Resources Survey Project

Ministry of Agriculture

Brazil

E-1, Project Number 512-15-120-249

Pro. Ag. Signed May 30, 1964

Review Report

by

Roy D. Hockensmith
Director, Soil Survey Operations
Soil Conservation Service
Washington, D. C.

March 7 - April 1, 1966

and

May 2 - 26, 1966

United States Department of Agriculture

in cooperation with

Office of Agriculture and Rural Development

USAID

Rio de Janeiro, Brazil

May 26, 1966

Table of Contents

SUMMARY

1. The Resources Survey Project has made good progress when all factors are considered. Although some target dates for steps in the preparation of the exploratory soil map were not met, yet steady progress as a whole is being made.

2. The Project staff is to be commended for the carefully developed Plan of Operations.

3. The excellent training given the 42 trainees should give assurance of higher quality work. It is suggested, however, that in the future the University at Km 47, be in charge of the classroom phase of training.

4. It is recommended that the second two-year assignment of US Soil Advisors consist of one GS-15 and one GS-14. The GS-15 would be responsible for advising and consulting in all phases of soil survey work while the GS-14 would concentrate on soil interpretations. One of these should over-lap the tour of duty of the present two SCS soil scientists. If a proposed soil survey program in the CIVAT region materializes there may be need for an additional soil scientist at Grade FC-4 (GS-14) or FC-5 (GS-13).

5. Steps should be taken to reduce the delays in getting essential equipment and supplies.

6. The scope of activities of Mr. van der Voet should be broadened to encompass all phases of soil survey work which includes photo-interpretation as only one of many items in the total job of advising and consulting. Major emphasis should be in the field of soil survey operations especially in programming, organizing and scheduling soil survey work.

7. As work in the project advances, consideration should be given to adding specialists in forestry, economics, hydrology, crop and grassland management and other disciplines. This recommendation is in keeping with the original concept of this project that

emphasized its inter-disciplinary nature. In the meantime however, as the first phase that deals mostly with soil surveys as a basis for locating areas for settlement progresses, provision should be made for the project manager to work closely with people in the related disciplines.

In June 1964 an interagency team on Brazilian Frontier Development and Settlement consisting of specialists from 6 U.S. Agencies, 4 Brazilian Institutions and USAID in Rio in commenting on this project said "The objectives are excellent. However, the PIO/T seems inadequate in terms of money, personnel and time alloted." It recommended among other things that:

> "Specialists (preferably Brazilian) of high competence in additional fields should be added to the project". These specialists should include an ecologist (with specialization in tropical forestry), hydrologist (with competence in climatology), geomorphologist, and a cultural anthropologist or sociologist."

8. It is recommended that one or perhaps two Brazilians be considered for participant training in the US in "Public Administration in Agricultural Development" with emphasis on resource development and conservation projects such as this one. The present training course of 3 weeks in USDA in Washington DC and 2 weeks at the University of Wisconsin should be explored. This course is listed in the AID/USDA 1965 Prospectus on page 91.

Resources Survey Project, Brazil
Report by Roy D. Hockensmith
March 7 - May 26, 1966

Objective

The objective was to review the progress of the Resources Survey Project that was actively started about one year ago and to assist Dirk van der Voet and Francis W. Cleveland (two SCS soil scientists under the USDA/PASA) who are assigned to advise and help Brazilians. The Resources Survey Project has two objectives. One objective is to locate areas with agricultural potential most suitable for settlement withing the interior of Brazil and suggest alternative land uses and methods of soil management for sustained production. The other objective is to help train and develop a larger number of competent soil scientists for soil survey work in the Ministry of Agriculture.

Progress

A schematic soils map covering about 2/3 of Brazil (the central, west, and north) is nearly complete. This schematic map that shows the suitability of broad areas for settlement is being used to establish priority of areas for reconnaissance soil surveys that will provide more detail and more accurate information for agricultural development.

Information will be provided on best alternative uses of land, expected yields of crops and combinations of management practices needed for sustained productivity. The information that will accompany the schematic map will be general. More detail will be obtained later in reconnaissance surveys.

The Resources Survey Project has just completed a two-month soil survey training course for 42 recent graduates of Brazil's agricultural colleges.

Participant - Review

Many Brazilians as well as U.S. D.A./PASA and USAID people participated. A list of these is attached. (Attachment 1).

Major activities

On March 7 Ford M. Milam, Dirk van der Voet, Francis Cleveland and Albert Pollard gave a brief resume of progress on the Resources Survey Project. Later in afternoon (5:00 pm to 7:15 pm), Cleveland, Pollard, van der Voet and I met with:

Mauricio Reis, Secretary-General of the Ministry of Agriculture.
Hilton Salles, Director, ETA.
Francisco Siqueira, Director of Colonization Department, INDA.
David Felinto Cavalcante, Resources Division, IBRA.
A. Cavalcante, ETA.
N. Bloomfield, Resources Survey Project Leader, and
Waldemar Mendes, Director, DPFS, M.A.

Bloomfield described the Resources Survey Project; Siqueira outlined the work on colonization in the National Institute of Agrarian Development program; and D. F. Cavalcante discussed the work of IBRA (Brazilian Institute of Agrarian Reform).

On March 8 the Resources Survey Project staff discussed status, problems, and suggested revised target dates for completion of a schematic soil map for Brazil. The following were present:

Nathaniel José Bloomfield, Project Leader
Flavio Garcia de Freitas, Soil Scientist
Luiz Gonzaga de Oliveira Carvalho, Pedologist
Leandro Vettori, Chemist
Albert W. Pollard, ARDO/USAID
Dirk van der Voet, Soil Scientist, SCS, ARDO/USDA/PASA
Francis W. Cleveland, Soil Scientist, SCS, ARDO/USDA/PASA
Roy D. Hockensmith, Soil Scientist, SCS

During the following periods March 8 - April 1 and May 2 to 26 most of the time was spent assisting van der Voet and Cleveland in working with the Brazilians on:

1. Developing an annual plan of soil survey operations.
2. Developing a format for a report to accompany the schematic soil map.
3. Principles and criteria for soil survey interpretations.
4. Studying soils and agriculture in the field in the Amazon Basin in the vicinity of Belém, Santarém, Alenquer, Monte Alegre, Manaus, and Boa Vista. (May 8 - 18).

Each Tuesday while in Rio I attended the weekly staff meeting of the USDA/PASA Team in Dr. Ford M. Milam's office. Attached is list of PASA members. (Attachment 2).

A part of my time was used in consulting with officials in the Ministry of Agriculture, with the Agricultural Attachée and his staff and with USDA/PASA group on arrangements for Secretary Freeman's visit to Brazil. During the period April 4 to April 29 I participated in the First Pan American Soil Conservation Congress.

Plan of Operations

Attached is a Plan of Operations for the Resources Survey Project. (Attachment 3). This was developed by the Brazilian soil scientists but based on a working draft earlier by van der Voet. Nathaniel Bloomfield, the Project Manager will present this plan to the Project Council for adoption (with or without modification by Council).

During a period of two weeks in developing this plan the discussions among the Brazilians and with the U.S. advisors were extremely valuable in reaching an understanding on each phase of work and responsibilities of each member of the project. Assignments

are stated in terms of who, what, when, where and how. The group felt that a plan of operations such as this one should help each person to understand his job, be aware of target dates for accomplishing each phase of work and help each of them to perform his work more efficiently. The major items covered in the plan of operations are:

A. Training of new pedologists.

B. Selection and establishment of priority of areas for reconnaissance mapping.

C. Establishment of mapping goals for each reconnaissance soil survey area.

D. Development of soil survey interpretations.

E. Completion of first approximation of schematic soil map of project area.

F. Establish field headquarters in appropriate cities or towns in areas of field operations.

G. Prepare a work plan for each area selected for reconnaissance soil survey.

H. Prepare a preliminary legend for each reconnaissance soil survey area.

I. Develop plan of systematic collection of samples for characterization of soils in each reconnaissance soil survey area.

J. Initiate collection and classification of information for each reconnaissance soil survey area.

K. Develop system of field reviews and inspections to evaluate progress and effectiveness of training and field mapping.

L. Increase use of aerial photographs in soil survey.

M. Promote increased use of techniques of operations management.

N. Initiate public information program.

O. Collect data, maps and photographs for each reconnaissance soil survey area.

P. Central control of project technical documentations.

Q. Publication of technical works and maps.

Interpretations

Attached is a draft of a format suggested for the report to accompany the schematic soil map of the interior of Brazil covering 2/3 of the country. (Attachment 4). The section on interpretations will emphasized alternative uses of land, expected yields of crops and combinations of practices under different levels of management. Mr. Cleveland is devoting a large amount of his time in assisting the Brazilians on this important part of the project.

Training

The training of 42 trainees in the project was well received and should give assurance of higher quality soil maps made by those who become permanent members of the project and the Soils Division. A copy of this training outline is attached. (Attachment 5).

Organization of the Resources Survey Project

The Project is organized within the Division of Pedology and Soil Fertility in the Ministry of Agriculture. The Project Manager reports to a 3-man Project Council consisting of the Director of the Division of Pedology and Soil Fertility, Executive Director of Technical Office of Agriculture (ETA), and Director of Agriculture and Rural Development Office (ARDO), USAID. A recent change however is underway in accord with PRO-AG 512-15-130-247, CONTAP - 1, dated April 5, 1966.

The U. S. Department of Agriculture under a Participating Agency Service Agreement with the U. S. Agency for International Development has a technical and scientific staff serving in Brazil with

headquarters in Rio de Janeiro. Two members of this staff are Dirk van der Voet and Francis W. Cleveland of the U.S. Soil Conservation Service. They serve as advisors to the Resource Survey Project Staff.

A more complete explanation of the organization structure is given in a paper by van der Voet, Cleveland and Bloomfield under title "Resources Survey Project, Brazil, A Report of Objectives, History, Organization and Progress. A copy of this paper is attached (Attachment 6). This paper was presented at First Pan American Soil Conservation Congress, April 12 - 29, 1966. Still more detail is given in the PRO/AG for this project signed July 27, 1965. The plan of implementation is also on file in office of Soil Survey Operations, Washington, D. C. as well as in ARDO/USAID/BR in Rio de Janeiro. A copy is attached. (Attachment 7).

A very brief outline of the highlights of this Project was presented to Secretary Freeman during his visit to Rio, April 19 - 22. This was prepared by van der Voet and Cleveland and presented by van der Voet. A copy is attached. (Attachment 8).

Accomplishments of Field Trip May 8 - 18 in Amazon Valley.

