

ANNUAL REPORT 1980 - 1981 SOIL MANAGEMENT SUPPORT SERVICES

(Project No. PASA
AG/DSB 1129-5-79)

Soil
Conservation
Service

**United States
Department of
Agriculture**

SOIL MANAGEMENT SUPPORT SERVICES

GOAL

To increase food production through improved land resource management in the developing nations.

PURPOSE

To develop the prerequisites for soil conservation, soil fertility and soil based agro-technology transfers among tropical and subtropical countries.

OBJECTIVES

1. To provide technical assistance to AID and LDC's in problem identification, evaluation of opportunities, planning and utilization of land resources, especially in the subject area of soil survey, soil conservation, and soil fertility and management.
 2. To develop worldwide linkages for a more efficient utilization of agricultural information for crop production.
 3. To improve the interpretation potential of soil surveys for agricultural development in LDC's.
 4. To refine Soil Taxonomy for the intertropical areas and assist LDC scientists in its use and application in transferring agrotechnology from one tropical region to another similar region.
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SOIL MANAGEMENT SUPPORT SERVICES

Project No. AG/DSB 1129-5-79

ANNUAL REPORT

for the period

October 1, 1980-September 30, 1981

Submitted to: U.S. Agency for
International Development
By the: Soil Conservation Service
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Table of Contents

	<u>Page</u>
Project Summary	1
Part I	
Introduction	4
1. Technical assistance	5
2. Technology transfer	5
Part II	
Output--Technical Assistance	6
1. Review of activities, FY 80	6
2. Technical assistance	6
2.1 Sudan	6
2.2 Tanzania	7
2.3 Senegal	8
2.4 Ecuador	8
2.5 Suriname, French Guiana, Belize	9
2.6 Thailand	10
2.7 Western Samoa	10
2.8 Indonesia	11
2.9 Syria	12
2.10 Jordan	12
Part III	
Output--Technology Transfer (<u>Soil Taxonomy</u>)	
1. Strategy for technology transfer	13
2. Activities	14
2.1 International committees	14
2.2 Rationale and concepts in <u>Soil Taxonomy</u>	17
2.3 International soil classification workshops	18
2.4 Publications	22
2.5 Soil analyses	25

Part IV	Impact and Utilization	<u>Page</u>
Acknowledgements		34
Enclosures	I SMSS Advisory Panel	35
	II Report of Chairman of Advisory Panel	37
	III Major Activities of SMSS	44
	IV Recommendations of 4th Workshop	51
	V Papers Published by SMSS Staff	58
	VI Visitors to SMSS	60

Project Summary

1. Statistical

Title: Soil Management Support Services
(PASA No. AG/DSB-1129-5-79)

Contractor: U.S. Department of Agriculture
Soil Conservation Service (OICD)
Washington, D.C. 20250

Principal Investigator: Dr. Klaus W. Flach

Project Leader: Dr. Hari Eswaran

Soil Chemist: Dr. John M. Kimble

Duration: 3 years (October 1, 1979, to September 30, 1982)

AID Project Monitor: Dr. Tejpal S. Gill (S&T/AGR/RNR)

Total AID Funding (3 years) \$2,127,000

2. Descriptive

To accelerate the wise development of LDC land resources for agriculture and other uses requires detailed knowledge of soils and their potentials. Unfortunately individual LDC's have neither sufficient qualified personnel nor financial resources to acquire this knowledge on their own. Compounding this problem is the fact that until recently there has been no common soil classification system used internationally. Different countries have been using numerous and different soil classification systems, thereby preventing the exchange of soil research information (usually acquired at high expense) from one country to another, even though their soils may be the same or similar. With the advent of Soil Taxonomy--the U.S. system of soil classification--a common and universal system has been established that serves as an international language for information exchange and technology transfer between countries, especially the LDC's.

Soil Management Support Services (SMSS) was initiated in September 1979 to provide technical assistance to USAID Missions and LDC's on a TDY basis and to assist the technology transfer process. Technical assistance is provided at request by USAID Missions in problem identification, program development, evaluation of ongoing programs and data analysis in the subject areas of soil survey, land use, land use planning, soil conservation, and soil fertility maintenance. The technology transfer component deals with the use and application of Soil Taxonomy in the tropical areas.

In FY 1981, technical assistance was provided to Sudan, Tanzania, Senegal, Liberia, Ecuador, Syria, Suriname, Belize, Thailand, Bolivia, Western Samoa, Indonesia, India, and Jordan. Twenty-eight scientists from the Soil Conservation Service and U.S. universities provided about 500 staff days of assistance. The feedback from USAID Missions and countries has been excellent. The repeated requests from some Missions testifies to the usefulness of this service.

Activities related to the Soil Taxonomy component have also been equally productive. Based on studies of Cornell University (Dr. M. G. Cline) and University of Puerto Rico (Dr. R. Guerrero), SMSS compiled a map showing the utilization of Soil Taxonomy in different parts of the world. This map (enclosed) shows the status in 1981 and will be useful for guiding future work. For purposes of technology transfer, workshops, training course, technical monographs, and audio-visual materials have been organized or prepared. The report gives details of these activities.

The activities of FY 1981 clearly indicate that much has been achieved with respect to the objectives of SMSS. Most USAID Missions are now aware of the services that are available and are utilizing them. This component of SMSS activities is proceeding at the desirable rate. Many LDC's desire to use Soil Taxonomy either as their primary or secondary system of soil classification and have requested assistance. In some of these countries, adopting Soil Taxonomy as the primary system requires a major policy change and cannot be achieved immediately. The use of Soil

Taxonomy as a secondary system enables the countries to relate their own systems to Soil Taxonomy and thus achieve effective technology transfer. Some countries are aware of the advantages of the system but do not use it as they are not familiar with it. In the technology transfer component, we try to rectify this situation through the training courses, workshops, and monographs.

Part I

Introduction

The Soil Management Support Services (SMSS) is a program of international technical assistance of the Agency for International Development (AID) executed through a participating agency service agreement with the Soil Conservation Service (SCS) of the U.S. Department of Agriculture (USDA) (PASA AG/DSB 1129-5-79).

SMSS was started in 1979 to serve USAID Missions and developing countries. The Less Developed Countries (LDC's) do not have enough time, money, and personnel to undertake needed research programs, or to make the necessary tests before developing recommendations for the optimal use of the land. Mistakes or misjudgments are costly both in terms of money, time, and social impacts and must be avoided. The solution clearly lies in international agricultural technology transfer--experience of one country can and should be transferred to another with similar agro-ecological conditions. In order to be able to do this, a common base is necessary which includes standardized methods, techniques, evaluations, etc.

The use and application of Soil Taxonomy is a key element of SMSS. We are convinced that a good soil resource inventory of a country made with Soil Taxonomy is the basic step for the transfer of farm technology. We are confident that the interpretive potential of the system is unmatched and will be extremely valuable to developing countries for developing their capability to feed themselves.

With these premises, the strategy of SMSS is broadly to provide technical assistance and assist in the technology transfer process. This forms the two basic components of SMSS.

1. Technical assistance

The need for technical assistance can be measured both in terms of actual and anticipated requirements.

The countries themselves or USAID country missions are aware of the actual needs and when necessary make the request for assistance. Since its inception in September 1979, SMSS has operated in this manner and responded to the requests. Although SMSS will continue to respond to these requests, in the framework of the general strategy, this is considered as an interim mechanism which has several advantages. Firstly, LDC's and USAID Missions become aware of the services available to them. Secondly, the contacts so established will enable SMSS to formulate a strategy whereby countries needing specific assistance are identified and a concerted and coordinated effort can be made to assist them. This, of course, can only be done through recommendations from USAID Missions and this is what is implied in the term "anticipated needs."

2. Technology transfer

SMSS activities in the transfer component are more specific and based on the principle that a well conceived, quantitative system of soil classification appropriately applied in soil surveys is a powerful tool in agricultural development because it facilitates the evaluation of soil potential, soil limitation, aspects of soil management, and response to management and more important, the transferability of soil management experience. The thrust here is to reach the scientist and decisionmakers in the developing countries as the transfer mechanism only becomes effective through a local pool of informed scientists.

Part II. Output--Technical Assistance

The program was officially started in September 1979 with Dr. Richard Guthrie of SCS as the Acting Project Leader. Despite a very small lead time, activities commenced almost immediately and much had been achieved by the end of the fiscal year as reported in the first annual report.

The Program Leader for SMSS, Dr. Hari Eswaran, was appointed on November 1, 1980, though he had previously served as a consultant to SMSS for about 3 months--July, August, September. This report summarizes the major activities during the period October 1, 1980, to September 31, 1981.

1. Review of Activities, FY 1980

In November 9-10, 1980, a meeting was held at SCS to review the previous year's work of SMSS. The meeting was attended by representatives of AID and staff of SCS National Office. Some members of SMSS Advisory Panel (see enclosure 1 for list of members) were also present. A report on the meeting was prepared by Dr. A. Van Wambeke, Chairman of SMSS Advisory Panel (Enclosure II).

2. Technical assistance, FY 1981

As stated earlier, the technical assistance component of the program depends on requests received from AID country missions. Enclosure III lists the major activities of SMSS. At the conclusion of each mission, the authors furnish USAID and SMSS with a report, a summary of some of which is given below after which an evaluation is made according to the kinds of services offered.

2.1 Sudan (October 2-16, 1980)

Pursuant to a request from the Soil Survey Administration of Sudan (SSAS), Drs. Hari Eswaran and John Kimble assisted the Sudan from

October 2-16, 1980. The request for technical assistance was to (a) develop and strengthen the SSAS and (b) plan for an International Soil Classification Workshop in 1982.

The consultants met with SSAS staff and also with His Excellency Dr. Mohammed El Hassan El Jack (State Minister of Agriculture) and with Mr. Kamal Ali Babiker (Under Secretary of Agriculture).

