VII. Relations to Host Country, and to International Research Institutions.

Relations in Brazil.
Relations to EPAMIG, CIAT, ICA, IICA, and FAO/UNDP Projects (LAT 70/32 and LAT 70/457).

VIII. Training Component.

Adequacy of present plan and operations.
Additional needs.
Progress.

IX. Utilization of Project Output.

Implications of project results to AID and LDC's: ways of using outputs, scope of extension activities, timetable.
Implications of project results to soil classification.
Future information dissemination and utilization activities.

X. Panel Recommendations - Summary.

INTERNATIONAL SEMINAR ON USES OF SOIL SURVEY
AND CLASSIFICATION IN PLANNING AND IMPLEMENTING
AGRICULTURAL DEVELOPMENT IN THE TROPICS

JANUARY 18-23, 1976

HYDERABAD
INDIA

CONTENTS

1. List of Participants
2. "Keynote Address", William Panton, International Bank for Reconstruction and Development, Washington, D.C., U.S.A.
3. "Modern Soil Classification Fundamentals", W.M. Johnson, Soil Conservation Service, USDA, Washington, D.C., U.S.A.
4. "Some Fundamentals of Soil Classification - U.S. Soil Taxonomy", F.H. Beinroth, University of Puerto Rico, Mayaguez, Puerto Rico, U.S.A.
5. "The Occurrence and Significance of Climatic Parameters in the U.S. Soil Taxonomy", H. Ikawa, University of Hawaii, Honolulu, Hawaii, U.S.A.
6. "Agro-technology Transfer and the Soil Family", G. Uehara, University of Hawaii, Honolulu, Hawaii, U.S.A.
7. "The Contribution of Soil Survey Interpretation in Land Appraisal", A.J. Smyth, Ministry of Overseas Development, Surbiton, Surrey, United Kingdom.
8. "Soil Survey, Classification, and the Transfer of Agricultural Information", A.W. Moore, Cunningham Laboratories, CSIRO, Brisbane, Australia.
9. "Developments in Soil Surveys for Improved Rubber Production in Peninsular Malaysia", Chan Heun Yin, Rubber Research Institute, Kuala Lumpur, Malaysia.
10. "Land Evaluation for Agricultural Land Use planning", J. Bennema University of Agriculture, Wageningen, Netherlands.
11. "Use of Soil Data in Land Use Planning - Techniques for Displaying Soil Data to Planners and Decision Makers", G.A. Nielsen, Montana State University, Bozeman, Montana, U.S.A.
12. "Uses of Soil Resources Data in Land Use Planning", M. Vakilian, Soil Institute of Iran, Teheran, Iran.
13. "Use of Soils Data in Land Use Planning - A Case Study from Karnataka (India)", R.S. Murthy, All India Soil and Land Use Survey, New Delhi, India.

14. "Use of Soils Data in Regional and National Development",
M.L. Dewan, Regional Bureau for Asia and Far East, F.A.O.,
Rome, Italy.
15. "Use of Soils Data in National and Regional Agricultural
Development in Ghana", H. Obeng, Soil Research Institute,
Kwadaso-Kumasi, Ghana.
16. "Use of Soil Data in Regional and National Development - A
Case Study of Tropical Alfisols from Sri Lanka", C.R. Panabokke,
Central Agricultural Research Institute, Peradeniya, Sri Lanka.
17. "Use of Soil Survey Data for Agricultural Development in Korea:
Land Selection for the Introduction of Newly-Bred High Yielding
Rice Variety, "Tongil", Yong Hwa Shin, Institute of Agricultural
Science, Suweon, Korea.
18. "Interpretation of Small and Large Scale Maps for Land Use Planning
in Semi-Arid and Arid North Indian Plains", H.S. Shankaranarayan,
Indian Agricultural Research Institute, New Delhi, India.
19. "A Need for an International Research and Technology Network in
Tropical Soils", G.B. Baird, United States Agency for Interna-
tional Development, Washington, D.C., U.S.A.
20. "A Soil Research Network through Tropical Soil Families",
L.D. Swindale, University of Hawaii, Honolulu, Hawaii, USA.
21. "Soil and Water Management in the Semi-Arid Tropics", B.A. Krantz
and Associates, ICRISAT, Hyderabad, India.
22. "Soil and Water Management in Rain-Fed Agriculture",
Dr. Ch. Krishnamoorthy, All India Coordinated Research
Project for Dryland Agriculture, Hyderabad, India.
23. "Use of Soils Information for Planning Agricultural Development
in the Semi-Arid Tropics", B.A. Krantz and Associates,
ICRISAT, Hyderabad, India.

24. "Soil Taxonomy - Indian Style", T.R. Srinivasan, Indian Photo-interpretation Institute, Dehra Dun, India.
25. "Translocation of Clay in Soils of NW India and Implications involved in using this criterion for glassifying soils" J.L. Sehgal, Punjab Agricultural University, Ludhiana, India.
26. "Soil Survey Interpretations for Watershed Development Programs", Y.P. Bali & Associate, All India Soil and Land Use Survey, Department of Agriculture, New Delhi, India.
27. "A New Approach in the Study of Vertisol Morphology", J.C. Bhattacharjee & Associates, Directorate of All India Soil and Land Use Survey Regional Centre, Nagpur, India.