1. Technique of studying soils and agriculture in relatively underdeveloped and unexplored areas by use of low altitude air taxi flights accompanied by ground examination where possible was tested.

2. Tentative soil boundary lines on Exploratory Soil Map were confirmed or modified.

3. Interviews with farmers and technicians along with data from field experiments should help determine recommendations for alternative land uses and management practices for new areas that comprise similar soils.

4. The following is a more detailed account of the Amazon trip May 8 - 18.

Field Trip in Amazon Basin (May 8 - 18)

On May 8, van der Voet, Cleveland, Tomasi, Antonio Manoel and I took a low altitude flight from Rio to Belém via Brasilia, Terezina, and São Luis to study and record data on land features, types of agriculture, and vegetation. This permitted refining some tentative soil boundaries around areas previously studied on the ground. Helmut Kohnke from Purdue University although on another mission joined us on a part of the trip to the Amazon.

On May 9 after a briefing by Melvyn Levitsky at the office of the U.S. Consulate we visited the experiment station at IPEAN where VIRGILIO LIBONATI told us about the soils, crop yields and expected agricultural development in North Brazil. The experiments on Cacao in cooperation with CEPLAC (Charlos Santana) were impressive. VALMIR SANTOS State Secretary of Agriculture gave us his views on the future agricultural development in the State of PARÁ. In addition to increased production of the usual stable crops (rice, corn, beans, mandioca) he told us about the possibilities for more speciality crops such as black pepper, jute, oil palm, peanuts, and sugar cane.

On May 10 Benedito Nelson R. da Silva with IPEAN joined us for the remainder of our trip up the Amazon. Fortunetely the weather was clear permitting good observation on the low altitude flight from Belém to Santarém. During the high water period the Amazon River is about 25 miles wide with many islands and lakes. Shifting cultivation was evident on the drier areas above the flood plain. The wet areas are in grass and used for grazing by both zebu cattle and water buffalo that are marketed live in Belém and Manaus. At Santarém, although the dominant soils are yellow latosols with three phases medium textured phase, sandy phase, and concretionary phase, we observed a few small and interesting areas of 5 to 20 hectares of soils with black (10 YR 2/1) silty clay loam surface 16", pH 6.5, over brownish yellow clay loam, pH 5.5. We were told that the phosphate content is relatively high. Crop yields are high. The Regional plant materials center of the Ministry of Agriculture is located on

one of these areas.

The clear TAPAJÓS River enters the muddy Amazon River at Santarém. Now the water level at this confluence is about 18 feet above the low water level as it is annually at this time of year. Many fields and grasslands are covered with water. Sediment (clay and silt) from the Amazon replenish plant nutrients but the short season during low water period limits use of these soils for crops to August, September, October, and November.

On May 11 and 12 in a Piper-260 - Cherokee - six passenger air taxi (Capt. Garret Boro, Pilot) we made low altitude flights from Santarém over Alenquer and Monte Alegre. Four wheel-drive jeeps met us at each of these two towns from which we made excursions to examine soils and interview farmers on use and management of soils. The yellow latosols, both sandy phase and concretionary phase are used mostly for grazing. The grass vegetation has scattered scrub trees. The dusky red latosols and especially a red clay similar to the Terra Roxa Estruturada have dense tropical rain forest vegetation and when cleared produce good crops with a good system of shifting cultivation. Jute is the principal crop for export. Commonly the yield of jute is 1500 kg/ha. of fiber and 300 Kg/ha. of seed. The present price to farmers is Cr$400 per Kg. for fiber. One family can manage one hectare which is planted in December and harvested in June.

Associated with the Terra Roxa-like soils are small areas of Grumusols from basic rocks. These soils are relative high in fertility and produce excellent grass but are difficult to cultivate owing to their heavy texture. The grasses are Elephant grass, Jaraguá, Colonial, and Pangola.

At a colony (organized in 1928) of 2000 families near Monte Alegre the principal crops are rice, corn, beans, and mandioca but some speciality crops such as cacao, black pepper and tobaco are grown. Peanuts and cotton are often included in cropping systems.

On May 13 a low altitude flight along the Amazon between Santarém and Manaus revealed a pattern of land use similar to that from Belém to Santarém. Many fields are flooded at this time of year. Nearby buildings are on slighty higher land. Although the Amazon River is about 25 miles wide at Obidos there are many small islands scattered throughout the braided river. The larger islands (5 to 10sq miles) have many inland lakes. About 10 - 20% of the land on islands appear to be cultivated. About 50% is in grass and 30 - 40% in trees. Along and near the banks of the Amazon above flood plains shifting cultivation is evident.

On May 14 FLAVIO joined our group. From Manaus to Boa Vista, Territory of Roraima, the vegetation pattern varied from dense tropical rain forest with small areas of shifting cultivation to large areas of open grassland a part of which had scattered scrub trees. As we crossed the equator the heavily forested areas with rubber and Brazil nut trees gave way to cerrado vegetation. The higher elevations on each side of the Rio Branco valley appeared to be more heavily forested. Shifting cultivation was evident along the Rio Branco River.

The Governor of Roraima, DILHERMANDO CUNHA DA ROCHA, briefed us at his home in Boa Vista on the potentialities of the territory of Roraima. He generously made available to us two of his top technicians (Morvan de Paulo Barbosa and Dorval de Magalhães) in the Division of Production.

We travelled by jeep 50 miles northwest from Boa Vista across nearly level to undulating grassland plains with occasional areas of scrub trees, to a densely forested area. A colony of 50 families is settled here. The dominant soils are Dark Red Latosols clay texture approaching the Terra Roxa Estruturada at the colony in contrast to the Yellow latosol sandy phase and medium textured phase in the area across the campo cerrado between the Colony and Boa Vista.

On May 15 we travelled by jeep 35 miles south of Boa Vista on Brazilian Highway Br-17 across the campo cerrado to the edge of a forested area. The dominant soils appear to be medium textured Yellow Latosols with small areas of hydromorphic soils in slight depressions.

Very little of the land is cultivated in this large nearly level to undulating area of grassland surrounding Boa Vista that extends about 30 to 50 miles in each direction from Boa Vista.

The commom practice is to burn the old grass vegetation in March each year. New growth starts in April. Best grazing is in May, June and July. During some years however the dry vegetation is burned two or three times.

Cultivated crops marketed in Boa Vista are grown mostly on the better soils (Dark Red Latosols, Clay, texture) located about 35 to 50 miles from Boa Vista.

On May 16, two technicians from IPEAN (João Vianna Araújo and Roberto Nakajima) showed Cleveland, van der Voet and me the soils and agriculture along a fairly new highway running 50 miles north-east from Manaus. The soils are dominantly heavy textured yellow Latosols developed under dense tropical-rain-forest. The relief is hilly. Many small areas are being cleared for cultivated crops. A few older farmed areas along an old road that ran adjacent to or coterminous with the new road appear to have been farmed successfully under shifting cultivation. The commom crops are rice, corn, beans, mandioca and some vegetables and fruits. We saw two small commercial poultry farms. A good market exists in Manaus (population 175,000) for these products.

Highly impressive was a successful Japanese colony locate about 20 miles from Manaus that produces black pepper. About 50 families now have about 120 hectares of black pepper.

The black pepper is marketed through a cooperative that also aids in buying fertilizers, fungicides, and other supplies. Fusarium is a

dreaded disease. Not many pepper plants have been lost yet but control measures must be strict. Maximum production is obtained when plants are 5 years old. After 10 to 15 years production becomes low. Fertilization consists of 3 kg. chicken manure and 1/2 kg. of chemical fertilizer (N-P-K) per hill.

On May 17, Marshall Whitlock, U.S. Consular Agent in Manaus briefed us on the agricultural potential for the State of Amazonas. The principal crops that aid most in the economy of this area are jute, rubber, Brazil nuts, lumber especially plywood, and skins especially alligator. There is good potential for sugar cane, pineapple, oranges and black pepper. Poultry and dairy products could be increased with better refrigeration and with better feed rations.

On the trip from Manaus to Rio via Brasilia the boundary lines between the densed forested and cerrado areas as well as relief features of the landscape were observed.

Equipment and Supplies

It was highly unfortunate we did not have field glasses (binoculars) on our trip to the Amazon in making observation from airplanes. A lack of this kind of equipment is a severe handicap to the work on this project. Immediate attention needs to be given to getting necessary equipment and supplies. We should not assign competent technical people to projects and then limit their usefulness by inadequate or lack of equipment.

On May 26, 1965 a special request was signed by Lincoln Gordon, then Ambassador to Brazil, for the SCS to procure 2 Binoculars 7 x 50 and charge to PIO/T 512-249-2-40341. The identification number of this communication is"TOAID A-1500".

On October 29, 1965, Dirk van der Voet reminded us in SCS in Washington that this item as well as some other items had not been received. Other items not yet received but included in PIO/T 40341, Rio de Janeiro AIDTO A847, Jan. 25, 1965 are:

Soil Sampling Tubes
Kits for making micromonoliths
Planimeter
Slide rule

Attention to this situation should receive high priority.

Also some equipment and supplies that were procured directly by USAID have not been delivered to the technical people although this equipment arrived in Brazil more than 8 months ago. For example, some of this equipment ordered on "PIO/C 512-249-4-40367" was delivered to the ETA warehouse in Rio in September 1965. Yet it has not reached the Divisão de Pedologia e Fertilidade do Solo, Rua Jardim Botânico 1024, the project headquarters. Repeated requests have been made to get this equipment delivered. Memoranda dated March 9 and March 30, 1966 between Jerome Hulehan and Andrew Dressler as well as a memorandum of April 1, 1966 from Albert Pollard to Hilton Salles expressed the need for this equipment. A copy of an additional memorandum dated May 20, 1966 is attached. (Attachment 9).