The SSAS is responsible for the soil resource evaluation program for the nation but is unable to perform efficiently due to lack of equipment. The consultants developed a project proposal for USAID/Khartoum to consider. The proposed project, the duration of which would be for a period of 5 years, would upgrade and strengthen SSAS. A training component of the project would provide the skills necessary for their role in the country.

Initial plans were also made for a workshop on Vertisols. Sudan has about 20 percent of the world area of these soils with high shrink/swell potential. Bringing the international experts on these soils will be an excellent exercise in technology transfer.

2.2 Tanzania (October 28-November 4, 1980)

The SMSS was invited (through AID Washington) by the Food and Agricultural Organization (FAO) of United Nations to send an expert to participate in the East African Soil Correlation Meeting in Tanzania. Mr. F. Ted Miller, Head, Soils Staff of the Northeast Technical Service Center of SCS, participated in this meeting.

The purpose of the meeting was to bring together leaders in soil survey from seven East African countries (Botswana, Ethiopia, Kenya, Malawi, Sudan, Tanzania, and Zambia) to discuss and exchange information relative to soil correlation and land evaluation. Much of the discussions were centered around FAO's "Framework for Land Evaluation." In addition, country reports were presented. During the field trips, Mr. Miller was

able to inform the participants on Soil Taxonomy and to classify the soils according to this system. He reports that he had few difficulties in applying the system. Some of the participants were not familiar with the system and had suggested that SCS consider developing training programs in the region.

2.3 Senegal (October 25-November 18, 1980)

Mr. James H. Brown, Lawson D. Spivey, and Donald McDaniel, all Soil Scientists from SCS, formed a team to provide assistance to USAID/Dakar in its Senegal Fuelwood Production Project. The purpose was (1) to continue a very detailed soil survey (1:5,000) in support of the project, (2) identify soil ratings of soil map units within the survey area for woodland production potential, and (3) develop a soil map unit legend and classify soils identified in the legend using Soil Taxonomy.

The team surveyed an area of 3,142 ha using standards and guidelines set forth by the National Cooperative Soil Survey of SCS, USDA. In addition, the team made several recommendations which are being followed up by USAID/Dakar.

As a follow up on the project, USAID/Dakar requested SMSS to produce base maps of the area. This has been complied with. Recently, a new request has been received for further assistance.

2.4 Ecuador (January 8-26, 1981)

At the request of the Institute Nacional de Investigaciones Agropecuarias (INIAP) Ecuador and USAID/Quito, a technical assistance team was sent by SMSS. Members of the team were Jesse Hicks, State Conservationist, SCS, Raleigh, North Carolina; Jerry Dutchover, District Conservationist, SCS, Espinola, New Mexico; and Paul Britt, SCS, Troy, North Carolina. The purpose of the trip was to (a) review soil erosion and management problems on selected areas of coastal and highland Ecuador, (b) assess cause-effect relationships of the problems of soil erosion, and (c) to recommend an action research program to INIAP for soil conservation and management.

Apart from the technical observations and recommendations, nine specific recommendations were made by the team. The team also emphasized the need for in-country training in soil survey, classification, and interpretation.

Technical assistance in the use of soil surveys for conservation planning was also requested by the National Regionalization Program (PRONAREG) through USAID/Quito. Mr. Lewis A. Daniels, Soil Scientist (Montana) of SCS, spent 6 weeks working with the Soil Survey Department of PRONAREG. Mr. Daniels also assisted in a seminar organized by USAID which was attended by representatives by several Ecuadorian institutions.

Mr. Daniels made several observations and recommendations in his report. As PRONAREG has no formal program of training for its employees, he recommended several kinds of training programs. He also assessed PRONAREG's activities and indicated areas where their program could be strengthened.

2.5 Suriname, French Guiana, Belize (January 5-14, 1981)

Pursuant to a request from the State Department, Mr. Richard Gilbert, Soil Scientist of SCS, went to Suriname and Belize to evaluate the possibility of Indochinese refugee resettlement and to French Guiana to observe the resettlement efforts in that country during the past 4 years. Mr. Gilbert was a member of a team together with Mr. Nelson Ledsky, Deputy Assistant Secretary of State, and Ms. Dianne Lawson, World Relief Organization.

As a result of this trip, it was determined that both Suriname and Belize were interested in the resettlement of the Huong people and had designated potential sites for the communities. The sites were investigated and found to be adequate for development of agricultural activities and resettlement efforts.

Mr. Gilbert, on his own initiative, has been following up on the project during this fiscal year and recently assisted World Relief Organization to acquire a retired SCS soil scientist to join a team to develop the detailed plans.

2.6 Thailand (February 9-March 13, 1981)

Jerry Latshaw, State Soil Scientist, Oregon, provided technical assistance to the Soil Survey Division--Department of Land Development of Thailand--in soil classification, soil interpretations, and land use planning.

A detailed soil survey was being started for an irrigation project (Huai Aeng) in northeast Thailand near the city of Roi Et. The major purpose of the soil survey is to provide soil resource data to the Thai's Rural Irrigation Project. The Thai's have been using Soil Taxonomy in classifying soils but they wanted additional training in interpreting soil surveys based on Soil Taxonomy, in designing map units, and in preparing soil interpretations for engineering and other noncropland uses.

Recommendations included the suggested format for the soil survey report. It was also proposed that some new subgroups in Soil Taxonomy be added to accommodate recognized soil series in the country.

2.7 Western Samoa (May 17-25, 1981)

The School of Agriculture, Alafua Campus of the University of South Pacific, requested the assistance of Dr. James A. Silva to (a) review current crop and soil management experiments and suggest possible improvements, (b) to discuss the overall development of the soils unit at the School, and (c) to discuss implementation of the Benchmark Soils approach to permit transfer of agrotechnology.

Discussions were held with the Director of Agriculture of Western Samoa and the Development Coordinator of the Western Samoa Trust Estate Corporation, and staff of the University. Dr. Silva also presented two seminars at the University, part of which was broadcast over the local radio station, and taped an interview for release on the PEACESAT satellite.

The similar agro-ecological conditions prevailing in Western Samoa and Waimea (Hawaii) indicated that agro-technology developed in Hawaii could be easily transferred to Western Samoa. To be able to do this, Dr. Silva recommended that the soils of Western Samoa be classified according to Soil Taxonomy as a vehicle for agro-technology transfer.

2.8 Indonesia (May 5-28, 1981)

Pursuant to a request from USAID/Jakarta, Richard L. Duesterhaus, Assistant Chief (SCS), and Gary A. Margheim, Environmental Coordinator (SCS), evaluated GOI's efforts to strengthen institutions for soil and water conservation in the country. Their trip included discussions with GOI and USAID officials, visits to several field locations, and participation in a seminar on integrated management of DAS (watersheds).

The consultants observed that the level of technology and research data for agriculture and soil and water conservation, and delivery of these data to farmers and others, needs strengthening. The recommendations made are aimed at a substantial improvement in GOI capability to conduct a soil and water conservation program nationwide. The essential elements in doing this involve: (1) a better definition of soil and water conservation problems, (2) assignment of additional soil and water conservation functions and goals, and (3) establishment of a decentralized delivery system. They proposed that USAID's assistance can serve as a catalyst for helping to bring this about.

2.9 Syria (May 30-June 8, 1981)

Drs. Steve L. Rawlins, National Research Program Leader, USDA-SEA, and Gordon Stroup, Agricultural Engineer, SCS, participated in a symposium for land use and reclamation held in Damascus, Syria, that had been organized by the Arab Centre for Studies of Arid Zones and Drylands (ACSAD). Request to participate was made by ACSAD to USAID/Damascus. The seminar was attended by delegates from seven Arab countries.

2.10 Jordan (September 5-9, 1981)

The Arab Centre for the Studies of Arid Zones and Dry Lands (ACSAD), wishing to prepare a soil map of Jordan at scale 1:1,000,000 and using Soil Taxonomy in the legend, invited Dr. Hari Eswaran, Program Leader of SMSS, through USAID/Damascus, to participate in an evaluation meeting. The purpose was to determine the status of soil surveys in Jordan, to evaluate the kind of support they needed to prepare the map and to develop a program for the project. The team comprised of Dr. A. Osman, Director of Soils Division, ACSAD, and Dr. R. Tavernier of the University of Ghent, Belgium.

Officials of the Ministry of Agriculture GOJ and staff of the Soil Survey Division met with the team to discuss problems and solutions. Two field trips were arranged to visit agricultural stations and observe soil survey activities. At the conclusion of the visit, the team also briefed the Agricultural Development Officer of USAID/Amman on the proposed plan of work.

A report has been submitted by ACSAD to the Ministry of Agriculture. SMSS will be contacted for certain phases of soil map project, mainly to serve as consultant.

Part III Output--Technology Transfer (Soil Taxonomy)

1. STRATEGY FOR TECHNOLOGY TRANSFER

OBJECTIVE 1

To refine Soil Taxonomy for its better use in the intertropical areas.

Action:

- o Develop international working groups or committees (ICOM's) to initiate discussion and make proposals for changes.
- o Document rationale and concepts through interviews with principal contributors to Soil Taxonomy.
- o Organize international soil classification workshops for mandates of ICOM's.
- o Develop data file on benchmark soils of the intertropical areas.
- o Develop techniques to better evaluate intertropical soils.
- o Encourage and collate inputs from soil management specialists.

OBJECTIVE 2

Dissemination of Soil Taxonomy.

Actions:

- o Utilize international forums to discuss use and application of Soil Taxonomy.