Attachment 1

List of People Who Participated in Review of Project Work

List of People Who Participated in Review of Project Work

USAID:

1. Albert W. Pollard
2. Richard R. Newberg
3. Howard W. Ream

USDA/PASA:

1. Ford M. Milam
2. Dirk van der Voet
3. Francis W. Cleveland

SCS:

1. Fred A. Prange (May 1 - 8)
2. Roy D. Hockensmith

DPFS, Ministry of Agriculture:

1. Nathaniel Jose Torres Bloomfield
2. Valdemar Mendes
3. Luiz Edmundo Rangel de Sousa Britto
4. Flavio Garcia de Freitas
5. Leandro Vettori
6. Luiz Gonzaga de Oliveira Carvalho
7. Joao Mauricio Gralha Tomasi
8. Antonio Manoel Piros Filho
9. Abeilard Fernando de Castro
10. Marcelo Nunes Camargo

IPEAN:

1. Benedito Nelson R. da Silva
2. Italo Falesi

Attachment 2

List of Personnel, USDA/PASA, Brazil

UNITED STATE DEPARTMENT OF AGRICULTURE
International Agricultural Development Service

Status of Personnel
AID/USDA/PASA - BRAZIL
March 2, 1966

POSITION AND NOMINEE	LOCATION	ARRIVAL IN BRAZIL
1. Chief of Party -USDA/PASA Milam, Ford (IADS)	Rio	November 11, 1964
2. Marketing News Specialist Hooks, Lance G. (C&MS)	Rio	November 30, 1964
3. Marketing (Livestock) Knister, Russell B. (C&MS)	Rio	January 8, 1965
4. Soil Scientist van der Voet, Dirk (SCS)	Rio	January 29, 1965
5. Soil Scientist Cleveland, Francis (SCS)	Rio	February 1, 1965
6. Credit Specialist Daniel, Luther B. (FHA)	Recife	February 9, 1965
7. Economist (Marketing) Poats, Frederick (ERS)	Rio	February 13, 1965
8. Economist (Agric. Prod. Est. and Forecasts Coffrey, Fred (ERS)	Rio	March 8, 1965
9. Credit Specialist Schroepfer, Eugene C. (FHA)	Rio	March 9, 1965
10. Cooperative Specialist Bradford, Henry (FCS)	Rio	April 5, 1965
11. Minimum Price & Stabilization (Program Development Specialist Harris, R.M. Sidney (ASCS)	Rio	April 2, 1965
12. Marketing Specialist Swentor, August J. (ARS)	Rio	April 9, 1965
13. Minimum Price & Stabilization (Storage Program Specialist) Ferguson, Arnold E. (ASCS)	Rio	April 22, 1965

POSITION AND NOMINEE	LOCATION	ARRIVAL IN BRAZIL
14. Economist (Agric. Analyses) Wheeler, Richard G. (ERS)	Rio	April 27, 1965
15. Minimum Price & Stabilization (Field Operations Specialist Crowell, Franl, (ASCS)	Rio	May 13, 1965
16. Minimum Price & Stabilization (Fiscal Specialist) Johnson, Maxwell, L. (ASCS)	Rio	May 15, 1965
17. Credit Specialist Miller, Ralph E. (FHA)	Rio	July 18, 1965 (Effective date of transfer to PASA from USAID/Brazil)
18. Cooperative Advisor (Management) Gerber, Henry (FCS)	Curitiba	October 15, 1965
19. Cooperative Advisor (Management)	São Paulo	Nominee being selected
20. Cooperative Advisor (Management) Thomas, Lucius (FCS)	Recife	January 4, 1966
21. Agricultural Credit Specialist Smith, W. Ray (FCA)	Rio -ETA 3/10/66	EOD - Washington - January 3, 1966
22. Marketing Specialist (Storage) Coonrod, George (ARS)	Rio	Appointment eminent. Finalize of appointment documents awaiting acceptance by Coonrod
23. Marketing Specialist (Facilities) Brandenburg, Roy (ARS)	Recife	Appointment documents now in preparation by ARS. (Awaiting Clearance)
24. Cooperative Advisor (Credit)	Rio	Nominee being selected

Short-term consultantes provided by USDA/PASA

1.	Shofner, William	(ASCS)	1 1/2 months
2.	McGary, Dan	(ASCS)	2 months
3.	Chatto, Larry	(ASCS)	3 months
4.	Brown, Leo	(FHA)	3 months
5.	Shigley, Fred	(ARS)	6 months
6.	Smith, Guy D.	(SCS)	1 month
7.	Scharen, Albert, L.	(ARS)	6 months *
8.	Barry, Robert J.	(FCA)	2 months
9.	Samuels, Kennoth J.	(FCS)	2 weeks
10.	Orvedal, Arnold C.	(SCS)	1 month

* Reimbursable detail prior to signing of PASA.

Attachment 3

Plan of Operations for the Resources Survey Project, 1966

PLAN OF OPERATIONS

FOR

THE RESOURCES SURVEY PROJECT

1966

I. INTRODUCTION

The purpose of the Plan of Operations is to state clearly the objectives of the Project for 1966. It indicates the responsibilities and duties of the Project personnel under the supervision of the Project Manager. These responsibilities and duties are expressed on terms of who, what, when, where and how.

Also included in this Plan of Operations are general procedures for the operation of Project activities.

The Plan of Operations has the purpose of helping each person concerned with the Project to understand clearly his work and when it should be done. Thus the work will be accomplished more efficiently. The objectives are stated and provisions are made for each phase of the work.

It is recognized that complete attainment of all these objectives may not be accomplished in 1966, but at least a start will be made and work developed according to this Plan.

This Plan of Operations is developed in accordance with the terms of item nº 4 of "TÊRMO DE ENTENDIMENTO E COORDENAÇÃO, REF.: PRO-AG 124 de 26/11/65".

II. OBJECTIVES

A. Training of New Pedologists.

B. Selection and Establishment of Priority of Areas for Reconnaissance Mapping.

C. Establishment of Mapping Goals for Each Reconnaissance Soil Survey Area.

D. Development of Soil Survey Interpretations.

E. Completion of the 1st. Approximation of Schematic Map of Project Area and Progressive Development of Exploratory Map.

F. Establish Field Headquarters in Appropriate Cities in Areas of Field Operations.

G. Preparation of a Work Plan for Each Area Selected for Reconnaissance Soil Survey.

H. Preparation of Preliminary Legend for Each Reconnaissance Soil Survey Area.

I. Development of Plan of Systematic Collection of Samples for Characterization of Soils in Each Reconnaissance Soil Survey Area.

J. Initiate Collection and Classification of Information for Each Reconnaissance Soil Survey Area.

K. Development of a System of Field Reviews and Inspections to Evaluate Progress, Effectiveness of Training, and Field Mapping, and Standard Procedures for the Execution of Work.

L. Increase Use of Aerial Photograph in Soil Surveys.

M. Promote Increased Use of Operations Management Techniques.

N. Initiate Public Information Program.

O. Collect Data, Maps and Photographs for Each Reconnaissance Soil Survey Areas.

P. Central Control of Project Technical Documentation.

Q. Publication of Technical Works and Maps.

III. DETAILS OF PLAN

A. Training of New Pedologists.

1. Person Responsible: Project Manager.
2. Target Date: December 31, 1966.
3. Procedures:

   a. Prepare schedule, select instructors, arrange for classrooms.
   Project Manager and staff, 30 days prior to opening session.

   b. Select students from list of applicants.
   Project Manager and staff, 30 days prior to opening session.

   c. Supervise execution of instruction.
   Project Manager and staff throughout training.

   d. Organize field parties for in-service-training and select leader from experienced pedologists.
   Project Manager and staff, 30 days prior to beginning of field operations.

   e. Supervise and evaluate progress of field parties during training.
   Project Manager and staff.

   f. Select those students to be hired by Project.
   Project Manager by end of field training period.

B. Selection and Establishment of Priority Areas for Reconnaissance Survey Area.

1. Person Responsible: Project Manager.

2. Target Date: Before June 1st.

3. Procedures:

   a. Study Schematic Map for potential areas.

   b. Request cooperation from other Brazilian agencies having responsibilities for colonization, settlement and development of Brazil's Interior.

   c. Evaluate with these agencies the selection and taking into consideration soils, markets, communications, health problems, jointly select and establish a priority list of areas for reconnaissance surveys.

   d. Select areas for initiation of surveys this year.

   e. Select at least one area before June 1st. to start a reconnaissance survey.

C. Establishment of Mapping Goals for Each Reconnaissance Survey Area.

1. Person Responsible: To be designated by Project Manager.

2. Target Date: Prior to initiation of mapping in each area.

3. Procedures:

   a. Review available records of past mapping to determine a monthly rate of mapping by party.

   b. Determine length of mapping season.

   c. Considering experience of party chief, training responsibilities, topography of survey area, available roads and inadequate knowledge of the area establish mapping goals for this year.

4. Remarks:

   a. These goals should be reasonably low this year, but the objectives of the Project and time limits must be kept in mind, yet quality and not quantity is the first priority.

D. Development of Soil Survey Interpretations

1. Person Responsible:

2. Target Date: August 31, 1966.

3. Procedures:

   a. Designation of counterpart in area of Soil Survey Interpretation.

   b. Determine levels of management to be used in scheme of interpretations.

   c. Determine best method and form for presenting interpretations.

   d. Become familiar with legend of Schematic Map.

   e. Assemble all available supporting data making necessary field trips for this phase.

   f. Develop interpretations under several levels of expected management expressed in such a way that they are easily understood by those concerned with planning.

4. Remarks:

   Publications which may be useful in this area.

   a. U.S. SCS Soils Memo Nº 9 (10/6/55).

   b. (Others to be added by Cleveland).

E. Completion of the 1st. Approximation of Schematic Map of Project Area and Progressive Development of Exploratory Map.

1. Person Responsible: To be designated by Project Manager.

2. Target Date: July 1st. for schematic map and completion of Project for exploratory map.

3. Procedures:

a. See recommendations of A. C. Orvedal and complete schematic map by July 1st., 1966.

b. Evaluate progress to date and determine additional information required to produce a reasonably reliable map.

c. Plan and schedule the field trips necessary to provide the required data for completion of the schematic map.

d. Revise present first approximation of schematic map using additional data acquired.

e. Determine final publication scale of schematic map by May 1st., 1966. 1:5,000,000.

f. Present to the Project Manager for discussion, reproduction and publication of 1st. approximation schematic map with solid delineation to indicate areas examined and dotted lines to indicate areas not examined but where information was extrapoled by July 1st., 1966.

g. Prepare a brief descriptive legend to accompany the schematic map.

h. Determine the scale and compilation of the exploratory map by December 31st., 1966.

i. Present to the Project Manager the first exploratory map completed by the final phase of Project.

F. Establish Field Headquarters in Appropriate Cities in Areas of Field Operations.

1. Person Responsible: Project Manager.

2. Target Date: From May 1966.

3. Procedures:

a. Taking in consideration the following factors:

1) Accessibility by comercial air lines.

2) Accessibility by car.

3) Distance to actual soil survey areas.

4) Distance to field headquarters of other agencies. cooperating with the Project.

5) Available office space and rental costs.

6) Hotel and restaurant accommodations.

7) Available supplies.

b. Select and establish headquarters in location which most closely meets the criteria listed above.

G. Preparation of a Work Plan for Each Area Selected for Reconnaissance Soil Survey.

1. Person Responsible: To be designated by the Project Manager.

2. Target Date: Prior to mapping.

3. Contents of Soil Survey Work Plan:

   a. Name of area.

   b. Size of area.

   c. Location and description of area.

   d. Cooperating agencies.

   e. Basic cartographic material to be used.

   f. Specification and description of the work to be developed.

   g. General publication plans.

   h. Designation of person responsible for soil survey report.

   i. Development of a work plan for steps and phases, and make provisions for completion of survey.

4. Remarks:

   a. The work plans should be, whenever possible, developed after consultation with other agencies having an interest in the area, and when it has been determined what contribution they can make to the survey.

   b. U.S. SCS Soils Memo Nº 4, Soil Survey Work Plans, Jan. 30, 1959 should be of value in meeting this objective.

H. Preparation of a Preliminary Legend for Each Reconnaissance Soil Survey Area.

1. Person Responsible: Party Chief of Soil Survey Area.

2. Target Date: After work starts on each area.

3. Contents of Preliminary Legend:

   a. The mapping units and symbols by which they are identified.

   b. A description of each taxonomic unit and each mapping unit.

   c. A table showing the characteristics and genetic relationship of each of the mapping units.

4. Preparation, Approval and Distribution:

   a. Prepared by Party Chief.

   b. Approved by Project Manager or Soils Correlator.

   c. Distribution:

      1) Each member of field party.

      2) Cooperating agencies (if desired by them).

      3) Project Manager.

      4) Soils Correlator.

5. Remarks:

   a. Descriptive legends should include the information needed by other competent field scientists to distinguish the mapping units from one another.

      They should also provide the information necessary for the proper classification and correlation of the mapping units.

   b. U.S. SCS Soils Memorandum Nº 5, April 19, 1955, "Procedures for Legend Preparation and Field Reviews of Soil Surveys", should be of value in carrying out this objective.

1. Development of Plan of Systematic Collection of Samples for Characterizations of Soils in Each Reconnaissance Soil Survey Area.

   1. Person Responsible: Party Chief of each Reconnaissance Soil Survey Area.

   2. Target Date: After start of survey.

   3. Procedures:

      a. Establish list of soils to be sampled.

      b. Determine priorities.

      c. Prepare plan for sampling.

      d. Submit plan to Project Manager for review and approval.

      e. Arrange with Soils Laboratory for Cooperation in sampling.

      f. Check and review the analytic data.

      g. Methodic classification of analytic data.

   4. Remarks:

      a. Sampling of soils for laboratory analysis may be done for studies of soil properties in relation to their:

         1) Characterization.

         2) Classification.

         3) Genesis.

         4) Interpretation for management and some engineering uses.

      b. U.S. SCS Soils Memo Nº 14, March 30, 1961 should be of value in carrying out this objective.

J. Initiate Collection and Classification of Information for Each Reconnaissance Soil Survey Area. (Soils Handbook)

1. Person Responsible: Party Chief of each Reconnaissance Soil Survey Area with assistance from Cleveland.

2. Target Date: Soon after start of work.

3. Assemble in a ring binder all available data on the soil of the area. Basically it consists of the following items:

   a. Descriptive legend.

   b. Characterization Data.

   c. Yield tables.

   d. Capability tables.

   e. Description of the area.

   f. All phases of interpretations.

   g. Climatic data.

   h. Geological data.

   i. Other soils information as developed.

4. Procedures:

   a. Obtain binder from Project Manager.

   b. As data are available insert copies in binder. Keep current a table of contents.

   c. Make binder available to all interested people for use and information.

K. Development of Systems of Field Reviews and Inspections to Evaluate Progress, Effectiveness of Training and Field Mapping, and Standard Procedures for the Execution of Work.

1. Person Responsible: To be designated by Project Manager.
2. Target Date: After starting survey work.
3. Field reviews consist of:
   a. Initial Review (Field study of soils and preparation of preliminary legend).
   b. Progress Review (Check on quality and progress of field work).
   c. Final Review (Evaluation of entire survey).
4. Procedures:
   a. Develop schedule of initial review and make arrangements for carrying out provisions of initial review. Project Manager in cooperation with party chief. At the initiation of survey work.
   b. Designate person to conduct initial review. Project Manager. At the initiation of survey work.
   c. Schedule progress review for each survey area. Project Manager. After initiation of survey work.
   d. Designate person to conduct Progress Review. Project Manager. After initiation of survey work.
   e. At least one annual meeting will be held with staff members of all soil surveys, including specialists in photo interpretations, soils analysis and soil survey interpretations for a joint discussion of techniques.
   f. Date of the meeting to be determined by Project Management and conducted by the technician designated by him. Notices about the meetings will be posted by Project Manager.

5. Remarks:

a. Written reports should be prepared for each review.

b. Participants will be notified in advance of matter to be discussed at the meeting.

c. Technical reports will be prepared after each meeting and sent to all staff members, and when asked to people concerned.

d. Reports should be reviewed and approved by Project Manager and Soil Correlator.

e. U.S. SCS Soils Memorandum Nº 5, April 19, 1955, "Procedures for Legend Preparation and Field Reviews of Soil Surveys" should be of value in carrying out this objective.

L. Increase Use of Aerial Photograph in Soil Survey

1. Person Responsible:

2. Target Date: Throughout year.

3. Procedures:

a. When areas for reconnaissance survey have been selected determine availability of aerial photograph coverage.

b. If area has coverage review for suitability of use in soil survey and arrange for procurement if satisfactory.

c. If area has no coverage arrange for it if at all possible.
(Contact IAGS on this).

d. Study area on photos with stereoscope, select samples land forms for ground examination.

e. Develop procedures for improving speed and accuracy of survey through air photo interpretation techniques without sacrificing quality of mapping.

f. Select trainees with aptitude for API for additional training.

g. Encourage all soil scientists to improve their skill and knowledge of API techniques and use.

M. Promote Increased Use of Operations Management Techniques

1. Person Responsible: Project Manager.
2. Target Date: Throughout year.
3. The techniques of Operations Management:
   a. Schedules of activities (with dates) for each phase of work.
   b. Diaries - entries daily.
   c. Progress records - submit reports on progress at request of Project Manager.
   d. Summary of activities developed during the year, presented by person responsible.
   e. Quarterly meetings with party chiefs for discussion on progress made and operations management.
   f. Monthly meetings by party or team to discuss progress made and operations management.
   g. Time distribution studies - Project Manager and party chiefs.
   h. Review and inspection of soil survey work in the field.
   i. Personnel appraisals, commendations and promotion for improvement of professional standards.
   j. Estimate of work done and later report.
4. Procedures:
   a. At staff meetings discuss the techniques, means of employment, purpose and effectiveness.
   b. Develop forms to be used and procedures to be followed.
   c. Set starting date for each technique adopted.

N. Initiate Public Information Program

The people of Brazil need to be made aware of the Project, its purposes, and objectives and its significance to Brazil's economic growth and development.

1. Person Responsible: To be designated by Project Manager.

2. Target Date: June 30, and throughout year.

3. Procedures:

   a. Compile list of "News Outlets" - television, radio, newspapers by area.

   b. Make personal contacts with editors and managers of those outlets determined to be suitable for use. Find out what they will use and form they want it in.

   c. Evaluate contacts and determine those agreable to accept and use releases.

   d. Periodically prepare releases - insure that they are well written, timely, and interesting and submit to appropriate outlets.

   e. Evaluate program from time to time and make necessary revisions, renew contacts, keep aggressive program going.

   f. Organize a collection of slides and photographs for speeches and news outlets.

   g. Preparation and distribution of technical reports to people concerned.

O. Assemble Data, Maps and Photographs of Each Reconnaissance Soil Survey Area.

1. Person Responsible: Party Chief.

2. Target Date: One month prior to initiation.

3. Procedures:

   a. Collect, review and evaluate all available data on geology, climate, vegetation, topography, etc.

   b. Collect, review and evaluate all available topographic and other maps of area.

   c. Determine available photographic coverage of area, and request coverage if available.

4. Remarks:

   Work closely with Soils Correlator with respect to availability and sources of data.

P. Central Control of Project Technical Documentation.

1. Person Responsible: To be designated by Project Manager.

2. Target Date: Throughout Project.

3. Procedures:

   a. Organize at Project Hq. a system of technical documentation of all work developed.

   b. Party Chiefs will send to Project Hq. copies of all reports, legends, profile descriptions and characterizations of soils.

   c. Send to Project Hq. copies of all maps.

   d. Send samples of photographs, micro monoliths with legend to the Control of Documentation, Project Hq.

   e. Review of all collected material for laboratory analysis, numbered and identified.

   f. Organize at the Central Control the classification of technical documentation compiled and keep them up to date.

4. Remarks:

   The collection of material and indexed information at the Central Control is an accummulation of all work done, to be used for consultation by Project technicians and other people concerned, and for reproduction if needed. It is essential for correlation work.

Q. Publication of Technical Works and Maps

1. Person Responsible: To be designated by Project Manager.

2. Target Date: Throughout the Project.

3. Procedures:

   a. Project Manager will establish a control department for coordination of publications and informations.

   b. The results of works and other matters of interest will be published by the Project or by authorized agencies, giving due credit to those responsible.

   c. Texts for publication must have Project Manager's approval.

   d. All technical reports will be published and distributed to Project staff.

   e. Publications of all descriptive legends of areas of reconnaissance soil survey.

   f. Publication of all technical work translated if authorized by author.

4. Remarks:

   a. Copies of these publications will be distributed to all Project staff.

   b. Copies of these publications can be distributed to people interested.

   c. Copies of the Training Course publications will be donated to the Brazilian Soil Science Society. It can be reproduced if needed.

Attachment 4

Format: Exploratory Soil Map with Soil Interpretations for Western Brazil

EXPLORATORY SOIL MAP
WITH SOIL INTERPRETATIONS
FOR
WESTERN BRAZIL

PREPARED BY:

MAPS PREPARED BY

Ministério da Agricultura
USAID

TABLE OF CONTENTS

INTRODUCTION

This report provides information about the soils of Central and Western Brazil. The information will be of interest and can be of help to many people who work with or have a concern about soils and their interpretations for agricultural use. It will also be of interest to those concerned about climate, vegetation, and geology.

In preparation for this report, soil scientists made trips into the interior of Brazil. As they traveled the roads they dug holes to depths of five feet or to rock, whichever was the shallower, in order to examine, describe, and classify the soils. They also examined road cuts, evaluated soil erosion and wetness characteristics and recorded observations of the vegetation and rock formations. Soil samples were collected on the major soils during the field trips. The samples were brought to laboratories where chemical and physical properties were determined. The tables in the back of this report and other interpretative information throughout this report are based on the results of these laboratory tests and field observations.