- o Encourage international journals to use Soil Taxonomy terms and request cooperators to use Soil Taxonomy in all their reports and publications. Urge scientists to use Soil Taxonomy as reference system in their soil survey reports.
- o Organize training courses in the use and application of Soil Taxonomy.
- o Translate Soil Taxonomy or parts of it into foreign languages.
- o Translate glossary of soil science terms into foreign languages.
- o Publish technical monographs on subject matter related to Soil Taxonomy.
- o Organize or cooperate in organization of seminars for the use and application of Soil Taxonomy.
- o Provide assistance to countries wishing to upgrade their laboratory facilities to perform analysis required by Soil Taxonomy.
- o Develop bibliography on Soil Taxonomy.
- o Continue bibliography on soils of the tropics.
- o Provide assistance in cartography.

2. ACTIVITIES

2.1 International committees

Seven international committees are now working:

1. International Committee on classification of soils with low activity clays--ICOMLAC.

2. International Committee on Oxisols--ICOMOX.
3. International Committee on soil moisture regimes in the tropics--ICOMMORT.
4. International Committee on Andisols--ICOMAND.
5. International Committee on Aridisols--ICOMID.
6. International Committee on Vertisols--ICOMERT.
7. International Committee on soils with aquic soil water regimes--ICOMAQ.

2.11 International Committee on Soils with Low Activity Clays (ICOMLAC). Chairman: Dr. F. R. Moormann, Netherlands.

Dr. Moormann has now sent out 13 circulars. ICOMLAC tested a formal proposal at the Rwanda workshop and the chairman indicated that there were still a few minor details to be worked out before the proposal can be submitted to SCS.

More than 30 scientists of international reputation have worked for nearly 8 years to develop its proposals. As ideas evolved, there was a convergence of opinion with the sister committee--ICOMOX. Once the boundary between the mandates of ICOMLAC and ICOMOX is agreed to, the latter will also be in a stage for initial testing.

2.12 International Committee on Oxisols (ICOMOX). Chairman: Dr. S. W. Buol (North Carolina)

The 4th Workshop in Rwanda was organized mainly for the mandate of ICOMOX. ICOMOX has sent out seven circulars. Much of the initial work of this committee has been to improve the definition of the oxic horizon

and to develop a definition for the order of Oxisols so that it does not overlap with the LAC soils. Progress has been made in this direction. The next circular letter will summarize the major points and agreements reached at the 4th Workshop.

2.13 International Committee on Soil Moisture Regimes in the Tropics (ICOMMORT). Chairman: Dr. A. Van Wambeke (Cornell University)

ICOMMORT is in the final stages of developing firm proposals for making subdivisions of the current soil moisture regimes in Soil Taxonomy.

2.14 International Committee on Andisols (ICOMAND). Chairman: Dr. M. L. Leamy (New Zealand)

Through the initiative of the ICOMAND Chairman, Mike Leamy, a special conference on soils with variable charge was organized by the New Zealand Soil Science Society and the International Soil Science Society (ISSS) from February 10-19, 1981, in the Palmerston North, New Zealand. The conference addressed Soil Taxonomy and is perhaps the first ISSS conference with a focus on Soil Taxonomy. The organizers provided time for the discussions of not only ICOMAND but also ICOMOX. The SMSS was also invited to present a paper on the project. In addition, one whole day was devoted to the work of the Benchmark Soils Project of the Universities of Hawaii and Puerto Rico, during which Dr. Arnold presented a paper on "Internationalization of Soil Taxonomy."

ICOMAND and the Soil Bureau of the Department of Scientific and Industrial Research (DSIR, New Zealand), have produced a series of flow charts for easy use of Soil Taxonomy. Together with SMSS, they will be producing a computer program based on these flow charts.

ICOMAND has developed proposals for the new Order of Andisols. An initial discussion was held in Rwanda during the 4th Workshop and plans are underway to have a full workshop in 1983 or 1984.

2.15 International Committee on Aridisols (ICOMID). Chairman: Dr. A. Osman, Syria

This new committee was formed to develop criteria for recognizing the Order of Aridisols, particularly in the Middle East. These soils have excessive accumulation of carbonates and gypsum that strongly influence their use and management. ICOMID will be generating a considerable amount of data on these soils which is necessary for a rational classification.

2.16 International Committee on Vertisols (ICOMERT). Chairman: Dr. J. Comerma (Venezuela)

ICOMERT is the second committee to be established this year. It hopes to obtain information from the Vertisol areas of the world, such as the Tir Noir of Morocco, the Grumosols of eastern Europe, the Black Cotton soils of the Deccan Plateau India, the Gezira clays of Sudan, and the shrinking soils of Australia. These data will be helpful to refine the lower categories in the classification of the Vertisols.

2.17 International Committee on Classification of Soils with Aquic Soil Water Regimes (ICOMAQ). Chairman: Dr. F. Moormann

ICOMAQ was also established this year and will consider primarily the rice growing soils of the world. At a later stage they will look at other soils with natural or induced (paddy soils) perched water tables. The treatment of such soils in Soil Taxonomy has been considered unsatisfactory by many soil scientists in Europe and Asia.

2.2 Rationale and Concepts on Soil Taxonomy

Soil Taxonomy was developed between 1951 and 1976 under the leadership of Dr. Guy D. Smith. There is very little documentation on the principles and the philosophy that guided Dr. Smith in his work. While this presented no major problem as long as the use and further development of Soil

Taxonomy was restricted to the U.S., there is now a great need for documentation as many more scientists with vastly different backgrounds are cooperating in improving Soil Taxonomy for intertropical areas. Therefore, SMSS arranged for interviews of Dr. Smith by experienced soil scientists. The material is now being transcribed and edited and will be published as a monograph. Dr. Smith died shortly after the interviews were completed.

In June 1980, Dr. Smith was interviewed by Dr. M. Leamy of New Zealand. In December 1980 and January 1981, Dr. Smith was interviewed in the U.S. and in Trinidad and Venezuela as follows:

1. Cornell University--Staff of Cornell University and SCS State Soil Scientists, New York.
2. Washington, D.C.--SCS National Office staff.
3. Texas A&M, Lubbock--Staff of Texas A&M and SCS State Soil Scientists from Texas and staff from other universities.
4. University of Minnesota--Staff and others.
5. Trinidad--Soil scientists of Trinidad.
6. Venezuela--Soil scientists of Venezuela.

2.3 International Soil Classification Workshops

The University of Puerto Rico through a grant from AID under the 211(d) program initiated and organized three international soil classification workshops for the mandates of some of the committees.

<u>Year</u>	<u>Country</u>	<u>Committee</u>
1976	Brazil	ICOMLAC
1978	Malaysia-Thailand	ICOMLAC-ICOMOX
1980	Syria-Lebanon	ICOMMORT

This activity is now handled by SMSS. SMSS, in cooperation with the University of Puerto Rico, organized the first workshop in Rwanda from June 2-12, 1981, for the mandate of ICOMOX, ICOMLAC, and ICOMAND.

SMSS has also plans for future workshops as follows:

<u>Year</u>	<u>Country</u>	<u>Committee</u>
1982	Sudan	ICOMERT, ICOMID
1983	Ecuador-Chile (Tentative)	ICOMAND

At each workshop, several recommendations are proposed and Enclosure IV gives the recommendations at the first and second workshops and the actions taken to date. Enclosure V gives the recommendations adopted at the Rwanda workshop.

The workshops have the following objectives:

(i) Present, discuss, and, if possible, finalize proposals to modify Soil Taxonomy.

(ii) Discuss proposals in the field on the basis of carefully selected and analyzed soil profiles.

(iii) Generate basic data on soils of the country.

(iv) Assists in the technology transfer process by bringing together the scientists from LDC's.

For each workshop, a proceedings is published. SMSS is now involved in the preparation of the proceedings of the Syria-Lebanon workshop.

2.31 4th International Soil Classification Workshop

The workshop on classification and management of tropical mountain soils was held in Rwanda from June 2-13, 1981.

The workshop was cosponsored by several organizations. Financial support came from SMSS, the Algemeen Bestuur voor Ontwikkelings Samenwerking (ABOS, or the Belgian Technical Assistance Program), and the Institute de Science Agronomique Rwanda (ISAR) who, together with the Ministry of Agriculture (MINAGRI), were the host organizations. The meeting was cosponsored by the University of Ghent, Belgium, the Catholic University of Louvain, Belgium; additional support was given by Cornell University and the University of Hawaii. The technical aspects of the program were developed by the University of Puerto Rico and SMSS in cooperation with the other organizations and an advisory panel.

There were 61 participants and their distribution by countries and affiliation is given below:

1. By Country

Australia	1
Belgium	5
Burundi	3
Cameroon	1
Colombia	1
Fed. Rep. Germany	1
France	1
Italy	1
Kenya	1
Malaysia	1

Martinique	1
Netherlands	3
New Zealand	1
Nigeria	1
Portugal	1
Rwanda	21
Sudan	1
Syria	1
Tanzania	1
Thailand	1
USA	8
Venezuela	2
Zaire	2
Zambia	<u>1</u>
(24 countries)	61

2. By Affiliation

Soil Survey Organizations	20
Universities	17
Technical Assistance Programs	6
Int'l Organizations (FAO, ACSAD, ISM)	4
IARC's	3
Other	<u>11</u>
	61

The workshop was opened by the Secretary General to the Ministry of Agriculture of Rwanda, and the opening session was attended by several dignitaries including the U.S. and Belgian ambassadors. In total, 11 technical sessions and 9 field trips were held. SMSS prepared a tour guide for the field trips.

At the closing session, several commendations and recommendations were adopted by the workshop and these are included in Enclosure IV.

Plans for the 5th International Soil Classification Workshop, which will be held in November 1982 in Sudan, are underway. The general theme of the workshop is "Classification and Management of Soils with High Shrink-Swell Potential."

2.4 Publications

Scientists in many LDC's are starved of information as many publications are not readily available. Foreign exchange restrictions prevent the institutions or individuals to purchase foreign publications. In order to alleviate this problem, technical monographs on subjects related to the objectives of SMSS are prepared and distributed.