Aerial photographs were used, where available, to determine the kind of topography and vegetation of inaccessible areas. Maps, books, and technical reports prepared by travelers and workers in various types of activities, such as forestry, mineralogy, geology, climatology, hydrology, etc., were consulted to obtain information about areas of the interior where little is know about the kinds of soils that are present.

Using the information from these and other sources, soil scientists drafted an exploratory soils map to aid those concerned with the settlement and development of the resources of the interior of Brazil. The soil map with interpretations lack the accuracy desired because of the inaccessibility of vast inexplored regions; therefore revision will be needed from time to time as further explorations are made and knowledge is gained.

Source of the areas shown on the map are known to have potential for development and in these areas, reconnaissance surveys may be made in more detail to guide settlement. Other areas shown on the map are known to lack any potential for development and these areas may be eliminated from consideration by those concerned with settlement.

The Resource Survey Project has been organized and established within the Division of Pedology and Fertility of Soils which is a division within the Brazilian Ministry of Agriculture. This project is financed jointly by the Ministry of Agriculture and USAID and has the objective of locating approximately 30 million hectares of soils with relatively high fertility suitable for cultivation by farmers who presently possess little or no capital resources, education or skills. In addition to being relatively high in fertility, the areas selected for settlement should meet other conditions

including accessibility to markets, relative freedom from health hazards, suitable climate for plant growth, etc.

At the time this report was prepared, about 30 soil scientists had received training and were engaged in making exploration and reconnaissance surveys to aid in meeting the objectives of the Resource Survey Project. Two soil scientists of the U.S. D.A. specialists in aerial photograph interpretations and soil survey interpretations, were assisting with the work.

The purpose of this report is to present information about how soils maps and interpretations can be used in making planning decisions. The report contains an exploratory soils map, interpretive maps, and interpretive tables, along with explanatory information.

Soil Surveys provided by the Ministry of Agriculture are a source of information that can be used by planners in developing sound, long-range plans for settlement of the Interior.

How To Use The Report

Different readers will be interested in different parts of the report; however for greatest understanding, the information should be examined in the following sequence:

Examine the Soil Map

It is advisable for most readers to first examine the soil map, page . It shows the location and extent of the various soils.

To help locate an area of land, features such as roads, streams, state boundaries, and degrees of latitude and longitude, will be helpful.

After location is made, it will be found that any sizeable land area may have a member of different soil areas delineated. Each of these soil areas is referred to as a Soil Mapping Unit and contains a symbol. The symbol on the map is the tool to be used throughout this report to help in locating desired information. All symbols appearing on the soil map are defined on the legend which accompanies the map. It should be recognized that the boundaries between the soil mapping units are not sharp and that one soil tends to grade into another.

Study the Soil

After finding the symbol on any tract of land turn to the appropriate mapping unit description. The table of contents will assist in finding the pages on which the description of a given mapping unit occurs. Each mapping unit description includes general statement about the kinds of soils occuring within the mapping unit. Persons interested in technical descriptions and laboratory data of representative profiles will find this information in Appendix . In studying the soil descriptions, it should be understood that there are ranges in the properties and those given are most typical for the soils of the mapping units.

Refer to the Soil Interpretations

Soil interpretations are made to aid in the understanding of how soils can be expected to react under a particular use and treatment.

Past experience and study reveal that soil behavior differs from one soil to another.

The soil map and descriptions of the mapping units are generalized and in much of the area are estimations . Therefore, the data and interpretations need to be considered in a general way also. The information should be used only as preliminary to more detailed study when specific information is secured on the kind and extent of soil at a particular location. This is especially true in the consideration of the properties of the soils as they affect the settlement and development of areas.

General

Location

The area covered by the exploratory soil map includes all of the States of Piaui, Maranhão, Para, Amazonas, Acre, Mato Grosso, Goias, the federal district of Brasilia, and the territories of Rondonia, Roraima, and Amapa. It includes all of Brazil except the states along the eastern coast which extend inland about 300 to 500 miles. It comprises approximately square miles or acres. At 7 degrees south of the equator the distance from the eastern boundary of the area to the western boundary is about 2000 miles. At about half the distance from east to west, (or about the center of the state of Mato Grosso), the distance from the north boundary of the area to the southern boundary is about 1700 miles.

Physiography

Most of the area is drained by the Amazon River and its many tributaries. The southern part of Mato Grosso and Goias is drained by the Paraguai and Parana Rivers and their tributaries which flow southward through Paraguay and Argentina emptying into the Atlantic Ocean near Buenos Aires. Most of the area of the States of Maranhão and Piaui is drained by rivers flowing northward into the Atlantic Ocean east of Belem.

Attachment 5

Training Outline, Soil Survey Training Course

Soil Survey Training Course

Jan. 10 - Monday

HOUR	SUBJECT
8:30 - 9:20	Inaugural session with explanation about the course. Presentation of teachers and students.
9:30 - 10:20	Talk: Organization of M.A. - D.P.E.A. Activities and responsibilities of the D.P.E.A.
10:30 - 11:20	PRO-AG. 249 and its objectives.
13:30 - 14:20	Evolution and review of the history and development of soil science.
14:30 - 15:20	General bibliography of references. Procedures of operation of training, noticies and explanations.

Jan. 17 - Monday

HOUR	SUBJECT
8:30 - 9:20	Concept and definition of soils. Components of soil: organic matter, solid mineral matter, air and water.
9:30 - 10:20	Soil Profile, horizons.
10:30 - 11:20	Morphological characteristics: color and mottling.
13:30 - 14:20	Work on use of Munsell Book and determination of color.
14:30 - 15:20	" " "
15:30 - 16:20	" " "

Jan. 18 - Tuesday

HOUR	SUBJECT
8:30 - 9:20	Continuation of morphological characteristics: texture
9:30 - 10:20	Continuation of morphological characteristics: structure and porosity.
10:30 - 11:20	Continuation of morphological characteristics: consistence.
13:30 - 14:20	Work on Evaluation of textural class on standardized samples.
14:30 - 15:20	" " "
15:30 - 16:20	" " "

Jan. 19 - Wednesday

HOUR	SUBJECT
8:30 - 9:20	Continuation of morphological characteristics: clay skins concretions. Krotovinas, friction surfaces and florescence.
9:30 - 10:20	Continuation of morphological characteristics: consolidated and unconsolidated pans.
10:30 - 11:20	Explanation Projection of devices used in determining morphological characteristics.
13:30 - 14:20	Field work on identification of structure and clay skins.
14:30 - 15:20	" " "
15:30 - 16:20	" " "

Jan. 20 - Thursday

HOUR	SUBJECT
8:30 - 9:20	Soil profile: definition, identification and nomenclature of horizons.
9:30 - 10:20	Symbols and conventional connotations. Subdivision of horizons. Boundaries.
10:30 - 11:20	Procedures for examining and describing of profiles and their recording.
13:30 - 14:20	Work on field evaluation of consistence.
14:30 - 15:20	" " "
15:30 - 16:20	" " "

Jan. 21 - Friday

HOUR	SUBJECT
8:30 - 9:30	Characterization of physical properties recording and preparation of samples ;Mechanical analysis of natural clay composition - degree of floculation.

9:30 - 10:20	Specific gravity, real and apparent. Natural solid matter and natural porosity.
10:30 - 11:20	" " "
13:30 - 14:20	Field work: examination of morphological characteristcs identification of horizons and description of soil profiles.
14:30 - 15:20	Field work: " "
15:30 - 16:20	Field work: " "

Jan. 22 - Saturday

HOUR	SUBJECT
8:30 - 9:20	Interpretation and significance of physical properties.
9:30 - 10:20	" " "
10:30 - 11:20	" " "
13:30 - 14:20	Visit to DPFS Laboratory
14:30 - 15:20	" " "
15:30 - 16:20	" " "

Jan. 24 - Monday

HOUR	SUBJECT
8:30 - 9:20	Constancy of soil moisture equivalent units, wilting point, field capacity, available water.
9:30 - 10:20	" " "
10:30 - 11:20	" " "
13:30 - 14:20	Visit to DPFS Laboratory
14:30 - 15:20	" " "
15:30 - 16:20	" " "

Jan. 25 - Tuesday

HOUR	SUBJECT
8:30 - 9:20	Interpretation and significance of constancy of water.
9:30 - 10:20	" " "
10:30 - 11:20	" " "
13:30 - 14:20	Field work: examination of morphological characterristics, identification of horizons and soil profile description.

14:30 - 15:20	Field work: examination of morphological characteristics, identification of horizons and soil profile description.
15:30 - 16:20	" " "

Jan. 26 - Wednesday

HOUR	SUBJECT
8:30 - 9:20	Characterization of chemical properties: silica, aluminium, iron, titanium and manganese; relation Ki and Kr.
9:30 - 10:20	Characterization of chemical properties: calcium, magnesium, sodium, potassium, hydrogen and exchangeable aluminium; S.T.V. values and percent of saturation with aluminium.
10:30 - 11:20	Characterization of chemical properties: pH, total and assimilable phosphorus; carbon nitrogen and relation C/N.
13:30 - 14:20	Visit to DPFS Laboratory.
14:30 - 15:20	" " "
15:30 - 16:20	" " "

Jan. 27 - Thursday

HOUR	SUBJECT
8:30 - 9:20	Conductivity of the saturation extract and percentage of saturation with sodium.
9:30 - 10:20	" " "
10:30 - 11:20	" " "
13:30 - 14:20	Interpretation and significance of chemical characteristics.
14:30 - 15:20	" " "
15:30 - 16:20	" " "

Jan. 28 - Friday

HOUR	SUBJECT
8:30 - 9:20	Analytic determination for evaluating fertility.
9:30 - 10:20	" " "
10:30 - 11:20	" " "
13:30 - 14:20	Visit to DPFS Laboratory
14:30 - 15:20	" " "
15:30 - 16:20	" " "

Jan. 29 - Saturday

HOUR	SUBJECT
8:30 - 9:20	Mineralogic characterization: primary minerals(essential minerals of rocks); mineralogic analysis of fractions, gravel and sand.
9:30 - 10:20	" " "
10:30 - 11:20	" " "
13:30 - 14:20	Visit to DPFS Laboratory
14:30 - 15:20	" " "
15:30 - 16:20	" " "

Jan. 31 - Monday

HOUR	SUBJECT
8:30 - 9:20	Importance and significance of mineralogic analysis.
9:30 - 10:20	" " "
10:30 - 11:20	Clay minerals classification, genesis and characteristics.
13:30 - 14:20	Macroscopic determination of principal primarian minerals of rocks.
14:30 - 15:20	" " "
15:30 - 16:20	" " "

Feb. 1 - Tuesday

HOUR	SUBJECT
8:30 - 9:20	Exchange capacity of ions and other properties.

9:30 - 10:20	Importance of organic colloids.
10:30 - 11:20	" " "
13:30 - 14:20	Talk: Fertility
14:30 - 15:20	Talk: Fertility
15:30 - 16:20	Talk: Fertility.

Feb. 2 - Wednesday

HOUR	SUBJECT
8:30 - 9:20	Factors of soil formations: parent material.
9:30 - 10:20	Principal rocks which form soils. Erratic and residual material.
10:30 - 11:20	Continuation of factors forming the soils - climate.
13:30 - 14:20	Mascrocopic identification of the principal types of rocks.
14:30 - 15:20	" " "
15:30 - 16:20	" " "

Feb. 3 - Thursday

HOUR	SUBJECT
8:30 - 9:20	Continuation of factors forming the soils. Relief.
9:30 - 10:20	" " : Vegetation and time.
10:30 - 11:20	Basic principles of soil classification:
13:30 - 14:20	Talk: Climate.
14:30 - 15:30	Talk: " "
15:30 - 16:20	Talk: " "

Feb. 4 - Friday

HOUR	SUBJECT
8:30 - 9:20	System of soil classification.
9:30 - 10:20	Process of azonal soil formation.
10:30 - 11:20	Process of halomorphic soil formation.
13:30 - 14:20	Talk: Organism.
14:30 - 15:20	Talk: " "

15:30 - 16:20 Talk: Organism.

Feb. 5 - Saturday

HOUR	SUBJECT
8:30 - 9:20	Process for the formation of hydromorphic soils and calcimorphic soils.
9:30 - 10:20	" " "
10:30 - 11:20	" " chernozomic and desert soils.
13:30 - 14:20	Talk: Phytogeography
14:30 - 15:20	Talk: " "
15:30 - 16:20	Talk: " "

Feb. 7 - Monday

HOUR	SUBJECT
8:30 - 9:20	Process for the formation of chernozemic soils and desert (arid) soils - cont.
9:30 - 10:20	Process for the formation of podzolic soils.
10:30 - 11:20	" "
13:30 - 14:20	Talk: Geomorphology
14:30 - 15:20	Talk: " "
15:30 - 16:20	Talk: " "

Feb. 8 - Tuesday

HOUR	SUBJECT
8:30 - 9:20	Process for the formation of podzolic soils - cont.
9:30 - 10:20	Process for the formation of latozolic soils.
10:30 - 11:20	" " "
13:30 - 14:20	Talk: Ecology
14:30 - 15:20	Talk: " "
15:30 - 16:20	Talk: " "

Feb. 9 - Wednesday

HOUR	SUBJECT
8:30 - 9:20	Process for the formation of latosolic soils - cont.
9:30 - 10:20	Types of A horizons, types of B horizons. Other diagnostic horizons.
10:30 - 11:20	" " "
13:30 - 14:20	Talk: Geology
14:30 - 15:20	Talk: " "
15:30 - 16:20	Talk: " "

Feb. 10 - Thursday

HOUR	SUBJECT
8:30 - 9:20	Mapping units: taxonomic and combined.
9:30 - 10:20	" "
10:30 - 11:20	Purposes and different types of soil surveys.
13:30 - 14:20	Talk: Geology
14:30 - 15:20	Talk: " "
15:30 - 16:20	Talk: " "

Feb. 11 - Friday

HOUR	SUBJECT
8:30 - 9:20	Purposes and different types of soil surveys. cont.
9:30 - 10:20	Survey of land use capability.
10:30 - 11:20	Soil Survey - field work: basic maps, preliminary works, exploratory study and preliminary legend; selection and examination of profiles.
13:30 - 14:20	Talk: Interpretation of surveys.
14:30 - 15.20	Talk: " "
15:30 - 16:20	Talk: " "

Feb. 12 - Saturday

HOUR	SUBJECT
8:30 - 9:20	Soil survey: field work: description, description

	recordings, and sampling of profiles; soil mapping; correlation.
9:30 - 10:20	Soil Survey: office work: descriptive legends; cartographic works for the preparation of the final map, compilation, reduction and generalization; composition and printing of maps and explanatory text.
10:30 - 11:20	Soil survey - office work: " "
13:30 - 14:20	Talk: Soil Conservation
14:30 - 15:20	Talk: " "
15:30 - 16:20	Talk: " "

Feb. 14 - Monday

HOUR	SUBJECT
8:30 - 9:20	Photogrametry - Generality, definition and division; Production of air photos - planes and cameras - film speed - special films - printing of films - copies; Air photos studies - information from the air photos - geometric elements of air photos.
9:30 - 10:20	" " "
10:30 - 11:20	" " "
13:30 - 14:20	Displacement of points; resulting images displacement of point, tilt, distortion.
14:30 - 15:20	Scale of photography - Photogrametric flight. Calculation of the number of photographs necessary to cover a region. Execution of the flying. Flight study. Mosaics and photo indices. Filing of photographs and films.
15:30 - 16:20	" " "

Feb. 15 - Tuesday

HOUR	SUBJECT
8:30 - 9:20	Stereoscope - Human Eye - Visual perception stereoscopic or binocular. Methods of obtaining stereoscopic

1st. Section 20 students	vision. Simple stereoscopy. By anaglyph. Visual paralaxe or convergence. Angular stereoscopic paralaxe - linear stereoscopic paralaxe. Deduction of the fundamental formula of the altimetric measurements.
9:30 - 10:20	" " "
10:30 - 11:20	" " "
13:30 - 17:00	Measurements of the altitude of the points in stereoscopic pairs - Paralaxe bar - Construction of planimetric maps - Instruments for utilization in air photo interpretation.
2nd. Section 20 students	

Feb. 16, 17, 18 - Wednesday, Thursday and Friday

Photo Interpretation Technique

a) Application of air photos: Mosaics - Photogrametry - Photo Interpretation - Photo reading - Photo-Analysis.
b) Inter-relation to the different sciences: Geology - Soil Science - Geomorphology - Geography - Engineering - Forestry, etc.
c) Field application of Photo Interpretation: Geology, Soil Science, Forestry, Engineering. Geomorphology, Geography, Archaeology, Natural Resources, etc.
d) Acquirement of air photos suitable for each type of study: Film - Filters - Scale - Season of the year, etc.

Fundamentals of Photo Interpretation

Judgement and Elements for the Analysis of Air Photo

a) Analysis of physiographic forms: Topography (shape, altitude, slope variations) - Physiographic forms deposited by water, wind, glacial, gravity.
b) Drainage analysis - Types of drainage- Controled and uncontroled drainage - Absence - Parts of a drainage system - Characteristics of drainage system - Factors that control or modify a system of drainage- Basic systems and Modified systems - Importance of the drainage judgement.

c) Erosion analysis: granulometry of different materials - Section made by erosion.
d) Tone analysis: factors that limit the tone in a air photo - graduation of tones - Uniformity and Variations.
e) Vegetation analysis: vegetation association and its significance:
f) Analysis of changes made by man: Changes made now and in the past.
g) Other criteria.

Projection of slides referring to the criteria of Photo Interpretation.

Feb. 19 - 21 - Carnival (holiday)

Feb. 24 - Thursday

HOUR	SUBJECT
8:30 - 9:20	Use of photographs in the field: base of preliminary and final legend; selection of places that show difficulties during the analysis;recording in the field; orientation with km.
9:30 - 10:20	" " "
10:30 - 11:20	" " "
13:30 - 14:20	" " "
21 students	
14:30 - 15:20	" " "
15:30 - 16:20	" " "
15:30 - 17:00	" " "

Feb. 25 - Friday

HOUR	SUBJECT
8:30 - 12:00	Photo Interpretation: Classes of drainage (dry, wet and waterlogged areas); classes of gullies, pattern of drainage. Use of air photo in soil survey. Scale of photographs for different types of survey. Transfer of boundaries of the areas to basic maps. Enlargements and reductions. Use of photo indices in the exploratory survey.

Practical Work

Panchromatic photographs, infra-red and colored. Different problems of scale and handling of photographs. Use of different types of mosaics and photo-indices.

Feb. 28 - March 10

Field trip.

March 11 - 15

Delivery of reports, Verification of progress and conclusion of the training.

Attachment 6

"Resources Survey Project, Brazil, A Report of Objectives, History, Organization and Progress"

Resources Survey Project[1]

Brazil

A Report
of
Objectives, History, Organization and Progress

by
Dirk van der Voet, Francis W. Cleveland and
Nathaniel José Torres Bloomfield[2]

(1) A project under the Alliance for Progress co-sponsored by the Brazilian Ministry of Agriculture and the United States Agency for International Development.

(2) Soil Scientists, U. S. Soil Conservation Service, United States Department of Agriculture, Agricultural and Rural Development Office, Participating Service Agreement, Brazil; and Engenheiro Agronomo and Project Manager, Ministry of Agriculture, Department of Pedology and Fertility of Soils.

SUMMARY

The Resources Survey Project is a project under the Alliance for Progress co-sponsored by the Brazilian Ministry of Agriculture and the United States Agency for International Development. Large areas of Brazil known to have potential for development are presently unoccupied. Settlement of those areas guided by knowledge of the extent, location, and qualities of arable soils, and requirements for proper cropping and soil management will contribute to Brazilian Progress.

To meet the demand of the next ten years it is estimated that 30 million hectares of soils of relatively high fertility will have to be located. This is the objective of the Resources Survey Project. An exploratory soil survey map and general reports are being prepared by the Project. Based on this map and report it is planned to indicate broad areas as generally suitable for settlement. To further confirm and more accurately identify those areas suitable for settlement "reconnaissance soil and resource surveys" will be carried out by the project to delineated 30,000,000 hectares.

With the realization and fulfillment of the objectives of the Resources Survey Project it is believed that assistance and guidance of considerable value will be available to those who have the responsibility for the orderly and progressive development of Brazil's vast interior.

Introduction and Objectives

The purpose of this paper is to present the objectives of the Resources Survey Project, and briefly outline its history, its organization and its progress as of Feb. 1, 1966.