2.4.1 SMSS Technical Publications

During this fiscal year, several publications have been initiated. As it takes between 6 months to a year for a publication to be written, edited, and published, the first publication is only expected about the end of this year. A brief resume of each of the publications is given below.

a. Soil Resource Inventories and Development Planning. National, regional, and even local planning for agricultural purposes require an accurate information of soil resources. This monograph is written not only for the decisionmakers but also for the scientists. It evaluates the current status of resource inventories and discusses the methodologies adopted in different countries. It also looks into the aspect of presentation of soil information to planners and suggests means to improve communication between decisionmakers and planners. Quality and quality control are critical aspects of developing soil inventories and means to evaluate these are presented.

b. Soil Taxonomy and Technology Transfer. The guiding principle of SMSS is that Soil Taxonomy, the U.S. system of soil classification, is the vehicle for international agro-technology transfer. Recently two

articles on this subject were published in the journal Advances in Agronomy. As the circulation of this journal is limited and as the two articles are semitechnical and deserve a wider audience, SMSS, with permission of the publishers, is reproducing the articles.

The two comprehensive evaluations give an excellent account of the international use of Soil Taxonomy and its potentials for agro-technology transfer. The monograph will be a useful information material for USAID Missions, national planners, and scientists alike.

c. Soil Moisture Regimes. Professor A. Van Wambeke, Cornell University. Using a model developed by the Soil Conservation Service, the soil moisture and temperature regimes are calculated. The monograph includes a map giving the distribution of the soil moisture and temperature regimes.

Companion monographs on Africa, Asia, and Middle East are being prepared. These monographs give some of the basic information necessary for technical assistance and technology transfer.

d. Soil Analysis for Soil Taxonomy. This monograph, in preparation, deals with the kinds of analyses needed for soil classification. It is a companion document to the one entitled "Methods of Soil Analyses" published by the Soil Conservation Service.

In addition to these monographs, scientific papers have also been submitted by SMSS staff for publication in scientific journals or meetings and other less technical reports for news magazines.

a. Scientific articles. A list of technical articles published by staff of SMSS is included in Enclosure V.

b. Semitechnical articles. A few semitechnical articles and talks were presented by SMSS staff during the past year. An article entitled "Technical Assistance Through the Soil Management Support

Services" has been submitted to Soil Survey Horizons. This is a magazine published by the Agronomy Society of America. Several news items on SMSS activities have been published in the Bulletin of the International Soil Science, Agronomy News, and SCS Newsletter.

2.42 SCS Publications

In line with the general policy of informing LDC scientists, SMSS also distributes any SCS publication that is available for distribution.

- o Approved chapters of the new Soil Survey Manual
- o Soil Taxonomy. This is only distributed on specific request.

A similar philosophy is followed for publications originating from other places. SMSS purchased and distributed the monograph by Dr. M. G. Cline of Cornell University on the History of Soil Classifications in the U.S.

2.43 Bibliography of Soils of the Tropics

This Bibliography was compiled for USAID by Dr. A. C. Orvedal. Volumes I, II, and III were published as Technical Series Bulletin No. 17 of the Agency for International Development. The succeeding volumes are published by SMSS.

Volume IV has been published and Volume V is under preparation.

2.44 Bibliography on Soil Taxonomy

There have been several requests to compile a bibliography of all articles published on Soil Taxonomy between the years 1970 and 1980. SMSS is working on this bibliography.

2.45 Translations

Soil Taxonomy is now widely used all over the world. To date, the GPO has printed 19,000 copies. Under an agreement between SCS and Soil Survey of India, an Indian edition has been published and about 3,000 copies sold. About 1,000 copies of an Italian edition have been published in Rome by Italian soil scientists that is being circulated in Ethiopia and Somalia. A private publishing firm in Great Britain has reproduced Soil Taxonomy for sale. The Arab Center for Studies of Arid Zones and Dry Lands (ACSAD) has published a summarized version of Soil Taxonomy in Arabic. Finally, the International Soil Museum has produced a field extract of Soil Taxonomy which only gives the keys.

There have been several requests to translate, at least the diagnostic horizons and the keys of Soil Taxonomy into Spanish and French. The Spanish translation is underway and the French translation is being planned.

2.5 Soil Analysis

The Soil Chemist of the project, Dr. John Kimble, coordinated the analysis of the soils at the National Soil Survey Laboratory in Lincoln, Nebraska. This service is provided for both the technical assistance and technology transfer components of the project. In addition to providing the analyses, methods for characterization of the soils of the tropics were tested or developed. These activities are discussed in greater detail below.

2.51 Rwanda--Fourth International Soil Classification Workshop

A total of 96 samples representing 16 pedons were samples by Institute de Science Agronomique Rwanda and by Mr. H. Neel of the Belgium Embassy. These were shipped to the National Soil Survey Laboratory by the USAID Mission in Rwanda. Complete characterization of these samples were run, and part 2 of the tour guide for the Fourth International Soil Classification Workshop, Rwanda, June 2-12, 1981, was put together using this data.

The following analyses were run on these samples: 15-bar moisture retention; particle size analyses; fine clay; clay mineralogy; optical mineralogy; organic carbon; nitrogen; pH 1:1 soil water suspension; pH 1:2 soil-CaCl₂ suspension; pH 1:1 soil-KCl suspension; pH 1:50 soil-NaF suspension; NH₄Cl-CEC; NH₄OAc-CEC; NH₄OAc extractable Ca, Mg, Na, and K; citrate dithionite extractable Al and Fe; KCl extractable Al; surface area by EGME; P-adsorption; P retention; and KOH extractable Al.

2.52 Sudan--Low Activity Clay Study

Thirty-five horizons representing five pedons were sampled by M. Ali, Director of the Soil Survey Administration of Sudan, and sent by the USAID Mission in Sudan to the National Soil Survey Laboratory for complete characterization. This data was used by Mr. Ali to characterize the low activity clays of southern Sudan. He presented a paper on this at the Fourth International Soil Classification Workshop, June 2-12, 1981, Rwanda, Africa. He also used the data to compare the results that the Sudanese laboratory is getting with the results from the National Soil Survey Laboratory. Sudan is using Soil Taxonomy for the classification of their soils and having this data is a great help to them in using the USDA soil classification system. Large samples were taken from one of the pedons, and will be used as reference samples in the development of new and improved methods for classifying tropical soils. The following analyses were run on these soils: 15-bar moisture retention; bulk density; particle size analysis; fine clay; clay mineralogy; optical mineralogy; organic carbon; carbonate content; pH 1:1 soil water suspension; pH 1:2 soil-CaCl₂ suspension; pH 1:1 soil-KCl suspension; NH₄OAc-CEC; NH₄OAc extractable Ca, Mg, Na, and K; extractable acidity at pH 8.2; citrate dithionite extractable Fe; and KCl extractable Al.

2.53 Brazil--Low Activity Clay

One pedon (four horizons) was sampled by personnel of EMBRAPA in Brazil at the request of J. Kimble. These samples will be used in testing and

development of new methods for the classification of tropical and subtropical soils. Subsamples of these horizons were kept by the SNLCS Laboratory in Brazil. They will run their analyses, and compare the results with those obtained at NSSL. The following analyses were run on these samples: 15-bar moisture retention; particle size analysis; clay mineralogy; optical mineralogy; organic carbon; nitrogen; carbonate content; pH 1:1 soil water suspension; pH 1:2 soil-CaCl₂ suspension; pH 1:1 soil-KCl suspension; NH₄OAc-CEC; NH₄OAc extractable Ca, Mg, Na, and K; extractable acidity at pH 8.2; citrate dithionite extractable Fe, Al, and Mn; and KCl extractable Al.

2.54 Malaysia

Eight horizons were samples by W. Lynn during a field trip after the Acid Sulfate Symposium, January 26-30, 1981. Four of these samples were for developing data for the improved classification of acid sulfate soils. One Oxisol pedon (four horizons) was sampled for use at the National Soil Survey Laboratory for developing laboratory procedures and methods for low activity clay soils in the tropics and subtropics. Copies of all this data will be sent to personnel in Malaysia for their use in comparing laboratory methods and for correlation of their soils. The following analyses were run on these samples: 15-bar moisture retention; 1/3-bar water retention; particle size analysis; clay mineralogy; optical mineralogy; total mineralogy; organic carbon; nitrogen; pH 1:1 soil-water suspension; pH 1:2 soil-CaCl₂ suspension; pH 1:1 soil-KCl suspension; NH₄OAc-CEC; NH₄OAc extractable Ca, Mg, Na, and K; extractable acidity at pH 8.2; citrate dithionite extractable Fe, Al, and Mn; and KCl extractable Al.

2.55 Senegal--Fuel Wood Production Report, Bandia Forest

Three pedons with a total of 15 horizons were samples by James Brown during his detail to Senegal and sent to the National Soil Survey Laboratory for complete characterization. This data will be used for the characterization of these soils. The data will make possible the

proper classification and correlation of these soils and provide needed soils laboratory information to Senegal. These analyses have been completed and the data were distributed June 30, 1981. The following analyses were run on these samples: 15-bar moisture retention; particle size analyses; clay mineralogy; organic carbon; carbonate content; pH 1:1 soil-water suspension; pH 1:2 soil-CaCl₂ suspension; pH 1:1 soil-KCl suspension; NH₄OAc-CEC; NH₄OAc extractable Ca, Mg, Na, and K; extractable acidity at pH 8.2; and KCl extractable Al.

2.56 Syria--Third International Soil Classification Workshop

A total of 39 samples from 11 different profiles were sent to the National Soil Survey Laboratory for analyses by Dr. A. Osman, Director, Soil Science Division of ACSAD, to answer questions that came up during the workshop held there. The following analyses were run on these samples as per their request: carbonate content; pH of the saturated paste; pH 1:1 soil-water suspension; pH 1:2 soil-CaCl₂ suspension; resistivity of ohms; NH₄OAc-CEC; NH₄OAc extractable Ca, Mg, Na, and K; moisture content of the saturated paste; Ca, Mg, Na, K, carbonate, biocarbonate, chloride, sulfate, and nitrates in the saturation extract; and gypsum content.

2.57 Thailand--Acid Sulfate Soils

A total of four horizons in one pedon were sampled by W. Lynn during the Second Symposium on Acid Sulfate Soils, Bangkok, Thailand, January 18-24, 1981. They were sampled for developing data for improving the classification of acid sulfate soils. Copies of these data will be sent to personnel in Thailand for their use in characterization of their soils and as an interlaboratory comparison check. The following analyses were run on these samples: 15-bar moisture retention; 1/3-bar water retention; particle size analyses; fine clay analyses; clay mineralogy; thin section analysis; optical mineralogy; total mineralogy; organic carbon; nitrogen; carbonate content; pH 1:1 soil-water suspension; pH 1:2 soil-CaCl₂ suspension; pH 1:1 soil-KCl suspension; NH₄OAc-CEC; NH₄OAc extractable Ca, Mg, Na, and K; extractable acidity at pH 8.2; and KCl extractable Al.

2.58 International Soil Museum, Interlab Exchange Program

Ten standard samples were sent to the National Soil Survey Laboratory by the International Soil Museum for complete characterization analyses as part of the Interlaboratory Exchange Program. Also, ten samples were sent to the ISM by NSSL as part of this program. The data on the samples sent to the NSSL has been completed and sent to the ISM. A preliminary report was given at the Fourth International Soil Classification Workshop in Rwanda, June 2-12, 1981, on the results obtained. During his visit to the International Soil Museum, Dr. Kimble discussed this exchange program with Dr. Pieter van Reevwijk of the ISM and Dr. Floor van der Pol of the Royal Tropical Institute of the Netherlands. This program will continue because the standardization of laboratory methods is very important if Soil Taxonomy is to be used worldwide.

2.59 Development of Methods

1. Surface Area

The ethylene glycol monoethyl ether procedure was used to measure the surface area of the low activity clays from Rwanda. This is a simple procedure that only requires an analytical balance and a vacuum desiccator. It can, therefore, be used in laboratories of less developed countries. It can be used for estimating the activity and mineralogy of different clays. A paper that discusses these results entitled "Relating Observable Characteristics and Laboratory Properties in Some Soils of Rwanda, Africa" by J. M. Kimble, R. E. Nelson, and H. Eswaran has been submitted to the American Society of Agronomy for presentation at the 1981 annual meeting, November 29-December 4, 1981, in Atlanta, Georgia. This study using EGME will be continued on samples from Sudan, Brazil, Thailand, and Puerto Rico.

2. KOH extractable aluminum

KOH extractable Al was determined on several soils as a method of identifying Andepts (Andisols). A paper presenting these results entitled "An Evaluation of KOH Extractable Aluminum in Andepts (Andisols)" by J. M. Kimble and C. S. Holzhey has been submitted to the International Soil Science Society for presentation at the congress to be held in New Delhi, India, in February 1982.

3. Pamphlets written in draft form

a. "Laboratory Procedures for Equivalent Methods to Support Soil Classification" by Robert H. Jordan, C. Steven Holzhey, and John M. Kimble.

b. "Chemical Criteria Applicable to the Placement of Soils in 'Soil Taxonomy'."

Part IV--Impact and Utilization

The impact and utilization of a project such as the Soil Management Support Services is a function of several factors, the most important of which is awareness. The contract between AID and SCS initiating the project was only signed in September 1979 and activities in FY 80 concentrated on this aspect--informing USAID Missions and LDC's on the availability of the services. This is a continuing task carried on by staff of SMSS and AID bureaus.

The planning, strategizing, and initiating of activities to attain our objectives are beginning to bear fruits as evidenced in the activities for FY 81 (this report). These activities are less meaningful if they do not have an impact and if some or most components are not effectively utilized. Apart from the TDY's, reports, monographs, workshops, training courses, and training packages, the success of a project such as SMSS could also be evaluated in terms of the impact it is having or has had

and the extent of the utilization of its efforts. The latter can be judged from the letters of USAID Missions and LDC personnel and also from the followup activities and the feedback which is generated. There are less tangible aspects which are also relevant and these are listed below.

During FY 81, the project has been very active and is already highly visible. It has established its role with AID bureaus, USAID, Missions, and LDC personnel, and interactions with these entities and people has laid a strong foundation for future cooperation and growth. Feedback from USAID Missions and LDC personnel clearly indicate that this role is being appreciated.

The important ingredients for this foundation of efficient assistance are several.

1. SMSS has shown that major U.S. resources, in terms of technical expertise, can be tapped and channelled in an efficient and expeditious way. The specific advantage of SMSS is that staff of SCS and many land grant universities in the U.S. are at its disposal and, as has been demonstrated in the last 2 years, SMSS can respond to requests for technical assistance at very short notice.
2. SMSS, through the personal contacts and correspondence of its staff and through its activities including the TDY's, workshops, and training courses has established a linkage and opened a channel of communication with national planners, scientists, and project personnel of LDC's. This spirit of cooperation, built on a basis of confidence that SMSS can provide the assistance and expertise that is needed, helps cement the relationship and provides the basis for future activities. The fact that the services of SMSS is held in high esteem was demonstrated recently when the Staff Leader of SMSS was presented to the Minister of Agriculture in Sudan, and also by the fact that the opinions and views of TDY personnel are sought for by high government officials in the LDC's.

3. A third important factor arises from the quality of technical personnel that are sent out on TDY's, as instructors for training courses, or as participants in workshops. TDY personnel are very carefully selected and every effort is made to find the right person for assignments. Missions and LDC's are very satisfied with the experts they have received to date.

What the impact of SMSS has been in its 2 years of operation is difficult to gauge and can only be enumerated in terms of the organizations, institutions, or personnel who have been involved. It is apparent now that via SMSS, LDC's and USAID Missions are aware that there is a source of readily available assistance and, indirectly, this gives them a sense of confidence to handle complex land resource problems which require a wide range of expertise. In addition, more specific cases may be cited.

1. USAID Missions which have now received assistance from SMSS, even though on an ad hoc basis, are aware that this is a service which is very useful to them and which they can readily tap upon. The repeated requests and the cooperative endeavors proposed by missions testifies to this impact.

2. The impact has also been on the scientists of SCS and the land grant universities who have participated in SMSS activities. SMSS has helped to expose these people to a different environment and, consequently, aided in developing a pool of expertise within the U.S on international agriculture. The quality of technical expertise is enhanced and appreciated better if it can be geared to the local situation and if the solutions recommended utilize locally available resources. SMSS objective is not to graft western technology onto LDC systems but to adapt and package it to local needs and aspirations. Consequently, the impact on U.S. institutions and scientific personnel is a major indirect contribution of SMSS.

3. The personal contacts and relationships established by SMSS through the TDY's and other activities has a direct impact on LDC scientists and

decisionmakers. SMSS believes that having a local pool of informed scientists in the LDC's is vital for an effective agro-technology transfer. The fact that many LDC scientists are already using the National Cooperative Soil Survey of the U.S., standards is a testimony to the impact of the project.

As elaborated in the report, the services of SMSS have been used by AID bureaus, USAID Missions, LDC's, and also by international organizations. SMSS is continuously consulted about appropriate technology and methodology in land use. USAID Missions have used SMSS services for project identification, project evaluation, and relied on SMSS expertise for other appraisal. LDC's have requested assistance on specific technical aspects of ongoing projects. They have also sought SMSS inputs for developing strategies for agricultural development, strengthening institutions, or staff and facility evaluation. LDC's are assigning counterparts to SMSS initiated activities, and in some instances are funding some of these activities which clearly indicates the confidence in SMSS.

This impact and utilization of SMSS is due to several reasons, some of which have already been mentioned. The key to the success is Soil Taxonomy as the vehicle for an effective agro-technology transfer. SMSS, the Benchmark Soils Project of the Universities of Hawaii and Puerto Rico, and others have demonstrated that Soil Taxonomy is a conditio sine qua non for technology transfer. The map in this report shows the countries that are already using Soil Taxonomy. Others desire to use it and SMSS is committed to providing them the necessary assistance to enable them to use the system. We are aided in this aspect by the fact that many AID contracts stipulate that resource evaluations are made according to the system.

In conclusion, this discussion and the report have clearly shown the utility of the project. The objectives of the project cannot be attained overnight. There is considerable work to be done and much to be achieved. SMSS already has the satisfaction that its efforts are appreciated, desired, and utilized and these form the motivating forces to continue.

Acknowledgment

The achievements of SMSS to-date have been due to the excellent cooperation of several organizations and individuals. The technical assistance component could not have been so efficiently run and responses to request not so quickly met if not for the contributions and assistance of both the USAID country missions and the staff of the Soil Conservation Service. A significant contribution has been made by Dr. Steve Holzhey and his staff of the National Soil Survey Laboratory, Lincoln, Nebraska. Their prompt action on requests received for soil analyses enable SMSS to respond quickly and provide quality data.

We are indeed indebted to our international cooperators, particularly the chairmen of all the international committees. They have spent a lot of time and effort for SMSS and we greatly appreciate this. A special mention must be made of all the cooperating institutions, particularly Cornell University, the Benchmark Soils Project of the Universities of Hawaii and Puerto Rico, and the International Crop Research Institute for the Semiarid Tropics (ICRISAT) India. The individuals from these institutions who deserve mention are Professor A. Van Wambeke, Professor Goro Uehara, Professor F. H. Beinroth, and Dr. L. D. Swindale.