Large areas of Brazil, known to have potential for development, under the right combination of crop, pasture, forest use and with management adapted to the type of soil and terrain are presently unoccupied. Settlement of these areas by low-income farmers from the over populated Northeast and other areas of excess population will contribute to Brazilian progress and stimulate economic and social development in an orderly manner, if this settlement can be guided by knowledge of the extent, location, and qualities of arable soils and requirements for proper cropping and soil management.

It is, therefore, particularly important to locate areas with soils that are suitable for cultivation by farmers who presently possess relatively little or no capital resources, education, and skills and to provide opportunities for these farmers to develop both skills and sound economic farm units.

To meet the demand of the next ten years it is estimated that 30 million hectares of soils of relatively high fertility will have to be located. To be used effectively in agriculture, these areas must meet other conditions, including reasonable accessibility to markets and relative freedom from health hazards. After general economic feasibility for development has been determined, plans will need to be made for development on a significantly large scale to meet needs of families who desire to migrate and establish farms in the interior of Brazil.

In keeping with these objectives the Coordinating Commission for the Alliance for Progress (COCAP), the Brazilian Ministry of Agriculture, and the United States Agency for International Development with the concurrence of the Brazilian Government together with Ponto IV have entered into agreement for a cooperative project known as the "Resources Survey Project".

Organization and Responsibilities

Brazilian Ministry of Agriculture

Responsibility at the national level for the necessary soil survey rests with the Division of Pedology and Soil Fertility (DPFS) within the Department of Research and Experimentation (DPEA) of the ministry. The DPFS provides leadership, training, coordination and correlation of soil survey and soil classification throughout Brazil. It also has responsibilities in determining the nature and relative fertility of the various different kinds of soils and their suitability for agricultural use. It cooperates with state government agencies in the conduct of its programs.

The Resources Survey Project has been organized and established under the DPFS with headquarters at the Jardim Botânico in Rio de Janeiro.

An exploratory soil survey map and general report are being made by the project. The relatively sparsely settled regions of Brazil include the States of Acre, Amazonas, Goiás, Mato Grosso, Pará and Piauí, and the Federal Territories of Amapá, Roraima, and Rondônia. This comprises an area of approximately 6,000,000 square kilometers. Based on the exploratory map it is planned to indicate broad areas as generally suitable for settlement.

Reconnaissance soil and resources surveys will be carried out by the project to further confirm and more accurately identify those areas suitable for settlement. It is intended to delineate 30,000,000 hectares. Major emphasis will be on soils, climate, vegetation cover, surface water, and related factors which determine resource capacity for possible agricultural uses of land.

A Project Council has been established which is responsible for the technical planning of the program and approval of detailed work plans, budget and any work done by contract. The Project Council is constituted by the Executive Director of Technical Agricultural Office, the Director of the Department of Pedology and Soil Fertility, and the Director of the Agricultural and Rural Development Office, United States Agency for International Development.

The Ministry has designated a member of the DPFS, acceptable to the Project Council, to serve as Project Manager to the exclusion of other duties, and to be immediately in charge of day-to-day operations, including supervision of the locally employed project staff, preparation and submission of detailed work plans and budgets for approval by the Project Council, preparation of periodic reports and management of property assigned to the Project.

For the development of this Project the Ministry of Agriculture agreed to give financial aid in 1965 and in the following years, besides making available to the Project resources and chemistry laboratories for soils. It also will aid and help to get the cooperation, interchange of informations and use of facilities from other federal and state agencies.

At the same time, the Ministry of Agriculture through the DPFS designated 4 members of its staff to participate specifically in the activities of the Project, and also designated for short periods of times other technicians to give assistance, thus making available contribution. Some technicians from Institute of Agricultural Research and Experimentation - North (IPEAN) and Institute of Agricultural Research and Experimentation - Central-West (IPEACO) have been participating in these activities. Four agronomists have also been working for the Project under contract.

In respect to the laboratories, the intention has been to standardize the methods of analysis between those of DPFS and IPEAN, which meets the objectives of the DPFS to standardize the methods in the laboratories of the other institutions, outside the area of the Project.

United States Agency for International Development (USAID)

The U.S. Department of Agriculture under a Participating Agency Service Agreement with the U.S. Agency for International Development has a technical and scientific staff serving in Brazil with headquarters in Rio de Janeiro. Two members of this staff are soil scientists of the U.S. Soil Conservation Service and serve on the Resources Survey Project Staff. One is a specialist in the field of soil survey

interpretation and the other in the field of aerial photograph interpretation for soil survey. These soil scientists are working in a full time capacity and are an integral part of the survey operations. They are helping in all phases of the project including: (1) development of survey work plan; (2) training of inexperienced and new personnel; (3) field and laboratory operations; (4) preparation and publication of maps and reports. These men are working with Brazilian counterparts of DPFS and others serving the Project.

The Director of the Agricultural and Rural Development Office of the United States Agency for International Development has on his staff a Project Coordinator who meets several times weekly with the Project staff and U.S. technicians.

In addition to the full time technicians there are provisions for a series of short term consultants from the U.S. Soil Conservation Service. These are specialists in a particular field such as soil classification, operations, small scale soil maps, and cartography. In the fall of 1963 and summer of 1964 Mr. Hockensmith, Director of Soil Survey Operations of the Soil Conservation Service, made trips to Brazil to lay groundwork for the Project. Dr. Guy Smith, Director of Soil Survey Investigations, spent several weeks in the fall of 1964 in Brazil working in the field of soil classification preliminary to the organization of the Project. Mr. A. C. Orvedal, Chief, World Soil Geography Unit was in Brazil from 16 August to 14 September 1965. He gave advice and assistance in the preparation of a legend for the exploratory map and guidelines for developing the 1st. Approximation of the exploratory map.

Preliminary background work prior to the organization and establishment of the project was performed in 1964 by the USAID Frontier Development Team. This team was composed of personnel from various Brazilian and United States government agencies. They worked in Brazil from late May until late June making field studies and developing recommendations.

During July of 1965 Dr. Matthew Drosdoff, Administrator of the International Agricultural Development Service of the U.S. Department of Agriculture, visited the Project. His objective was to meet the personnel of the Project and to familiarize himself with project operations.

Special field and laboratory equipment not available in Brazil were provided by U.S. Agency for International Development (USAID).

Financial Support. The Project is jointly financed by the Brazilian Ministry of Agriculture and USAID. For example, during the calendar year of 1965, the USAID contribution was 330 million cruzeiros, and the contribution of the Ministry of Agriculture was 273 million cruzeiros.

Progress to Date

The operation of the Project actually got under way in late April of 1965. One of the first operations was the determination of available aerial photographic coverage for Brazil. This was determined by visiting all known agencies performing aerial photographic services and indicating their coverage on a map of Brazil.

As part of the exploratory survey in June and July of 1965 a field expedition was made overland through the States of Mato Grosso, Territory of Rondônia, and State of Acre, and return through the State of Goiás. A study of the soils, parent material, vegetation, and land use enroute was made and recorded on maps of the area. Co-sponsoring this expedition was the Food and Agricultural Organization of the United States (FAO), Soil Map of the World Project.

In addition to the field trip of June and July exploratory survey field parties have operated in the States of Goiás, Maranhão, Mato Grosso, Pará, and Piauí.

The first approximation of the exploratory map is about complete. Although there is a deadline of June 30, 1966 for the final approximation of the exploratory map it will be continuously improved as additional information becomes available throughout the course of the

survey.

The construction of the first approximation of the exploratory map in addition to field trips was based on past experience and knowledge of the soil scientists of the DPFS, existing soils maps of Brazil, and available maps and information on geology, topography, vegetation and climate. Also information on vegetation, drainage and broad land forms was obtained from aerial photo indices.

Continuing with the work, several trips are scheduled in 1964 to the area of the Project, especially in the States of Mato Grosso, Goiás, Piauí and Maranhão, and the Amazon Region with the cooperation of the Navy and Air Force for transportation. Observations and gathering of material will be made by technicians of the Project, Division of Pedology and Soil Fertility (DPFS), and IPEAN (Institute of Agricultural Research and Experimentation - North).

A great deal of difficulty was experimented in the early stages of the Project in recruiting new personnel. The nature of the Project requires field trips into the wilderness and forested areas of the interior of Brazil for extended periods of time where living conditions are difficult and accommodations are not adequate. However, this problem has been overcome and during the period January 10 through March 10 an intensive training course was administered in Rio by the Project to 40 recent graduates of Brazil's Agricultural Universities. This is being followed up by on the job training in soils in the field. Instructors for this course have been drawn from the staff of the Rural University of Brazil, the Division of Pedology and Soil Fertility (PDFS) and the Pan American Center for Improvement of Research of Natural Resources (CEPERN).

Twenty of the trainees will be working for the Project when survey teams, consisting of 4 to 5 trainees will operate under the direction and leadership of an experienced soil scientist of the DPFS.

Selection of areas in which these reconnaissance surveys will be conducted will be determined from the exploratory map and in consultation with other agencies of the Brazilian government concerned in

colonization and settlement of Brazil's interior, such as the National Institute of Agrarian Development (INDA) or Brazilian Institute of Agrarian Reform (IBRA). In addition to soils, factors to be considered before final selection of areas are made will be transportation, communications, markets, health hazards, and other requirements.

Aerial Photograph Interpretations

Seven days of the training course have been devoted to the fundamentals of aerial photography and aerial photograph interpretation for soil surveys. Several members of the DPFS staff are already experienced in the use of aerial photograph interpretation methods in reconnaissance surveys, and the soil scientists of U. S. Soil Conservation Service are experienced in the use of aerial photographs in soil survey. The techniques of aerial photograph interpretation will be utilized in the conduct of the reconnaissance soil and resource surveys. The advantages and limitations of aerial photograph interpretation in soil survey are recognized and aerial photograph interpretation will be used as an aid and a tool and not a substitute for on the ground examination of the soils.

Soil Survey Interpretations

A general report will accompany the exploratory map of Brazil. This report will describe the soils and the mapping units delineated on the map and will provide general interpretations of the soil suitability.

Soil interpretations are developed for specific objectives such as production of ordinary cultivated field crops, irrigated crops, range crops, forest crop, and for engineering purposes, wildlife uses,etc.

It is not possible, however, at this time to give accurate predictions of the potential use of soils of unexplored regions because more detailed studies and research data are needed. However, the soil interpretations provided in the general report will aid economists,

sociologists, geographors, foresters, engineers, agronomists, and others who will be involved with the development of the interior of the country.

Users of the map and report will be able to eliminate from consideration of development, large areas known to have low potential due to topography, climate, soils, and ohter factors. They can give priority to selected areas of higher potential where reconnaissance surveys will assist in the selection of specific sites suitable for colonization and development and where settlers will be able to make a satisfactory living with their present level of technology and education. The standard of living should be able to be raised with assistance from credit, extension, research and other agencies.

The exploratory map of Brazil with the interpretations of the map units should aid in the selection of regions where research stations and experiment fields are needed to obtain data and to gain knowledge of adapted varieties of plants and of methods for managing the soils to achieve maximum yields with sustained production. As new varieties of crops, new machines, new chemicals, and new methods of soil use become available we will need to change our evaluation of the productivity of the various kinds of soils under different combinations of practices. As new explorations are made and as new information becomes available, it will be necessary to revise this first draft of the soil map of the interior of Brazil and to reinterpret the map units as progress is made in the development of new knowledge.

The southern part of the United States is an example of a region where improvements and lowered cost of fertilizers have greatly changed the relative advantage of many soils[1]. Soils that were considered useless for farming only a few years ago with the practices current at that time are now of high value. The difference was caused by greatly improved varieties of plants, new machines for developing water control practices, and good fertilizers at low cost.

---

(1) Kellog, Charles E., Soil Interpretation in the Soil Survey, April 1958

Other soils that were formerly used for cultivated crops are now in pasture or forest because they did not respond to the new methods.

With the realization and fulfillment of the objectives of the Resources Survey Projec it is believed that assistance and guidance of considerable value will be available to those who have the responsibility for the orderly and progressive development of Brazil's vast interior.

Attachment 7

Frontier Resource Survey (Resources Survey Project)
Implementation Plan and Budget

Since the Implementation Plan is still under revision a copy is not attached. As soon as it is complete and reproduced copies will be forwarded to all offices receiving copies of this report.

Attachment 8

Outline of Report on Resources Survey Project
presented to Secretary Freeman on April 20, 1966

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PARTICIPATING AGENCY SERVICE AGREEMENT

COOPERATING WITH

RESOURCES SURVEY PROJECT
DIVISION OF PEDOLOGY AND SOIL FERTILITY
BRAZILIAN MINISTRY OF AGRICULTURE

USDA, SCS soil scientists serving as advisors to the Project

1. FRANCIS W. CLEVELAND
2. DIRK van der VOET

I. PROJECT OBJECTIVES

A. To locate 30,000,000 hectares of soil of relatively high fertility suitable for settlement within the interior of Brazil.

B. To increase the size, scope, and effectiveness of the soils staff within the Ministry of Agriculture.

II. AREA OF OPERATIONS

A. Western two thirds of Brazil

1. The States of:

Acre - Amazonas - Goiás - Maranhão - Mato Grosso - Pará - Piauí.

2. The Federal Territories of:

Amapá - Roraima - Rondônia.

III. SIZE OF AREA

A. Square Kilometers: 6,000,000.

B. Square Miles: 2,400,000.

C. Acres: 1,536,000,000.

IV. PROCEDURE OF OPERATIONS

A. Phase I

Collection, review, evaluation and classification of available data on soils, geology, climate, vegetation, topography, population, transportation, markets health (Publications, maps, research data).
(This Phase completed).

B. Phase II

Exploratory Soil Map of Project area, with accompanying legend and interpretations.

1. Purpose:

To indicate these areas which are:

a. Suitable for settlement.

b. Not suitable for settlement.
(Too steep or rough, too wet, or infertile).

c. Questionable, requiring further study.

2. Based on:

a. Previous soil studies and experience.

b. Exploratory field studies.

c. Information on geology, climate, vegetation and topography.

d. Aerial photo interpretation.

e. Air observation.

C. Phase III

Reconnaissance soil survey of 30,000,000 hectares.

1. Purpose:

To confirm and more accurately identify those areas suitable for settlement which will permit efficient use of land on a sustained basis.

D. Interpretations of Soil Map Units.

Will be included in report accompanying maps.

1. Suitability of soil areas for development will be indicated under 3 kinds of management:

a. Traditional farming methods.
(Hoe, machete, no fertilizers).

b. Modern farming methods.
(Machinery, fertilizers, skilled operators).

c. Irrigation farming.
(With modern methods).

2. Soil areas will be rated:

a. Good.

b. Fair.

c. Poor.

3. Factors limiting soil areas for agricultural use are:

a. Low natural fertility.

b. Excess water.

c. Lack of water.

d. Modern machinery limitations.

e. Susceptibility to frosts.

Limitations will be rated as slight, moderate, severe.

E. Coordination Required in Selection of Areas for Reconnaissance Survey.

Other agencies of the Brazilian Government having responsibilities for settlement and development of the interior.

1. INDA - National Institute for Agricultural Development.

2. IBRA - Brazilian Institute for Agrarian Reform.

3. CIVAT - Interstate Commission of the Araguaia and Tocantins Valleys.

4. Other Agencies.

F. Training.

1. Provide in-service-training to 75-100 technicians in field of soil survey to include:

a. Field and laboratory methods for soil and land classification.

b. Cartography.

c. Air photo interpretation.

d. Preparation of reports.

e. Interpretation and use of resource surveys in planning.

2. Key men to have training in the United States.

3. Student trainee programs during university vacations.

V. UNITED STATES CONTRIBUTIONS

A. Technicians.

1. Two soil scientists, USDA, SCS.

a. Soil Survey Interpretations.

b. Soil Survey Operations and Air Photo Interpretations.

2. Short term consultants.

These are specialists in various areas of soils for one to three months duration.

B. Financial.

1965: $148,000

VI. ACCOMPLISHMENTS TO DATE

Considering the problems and obstacles encountered it is believed that reasonable progress has been made in the first year of Project operations. Specific accomplishments

are as follows:

A. Phase I.

Collection and classification of data - Completed.

B. Phase II.

Exploratory soils map nearly completed - 1st. Approximation by June 30, 1966.

C. Training.

1. Annual Basic Soil Survey Course - Completed.
   a. Jan. 10 - March 15, 1966.
   b. Forty-two recent graduates of Brazil's Agricultural Colleges.
   c. USDA, SCS Soil Scientists assisted in instruction.
2. In-Service-Training in the following areas currently taking place:
   a. Soil survey interpretations.
   b. Aerial photo interpretations.
   c. Soil Survey operations.

Attachment 9

Memorandum from J. Hulehan to A. Dressler on Equipment and Supply Problem

Copy Copy Copy

May 20, 1966

Mr. Andrew Dressler
General Services Officer

Jerome Hulehan
Asst. Agri. Program Officer, ARDO

PIO/C 40367

1. In September 1965 one box of intrenching tools was delivered to the ETA warehouse from the Alfandega. These commodities were ordered by PIO/C 512-249-4-40367.

2. These commodities ordered are for the use of "Divisão de Pedologia e Fertilidade do Solo - Rua Jardim Botanico 1024."

3. By memoranda of March 9th and March 30, 1966, I asked your office to request the FINK Transport to pick up these commodities in the ETA warehouse and deliver them to Jardim Botanico.

4. I have been informed that these commodities still have not been delivered.

5. These commodities were originally ordered in January of 1965, seventeen months ago, and are needed to permit the project to effectively continue its work.

6. Will you please check with FINK to see what the problem is and advise me if there is something further I need to do.

JH/dv

cc: Mr. Cleveland, USDA/PASA
Mr. Whittle, ARDO

Attachment 10

Names of Agencies with Abbreviated Titles

Names of Agencies with Abbreviated Titles

CEPERN - Pan American Center for Improvement of Research of Natural Resources - (Contro Pan Americano de Aperfeiçoamento para Pesquisa de Recursos Naturais).

CEPLAC - Executive Commission for Research and Development of the Cocoa Crop - (Comissão Executiva para Proteçao a Lavoura Cacaueira).

CIVAT - Inter-state Commission of the Araguaia and Tocantins Valleys - (Comissão Interestadual dos Vales do Araguaia e do Tocantins).

CNG - National Geography Council - (Conselho Nacional de Geografia).

CNP - National Research Council - (Conselho Nacional de Pesquisa).

COCAP - Coordination Commission of Alliance for Progress - (Comissão Coordenadora da Aliança para o Progresso).

CONTAP - Technical Council of Alliance for Progress - (Conselho Tecnico da Aliança para o Progresso).

FAO - Food and Agriculture Organization of the United Nations - (Alimento e Agricultura da Organização das Nações Unidas).

IAGS - Inter-American Geodetic Survey - (Levantamento Geodesico Inter-Americano).

IBGE - Brazilian Institute of Geography and Statistics - (Instituto Brasileiro de Geografia e Estatistica).

IBRA - Brazilian Institute for Agrarian Reform - (Instituto Brasileiro de Reforma Agraria).

ICAD (CIDA) - Inter-American Committee for Agricultural Development - (Comite Inter-Americano para Desenvolvimento Agrícola).

INDA - National Institute for Agrarian Development - (Instituto Nacional de Desenvolvimento Agrario).

IPEACO - Institute of Agricultural Research and Experimentation - Central-West - (Instituto de Pesquisas e Experimentação Agropecuario - Centro-Oeste). - Sete Lagoas - Minas Gerais.

IPEACS - Institute of Agricultural Research and Experimentation - Central-South - (Instituto de Pesquisas e Experimentação Agropecuario - Centro-Sul) - Km 47.

IPEAL - Institute of Agricultural Research and Experimentation - East - (Instituto de Pesquisas e Experimentação Agropecuária -Leste) - Cruz das Almas - Bahia.

IPEAN - Institute of Agricultural Research and Experimentation - North - (Instituto de Pesquisas e Experimentaçao Agropecuário - Norte) Belem - Para.

IPEANE - Institute of Agricultural Research and Experimentation - Northeast - (Instituto de Pesquisas e Experimentaçao Agropecuario - Nordeste) Recife - Pernambuco.

IPEAS - Institute of Agricultural Research and Experimentation - South - (Instituto de Pesquisas e Experimentação Agropecuário - Sul) Pelotas - Rio grande do Sul.

OAS - Organization of American States - (Organizaçao das Naçoes Americanas).

SGE - Brazilian Army Map Service - (Serviço Geografico do Exercito).

SUDENE - Superintendency for Northeastern Development - (Superintendencia do Desenvolvimento do Nordeste) - Recife.

SUNAB - National Superintendency for Supplies - (Superintendencia Nacional do Abastecimento).

SUPRA - Superintendency for Agrarian Program - (Superintendencia da Politica Agraria) in the Ministry of Agriculture.

SPVEA - Superintendency for Economic Improvement of the Amazon Region - (Superintendencia do Plano de Valorizaçao Economica da Amazonia).

URB Km. 47 - Rural University of Brazil - (Universidade Rural do Brazil).