The members of the SMSS Advisory Panel are also thanked for the prompt manner by which they respond to our requests. Finally, we wish to express our appreciation to Dr. T. S. Gill of the Science and Technology Bureau of AID, and Dr. R. McCracken, Deputy Chief of the Soil Conservation Service, for their continuous support, advice, and encouragement. Last but not least we wish to acknowledge the painstaking work of our secretarial staff particularly Wendy Merchant and her predecessor Brenda Jillson, the staff of the Word Processing Center of the SCS, and also the continuous support and assistance of Dr. R. W. Arnold and the Soils staff of the SCS National Office.

Enclosure I

Soil Management Support Services Advisory Panel
October 1980

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Enclosure II

Report of Chairman of SMSS Advisory Panel

1. USAID expressed its satisfaction with the first year of operations of the SMSS program as it provided rapid availability of a large group of experts from USDA to be of assistance to LDC's.
2. It is felt that a large amount of soil and crop information is already available at numerous sites in LDC's but that more effective mechanisms are needed to facilitate the exchange of this information. Hence the importance of Soil Taxonomy, which provides a common scientific language to stimulate more efficient use of this technical knowledge.
3. The panel considered that SMSS should develop stronger linkages with existing or with planned agricultural experimental networks, and that it could play a more active role in promoting coordinated soil management research programs. SMSS can also participate in institution building programs in LDC's, especially by strengthening soil correlation activities. In certain geographical areas SMSS may also assist in the identification and mapping of specific soil constraints which would become the focal points of agricultural research to increase food production in farmers field.

Active cooperation with International Board of Soil Resources Management (IBSRAM), with FAO and ISSS in order to promote an International Soil Classification Reference System, and with agricultural research networks (i.e., Soil Conservation in Africa) was recommended.

4. Dr. R. Arnold explained the staffing and personnel aspects of SMSS. Most requests for assistance come from USAID Missions and agencies involved in the planning of agricultural development in less developed countries. The SMSS program has prepared a list of approximately 50 readily available individuals.

The problem of the effectiveness of short-term missions to less developed countries was raised. It was discussed in relation to the need of precise problem identification, to the presence of a suitable infrastructure in the LDC, and to the scope of the consultancy.

It was pointed out that short-term missions run the risk of contacting only a small number of institutions in the LDC, and that for this reason it was difficult to avoid bias. The final consensus was that well prepared and precisely described short-term assignments can be useful, especially to remove bottlenecks in development operations.

5. It was recommended that SMSS also serve as a mechanism for quality control on the use of Soil Taxonomy in soil surveys conducted by contractors to AID.

6. The second component of the SMSS program relates to the improvement and the promotion of Soil Taxonomy in less developed countries.

The discussion dealt with the search of an appropriate mechanism to identify the need of the changes, to test the approved modifications, and include the proposals into Soil Taxonomy. Without this mechanism there is little use in proposing changes.

It was pointed out by the Soil Conservation Service directors that proposals originating abroad could be accepted in Soil Taxonomy even if they would cause changes in the classification of the soil series in the United States.

The panel recommended that guidelines be developed indicating the criteria to approve proposals for their introduction in Soil Taxonomy.

The shortage of personnel to keep up with the incoming proposals and the enormous task to sort, evaluate, and incorporate them into Soil Taxonomy were pointed out. A recommendation to computerize Soil Taxonomy was approved.

7. It was felt that the specialized international committees to solve particular classification problems in Soil Taxonomy have been very successful in promoting Soil Taxonomy. The seminars they organized brought people from different countries and backgrounds together to study soil classification problems in the field. However, the panel considered that precise descriptions of the mandates of the committees was necessary and that the decision mechanisms within each committee should be clearly defined. Potential problems of authorships of members are to be recognized and given due consideration.

An excessive number of new committees, however, may erroneously give the impression that Soil Taxonomy needs complete and drastic revisions. Therefore, its effectiveness as a stable transfer mechanism may be reduced and users may lose confidence. Equal consideration should be given to the positive aspects of Soil Taxonomy. Increased activities which would emphasize the correct use of Soil Taxonomy as it now stands were advocated.

Several participants insisted that soil properties which are important for land use be given higher priority in the taxonomic system.

8. The SMSS program has the capability to advise AID on laboratory equipment needs in LDC's. The importance of training people to use modern analytical equipment and to make correct interpretation of the results was also stressed. Sound sampling methods are considered a prerequisite for obtaining representative data both for mapping and soil management recommendations.

It was pointed out that exaggerated requests for soil analyses were often included in soil survey budgets. A good understanding of soil genesis and the relationships between soils and landscapes can considerably reduce the need for soil analyses. The panel indicated that the training of field personnel knowledgeable in the use of Soil Taxonomy as well as in the supporting sciences may be more important than the purchase of very specialized laboratory equipment.

SMSS was asked to place high priority on analytical methods of physical properties of surface horizons, rather than on chemical characteristics of deeper layers.

9. The panel considered that short training courses can favorably complement the consultancy activities. They would address a larger group of people from one region to be informed about new methodologies for using and applying Soil Taxonomy. The panel thought that short-term training sessions are effective provided the students have reached an adequate level of experience, and that the instruction focuses on specific problems. Most drawbacks in the past were due to improper selection of candidates. It was also recommended that the short-term courses include an intensive field training program in an LDC.

Training was considered a necessary component of future operations of SMSS. It was suggested that these efforts not only address scientists and planners in the less developed countries but also be directed towards a more general audience, for example, staff in development agencies who are not familiar with the benefits that soil science can bring to agriculture.

10. SMSS should develop packages including audiovisual aids and tape recorded explanatory texts for use in short-term training sessions. SMSS was also asked to accelerate the publication of monographs and other teaching materials.

11. The members of the Advisory Panel formulated several commendations and recommendations. These are given below with a brief note on the actions take to date.

Commendation

1. The Advisory Panel commends the SMSS for the excellent progress made since project initiation and expresses its appreciation to the Agency for International Development for supporting the program.

Recommendation

2. Noting that Soil Taxonomy is being increasingly used in AID-supported programs but realizing that if incorrectly used it can be counterproductive, it is recommended that the SMSS assist in the evaluation of the competence of the AID contractors. It is further suggested that SMSS be involved in such evaluations and that it provide quality control in such projects. Although the evaluation of the competence of the AID contractors may be desirable in some instances, this depends on requests from AID, and SMSS has received no requests. The last part of the recommendation is more feasible and has been requested several times as reported later.

3. The Panel recommends that SMSS establishes viable linkages with the International Agricultural Research Centers and the International Service to National Agriculture Research (ISNAR) of CGIAR, regional organizations such as the Association of South East Asian Nations (ASEAN) and the Arab Center for Studies of Arid Zones and Dry Lands (ACSAD), and AID-supported programs such as the Benchmark Soils Project (BSP) and the proposed International Benchmark Soils Network for Agrotechnology Transfer (BSNAT) and the Soil Management Collaborative Research Program (CRSP) and other relevant institutions including the International Soil Museum.

These linkages have now been established and several joint activities have been initiated as reported later.

4. The Panel recommends that SMSS strengthen its training component, develop audiovisual teaching aids on Soil Taxonomy, and also prepare technical and nontechnical publications on soil management and management implications of Soil Taxonomy. The Panel endorses the efforts of SMSS to document the rationale and concepts of Soil Taxonomy and the translation of the latter into Spanish and French.

Audiovisual teaching aids, technical, and nontechnical publications are being prepared.

5. The Panel recommends that SMSS continue to pay major attention to the application of Soil Taxonomy to soil management and research on the relationships between soil characteristics and the requirements of crops. More specifically, the diagnostic criteria used in Soil Taxonomy should be investigated in terms of their significance for various types of land used. From the point of view of refining Soil Taxonomy, the study of these relationships could lead to adjustments in the separation of taxa or in the definition of diagnostic criteria. It is suggested that the international committees consider the management implications of the modifications which they propose.

The international committees have been informed of this recommendation.

6. As computerized Soil Taxonomy would facilitate the integration and testing of proposed amendments, the matching of taxonomic criteria with management properties and the clustering of taxa into specific interpretative groupings, the Panel, therefore, recommends that the key of Soil Taxonomy and the definitions of diagnostic differentiae be stored in a computer retrieval system.

A computer program is being prepared for this purpose.

7. The link between Soil Taxonomy and soil management is still not well appreciated by many agronomists. Although the Benchmark Soils Project of the Universities of Hawaii and Puerto Rico and the SMSS have already made important contributions in this regard, the Panel recommends that a symposium be organized by SMSS in collaboration with BSP on the subject "Matching Crop Requirements with Soil Conditions." This symposium should attempt to examine the role of Soil Taxonomy in evaluating crop performance and response to management. The symposium should preferably be held in an LDC.

Plans are already underway to hold this symposium. The Benchmark Soils Project of the Universities of Hawaii and Puerto Rico is taking the leadership to organize the symposium. The symposium will be held in

India in 1982 and cosponsored by the International Crop Research Institute for the Semiarid Tropics, Hyderabad, and the Soil Research Institute of India.

8. By virtue of the design and nature of the SMSS, this excellent program cannot be expected to achieve its objectives on a short-term basis. The Panel, therefore, strongly recommends that the program be extended for 5 years beyond its termination of 1982. This extension would enable SMSS to have measurable and lasting impact of consequence to the agricultural development in tropical and subtropical LDC's.

Enclosure III

MAJOR ACTIVITIES OF SMSS

(TT and TA refer to technology transfer and technical assistance components, respectively)

September 1979	Establishment of Soil Management Support Services. Richard L. Guthrie appointed as Acting Director.
October 1979 TT	Conference on Soil Information Systems. Ottawa, Canada Richard L. Guthrie. 5 days
January 1980 TA	ASIA/TR/ARD. Review Proceedings of ASEAN Workshop on Watershed Conservation and Management. Richard Guthrie and Robert Hartung. 4 days
March 1980 TA	USAID/El Salvador. Information on Soil Conservation Practices. Richard Guthrie and Arnold King. 4 days
April 1980 TA	DA/AGR. Review small farm Soil Conservation Project in Guatemala, Project AB/Bua 233. W. M. Johnson and T. S. Gill. 7 days
April 1980 TA	USAID/Senegal. Soil Survey for fuelwood production. Project AG/SEN--685-0219. James Bower. 14 days
April 1980	SMSS Brochure published.
April 1980 TT	Followup meeting of 3rd International Soil Classification Workshop, Athens, Greece. R. W. Arnold and K. W. Flach. 6 days

April TT	1980	Conference on International Reference Base for Soil Classification, Sofia, Bulgaria. R. W. Arnold and K. W. Flach. 7 days
April TA	1980	USAID/Peru. Assist USAID Mission and the Government of Peru in the preparation of a bilateral project related to the development and institutionalization of a soil conservation program. Ray T. Margo, Eugene S. Pope, and Clayton Ogg. 30 days
May TA	1980	USAID/Senegal. Soil survey for fuelwood production. James Bower and James Brown. 21 days
June TA	1980	USAID/Rwanda. Develop legend of national soil map. Armand Van Wambeke. 10 days
June TT	1980	Cameroon, Kenya, Rwanda. Exploratory mission to determine site for 4th International Soil Classification Workshop. Hari Eswaran. 21 days
June TA	1980	USAID/Philippines. Review national Soil Classification Program. Richard Arnold. 30 days
June TA	1980	REDSO/EA. Scientific review of soils information and translation of French data of Kajondi Seed Farm in Burundi. Richard Guthrie. 4 days
July	1980	John Kimble appointed as Soil Chemist in SMSS.
July TA	1980	USAID/Tunisia. Provide landsat imagery. Richard Guthrie. 4 days

July 1980 Dr. Leamy visits Belgium and U.S.
TT

July 1980 Hari Eswaran appointed as consultant to SMSS 75 days.

August 1980 USAID/Thailand. Evaluation and upgrading of soil,
TA water, and conservation organizations, projects,
and practices.
Victor Link and W. Austin. 14 days

September 1980 USAID/Jamaica. Soil survey, land use, and soil
TA classification, training.
Richard Guthrie and Arnold King. 14 days

September 1980 Symposium on management of tropical clay soils. Trinidad.
TT Richard Guthrie. 10 days

September 1980 Mailing of Proceedings of 2nd International Soil
Classification Workshop to international cooperators
(250 copies).

October 1980 USAID/Mali. Information on resource inventory and
TA soil classification to GOM official.
John Witty. 1 day

October 1980 Symposium on Paddy soils, Nanjing PRC.
TT Klaus W. Flach. 11 days

October 1980 USAID/Sudan. Evaluating training and laboratory
TA equipment needs for soil survey and classification.
Hari Eswaran and John Kimble. 14 days

October 1980 DS/AGR. Expert consultation on soil correlation and
TA land evaluation, FAO, in Tanzania.
F. T. Miller. 7 days

November 1980 Hari Eswaran appointed as Program Leader of SMSS.

November 1980 USAID/Senegal. Soil survey for fuelwood production
TA project.
James Brown, Lawson Spivey, Donald McDaniels. 41, 18,
18 days, respectively

November 1980 Phyliss Wigginton resigns as secretary.

November 1980 Rwanda. Planning meeting for 4th International Soil
TT Classification Workshop.
Hari Eswaran and Fred Beinroth. 14 days

December 1980 Brenda Jillson appointed as secretary of SMSS.

December 1980 Annual meeting of Advisory Panel of SMSS.

December 1980 Guy D. Smith commences interviews on Soil Taxonomy.
TT

December 1980 USAID/Liberia. Assistance in soil conservation.
TA William Hance. 15 days

December 1980 Annual meeting of Agronomy Society of America.
TT John Kimble. 5 days

January 1981 USAID/Ecuador. Develop long-term soil management
TA (soil erosion) program.
Luis Daniel. 32 days

January TA	1981	USAID/Swaziland. Request for soil management publications. Richard Guthrie. 1 day
January TA	1981	USAID/Syria. Review possible technical assistance to ACSAD in soil survey and classification. Klaus Flach. 7 days
January TA	1981	USAID/Sudan. Assist in soil sampling for Soil Classification Workshop. W. D. Nettleton. 21 days
January TA	1981	USAID/Ecuador. Develop long-term soil management program. Jesse Hicks, Paul Britt, and Jerry Dutchober. 17 days each
January TA	1981	AID/W. Evaluate refugee resettlement area in Suriname and Belize. Richard Gilbert. 12 days
January TT	1981	Venezuela, Trinidad. Guy Smith consultations. 14 days
January TT	1981	John Kimble. Sampling trip to Puerto Rico
January TT	1981	Symposium on Acid Sulfate Soils. Thailand, Malaysia. Hari Eswaran, John Witty, Warren Lynn. 14 days each
February TA	1981	USAID/Bolivia. Van K Haderlie. 17 days
February TA	1981	USAID/Thailand. Assistance in soil conservation. Gerald Latshaw. 40 days

February	1981	Conference on soils with variable charge, New Zealand.
TT		Hari Eswaran, Richard Anold. 17 days each
February	1981	Three chapters of new Soil Survey Manual mailed out
TT		to international cooperators (350).
March	1981	<u>Soil Classification</u> in United States. M. G. Cline.
TT		Mailed to international cooperators (350).
March	1981	Conference on Aridisols, Israel.
TT		Richard Guthrie. 14 days
April	1981	Brenda Jillson resigns as secretary of SMSS.
April	1981	National Work Planning Conference.
TT		Washington, D.C.
		Frank Moormann invited by SMSS. 4 days
		Special symposium on international technical assistance.
April	1981	Micromorphological evaluation of soils of Rwanda.
TT		Ghent, Belgium
		H. Eswaran. 7 days
May	1981	USAID/Samoa. Training course in Samoa.
TT		James Silva. 7 days
May	1981	Wendy Merchant assumes post of secretary, SMSS.
May	1981	USAID/Indonesia. Assistance in evaluation of
TA		transmigration program of GOI.
		Gary Margheim and Rich Duesterhaus. 10 days each

June TT	1981	4th International Soil Classification Workshop, Rwanda. 28 out of 62 participants funded by SMSS. Richard Arnold, John Kimble, and Hari Eswaran. 15, 15, 21 days, respectively
June TA	1981	USAID/Syria. Training course on erosion under arid conditions, organized by ACSAD. Gordon Stroup and Steve Rawlings. 14 days each
July TA	1981	USAID/India. Assistance in irrigation project of GOI. Ray Meyer. 45 days
August TT	1981	USAID/Sudan. Assistance in planning workshop. Hari Eswaran. 10 days
August TT	1981	International Working Meeting in Soil Micromorphology. London. Hari Eswaran. 8 days

Enclosure IV

4th International Soil Classification Workshop

RWANDA

June 2-12, 1981

Commendations and recommendations

The following commendations and recommendations were passed unanimously at the closing session of the workshop on Friday, June 12, 1981. Three other recommendations were also debated by the participants and not passed.

Commendations

1. The participants of the 4th International Soil Classification Workshop in Rwanda, commend the Soil Conservation Service of the U.S. Department of Agriculture and the U.S. Agency for International Development for the establishment of the Soil Management Support Services (SMSS). The activities of the SMSS in the past 2 years have already established the fact that it can play a positive role in international technical assistance and technology transfer. We are confident that this service is appreciated not only by the scientific community but also by the recipient countries and strongly urge that the services provided under SMSS be strengthened and continued as long as possible.

Proposed by: Prof. A. Tavernier, Director, Geological Institute of Ghent, Belgium.

Seconded by: Prof. F. Moormann, University of Utrecht, Nederland.

2. The participants of the 4th International Soil Classification Workshop wish to record their appreciation to the Government of Rwanda and particularly to the Institute de Science Agronomique Rwanda (ISAR) and the Ministry of Agriculture (MINAGRI) for their invitation to host this workshop and their excellent cooperation in the organization of the workshop.

The success of the workshop was also ensured by the financial, logistics, and technical support of various other organizations to whom we are deeply indebted:

1. Alegemeen Bestuur voor Ontwikkelings Samenwerking (ABOS)-- Belgian technical assistance program in Rwanda and the Belgian Embassy of Rwanda.

2. United States Agency for International Development, Washington, and AID Mission, Rwanda.

3. University of Ghent, Belgium.

We wish to congratulate these organizations and particularly the Soil Management Support Services of the U.S. Department of Agriculture under whose auspices the workshop was organized, and the University of Puerto Rico, for organizing and bringing the workshop to a successful conclusion.

Proposed by: Dr. A. Osman, Director, Soils Division, ACSAD, Syria

Seconded by: Dr. A. Ali, Director, Soil Survey Administration, Sudan

3. The participants of the 4th International Soil Classification Workshop welcome the decision of the Soil Management Support Services to hold the 5th International Soil Classification Workshop in Sudan in 1982 and thank the Soil Survey Administration of Sudan for the invitation to host the Workshop and the Arab Centre for the studies of Arid Zones and Dry Lands (ACSAD, Syria) to cosponsor it. Aridisols and Vertisols are one of the more problematic soils of the world and the 5th International Soil Classification Workshop will not only generate more information on these soils but also assist in the evaluation of the management and classification problems of these soils.

Proposed by: Dr. A. Pecrot, FAO, Rome
Dr. J. Comerma, CENIAP, Venezuela

34

Recommendations

1. The participants of the 4th International Soil Classification Workshop, realizing the need for training of scientists in Less Developed Countries in the use of Soil Taxonomy, soil survey interpretations and methods of soil analyses, and cognizant of the fact that technology transfer can only be realized through an informed pool of scientists in these countries, endorse the efforts of the Soil Management Support Services (SMSS) of U.S. Department of Agriculture and the Benchmark Soils Project (BSP) of the Universities of Hawaii and Puerto Rico in their training programs. Further, the participants would like to urge both SMSS and BSP to enhance these activities and ensure a continuing program in the Less Developed Countries.

Proposed by: Mr. J. Samki, Director, Soil Survey of Tanzania

Seconded by: Mr. L. Moncharoen, Chief Correlator, Thailand

2. Recent studies on the mineralogy of the soils in the intertropical areas clearly shows a need for the refinement of Soil Taxonomy with respect to the use of mineralogical parameters and also the classes at the family level. The participants of the 4th International Soil Classification Workshop recommend that the Soil Management Support Services consider the establishment of an international committee (ICOMIN) on soil mineralogy to evaluate and develop proposals for testing.

Proposed by: Dr. S. Paramanathan, Head, Soil Survey of Malaysia

Seconded by: Prof. A. Herbillon, Catholic University of Louvain,
Belgium

3. To improve communication between Soil Scientists in the Less Developed Countries and to facilitate the technology transfer process, the participants of the 4th International Soil Classification Workshop,

recommend that the Soil Management Support Services investigate the possibility of publishing a journal of Soil Taxonomy. This journal should have an international editorial board and should preferably be published in a Less Developed Country.

Proposed by: Dr. M. Leamy, Director, Soil Bureau, D.S.I.R., New Zealand

Seconded by: Dr. J. Bennema, Agricultural University, Wageningen,
Nederland

4. The participants of the 4th International Soil Classification Workshop commend the Universities of Hawaii and Puerto Rico in their efforts in agro-technology transfer through their Benchmark Soils Project and welcome the proposed larger network referred to as the International Benchmark Sites Network for Agro-technology Transfer (IBSNAT). The participants recommend that IBSNAT assists in determining the major benchmark Low Activity Clay soils that should be considered for future transfer studies, particularly in tropical Africa, and consider the possibility of including such studies in tropical Africa in their network.

Proposed by: Dr. B. T. Kang, IITA, Nigeria
Mr. F. Muchena, Kenya

5. The participants of the 4th International Soil Classification Workshop, request SMSS to coordinate activities relating to data acquisition for updating and revising Soil Taxonomy. National or regional Soil Survey Organization who use or plan to use Soil Taxonomy may be requested to cooperate in this effort to provide data for the work of the International Committees of SMSS. SMSS is also urged to investigate the possibilities of sampling benchmark pedons in intertropical areas and analyze them at the National Soil Survey Laboratories of the Soil Conservation Service, USDA, in order to develop a data bank with well characterized soils.

Proposed by: Dr. F. R. Moormann, University of Utrecht, Nederland

Seconded by: Dr. J. Comerma, CENIAP, Venezuela

6. The participants of the 4th International Soil Classification Workshop, realizing the need for international correlation in soil survey and classification and aware of the fact that the United Nations Environmental Program is initiating activities leading to an international reference base for soil classification, recommend that the International Soil Museum in cooperation with the Soil Management Support Services and other interested organizations, produce a monograph on correlation between terms and categories in Soil Taxonomy with other classification systems particularly the French Systems and the FAO legend. The monograph will deal with soils in the intertropical areas and will be most useful for technical assistance activities in these areas.

Proposed by: Dr. B. T. Kang, IITA, Nigeria

Seconded by: Mr. Elias Awa, EKONA Research, Cameroon

7. Reaffirming the recommendation on interlaboratory cross-checks of soil analyses submitted at the 2nd International Soil Classification Workshop in Malaysia-Thailand in 1978, the participants of the 4th International Soil Classification Workshop wish to commend the International Soil Museum and the Soil Management Support Services for the activities already initiated. As the methods of analyses are based on the SCS procedures, they urge that the monograph on methods of soil analyses be published with minimum delay and be distributed free of charge to all soil survey laboratories in LDC's. They further request both ISM and SMSS to explore possibilities to upgrade LDC laboratories to enable them to produce reliable and reproducible results.

Proposed by: Dr. Cheatle, Zambia

Proposed by: Dr. V. Ndoreyaho
Professor, National University, Rwanda

8. Realizing that little or no information exists on tropical mountain soils, particularly those with the sombric horizon and aware of the fact that at least in Africa, these soils have one of the largest population densities, the participants of the 4th International Soil Classification Workshop request the Soil Management Support Services to initiate a program of collaboration with national and regional institutions to develop more studies on such soils. It is further recognized that the classification of these soils is inadequate in Soil Taxonomy and that such collaborative work will ensure a rationale classification of these soils which can lead to a more efficient transfer of technology. It is also recommended that IBSNAT consider including such soils in their international network of transfer experiments.

Proposed by: Dr. V. Ndoreyaho, Professor, National University of
Rwanda

Seconded by: Mr. M. T. Mutanda, INERA, Zaire

Enclosure V

Papers published by SMSS staff

- Eswaran, H., A. Osman, and M. Iliawi. 1980. Mineralogy and micromorphology of Aridisols. Proc. 3rd International Soil Classification Workshop, Damascus, Syria. In Press.
- Eswaran, H., N. Daud, and Nik Mokhtar. 1981. Extractable aluminum in some acid sulfate soils of Peninsular Malaysia. Proc. 2nd International Symposium on Acid Sulfate Soils, Thailand. In Press.
- Paramanathan, S., and H. Eswaran. 1980. Morphological properties of Oxisols. In: Soils with Variable Charge (Ed. B.K.G. Theng). Publ. New Zealand Soil Science Society 35-44.
- Eswaran, H., and R. Tavernier. 1980. Classification and genesis of Oxisols. In: Soils with Variable Charge (Ed. B.K.G. Theng). Publ. New Zealand Soil Science Society 427-442.
- Eswaran, H. 1981. Scanning electron microscopy as applied to soil research. Proc. VI International working meeting on Soil Micromorphology. London. In Press.
- Eswaran, H. 1982. Research priorities for the tropics. Submitted to the 12th International Soil Science Society Congress. New Delhi, India.
- Flach, K. W., and O. W. Rice. 1980. Principles of classification as applied to paddy soils. Submitted to the Conference on Paddy Soils, Nanjing, China.
- Flach, K. W., C. S. Holzhey, F. de Coninck, and R. J. Bartlett. 1980. Genesis and classification of Andepts and Spodosols. In: Soils with Variable Charge (Ed. B.K.G. Theng). Publ. New Zealand Soil Science Society 411-426.

- Guthrie, R. L. 1980. Analytical requirements for placement in Soil Taxonomy and methods used. Proc. 3rd International Soil Class. Workshop. Syria. In Press.
- Guthrie, R. L. 1981. Classification of Aridisols in Soil Taxonomy. Proc. Int. Conference on Aridisols. Israel. In Press.
- Guthrie, R. L. 1982. Classification of Vertisols in Soil Taxonomy. Submitted to the 12th International Soil Sci. Soc. Congress. New Delhi, India.
- Kimble, J. M., and C. S. Holzhey. 1982. An evaluation of KOH extractable aluminum in Andepts (Andisols). Submitted to the 12th International Congress of Soil Science, New Delhi, India.
- Kimble, J. M., R. E. Nelson, and H. Eswaran. 1981. Relating observable characteristics and laboratory properties in some soils of Rwanda. Submitted to the Annual Meeting of the Agronomy Society of America, Atlanta, Georgia.
- Kimble, J. M. 1981. Analytical techniques for soils with variable charge. Presented at 4th International Soil Clasification Workshop, Rwanda.

Enclosure VI

Visitors to SMSS

<u>Date</u>	<u>Name</u>	<u>Country/City</u>
October 1980	R. Fletcher Thomas	New Zealand
December 1980	F. R. Moormann	Netherlands
	Guy D. Smith	Belgium
	R. Tavernier	Belgium
	R. Dudal	Italy
	F. H. Beinroth	Puerto Rico
	W. Sombroek	Netherlands
	A. Van Wambeke	New York
January 1981	L. A. Nnadi	Nigeria
	M. Gardiner	Ireland
February 1981	C. A. Reynolds	Haiti
March 1981	L. Daniels	Montana
	J. King	Yemen
	J. E. Bower	Texas
	T. Forbes	New York
	April 1981	W. Kantor
	M. L. Leamy	New Zealand
	C. Scoppa	Argentina
	J. Comerma	Venezuela
	R. Tavernier	Belgium
	F. R. Moormann	Netherlands
	A. Osman	Syria
	June 1981	T. I. Ashaye
T. A. Adegbola		Nigeria
F. Colmet-Daage		Martinique
B. Ortega		Mexico
T. M. Flores		Mexico
H. Beromen		Mexico
	S. H. Davis	Gambia

July 1981	J. Jackson	Library of Congress, D.C.
	J. Hornbeck	Library of Congress, D.C.
	D. L. Lawson	World Relief, D.C.
	P. M. Cauley	Lesotho

Foreign Visitors to the National Soil Survey Laboratory (SMSS)

November 1980	T. M. Metra	Philippines
	J. Bouma	Netherlands
December 1980	H. Salaymeh	Syria
April 1981	D. Kargbo	Sierra Leone
	M. Renger	Germany
June 1981	W. C. K. Hammer	Australia
	S. Iqbal	Bangladesh
	J. F. M. Ronchaine	Belgium
	A. Darwis	Indonesia
	H. Katagiri	Japan
	Z. Khan	Pakistan
	N. Wilken	South Africa
	U. Knuppel	
	A. Troni	Washington, D.C.
	Zhu Xiang San	China
	Wang Wei Qi	China
	Zheng Xing Wu	China
	Huang Zi Li	China
	Shi Ding	China
	Kang Shu Sen	China
July 1981	Guo Tingfu	China
	Zeng Boqing	China